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From  
Department of Clinical Sciences, Malmö,  
Family Medicine, Lund University, Sweden

**Country of birth and socioeconomic disparities in  
utilisation of health care and disability pensions  
– a multilevel approach**

Anders Beckman



**FACULTY OF MEDICINE**  
Lund University

Malmö 2005

**Akademisk avhandling**

Som, med vederbörligt tillstånd av Medicinska Fakulteten vid Lunds universitet, för  
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Abstract <p>Besides individual characteristics, people born in the same country may present a related pattern of health status and health care utilisation, perhaps because they share a number of socioeconomic and cultural characteristics in addition to their common geographic origin and language. Rather than using simple ethnical or geographical categories, we apply multilevel regression analysis with individual nested within countries of birth. By this innovative approach the present thesis investigates socioeconomic differences in health care utilisation and disability pensions in the city of Malmö, Sweden, and the role country of birth plays in this context. It is based on the Register for Resource Allocation (1999 and 2003).</p> <p>Independently of individual socioeconomic characteristics, this thesis identifies a contextual phenomenon related to country of birth that conditions individual health care utilisation and receiving a disability pension. Among other findings we observed that men of low income and those from countries with low economies showed greater total health care utilisation than those with high incomes or who were born in countries with high incomes. However, those individuals presented a lower health care utilisation of private health care providers.</p> <p>Low educational achievement and living alone were associated with a higher likelihood of receiving a disability pension. Individuals from middle income countries also had a greater chance of receiving a disability pension. Interestingly, country of birth modifies individual level socioeconomic associations.</p> <p>The country of one's birth appears to play a significant role in understanding how individual socioeconomic differences bear on the likelihood of utilising health care services and of receiving a disability pension.</p>			
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Date 2005-10-27

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Till Familjen

For indeed any city, however small, is in fact divided into two, one the city of the poor, the other of the rich; these are at war with one another; and in either there are many smaller divisions, and you would be altogether beside the mark if you treated them all as a single State.

Book IV, The Republic, Plato, 370 BC



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## **Abstract**

Besides individual characteristics, people born in the same country may present a related pattern of health status and health care utilisation, perhaps because they share a number of socioeconomic and cultural characteristics in addition to their common geographic origin and language. Rather than using simple ethnical or geographical categories, we apply multilevel regression analysis with individuals nested within countries of birth. By this innovative approach the present thesis investigates socioeconomic differences in health care utilisation and disability pensions in the city of Malmö, Sweden, and the role country of birth plays in this context. It is based on the Register for Resource Allocation (1999 and 2003).

Independently of individual socioeconomic characteristics, this thesis identifies a contextual phenomenon related to country of birth that conditions individual health care utilisation and receiving a disability pension. Among other findings we observed that men of low income and those from countries with low economies showed greater total health care utilisation than those with high incomes or who were born in countries with high incomes. However, those individuals presented a lower health care utilisation of private health care providers.

Low educational achievement and living alone were associated with a higher likelihood of receiving a disability pension. Individuals from middle income countries also had a greater chance of receiving a disability pension. Interestingly, country of birth modifies individual level socioeconomic associations.

The country of one's birth appears to play a significant role in understanding how individual socioeconomic differences bear on the likelihood of utilising health care services and of receiving a disability pension.

## List of publications

**I Beckman A**, Merlo J, Lynch JW, Gerdtham UG, Lindström M, Lithman T. Country of birth, socioeconomic position, and healthcare expenditure: a multilevel analysis of Malmö, Sweden. *J Epidemiol Community Health*. 2004;58:145-9

**II Beckman A**, Håkansson A, Råstam L, Chaix B, Gerdtham U, Merlo J. Country of birth economic characteristics and individual inequities in health care utilisation—a multilevel analysis of the choice of providers in the city of Malmö, Sweden. *Submitted*

**III Beckman A**, Håkansson A, Råstam L, Lithman T, Merlo J. The role country of birth plays in receiving disability pensions in relation to patterns of health care utilisation and socioeconomic differences: a multilevel analysis of Malmö, Sweden. *Submitted*

**IV Merlo J**, Chaix B, Ohlsson H, **Beckman A**, Johnell K, Hjerpe P, Råstam L, Larsen K. A brief conceptual tutorial of multilevel analysis in social epidemiology – using measures of clustering in multilevel logistic regression to investigate contextual phenomena. *Accepted for publication in J Epidemiol Community Health*

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## **Preface**

Family medicine is a medical speciality in which both the individual and society play a prominent role. As a physician you need to provide insight into lives from conception to the grave. This means you have to know a little about a lot.

As a practitioner of family medicine, my initial enthusiasm for the biological explanations taught in medical school soon gave way to curiosity about human behaviour. Why did some patients seek my advice and others not? Why did some follow my guidance while others, despite obvious needs, ignored it?

Although human nature is complex and behaviour is hard to predict, it has long seemed to me that there are certain factors which influence people's actions when it comes to utilisation of health care—factors that operate independently of the individual.

It was my curiosity that caused me to enter the field of research. The journey has led me high and low and given me some understanding of various disciplines. At the moment, I would have to say, I know a lot, but only about a little.



## Introduction

In Sweden, equitable access to health care is ensured by law. (1982) Ninety-four percent of the health care system originates from state and county finances that support providers in the public and private sectors. This universal health insurance seeks to allocate resources on the basis of need, rather than such factors as gender, socioeconomic position, or country of birth. (2001)

It is a known fact that low socioeconomic position (for example, a low income) and a weak social network (for example, living alone) impair physical and mental health. (Berkman 1987; Lynch 1996; Marmot and Feeney 1997) In an equitable society, it might be expected that people with such social background characteristics should have higher health expenditures. (Berkman, Glass et al. 2000; Lynch, Smith et al. 2000; Wilkinson and Marmot 2003) We know that care-seeking is determined by factors besides disease, and that complex relationships between symptoms, expectations, social issues, and the individual's conception of disease exist. (Fylkesnes 1993; Campbell and Roland 1996; Hopton, Hogg et al. 1996; Norcross, Ramirez et al. 1996) Individual health can be influenced by the patient's care-seeking behaviour, as well as by the supply of providers and their attitudes. (Starfield, Shi et al. 2005) For example it is widely accepted that individuals with high incomes will visit specialist physicians more frequently than those with low incomes. (Bongers, van der Meer et al. 1997; Dunlop, Coyte et al. 2000) Moreover, the concepts of disease, illness, and need are to a great extent culturally defined and, consequently, affected by societal and contextual factors acting over and above individual characteristics. (Adamson, Ben-Shlomo et al. 2003)

Also of possibility is the influence of country of birth on health and healthcare utilisation. (McKay, Macintyre et al. 2003) People born in the same country may present an intra-country of birth correlation regarding health and health care utilisation because they share a number of economic, social, and cultural characteristics, in addition to their common geographic origin and language. In a life-course approach, it is suggested that global social circumstances conditioned by the economy of the country of one's birth and individual experiences while growing up may be expressed years later, after immigration to a new country. One's country of birth may, therefore, bring about patterns of health care utilisation of greater similarity among those born in the same country than among individuals born in different countries.

A greater understanding of the influence of country of birth on healthcare utilisation is relevant for resource allocation, (Sundquist 1993) especially in cities with a large percentage of migrants, as is the case with Malmö, where 25% of the population are born abroad.

However, the role of one's country of birth in the understanding of individual patterns of health care utilisation is not clear, and whether over and above individual socioeconomic position, health care utilisation is conditioned by the socioeconomic characteristics of one's country of birth has yet to be explored

Swedish circumstances provide a unique opportunity to disentangle the role of cultural and socioeconomic factors related to country of birth from the individual economic barriers related to social position. A societal funding of both public and private health care sectors removes fees for services as a major contributing factor by making costs similar between sectors. Also, a direct access to health care, with no gatekeeper function exercised by general practitioners, makes individual choice of provider possible. By investigating total health care expenditure within this Swedish

framework, the effect of low income, marital status and country of birth can be assessed on individual differences in total health care expenditure. In addition, patterns of utilisation of specific health care services that may be influenced by country related factors (e.g., learned patterns and expectations) or by an immigrant's interaction with Swedish society, can also be studied. One can investigate the choice of a private rather than a public practitioner which may express individual preferences, demands and expectations related to socioeconomic position.

Sweden has a general welfare policy that is aimed at guaranting financial security and social rights to all citizens. (2001) Included in this system is the possibility of disability pension which is a financial benefit for those between 30 and 64 who for medical reasons are incapable of working and supporting themselves financially. (1962)

A number of studies have investigated the association between different measures of health status, (Mansson and Rastam 2001; Krokstad, Johnsen et al. 2002) medical conditions (Wallman, Burel et al. 2004) and disability pension. Studies of health care utilisation after a granted disability pension have produced varying results. (Eden, Ejlerstsson et al. 1995; Hojsted, Alban et al. 1999; Wallman, Burel et al. 2004) For the same reasons that are stated above regarding health care utilisation, it is known that people with low socioeconomic position have poorer health and higher health care needs than people with high social position (Lynch 1996; Lynch, Kaplan et al. 1997; Berkman, Glass et al. 2000; Wilkinson and Marmot 2003) and, therefore, they present a higher probability of receiving a disability pension. (Krokstad, Johnsen et al. 2002) However, even if disability pension could be grounded on objective medical conditions of the individual, the probability of obtaining a disability pension may depend on other kind of factors acting at different levels. (Krokstad, Magnus et al. 2004; Johnell, Månsson et al. 2005; Suominen, Gould et al. 2005) It is known that patients degree of information and demands influences somewhat the utilisation of health care (Andersen 1995) and disability pension. (Ostlund, Borg et al. 2003) Based on analyses of sick certificates, it has already been shown that different types of physicians have varying practices for issuing sick leave certificates. (Arrelöv 2003; Hetzler, Melén et al. 2005) To date, few studies have investigated the influence of ethnicity in this context. (Eden, Ejlerstsson et al. 1994; Hyypä and Maki 2001; Bengtsson and Scott 2002; Elders, Burdorf et al. 2004) Members in an ethnic group identify with one another and are identified by others on the basis of specific boundaries that differentiate them from other groups. Using country of birth as a proxy of "ethnicity" and for reasons already exposed above regarding health care utilisation, the original country of birth may bring about patterns of health care utilisation and propensity for disability pensions that are common among those individuals born in the same country.

In the presence of an intra-country of birth correlation – as discussed above – multilevel regression analysis (MLRA) is an appropriate methodological approach when it comes to investigating the influence of country of birth on health care utilisation and disability pensions for both statistical and epidemiological reasons.

MLRA allows us to quantify the role that one's country of birth plays for understanding individual differences (Goldstein, Browne et al. 2002; Merlo 2003) and to perform correct estimations of the association between country of birth characteristics (e.g., the economy of the country of one's birth) and health care utilisation and disability pensions. (Merlo, Chaix et al. 2005)



In the study of contextual determinants of health, considering the extent to which individual health phenomena cluster within higher structural levels (e.g., areas, country of birth) is not only necessary for obtaining correct estimates in regression analysis, it also provides relevant information that allows assessment of the importance that the context has for different individual health outcomes. (Boyle and Willms 1999; Merlo 2003) This information can be obtained by investigating components of variance in the MLRA.

