Time to tip the scales: tackling overweight and obesity in primary care

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Chapter 1

General introduction
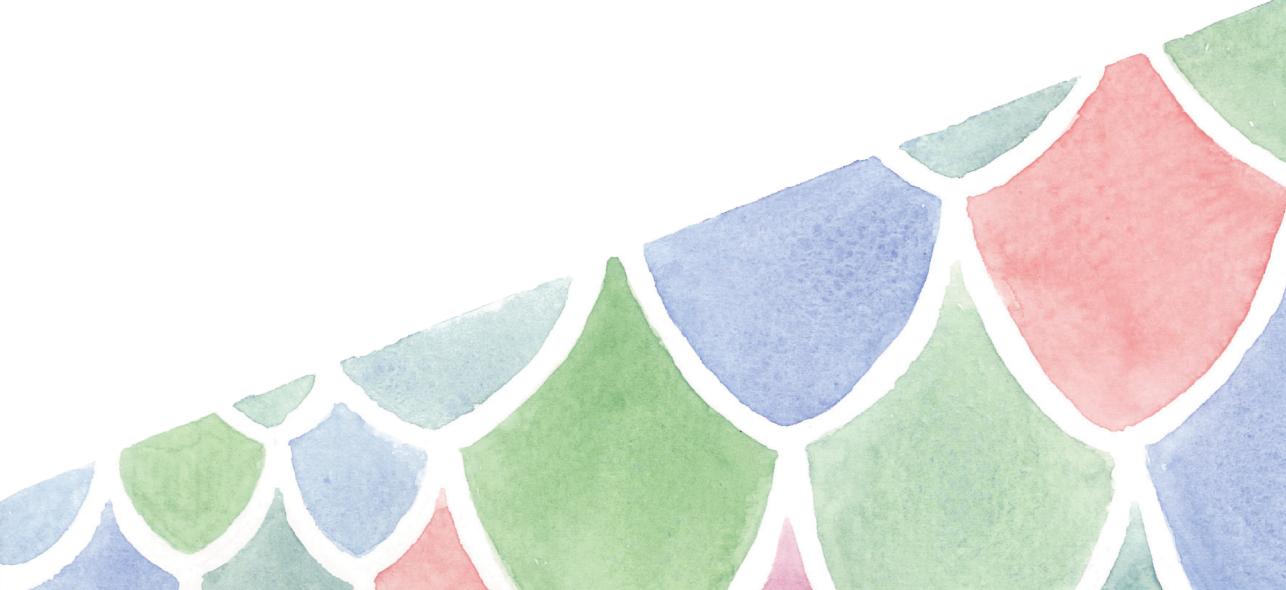
General introduction

Obesity is a growing global health problem affecting many countries, and it is recognised as a chronic disease (1). In the Netherlands, almost half of the adults are classified as overweight, with around fifteen percent considered obese (2). According to the World Health Organization, a body mass index of ≥25 kg/m^2 is classified as overweight and a body mass index ≥30 kg/m^2 is classified as obesity (1). Body mass index is defined as a person's weight in kilograms divided by the square of their height in metres (kg/m^2) (3).

Obesity is associated with various health problems, including type II diabetes, cardiovascular disease, mental health problems, joint complaints, and certain cancers (4-6). The rise in obesity-related diseases is placing an increasing burden on the healthcare system and has broader societal consequences. Healthcare costs are rising due to the need for ongoing treatment, medication, and medical appointments (7-9). Furthermore, individuals with obesity contribute less to society due to lower labour force participation, more unhealthy years of life, and an increased risk of premature mortality (10-12). These burdens on the healthcare system and society underscore the need to adapt to the growing prevalence of obesity, with the ultimate goal of preventing it: *Time to tip the scales on obesity and find balance.* To help to address these issues, this thesis aims to provide a contribution to the improvement of obesity management in primary care. In this introduction, we first describe key professionals and organisations involved in addressing obesity alongside an overview of how primary care is organised in the Netherlands. Furthermore, we describe the complexity of obesity, and the challenges involved in identifying high-risk patients with obesity. Finally, we present the aims and outline of the thesis, along with an overview of the studies included.

Professionals and organisations involved in addressing obesity

Various healthcare providers and organisations are involved in addressing obesity at macro- meso- and micro-levels.

