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**ANALYSING EQUITY IN OUTPATIENT CARE IN STOCKHOLM
COUNTY AND THE IMPACT OF USING DIFFERENT DATA
SOURCES**

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Analysing equity in outpatient care in Stockholm County and the impact
of using different data sources
THESIS FOR DOCTORAL DEGREE (Ph.D.)

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Til Rikard, Elias og Gry

*Problems worthy
of attack
prove their worth
by hitting back.*

Piet Hein

ABSTRACT

Healthcare plays an important role in tackling inequalities in health by providing care to groups in need, and protecting lower income groups from further impoverishment due to ill health. Continually evaluating equity in healthcare is important as it changes with altered needs in the population and changes within the healthcare system itself. The aim of this thesis was to increase knowledge on equity in outpatient healthcare based upon data from Stockholm County in the period 2005-2013. The conclusions made are based upon the results from four different studies.

In Study I, we investigated the non-response bias in a health survey with respect to socio-economic differences in healthcare utilisation by comparing data from a health survey with data of the general population in Stockholm County.

In Study II, we investigated how the income gradient in healthcare utilisation changed when taking need into account, by comparing socioeconomic differences using register data on healthcare consumption and sociodemographic background characteristics, and linked survey data.

In Study III, we compared socioeconomic differences in healthcare utilisation in Stockholm County before and after the introduction of a primary care reform in 2008 focusing on free choice of provider and free establishment for providers along with a change in reimbursement system from a need-weighted capitation based system to a system based primarily on fee-for-service.

In Study IV, we investigated changes in resource allocation to primary care clinics in areas with different levels of median income over a period of nine year and whether the introduction of the 2008 primary care reform changed the trends in resource allocation. We also investigated whether a change in resource allocation was associated with changes in rates of ambulatory care sensitive conditions and emergency ward visits in areas with a decrease and increase of resources, respectively.

The conclusions of this thesis is that although response rates in health surveys can be relatively low and differ between socioeconomic groups, relative differences in healthcare utilisation between different socioeconomic groups are representative of the source population and not biased, for most groups. Using health survey data to investigate equity in healthcare utilisation allows adjusting the analyses for healthcare needs. Using data where this is not possible is likely to underestimate socioeconomic differences.

The 2008 primary care reform did not particularly benefit groups with higher healthcare needs, on the contrary there seems to be a decline in vertical equity in primary care in Stockholm from 2007 to 2011; especially among women with poor health and men with poor mental health as well as men living in disadvantaged areas. In addition, resources have been shifting from areas with populations with higher healthcare needs to areas with populations with lesser healthcare needs in this period (2005-2013). Further investigation is needed in order to fully understand the health effects of shifting resources from poorer to richer areas.

LIST OF SCIENTIFIC PAPERS

- I. Agerholm J, Bruce D, Burstrom B. *Comparing healthcare utilisation among health survey respondents with the total population - are respondents representative?* BMC Health Serv Res. 2016;16(1):510.
- II. Agerholm J, Bruce D, Ponce de Leon A, Burstrom B. *Socioeconomic differences in healthcare utilisation, with and without adjustment for need: an example from Stockholm, Sweden.* Scand J Public Health. 2013 May;41(3):318-25.
- III. Agerholm J, Bruce D, Ponce de Leon A, Burstrom B. *Equity impact of a choice reform and change in reimbursement system in primary care in Stockholm County Council.* BMC Health Serv Res. 2015;15:420.
- IV. Agerholm J, Ponce de Leon A, Barr B, Burstrom B. *Changes in resource allocation to primary care over time and the impact on ambulatory care sensitive conditions and emergency ward visits.* (Manuscript)