In multilevel linear regression analysis it is easy to partition the variance between different levels and compute measures of clustering that provide intuitive information for capturing contextual phenomena. (Merlo, Chaix et al. 2005; Merlo, Chaix et al. 2005) For binary outcomes, however (e.g., utilisation or not of health care resources), the partition of variance between different levels does not have the intuitive interpretation of the linear model. Nevertheless, several methods have been developed in logistic regression to obtain suitable epidemiological information on area-level variance and clustering within areas. (Larsen, Petersen et al. 2000; Rasbash, Browne et al. 2000; Goldstein, Browne et al. 2002; Larsen and Merlo 2005)

Since MLRA in general and multilevel logistic regression in particular are modern techniques that still do not have a broad diffusion in health care research, the present thesis aimed to clarify in a conceptual rather than in a mathematical way how to calculate and interpret multilevel measures of variance and clustering in logistic regression. (Merlo 2003)

Having shortly stayed the main aims of my thesis, I want to give a summary and a personal view of a number of key concepts related to the subject of my thesis.

**The Swedish Health care system**

In Sweden, three political and administrative levels operate with the provision and financing of health services for the entire population: central government, county council and the municipalities (Figure 1). (2003) An important role for central government is to establish basic principles for the health services through laws and ordinances. The most important of these laws is the Health and Medical Services Act of 1982. (1982) Additional laws regulate, among other things, the obligations and responsibility of personnel (1998) and health care records. (1985) The National Board of Health and Welfare acts as expert and supervisory authority for the social services, and the health services. (Gross-Tebbe and Figueras 2004)

The domestic care of elderly and disabled people is the responsibility of the municipalities, and the responsibility for the delivery of health services on all levels rests largely with the county councils. The county councils decide on the allocation of resources to the health services and are responsible for the overall planning of these services, even if the health institutions are run by private providers. (2003; Gross-Tebbe and Figueras 2004)



**Figure 1 Levels of organisation and responsibilities in the Swedish health care system**

Health care service is principally delivered in three levels – primary care, secondary care and tertiary care (Figure 2). The 21 county councils are responsible for all levels, but tertiary care is managed by grouping the councils into six medical care regions.

In Malmö, all three levels of health care are available for the inhabitants, and the responsibility is with the county council of Scania.

Although publicly financed, health care providers are both publicly and privately organised. (Gross-Tebbe and Figueras 2004)

In 2000, Sweden had nine regional hospitals, about 70 central and district county hospitals and approximately 1000 health care centres. (2000; Gross-Tebbe and Figueras 2004) There were about 26 000 working physicians, of which one fifth were privately employed. The privately employed physicians mainly worked in the three big cities of Sweden (i.e., Stockholm, Gothenburg and Malmö). Of the publicly employed

physicians, 3000 were specialists in family medicine, about 11 000 other specialists and about 8000 under formal training. Of the publicly funded and privately employed physicians, about one third of them were specialists in family medicine. (2003)

The primary care level of health care is organized in primary health care centres covering local geographical areas. Most of these centres are publicly run and are supported by a wide variety of health professionals—physicians, nurses, auxiliary nurses, midwives and physiotherapists. The physicians are mainly specialists in family medicine, so called general practitioners (GP). Within this primary care level there are also private providers; mostly specialist physicians in family medicine and physiotherapists.

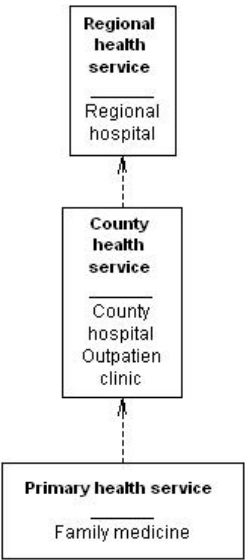
In Malmö 1999 there were 17 primary health care centres with approximately 100 public general practitioners. The private general practitioners were about 30.

The secondary care level of health care service covers whole county level and provides different forms of specialized health care (e.g., orthopaedics, paediatrics), working at both hospitals and outpatient clinics. In addition, different private specialists are also providers of medical services, mostly at private surgeries and only a minor part in private hospitals (e.g., plastic surgery).

Finally, the tertiary care level has a regional level of coverage and serves several counties. This level adds a wider range of sub-specialized medical services as thoracic surgery, neurosurgery, plastic surgery and highly specialised laboratories.

In Malmö the secondary level and part of the tertiary level were both covered by the local hospital (Malmö Allmänna Sjukhus–MAS). This had about 40 different outpatient surgeries and a varying number of doctors. Private surgeries with about 140 specialists contributed to these levels of health care service.

Patient fees for both public and private outpatient care are set by the county councils, and varied from SEK 100 to SEK 150 for consulting a physician in the primary health care services. The fee for visiting specialist physicians ranged from SEK 180 to SEK 300. The fee charged for a stay in hospital was SEK 80 per day. (prices in 2003) (2003) In Scania during the actual study period the fees were SEK 100 in the primary care level and 200 in the secondary and tertiary levels.



**Figure 2 Principle of provider levels**

Approximately 25 million visits to physicians were made in Sweden during the year 2000. Of these 74% were with publicly employed physicians and 26% with private physicians. In the public sector, 48% of the visits were made to specialists in family medicine, and in the private sector this portion was 46%. However, the distribution of visits varied between big cities and the rest of the country. (2003)

From the 257 574 inhabitants of Malmö during 1999, almost 190 000 had made close to 900 000 visits to physicians, of which about 42% were to private providers. Visits to specialists in family medicine were about 46%. In the public sector this figure was 48% and in the private sector 38%.

### ***Equality and equity in health care***

There is a difference between equality and equity. Equality is concerned with equal shares or uniformity, and is referring to measurable quantities. (Kawachi, Subramanian et al. 2002) Equity is about fairness, and has an important ethical and moral component. (Braveman and Gruskin 2003)

According to the International Society for Equity in Health (SEqH) (<http://www.iseqh.org/>), equity in health can be defined as the absence of systematic and potentially remediable differences in one or more aspects of health across populations or population groups defined socially, economically, demographically, or geographically. But equity also occurs at the individual level, in the meeting between patient and physician. (Culyer 2001)

In the discussion regarding equity in health, the distribution of health and the contextual influences are recognised, and the study of equity in health therefore requires an approach that is multilevel. (Starfield 2002)

### ***Health***

Health is important. Without health the ultimate vital goal of achieving “flourishing” – using Culyer expression (Culyer 2001) – is hindered, and therefore maximizing health is involved in the achievement of “flourishing”. Throughout life, health is a major concern and, independent of definition, it is of interest both for the individual and for society at large. Lack of health has effects on the quality of life for the individual, as well as costs for society in the form of lost work force, health costs and transfers of money. Preserving and improving equity in health is therefore a major concern for both the individual and the society. (Anand 2002) Furthermore, healthcare in itself has vast economical consequences. The expenditure in Sweden was 2001 approximately 8% of gross domestic production. (2004)

Actions for maintaining and improving health is not only a responsibility of the individual, it is also a responsibility of the society and the medical profession. This multilevel perspective is highly relevant to avoid the blaming of the individual, since in many cases individual choices are conditioned by the community in which he/she lives.

The contribution of healthcare to preserving or improving health have been debated in terms of having little impact (Pincus, Esther et al. 1998), doing no good (McKeown 1976) to doing harm. (Illich 1974) Despite the fact that much blame of ill health is attributed to poor social and economic circumstances (Wilkinson and Marmot 2003), healthcare does appear to be of some importance. (Bunker 2001; Rosen and Haglund 2001; McKee 2002)

The costs and sufferings inflicted by lack of health, and the contribution that health care can provide to diminish them, makes health care an important issue of justice and morale and makes the question of equality and equity of universal interest.

The concept of lack of health can be approached in different ways. The individual's perception of different symptoms, named illness, is separate from the definition by the medical profession i.e., disease. (Wikman, Marklund et al. 2005) Disease is the condition diagnosed by a medical expert (physician, physiotherapist etc), and not always detectable in illness. Moreover, illness and disease as concepts of (inadequate) health can be further elaborated by the concept of sickness. Sickness can be used to symbolize the social role that an individual with illness or disease takes or gets in a society. All these concepts are in varying degrees value judgements, and therefore susceptible to time-trends. (Boyd 2000) The models of illness and disease also influence how the health care system is employed. (Wade and Halligan 2004)

### ***Socioeconomic position and health***

Socioeconomic position is traditionally measured by an individual's education, income, and occupation. (Lynch and Kaplan 2000) These are indicators of the social and economic forces in the social structure. Although they are limited indicators, they are derived from larger social and economic processes that shape the distribution of these measures across the population, and are strong health determinant factors. (Lynch and Kaplan 2000) They are both the core of socioeconomic position, but also proxies used to measure socioeconomic position. (Adler and Newman 2002; Graham 2005)

There is a strong relationship between socioeconomic position and health, in that those with better socioeconomic position have better health measures. The relationship of these indicators with health follows a sociological framework, where the individual indicators are interlinked, and express different aspects of determination of health. (Lynch and Kaplan 2000)

The term socioeconomic position concerns the social and economic factors that influence the positions individuals hold within a society. (Lynch and Kaplan 2000) The most developed conceptual framework in social epidemiology is the Weberian approach to social stratification, where the key linkage between social stratification and health is the distribution of skills, knowledge and resources. (Lynch and Kaplan 2000) The concept of stratification applied in this thesis, as a measure of socioeconomic position, is income. Income relates directly to material conditions, not only on basic conditions as food, water and sanitation, but also on more elaborated benefits as e.g., healthier diet, and access to computers.

Level of education can provide an individual with a collection of cognitive resources that can influence health and health behaviour. In addition, high educational achievement is often predictive of better job, higher income and place of living.

Occupation can have direct effect on health, such as poor working conditions with hazardous environments.

The effects of income on health for the individual and of the society, in which he/she lives, can be mediated directly and/or indirectly. (Marmot 2002) In developing countries infectious disease and injuries are the main contributors to bad health and disability, whereas in developed countries cancer and cardio-vascular diseases dominate. (Svanström 2003; Marmot 2005) The patterns of disease and mortality changes over time, (Vågerö and Leinsalu 2005) and although improvement in reducing health determinants have been achieved (e.g., better living standards, less smoking), health inequality still persists due to the uneven distribution of those health determinants.