Macro-level

In the Netherlands, the Ministry of Health, Welfare and Sport sets nationwide health policies and regulations, and funds large-scale preventive initiatives. One such initiative is the combined lifestyle intervention programme, which aims to promote healthier lifestyles among individuals with overweight or obesity. The programme promotes weight loss and reduces the risk of chronic diseases by encouraging behavioural changes in nutrition, physical activity, sleep, and stress management (13-15). Since

January 2019, the government has included the combined lifestyle intervention programme in the health insurance package, meaning that health insurances now reimburse this intervention for individuals with obesity and an increased risk of health-related risk (16). Other organizations at the macro-level include the pharmaceutical industry, which plays a role by researching and developing medications and treatments for weight management and obesity-related diseases. This is particularly relevant at present, given the emergence of promising new medications for weight loss (17).

Meso-level

The municipal public health services (*Gemeentelijke Gezondheidsdienst, GGD*) play a key role in monitoring public health, providing community-based preventive programmes, and promoting lifestyle interventions at the local level, for example initiatives in school settings, collaborations with primary care and social services, walking groups and community exercise programmes. The GGD also contributes to public awareness campaigns, early detection of health risks, and the development of supportive environments that facilitate healthy choices (18).

Micro-level

Various healthcare providers are involved in identifying and managing patients with obesity. General practitioners play a crucial role in this, as they are often the first point of contact for patients seeking help. They can provide essential guidance and referrals for weight management. Other healthcare providers involved in obesity management include the dietitians, psychologists, physiotherapists, social workers, lifestyle coaches and clinical specialists (Figure 1). In particular, the dietitian, physiotherapist, and lifestyle coach play an important role in the implementation of the combined lifestyle intervention. A person's socio-economic position, including their income, access to healthy food, opportunities for physical activity, and cultural attitudes towards weight, also plays an essential role in the development and management of obesity.

The Dutch primary healthcare system

In the Dutch primary healthcare system, general practitioners act as gatekeepers. They manage patient access to specialised care and coordinate overall healthcare services. More than 75% of patients contact their general practitioner at least once a year, with a mean of about five points of contact per year. However, this frequency varies based on age and health status (19). Patients with chronic diseases, including obesity, visit their general practitioner more frequently, thereby increasing the burden on primary care (20-22). This increase in visits results in a higher workload for general practitioners, requiring them to invest more time. However, this increased interaction

with patients also allows general practitioners to identify and manage obesity. Their main tasks in addressing obesity include discussing weight, diagnosing obesity, and referring patients with obesity based on their presumed health risk. In daily practice, many general practitioners fail to address obesity and experience difficulties adhering to practice guidelines (23, 24). Previous research has shown that body mass index measurements are underreported in the electronic health records (25-29) and less than half of the general practitioners refer patients with obesity to a weight management professional (27, 30). In addition to healthcare providers perceiving difficulties, patients with obesity often encounter a social stigma in healthcare settings (31-36). This stigma causes these patients to avoid support from their general practitioners, thereby reducing opportunities for general practitioners to address obesity (35, 37, 38). However, research has shown that patients want support with weight management from their healthcare providers, albeit in a non-stigmatizing manner (39, 40). This highlights the importance of examining the barriers that healthcare providers face when addressing obesity.

Complexity of obesity

According to the World Health Organization, obesity is recognised as a chronic disease (1) which induces metabolic dysfunction and inflammation of adipose tissue (41, 42). Obesity involves not only an increase in subcutaneous fat but also, and more critically, an increase in visceral adipose tissue. This visceral adipose tissue is often dysfunctional, leading to insulin resistance, hypertension, an adverse lipid profile, and excessive blood clotting (43, 44).

In the past, obesity was believed to be simply a matter of an imbalance between calorie intake and physical activity. However, obesity is now recognised as a complex, multifactorial condition (45). Although lifestyle factors such as a poor diet and physical inactivity are important contributors, these factors exist within a broader context. The development of obesity involves an interplay of biological, behavioural, social, and environmental influences (46). Other contributing factors include the side-effects of certain medications, socioeconomic disadvantage, psychological factors, hormonal and hypothalamic dysregulation, and genetic predisposition (Figure 1) (46-48).

