Physical activity among Swedes in general and minority women in particular

Marita Södergren
From Department of Neurobiology, Care Sciences and Society, Center for Family and Community Medicine, Karolinska Institutet, Stockholm, Sweden

PHYSICAL ACTIVITY AMONG SWEDES IN GENERAL AND MINORITY WOMEN IN PARTICULAR

Marita Södergren

Stockholm, 2009
Hell Yeah

Time is all we'll ever need
But it's gotta have a meaning
You be careful how it's spent
cause it isn't going to last
I hear you wondering out loud
are you ever going to make it
Will you ever work it out
Will you ever take a chance and
Just believe you can
Hell Y eah Y ou Will
Y ou're going to be okay
Y ou might get lost
But then you'll find a way
Don't go alone
Can't be afraid
Hell Y eah this life is here
A nd it's made for living
and loves a gift that's made for giving
you Give it all away and have it still
A nd H eil y eah you will

Neil Diamond

To Jesper

You're the reason for my today
ABSTRACT

Despite the well-known positive effects of physical activity on health, many people are not sufficiently active. Several studies have reported a low level of physical activity among minority women, but few studies have investigated the reason why. The purpose of this thesis was to investigate physical activity among Swedes with a special focus on minority women. The specific aims were to examine the association between physical activity and self-rated health, patterns of physical activity and the relationship between physical activity and country of birth in minority women. In order to increase our understanding of the possible underlying causes of low levels of physical activity, this thesis also explores minority women’s attitudes and experiences of physical activity and exercise, using a qualitative approach.

A sample (n = 3756) of the Swedish population (aged 25–64) was used to examine the association between physical activity and self-rated health (Study I). Patterns of physical activity and the relationship between physical activity and country of birth were examined in a simple random sample (n = 1945) of minority women in Stockholm (Studies II–III). The women (aged 18–65) were all first-generation immigrants born in Finland, Iraq and Chile. A random sample of Swedish women (n = 704) was used as a control group (Study II). In the qualitative part, data were collected through interviews in 10 focus groups (Study IV). The participating women (n = 63) were first-generation immigrants (aged 26–65) born in Iraq, Chile and Turkey and living in Stockholm.

The results showed an apparent gradient: with increasing physical activity, the odds of good self-rated health increased. Women born in Sweden reported more exercise and rated their health better than foreign-born women did. The patterns of physical activity varied within and between different domains of physical activity and countries of birth. Finnish women were physically active to a higher degree than women from Chile and Iraq; they had the highest total amount and highest average intensity of physical activity. However, there were no significant differences in time spent in the lower intensity categories. The results imply that the Finnish women balanced sedentary time with active periods at higher intensities. A strong and varied association between country of birth and physical activity (subjectively and objectively assessed) was found. Women from Finland were more likely and women from Iraq less likely to report higher levels of physical activity than Swedish-born women. Women from Finland also had significantly more time at higher intensities compared to Chilean and Iraqi women. The women in the focus groups expressed a strong desire to start exercising, but they felt that they were unable to do it by themselves. They all agreed that the local community should help them and arrange appropriate exercise.

The diverse results underline the need to examine physical activity in each minority group separately. The included socio-demographic and lifestyle variables could not explain the differences between countries of birth. This implies that there are other factors influencing the association, such as cultural ones. Future studies should try to identify factors that have an impact on the levels of physical activity among minority women.
LIST OF PUBLICATIONS


III. Södergren M, Sundquist K, Johansson SE, Sundquist J, Hagströmer M. Physical activity patterns among minority women in Sweden assessed by accelerometry. *Submitted*

IV. Södergren M, Sundquist K, Johansson SE, Sundquist J, Hagströmer M. Associations between health-enhancing physical activity and country of birth among women. *Submitted*
CONTENTS

1 INTRODUCTION ........................................................................................................7
2 BACKGROUND ........................................................................................................8
   2.1 Physical activity ............................................................................................8
      2.1.1 Physical activity recommendations ...............................................8
      2.1.2 Accumulation of physical activity ................................................8
   2.2 Sedentary behaviour and physical inactivity .............................................9
   2.3 Physical activity and health .........................................................................10
      2.3.1 Self-rated health .............................................................................10
   2.4 Assessment of physical activity .................................................................11
      2.4.1 Subjective methods ........................................................................11
      2.4.2 Objective methods ........................................................................12
   2.5 Assessment of sedentary behaviour ...........................................................12
   2.6 Correlates of physical activity .....................................................................12
      2.6.1 Social ecological model and stages of change .............................13
   2.7 Minorities in Sweden ................................................................................14
   2.8 Physical activity in Sweden ......................................................................14
      2.8.1 Physical activity in minority women ...........................................15
3 AIMS ......................................................................................................................17
4 MATERIALS AND METHODS ............................................................................19
   4.1 Participants and data collection .................................................................19
      4.1.1 The SCB Survey (Study I) ...............................................................19
      4.1.2 The CeFAM Survey, quantitative part (Studies II–III) ..........19
      4.1.3 The CeFAM Survey, qualitative part (Study IV) ..................20
   4.2 Ethical approval .........................................................................................21
   4.3 Assessment of physical activity (STUDies I–III) ......................................22
      4.3.1 Study I ............................................................................................22
      4.3.2 Study II ..........................................................................................22
      4.3.3 Study III .........................................................................................23
   4.4 Explanatory variables (StudIES I–III) ......................................................24
   4.5 Data analysis ..............................................................................................26
      4.5.1 Studies I–III ....................................................................................26
      4.5.2 Study IV .........................................................................................27
5 RESULTS ..............................................................................................................28
   5.1 Study I .........................................................................................................28
      5.1.1 Physical activity and self-rated health ..........................................28
   5.2 Studies II–III ..............................................................................................29
      5.2.1 Amount and intensity of physical activity ....................................29
      5.2.2 Physical activity and country of birth ...........................................29
   5.3 Study IV ......................................................................................................34
      5.3.1 Enabling exercise ..........................................................................34
      5.3.2 Strategies for deciding to exercise .................................................35
6 DISCUSSION .........................................................................................................36
   6.1 Main findings ...............................................................................................36
   6.2 Strengths and limitations ............................................................................36
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.2.1 Strengths</td>
<td>36</td>
</tr>
<tr>
<td>6.2.2 Limitations</td>
<td>37</td>
</tr>
<tr>
<td>6.3 General discussion – interpretation</td>
<td>38</td>
</tr>
<tr>
<td>6.3.1 Physical activity and self-rated health</td>
<td>39</td>
</tr>
<tr>
<td>6.3.2 Patterns of physical activity</td>
<td>40</td>
</tr>
<tr>
<td>6.3.3 Physical activity and country of birth</td>
<td>41</td>
</tr>
<tr>
<td>6.3.4 Minority women’s ideas of enabling exercise</td>
<td>42</td>
</tr>
<tr>
<td>6.4 Possible Mechanisms</td>
<td>43</td>
</tr>
<tr>
<td>6.5 Clinical and public health implications</td>
<td>44</td>
</tr>
<tr>
<td>7 CONCLUSIONS</td>
<td>45</td>
</tr>
<tr>
<td>8 ACKNOWLEDGEMENTS</td>
<td>46</td>
</tr>
<tr>
<td>9 SAMMANFATTNING – SUMMARY IN SWEDISH</td>
<td>48</td>
</tr>
<tr>
<td>10 REFERENCES</td>
<td>50</td>
</tr>
</tbody>
</table>
## LIST OF ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI</td>
<td>Body mass index</td>
</tr>
<tr>
<td>CeFAM</td>
<td>Center for Family and Community Medicine (Centrum för allmänmedicin)</td>
</tr>
<tr>
<td>CI</td>
<td>Confidence interval</td>
</tr>
<tr>
<td>DLW</td>
<td>Double-labelled water</td>
</tr>
<tr>
<td>IPAQ</td>
<td>The International Physical Activity Questionnaire</td>
</tr>
<tr>
<td>MET</td>
<td>Metabolic equivalent</td>
</tr>
<tr>
<td>MVPA</td>
<td>Moderate- and vigorous-intensity physical activity</td>
</tr>
<tr>
<td>OR</td>
<td>Odds Ratio</td>
</tr>
<tr>
<td>SALLS (ULF)</td>
<td>Swedish Annual Level of Living Survey (Undersökningarna av levnadsförhållanden)</td>
</tr>
<tr>
<td>SCB</td>
<td>Statistics Sweden</td>
</tr>
<tr>
<td>SD</td>
<td>Standard deviation</td>
</tr>
<tr>
<td>SES</td>
<td>Socioeconomic status</td>
</tr>
<tr>
<td>WHO</td>
<td>The World Health Organization</td>
</tr>
</tbody>
</table>
1 INTRODUCTION

The World Health Organization (WHO), states that lack of physical activity is a global public health problem and large health benefits can be achieved if sedentary individuals are encouraged to reach at least moderate levels of physical activity. It is also important to promote active breaks in order to avoid prolonged sedentary periods. Over the past decade a large number of studies have striven to identify both those individuals who are insufficiently active and those who are sufficiently active according to the current physical activity recommendations. The everyday life of most people includes, however, both active and sedentary periods and it is therefore important to examine patterns of physical activity. Thereby it is possible to distinguish those who balance sedentary time with active periods from those who are most inactive and consequently have a higher risk of developing various health problems.

From a public health perspective, leisure time provides opportunities for engaging in “healthy” and “unhealthy” behaviour. For example, the number of people in Sweden who exercise on a regular basis is increasing steadily, whereas those who do not exercise are decreasing slightly. Thus, a trend towards polarization can be seen, in which the population is divided into those who are exercising and those that are not. Why some people are into exercise and some reject it is an unanswered question: perhaps they just don’t see themselves as exercising people even though they have an active lifestyle and could be classified as such. In addition, the terms “exercise” and “physical activity”, frequently used in surveys, may be understood differently. There are also substantial differences in the level of physical activity between individuals on the basis of individual factors such as age, gender, education, socioeconomic status and country of birth. Since physical activity can be accumulated throughout the day, it is important to examine the total amount of physical activity and not only leisure-time physical activity or exercise. It is also important to use validated questions when screening for sedentary people.

The established link between physical activity and health has resulted in several studies on physical activity. For example, telomere length and sets of genes are associated with physical activity and various environments also have an impact on physical activity. However, even if it were possible to modify all these factors, it is important to remember that the desire and willingness to be physically active lies within the individual. This thesis will not be able to explain the complex and multidimensional factors that are associated with the individual’s choice to be physically active. However, it could increase our knowledge of physical activity patterns among Swedes in general and minority women in particular, which could provide information that has the potential to decrease disparities in health.
2 BACKGROUND

2.1 PHYSICAL ACTIVITY

The definition of physical activity is “any bodily movement produced by skeletal muscles that results in energy expenditure”. In contrast, exercise is defined as “a specific type of physical activity that is planned, structured and repetitively done to improve or maintain physical fitness” [1]. Thus, all exercise is physical activity although all physical activity is not exercise.

2.1.1 Physical activity recommendations

Although all physical activity increases energy expenditure, only physical activity of at least moderate intensity has been proven to be health-enhancing. Public health recommendations from the American College of Sports Medicine and the Centers for Disease Control and Prevention [2, 3] reflect the minimum amount of physical activity needed to improve or maintain adequate health and is defined as either moderate-intensity physical activity for \( \geq 30 \text{ min/day on } \geq 5 \text{ days/week} \) or vigorous-intensity physical activity for \( \geq 20 \text{ min/day on } \geq 3 \text{ days/week} \). It is critical in health surveys to track the three core dimensions of the physical activity dose: intensity, duration and frequency. These recommendations clearly define minimum levels for healthy physical activity and the recently updated recommendations underline the fact that physical activity above this minimum provides even greater health benefits [3].

2.1.2 Accumulation of physical activity

Physical activity at different intensities can be accumulated throughout the day; as a result, the positive effects of physical activity can be gained in different ways and do not necessarily include exercise. Although bouts of moderate- and vigorous-intensity physical activity (MVPA) lasting \( \geq 10 \text{ minutes} \) might be a more time-efficient strategy to gain those positive effects, accumulation of MVPA in non-bouts can be a beneficial starting point for individuals to increase their physical activity levels [4]. Weekend warrior is a term used to describe people who tend to compress their weekly activity into long periods of physical activity performed on weekends. Weekend warriors may reap some health benefits by being physically active, but they may be at a higher risk for chronic disease than those who are active regularly. On the other hand, survey data indicate that relatively few adults participate in the weekend warrior pattern of activity on 1–2 days/week at quantities that approximate the recommended levels [5].