(Leinsalu, Vagero et al. 2003; Dyer 2005; Huisman, Kunst et al. 2005; Ljung, Peterson et al. 2005)

### **Measuring socioeconomic differences in health**

Traditionally several variables have been used to estimate health, or the lack of it, both on an individual level and on a group level. It is possible to assess both the distribution and the differences in health measure. (Regidor 2004) Since estimation of health have different purposes, the goal of the assessment influences which variables and outcomes should be analysed, and which methods should be used. (Regidor 2004) Measures of health outcomes or variables include e.g., mortality (total and infant), morbidity, complications, functional ability, psychosocial function, quality of life, cost of care. (AcademyHealth 2004)

To assess socioeconomic differences, absolute or relative, in health, traditional statistical methods of frequencies, frequency differences, ratios and correlations can be used. It is important to beware of the limitations in these methods, to be able to interpret the results correctly. (Mackenbach and Kunst 1997) The variation in the social distribution of risk factors makes inequalities in health changeable over time and place. (Vägero and Leinsalu 2005) Therefore, results on studies on health inequalities are dependent on chosen methods. Both changes in the structure of social groups and choice of groups influence results, as do choice of outcome. (Boström and Rosen 2003) To enhance the understanding of studies, and the interpretation, several authors suggest that summary measures should be presented as basic data, before differences are presented. Depending on the prevalence of phenomena, absolute or relative figures can mediate completely different pictures. Rare phenomena with small absolute differences have greater relative differences than common phenomena with the same absolute differences. (Boström and Rosen 2003)

### **Health care utilisation**

#### **Need, demand and access**

Impaired health indicates need for health care. However, the concept of need is rather ambiguous and is dependent on whose perspective – patient or health care system – is used. For the individual, there must be a perception of illness, i.e., a subjective experience of bad health or risk of bad health. This experience must be interpreted by the individual's health literacy, i.e., the individual must have functional capacity to understand and use the health system. (Baker, Gazmararian et al. 2004; Schillinger and Chen 2004) This literacy is affected by the individual's context, the society in which the individual lives, whereby behaviour is internalised. (Williams 1995) Despite appropriate behaviour from the individual, the health care system recognises only need for health care if there is a capacity to benefit. That is, there is a potential for effective actions that benefits the individual, like health care interventions, including reassurance and supportive care. (Stevens and Gillam 1998) Further, need is not an absolute entity, it is culturally dependent and it is also conditioned by the capacity of the health care. (Culyer 2001)

The assessment of need can be made on an individual or a group level, or both, depending on purpose. (Stevens and Gillam 1998) A direct assessment of need for the individual is available in surveys, by use of patient records or by a physical examination. For groups obtaining information by surveys, from patient records or physical examination can be a costly and timely assessment, and hence proxies for need

are used. (Diderichsen, Varde et al. 1997) These proxies are different for different countries. (Oliver and Mossialos 2004) Components that are used to estimate need are age, gender, socioeconomic position and mortality. (Burstrom and Lundberg 2004; Oliver and Mossialos 2004)

The *need* for health care is not always expressed in a *demand* for health care. Due to several circumstances, the individual can refrain from health care seeking, despite need for health care. This can occur due to financial difficulties or modulated by other reasons such as self-esteem. (Bazin, Parizot et al. 2005)

According to a survey in Sweden (Westin, Ahs et al. 2004), about 24% of respondents with self reported need of health care, had refrained from seeking medical care, because of lack of confidence, availability and economy. Non-demand was highest among women with low educational achievement and foreigners. This indicates a problem with suboptimal or under-utilisation, i.e., people in need of medical care refrain from seeking care.

In a study from Iceland (Vilhjalmsson 2005), an under-utilisation was detected, predominantly in young, economically troubled and those with inflexible day schedules and chronically illness. Other studies confirm a picture of under-utilisation, and then due to ethnicity. (van Ryn 2002) Recent investigations indicate that experiences of discrimination and social injustice are strong determinants of refraining from physician visits or medication use in Sweden. (Wamala & Merlo 2005, personal communication).

The antithesis to unmet need is over-utilisation, often identified by the health care system, especially in emergency departments. (Murphy 1998; Murphy 1998) However, over-utilisation could also be attributed to bad performance or organisation, i.e., the performance of the health care system, or its providers, does not give remedy to the health problem, and consultation is required again. Finally, the health care system itself may convey structures that promote incorrect advice for utilisation.

*Access* can be expressed as the availability of the health care system, and is often used in discussion concerning equality. It entangles the relevant range and quality of healthcare services, the inconvenience, time costs, and financial costs of securing those services, and the information required to take advantage of those services. (Oliver and Mossialos 2004) It is predominantly a provider concept, but affects patient behaviour. The so called potential access is described in terms of number of hospitals and hospital beds, number of surgeries, physicians and so forth, as well as distance to these. (Khan and Bhardwaj 1994) The potential access is a consequence of planning and politics in society and has a direct effect on the utilisation of health care. (Rosenberg and Hanlon 1996) Irrespective of the quality of the potential access, the relevant aspect is that access has to be used. This concept is termed as “realised access”, i.e., utilisation of health care.

Both potential and realised access can have barriers and facilitators that influence both sides of the equation “demand = supply”. Geographical or spatial barriers and facilitators to access exist in the form of both opportunity and cost, e.g., ways and means to travel. This is both a result of planning and policies on the supplier side with distribution of health services and transportation, as well as behaviours on the demand side. There also exist non-geographical barriers and facilitators of access that can be characterised as organisational, economical, social and/or psychological. An example of organisational barriers is the gatekeeper function of general practitioners. Economical

barriers could be patient fees and psychological barriers are well conceptualised by attitudes. (Khan and Bhardwaj 1994)

In summary, the concepts of need, demand and access are partly difficult to define and quantify using administrative data. Administrative data provide information about the utilisation of health services but have limited information about individual-level health determinants. However, data on utilisation can be used together with proxies for need, to study patterns of utilisation, to estimate equity in health care, and to allocate health care resources. (Carr-Hill, Rice et al. 1996; Carlisle, Groom et al. 1998; Burstrom and Lundberg 2004; Oliver and Mossialos 2004)

Some authors assess utilisation by measuring expenditure (Gerdtham and Sundberg 1998; Merlo, Gerdtham et al. 2003) or by analysing visits to health care providers. (Dunlop, Coyte et al. 2000; Gilthorpe and Wilson 2003) Although in-hospital treatment is the most expensive health care (3.5% of the population in Skåne that has been hospitalized for certain cost demanding diagnoses account for 50% of the health care expenditures) (Thor Lithman, personal communication), the volume of visits to physicians largely dominates the panorama of health care utilisation, as these visits are much more frequent than hospitalisations.

The determinants of health care utilisation are complex and not necessarily related to needs. It has been observed that previous contacts with medical services have a great influence on future patterns of seeking care. Studies performed in Great Britain showed that past consultation rates predicted future consultation better than self rated health. (Jordan, Ong et al. 2003) Some studies have shown that previously established contact with a physician did not affect the pattern of seeking emergency medical care, (Haglund 1985; Hopton and Dlugolecka 1995; Gill and Sharpe 1999) but others have arrived to opposite conclusions and show that people with established contact with a physician made more emergency visits. (Levkoff, Cleary et al. 1987; Shah-Canning, J.J. et al. 1996) Furthermore, it appears that there is a complex relationship between symptoms, expectations and social factors. (Hopton, Hogg et al. 1996) Demographic and socio-economic factors can have great significance for utilisation of health care. (Blaxter 1984; Carr-Hill, Rice et al. 1996; Carlisle, Groom et al. 1998) The influence of parents' knowledge and anxiety about their children can also influence utilisation. (Kai 1996)

The effect of socioeconomic position on utilisation varies: In Brazil low individual income reduced visits with 62%, despite medical need. (Mendoza-Sassi, Beria et al. 2003) In the USA income related inequity exists and favours the wealthy. (Chen and Escarce 2004) A pattern of unequal treatment has been demonstrated in the EU (van Doorslaer, Koolman et al. 2004), revealing a pro-poor pattern of GP utilisation, and pro-rich pattern in utilisation of specialists.

If need is regarded as the indicator for health care, equity in health care can have two dimensions: horizontal and vertical. Horizontal equity consists of equal treatment for equal needs, i.e., similar levels of disease severity in different individuals should receive similar intervention (equal use for equal need or equality). On the other hand, if the severity differs, more severe disease should receive more intervention, (i.e., unequal use for unequal need or vertical equity). (Bambas and Casas 2001; Raine, Hutchings et al. 2004) This vertical equity should be detected as a larger utilisation of health care for disadvantaged groups, i.e., individuals with low socioeconomic position.

Since it is known that people with low socioeconomic position have impaired health and higher needs, (Lynch, Smith et al. 2000) people with low socioeconomic position



should have higher health care utilisation. If health care utilisation is equal for individuals with low and for individuals with high socioeconomic position or higher in people with high social position than in people with low social position, this implies an unfair or inequitable distribution of health care resources.

### **Contextual, structural and provider factors**

Over and above individual factors, there seems to be contextual and spatial circumstances that can affect different aspects of utilisation of health care. (Chaix, Boelle et al. 2005; Chaix, Veugelers et al. 2005; Larsen and Merlo 2005) Those contextual effects may be determined by an uneven geographical distribution of physicians, a phenomenon that seems to have different effects in the elderly than in young people and among men than among women. (Chaix, Veugelers et al. 2005)

Another example of contextual determinant is that besides the individual background, barriers to utilisation appear when the ethnical group of the individual is a minority in the area. (Haas, Phillips et al. 2004)

Several studies have detected different degrees of inequity regarding utilisation of private providers (Gulliford and Mahabir 2001), and that the utilisation rate is affected by organisational structure, such as “density” of specialists – a contextual effect – (Chaix, Boelle et al. 2005) as well as payment types to the provider. (Kravitz and Greenfield 1995) These are predominantly structural factors, but other factors pertaining to behaviour or attitude of provider are also important. There is a concept of supplier-induced demand, which can be interpreted as either the result of economic enhancement to the supplier due to income incentives, or uncertainty of clinical judgements due to ambiguity. (Davis, Gribben et al. 2000) The opposite is also possible—supplier reduced demand—when resources are not available. Another explanation for variations in utilisation of health care is the variation due to supply-sensitive care, i.e., the frequencies in the use of services (consultations, diagnostic tests, referrals to medical specialists, hospitalisations, and stays in intensive care units) are largely determined by the per capita quantity of healthcare resources allocated to a given population. (Wennberg 2002) Patient socio-demographic and ethnical characteristics have been shown to affect physician behaviour, rendering different results in diagnosis and treatment of different patients. This behaviour can in turn reflect on the way patients demand health care. (van Ryn 2002)

The question of trust between patient and provider has emerged in recent years. Trust can be builded on perceived technical competence, on inter-personal dimension of care or both. (Russell 2005) The feeling of trust or distrust lies in the eye of the patient, but is dependent on the behaviour of the provider. (Thiede 2005) It has been observed that a relation exists between low trust in the health care system and low adherence with pharmacological treatment. (Johnell K & Merlo J, 2005 submitted) There is a current discussion about the lack of people’s trust in the health care system and health care professionals. It is known that trust and the quality of the doctor-patient relationship are important determinants for adherence to treatment. (Murphy, Chang et al. 2001; Schlesinger 2002)

### **Immigration**

The consequences of immigration on utilisation of health care are various. Existing patterns of utilisation in the original country can be maintained, despite immigration to a new country with differing health care services. (Ivanov and Buck 2002) Recent

immigration seems to reduce utilisation of health care, i.e., when acculturation is accomplished, utilisation resembles those of the new country. (Leclerc, Jensen et al. 1994; Ivanov and Buck 2002) The use of complementary and alternative therapies might play a role in this process. (Keith, Kronenfeld et al. 2005)

### ***Race and ethnicity***

The use of the concepts race and ethnicity is both widespread, and controversial. Despite the growing use of both race and (more so) ethnicity in scientific literature, these terms are diversely used and poorly differentiated. (Osborne and Feit 1992; Sheldon and Parker 1992; Kaplan and Bennett 2003)

Regardless of the fact that the concept of race, alleged as deterministic biological differences between individuals, is rejected on the grounds that it, actually, does not exist according to genetic evidence or that it is not otherwise scientifically meaningful, it is still in use in many countries. (Smedley and Smedley 2005) Even though attempts to diminish its use are made (Comstock, Castillo et al. 2004), the racial framework is still growing. (Afshari and Bhopal 2002) Some of the use of race is based on physical appearance and/or behaviour, and are as such regarded as a social and cultural classification. (Krieger 2001) This use of race is still defended, but on the basis of social context and prejudice. (Gornick, Eggers et al. 1996; Oppenheimer 2001; Smedley and Smedley 2005) Nevertheless, the use of race is obsolete in most European countries due to historic events, and instead culture or ethnicity is used.