CONTENTS

1	Introduction	7
2	Theoretical Background	8
2.1	Equity in health and healthcare	8
2.1.1	The concept of health	8
2.1.2	The concept of equity in relation to health	8
2.1.3	The concept of equity in relation to healthcare	9
2.2	Conceptual framework	12
2.2.1	What affects health?	12
2.2.2	What affects utilisation of healthcare?	13
2.3	How does healthcare affect health and equity in health?	14
3	Empirical background	15
3.1	The Swedish healthcare system	15
3.1.1	Primary care	15
3.2	The 2008 Primary care reform in Stockholm County	16
3.3	Previous research on equity in Swedish healthcare	17
3.3.1	Equity impact of the primary care reform in Sweden	18
3.3.2	The effects of healthcare reforms on health inequalities in an European perspective	20
3.4	Knowledge gaps	20
4	Aim and research questions	22
4.1	Aim	22
4.2	Research questions	22
5	Overview of the four studies in this thesis	23
6	Materials and methods	25
6.1	Materials	25
6.1.1	Stockholm Public Health Cohort	25
6.1.2	The VAL-databases	26
6.1.3	Longitudinal integration database for health insurance and labour market studies (LISA by Swedish acronym)	26
6.1.4	Costs	26
6.2	Outcome measures	27
6.2.1	Study I	27
6.2.2	Study II	27
6.2.3	Study III	27
6.2.4	Study IV	28
6.3	Independent variables	30
6.3.1	Demographic variables	30
6.3.2	Socioeconomic variables	31
6.3.3	Variables used as proxies for healthcare needs	32
6.3.4	Other variables	34
6.4	Statistical methods	35

6.4.1	Modelling binary variables	35
6.4.2	Modelling discrete variables	35
6.4.3	Modelling time series data	36
6.5	Ethical considerations	36
7	Results	37
7.1	How does differential non-response in health surveys affect analyses of socioeconomic differences in outpatient healthcare utilisation?.....	37
7.2	How does the socioeconomic gradient in use of outpatient services change when taking need into account?	39
7.3	How has the 2008 primary care reform affected equity in primary care?	40
7.4	How are changes in resources to primary care related to changes in rates of visits to emergency wards and rates of hospitalizations due to ambulatory care sensitive conditions?	42
8	Discussion.....	42
8.1	Main findings.....	43
8.2	Implications of choice of data	43
8.3	Changes in equity in healthcare in Stockholm County	44
8.3.1	Changes in the social patterning of utilisation	44
8.3.2	Changes in resource allocation between geographical areas	45
8.3.3	Changes in service availability and quality of care.....	46
8.4	Methodological considerations	46
8.4.1	Data sources	46
8.4.2	Measures.....	46
8.4.3	Validity	48
8.4.4	Generalisability	49
9	Conclusion.....	50
9.1	Future studies and implications of the findings.....	50
10	Acknowledgements	52
11	References	55
12	Appendix A	64
12.1	Search string	64
13	Appendix B.....	66
13.1	Coding of healthcare visits in study III.....	66
14	Appendix C.....	67
14.1	Coding of emergency ward visits	67
14.2	Coding of ambulatory care sensitive conditions	68

LIST OF ABBREVIATIONS

ACG	Adjusted clinical groups
ACSC	Ambulatory care sensitive conditions
ARV	Register of private specialists
DP	Disability pension
EWV	Emergency ward visits
GP	General practitioner
LISA	Longitudinal integration database for health insurance and labour market studies
LLI	Limiting longstanding illness
OVR	Outpatient care register
SAHCSA	Swedish Agency for Health and Care Services Analysis
SALAR	Swedish Association of Local Authorities and Regions
SLV	Inpatient care register
SPHC	Stockholm Public Health Cohort
SRH	Self-rated health
VAL	Stockholm County Council's administrative database for analysis and follow-up of healthcare utilisation
WHO	World Health Organization

1 INTRODUCTION

Health is considered an intrinsic human right and achieving equity in health is one of the primary objectives of public health. In 1946 it was stated in the World Health Organization's Constitution that "the highest standards of health should be within reach of all, without distinction of race, religion, political belief, economic or social condition" (1). Health, however, follows an inverse social gradient both on individual and on area level: the lower the socioeconomic status, the higher mortality and morbidity (2-5).