2.1.2.1 Domains of physical activity

The total amount of physical activity includes physical activity accumulated in all domains of daily life: during active transportation, at work, in the household and during leisure time. Active transportation is a human-powered form of transportation like walking or bicycling to and from work, or for errands. Work-related physical activity contributes to a person’s overall activity level and thus could incur positive health benefits [6]. However, there are substantial differences in physical activity due to the variety of work tasks. Work-related physical activities therefore need to be evaluated further [7]. A questionnaire survey studying walking patterns among women in the US
found that most daily walking was accumulated during transportation and housework [8]. Although some household-related and gardening activities (e.g. vacuum-cleaning, lawn-mowing) have been recognised for accruing MVPA [9], these activities are yet to be accepted as important types of physical activity that would confer health benefits. This is partly due to the lack of current scientific evidence concerning the validity of the self-reported intensity of “strenuous” gardening and household tasks and the reliability and precision of measuring domestic-based activities [10].

Pronounced health effects have been suggested for leisure-time physical activity as compared to physical activity in other domains [7, 11]. Most exercise is performed at a higher intensity and in bouts, which partly explains these differences. Nevertheless, leisure-time physical activity can include a variety of activities, from outdoor-life activities like mushroom-picking and backpacking to sports activities and participating in exercise classes. To get a better understanding of physical activity patterns among individuals and populations, it is important to assess the total amount of physical activity and the contribution of each domain. Assessing various domains of physical activity is also important for promoting physical activity participation through a combination of physical activities in different domains in a range of settings.

2.2 SEDENTARY BEHAVIOUR AND PHYSICAL INACTIVITY

Time spent in sedentary behaviours (as distinct from a lack of physical activity) is related to health outcomes and to biomarkers of disease risk among adults [12, 13]. Although the concepts of sedentary behaviour and physical inactivity are related, these behaviours are empirically distinct and should be regarded as such both in assessment methods and the terms used to define them. The term sedentary should be used to refer to behaviours that are actually sedentary rather than to people who are inactive (unmoving). Sedentary behaviour refers to activities that do not increase energy expenditure substantially above the resting level and includes such activities as sleeping, sitting, lying down and watching television and other forms of screen-based entertainment [14].

A lack of clarity in the use of the term sedentary is a problem in physical activity research. A study that explored definitions of sedentary behaviour found that describing individuals who are inactive during leisure time as sedentary proved to be a misnomer [15]. Participants who reported high amounts of sitting were just as likely to be classified as active on the physical activity measure as those who reported sitting the least. Among the highest tertile of sitters, 44% were classified as meeting the physical activity recommendations. This suggests that individuals who are sedentary for large amounts of time can also be physically active. However, their high levels of sedentary behaviour throughout the day could be independently associated with health problems. The first objectively assessed survey of time spent sedentarily in the US population indicated that Americans spend most of their time in behaviours that expend very little energy, and that adults spend most of their waking time in sedentary behaviours [16]. Occupational and leisure-time factors, as well as inherent individual differences, contribute to variations in how sedentary time is accumulated. In this thesis, sedentary people are defined as having low levels of physical activity.
2.3 PHYSICAL ACTIVITY AND HEALTH

Individuals who are regularly physically active are less likely than sedentary ones to develop health problems. The inverse gradient of risk across activity groups is seen in different population groups and for fatal and non-fatal outcomes [17-24]. For example, physical activity can prevent diabetes mellitus, cardiovascular disease [17, 19, 21, 22] and reduce mortality [20, 25]. Conversely, a sedentary lifestyle is followed by an increased incidence of these diseases and a number of unfavourable biochemical and physiological aberrations. There is also evidence that physical activity is associated with a reduced risk of cancers of the colon, breast, prostate and lung. Emerging evidence also suggests its role in cancer survival and that physical activity is associated with an improved quality of life among cancer patients [26].

The current physical activity recommendations produce a sufficient volume of physical activity to decrease all-cause mortality. The dose response relationship between physical activity and health point towards greater health benefits of a higher intensity and increasing fitness [23, 24]. However, there are also some data suggesting that even lower volumes and intensities of physical activity may be associated with health benefits [27, 28]. For example, increasing overall energy expenditure and low-intensity physical activity are beneficially associated with a lower risk of diabetes mellitus [21, 29]. In addition, studies have also shown that breaks in sedentary time are beneficially associated with metabolic health [30]. Thus, regularity is an important factor both in the accumulation of physical activity and in interrupting sedentary time. Consequently, the public health messages should be to encourage participation in MVPA [2, 3] and also to promote a reduction in sedentary time through increasing low-intensity day-to-day activities [30-32]. Even though the dose-response relationship is under discussion, researchers agree that the major public health problem is a lack of physical activity and that the largest health benefits of increasing the level of physical activity can be expected among those that are most sedentary. Any type of physical activity is better than no activity at all, and it is also essential to maintain an active lifestyle all through the life cycle.

A recent study from Canada estimated the effects of a sedentary lifestyle and found that life expectancy could be increased by over 10 months if the Canadian population adopted a physically active lifestyle [33]. A sedentary lifestyle also has an effect on leukocyte telomere length and may accelerate the aging process [34]. Despite the well-known health effects of physical activity, it does not seem to have an impact of motivating the population to be physically active. Perhaps this new finding, the potentially anti-aging effect, will provide a powerful message that could be used by clinicians to promote regular physical activity.

2.3.1 Self-rated health

Physical activity is positively linked to both quality of life [35] and self-rated health [36-38]. Although self-rated health might be regarded as a subjective measure, it is a powerful predictor of morbidity and mortality [39-42]. A single question is often used and the response elicits the individuals’ conditions more accurately than, for example, reported symptoms [41]. Previous studies on the relationship between physical activity
and self-rated health have shown somewhat divergent results [11, 36, 37]. One reason for this divergence could be that the self-assessment of health is understood differently, as it is a subjective indicator. Another reason could be that studies have addressed different forms of physical activities, e.g. leisure-time, occupational, habitual and total physical activity or exercise. Thus, little is known about how self-rated health is associated with different forms of physical activity.

2.4 ASSESSMENT OF PHYSICAL ACTIVITY

Physical activity is often assessed as physical activity during leisure time, i.e. exercise. However, the evidence for the link between physical activity and health emphasises that all MVPA are important independent of the domain in which they take place [3]. This requires an instrument that captures health-enhancing activities in all areas of daily living. Physical activity can be assessed subjectively or objectively using direct or indirect methods. Subjective methods usually assess physical activity performed at some time in the past, whilst objective methods assess physical activity as it occurs. Assessment methods are often validated against the criterion methods Calorimetry or double-labelled water (DLW). All methods have specific advantages and disadvantages and a method that is non-obtrusive for the participants and that agrees with the timing plan and economy is often chosen. Regardless of the method, the collected data are usually summed up over a specific time period and then analysed as continuous or categorical scores.

Disparities in assessing and quantifying physical activity in earlier studies limit the interpretation and comparison across studies. In order to overcome these disparities, it is suggested that instruments used to assess physical activity should allow for conversion of physical activity dimensions to units of energy expenditure, for example metabolic equivalents (METs) [27, 43]. The MET is used to estimate the amount of energy used during physical activity. The resting metabolic rate (1 MET) is assumed to be 1 kcal/kg/h for most individuals. The higher the intensity of physical activity, the more energy is consumed and the higher is the MET level. Three to 6 METs is considered to be moderate-intensity physical activity and > 6 METs is regarded as vigorous-intensity physical activity.

2.4.1 Subjective methods

Subjective methods include physical activity diaries and questionnaires. Questionnaires are by far the most frequently used method to assess physical activity. Some disadvantages of the use of self-reported data are recall and self-report bias [44-46]. Recall bias occurs when the way a respondent answers a question is affected by the respondent's memory. Self-report bias occurs when individuals respond in socially desirable ways. Thus, they tend to under-report behaviours deemed inappropriate and over-report behaviours viewed as appropriate.

Earlier studies on physical activity were often based on self reported physical activity from questionnaires and/or have only analysed leisure-time physical activity [47-50], whereas more recent questionnaires include several domains. One example of such an instrument is the International Physical Activity Questionnaire (IPAQ), which is
designed to capture intensity, duration and frequency of MVPA lasting ≥ 10 minutes. The IPAQ instrument has been widely used in several previous studies conducted in various settings and has reliability and validity properties similar to those of other physical activity questionnaires [51, 52].

2.4.2 Objective methods

Besides calorimetry and DLW, objective methods also include heart-rate monitors and motion detectors, such as pedometers and accelerometers. Calorimetry, DLW and heart rate monitoring measure energy expenditure and not physical activity per se, whereas pedometers and accelerometers assess body movement in terms of acceleration. ActiGraph model 7164 is a uniaxial accelerometer that has been tested for validity and reliability [53-55] and is frequently used to measure ambulatory physical activity. The comprehensive data obtained by accelerometers offers the opportunity to assess physical activity patterns over single days and weeks (time of day activity distribution, weekly variations). A n obvious strength of objective methods and accelerometers is that they do not include subjective bias and give a more accurate assessment of the duration and intensity of physical activity. However, they cannot distinguish whether the activities are occupational or from other domains such as transportation and household or leisure-time activities. Physical activity diaries are therefore a good complement to objective methods.

2.5 ASSESSMENT OF SEDENTARY BEHAVIOUR

There is no acknowledged method of assessing a sedentary lifestyle; most studies have focused primarily on assessing physical activity and thereby identify insufficiently active persons as well as persons achieving the recommended levels of physical activity. In addition, several studies have used self-reported television viewing, computer use and sitting time as a proxy for sedentary behaviour [12]. Although sedentary behaviour can be estimated via self-report instruments, the recent development of objective systems for assessing physical activity now allows researchers to monitor a wide range of intensities of activity, including sedentary and light activity, with considerable precision [14, 16, 56]. Operationally, sedentary behaviour includes activities that involve energy expenditure at the level of 1.0–1.5 METs. Light physical activity, which is often grouped with sedentary behaviour but is in fact a distinct activity construct, involves energy expenditure at the level of 1.6–2.9 METs. It includes such activities as slow walking, sitting and writing, cooking food, and washing dishes [14].

2.6 CORRELATES OF PHYSICAL ACTIVITY

Correlates are used to describe and understand the factors that influence physical activity behaviour. A variety of such correlates have been proposed, but the lack of convergence between assessment methods limits the ability to fully evaluate the correlate measures. Some of the recognised correlates are gender, age and education. Men are found to be more active than women, older persons less active than younger ones and highly educated persons are often more active than low-skilled ones [57-59]. Several studies have also found substantial differences in physical activity in relation to
A Swedish study examining physical activity among men found that increasing age was attributed to lower levels of leisure-time physical activity. In addition, total physical activity was inversely associated with body weight, and education was an important explanatory variable for total physical activity [63]. Correlates of physical activity have also been examined in Swedish women and the findings showed that the likelihood of engaging in higher physical activity levels decreased with age, BMI, educational level and growing up in urban places [64]. The link between physical activity and geographic region has also been demonstrated in previous studies [65]. Furthermore, the environment and the shaping of neighbourhoods are other important factors contributing to physical activity levels [49, 66, 67].

Women tend to spend substantial amounts of time engaged in household chores, gardening or yard work rather than, or as a supplement to, leisure-time physical activity. Being a mother and wife, taking care of home and family, working part- or full-time, and a lack of time and money are common explanations for low levels of leisure-time physical activity in previous studies [57-59]. No motivation and no experience of exercise are other hindrances that have been reported [68]. Women have a tendency to identify themselves as non-exercising persons. They also feel that they get enough physical activity during the working day from housekeeping and care giving [69]. Maintenance of good health, weight reduction, and looks seem to be the most important reasons for women to exercise [70-72].

### 2.6.1 Social ecological model and stages of change

Our society is becoming increasingly successful in reducing our need to move. Many individuals in Western countries have over time become more sedentary and these societal changes imply that people need to take active decisions and initiatives to increase their physical activity. Promotion of physical activity during the time the individuals dispose of, i.e. leisure time, is therefore vitally important. Factors associated with making choices to be physically active in leisure time and/or exercising are complex and multidimensional.

The social ecological model is a commonly used public health model that helps to identify multiple levels of influence on behaviour. It addresses the importance of interventions directed at changing interpersonal, organisational, community and public policy factors that support and maintain unhealthy behaviours. The model assumes that appropriate changes in the social environment will produce changes in individuals, and that the support of individuals in the population is essential for implementing environmental changes [73]. Thus physical activity behaviours cannot be influenced directly; instead, we need to influence people’s choices. However, behaviour change does not happen in one step. Rather, people tend to progress through different stages on their way to successful change [74, 75]. Each person must decide for himself or herself when a stage is completed and when it is time to continue to the next stage. This decision must come from inside you, stable and long-term change cannot be externally imposed [76].
2.7 MINORITIES IN SWEDEN

Looking at Sweden’s history, groups of people have been coming to this country for centuries. For example: Walloons, who were brought over to teach Swedes the iron trade, Italian stuccoists when the stone towns were being built and Scots who, among other thing, started breweries. One hundred years ago Sweden was an emigrant country, with a huge emigration to the US, Canada and South America. The First World War slowed the rate of emigration, which had become a major problem in Swedish society. In conjunction with the Second World War, refugees from Germany, the Nordic countries and the Baltic States transformed Sweden from an emigrant country into an immigrant country. Every year since 1930, except for a couple of years in the 1970s, immigration has exceeded emigration.