Cultures are an essential term to anthropology—the holistic study of humankind—and several definitions exist. Culture involves mental processes, beliefs, knowledge, as well as values. (Bodley 1994) Culture is dynamic and can be changed by time and place. (Bodley 1994) Culture is one way of explaining differences in the perception of health and health care behaviour. (Sachs 1984)

Ethnicity is described by the United Nations Economic Commission for Europe as: Ethnic groups (and/or national groups) are made up of persons who consider themselves as having a same origin and/or culture, which may appear in linguistic and/or religious and/or other characteristics which differ from those of the rest of the population. It depends on the historical and political circumstances whether countries consider such groups as ethnic groups and/or national groups. (Europe 1998)

Ethnicity can thus be defined as a cluster of people who share a common language, place of origin, religion, tradition, values and so forth, i.e., have the same culture. Ethnicity — as opposed to the biological defined concept of race — is thus a multifaceted concept that includes aspects from biology, history, cultural orientation and behaviour, language, religion and lifestyle. (Pearce, Foliaki et al. 2004) Partly due to this complexity of ethnicity, it is used intermingled with the use of race, and the purpose is not always stated. (Comstock, Castillo et al. 2004) This makes ethnicity a sensitive concept, but at the same time it must be used for the gathering of knowledge. (Sheldon and Parker 1992; Bhopal 1997; Chaturvedi 2001) The membership in an ethnic group varies according to when, how and by whom it is defined. For the reasons exposed above comparisons based on ethnicity are difficult. (Senior and Bhopal 1994)

Ethnicity has been used in several studies of health and health care utilisation, but a large part of the studies are based on aggregated information, which does not allow one to account for individual heterogeneity. Moreover, many investigations often only use broad definitions of ethnicity, such as Asian, European and so forth. (Smaje and Grand 1997; Ayonrinde 2001; Jacobs 2002; Karlsen and Nazroo 2002; Karlsen, Nazroo et al. 2002) Amazingly, a recent study rediscover as mayor news, that the Hispanic

population (in USA) is composed of several different groups. (Weinick, Jacobs et al. 2004)

Due to the problems and complexity in the use of the concepts of race and ethnicity, and the difficulties to compare results, several guidelines for the publication of scientific articles in medical journals (e.g., BMJ) have been proposed. (1996; Kaplan and Bennett 2003; Bhopal 2004)

In short, the guidelines state that the logic behind the various groupings should be explicitly described in the methods section, and the terms used should be as descriptive as possible and reflect how the groups were demarcated. Further, race and/or ethnicity should not be used as a proxy for genetic variation. Finally, relevant factors that can conjure bias, most predominantly socioeconomic status, should be considered.

To view one's own culture as the standard against which others are judged is called ethnocentricity. Such a view will inevitably interfere on the design, aims, and methods of studies and hence the interpretation of results. (Senior and Bhopal 1994)

The term immigrant is used to denote individuals born in another country than the one they are currently residing. This includes people who have moved because of financial, educational, political, family or other reasons. The translation of the term immigrant to Swedish is "invandrare". Along the last years the term "invandrare" has appeared side by side with "criminal", "prostitute" "drug abuser" and other marginalized people in social reports and media. Therefore, this term is object to political discussion, and a new term "utländsk bakgrund" (i.e., individual with foreign background) has been proposed in Sweden in order to avoid acquired negative connotations of the term "invandrare".

The problem with a term with such a wide meaning as immigrant is that it gives way to ample assumptions and misconceptions, including likeness between immigrant and problem. It also emphasises the simplistic stereotyping of "us and them", sometimes based on differences in physical appearance. A simple dichotomization (e.g., immigrants vs. Swedes) may be useful in some administrative context but seems largely inappropriate in health care research.

In Sweden the term "country of birth" refers to the place of residence of the mother at the time of birth. (SCB 2002)

Usually specific countries of birth are not investigated in epidemiological studies as this information is sometimes considered to be sensitive or complicating analysis. Exceptionally, specific countries of births are sometimes investigated when specific questions are of interest. (Essén, Bödker et al. 2002) Otherwise, broader categorisations (e.g., European, Asian) are often used.

Albeit correct scientific use of race and ethnicity is necessary, there is a clinical reality, in which we know that heuristics or rules of thumb play an important part, (André 2004) and in a strict bio-medical setting, the role of Bayesian thinking is said to prevail. (Gill, Sabin et al. 2005) Together with the non-medical features of patient, physician and practice characteristics (McKinlay, Potter et al. 1996) this can facilitate racial or ethnic stereotyping. This means that deviant identities of groups, rather than deviant behaviours of individuals, become the basis for refuting patients and – using the word of Goffman – stigmatising immigrants. (Scott and Marshall 2005) Stigmatisation of people means to assume that alleged characteristics of a group apply to all members and to deny within-group variability.

However, there can be certain circumstances where it can be justified to use explicit ethnicity as a clinical tool for the benefit of the individual. (Krieger 2000; Chin and

Humikowski 2002) Chin proposes these circumstances to be history, language, culture and health beliefs.

### ***Health in immigrants***

Several studies have investigated the health of immigrants, with varying definitions of immigrant. A number of these studies have found a lower risk of mortality in some immigrant groups, and higher in other. (Sheth, Nair et al. 1999; Singh and Siahpush 2001; Singh and Siahpush 2002) Some of these results are unexpected, because of likely higher mortality risk due to lower socioeconomic position. (Abraido-Lanza, Chao et al. 2005) This is sometimes called the “paradox of the healthy immigrant”. It is evident that the picture is complicated and that many factors affect the health of the immigrant.

Leaving behind racial and ethnocentric aspects, two main mechanisms could explain specific health differences between natives and immigrants: the process of immigration itself and cultural factors related to the country of birth. It is possible that the process of immigration in itself is a more general mechanism but that its effects on health are modified by an array of different factors. In order to investigate cultural factors related to the country of birth we need knowledge on the specific countries of origin.

In any case the process of immigration is dynamic and not necessarily unlimited but rather self-limited. Once the individual has integrated him- or herself in the new country (acculturation), it is difficult to find relevant arguments to maintain the condition of immigrant as an individual characteristic. This idea is especially true for children to immigrants – so called 2<sup>nd</sup> generation immigrants. In discordance with modern genetics, it seems like there is an extended belief that the condition of immigrant follows (obsolete) Lamarckian inheritance.

A substantial review of immigration and health was done by McKay and co-workers. (McKay, Macintyre et al. 2003) They found that the health patterns of immigrants can be influenced by both their country of birth and their destination, and by the process of immigration itself. After immigration the individuals health may stay the same (as in the country of birth), or it may change and appear to be worse or better. Health may also converge to the rates of the resident country, and in this process worsen or improve. The explanations for maintained or altered health include genetic factors, lifestyle, ‘protective effect’, and adoption of certain characteristics of the host. In addition, the effect of duration of residence and the influence of selective immigration must be considered. It has been speculated that immigrants are healthier than their staying fellow country people, and it has also been speculated that there is a “salmon” effect, i.e., that immigrants return to their country of birth when retiring, and thus not affecting the levels of ill health in the ageing population.

## Aims

The general aim for this dissertation was to study socioeconomic differences in health care utilisation and disability pensions, investigating the role that one's country of birth plays in this context.

In this dissertation we hypothesised that there was a contextual phenomenon related to one's country of birth. This phenomenon should condition individual utilisation of health care, independent of individual characteristics.

It is known that low social position conveys higher health care needs and, therefore – under conditions of equity in health care – one should expect higher health care utilisation in people with low income. However, we hypothesised that cultural or other aspect of the country of birth could modify the association between socioeconomic position and health care utilisation.

Analogously we hypothesised the existence of contextual phenomena due to country of birth that conditioned the individual propensity of receiving a disability pension, independent of individual characteristics. We also hypothesised that cultural or other aspects of the country of birth could modify the association between socioeconomic characteristics (i.e., educational achievement and marital status) and having a disability pension.

Simultaneously, we aimed to apply multilevel regression analysis – specifically logistic regression analysis – in order to arrive to informative epidemiological measures that could be useful when it comes to investigate socioeconomic and ethnical differences in health care utilisation.

The specific aims of this thesis were:

- To quantify the role of country of birth when it comes to explain individual differences in total healthcare expenditure in the city of Malmö, Sweden, investigating the role that individual income and marital status play in this context. (Paper I)
- To investigate the role of country of birth and the economic characteristics of that country for understanding individual differences in utilisation of different health care providers, and whether country of birth modify the well-known association between socioeconomic position and health care utilisation. (Paper II)
- To quantify the role of country of birth when it comes to explain individual differences in disability pensions in the city of Malmö, Sweden, and whether country of birth modify the association between on the one hand socioeconomic characteristics (i.e., educational achievement and marital status) and health care utilisation and on the other disability pensions. (Paper III)
- To explain in a conceptual way how to calculate and interpret multilevel measures of variance and clustering, focusing at measures of variation in logistic regression, and indicating the relevance of these measures in social epidemiology and community health. (Paper IV)

## Populations and methods

### Data sources

Three papers are based on register data (I, II, III), and one on survey data (IV). The register data are the 1999 and 2003 County of Scania Register for Resource Allocation, which includes, among other variables, information on age, gender, marital status, income, country of birth and granted disability pensions (2003), as well as detailed information on health care utilisation for each individual in the county. The County of Scania Register for Resource Allocation was created by individual record linkage between the population register and the health care register at the county of Scania.

After giving approval of the research plan, the Regional Office of Scania, Sweden, provided us with unidentified data extracted from the Database for Resource Allocation that the Regional Office of Scania had obtained from Statistics Sweden. This project was in turn approved by Statistics Sweden and a contract was signed to ensure the appropriate managing of the database. The studies in this thesis are included in the Longitudinal Multilevel Analysis in Scania (LOMAS) project that has been approved by Statistics Sweden, the Centre for Epidemiology (Swedish National Board of Health and Welfare) and by the Regional Ethical Committee.

The survey data are from a postal self-administered questionnaire survey performed in Scania in 1999 – 2000. (Hansson, Östergren et al. 2001) The Health Survey for Scania 1999–2000 has been approved by the Regional Ethical Committee.

### Populations

The study population in Papers I and II consisted of all 52 419 men aged 40 to 80 years, who were residing in Malmö, Sweden, during 1999. In Paper II hospitalisations were excluded, and we performed the analysis on the whole population and also on the selected group of patients with at least an encounter with a physician (i.e., both general practitioners and other specialists, whether publicly or privately employed) during the study year.

In Paper III the study population was all 80 212 men and women aged 40 to 64 years, who were residing in Malmö, Sweden, during 2003 and the sub sample of 58 848 (73%) of the population who had made at least one visit to a physician.

In Paper IV the study sample consisted of 13 715 participants in the Health Survey from Scania 1999–2000. These individuals were born between 1919 and 1981 and were living in Scania in 2000. They represent 59% of the population sample in these ages. These survey data were linked to the 1999 patient administrative register. The study only considered individuals who had made at least one visit to a physician during 1999 (10 723 individuals aged 18–80 years).

### Assessment of variables

#### Outcome variables

In Paper I the outcome variable was individual total health care expenditures in SEK, expressed as a continuous variable in the logarithmic scale. These expenditures were calculated by the section of Economics at the County of Scania as a function of a patient's utilisation of all publicly financed health care, that is, all inpatient and outpatient hospital care, including visits to public and private providers, irrespective of

profession. Every contact with a specific health department generated a specific expenditure amount. Assessment of the expenditure for hospitalisation was based on expenditure itemised for diagnosis related group (DRG); where this was not available (for example, in the case of oncology and psychiatric wards) costs were calculated as a function of the total cost per day in the ward. For outpatients, the cost was calculated by the visit rather than per day, using differentiated weights based on the category of the visit. Information on expenditures related to outpatient medication and nursing homes for the elderly population was not recorded.