Although the healthcare system might not be thought of as a main determinant of inequalities in health, it plays an important role in tackling inequalities in consequences of ill health and could potentially promote equity in health by providing care to groups in need, and by protecting lower income groups from further impoverishment due to ill health (6, 7). This makes the healthcare system important from a public health perspective.

Equity in health and healthcare has high priority in Sweden. In the Swedish Healthcare Act it is stated that: "*Health and medical services are aimed at assuring the entire population of good health and of care on equal terms*" and that "*priority should be given to those who are in greatest need of health and medical care*" (8). Nevertheless, healthcare services are not always made available to all groups in an equitable way. In Sweden several studies have demonstrated inequity in utilisation of healthcare services despite a long tradition of a healthcare system based on egalitarian principles and with universal healthcare coverage (9-11).

The level of equity or inequity in healthcare changes over time, it is not a static state. Therefore, it is important to continually evaluate equity in healthcare as it changes with altered needs in the population and modifications of the healthcare system itself. Especially the introduction of new policies and organisational changes could potentially affect equity in healthcare and ultimately equity in health.

In Sweden as well as in many other European countries market-oriented healthcare reforms have been introduced since the 1990s (12-14). The latest healthcare reform focused on increasing free choice of provider and free establishment for providers in primary care. This reform was not explicitly designed to improve equity in healthcare, but to increase access. Nevertheless, or perhaps especially therefore, it is important to assess the impact of the reform on equity in healthcare.

The aim of this thesis is to investigate equity in outpatient healthcare. Using data from Stockholm County the focus will be both on testing the impact of using different data sources when analysing equity in healthcare, and on how a policy change in the healthcare system can affect equity in healthcare. Equity in healthcare is an area which is researched in many different disciplines, however this thesis is written within the field of public health and social medicine.

2 THEORETICAL BACKGROUND

This chapter provides definitions of the concepts used throughout this thesis and explains the conceptual framework for the thesis. Many of the concepts introduced in this chapter have their origin in areas like sociology, psychology, health economics, and moral philosophy, and might have broader usage, another theoretical background or be operationalised in different ways in other disciplines. However, in this chapter only the usage of the concepts in this thesis will be defined.

2.1 EQUITY IN HEALTH AND HEALTHCARE

The chance to live a long life in good health is not equally distributed in the population. There is an inverse social gradient in health, both on an individual level and on an area level: the lower the socioeconomic group, the higher the mortality and morbidity. This has been proven in many studies across different contexts and time periods. (3, 5, 15, 16)

The healthcare system is one of many determinants of health (7). It is though, identified as an important arena for promoting equity in health (6, 7). The right to essential healthcare according to need, not ability to pay, is a fundamental part of most European health policies (7).

2.1.1 The concept of health

While health is a relative concept, the World Health Organization (WHO) defines health, as *“a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity”*(17). This definition broadens the concept on health, overcoming the previous more negative definitions that focus only on the absence of disease (18). However, the absoluteness of the word *“complete”* has been criticized and a less abstract definition is included in the Ottawa Charter where health is defined as a resource for everyday life: *“...a resource which permits people to lead an individually, socially and economically productive life”*(17). Thinking of health in terms of a resource makes sense in relation to understanding the importance of equity in health. If good health is a prerequisite to achieve our full potential, socially and economically, equity in health is a necessary condition for achieving equal opportunities in life. Equal opportunities in life is one of the principles of the welfare state (19).

2.1.2 The concept of equity in relation to health

The strive for equity in health has been and still is an underlying concept in most European health policies (20), including Sweden. However, inequities in health are still present in every European Country (5, 20).