In the 1950s–1960s, immigration was dominated by labour immigrants from other Nordic countries as well as from Italy, Greece, Yugoslavia and Turkey. Sometimes, people were brought to Sweden in organised groups by the labour market authorities. Owing to regulated immigration in the 1970s, immigrants from non-Nordic countries decreased and Nordic immigration – especially from Finland – increased dramatically. However, when the Finnish economy improved the immigration from Finland declined. There was also an increase in non-Nordic immigration by reason of family ties during this decade, i.e. in the arrival of family member refugees during certain intervals, usually in connection with wars or crises, such as the military coup in Chile in 1973. Asylum-seekers from Iran and Iraq, Lebanon, Syria, Turkey and Eritrea began to increase in number in the mid-1980s. In addition, over 100,000 ex-Yugoslavs, found a new home in Sweden when former Yugoslavia collapsed in the beginning of the 1990s.

Today 13% of the Swedish population and 22% of the inhabitants in Stockholm County are foreign-born. The largest numbers of immigrants in Sweden come from Finland, former Yugoslavia, Iraq, Iran, Poland, Turkey and Chile [77]. A large proportion of immigrant women in Sweden have a low educational level, are unemployed and live on scarce resources. Many of them also come from patriarchal cultures [78-80]. The Malmö Public Health Survey showed that immigrants were more overweight and obese than Swedish-born individuals and that low levels of leisure-time physical activity were more common among immigrants. However, there were also significant differences between the countries of birth [62, 81].

2.8 PHYSICAL ACTIVITY IN SWEDEN

The prevalence of Swedes that exercise more than twice a week has increased more than 10% during the past decade (the increase is higher in women than in men), whereas the prevalence of Swedes who do not exercise has decreased only slightly [82]. A recent national study assessed physical activity objectively and found that 52% of the individuals aged 18–69 years reached the recommended level of physical activity (≥ 30 min/day). The proportions were 57% and 48% for men and women, respectively [56]. However, only 1% achieved those 30 minutes from three or more bouts of at least 10 min. Compared to people in many other European countries, Scandinavians report high levels of physical activity during their leisure time [83, 84]. In Sweden, exercise for health reasons is regarded as natural for young and old people of both sexes. The
government and non-governmental organisations have promoted physical activity for several decades. Various sports associations and organisations offer exercise programmes that receive subsidies from the government. In addition, many employers allow employees to exercise during working hours and/or grant subsidies for exercise during leisure time.

2.8.1 **Physical activity in minority women**

Several studies from all over the world have established that minority women are more sedentary and less physically active than women in the majority population [50, 60, 85] [47, 48]. Minority women are therefore exposed to an increased risk of chronic diseases which contribute to disparities in health [17, 19, 25]. Swedish statistics show that immigrant women from Southern Europe, Iran, Turkey and Chile are less physically active than Swedish-born women. For example, among Turkish women, only one out of five exercised regularly compared to one out of three among the Chilean women [85].

An important factor for exercise is social support, which is often insufficient among minority women [86, 87]. A study from the US of minority women showed that African Americans and American Indians/Alaskan Natives have the lowest level of physical activity during leisure time [48, 50]. Other studies have shown that minority women report more physical activity during working hours than during leisure time [49, 88]. However, findings in previous studies make it difficult to obtain a general view when total physical activity has not been taken into account. This was pointed out by Brownson et al., who examined all areas of physical activity among women. The authors concluded that although minority women are among the least active subgroups in American society, not all minority women groups are less active than women in the majority population when all domains of physical activity are taken into account [48]. This highlights the importance of studying total physical activity in different minority groups separately and not to generalise. This is most likely particularly salient among different groups of minority women because they often have a more traditional role in the family and are perhaps more physically active during housework and transportation.
<table>
<thead>
<tr>
<th>Study</th>
<th>Design</th>
<th>Data collection</th>
<th>Participants</th>
<th>Data sources</th>
<th>Outcome variables</th>
<th>Explanatory variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study I (SCB)</td>
<td>Cross-sectional design</td>
<td>1999</td>
<td>Swedish population aged 25–64 years (3756 individuals)</td>
<td>Face-to-face interviews about living conditions (ULF)</td>
<td>Good self-rated health</td>
<td>Physical activity</td>
</tr>
<tr>
<td>Study II (CeFAM)</td>
<td>Cross-sectional design</td>
<td>2002–2005</td>
<td>Women aged 18–65 years, living in Stockholm and Botkyrka (2946 individuals)</td>
<td>Postal questionnaire translated into Finnish, Spanish or Arabic</td>
<td>Reported health-enhancing physical activity as MET-min/week</td>
<td>Exercise &amp; total physical activity</td>
</tr>
<tr>
<td>Study III (CeFAM)</td>
<td>Cross-sectional design</td>
<td>2002–2004</td>
<td>Minority women aged 18–65 years, living in Stockholm and Botkyrka (144 individuals)</td>
<td>Accordion questionnaires translated into Finnish, Spanish or Arabic</td>
<td>Timespent in at least moderate intensity physical activity</td>
<td>Age groups</td>
</tr>
<tr>
<td>Study IV (CeFAM)</td>
<td>Focus groups</td>
<td>2002–2004</td>
<td>Minority women aged 18–65 years, living in Stockholm County (63 individuals)</td>
<td>Focus groups, Transcriptions and notes</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 1. Summary of design, data sources, and participants in the four studies.
3 AIMS

The general aim of this thesis was to investigate physical activity patterns and to distinguish physically active and less physically active groups in the population.

The specific aims were to examine:

- The association between self-rated health and two dimensions of physical activity: exercise habits and total physical activity among Swedes (Study I)
- The amount and intensity of physical activity among minority women (Studies II–III)
- The association between country of birth and physical activity assessed in two ways: subjectively and objectively (Studies II–III)
- Minority women’s attitudes towards and experiences of physical activity and exercise, using a qualitative approach (Study IV)
Figure 1. Flowchart of the study sample in Studies II–III

Physical Activity & Health survey
5070 – Eligible

2750 Participants

2750 Returned the questionnaire

166 Wore an accelerometer

125 Non-response analysis

2320 Non-participants

101 Excluded

22 Excluded

Sample Study II
2649 women from Swe, Fin, Chi, Iraq

Sample Study III
144 women from Fin, Chi, Iraq
4 MATERIALS AND METHODS

4.1 PARTICIPANTS AND DATA COLLECTION

Both qualitative and quantitative approaches as well as subjective and objective methods were used in the four studies included in this thesis. The studies were based on two cross-sectional surveys: the Swedish Annual Level of Living Survey (SALLS, in Swedish: ULF) from Statistics Sweden (SCB) and the Physical Activity & Health Survey conducted at the Center for Family and Community Medicine (CeFAM). The CeFAM survey investigated physical activity among minority women living in the municipalities of Stockholm and Botkyrka, between 2002 and 2005. A summary of design, data sources and participants in the four studies is found in Table 1.

4.1.1 The SCB Survey (Study I)

The participants in the SCB Survey consisted of a simple random sample representative of the Swedish population aged 25–64 in 1999. They were interviewed face-to-face by trained interviewers about their living conditions, including questions about health and health-related conditions, welfare and lifestyle. The survey usually includes only one question about physical activity which is an assessment of exercise habits, but in 1999 two physical activity questions were included that assessed both exercise habits and total physical activity in all domains. A total of 3756 participants (1876 women and 1880 men) aged 25–64 completed the survey during 1999. The response rate was 76.6%. Participants aged 25–64 were selected because the focus of the study was on individuals in working ages.

4.1.2 The CeFAM survey, quantitative part (Studies II–III)

The minority women in the quantitative part of the CeFAM Survey were all first-generation immigrants born in Finland, Chile and Iraq. Each group of women (aged 18–65) comprised a simple random sample drawn from the local government population registers in the municipalities of Stockholm and Botkyrka. These countries were chosen because they represent large minority groups in Sweden stemming from different parts of the world. A Swedish control group was also drawn in the same municipalities (Study II). The total eligible sample consisted of approximately 5000 women (Figure 1). Every five of the minority women in Study II were randomly selected and invited to wear an accelerometer (Study III). Data were collected all year round in order to capture seasonal variation in physical activity. The age range of 18–65 years was selected because it comprises the socioeconomically active part of the population.

4.1.2.1 Study II

Self-reported physical activity was collected through a postal questionnaire that was translated into the women’s native language (Finnish, Spanish or Arabic). All participants were also offered the questionnaire in Swedish. A total of 2750 women answered the questionnaire. The response rate was 54%, with the highest and lowest rates for Swedish and Chilean women (60% and 47%, respectively). After exclusion of
outliers and those who had not answered the questions about physical activity or weight or height (n=101), 2649 women remained and they were included in the analyses.

4.1.2.2 Study III
Accelerometers were used to collect objective data on physical activity. A letter containing information and a reply form (in Swedish and in the woman’s native language) was sent out by post. All women who agreed to participate in the study were contacted by telephone and a meeting was scheduled at an optional time and place. A total of 166 women participated and wore an accelerometer for one week, and they also answered the questionnaire used in Study II. After exclusion of those with incomplete data (n=22), 144 women remained and they were included in the analyses.

4.1.2.3 Non-respondents
Non-respondents were approached by telephone in their native language and they answered five questions. In most cases the reason for non-participation was a lack of time. There were no statistically significant differences in age, educational and employment status, sick leave, and self-rated health between respondents and non-respondents (data not shown).

4.1.3 The CeFAM Survey, qualitative part (Study IV)
Study IV attempted to explore immigrant women’s attitudes and experiences of physical activity and exercise and thereby increase understanding of the possible causes underlying their low level of physical activity. For this purpose, a qualitative approach is appropriate. The minority women in Study IV were all first-generation immigrants born in Chile, Iraq and Turkey living in Stockholm County. The women were recruited through women’s associations, child welfare centres, pre-schools and courses in Swedish for immigrants. Verbal and written information was given to the participants when they were recruited and before the interviews. Women aged 18–65 were considered eligible for the study. However, the actual age range of the 63 recruited participants was between 26 and 65. Data were collected through interviews in 10 focus groups. Table 2 describes the focus group interviews in the order in which they were conducted.

4.1.3.1 Focus groups
The focus group interviews were conducted in the women’s native language in order to make it easier for them to express themselves and discuss with others more naturally. Interpreters were present at all interviews with the exception of one Turkish focus group in which the participants were fluent in Swedish. Two female interpreters were used for each language (i.e. Spanish, Arabic and Turkish). All interpreters were authorised and recruited through the official translation agency used by the Stockholm County Council. The focus groups met at a time and place chosen by the women, often the place where the women had been recruited. The interviews lasted 1–1.5 hours and were audiotaped and transcribed verbatim. A trained moderator conducted the interviews with the aid of interpreters. An observer took notes on such non-verbal communication as gestures and facial expressions. Before the interview started, the women were informed about the tape recorder and that only authorised researchers
would listen to the tapes. It was also pointed out that the material would not be used in any context other than research.

4.1.3.2 Question guide

A semi-structured question guide was used with the following themes: previous experiences of physical activity, knowledge of the effects of physical activity and similarities and differences in physical activity habits between the home country and Sweden. The moderator talked directly to the participants, the participants discussed with each other and/or the moderator and the interpreter translated simultaneously. The moderator ensured that all the topics in the question guide were covered. At the end of each focus group interview, the moderator summarised the session and the participants verified and/or added more information. Moderator, observer and interpreter came together shortly after each interview to transcribe and reflect on the interview and the question guide was gradually modified as new themes emerged from the participants.