In Paper II the outcome was categorised (i.e., yes versus no) by the type of provider consulted: any kind of physician, public general practitioner, private general practitioner, public specialist, or private specialist.

In Paper III the outcome was disability pensions. A disability pension may be granted for medical reasons to a person who has lost 25% to 100% of their working capacity. For our purposes, the beneficiary of a disability pension (yes versus no) is any individual who has been granted such a pension, irrespective of their degree of disability.

In Paper IV the outcome was utilisation of private providers categorised as yes versus no.

## **Individual variables**

### **Age**

In the analyses, age was considered as a continuous variable and centred on the median in all papers. Since the association between age and the outcome may not be linear, age-squared was also included in the different models.

### **Gender**

We studied men in papers I and II, and men and women in papers III and IV. The reason for studying only men in papers I and II was that the available information on income was on pre-tax personal income rather than household disposable income and people with a low personal pre-tax income may live in households with a high disposable income, a circumstance that is more common in women. Therefore, to improve the validity of income as a measure of social position we limited the study to the population of men.

### **Income**

For our purpose (Papers I and II), low income individuals were those with a pre-tax personal income less than the median income for their specific age group. Pre-tax personal income included earnings from employment and business, and income transfers (e.g., pension payments, unemployment benefits, or paid sick leave) but not capital returns.

### **Education**

Formal educational achievement in years was categorised into low (i.e., nine years or less) and high (i.e., more than 9 years) educational achievement (Papers III and IV).

**Marital status**

People who were single, separated, or widowed according to the register were considered to be living alone.

**Contextual variables****Country of birth**

This refers to the place of residence of the mother at the time of birth according to SCB's population register. Country of birth was considered as a second level in the multilevel analysis.

**Area educational level variable**

In paper IV, an area-level socioeconomic variable, defined as the percentage of people with high educational achievement, was coded in two classes with the median value as the cut-off. In order to increase the reliability of this information, this area variable was derived from data on the whole population of the county and not from the sample survey only.

**Country of birth economic characteristics**

The socioeconomic characteristics of one's country of origin (Papers II and III), were operationalised by using the World Bank Classification of Country Economies as a contextual variable (see [<http://www.worldbank.org/data/countryclass/countryclass.html>]). In this classification, countries are classified according to their gross national income (GNI) per capita, using the World Bank Atlas method. The GNI categories are low, lower middle, upper middle, and high income. Due to small sizes, we merged the first two into a single category (low income), and used the high income category as a reference in the comparisons.



***Multilevel regression analysis (MLRA)***

People living in the same area or being born in the same country share a number of characteristics and, therefore, may be more similar to each other in relation to their health status and behaviour, than to people from other areas or born in other countries. In other words, persons with similar characteristics may have different health status or behaviour because they live in different areas or because they are born in a different country. Sharing a similar context conveys common cultural, economic, political, climatic, historical, or geographical influences that may affect individuals over and above their individual characteristics. (MacIntyre and Ellaway 2000) This contextual phenomenon expresses itself as clustering of individual outcomes within a defined context (e.g., area, country of birth). That is, a portion of the differences among people may be attributable to the areas in which they reside or their country of birth. (Merlo 2003; Merlo, Asplund et al. 2004)

According to the ideas of Durkheim (1858–1917) people belonging to a specific community share a collective conscience (common social values and norms that are formed by human relations and interactions and that generate collective feelings of solidarity and connectedness). Understood in this way, the social group emerges as an independent social fact rising over and above individual circumstances, and going beyond the sum of the people that compose it. (Scott and Marshall 2005) This notion of contextual phenomenon supports the idea that knowledge on the distribution and determinants of population health is epistemologically multilevel (Diez-Roux 2000) and needs to consider both people and areas. (Merlo, Asplund et al. 2004)

The idea of contextual phenomenon corresponds to the statistical concept of clustering and this is the main reason for applying multilevel regression techniques. Statistically, it is necessary to use techniques that consider the dependence of the outcome variable between people from the same context. An important assumption made in usual regression analyses is the independence of individual measures. If this assumption is violated, the results of the regression analysis are biased. (Goldstein 1995) However, clustering of individual health or behaviour within neighbourhoods or countries of birth is not a statistical nuisance that only needs to be considered for obtaining correct statistical estimations, but a key concept that yields important information by itself. (Snijders and Bosker 1999; Leyland and Goldstein 2001; Merlo, Ostergren et al. 2001; Merlo 2003) The more the health or behaviour of the people within a context is alike (as compared with people in other contexts), the more probable it is that the determinants of individual health or behaviour are directly related to the contextual environment, and/or that social processes of segregation are taking place — by choice or force. (Merlo, Chaix et al. 2005)

The aspect of contextual phenomena is of high significance as it has a value in the context of ideas about the efficacy of focusing intervention to reduce inequalities on certain contexts (e.g., areas) rather than on specific people only. (Merlo 2003) Measures of variation are important in public health to understand the significance of specific contexts for different individual outcomes. (Boyle and Willms 1999) Traditional measures of association, in contrast with measures of variation, do not inform on the multilevel distribution of outcome differences.

MLRA is a suitable statistical technique that can be used to operationalise conceptual schemas in multilevel analysis. In this thesis this technique is applied in the investigation whether utilisation of health care or disability pensions has a contextual dimension. (Merlo, Chaix et al. 2005) By using MLRA we can investigate possible

effects of contextual variables on individual level outcomes, and also study cross-level interaction effects between variables located at different levels. Both multilevel theory and modelling are suitable for analysis in the health care sector. (Leyland and Goldstein 2001)

Under a simplified point of view multilevel analysis can be separated into two parts: the fixed effects and the random effects. (Snijders and Bosker 1999)

The fixed effects refer to average parameters of association (e.g., the odds ratio of the association between living alone and visiting a private physician).

The random effects are expressed by measures of variance at different levels in the multilevel analysis (e.g., the country of birth intercept variance around the overall mean in the city).

However, these parts are interconnected. For example, in a random cross-level interaction the association between living alone and visiting a private physician may vary in different countries of birth.

Due to the hierarchical structure of our data, with individuals nested within countries of birth (Paper I, II and III), or areas (Paper IV), and the possibility of intra-country or intra-area correlation in the individual tendency towards the measured outcome, we applied MLRA in all our analyses.

Multilevel analysis account for the possibility that people born in the same country or residing in the same area, may to different degrees, be alike in relation to factors that influence total health care expenditure (Paper I), utilisation of different providers (Paper II), propensity for a disability pension (Paper III), or utilisation of private providers (Paper IV).

Simultaneously, the multilevel analysis establish whether country of birth or area is relevant or not in understanding individual differences in the propensity for those outcomes.

The principle for multilevel analysis is consistent in all studies, i.e., individuals on the first level and country of birth (Papers I, II and III) or residence area (Paper IV) on the second level. We applied multilevel linear regression for modelling the continuous health care expenditures variable (Paper I), and multilevel logistic regression for the dichotomous variables of visits to physicians (Paper I, II and IV) and receiving a disability pension (Paper III).

In all analysis a series of consecutive models are performed. With the exception of paper I, the first model is always an empty model that only includes a random intercept. This empty model quantifies the size of possible differences (i.e., variance) between various countries of birth or areas. The next model further estimates the role played by individual characteristics. The following model studies possible cross-level interactions between an individual variable (income, educational achievement, marital status) and country of birth. The last model estimates the association between the individual outcome and the contextual variables area education (Paper IV) or economy of country of birth (Papers II and III).

### **Multilevel linear regression (Paper I)**

Multilevel models using linear regressions was performed for the continuous logarithmic transformed expenditure variable expressed in Swedish crowns, with individuals considered to be at the first level, and countries of birth at the second level. Multilevel analysis accounted for the possibility that people born in the same country may to different degrees be alike in relation to factors that influence health care

expenditure. Uncertainty around the estimations was appraised by 95% confidence intervals (CIs).

First level variance (that is, differences between people within countries) as well as second level variance (that is, differences between countries) and their 95% confidence intervals (CIs) were computed. The intra-country of birth correlation (ICC) (that is, the percentage of the total variance in expenditure attributable to country of birth) was calculated as:

$$ICC = V_c / (V_c + V_i)$$

where  $V_c$ =variance between countries of birth and  $V_i$ =variance between individuals.

A large ICC would indicate that differences between countries were responsible for an appreciable part of all the individual differences in healthcare expenditure observed throughout the city (that is, that country of birth played a noteworthy part in understanding individual differences). On the other hand, an ICC close to zero would indicate that country of birth could be effectively ignored as a factor to help explaining individual differences in health care expenditure.

Countries were ranked according to second level residuals (with 95% CIs indicated). The second level residual is the difference between the logarithmic mean expenditure in the country of birth and the logarithmic mean expenditure in the entire city of Malmö (that is, logarithmic expenditure ratio).

Two multilevel models using linear regressions were analysed. In the first model age was included as a continuous variable centred at 60 years and as a square term to allow for a possible quadratic association between age and expenditure. In the second model the variables low income and living alone were added.

### **Multilevel logistic regression (Paper I-IV)**

In logistic regression the aim is to predict the probability  $p_i$  that a phenomenon (e.g., visiting a physician, having health care expenditure, or disability pension) occurs for the individual  $i$  in function of a certain number of variables. Since the natural values of  $p_i$  extend from 0 to 1 and a regression analysis is better performed on values between  $-\infty$  and  $+\infty$  we transform  $p_i$  in logit ( $p_i$ ), which is comprised of values between  $-\infty$  and  $+\infty$ .

More specifically, multilevel logistic regression considers that the individual probability is also statistically dependent on the country of birth or area of residence of the individuals. This dependence on the context needs to be accounted for to obtain correct regression estimates, but doing so also conveys substantive information in itself.

In Models A (i.e., the empty models) the probability of the outcome is only a function of the country of birth or area in which the individuals live, which is accounted for with a country of birth/area-level random intercept.

In Models B the model A is expanded and the probability of the outcome is also a function of the individual variables (i.e., where appropriate gender, age, income, marital status and educational achievement).

In Model C (Papers II-III) the probability of the outcome is – moreover the variables included in the previous models – a result of the interaction between country of birth and individual characteristics. This possible cross-level interaction between individual variables and country of birth is investigated by allowing the regression coefficients of the individual variable to be random at the level of the country of birth (random slope analysis). Such a model indicates whether the effect of individual variable on the

outcome (i.e., health care visits or disability pensions) differed by country of birth (e.g., for individuals from some countries, low income status may be associated with a greater probability of visiting a special provider than for their compatriots with higher incomes, and in other countries this could be the reverse).

In Models D (Model C in Paper IV) the probability of the outcome also depends on the contextual variable (i.e., country economies or area educational variable).

Parameters were estimated using the restricted iterative generalised least squares (RIGLS) procedure and the Markov Chain Monte Carlo (MCMC) method. The Deviance Information Criterion (DIC) was used as a measure of how well the different models fit the data. A lower value on the DIC indicated a better fit of the model. (Browne 2004)

Extra-binomial variation was systematically explored in all binomial models and there was no evidence of under- or overdispersion. The MLwiN, version 1.1 (Paper I) and version 2.0 (Papers II-IV) software package was used to perform the analyses.