So what is inequity in health? Firstly, inequity in health should be distinguished from inequalities in health, although the two terms are often used interchangeably (17, 21). Equality is a descriptive concept and inequalities in health are differences in health status between different population groups (17). Some inequalities can be seen as inevitable or

unavoidable e.g. biological or natural variation or health effect of freely chosen health-damaging behaviour (17, 20). Equity is a normative concept and inequities in health are more value laden, based upon judgements about fairness and justice. Whitehead defines inequities in health as health differences which are unnecessary, avoidable and unfair such as differences attributed to exposure to unhealthy living and working conditions or inadequate access to healthcare (20). This definition of inequity in health as being unfair or unjust has a moral and ethical component and the interpretation and operationalisation can thus vary depending on the underlying ideology (21-23). Whitehead argues that the concept of equity in health is related to the concept of human rights (7) and that health equity “*implies that ideally everyone could attain their full health potential and that no one should be disadvantaged from achieving this potential because of their social position or other socially determined circumstance*” (7).

In this thesis the Braveman and Gruskin definition of health equity is used, where health equity is defined as the “*absence of systematic disparities in health (or its social determinants) between more and less advantaged social groups*”. This definition builds on Whitehead’s definition but attempts to make the concept more measurable (21).

2.1.3 The concept of equity in relation to healthcare

As a mean to achieve equity in health, equity in healthcare becomes important. If health is a resource and good health is “*necessary for an individual to flourish as a human being*” then a fair and just distribution of healthcare, insofar as it is contributing to “*good health*”, becomes an ethical concern (24).

When talking about a fair and just distribution of healthcare, it becomes evident that a distinction between equity and equality is important, as an equitable distribution of healthcare resources is by most definitions not an equal distribution.

Several different definitions have been used to define when equity in healthcare is achieved; from the simple and easily operationalised definition of ‘equality of expenditures per capita’ to the much broader definition of equity being achieved when equality of health is achieved (20, 24). According to the first definition, allocation of resources would be based on the size of the population in an area, the obvious objection being that there would be no considerations for differences in need (20). In the latter definition, need is most certainly taken into account but to obtain equity in health by healthcare alone is probably impossible as healthcare is only one of many determinants of health and equity in health (20) and additionally not all health issues can be taken care of in the healthcare services.

The most frequently used definition of equity in healthcare is ‘equal access to healthcare for equal needs’. This definition is also used as an underlying principle in many health policy documents, including the Swedish (8, 25), and is sometimes divided into two dimensions: horizontal and vertical equity. Horizontal equity in access to healthcare means that people with equal needs receive equal access to healthcare and vertical equity in access to healthcare

means that groups with unequal needs receive access to healthcare in proportion to the inequality of their needs (26).

The definition of equity in healthcare as ‘equal access to healthcare for equal needs’ is very intuitive and is also the definition used in this thesis, however, it depends heavily on the definition of the two concepts; access and need.

2.1.3.1 Access

Access can also be defined in many ways; one way is to look at access as utilisation. Utilisation of healthcare is often used synonymously with access to healthcare in many studies (24, 27-29) and the definition of equity in healthcare is sometimes phrased as equal utilisation for equal need. The problem with this definition is that it is not possible to interpret differences in utilisation as being purely inequitable; and needs further investigation (20, 30). Some of the differences could be attributable to individuals using their individual right not to use healthcare; other differences could be due to an over utilisation in some groups and therefore not a question of inequitable access. However, often socioeconomic differences in utilisation will be due to barriers to access; either personal, financial or organisational barriers (20, 29).

Gulliford et al. differentiate between having access and gaining access where having access is defined as the “*potential to utilise a service if required*” also denoted *service availability* and gaining access is defined as “*the initiation into the process of utilising a service*”(29). According to Gulliford et al. having access or service availability is a limited measure as the potential access may not be realized due to the above mentioned barriers. In most cases only actual use of services can be used as proof of actual access (29) and therefore utilisation measures in the form of number of visits or contacts are frequently used as outcome measures when evaluating equity in healthcare. There are however disadvantages with these measures that are seldom discussed.

When using e.g. doctor visits as an outcome measure we assume that a visit to the doctor is a comparable entity. It is however most likely that visits vary depending on health status and need; especially when it comes to time spent, costs and number or types of interventions. When it comes to the quality of the visit it might be more complex to measure and quality might also vary with socioeconomic position (31, 32).