Table 2. Description of the focus groups in study IV, in the order in which the interviews were conducted (2002–2005)

<table>
<thead>
<tr>
<th>Focus group</th>
<th>Number of women</th>
<th>Country of birth</th>
<th>Age (Mean) (SD*)</th>
<th>Years in Sweden (Mean)</th>
<th>Number of children (Mean)</th>
<th>Employment (Number/%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6</td>
<td>Turkey</td>
<td>48 (8.1)</td>
<td>20 (1.9)</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>7</td>
<td>Iraq</td>
<td>38 (4.5)</td>
<td>4 (1.7)</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>6</td>
<td>Iraq</td>
<td>46 (2.7)</td>
<td>4 (2.5)</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>6</td>
<td>Iraq</td>
<td>31 (2.7)</td>
<td>4 (2.1)</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>7</td>
<td>Turkey</td>
<td>49 (7.9)</td>
<td>27 (8.6)</td>
<td>3</td>
<td>5 (71%)</td>
</tr>
<tr>
<td>6</td>
<td>7</td>
<td>Turkey</td>
<td>45 (5.8)</td>
<td>22 (12.2)</td>
<td>3</td>
<td>3 (43%)</td>
</tr>
<tr>
<td>7</td>
<td>8</td>
<td>Chile</td>
<td>57 (10.8)</td>
<td>18 (6.0)</td>
<td>3</td>
<td>4 (50%)</td>
</tr>
<tr>
<td>8</td>
<td>7</td>
<td>Turkey</td>
<td>55 (5.2)</td>
<td>29 (5.7)</td>
<td>2</td>
<td>3 (43%)</td>
</tr>
<tr>
<td>9</td>
<td>4</td>
<td>Iraq</td>
<td>49 (11.6)</td>
<td>11 (2.9)</td>
<td>3</td>
<td>2 (50%)</td>
</tr>
<tr>
<td>10</td>
<td>5</td>
<td>Chile</td>
<td>55 (7.8)</td>
<td>22 (5.8)</td>
<td>3</td>
<td>3 (60%)</td>
</tr>
</tbody>
</table>

* Standard deviation

4.2 ETHICAL APPROVAL

Studies I–IV were approved by the Ethics Committee of the Karolinska Institute, Huddinge and were conducted in compliance with the Helsinki Declaration. Verbal informed consent was obtained from all participants in Study I. Written informed consent was obtained from the participants in Studies II and III. Participation was voluntary and the women had the option to terminate their participation at any time. In Study IV, verbal informed consent was obtained before the interviews started, and the women had the option to end their participation at any time.
4.3 ASSESSMENT OF PHYSICAL ACTIVITY (STUDIES I–III)

4.3.1 Study I
Study I investigated the association between good self-rated health (outcome) and self-reported physical activity. Two questions were used to collect data on physical activity. The first question reflected the frequency of exercise and the second the total amount of physical activity in all domains.

4.3.1.1 Frequency of exercise
Exercise was assessed by asking the participants how often they exercise during their leisure time and was categorised in three groups based on the following five response alternatives: (1) I get practically no exercise at all, (2) I exercise occasionally, (3) I exercise regularly, about once a week, (4) I exercise regularly, about twice a week and (5) I exercise regularly, quite vigorously at least twice a week. Those who responded to alternative 1 were categorised in group 1, those who responded to alternative 2 were categorised in group 2, and those who responded to alternatives 3, 4 or 5 were categorised in group 3. The response alternatives 3–5 were collapsed because previous research has shown that the long-term association between coronary heart disease and each of the response alternatives 3–5 is of equal size [19]. This procedure generated the following three categories for exercise: (1) None, (2) Occasionally and (3) Regularly.

4.3.1.2 Total amount of physical activity
Total physical activity was assessed based on the following question/request: “Try to assess (during a normal week) how many hours in total you are physically active on an effort level that at least corresponds to walking. Count the total hours of physical activity, for example, walking to the bus, exercise and physical effort at work.” Total physical activity in all domains of daily life (e.g. occupational, household and exercise) was divided into three categories. The categories were based on seven response alternatives: (1) < 1 hour per week, (2) 1–2 hours per week, (3) 3–5 hours per week, (4) 6–10 hours per week, (5) 11–20 hours per week, (6) 21–30 hours per week and (7) >30 hours per week. Category 1 included response alternatives 1–2, category 2 included response alternative 3, and category 3 included response alternatives 4–7. The choice of cut-off points resulted in three equal-sized categories for the two physical activity questions, which makes it easier to compare the categories in each group. In addition, the main focus of Study I was not on those who exercise regularly. These individuals were therefore categorised together.

4.3.2 Study II
Data on physical activity were collected using the self-administered long format of the International Physical Activity Questionnaire (IPAQ-long). The translated versions of the IPAQ-long in Swedish, Finnish and Spanish were obtained from the IPAQ official home page (www.ipaq.ki.se). The Arabic version was translated and back-translated into English and, for this purpose, official translators were used. The Swedish Judicial Board for Public Lands and Funds recommended the use of classical Arabic in the translation, as it is used as an official language in many countries in the Middle East, including Iraq.
4.3.2.1 The International Physical Activity Questionnaire

The IPAQ-long asks the respondents to report the frequency and duration (≥ 10 min) of walking, cycling and moderate- and vigorous- intensity physical activity during the past seven days in four domains: work, active transportation, domestic and garden, and leisure time. It has been questioned whether work-related physical activity should be regarded as health-enhancing [6, 88]. For this reason, the physical activity reported in the domain work was not included in the analyses. We followed the guidelines obtained from the IPAQ official web page (www.ipaq.ki.se) when processing data and generating continuous and categorical scores. However, as computation of the total scores from the IPAQ-long version may give rise to a self-report bias in the form of overreporting, truncation was set to 120 minutes (instead of 180 minutes as suggested in the guidelines).

4.3.2.2 Calculations

The self-reported physical activity was converted into MET minutes per week (MET-min/week) and presented as continuous and categorical scores. Minutes per week of walking, cycling, moderate intensity of physical activity and vigorous intensity of physical activity were calculated. The summed minutes of each type of activity were then weighted by a metabolic equivalent (MET). The used MET weights were 3.3 for walking, 4.0 for moderate intensity, 6.0 for cycling and 8.0 for vigorous intensity [9]. The continuous score, MET-min/week, was then summed up in total and by each domain.

Each respondent’s total MET-min/week was then categorised, using the IPAQ scoring criteria, into the following three levels of physical activity: Low, < 600 MET-min/week reported for < 5 days; Moderate, ≥ 600 – < 3000 MET-min/week reported for ≥ 5 days; and High, ≥ 3000 MET-min/week reported for ≥ 7 days. The cut-off limits for the three levels were based on the current guidelines for physical activity [3]. In terms of how the IPAQ measures activity, this would be equal to 600 MET-min/week, which is the lowest limit for the moderately active category. The highest category is focused on including persons who are accumulating 3000 MET-min/week or more. Subjects in this category are believed to be sufficiently active for health benefits across all domains. The categorical scores (low, moderate and high) were used as outcome in the analysis.

4.3.3 Study III

Data on physical activity were collected using accelerometers (ActiGraph model 7164; Pensacola, Florida, USA). The accelerometer was placed in an adjustable belt at the back and around the waist, as close as possible to the centre of gravity. The device was worn under clothing and during awake hours for seven consecutive days, but not during water-based activities.

4.3.3.1 The ActiGraph accelerometer

The ActiGraph model 7164 is a uniaxial accelerometer that measures movements in the vertical plane. Software from the manufacturer was used to calibrate and initiate the accelerometers. The devices were set to sum up all physical activity per minute (60-s
epoch) and the output from the accelerometer was given in (activity) counts. The interpretation of the output was based on decision rules from previous research [89-91]. A period of $\geq 20$ continuous zero counts (i.e. $\geq 20$ minutes with no activity) was considered to be non-wearing time. Wearing time for each day was calculated by subtracting non-wearing time from 24 hours. A valid day was defined as having a wearing time of at least 10 hours. The minimum number of valid days required for inclusion in the analysis was four, with at least one of the four days being a weekend day [92, 93]. Counts of $\geq 20,000$ per minutes were considered to be artefacts and were excluded from the analyses.

4.3.3.2 Calculations

The recorded minute-by-minute counts were summed up for each day and are presented as the amount and intensity of physical activity. Time spent at different intensities of physical activity was calculated according to the following threshold values: $1952–5724$ counts (moderate-intensity physical activity) and $\geq 5725$ counts (vigorous-intensity physical activity). These thresholds have been developed for adults [94]. Sedentary time was set at an arbitrary range of $0–100$ counts [16, 29, 56] and, consequently, low intensity was then set at $101–1951$ counts. The minutes spent at each intensity were summed up. Times spent at moderate and vigorous-intensity physical activity were categorised together, i.e. as at least moderate physical activity (MVPA). Time spent at MVPA was also used to classify participants into two groups, i.e. those who satisfied and those who did not satisfy the physical activity recommendation of at least 30 minutes of moderate physical activity at least five days of the week [3].

No statistical differences were found between weekdays; thus the daily average was used in the analyses. The average number of valid days was 6.4, 6.2 and 6.2 for women from Finland, Chile and Iraq, respectively. Wearing time was about 14 hours per day and did not differ between the countries of birth ($p = 0.22$) (data not shown). The variable MVPA was used as outcome in the analysis.

4.4 EXPLANATORY VARIABLES (STUDIES I–III)

Information about the participant’s demographics and health was obtained from the interviews and questionnaires used in Studies I–III. A summary of the explanatory variables used in the analyses is found in Table 3. Some clarifications: Employment status was dichotomised into being employed or unemployed. However, besides those without work, the unemployed group also included women who were on maternity leave, students, housewives and those with early retirement pensions. Women with underweight ($\text{BMI} < 18.5$) were included in the normal weight category since this small group was judged not to influence the results to a large extent. The selected explanatory variables were included because previous research has shown that lifestyle and socio-demographic factors are associated with physical activity and self-rated health [38, 95-97]. Explanatory variables found to be significantly associated with the outcome variables were included in the final analysis.
### Table 3. Characteristics of the individual variables for women in Studies I–III.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Study I</th>
<th>Study II</th>
<th>Study III</th>
<th>Study IV</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total women</td>
<td>Swedish-born women</td>
<td>Foreign-born women</td>
<td>Total Swe Fin Chi Iraq Total Fin Chi Iraq</td>
</tr>
<tr>
<td>n</td>
<td>(1876)</td>
<td>(1636)</td>
<td>(240)</td>
<td>(2649)</td>
</tr>
<tr>
<td>Mean age</td>
<td>43.6</td>
<td>43.6</td>
<td>43.3</td>
<td>43.2</td>
</tr>
<tr>
<td>(SD)</td>
<td>(11.2)</td>
<td>(11.3)</td>
<td>(10.6)</td>
<td>(12.3)</td>
</tr>
<tr>
<td>Good self-rated health (%)</td>
<td>77.6***</td>
<td>79.5</td>
<td>64.6</td>
<td>57.3***</td>
</tr>
<tr>
<td>Education (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥ 10 years</td>
<td>84.7***</td>
<td>86.0</td>
<td>75.4</td>
<td></td>
</tr>
<tr>
<td>University degree</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employed (%)</td>
<td>79.1***</td>
<td>81.6</td>
<td>61.7</td>
<td>65.6***</td>
</tr>
<tr>
<td>Body mass index (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;25</td>
<td>63.7</td>
<td>64.3</td>
<td>59.6</td>
<td>59.3***</td>
</tr>
<tr>
<td>25-29.9</td>
<td>26.4</td>
<td>26.0</td>
<td>29.2</td>
<td>27.3</td>
</tr>
<tr>
<td>≥ 30</td>
<td>9.9</td>
<td>9.7</td>
<td>11.2</td>
<td>13.4</td>
</tr>
<tr>
<td>Smoking (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never-smoker</td>
<td>48.7***</td>
<td>47.9</td>
<td>54.2</td>
<td>52.3***</td>
</tr>
<tr>
<td>Former smoker</td>
<td>28.6</td>
<td>30.2</td>
<td>17.9</td>
<td>29.2</td>
</tr>
<tr>
<td>Daily smoker</td>
<td>22.7</td>
<td>21.9</td>
<td>27.9</td>
<td>18.5</td>
</tr>
<tr>
<td>Marital status (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married/cohabiting</td>
<td>76.9</td>
<td>77.2</td>
<td>74.6</td>
<td>62.0***</td>
</tr>
</tbody>
</table>

*One-way ANOVA and Chi-square test for statistical differences by country of birth, * < 0.05, *** < 0.000

### Table 4. Analyses used in the four studies included in this thesis.

<table>
<thead>
<tr>
<th>Analysis</th>
<th>Study I</th>
<th>Study II</th>
<th>Study III</th>
<th>Study IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chi-square</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>One-way ANOVA</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Kruskal-Wallis</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>MANOVA</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Goodman Kruskal gamma correlation</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cook-Weisberg test</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Logistic regression</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Generalised ordinal logistic regression</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Multiple regression</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grounded theory</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4.5 DATA ANALYSIS

4.5.1 Studies I–III

Tests of differences in the distribution of the descriptive variables (categorical) were performed using the Chi-square test and a test of differences in means using ANOVA with pairwise comparisons. The relationship between country of birth and the physical activity variables was examined using the Kruskal-Wallis test and multivariate variance analysis (MANOVA) [98, 99]. The association between country of birth and the probability of meeting the recommendations for physical activity were examined using logistic regression analysis. All possible interactions were tested and an interaction between country of birth and BMI was found in Study II, and an interaction between country of birth and age in Study III. A summary of the performed analyses in Studies I–IV is shown in Table 4.