## **Measures of second level variance and clustering in multilevel regression**

### **Intraclass correlation in multilevel linear regression**

The intraclass (ICC) correlation is a measure of the degree of similarity among the outcomes of members of the context (e.g., area or country of birth). As discussed above, individuals residing in the same area may be more similar to each other than individuals residing in other areas, as they share a number of economic, social, and other area characteristics that may condition similar outcomes. In this sense areas (or countries of birth) can be considered as "clusters" of individuals sharing a common propensity for similar outcome within clusters. More technically, the intraclass correlation is a variance partition coefficient that indicates the proportion of the total variance ( $V$ ) — that is, the sum of 1st level (between individuals within areas) and 2nd level (between areas) variances — in a health outcome that is accounted for by the 2nd level variance. (Goldstein, Browne et al. 2002) Intraclass correlation needs to be accounted for in regression analysis. Otherwise, the lack of independence of the individuals' residuals arising from two sources of variation at different levels of the data hierarchy contradicts the assumption for performing traditional regression analysis. If ICC is not considered, the study sample is artificially "inflated" and the standard error of neighbourhood variables underestimated.

When studying individuals nested within a defined context (e.g., area), an ICC close to zero suggests that the context is not an important determinant of the outcome, as the different areas resemble random samples from the whole population.

In the linear model, the ICC is based on the clear distinction that exists between the individual-level variance and the second-level variance. In multilevel linear regression both the individual-level and the second-level variances are expressed on the same scale (for example, income in SEK). Therefore, partition of variance between different levels is easy to perform for detecting contextual phenomena.

### **Intraclass correlation in multilevel logistic regression**

By contrast, when modelling a binary (values are always 0 or 1) individual-level variable using a logistic regression, the individual-level variance and the second-level variance are not directly comparable. Whereas the second-level variance is on the logistic scale, the individual-level residual variance is on the probability scale.

Moreover, the individual-level residual depends on the prevalence of the outcome (i.e., its probability).

To solve these difficulties with interpretation, alternative approaches exist for computing the ICC in the case of logistic regression. The principle is to convert the individual-level and second level components of the variance to the same scale. In this thesis (Paper IV), three methods are presented.

- The simulation method (Goldstein, Browne et al. 2002)
- The linear threshold model method, or latent variable method (Snijders and Bosker 1999)
- The Median odds ratio (MOR) (Larsen, Petersen et al. 2000; Larsen and Merlo 2005)

#### *Simulation method*

The principle of the simulation method is to translate the second level variance from the logistic to the probability scale in order to have both components of variance on the probability scale. These two components of variance can then be used on the probability scale to compute the ICC.

As noted previously, the individual-level variance depends on the prevalence. A first consequence is that different phenomena with a similar second level variance but a different prevalence will have different ICCs. The ICC will always be the highest for outcomes with a prevalence of 50%. This aspect needs to be considered when comparing the magnitude of clustering between phenomena with a different prevalence.

A second consequence occurs in the model including covariates. Since the ICC depends on the prevalence, which in turn depends on the characteristics of the individuals, there will be one different ICC for each different group of individuals.

#### *Linear threshold model method*

The linear threshold model method or latent variable method converts the individual-level variance from the probability scale to the logistic scale, on which the second level variance is expressed. In our case, the method assumes that the propensity for visiting a specific physician is a continuous latent variable underlying our binary response (i.e., having visited a specific physician or not). In other words, every individual has a certain propensity for visiting a specific physician but only individuals whose propensity crosses a certain threshold actually do it. This unobserved individual variable follows a logistic distribution with individual-level variance equal to  $\pi^2/3$  (i.e., 3.29). (Snijders and Bosker 1999)

In this method, the ICC is only a function of the second-level variance and does not directly depend on the prevalence of the outcome as in the simulation method.

These methods for computing the ICC in logistic models have their own statistical consistency. However, they are an attempt to apply to the logistic case notions that are based on the clear distinction between the individual-level variance and the second level variance that exists in the linear case. Since this distinction is not so clear in the logistic case, the interpretation of the ICC for dichotomous outcomes is difficult to understand in epidemiological terms.

#### *The median odds ratio (MOR)*

The aim of the median odds ratio (MOR) is to translate the second level variance to the widely used odds ratio (OR) scale, which has a consistent and intuitive

interpretation. The MOR is defined as the median value of the odds ratio between the country of birth or area at highest risk and the corresponding at lowest risk when randomly picking out two countries of birth or areas. Giving an example, the MOR expresses how much (in median) the risk of visiting a private physician increases if an individual were living in an area with a higher prevalence of visiting private physicians. If the MOR is equal to one, it indicates that the area of one's living is not relevant for understanding the individual propensity of visiting private physicians.

In the present studies, the MOR shows the extent to which the individual probability of visiting a specific physician or receiving a disability pension is determined by country of birth or residential area and is therefore appropriate for quantifying contextual phenomena. The MOR is statistically independent of the prevalence of the phenomenon, and can be easily computed in the empty model and in more elaborated models.

If the MOR is equal to one, there are no differences between countries of birth or areas in the probability of the outcome (visits or disability pensions). If there were strong second level differences, the MOR would be large and the second level would be relevant for understanding variations of the individual probability of visiting a specific physician or receiving a disability pension.

One feature of interest of the MOR is that it is directly comparable with the ORs of individual or area variables.

## Main results

### ***Health care expenditure and country of birth (Paper I)***

We observed that country of birth proved to be important in understanding income differences (18% of the total variation in the age adjusted probability of having a low income was attributable to this second level), and the same was true for living alone (13%). The proportion of people having some health care expenditure was fairly similar for all countries; only 3% of the total differences in the city were at the country of birth level. Expenditure increased with age, as well as with having a low income or living alone. Differences in health care expenditure among countries of birth, albeit very small, were statistically significant since the database was large and included all the individuals in the city. Only a few countries of birth could be distinguished with any certainty from either the city mean or other countries. Country of birth did not provide much extra information for understanding health care expenditures, as this second level only explained 0.7% of the total age adjusted variation in expenditure. The remainder (99.3%) was variation at the individual level, which proved to be unrelated to country of birth. After further adjustment for individual low income, and living alone, the intra-country correlation was reduced to 0.4%. These results contrast with the relatively high relevance of the country of birth as a channel for socioeconomic segregation. This study also showed that people born in Sweden presented a comparatively high probability of living alone, but a lower probability of having a low income. Simultaneously Swedish natives presented a relatively high probability of having some contact with the health care system.

### ***Utilisation of different physician types and country of birth (Paper II)***

Our findings indicated that there was less total health care utilisation in individuals with low income than individuals with high income in the older age group, and that overall the probability of health care utilisation among men living alone was even slightly lower than those who were married.

When total health care utilisation was categorised by public vs. private sector, and by general vs. specialised care, a considerable heterogeneity appeared. Except for recourse to public specialists by older men, we found a clear pattern of higher utilisation of public providers in the lower income group. The reverse was true when it came to private providers, where individuals with low income and living alone presented a lower probability of utilisation of private physicians. These opposing patterns explain the apparently weak association between socioeconomic factors and overall health care utilisation.

Using the information provided by the MOR as a measure of country of birth variance, we found that, with the exception of consulting specialists in the public sector, country of birth played an appreciable role when it came to understanding individual differences in the probability of utilisation of specific health care providers. We found these country effects to be stronger in people with low incomes. In the case of private specialist and GP utilisation, these country effects were more important among elderly males than among younger men.

### ***Disability pensions and country of birth (Paper III)***

Living alone and having limited educational achievement was positively associated with having a disability pension. Utilisation of public specialists was associated with a higher probability and utilisation of private GPs with a lower probability of having a disability pension. However, these associations differed by countries of birth. Over and above individual socioeconomic status, men from countries with middle income had a higher probability of having a disability pension.

### ***Utilisation of private providers and area of residence (Paper IV)***

This study is based on genuine survey data but has a didactical purpose as it is not mainly concerned with the substantive interpretation of the results in relation to the rest of the paper in this thesis. Having said that, the results suggest that being female, having high educational achievement and being older was associated with utilisation of private provider. However, the MOR (MOR = 1.81) showed that the unexplained heterogeneity between areas was of greater relevance than the individual variables considered in the analysis for understanding variations in the individual propensity of visiting private physicians. Residing in a high-education area increased the probability of visiting a private physician, and reduced the unexplained clustering. However, the IOR indicated that the unexplained variability between areas was too strong to allow one to clearly distinguish low- from high-propensity areas with the area educational level.



## General discussion

This dissertation studies socioeconomic differences in health care utilisation and disability pensions, and it investigates the role that country of birth of an individual plays in this context. The present investigation identified a contextual phenomenon related to one's country of birth that conditions individual utilisation of health care and disability pensions over and above individual socioeconomic and demographical characteristics. An evident result is that country of birth modifies the individual level association between socioeconomic position and health care utilisation and a disability pension.

The present investigation applies a modern methodology of analysis (i.e., multilevel logistic regression analysis) and also discusses informative epidemiological measures obtained in multilevel logistic regression analysis. Those measures could be useful when it comes to investigate socioeconomic and ethnical differences in health care utilisation.

By considering country of birth as a higher level in which individuals are culturally nested, multilevel regression analysis appeared to be both statistically and conceptually a more appropriate analytical approach than a single level analysis that disregards the natural structure of the data. Multilevel analysis is a growing but still rather innovative methodology in the health care sector, although it has been used in the social sciences for a much longer period of time. (Duncan, Jones et al. 1996; Veugelers, Yip et al. 2001; Bingenheimer 2005) As a new method, it can be used to study less accessible phenomena, as well as a novel way of revisiting normal research fields. Multilevel analysis may expand our knowledge regarding a broad range of phenomena. (Bingenheimer 2005) However, there are always drawbacks to using new methods. At the initial period the understanding of a new method by the research community is limited, which in turn may raise criticism. Also, the novelty of the method risks obscuring the need for theoretical considerations about inferences. (Greenland 2000; Bingenheimer 2005)

### **Health care utilisation**

The first study in this dissertation showed that low individual income and living alone were associated with higher health care expenditures, suggesting that health care resources, as measured by total health care expenditure, were distributed according to individual needs, at least as they relate to the included socioeconomic characteristics. Country of birth played a minor part when it came to understanding individual total health care expenditure. This study, however, did not focus on access to specific services, nor did it investigate specific patterns of health care utilisation, in which areas other authors have observed differences. (Veugelers and Yip 2003; Suominen-Taipale, Koskinen et al. 2004)

However, Malmö is a socio-economically segregated city, and country of birth seems to play an important part in understanding individual differences in the probability of having a low income (ICC=18%) and living alone (ICC=13%). It is noteworthy that in the city of Malmö, individuals born in Sweden had the lowest percentage of low income, but a comparatively high percentage of men with some health care expenditure, as revealed by a comparison of all the countries of birth. This suggests that people born in Sweden may access the Swedish health care system more easily than people from

most other countries of birth. However, once a person has accessed the health care system, country of birth seems rather irrelevant in relation to total health care expenditure. It would be misleading to conclude based on these observations that contextual factors related to country of birth are epidemiologically significant for understanding health care expenditures in Malmö. In fact, excluding country of birth from the analysis would not have appreciable consequences for understanding determinants of health care expenditures in the city.

Another concern of this dissertation was to explore individual differences in the choice of health care providers. For this purpose, multilevel logistic regression analysis was applied in order to examine the association between individual income and health care utilisation, weighing whether this association was modified by the country of one's birth. We also considered if the economic status of one's country of birth influenced individual health care utilisation, independently of individual socioeconomic characteristics.