The fact that it is difficult to measure the content of a visit makes it especially difficult to investigate vertical equity, as it is very difficult to establish how much more healthcare individuals with higher needs should have in order for healthcare to be equitable. If the doctor takes need into account when providing a visit, equal number of visits could in theory be equitable healthcare although needs vary.

2.1.3.2 Need

Need is even more problematic to define and measure than access. Healthcare needs may be thought of as initial health status, as the capacity to benefit from care, as how much care a person requires to attain equality of health or the care required to effect the maximum possible health improvement (24). In practice healthcare need is mostly measured in terms of health status and this is also how we approach the concept in this thesis (26). However, there are some limitations with the use of health status as a measure for need. In some cases a certain health issue might not be treatable in healthcare or the patient will not benefit from getting care. In a medical assessment such a health issue will not be defined as a healthcare need; however, the patient might still perceive a need for healthcare.

2.1.3.3 The definitions of access and need for the purpose of this thesis

In this thesis, we have studied access to healthcare in terms of having access and gaining access. In Study IV, we have studied resources distributed to healthcare facilities as a way of investigating service availability, i.e. having access, in that we assume that the largest amount of resources to primary care clinics are used for staff and hiring more doctors and nurses is a way to increase service availability. In Study I-III we have looked at utilisation as a way to measure equity in gaining access. This has some obvious limitations, as mentioned above, but additionally utilisation measured by number of visits can conceal differences in quality of care and range of services given, especially when comparing utilisation over time.

We have tested several different types and combinations of health status measures and their ability to predict number of visits in primary care (e.g. health-related quality of life, health damaging behaviours like smoking and chronic diseases like diabetes). There were only small differences between different combinations. Some measures predicted visits better among older people and some better among younger, some better among men and some better among women. Therefore, we chose to use the combination of age, poor self-rated health and limiting longstanding illness as a proxy for need of healthcare. We assessed this combination to be the best for all groups combined. These measures have also been evaluated for their predictive value for healthcare utilisation in earlier studies (33).

2.2 CONCEPTUAL FRAMEWORK

The conceptual framework of this thesis is based upon a previous framework developed by Burström (13), but has been adapted to better suit the purpose of this thesis. It has also been inspired by an additional framework of Aday and Andersen (34, 35), the ‘Behavioural model of health service use’ by Andersen (36-38) and the model by Dahlgren and Whitehead of the determinants of health (7). The framework developed for this thesis describes components related with access to healthcare and shows the role of healthcare in impacting health.

The framework is by no means a complete description of the complex system in which healthcare and equity in health are related, but it provides an overview of the concepts used in this thesis and how they are linked.