4.5.1.1 Study I

Logistic regression models were used to investigate the association between good self-rated health and the physical activity variables, after adjusting for potential confounders. The fit of the final model was investigated by the Hosmer-Lemeshow test and was judged to be good ($p = 0.32$). The correlation between the two physical activity questions was tested using the Goodman Kruskal gamma correlation test [100]. In a subanalysis, the sample was stratified by gender and country of birth to examine differences between women born in Sweden and foreign-born women.

4.5.1.2 Study II

A multivariate analysis was performed using a generalised ordinal logistic model (partial proportional odds model) [101] in order to investigate the association between reported physical activity and country of birth after taking possible confounding factors into account. The model relaxes the assumption of parallel lines. This sequential model gives two binary logistic regressions for the dependent variable if the parallel lines assumption does not hold. The first threshold estimated the odds of reporting at least moderate physical activity versus low physical activity, and the second threshold estimated the odds of reporting high physical activity versus either moderate or low physical activity. Thus, each threshold estimated the association between country of birth and the other explanatory variables, and the odds of being at higher levels of physical activity versus lower levels. The proportional odds assumption was satisfactory ($p > 0.05$).

4.5.1.3 Study III

The relationship between country of birth and time spent in MVPA was explored using multiple regression analyses, after adjustment for potential confounders. The ordinary least squares regression was applied and the residuals were not normally distributed. The heteroscedasticity was, however, constant according to the Cook-Weisberg test [102]. Therefore, bootstrapped regression analyses with 1000 replications were used [103].
4.5.1.4 Statistical outcomes and software

The data were analysed using the statistical package STATA versions 9 and 10 (Stata Corporation, College Station TX, 2003). For comparisons between groups we used 95% confidence intervals for differences in proportions. The results are presented as odds ratios (ORs) with 95% confidence intervals (CIs) in Studies I–II and as \( \beta \)-coefficients with 95% CIs. A p-value of less than 0.05 was considered significant.

4.5.2 Study IV

Considering the aim of the study, i.e. to develop new theoretical knowledge in a relatively unexplored area, Grounded Theory was chosen as the method of analysis [104-106]. As defined by Strauss & Corbin, "the Grounded Theory approach is a qualitative research method that uses a systematic set of procedures to develop an inductively derived grounded theory about a phenomenon" [106]. An essential part of this analytical method is the derivation of codes, concepts and categories. The intention is to identify the major categories, their relationships, and the context and process, and to develop an explanation and provide a theory of the phenomenon. Data were collected and analysed simultaneously. The analytical process started after the first interview. The transcribed interview was examined line by line. After a few further interviews, a process was discernible and a possible core category emerged. We considered saturation to have been reached when additional interviews gave no further information and patterns were recognised according to the Grounded Theory [104, 106].

4.5.2.1 Validity

The emergent results in Study IV were constantly compared with our data in conformity with Grounded Theory. Thus the validity check on the criteria fit, relevance and work [104] was integrated in the analytical process. A respondent validity check was performed on both the women who had participated in the focus groups and on immigrant women who had not participated. Both groups said that the model was easy to understand and that it explained their situation well. The modifiability of the theory can be tested in another context when new relevant data are compared with existing data.
5 RESULTS

This section presents the main results, focusing on women’s physical activity. Therefore, only characteristics of the women in Studies I–III in total and by country of birth are presented in Table 3. Detailed results are found in each paper attached at the end of this thesis.

5.1 STUDY I

The least active individuals constituted 4.3% of the sample according to their answers to the question about exercise and the question about total physical activity in all domains. In addition, 4.9% of the individuals reported no exercise although they had ≥6 hours of total physical activity per week (Table 5). The correlation between the two physical activity questions was rather low (gamma = 0.4, p = 0.02). The subanalysis showed that Swedish-born individuals reported more exercise and higher levels of total physical activity than foreign-born individuals, and that 65% of the Swedish women reported exercising regularly compared to 59% of the foreign-born women. The prevalence rates for reporting no exercise were 9% and 15% for the Swedish and foreign-born women, respectively. These differences were statistically significant (p = 0.01). In contrast, no significant differences between Swedish women and foreign-born women were found for self-reported total physical activity (p = 0.07) (data not shown).

5.1.1 Physical activity and self-rated health

Figure 2a shows the odds for good self-rated health for the two physical activity variables separately, whereas Figure 2b shows the odds for good self-rated health for the combinations of the categories for exercise and total physical activity. The results in both figures are adjusted for all the explanatory variables simultaneously. There was an apparent gradient for both exercise and total physical activity: with increasing physical activity, the odds of good self-rated health increased. Those exercising occasionally and regularly had an OR for good self-rated health of 1.47 and 1.68, respectively. Those who reported 3–5 hours/week of total physical activity and ≥6 hours/week had an OR of 1.45 and 1.60, respectively. The highest odds of reporting good self-rated health was found among those that exercised on a regular basis and had a total physical activity of ≥6 hours/week (OR = 3.04). The combinations no exercise/total physical activity ≥6 hours per week and regular exercise/total physical activity ≤2 hours per week had an OR of 2.16 and 1.66, respectively. All ORs reported above were statistically significant. Good self-rated health was significantly associated with the socioeconomic variables education, housing tenure and employment, and all the other explanatory variables as well.
5.2 STUDIES II–III

Significant differences in the individual characteristics among the women are shown in Table 3. For example, Finnish women were significantly older than the other women, in both Study II and Study III. The proportion of women satisfying the physical activity recommendations was higher among the Finnish women (43%) compared to the Chilean and Iraqi women (27%), but not to a statistically significant extent (data not shown).

5.2.1 Amount and intensity of physical activity

The self-reported total health-enhancing physical activity and the contributions of each domain are shown in Figure 3 as quartiles (box) and limits for outlying values as the median of MET-min/week. The MET-min/week differed significantly between the countries of birth \( (p < 0.001) \) in some of the pairwise comparisons. Women from Finland had the highest median in total. Figure 3 also shows that more than 50% of the women from Iraq reported no physical activity during leisure time (median = 0). The summarised data from accelerometers are shown in Table 6 as total amount, average intensity and time spent at different intensities of physical activity by the daily average and weekdays for the women. There were significant differences in the total amount and average intensity of physical activity on a daily average basis: Finnish women had the highest total amount (counts) and average intensity (counts/minute). Finnish women also spent significantly more time in the highest intensity category (MVPA) on a daily average basis, whereas no significant differences were found in time spent in the lower intensity categories (sedentary and low).

5.2.2 Physical activity and country of birth

5.2.2.1 Subjectively assessed

Results from the generalised ordinal logistic model are presented as ORs for the two thresholds, i.e. at least moderate physical activity or high physical activity, in Figure 4. The results are adjusted for age, education and smoking simultaneously. Women from Finland had significantly higher odds of reporting higher levels of physical activity, whereas women from Iraq had significantly lower odds of reporting higher levels of physical activity in the comparison of least moderate versus low. All comparisons used Swedish-born women as the reference. The results for women from Chile were somewhat contradictory; they were less likely to be at least moderately physically active (OR = 0.69) but more likely to have a high level of physical activity (OR = 1.38), compared with Swedish-born women. This indicates that women from Chile tend to report more at the extremes of the physical activity level than Swedish-born women. The interaction model showed that a higher BMI was associated with lower odds of reporting high levels of physical activity in women from Sweden and Finland, but not for women from Iraq and Chile. In addition, women from Iraq had lower odds in all BMI categories, implying that women from Iraq reported lower levels of physical activity than Swedish women (data not shown).
5.2.2.2 Objectively assessed

Table 7 shows the multiple regression models of the association between the explanatory variables and time spent in MVPA on an average daily basis. The value of the beta-coefficients corresponds to the number of minutes spent in MVPA. All comparisons used Finnish-born women as the reference. Women from Chile and Iraq spent significantly fewer minutes in MVPA than Finnish women (β-coefficients -11.27, CI = -20.08, -2.45 and -11.89, CI = -19.50, -4.29). Overweight women spent significantly fewer minutes in MVPA than women of normal weight and this relationship remained significant in the adjusted model (β-coefficient -11.53, CI = -18.50, -4.55). The interaction between age and country of birth showed that higher age was related to fewer minutes in MVPA for women from Iraq, but not for women from Finland and Chile.

Figure 2 (a+b). Odds ratios (ORs) with 95% confidence intervals (CIs) for good self-rated health, adjusted for all the explanatory variables simultaneously. n = 3756, Sweden, 1999.

Figure 2a.

Figure 2b.

\[ \text{Adjusted for age, gender, country of birth, education, employment, marital status, housing tenure, smoking and BMI.} \]
Table 5. Distribution of the individuals by their answers to the two questions about physical activity. n = 3756, Sweden, 1999.

<table>
<thead>
<tr>
<th>Total physical activity (hours/week)</th>
<th>Exercise</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>None</td>
</tr>
<tr>
<td>≤ 2</td>
<td>160</td>
</tr>
<tr>
<td>(4.3 %)</td>
<td>(5.8 %)</td>
</tr>
<tr>
<td>3–5</td>
<td>62</td>
</tr>
<tr>
<td>(1.7 %)</td>
<td>(7.7 %)</td>
</tr>
<tr>
<td>≥ 6</td>
<td>184</td>
</tr>
<tr>
<td>(4.9 %)</td>
<td>(14.8 %)</td>
</tr>
</tbody>
</table>

Figure 3. Box plot for self-reported health-enhancing physical activity (MET-min/week), in total and for each domain, by country of birth. Quartiles (box) and limits for outlying values (outliers not shown), n=2,649

Table 4. Analyses used in the four studies included in this thesis.

<table>
<thead>
<tr>
<th>Analysis</th>
<th>Study I</th>
<th>Study II</th>
<th>Study III</th>
<th>Study IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chi-square</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>One-way ANOVA</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kruskal-Wallis</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MANOVA</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Goodman Kruskal gamma correlation</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cook-Weisberg test</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Logistic regression</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Generalised ordinal logistic regression</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multiple regression</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grounded theory</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 5. Distribution of the individuals by their answers to the two questions about physical activity. n = 3756, Sweden, 1999.

<table>
<thead>
<tr>
<th>Total physical activity (hours/week)</th>
<th>Exercise</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>None</td>
</tr>
<tr>
<td>≤ 2</td>
<td>160</td>
</tr>
<tr>
<td>(4.3 %)</td>
<td>(5.8 %)</td>
</tr>
<tr>
<td>3–5</td>
<td>62</td>
</tr>
<tr>
<td>(1.7 %)</td>
<td>(7.7 %)</td>
</tr>
<tr>
<td>≥ 6</td>
<td>184</td>
</tr>
<tr>
<td>(4.9 %)</td>
<td>(14.8 %)</td>
</tr>
</tbody>
</table>

Figure 4. Adjusted odds ratios (ORs) with 95% confidence intervals (CIs) for at least moderate or high levels of physical activity (n = 2,649). Generalised ordinal logistic regression.

Figure 4. Adjusted odds ratios (ORs) with 95% confidence intervals (CIs) for at least moderate or high levels of physical activity (n = 2,649). Generalised ordinal logistic regression.

* Adjusted for age, education and smoking simultaneously.
Table 6. Total amount, average intensity and time spent at different intensities of physical activity presented as daily mean and median, and by week-day mean values (n=144).

