Summary
This thesis is about two health-related behaviours: physical activity and sedentary behaviour. Physical activity is defined as “any bodily movement produced by skeletal muscles that results in energy expenditure” and comprises activities such as exercising, cycling to and from work, taking the stairs, or gardening. It is recommended that adults engage in at least 150 minutes of moderate to vigorous physical activity per week. Not meeting this recommendation is commonly referred to as physical inactivity. Sedentary behaviour, on the other hand, includes activities such as watching television, working at a desk, eating a meal, or driving a car. It has been defined as “any waking behaviour characterised by a low energy expenditure while in a sitting or reclining position” and is a relatively newly recognised health risk. Physical inactivity and high levels of sedentary behaviour are associated with negative health outcomes such as type 2 diabetes, cardiovascular diseases, certain cancers, and premature death.

Knowing how many people are inactive and/or sedentary (the ‘prevalence’) and what factors are associated with these behaviours (the ‘correlates’) is needed to monitor changes in population levels, identify and target populations at risk, and evaluate public health strategies. While physical activity levels are regularly monitored with varying estimates, sedentary behaviour prevalence data are scarce. In addition, correlates of especially sedentary behaviour are largely unknown. Therefore, the research in this thesis, that was part of the European ‘Determinants of Diet and Physical Activity’ (DEDIPAC) Knowledge Hub, aimed to study the prevalence and correlates of sedentary behaviour and physical activity in European adults. The primary emphasis was on sedentary behaviour, as less is known about this behaviour than about physical activity.

The prevalence of sedentary behaviour (chapter 2) and physical activity (chapter 3) across Europe were investigated by means of systematic literature reviews. These reviews aimed to 1) provide an overview of the existing cross-European studies that assessed sedentary behaviour and physical activity in European adults, 2) describe the (variation in) population levels according to these studies, and 3) discuss the impact of the measurement methods. For sedentary behaviour, a total of 12 articles were identified, half of which were based on the Eurobarometer surveys. These surveys used a self-report, single-item question to assess sedentary time, a measurement method which is prone to recall and social desirability bias. However, these Eurobarometer surveys were the only studies that included a large number of European countries and thus provided the opportunity for cross-European comparison. For physical activity, 25 articles were included, reporting on 16 different studies. These studies showed a large variation in assessment methods, reported outcomes and, consequently, presented population levels. Based on these results, it was concluded that the population levels of sedentary time and physical activity in European adults are currently largely unknown.
Data from the 2013 Eurobarometer survey were used in chapter 4 to assess the prevalence as well as a wide range of potential correlates of self-reported sitting time of more than 26,500 adults across all 28 European Union Member States. In this ‘European Sitting Championship’, participants reported a median of five sitting hours per day, with 19 percent reporting to sit more than 7.5 hours per day. This number ranged from 9 percent in Spain to 32 percent in the Netherlands. Adults from northern European countries generally reported more sitting time than adults in the south. Occupation and education were the strongest correlates of sitting time; people with white collar occupations and higher educational levels reported more sitting.

Chapter 5 reports on an initiative to pool, harmonise and re-analyse national accelerometer data from England, Norway, Portugal and Sweden. ActiGraph accelerometer count data from approximately 9,500 adult participants were centrally processed using the same algorithms. This data showed that 23 percent accumulated more than 10 sedentary hours per day, 72 percent did not meet the physical activity recommendations, and 9 percent were classified as sedentary and inactive. Norwegian adults were most often sedentary, while adults in England were most inactive. Age and weight status were positively associated with sedentary time and physical inactivity. Men and higher educated people were more likely to be sedentary, while women and lower educated people were more likely to be inactive.

In chapter 6, data from the 2007/08, 2011/12 and 2014/15 Australian Health Surveys were used to assess recent trends in population levels, as well as potential correlates, of self-reported sitting time in over 48,500 Australian adults. The proportion of respondents that accumulated ≥7 hours of combined occupational and leisure sitting time per day was 38 percent in 2007/08, 39 percent in 2011/12 and 42 percent in 2014/15. In addition, 15, 14 and 15 percent were defined as being sedentary and inactive, respectively. These upward trends were statistically significant, with the main increase observed in 2014/15. High educational level and high household income were most strongly associated with high sitting time, while old age and low self-reported health were most strongly associated with being sedentary and inactive.

Ethnic differences in sedentary behaviour were studied in chapter 7. The prevalence and potential correlates of objectively measured sedentary time were compared between almost 450 adults with a Dutch, Moroccan, African Surinamese, South-Asian Surinamese and Turkish origin living in the city of Amsterdam, the Netherlands. Gender- and age adjusted levels of sedentary time ranged from 569 minutes per day for participants from a Moroccan and Turkish origin to 621 minutes per day for African Surinamese participants. The prevalence and correlates of sedentary time did not statistically significantly differ between the ethnic groups, but statistical power was limited due to the relatively small number of participants. Meeting the physical
activity recommendations was the only statistically significant correlate of sedentary time identified, and was inversely related to sedentary time across all ethnic groups.

This thesis shows that the true population levels of sedentary behaviour and physical activity of European adults are currently unknown. Based on the harmonised accelerometer data, approximately 20 percent of European adults might be sedentary, 70 percent inactive, and 10 percent sedentary and inactive. These high percentages warrant the need for public health strategies aiming to improve these behaviours. Men, obese people, people with higher socio-economic status and those who are physically inactive are more often sedentary. Women, older people, obese people and lower educated people are more often physically inactive. Especially for sedentary behaviour, the evidence base is limited and mainly focused on individual-level correlates, while a broader perspective is needed to fully understand this behaviour.

The findings of this thesis demonstrate the need for longitudinal, cross-European surveillance of sedentary behaviour, physical activity and their correlates or determinants. Future studies are advised to use a combination of objective and subjective measurement methods to measure sedentary behaviour and physical activity, and quantitative as well as qualitative study designs to assess determinants of these behaviours, inspired by theoretical models and conceptual frameworks. In addition, public health strategies to increase physical activity and decrease sedentary behaviour levels are warranted. People should be encouraged to meet the physical activity recommendations and limit and break up their sitting time, ultimately aiming for a population with a healthy balance between sitting, standing and physical activity behaviours.