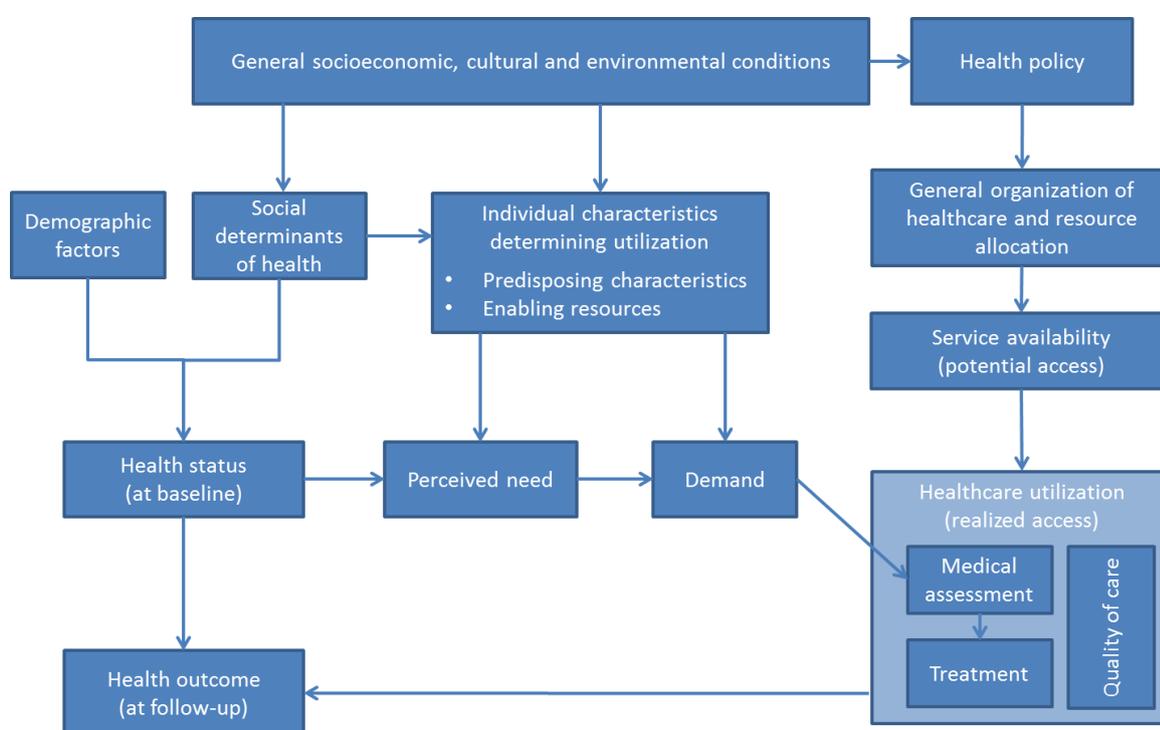


Figure 1 Components affecting access and utilisation of healthcare

2.2.1 What affects health?

Many different factors affect health. Some of these are fixed like age and biological inheritance, however most of the determinants are not fixed and can be influenced by individual, commercial and political decisions (7). In the rainbow-like model of the determinants of health, Dahlgren and Whitehead identify four layers of determinants that affect health directly in different ways, and interact with each other to affect health. The four layers of the model are: personal behaviour; social network; living and working conditions; economic, cultural and environmental factors. These factors can have a positive effect in that

they contribute to maintain health, a protective effect in that they eliminate risk of disease or they can be risk factors that cause disease and ill health. (7)

In the conceptual framework of this thesis, the outer layer from the model by Dahlgren and Whitehead (7) is put on the top since the general socioeconomic and cultural conditions affect both the other social determinants, the individual determinants of utilisation and the health policy that will be implemented in a society.

The demographic and social determinants are both affecting health status, but health status is not equitably distributed. The social determinants of health differ between socioeconomic groups (7) and contribute to this inequity.

2.2.2 What affects utilisation of healthcare?

Healthcare utilisation is the end product of a health seeking process of varying length (37). Many factors influence whether a certain health status is perceived as a healthcare need and whether this leads to demand and ultimately utilisation (13, 36). There are many different sociological theories about illness behaviour and health seeking behaviour (39) describing this path. However, in this thesis, the behavioural model of health service use by Andersen (36, 37) and the framework for the study of access by Andersen and Aday (34, 40) are used to underpin the conceptual framework. In the Andersen and Aday model, institutional and structural effects as well as individual characteristics are included. There are five variables and their interrelations that are important for the study of access to healthcare: health policy; characteristics of the health delivery system; characteristics of the population at risk; utilisation of health services; consumer satisfaction. Consumer satisfaction is however not included in the framework for this thesis.

Health policy, according to Aday and Andersen, is altering access to healthcare by influencing both the healthcare system and the population at risk. In the conceptual framework of this thesis the policy aspect is broadened to include the outer layer of Dahlgren and Whitehead's model of determinants of health (7) as also the general socioeconomic and cultural conditions as well as political factors can influence the individual's predisposing and enabling resources which ultimately determine demand of healthcare.

In Aday and Andersen's framework the concept of access is defined by the interrelation of the five aspects of access in the model, they also point out that "*access implies entry to the healthcare system*" (34) and in many aspects the real proof of access is actual utilisation (29). In the framework for this thesis, access is divided into service availability (potential access) and healthcare utilisation (realised access). Equity in healthcare is not necessarily always the same as equal healthcare for equal needs as individuals do have a right not to use healthcare although in need; however in practice it is very difficult to investigate potential access as such, and in this thesis, we used healthcare utilisation (realised access) to measure access.