<table>
<thead>
<tr>
<th></th>
<th>Mean ±SD&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Median (CI)&lt;sup&gt;b&lt;/sup&gt;</th>
<th>P&lt;sup&gt;c&lt;/sup&gt;</th>
<th>Mon</th>
<th>Tue</th>
<th>Wed</th>
<th>Thu</th>
<th>Fri</th>
<th>Sat</th>
<th>Sun</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total amount</strong>&lt;br&gt; (counts x 1000)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chile</td>
<td>301 ± 101</td>
<td>296 (254-340)</td>
<td>0.02&lt;sup&gt;d&lt;/sup&gt;</td>
<td>335</td>
<td>308</td>
<td>287</td>
<td>330</td>
<td>302</td>
<td>280</td>
<td>276</td>
</tr>
<tr>
<td>Finland</td>
<td>343 ± 115</td>
<td>330 (291-366)</td>
<td></td>
<td>354</td>
<td>347</td>
<td>373</td>
<td>339</td>
<td>333</td>
<td>328</td>
<td>336</td>
</tr>
<tr>
<td>Iraq</td>
<td>277 ± 99</td>
<td>278 (218-323)</td>
<td></td>
<td>267</td>
<td>279</td>
<td>277</td>
<td>301</td>
<td>275</td>
<td>271</td>
<td>280</td>
</tr>
<tr>
<td><strong>Average intensity</strong>&lt;br&gt; (counts/minute)</td>
<td></td>
<td></td>
<td>0.04&lt;sup&gt;d&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chile</td>
<td>363 ± 112</td>
<td>369 (292-407)</td>
<td></td>
<td>398</td>
<td>373</td>
<td>335</td>
<td>400</td>
<td>348</td>
<td>337</td>
<td>346</td>
</tr>
<tr>
<td>Finland</td>
<td>412 ± 144</td>
<td>386 (348-439)</td>
<td></td>
<td>418</td>
<td>409</td>
<td>428</td>
<td>403</td>
<td>401</td>
<td>415</td>
<td>421</td>
</tr>
<tr>
<td>Iraq</td>
<td>337 ± 116</td>
<td>331 (281-384)</td>
<td></td>
<td>326</td>
<td>340</td>
<td>336</td>
<td>352</td>
<td>336</td>
<td>335</td>
<td>340</td>
</tr>
<tr>
<td><strong>Time spent at different intensities</strong>&lt;br&gt; (minutes)</td>
<td></td>
<td></td>
<td>0.79</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sedentary</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chile</td>
<td>445 ± 71</td>
<td>450 (409-493)</td>
<td></td>
<td>422</td>
<td>463</td>
<td>476</td>
<td>450</td>
<td>456</td>
<td>440</td>
<td>433</td>
</tr>
<tr>
<td>Finland</td>
<td>457 ± 78</td>
<td>461 (438-489)</td>
<td></td>
<td>470</td>
<td>468</td>
<td>472</td>
<td>475</td>
<td>463</td>
<td>426</td>
<td>435</td>
</tr>
<tr>
<td>Iraq</td>
<td>463 ± 90</td>
<td>459 (410-490)</td>
<td></td>
<td>476</td>
<td>469</td>
<td>472</td>
<td>478</td>
<td>450</td>
<td>456</td>
<td>453</td>
</tr>
<tr>
<td>Low</td>
<td></td>
<td></td>
<td>0.64</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chile</td>
<td>345 ± 77</td>
<td>358 (306-385)</td>
<td></td>
<td>368</td>
<td>338</td>
<td>335</td>
<td>345</td>
<td>371</td>
<td>344</td>
<td>320</td>
</tr>
<tr>
<td>Finland</td>
<td>337 ± 72</td>
<td>329 (302-354)</td>
<td></td>
<td>327</td>
<td>341</td>
<td>356</td>
<td>332</td>
<td>339</td>
<td>327</td>
<td>323</td>
</tr>
<tr>
<td>Iraq</td>
<td>325 ± 77</td>
<td>340 (298-365)</td>
<td></td>
<td>311</td>
<td>315</td>
<td>319</td>
<td>337</td>
<td>325</td>
<td>331</td>
<td>333</td>
</tr>
<tr>
<td>MVPA&lt;sup&gt;e&lt;/sup&gt;</td>
<td></td>
<td></td>
<td>0.01&lt;sup&gt;d&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chile</td>
<td>33 ± 19</td>
<td>31 (21-40)</td>
<td></td>
<td>37</td>
<td>37</td>
<td>31</td>
<td>41</td>
<td>29</td>
<td>30</td>
<td>29</td>
</tr>
<tr>
<td>Finland</td>
<td>45 ± 26</td>
<td>39 (33-48)</td>
<td></td>
<td>49</td>
<td>46</td>
<td>50</td>
<td>44</td>
<td>41</td>
<td>43</td>
<td>45</td>
</tr>
<tr>
<td>Iraq</td>
<td>31 ± 18</td>
<td>32 (23-40)</td>
<td></td>
<td>30</td>
<td>31</td>
<td>34</td>
<td>37</td>
<td>31</td>
<td>27</td>
<td>30</td>
</tr>
</tbody>
</table>

<sup>a</sup> Standard deviation.<br>
<sup>b</sup> 95% confidence interval.<br>
<sup>c</sup> Kruskal-Wallis, test of differences between countries of birth.<br>
<sup>d</sup> Fin-Iraq significant, pairwise comparisons.<br>
<sup>e</sup> Moderate to vigorous physical activity.
Table 7. Bootstrapped beta-coefficients ($\beta$) with 95% confidence interval (CI) in three models (n=144) showing the association between the independent variables and minutes spent in at least moderate physical activity (MVPA).

<table>
<thead>
<tr>
<th>Variables</th>
<th>Model 1\textsuperscript{a} (Crude model)</th>
<th>Model 2\textsuperscript{b} (Adjusted model)</th>
<th>Model 3\textsuperscript{b} (Interaction model)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\beta$ (CI )</td>
<td>$\beta$ (CI )</td>
<td>$\beta$ (CI )</td>
</tr>
<tr>
<td>Country of birth</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Finland 0 (Ref)</td>
<td>0 (Ref)</td>
<td>0 (Ref)</td>
<td></td>
</tr>
<tr>
<td>Chile -11.73 (-20.51, -2.95) &amp; -11.27 (-20.08, -2.45)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Iraq -13.56 (-21.53, -5.60) &amp; -11.89 (-19.50, -4.29)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-39 0 (Ref)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40-54 2.99 (-5.06, 11.04)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>55-65 4.18 (-7.15, 15.50)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No university degree</td>
<td>0 (Ref)</td>
<td>0 (Ref)</td>
<td>0 (Ref)</td>
</tr>
<tr>
<td>University degree</td>
<td>5.95 (-1.61, 13.52)</td>
<td>6.49 (-0.77, 13.75)</td>
<td>7.39 (-0.28, 15.06)</td>
</tr>
<tr>
<td>Body mass index (BMI)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 25 0 (Ref)</td>
<td></td>
<td>0 (Ref)</td>
<td>0 (Ref)</td>
</tr>
<tr>
<td>25-29.9 -12.88 (-20.18, -5.57) &amp; -11.53 (-18.50, -4.55) &amp; -11.36 (-18.54, -4.18)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\geq$ 30 -5.02 (-19.74, 9.69) &amp; -5.61 (-20.01, 8.80) &amp; -4.26 (-19.51, 10.99)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interaction</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fin-Age 18-39</td>
<td></td>
<td></td>
<td>0 (Ref)</td>
</tr>
<tr>
<td>Fin-Age 40-54</td>
<td>13.67 (1.97, 25.37)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fin-Age 55-65</td>
<td>7.52 (-7.28, 22.32)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chi-Age 18-39</td>
<td>-1.31 (-14.44, 11.82)</td>
<td>-7.69 (-20.43, 5.06)</td>
<td></td>
</tr>
<tr>
<td>Chi-Age 40-54</td>
<td>6.33 (-18.04, 30.69)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chi-Age 55-65</td>
<td>2.04 (-8.84, 12.91)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Iraq-Age 18-39</td>
<td>-10.14 (-23.98, 3.70)</td>
<td>-19.35 (-37.70, -1.00)</td>
<td></td>
</tr>
<tr>
<td>Iraq-Age 40-54</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Iraq-Age 55-65</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Explained variance (adjusted)</td>
<td>$R^2 = 0.11$</td>
<td>$R^2 = 0.13$</td>
<td></td>
</tr>
</tbody>
</table>

\textsuperscript{a} Separate analyses for each of the explanatory variables. 
\textsuperscript{b} Adjusted for education and BMI simultaneously.
5.3 STUDY IV

The women described physical activity as any movement in their daily life, whereas they described exercise as being more structured and physically demanding than regular physical activity. The focus of the interviews was in accord with the women’s own interests, i.e. exercise rather than physical activity. One important factor that came forth was that the women expressed themselves in terms of “we”, “us”, and “our” and they emphasised that it is easier to do things in a group than by themselves.

5.3.1 Enabling exercise

The model that emerged and illustrated the core process and the variation in the women’s attitudes to exercise consisted of the core category enabling exercise. Most of the women lacked experience of exercise in their home countries. The women had discovered the possibility of exercising in Sweden. They expressed a strong desire to start, but they felt that they were unable to change their situation by themselves. All women in the focus groups agreed that the local community should arrange appropriate exercise.

5.3.1.1 Arranging exercise

Some women had tried by themselves to exercise but failed and they perceived a lack of officially arranged exercise. The few efforts that had been made had not led to regular exercise. For example, several women had received a referral to an exercise programme, but it was time-limited and the women did not understand why they could not continue to exercise. Others had been advised by a doctor to swim, although they could not swim or the public swimming pools did not offer women-only hours. The women stated that it was important that the exercise was arranged and planned close to their home, preferably indoors in a familiar place and in groups with only women. Some women asked for groups with women from their own culture. They also requested that the exercise should be arranged at times that did not conflict with their duties at home. In addition, not having time for themselves put obstacles in the way of their exercising. Since they were unaccustomed to exercising and needed to learn how, they wished to have access to an instructor.

5.3.1.2 Appropriate exercise

There were several aspects that determined what was appropriate or not. It was a big step for the women to go to a gymnasium all by themselves and they felt that they did not belong there. Even putting on a pair of training shoes made them feel “different” (not normal). Other aspects included their age, economy, and number of children. The women also mentioned that they needed to get used to how the body responds to exercise and overcome feelings of fear when the heart rate increases, so that it could be pleasant for them to exercise. Demands for blameless behaviour were very important for the women, and some activities were considered to be more proper than others. Activities they knew that others had performed felt “proper”. The women were therefore eager to talk about exercises that were appropriate for them. Most women thought that cycling, swimming and gymnastics were suitable, pleasant and proper activities. In addition, it was more acceptable to participate in exercise that was arranged by the school or the workplace because then participation was considered to
be compulsory. Demands for blameless behaviour did not only come from the family but also from other persons from their own culture. Social control was strong and many women were expected to wear a veil and not go out by themselves. However, many women said that their own husbands and male relatives encouraged them to exercise. All women asked for suitable and pleasant exercise, but the women from Iraq and Turkey also said that it was important that the exercise was proper.

5.3.2 Strategies for deciding to exercise

“We should do gymnastics but, we don’t have the same culture of using our leisure time as here” (Chilean, 45 years old). Many women were well aware of the positive effects of physical activity and that they should exercise more. They also hoped to take up activities like cycling and swimming, which they had to forsake when they were growing up. The strategies for deciding to exercise are presented as four categories (Figure 5)

a) Deciding – when arranged and appropriate exercise was available, some women decided to start exercising. However, few women had made the decision and we noticed a difference between the women, since mainly the women from Chile had really started to exercise (they said that they had taken the step from the decision to action). A lack of self-discipline and of inspiration were some hindrances to exercise.

b) Waiting – many women had found appropriate forms of exercise and waited for it to be arranged. However, the women had different reasons for waiting. Women from Turkey and Iraq waited for special women groups to be started in their neighbourhood, whereas women from Chile waited for the public authorities to take responsibility and wanted to increase the accessibility of exercise through information and subsidies.

c) Hesitating – arrangement of inappropriate exercise resulted in the women hesitating. Several women from Iraq and Turkey wanted some kind of assurance that the activities would be pleasant and that it is “legitimate” to participate.

d) Abstaining – if exercise was neither appropriate nor arranged, the women abstained from exercise. In addition, these women were probably not really prepared to exercise. Some of them wanted to exercise but felt insecure and experienced many hindrances. Many women in our study were waiting or hesitating. However, a few women tried to arrange activities by themselves or went to other neighbourhoods to exercise, although this was difficult and did not lead to any regularity.

Figure 5. Strategies for decision to exercise, the connection between arranged and appropriate exercise.

<table>
<thead>
<tr>
<th>Arranged</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>a) Deciding</td>
</tr>
<tr>
<td>No</td>
<td>c) Hesitating</td>
</tr>
</tbody>
</table>
### 6 DISCUSSION

This thesis provides more knowledge of minority women’s physical activity habits and patterns: how active they are, the periods of the day and week when they are most (and least) active and the balance of light, moderate and vigorous activities in which they participate. This thesis also shows that physical activities that go beyond traditional forms of exercise do have positive effects on self-rated health.

#### 6.1 MAIN FINDINGS

Exercise habits and total physical activity were independently associated with good self-rated health after adjusting for several confounders. Women born in Sweden reported more exercise and rated their health better than foreign-born women (Study I).

The amount and intensity of physical activity in minority women varied (Studies II–III). Finnish women reported the highest median in total physical activity, most of it in the domain leisure time, whereas women from Iraq reported the least physical activity and very little in the domain leisure time (Study II). In addition, Finnish women also had the highest total amount and highest average intensity of physical activity when physical activity was assessed objectively (Study III). However, there were no significant differences in time spent in the lower intensity categories (sedentary and low) (Study III). A strong and varied association between country of birth and physical activity (subjectively and objectively assessed) were found in Studies II and III. The association remained statistically significant after adjusting for several confounders. Women from Finland were more likely and women from Iraq were less likely to report higher levels of physical activity than Swedish-born women (Study II). Women from Finland also spent significantly more time in MVPA than Chilean and Iraqi women (Study III). Socio-demographic and lifestyle variables could not explain the differences between countries of birth, implying that there are other factors explaining these differences (Study III).

The model that emerged in Study IV described the women’s attitudes and experiences and their ideas of how exercise can be made possible. The women agreed that the local community should arrange exercise that felt appropriate. If appropriate exercise was arranged, the women sometimes decided to participate. Otherwise, they hesitated or waited.