Using the information provided by the MOR as a measure of country of birth variance, we found that, with the exception of consulting specialists in the public sector, country of birth played an appreciable role when it came to understanding individual differences in the probability of utilisation of specific health care providers. We determined these country effects to be stronger in people with low incomes. In the case of private specialist and GP utilisation, these country effects were more important among elderly males than among younger men.

Our findings indicate that there was less total health care utilisation by low income individuals in the older age group, and that the overall probability of health care utilisation among men living alone was lower than among married men. A straightforward interpretation of these results suggests the existence of inequity in access to health care, since it is known that individuals with low incomes and those who live alone have more health care needs than either people with high incomes or those who live with others. (Lynch, Smith et al. 2000) However, when total health care utilisation was categorised by public vs. private sector, and by general vs. specialised care, a considerable heterogeneity appeared. Except for recourse to public specialists by older men, we found a clear pattern of higher utilisation of public providers in the lower income group. The reverse was true for private providers, where individual low income status and living alone were associated with lesser utilisation of private physicians. These opposing patterns explained the apparently weak association between socioeconomic factors and overall health care utilisation.

Random slope analysis also significantly contributed to understanding the importance of country of birth in modelling the association between socioeconomic position and utilisation of health care. Because of this phenomenon, country of birth played a different role for understanding individual differences in the probability of health care utilisation among high income (as opposed to low income) males. Individuals with high incomes tended to be less influenced by their original country of birth and presented a more homogenous pattern of health care utilisation than low income individuals, except when it came to utilisation of public specialists.

According to information supplied by the MOR, country level factors only influenced young males in the utilisation of public specialists to a minor degree. We also noted that recourse to specialists in the public sphere was higher among low income men and men living alone, and was unrelated to the economic level of their country of birth. These results confirm that public health system provides specialized care for younger men, including those with serious medical conditions, without being

prejudiced by income, marital status, or country of birth. However, we found that socioeconomic differences in utilisation of public specialists disappeared in elderly people after retirement. It has been suggested that social inequalities in health diminish with age. (Jefferys 1996; Merlo, Gerdtham et al. 2003) It has also been proposed that biological and social factors associated with aging affect higher income groups more, and that this balance out socioeconomic gradients in health. (Jefferys 1996) It is believed that mortality rates among elderly low income groups tend to decrease because of selective survival, preventing the sicker individuals in those groups from reaching an advanced age, whereas mortality in the high income group is not expressed until later (i.e., by a relatively higher disease burden in later life), ultimately reaching a level comparable to the low income groups. These factors might explain the absence of a socioeconomic gradient in utilisation of public specialists such as we found in the elderly. However, this apparent equality in access to public specialist care for aging groups may be a fallacy: it could, in fact, express channelling of resources to high income groups — a question that deserves serious inquiry. (Merlo, Gerdtham et al. 2003)

The findings concerning the public health care sector contrast with the socioeconomic pattern of utilising private health care: private physicians were more frequently consulted by high income married men from countries with strong economies. That is, even if access to health care is guaranteed to all the inhabitants of Malmö (Paper I), public health care is more frequently utilised by people of low income coming from poorer countries. If private physicians were more expensive than public ones, this pattern of consumption could reflect economic barriers related to social position. However, the specific Swedish circumstance of providing free access to health care, a uniform fee for services, and societal funding of both public and private health care, speak against this argument. Historically, support for both public and private physicians has been available in Sweden for more than thirty years. (Werko 2000) It is, therefore, improbable that our findings reflect the influence of decades past, when expensive private physicians were only available to people of high socioeconomic standing.

A more likely explanation is that cultural preferences and health beliefs associated with both individual traits and the economy of one's country of birth may condition the choice of health care services in greater measure than economic barriers. Consumption is not only related to economics; rather, the object of consumption also has a symbolic meaning (Veblen, 1994), and this meaning may be reflected in common preferences among individuals in similar financial circumstances. In contrast, we found that country of birth had a lower impact on individuals with a high income. Those who enjoy high socioeconomic status may share a number of values that smooth out cultural and language factors related to country of birth.

Apart from individual or group preferences that are based on informed opinion or perceptions of disease and treatment, "invisible" barriers to health care utilisation may exist. It is conceivable that the attitudes of physicians generate a channelling of low income individuals from countries with poorer economies to public care facilities, if — as it seems to be the case — immigrants are treated with more respect in public practices. Unfortunately, the negative behaviours of some providers can also lead to individuals reluctance in demanding health care. (van Ryn 2002; Adamson, Ben-Shlomo et al. 2003; van Ryn and Fu 2003; Reimann, Talavera et al. 2004)

### ***Disability pensions***

Analogous to the findings concerning utilisation of health care, a clear association was found between low educational achievement and living alone, and receiving a disability pension. MOR revealed that country of birth played a greater role than other individual variables when it came to understanding individual differences in the probability of having a disability pension. These effects were more pronounced for women than for men. Further, because of the random slope phenomenon, country of birth played a different role for understanding individual differences in the probability of having disability pensions among married people and those with low educational achievement. It is possible that individuals with high educational achievement and those living alone share values and circumstances that are independent of their country of birth, which would explain the lower MOR for these groups. One might speculate that cultural aspects in some countries dissuade married people from seeking disability pensions, while in other cultures the opposite could be true. Further qualitative studies are needed in order to comprehend these reasons. In any case, conventional measures of association between socioeconomic factors and disability pensions may be misleading if contextual elements related to country of birth are not considered. This consideration would be of substantial importance in the analysis of health care.

It is known that having a disability pension is associated with health care utilisation (Eden, Ejlerstsson et al. 1995; Wallman, Burel et al. 2004) — a fact confirmed by our study. Unexpectedly, however, we noted that the odds ratio for having a disability pension was twice as great for those who had consulted public specialists (generally through hospital out-patients clinics) than for those who had utilised other types of physicians. The opposite, i.e., a lower odds ratio for being granted a disability pensions, was true among those who had visited private GPs. The apparent association between utilisation of public specialists and disability pensions might be attributable to patients with more severe diseases consulting public specialists, since these physicians have closer affiliations with hospitals. Alternatively, it may be that the Social Insurance Agency that grants disability pensions insists on medical certificates issued by public specialists. However, as our study was cross-sectional, we do not know whether utilisation of public specialists starts before or after disability pensions are granted.

Being outside the workforce might have a direct negative effect on an individual's health (Hansson, Andersson et al. 1996)(Rosval M 2005, personal communication), and result in higher utilisation of specialised care. The negative association between utilisation of private GPs and disability pensions may have an analogous explanation in this context, i.e., the demand for hospital resources and/or stipulations by the Social Insurance Agency. However, if the above were true, the same phenomenon would also be seen among private specialists and public GPs, which was not the case. Rather, the answer might partly lay in differences between public and private providers regarding incentives for certain actions. Some authors have reported significant differences in the length of sick leave certificates and the extent of cooperation with the Social Insurance Agency by private or public providers. (Arrelöv 2003) Although this study cannot answer these questions, it may point out a direction for future investigation.

### ***Analysis of countries of birth***

In our investigations we analysed specific countries of birth rather than making simple ethnic categorisations (for example, immigrant compared with Swedish born), which seemed inappropriate for capturing a possible heterogeneity in health care utilisation or receiving a disability pension. In general, the use of ethnic classifications in

epidemiological and biological research has been questioned. (Bhopal 1997) Ethnicity is a socially determined variable that is confounded by socioeconomic status. (Nazroo 2003) Its complex nature makes it difficult to use as a valid classification, (Senior and Bhopal 1994) and the latter can certainly not be achieved by a simple dichotomisation.

Investigating the health status of immigrants by comparing it with that of Swedish born people or using this dichotomisation as a proxy for social position implicitly means that the underlying explanation rests on immigrant status, rather than upon class, lifestyle, or social position. (Sundquist 1993) This approach leads to uncertain assumptions about the existence and importance of cultural and biological differences being asserted as fact. (Bhopal 1997; Nazroo 2003)

The perception that the health of immigrants is poor promotes the belief that immigrants are a burden to society, and results in placing blame on migrants. As Bhopal says, *“By emphasising the negative aspects of the health of the minority groups research may have damaged their social standing.”*. (Bhopal 1997) This is a teleological paradox, as most “immigrant” studies, rather than being racist or tending to stigmatise immigrants, aim to reduce inequity. (Beckman, Merlo et al. 2004)

### **Limitations of the studies**

This thesis is based on cross-sectional observational studies, and conclusions regarding the direction of causality are difficult to establish. However, some key variables like country of birth and education are rather stable across time. Moreover, observational studies present own advantages and are the only choice when the aim is to investigate a large population, no intervention is possible or an active participation of the subjects in the study would obscure the results. (Black 1996; Ayanian 1999; Concato, Shah et al. 2000) On the other hand, even if we can not exclude the existence of bias or residual confounding decreasing the internal validity of the results, our results represent a piece of relevant evidence.

By 1999 Malmö was divided into 10 different large areas that may differ in health care availability and there is an uneven geographical distribution of providers in the city of Malmö. Therefore, area of residence may confound differences in health care expenditure between countries of birth in cases where people from a certain country are geographically segregated in specific city areas. Because of the small number of city areas, and because the investigation focused on country of birth rather than on geographical effects, cross classified multilevel analysis was not performed. However, a suitable approach would be to perform a cross classified (country of birth – small area) multilevel analysis or to apply a spatial analytical approach. (Chaix, Merlo et al. 2005) These aspects will be the focus of future investigation.

We worked with information on country of birth in papers I, II and III, but it is possible that second generation immigrants (that is, people born in Sweden but sharing the language and culture of their foreign born parents) have a different pattern of healthcare utilisation or granted disability pensions than do people born in Sweden of Swedish parents. This fact may lead to differential misclassification and reduce the estimated differences between Swedish born people and people born in other countries. However, only about 3% of the people in the age groups included in this study (that is, 40–80 years of age) were second generation immigrants.

In the data country of birth does not represent all members of a particular country, but only the group of people that emigrate, and this aspect needs to be considered in the interpretation of the results.

Because the present database lacked information on how long individuals had been living in Sweden, it is possible that length of living affects patterns of health care utilisation so immigrants who have been living for many years in Sweden become acculturated and present patterns of consumption more similar to Swedish-born individuals. (Singh and Siahpush 2002; Abraido-Lanza, Chao et al. 2005) However, since acculturation in this context means a closing of the gap between Swedish natives and individuals from other countries, this aspect would create an underestimation of the between country variance.

Papers I, II and III are based on register information that has been gathered for administrative purposes and, therefore, its validity might be questioned. However, Sweden has a long tradition of keeping population and health care registers, and well-developed systems are in place for recording, storing, and managing information. Moreover, the databases we managed in our studies are used for resource allocation analysis in the county of Scania, and has been checked for registration errors by professional expertise in the Scania County Council and Statistics Sweden. In studies of health care utilisation, reliability seems to be higher when using register than survey data (Petrou and Kupek 2005), although survey data offers a reasonable estimate of utilisation. (Reijneveld and Stronks 1999; Reijneveld and Stronks 2001)

All visits to physicians in the county of Scania are recorded in two administrative systems: PASIS for public physicians and PRIVA for private physicians, and there is a risk for differential information bias if the quality of these two databases is different. For the private physicians the registrations are the only way to get paid for services, and therefore meticulously recorded. For the public sector of the county of Scania health care expenditures are of crucial importance, and recordings are constantly checked for inconsistency. However, even if the public physicians do not have a monetary incitement, the numbers of visits are nevertheless a measure used to evaluate performances in the public sector, and therefore also scrutinised for inconsistency. Therefore, we do not think that differential information bias is a mayor threat for our analyses.