The psychological factors are receiving increasing attention in obesity research, particularly regarding the association between anxiety, depression, and stress, and the development of obesity. The association between anxiety and obesity remains unclear. In a systematic review by Gariepy et al. (2010), an association was found between obesity and anxiety. However, the reverse relationship, whether anxiety leads to obesity

is inconsistent, and requires further research (49). Studies investigating the bidirectional relationship between depression and obesity have shown that the presence of one increases the risk of developing the other (50, 51). Stress can also contribute to obesity and is often triggered by negative life events such as a divorce, the death of a family member, or unemployment (52). Stress is defined as a negative emotional experience associated with biochemical, physiological and behavioural changes (53). It induces unhealthy eating behaviours that can lead to weight gain (52, 54), as well as metabolic changes that may influence the regulation of appetite and body weight (55). In addition to the factors that contribute to obesity, there are also important consequences of obesity (Figure 1) (5). The most prevalent of these are cardiometabolic complications. Among all these cardiometabolic conditions, the risk of type II diabetes is highest (5), but other cardiovascular diseases are also common (4, 5). However, these are not the only associated conditions with obesity. Obesity can lead to various other health problems, e.g., sleep apnoea, osteoarthritis, cancer, gastroesophageal reflux disease, and fatty liver disease (5). In conclusion, obesity is not just a weight issue; it is a complex condition that can affect the overall health in many ways.

Identification of high-risk patients with obesity

As described above, general practitioners are considered as key figures in identifying patients with obesity (56). Obesity is a complex condition, and it can be challenging to determine which patients are at increased risk. Until recently, body mass index was the main parameter used to identify obesity. Although body fat distribution is an important risk factor in the development of cardiometabolic diseases (57), body mass index alone does not accurately reflect body fat distribution (58). Consequently, relying solely on body mass index may overlook patients at relatively high risk of developing obesity-related diseases. Furthermore, individuals with a high muscle mass, which is generally considered healthy, may be incorrectly classified as being at risk.

Measuring waist circumference is an easy method to assess visceral adipose tissue that can be performed in a clinical setting (58-60). A normal measurement of waist circumference is defined as ≤ 94 cm for men and ≤ 80 cm for women, while an increased waist circumference is defined as > 94 cm for men and > 80 cm for women (61). Despite previous studies showing an association between an increased waist circumference and cardiovascular disease and mortality (62-66), the current body mass index-centric approach remains deeply embedded in clinical practice. This influences not only diagnostic criteria, but also treatment protocols, medication prescriptions, and reimbursement policies for general practitioners and patients. Recently, however, there has been a shift towards a more comprehensive approach in clinical practice.

Some updated guidelines suggest that waist circumference should play a more prominent role in obesity management.

Current guidelines in the Netherlands

In the Netherlands, the management of obesity and its associated cardiovascular risk in primary care is guided by two key guidelines: the national multidisciplinary guideline *obesity* and the guideline *cardiovascular risk management* of the Dutch College of General Practitioners (NHG). While both guidelines aim to identify patients at risk to enable early treatment and ultimately prevent cardiovascular disease, they differ in their approach to using waist circumference to identify those at risk of obesity-related diseases.

The national multidisciplinary guideline *obesity* (updated in 2023) from the Netherlands advises assessing the weight-related health risk of obesity-related diseases. This risk is estimated based on body mass index, in combination with waist circumference and the presence or absence of certain comorbidities (Table 1) (67). Treatment recommendations can be provided based on the category the patient belongs to, e.g. lifestyle advice, combined lifestyle interventions, bariatric surgery and pharmacological treatment.

The guideline of the Dutch College of General Practitioners (NHG) *cardiovascular risk management* (updated in 2024) recommends performing a cardiovascular risk assessment on patients with certain risk factors (e.g. patients with obesity (BMI≥30 kg/m²), diabetes mellitus or chronic obstructive pulmonary disease), in order to identify those at high risk of developing cardiovascular disease (68). Although waist circumference is part of the general physical examination in this guideline, it is not specifically used to determine eligibility for a cardiovascular risk assessment.

The differences between the guidelines highlight a gap in the current approach to managing obesity and cardiovascular disease. This discrepancy presents an opportunity for further research to ensure effective identification and management of high-risk patients in primary care.