#### 6.2 STRENGTHS AND LIMITATIONS

##### 6.2.1 Strengths

The random sampling in Studies I–III is a major strength compared to convenient sampling frequently used in physical activity research. The inclusion of women stemming from different parts of the world and different cultures and now living in the same Swedish municipalities (Studies II–IV) is another strength. The inclusion of only first generation immigrants may, however, represent a limitation as physical activity habits could change with a higher degree of acculturation, which often occurs in second
generation immigrants. However, this phenomenon is not found in all immigrant groups [107, 108]. No statistically significant differences were found between respondents and non-respondents in Studies II and III, and therefore there is no reason to expect a non-response or selection bias. The demographic variables were also similar to demographic statistics for immigrant women (aged 20–64) in Stockholm [79].

Another key strength is that we used various methods in the assessment of physical activity. The methods elucidated different aspects, which is an advantage when the aim is to obtain a general view of physical activity patterns. By assessing both exercise and total physical activity in a large national survey (Study I), a unique opportunity to examine the relationship between self-rated health and different aspects of physical activity was obtained. In Study II, the IPAQ-long was used to obtain information about the intensity, frequency and duration of self-reported physical activity. It also made it possible to distinguish between the contributions of the different domains to the total physical activity. To obtain a broader understanding of the total amount, intensity and patterns of physical activity, a recognised objective device to measure free-living physical activity was used (Study III). Data from accelerometers are very useful for understanding the complex nature of physical activity [109, 110]. Given many of the women’s traditional roles, the approach of using both subjective and objective methods should give a more comprehensive picture of the participants’ physical activity habits.

The cut-points used in Study III to establish different intensities were based upon an experimental study on walking and running, which does not include activities such as bicycling and activities that involve upper-body movement or the additional costs of load-carrying [111]. A comparison of different cut-points has shown that they produce varying results and that none of the cut-points seem to be ideal [112]. Using a lower cut-off point naturally results in more minutes in the respective activities. This is likely to be a false-positive misclassification because the values are established on the basis of activities that the accelerometer does not measure [112]. The cut-point for moderate-intensity physical activity used in this study corresponds to walking at 4 km/h.

There are also several strengths in Study IV. Data were collected through interviews in focus groups, which gave a large quantity of diverse and comprehensive data and an opportunity to analyse the interaction between the women [113, 114]. Theoretical sampling was used, i.e. the emerging theory decided which groups to interview and the formation/framing of the interview guide. The data reflected the women’s beliefs and the result was a product that appeared in the interaction between the researcher and the data. This shows that the data are well grounded. Thus, the model is useful and can explain and predict what may happen (work). The model has emerged from data during the course of constant comparative analysis, which ensures the empirical grounding or fit. The model may also be modified by the contribution of new data (modifiability).

6.2.2 Limitations

Limitations include the general problem when subjectively assessed physical activity is used as an outcome, i.e. recall and self-report bias [44-46]. Recall bias and self-report bias are therefore important limitations in studies using questionnaires. Another limitation is the understanding of the words moderate and vigorous, especially among
the lowly educated [115, 116]. It has also been suggested that the validity of the assessment of habitual physical activity is higher for higher intensities of physical activity than for lower ones [45]. Additionally, the diverse physical activity surveillance instruments used in previous studies make cross-study comparisons difficult as many of these instruments were not constructed for use across diverse population groups [117]. Moreover, there is a risk of overestimation when physical activities in many domains are summed up, which could imply that some less active individuals are classified as active. Another limitation is that it cannot be ruled out that some individuals do not take part in physical activity owing to health problems [19].

Even though the physical activity questions in Study I measure different aspects of physical activity (i.e. frequency and duration), it is possible to distinguish high and low levels of physical activity. The categorisation of the response alternatives and the cut-off points may, however, have led to a coarse picture of reality. In addition, the reported physical activity is a summation for a week and it can neither be quantified by different domains nor is it possible to assess if the activities were performed on a regular basis (Study I). On the other hand, the prevalence of irregular patterns of physical activity, so-called “weekend warriors”, has proved to be relatively low [5]. One may argue that those reporting no exercise but high levels of total physical activity could have included a large amount of occupational physical activity. However, studies have shown that occupational physical activity is not a predictor of self-rated health, whereas leisure-time physical activity is [11, 118]. Furthermore, we cannot distinguish between physical activities in different domains in Study III; it is therefore possible that some of the accumulated physical activity in this study could be work-related and not health-enhancing.

There are also some limitations in study IV. Country of birth was used to create homogeneous focus groups. However, these countries include people from many different cultures, religions and traditions. Therefore, huge cultural and social differences may exist between different groups of people, which could have an important effect on exercise habits. Thus there are limitations in the research on country of birth in relation to physical activity. In addition, the use of an interpreter entailed an obvious risk of misconstructions.

6.3 GENERAL DISCUSSION – INTERPRETATION

Physical activity is a complex behaviour, which is difficult to assess. This highlights the importance of screening for sedentary individuals in the population with the aid of several questions because different questions represent different dimensions of physical activity. This was demonstrated by the relatively low correlation between the two physical activity questions used in Study I. This study also showed that there is a risk of misclassification if only a single question is used to assess physical activity. Nearly 5% of the sample would be classified as sedentary or physically inactive even though they reported many hours of total physical activity, and about 4% would be classified as exercising regularly or being physically active despite the fact that they reported few hours of total physical activity. The limitations of using only one physical activity question has been discussed previously [119].
Furthermore, self-rated health is a concept shaped by a number of factors which may influence how the respondents answered the question about self-rated health. We have not analysed all these factors in our studies. It is therefore difficult to conclude which factors are determinants and which factors are consequences of good self-rated health. In general, individuals with high socioeconomic status have higher levels of leisure-time physical activity and better self-rated health than individuals with low socioeconomic status [62]. However, the correlation between different socioeconomic variables sometimes makes it difficult to estimate the independent contribution of each of these variables to health-related outcomes [96]. The results of Study I showed that the socioeconomic variables and the variable country of birth were associated with self-rated health. However, the association between physical activity and self-rated health was not explained by the socioeconomic factors. Likewise, the association between physical activity and country of birth (Studies II–III) could not be explained by the socio-demographic factors.

Body mass index (BMI) is a well-known correlate to health and lifestyle factors such as physical activity [38]. However, the relationship between physical activity and BMI was not constant in the studies included in this thesis. For example, BMI was associated with levels of physical activity in women from Sweden and Finland, but not among women from Iraq and Chile. Some Swedish studies have found that BMI levels are significantly higher in women born in Chile and the Middle East than in women born in Sweden [120, 121]. Age is another individual factor where the relationship with physical activity was not constant across country-of-birth groups. For example, age was significantly associated with physical activity among the Iraqi women, whereas this was not the case among the Finnish women. This is in agreement with a recently published study from Finland which showed that age is not associated with overall leisure and daily physical activity [122].

6.3.1 Physical activity and self-rated health

Both exercise and total physical activity were independently associated with good self-rated health (Study I). In addition, the highest odds for reporting good self-rated health was found among those who exercised on a regular basis and had a total physical activity of $\geq 6$ hours/week. The least active individuals constituted only 4.3% of the sample when both dimensions of physical activity were assessed. Our findings support the notion that lifestyle factors, such as physical activity, are independently related with good self-rated health [38]. The association between the two forms of physical activity and good self-rated health is in accord with previous studies [123]. The relationship between physical activity and self-rated health has also been investigated across countries in the European Union; the results showed some indications of a positive relationship, but not in all countries [36]. However, the European study showed a positive relationship between physical activity and self-rated health in the Swedish sample, with odds similar to those found in Study I [36]. Other previous studies of the association between physical activity and self-rated health have shown divergent results [11, 37]. One reason for this could be that previous studies have addressed different forms of physical activity, e.g. leisure-time,
occupational, household or total physical activity. Another possible reason is that the self-assessments of health and/or physical activity are understood differently as they are subjective measures. A study from Finland and the Baltic countries showed that the association between self-rated health and physical activity varied markedly between countries, suggesting that similar associations between lifestyle and self-rated health are only found between countries with similar socioeconomic conditions [124].

Self-rated health was also investigated in Studies II–III, and a varied result could be expected due to different socioeconomic conditions [124]. The minority women included in Studies I–IV have different backgrounds and have come to Sweden for a variety of reasons. Thus, cultural and social differences exist both within and between the countries of birth, which could have an important effect on the women’s answers to the question about self-rated health.

6.3.2 Patterns of physical activity

6.3.2.1 Amount of physical activity

One can assume that those exercising regularly also have an active lifestyle and accumulate many hours of physical activity during a week, and that those who are physically active during only a few hours do not exercise. Most individuals in Study I were in conformity with this assumption. However, regularity is important in order to achieve the health effects of physical activity, whereas exercise twice a week and a low level of physical activity during the rest of the week may not be sufficient to achieve health benefits. In addition, one can speculate that those reporting many hours of physical activity, but no exercise, engage in other activities during their leisure time that help them not only to reach the current physical activity recommendations, but also to reap the health benefits of regular physical activity. In fact, these individuals rated their health as better than some of those who exercised regularly (Figure 2b), thus indicating that it might be more important to have an active lifestyle than to just exercise a couple of times a week.

Previous studies have shown that most of the physical activity of women is accumulated during household work and transportation [8, 125]. Likewise, other studies have shown that walking is the predominant form of physical activity among women [61, 126]. We found that the contribution of each domain to the reported total physical activity varied between the countries of birth. The main domain for the Iraqi women was domestic work and gardening, whereas women from Sweden and Finland reported most activities during leisure time. In contrast, all domains contributed equally for the Chilean women (Figure 3). We also noted that half of the Iraqi women reported no physical activities during leisure time.

In agreement with Study II, Brownson et al. revealed substantial differences in levels of physical activity between different groups of minority women in the US [48]. For example, African American women were less likely to exercise regularly and Hispanic women were more likely to exercise regularly than non-Hispanic white women. That study also showed that a much higher proportion of women were classified as physically active when the level of physical activity was based on a variety of activities than when it was based on only leisure-time activities [48].

40
Some studies from the US have found that physical activity patterns vary between weekdays and weekends [92, 127]. The findings in Study III were unable to reveal significant differences between weekdays and weekends in patterns of physical activity. Nor was it possible to detect any statistical differences between the countries in sedentary time (Table 6). However, the Finnish women seemed to balance sedentary time with active periods at higher intensities. Although all health-enhancing physical activity is important and no domain should be neglected [23, 126, 128], epidemiological studies and clinical trials have shown pronounced health benefits mainly from leisure-time physical activities at higher intensities [23, 126, 128].

6.3.2.2 Intensity of physical activity

Finnish women had the highest total amount and highest average intensity of physical activity (Table 6). Women from Finland also spent significantly more time at the highest level of physical activity compared to Chilean and Iraqi women. A comparison of these results with those for Swedish women is possible because a recent national study used accelerometers to assess physical activity among Swedes. It was surprising that the minority women from Chile, Finland and Iraq did not accumulate fewer minutes of MVPA on a daily average basis (median = 31, 39 and 32 min, respectively) than Swedish women (median = 29 min) [56]. However, 48% of the Swedish women met the physical activity recommendations of ≥ 30 min per day on ≥ 5 days per week [56], which is similar to the figures for the Finnish women but higher than those for the Chilean and Iraqi women in Study III.

The physical activity recommendations are based on epidemiological studies in which 150 minutes a week of moderate-intensity physical activity has been shown to be sufficient to reduce all-cause mortality [2, 3]. However, aerobic fitness is also health-enhancing and vigorous-intensity physical activity has been shown to increase aerobic fitness more effectively than moderate-intensity physical activity. Swain et al. found that if the total energy expenditure of exercise is held constant, exercise performed at a vigorous intensity appears to convey greater cardioprotective benefits than exercise at a moderate intensity [23]. In addition, a study from Denmark investigating the impact of walking on all-cause mortality showed that the intensity of the walking is of greater importance than the duration (ref). The aim of the current physical activity recommendations is to encourage most individuals to reach at least moderate levels of fitness through a moderate level of physical activity. It would not make sense to encourage individuals to “become fit”, but instead we can, and should, recommend individuals to increase their activity. Most likely, if sedentary persons do the latter, they will achieve the former [24].

6.3.3 Physical activity and country of birth

Results from the national sample in Study I showed that Swedish-born individuals reported more exercise and higher levels of total physical activity than foreign-born individuals. A relationship between physical activity and country of birth was also found in Studies II and III. Women from Finland were significantly more likely and women from Iraq were less likely to report higher levels of physical activity than Swedish-born women (Figure 4). People from the Nordic countries are among the most
active in Europe with regard to leisure-time physical activity and exercise. The hypotheses for the present studies were therefore that similar results would be found for the women born in Finland and Sweden [83, 95]. However, the Finnish women reported more physical activity than the Swedish-born women. The low level of physical activity among women from Iraq, in total and during leisure time, is in line with previous research from Sweden [129, 130], which has shown that the risk of being sedentary during leisure time is significantly higher in women born in Arabic-speaking countries than in Swedish-born women.