Economy of the country of birth according to the World Bank was used. However, information for the year 1999 and 2002 was used, rather than from the exact period when the individual grew up, which may convey risk for contextual misclassification.

To produce statistical information on individual income, several administrative registers are used by Statistics Sweden. In these studies individual total income from employment and business was used, which excludes income of capital but incorporates income transfers (e.g., pension payments, unemployment benefits, paid sick-leave). Individual income, however, does not reflect the income of the household. This fact is particularly important when judging income for women, who are more prone to part time work and hence low income, but still can share a high income household level supported by the husband. Therefore, individual incomes in women but not in men convey risk of differential misclassification of women with high household income into the low individual income group. For this reason studies I and II are restricted to men.

Country of birth, income, and marital status are not self-reported, but are based on official statistics maintained by Swedish authorities, thus increasing the validity of this data. Regarding information on marital status in the registers, people sharing the same household are considered as living alone if they do not have mutual children. This factor might produce misclassification and lead to an underestimate of the association between living alone and health care utilisation in both genders.

The last article in this dissertation was mainly concerned on methodological aspects and has a didactical aim, but it does not have a substantive relation with the analyses performed in the other articles of this thesis. The questionnaire survey was based on a random sample of the population of Scania rather than on the register database for resource allocation that covered the complete population of Scania. It is known that non-participation in health surveys is a common phenomenon that may decrease the external validity of the information provided by the survey. If differences between participants and non-participant are considerable, false conclusions may deduced about health status in the population. However, a separate investigation auditing the representativity of the postal questionnaire survey as compared with the database for resource allocation has shown a rather acceptable representativity of the survey regarding health care utilisation costs. However, this study evidenced an under representation of men, of people with low educational achievement and of immigrants in the survey. (Carlsson, Merlo et al. 2005)

## Conclusions

People born in the same country present a related pattern of health care utilisation, possibly because they share a number of economic, social, and cultural characteristics, in addition to their common geographic origin and language. These findings suggest that factors related to the country of one's birth are relevant for understanding individual differences in the choice of health care providers and the association between socioeconomic position and specific patterns of health care utilisation, but are less relevant for understanding overall expenditure in the health care system (that is, even if groups of individual have insufficient access to the health care this phenomenon is not related to country of birth in a considerable degree).

Classifying countries of birth according to World Bank criteria for country economies, provides an information based on economic criteria that seems less prone to stigmatize people than using their demographic (e.g., immigrant vs. Swedish-born), ethnic (e.g., Caucasian, Hispanic, Asian, Black) or geographic origin (e.g., Northern European, African, South American).

Especially for men, the economic characteristics of one's country of birth influenced the probability of having a disability pension in the new country of residence, i.e., individuals from middle income countries had a greater chance of being granted a disability pension than individuals from more affluent countries. However, this contextual effect proved to be not very relevant since the residual country of birth variance was high and the fit of the model did not improve when including this variable.

Considering the findings above, simple ethnic categorisations (such as immigrant compared with Swedish born) do not seem appropriate for studying the impact of socioeconomic or ethnic background on healthcare utilisation. An appropriate way of improving general societal integration may be to focus on socioeconomic inequity wherever it is present, rather than on simple ethnic categorisations.

In the city of Malmö, low income males and those from countries with poor economies had greater total health care utilisation i.e., a pro-poor pattern of health care utilisation. A fact that seems appropriate as people with low income and from countries with poor economies may have worse health and more health care needs than people with high income and from countries with rich economies. However, this was only true for young males (i.e., age 40–64), older males (i.e., age 65–80) had lower total health care utilisation. These age differences disappeared when utilisation of public health care was analysed, i.e., the pro-poor pattern re-emerged. The contrary was detected in the

private sector, where low income males and those from countries with poor economies showed lower health care utilisation, irrespective of age. It is possible that the attitudes of physicians (e.g., respect) generate a channelling of low income individuals from countries with poorer economies to public care facilities.

Regarding patterns of health care utilisation, country of birth had a lower impact (lower MOR) on individuals with a high income than in individuals with low income. It is possible that those who enjoy high socioeconomic position may share a number of values that smooth out cultural and language factors related to country of birth.

A clear association between on the one hand having less educational achievement and living alone and on the other hand a higher likelihood of receiving a disability pension was observed. These associations were expected since it is known that people with low socioeconomic status and those who live alone have worse health than their counterparts with high income or married and, therefore, present a higher probability of being granted a disability pension. However, it was striking to find that these associations were modified by the country of one's birth.

The country of one's birth appears to play a significant role in understanding how individual socioeconomic differences bear on the likelihood of receiving a disability pension and on associated patterns of health care utilisation.

In health care utilisation studies it is easy to compute and interpret measures of variation in multilevel linear regression, but technical difficulties exist in the case of logistic regression. However, measures of variation in logistic regression can also be computed and should be promoted in health care utilisation studies as efficient means of quantifying the importance of the context for understanding disparities in health and health-related behaviour. The use of the MOR presents the advantage that it can be compared with odds ratios informing on the associations between variables at different levels and the outcome.

People born in the same country present a related pattern of health care utilisation and disability pension. In the presence of this intra-country correlation, multilevel regression analysis appears to be an appropriate methodological approach in social epidemiological and health care utilisation studies for both statistical and epidemiological reasons. In terms of epidemiology, it allows us to investigate the distribution of disparities in health care utilisation and disability pension among individuals and among countries and, therefore, quantify contextual phenomena.



## Sammanfattning på svenska

Det är känt att låg socioekonomisk position (t.ex., låg inkomst, kort utbildning) och civilstånd, (t.ex., ensamstående) kan försämra hälsan. Den sämre hälsan medför ett ökat sjukvårdsbehov, och i ett jämlikt samhälle borde därför sjukvårdsutnyttjandet vara större bland de med låg socioekonomisk position och bland de som är ensamstående. Av samma anledning bör en högre förekomst av sjukpension finnas i dessa grupper. Emellertid, oberoende av individens egna karakteristika, skulle sjukvårdsutnyttjande och förekomst av sjukpension kunna påverkas av faktorer relaterade till individens födelseland. Människor som är födda i samma land kan visa liknande hälsa, beroende på att de delar ett flertal ekonomiska, sociala och kulturella faktorer, förutom att de har gemensamt geografiskt ursprung och språk.

Detta avhandlingsarbete har studerat socioekonomiska skillnader avseende sjukvårdsutnyttjande och sjukpension hos befolkningen i Malmö stad, och vilken roll födelseland spelar i detta sammanhang. Arbetet baserar sig på den databas som används för resursfördelning av sjukvårdsresurser i Region Skåne och som innehåller avidentifierad information om alla individer i Malmö. För att undersöka förekomsten av faktorer som kan hänföras till födelseland och samtidigt skilja dessa från individuella faktorer, har multinivå regressionsanalys använts.

Huvuddelen av hälso- och sjukvården i Sverige, både den offentligt och privat drivna och som förmedlas av både distriktsläkare och organspecialister, är offentligt finansierad och skall förmedlas på lika villkor, oberoende av kön, ålder, inkomst eller födelseland. På dessa grunder erbjuder det svenska sjukvårdssystemet en unik möjlighet att undersöka hur sjukvårdskonsumtion kan vara avhängigt av både individuella socioekonomiska och kulturella faktorer, såsom födelseland, utan att ekonomiska hinder (patientavgifter) påverkar det individuella valet.

Termen invandrare har använts som begrepp för i Sverige ej födda invånare och ibland jämförts med låg socioekonomisk status. Invandrare är dock en heterogen grupp och riskerar att stigmatiseras genom grova kategorier som inte tar hänsyn till individualitet.

Även om den totala sjukvårdskostnaden för individen inte är beroende av födelseland, kan kvalitativa skillnader vad gäller individens val av olika läkare påverkas av kulturella och/eller socioekonomiska faktorer relaterade till födelseland.

I Studie I undersöktes sjukvårdskonsumtionen hos män i Malmö, 40-80 år, för år 1999 i form av totala sjukvårdskostnader. Kostnaderna ställdes i relation till individuell ålder, inkomst och civilstatus, men också i relation till individuellt födelseland. Genom multinivå regression kunde studien visa att totala sjukvårdskostnaden var högre för individer med låg inkomst och ensamstående och att födelseland endast hade minimal betydelse för sjukvårdskostnaderna. Däremot kunde betydelsen av födelseland visas för låg inkomst och att vara ensamstående.

I Studie II undersöktes sjukvårdskonsumtionen hos män i Malmö, 40-80 år, för år 1999 i form av besök till *olika* läkare – offentliga och privata, distriktsläkare och organspecialister –, och hur dessa besök var relaterade till individuell inkomst, civilstatus och födelseland (andra nivå). Dessutom studerades om födelselandets ekonomi påverkade besök hos olika läkare, oberoende och över individuella faktorer.

Studien avslöjade med hjälp av logistisk multinivå regression att individer med låg inkomst och individer från länder med låg ekonomi hade högre sjukvårdskonsumtion, men bara i offentlig sjukvård. Det motsatta var fallet i den privata vården. Analysen

visade också att födelseland hade större betydelse för män med låg inkomst än med hög inkomst.

Studie III undersökte befolkningen i Malmö 2003 avseende sjukpension och hur denna var relaterad till kön, individuella socioekonomiska faktorer och födelseland. Dessutom undersöktes associationen mellan besök hos olika typer av läkare och sjukpension.

I studien framgick klart att individuella faktorer såsom låg utbildningsnivå och ensamstående var starkt associerat till erhållen sjukpension. Detta var förväntat utifrån den högre förekomsten av ohälsa i socioekonomiskt utsatta grupper. Emellertid var ett helt överraskande fynd att födelseland hade avsevärd betydelse för att förstå det individuella sambandet mellan å ena sidan sjukpension och å den andra sidan civilstatus och utbildningsnivå. Mer specifikt var betydelsen av födelseland för sjukpension relativt mindre hos ensamstående och hos högutbildade än hos dem som levde tillsammans eller var lågutbildade.

Även födelselandets ekonomi hade någon – men tydligt mindre – betydelse för erhållen sjukpension än individuella socioekonomiska faktorer.

Analysen visade en högre förekomst av sjukpensionärer som besökare hos offentliga specialister (positiv association) men det motsatta hos privata distriktsläkare (negativ association). Då det var en tvärundersökning, kan fynden vara en effekt av sjukpensioneringen, eller ett beteende som föregår sjukpensioneringen, snarare än att offentliga specialister stödjer förtidspensionärer mer än privata distriktsläkare. Fynden skulle kunna förklaras av försämring i sjukdom och/eller önskemål från Försäkringskassan om intyg från sjukhusspecialister. Emellertid, om detta vore fallet, borde även besök hos de offentliga distriktsläkarna ha en negativ association med sjukpension. Så var inte fallet, snarare tvärtom, och förklaringen kan möjligen sökas i de skilda förutsättningarna för arbete och ersättning mellan offentliga och privata läkare.

Syftet med Studie IV var att på ett konceptuellt snarare än ett statistiskt sätt visa på hur analys och tolkning med hjälp av logistisk multinivå regression kan ske, och betydelsen av att denna typ av metodologi utnyttjas i hälso- och sjukvårdsforskning.

Sammanfattningsvis visar avhandlingen att genom användandet av multinivåanalys med födelseland som andra nivå, erhöles en statistiskt och konceptuellt lämpad modell för analys av sjukvårdskonsumtion och sjukpension. Studien visade också att användande av födelseland istället för dikotomisering i svenskar och invandrare, avslöjade en betydande heterogenitet.

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**Appendix**