People seek healthcare when they feel ill or want to prevent an anticipated illness (37). However, the self-assessed need might not be perceived as a medical need by the health

professionals. In the behavioural model by Andersen these concepts are differentiated into self-assessed need and professionally assessed need (41). In this conceptual framework, it is described as perceived need and medical assessment. The medical assessment is here a part of the healthcare utilisation box, as it is often difficult to disentangle medical assessment from use of medical treatment.

When individuals demand healthcare it is not the healthcare per se they are interested in but the improvement of a health status perceived as unfavourable. The utilisation of healthcare hopefully results in a change to a more favourable health status than at baseline. Several factors influences whether this will happen, both related to the quality of care and to personal factors like e.g. adherence to medical treatment (42). However these individual factors are not included in the framework for this thesis.

2.3 HOW DOES HEALTHCARE AFFECT HEALTH AND EQUITY IN HEALTH?

The WHO's Commission on Social Determinants of Health states that new policies should always be evaluated for their impact on health equity and they identifies the healthcare sector as one important site for improving equity in health (43). They stress that both what the healthcare sector does and how it is organised is important when it comes to the impact on equity in health (43).

Diderichsen et al. (44) developed a model to conceptualise the determinants of inequity in health and how they are related and this can be used to understand how the healthcare system can be interpreted as a determinant of equity in health. In Diderichsen's model, health inequalities are generated through four different pathways: social stratification; differential exposure; differential vulnerability; differential social and economic consequences of ill health (44). Social stratification refers to the way in which individuals in a society are arranged in different strata. In this stratification many factors like education, heritage, and health play a role in how individuals can achieve and maintain a certain position. Differential exposure refers to the fact that individuals, given their social position in society, are exposed to different risk factors and to risk factors in varying degrees. Differential vulnerability refers to risk factors interacting with each other increasing the risk of illness and disease. Differential social consequences of ill health, refers to the differential effect a given disease may have on social and economic circumstances, in different socioeconomic groups. (44, 45)

Dahlgren and Whitehead add the life-course effect to these pathways as the cumulative effects of the above mentioned pathways, how they interact and affect an individual over the life course is also an important piece of the puzzle to understand how inequalities in health occurs. (7)

By restoring health, health care can help decrease the effect of differential exposure and vulnerability, as well as affecting the differential consequences of ill health and how this "feeds back into social stratification" (46). By health promotion and attention to the needs of the most vulnerable groups, the healthcare sector can also impact equity by reducing differential exposure and vulnerability.(43)

3 EMPIRICAL BACKGROUND

This chapter provides a description of the Swedish healthcare system and the primary care reform introduced on national level in 2010 and in Stockholm in 2008. This chapter also provides a short review of previous studies on equity in healthcare.

3.1 THE SWEDISH HEALTHCARE SYSTEM

The term ‘healthcare system’ is used about the organization of people, institutions, facilities and resources that deliver healthcare to meet the needs of the population. In the Swedish Healthcare Act healthcare is defined as “*activities to medically prevent, investigate and treat diseases and injuries. Healthcare also includes medical transportation and taking care of the deceased*” (8).

The responsibility of the healthcare system in Sweden is shared between three administrative levels: 1) the central government sets the political agenda for the healthcare system by introducing guidelines and legislation; 2) the county councils are responsible for providing both inpatient and outpatient healthcare services and 3) the municipalities are responsible for student health, eldercare, care to people with physical disabilities or intellectual disabilities in institutions or in the homes of the patient; and for providing support and services for people discharged from hospital care.