Current statistics from the home countries of the minority women included in the present studies show that a high percentage of women living in Finland (55%) are physically active on a regular basis, whereas this appears to be unusual for women living in Chile (9%) and Iraq (12%) [131-133]. Although these percentages are not fully comparable with the results in the present studies, e.g. due to different methods of measuring physical activity, Finnish women living in Sweden appear to be less physically active than their counterparts in Finland. In contrast, the Chilean and Iraqi women living in Sweden appear to be more physically active than their counterparts in Chile and Iraq. It is possible that Swedish society offers women from Chile and Iraq better opportunities for physical activity. This shift in physical activity could also be described as a transition and an adaption to the host population.

An interesting result in Study IV was that the group is of vital importance for the minority women. Although the nature of this study did not allow any conclusions about why the women preferred group activities, it is possible that many immigrant women feel isolated and marginalised and that they therefore wish to be together in a group. It is also possible that they identify themselves as a collective based on similarities in cultural background. Many of these women spend their lives close to their homes and are dependent on other women in the same neighbourhood. This could make it more effective to aim efforts and resources at neighbourhoods and groups of women instead of at individuals. Such an approach could enable more women to start exercising, so that they in turn might inspire others. Thus, close collaboration with women from different minority groups is important in order to fully understand and adjust to their different needs [116, 134-136].

6.3.4 Minority women’s ideas of enabling exercise

Although the women in Study IV recognised the opportunities to exercise in Sweden and strove to conform to the Swedish system, they experienced a clash between two cultures. Through exercise, the women saw the opportunity for a better life, a life in which they could think of their own needs and have time on their own. They wanted the exercise to be arranged close to their homes and at times that did not conflict with their family duties. The women said that it is not considered appropriate for married women and mothers to exercise because exercise reduces the time available for home and family. A nother important factor was their need to feel safe and secure and that it is important that the exercise is “proper”. These factors have also appeared in other studies [136, 137]. Many women said that they had received support and encouragement to exercise from their husbands, although attitudes and opinions of other people from their own culture made them feel insecure about what was
appropriate. Social control was strong and high demands and expectations were put upon the women. Some women, however, tried to find different ways to get around some of these hindrances. It is possible that prescribed physical activity could help these women to start exercising. Another way is to arrange exercise in connection with school or work as such exercise would be considered to be compulsory. The type of arrangement of the exercise could thus act as an enabler for immigrant women to participate.

The model for strategies to exercise (Figure 5) can be compared to a process of change [74, 75], although without distinct stages, and many factors will determine which women will start exercising. Moreover, to rule your own life and feel control is important in order to achieve a change [76]. Consequently, it is important that there is a public awareness, so that the process of change can be supported and facilitated among minority women.

6.4 POSSIBLE MECHANISMS

For many people, leisure time is predominantly characterised by sedentary activities when it could actually provide the opportunity for healthier physically active “leisure styles”. In addition, although the prevalence of leisure-time physical activity is increasing in the majority population, minority women are still among the least active [49, 82, 85, 138]. The possible causal mechanisms explaining why minority women are less likely to be physically active during leisure time cannot be properly understood without grasping the entire context surrounding different groups of minority women, which was not feasible in the present studies. Cultural influences from the country of birth could have an impact on the levels of physical activity. In addition, some minority women are highly involved in caregiving, which might be a potential hindrance to physical activity. In a U.S. study, caregiving duties were significantly associated with inactivity in all groups of minority women. The likelihood of having a high level of leisure-time physical activity was lower among minority women as well as among those who had young children at home [50]. However, high levels of physical activity were found in the domain household and caregiving activities among Hispanic women and those having young children at home [50]. This emphasises the need to study all types of physical activity to be able to distinguish sedentary individuals from those who are physically active.

Minority women also face structural forces that may act as barriers to exercise, such as a low educational level, sparse economic resources and unemployment, which are often encountered in immigrant populations [139, 140]. Furthermore, findings from a study examining leisure-time physical activity among different ethnic minority groups in the U.S. concluded that social class moderates the association between ethnicity and leisure-time inactivity, particularly among women [49]. The relationship between social class and leisure-time physical activity and the link to health has also been demonstrated in Swedish studies [38, 62].

Previous studies have suggested that living in a society where everyone has equal opportunities to engage in physical activity is an important determining factor for women to be physically active [97, 141]. Eyler at al. used a qualitative approach to
investigate environmental and personal enablers and barriers to increased physical activity among minority women. The authors found that one of the most important environmental enablers was access in connection with work, home, community and church, whereas cost, lack of transportation and suitable programmes constituted environmental barriers [69]. A study from Sweden found, however, that societal factors were less associated with leisure-time physical activity than such individual factors as educational level and country of birth [142].

6.5 CLINICAL AND PUBLIC HEALTH IMPLICATIONS

Low levels of physical activity may contribute to disparities in health. It is therefore important to assess health-enhancing physical activity obtained in all areas of living among different population groups in order to identify the least active ones and target them in physical activity interventions, with the goal to reduce disparities in health.

Promoting physical activity has been an important public health issue during the latest decades. Additionally, some population groups are less active than others. Our findings may provide additional insight into important aspects of minority women’s time spent in sedentary and physically active behaviours. This is important as the number of immigrants is steadily increasing in many countries, including Sweden.

The results of Study IV show that it is difficult for immigrant women who lack previous experience of exercise to start exercising on their own. In addition, the study provides new information about cultural attitudes and social norms that hinder women from exercising in the new country. The immigrant women believed that it is important that the community should arrange appropriate programmes to enable exercise. Resources to create opportunities for immigrant women to exercise should therefore be focused on the group level and especially on the women who are waiting or hesitating.
7 CONCLUSIONS

- It is advantageous to use more than one question in order to evaluate several dimensions of physical activity and identify the least active individuals in the population. Population-based surveys should take this into account.

- The diverse results within and between the different domains and countries of birth underline the need to examine physical activity in each minority group separately. Further studies should examine possible barriers to physical activity among the least active groups of minority women.

- The socio-demographic and lifestyle variables could not explain the association between physical activity and country of birth. This implies that there are other factors influencing the association, such as cultural factors. Future studies should attempt to identify factors that have an impact on the levels of physical activity among minority women.

- If appropriate activities are arranged, levels of physical activity and exercise might increase among minority women. Future studies could explore specific activities that can facilitate minority women’s opportunities to exercise.
ACKNOWLEDGEMENTS

The work on this thesis was done at the Center for Family and Community Medicine (CeFAM), Department of Neurobiology, Care Sciences and Society, Karolinska Institutet. The work was supported financially by grants from the Stockholm County Council (SLL) and the Swedish Council for Working Life and Social Research (FAS).

I wish to express my sincere gratitude to all of those who have helped me during my work on this thesis. First and foremost, I wish to thank all participants in the Physical Activity and Health Study, above all the women who participated in the focus groups.

My special thanks are due to:

Kristina Sundquist, my main supervisor and co-author, for believing in my project and embracing both me and my ideas, for introducing me to the “scientific world” and for proficient guidance in scientific thinking and writing.

Maria Hagströmer, my co-supervisor and co-author, for all the interesting discussions, for your generosity and for being such a good friend. Your knowledge and engagement in physical activity research is inspiring.

Jan Sundquist, my co-author, for giving me the opportunity to become a graduate student at CeFAM. I would also like to thank you for always believing in me, and for always having your door open whenever I have had concerns about research issues or other matters.

Sven-Erik Johansson, my co-author, for guiding me in the field of statistical methods, for your encouragement and untiring support. I also thank you for the initiative to and planning of Study I.

Lena Törnkvist, my co-author, for taking care of me when I was lost in the world of qualitative research, for helping me sort out concepts and for fruitful discussions.

Ingrid Hylander, my co-author, for teaching me Grounded Theory, for guiding me through the analytical process and for helpful comments and suggestions concerning the manuscript.

Jenny Strollo, my mentor, for conversations about both things in life in general and in life as a graduate student. Your wisdom has given me new insights into myself.

Former and current colleagues and friends at CeFAM, for always being supportive, particularly: Amanda, Anita, Ing-Britt, Kamilla, Kattis and Marina for valuable conversations about qualitative research, life and other important things. And my colleagues in the research group, for creating such a pleasant work environment: Afsaneh, Johan, Paiman, Suheyla, Terhi, Ulf, Vania and Venus.
I would also like to send a special thank you to: Angela, Cecilia, Daphne, Kim and Yvonne, for help with different practicalities; Robert, for invaluable statistical advice and for your positive attitude; and to Julia, my dear African friend, may all your wishes come true.

And also to:
Jenny Larson, my newfound friend, for always being open-minded and a great listener. The future is yours.

My big family, for always being there and showing me the right perspective on life.

Someone said: Having a sister is like having a friend for life……well, I have two.

To all my sisters and brothers, and all sisters- and brothers-in-law for their support, even though it has been tricky to understand what I’ve been up to during this doctoral adventure. And to my mother and late father for always letting me do things my way.

My little family, for always standing by me. Not only as supportive children but also as helping hands in reviewing text and packing thousands of questionnaires and input data. Malin, Maria, Kristofer and Jesper, Henrik and Emmy, you are undoubtedly the most important persons in my life. And of course, my two little angels Hanna and Emma for bringing pure joy to my life, and Jesper, I treasure your love!

Last but not least I thank Roslagens Sparbanks Stiftelser, Capio, FAS and KI-travel grants for financial support during my work on this thesis.

Motion är en planerad strukturerad form av fysisk aktivitet och att komma igång med motion innebär för många en livsstilsförändring. Det är viktigt att öka intresset för motion men det mest angelägna är att skapa förutsättningar så fler kan nå gällande rekommendationer för fysisk aktivitet. Hälsovinsterna av måttlig daglig fysisk aktivitet är stora och det är de som rör sig allra minst som har mest att vinna. Vilka är de då som rör sig allra minst?

Det verkar finnas ett samband mellan aktivitetsgrad och födelseland, åtminstone när det gäller fritidsaktiviteter och motion. Några svenska studier har till exempel visat att utlandsfödda kvinnor motionerar i mindre utsträckning än svenskfödda kvinnor. Men forskning kring kvinnors totala fysiska aktivitet, där hänsyn tas till fysisk aktivitet under hushållsarbete, i arbetslivet och under transporter är begränsad.

Den här avhandlingen beskriver svenskars aktivitetsgrad i allmänhet, med ett särskilt fokus på kvinnor från olika invandrargrupper. Syftet med avhandlingen var att: 1) Studera samband mellan fysisk aktivitet och självskattad hälsa; 2) Studera aktivitetsmönster och samband mellan fysisk aktivitet och födelseland hos kvinnor; samt 3) Utforska kvinnors upplevelser av fysisk aktivitet och motion.

Avhandlingen består av fyra studier som integrerar kvantitativa och kvalitativa metoder. I den kvantitativa delen har fysisk aktivitet undersöks med hjälp av enkäter och rörelsemätare i två tvärsnittsstudier. Den ena omfattade 3756 personer (25–64 år) ur den svenska befolkningen (Studie I) och den andra inkluderade 2649 kvinnor (18–65 år) födda i Sverige, Finland, Chile och Irak, bofasta i Botkyrka och Stockholms kommun (Studie II–III). Data till den kvalitativa delen (Studie IV) samlades in genom fokusgruppintervjuer, totalt deltog 63 kvinnor (26–65 år) födda i Chile, Irak och Turkiet men nu boende i Stockholms län.
Sammanfattningsvis visar studierna att:

- Det finns ett klart samband mellan fysisk aktivitet och självskattad hälsa, ju mer aktiviteter som rapporterades desto bättre skattades hälsan. Dessutom visade studie I att svenskfödda kvinnor rapporterade fler motionstimmar och skattade sin hälsa bättre än utlandsfödda kvinnor.

- Aktivitetsmönster och aktivitetsgrad varierar inom och mellan olika födelseländer. Studie II och III visar även att det finns ett starkt och varierat samband mellan fysisk aktivitet och födelseland. Kvinnor från Finland var mer fysiskt aktiva, både med avseende på total volym och intensitet, de rapporterade också mer fysisk aktivitet under fritiden jämfört med kvinnor från Sverige, Chile och Irak. Kvinnor födda i Sverige och Finland balanserade perioder av stillasittande med perioder av ansträngande fysisk aktivitet.

- När aktivitetsvana saknas är det svårt att på egen hand komma igång med motion och då behövs ett ordnande av passande aktiviteter. I studie IV framkom även att det var nödvändigt med motion som kunde utföras i närheten av hemmet eller i anslutning till arbetet. Aktivitetsfrämjande insatser bör därför riktas mot grupper och samhället de lever i, det blir då legitimt och lättare för enskilda kvinnor att delta.
10 REFERENCES