Table 1 Weight-related health risks in adults

	Normal waist circumference or absence of comorbidity	Increased waist circumference Men ≥102cm, women ≥88cm	Comorbidity*
Overweight BMI ≥25 and <30kg/m²	Slightly increased risk	Moderate increased risk	Moderate increased risk
Obesity class 1 BMI ≥30 and <35 kg/m²	Slightly increased risk	Increased risk	Increased risk
Obesity class 2 BMI ≥35 and <40 kg/m²	Increased risk	Extremely increased risk	Extremely increased risk
Obesity class 3 BMI ≥40 kg/m²	Extremely increased risk	Extremely increased risk	Extremely increased risk

* Comorbidities include an increased cardiovascular risk, chronic kidney disease, metabolic syndrome, type II diabetes, cardiovascular disease, respiratory diseases, diagnosed gastro-intestinal reflux disease, metabolic-dysfunction associated steatotic liver disease (MASLD), diagnosed cox/gonarthrosis, fertility problems, obesity-related comorbidities for which weight loss has or is likely to have a positive effect (67).

Aim of this thesis

This thesis aims to provide a contribution to the improvement of obesity management in primary care by focusing on 1. the current practices of obesity management in primary care and 2. the identification of patients with obesity at increased risk of further long-term weight gain or cardiovascular disease.

I. Current practices

Although all levels of healthcare (micro-, meso- and macro-level) are involved in tackling the obesity pandemic, general practitioners play a key role in managing patients with obesity at the micro-level. It is important to examine current practices in primary care to support general practitioners in effectively managing these patients. The first aim of this thesis is therefore to examine the current practices of obesity management in primary care.

II. Identification of high-risk patients

Obesity is a multifactorial condition involving complex interactions between biological, behavioural, social, and environmental factors. Visceral fat, which accumulates around internal organs, is a key factor in the development of obesity-related health risks, particularly cardiovascular diseases. Understanding the complexity of obesity is essential for identifying patients at high risk of obesity-related diseases, enabling early treatment and enhancing prevention of obesity. The second aim of this thesis is therefore to improve the identification of patients with obesity at increased risk of further long-term weight gain or cardiovascular disease.

Figure 1 illustrates the various healthcare providers involved in obesity management and the complexity of the condition. The key areas of the focus in this thesis are marked in different colours, with each colour corresponding to a different chapter of this thesis.

Outline of the thesis

Part I: Current practices

In the first part of this thesis, we examine the current practices of obesity management in Dutch primary care. The findings of part I are described in **Chapters 2** and **3**. **Chapter 2** examines the current recording practices of body mass index, overweight, and obesity in primary care including a sub-analysis of age, sex, and comorbidities. **Chapter 3** explores the barriers and facilitators to addressing obesity in primary care regarding discussing weight, diagnosing, and referring patients with obesity in a qualitative study.

Part II: Identification of high-risk patients

In the second part of this thesis, we identify patients with obesity at increased risk of further long-term weight gain or cardiovascular disease. The findings of part II are described in **Chapters 4** and **5**. **Chapter 4** investigates the association between anxiety, depression, negative life events, and quality of life with weight change over ten years in a middle-aged, population-based cohort with overweight or obesity. **Chapter 5** consists of three parts and uses a mixed-methods approach. The first part examines the current recording practices of general practitioners in measuring waist circumference. The second part explores barriers and facilitators of general practitioners in measuring waist circumference. The last part examines the contribution of measuring waist circumference in identifying patients at increased risk of cardiovascular disease. Finally, **Chapter 6** presents a discussion of the main findings of this thesis, with implications for practice and suggestions for future research.
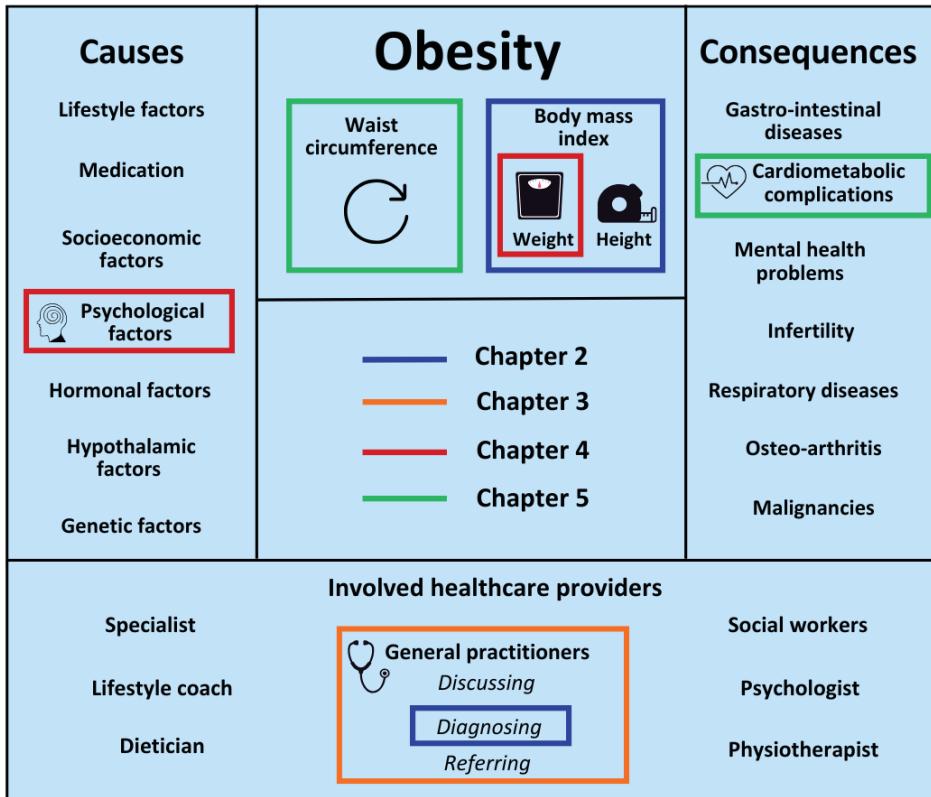
Figure 1 Illustration of the complexity of obesity combined with the outline of the subjects addressed in the different chapters of this thesis highlighted in blue (**Chapter 2**), orange (**Chapter 3**), red (**Chapter 4**), and green (**Chapter 5**)

Overview of the used data sources

Figure 2 shows the data sources used in each chapter of the thesis.

The Extramural LUMC (Leiden University Medical Center) Academic Network (ELAN)

In **Chapters 3** and **5**, we analyse routine healthcare data from ELAN. ELAN is a regional, integrative population-based data infrastructure comprising >1 million individuals. Routinely collected medical, social, and public health data at the patient level from the greater The Hague and Leiden area is linked within ELAN (69, 70). The ELAN data infrastructure has multiple potentials and objectives serving different actors e.g. it provides policymakers and healthcare providers with data and information enhances citizen involvement, and increases knowledge through scientific research. General practitioners enlisted in ELAN can also be recruited for qualitative studies. In this

thesis, we use routine healthcare data from the electronic health records of general practices enlisted in ELAN.

Qualitative data

In **Chapters 2** and **5**, qualitative data is analysed and collected from six focus groups with 21 general practitioners working in primary care in the Netherlands. Focus groups were organised with three to five general practitioners. The general practitioners were recruited from the extramural LUMC academic network (ELAN), an online platform for general practitioners (HAweb), a local network of locums and from the researchers' personal network.

The Netherlands Epidemiology of Obesity (NEO) study

In **Chapters 4** and **5**, we analyse data from the *Netherlands Epidemiology of Obesity* (NEO) study, a population-based cohort study including 6671 men and women aged 45 to 65 years (71). All inhabitants, living in the greater area of Leiden, the Netherlands, with a self-reported body mass index (BMI) of 27 kg/m^2 or higher and were eligible to participate in the NEO study. Additionally, all inhabitants aged between 45 and 65 years from one adjacent municipality (Leiderdorp, the Netherlands) were invited to participate, irrespective of their body mass index, allowing for a reference distribution of body mass index. Prior to the study visit, participants completed questionnaires at home with respect to demographic, lifestyle, and clinical information. Participants visited the NEO study center for an extensive physical examination, including anthropometry.

	ELAN	Qualitative data	NEO
Chapter 2	X		
Chapter 3		X	
Chapter 4			X
Chapter 5	X	X	X

Figure 2 Overview of the used data sources in the thesis
ELAN: Extramural LUMC Academic Network, NEO: The Netherlands epidemiology of obesity study

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