Swedish healthcare is universal and primarily financed through general taxation to minimize financial barriers to access. However, co-payments exist for most types of healthcare for adults. In Stockholm County a hospital stay costs 100 SEK/day in 2016, a visit to the doctor in primary care 200 SEK/visit, a visit to a district nurse in primary care costs 100 SEK/visit and a visit to a specialist costs 350 SEK/visit. The same level of co-payments applies to all adults, but is capped at 1100 SEK annually.

Although almost all healthcare in Sweden is publicly financed not all healthcare is provided by public providers. In 2013, 12% of the healthcare financed by the county councils was carried out by a private provider (47). However, privately provided healthcare is regulated by the same rules and legislations as the publicly provided healthcare and co-payment fees are the same no matter the type of provider.

As mentioned previously the Swedish healthcare is regulated by the Swedish Health Care Act where both horizontal and vertical aspects of equity in health and health care is emphasised. Further, there are three ordered ethical principles for prioritising in health care: “*All human beings have an equal entitlement to dignity and have the same rights regardless of their status*”; “*Those in greatest need take precedence in being treated*”; “*There should be a reasonable balance between costs and benefits of health care*” (48).

3.1.1 Primary care

Many studies have confirmed a positive effect of primary care on health and inequalities in health (49). Primary care can cover several different aspects of healthcare depending on the

context in which it is defined, however primary care is most often defined as being the first level of healthcare, providing entry into the healthcare system (50). Primary care should be “*continuous, comprehensive, and coordinated*” and “*provided to populations undifferentiated by gender, disease or organ system*” (51). The Swedish definition of primary care in the Swedish Health Care Act comes quite close to this definition as it defines primary care as that part of healthcare that, without delimitation of diseases, age or patient group, take care of basic medical needs of treatment, care, prevention and rehabilitation that do not demand hospitalisation or specialists competences (8).

The county councils are responsible for facilitating primary care. However, from 2010 private providers are free to establish primary clinics wherever they choose and get refunded by the county council for their services (52).

The reimbursement system, however, differ between counties. Most often a combination of several different types of payments are used (primarily capitation, fee-for-service, and pay-for-performance), however the proportion of each type differ between the counties. In most counties, capitation is the primary reimbursement (around 80-90%) and pay-for-performance is a minor percentages (2-4%) (53). Capitation is weighted according to age groups and in many counties also weighted either according to already registered diagnoses in the population (e.g. The Adjusted Clinical Groups (ACG)) or to some kind of socioeconomic weighting trying to take disease burden into account. This is nevertheless only how the primary clinics are being reimbursed by the county councils. The doctors employed at the clinics are typically payed a fixed salary.

3.2 THE 2008 PRIMARY CARE REFORM IN STOCKHOLM COUNTY

In 2008 a reform in primary care was introduced in Stockholm County. The reform aimed at improving patients’ free choice of provider and allow freedom of establishment for providers in order to increase access to primary care (52). Elements of this reform were later introduced on national level in 2010 and are sometimes referred to as the ‘choice reform’. This name is, however, somewhat misleading in the case of Stockholm, where free choice of provider was already introduced in primary care before 2008. In this thesis I will refer to the reform as the primary care reform.

Following the primary care reform in Stockholm the reimbursement system was changed. The system was changed from an allocation system, based primarily on need-weighted capitation (60%) with age and area specific socioeconomic indicators used as proxies for need; to a system based more on fee-for-service (60 %), less on capitation (40%) and now only age-weighted capitation, letting patient choice and demand direct the resource allocation to a much higher degree. The previous need-based resource allocation system provided more resources to primary care services in areas with poorer levels of population health and greater needs, compared to other areas. The new reimbursement system was intended to provide equal terms for all providers of primary care, regardless of where they operate and letting demand guide the distribution of resources instead of need.

The former need-based resource allocation system benefitted primary care units operating in socioeconomically disadvantaged areas and the current reimbursement system does not. Therefore primary care units in disadvantaged areas now have to produce more visits in order to achieve the same level of resources as before the reform, which could lead to lower quality of care or to prioritizing less demanding patients in order to achieve the production needed to sustain the unit's income.

The aim of the primary care reform was primarily to increase access to primary care and the total number of visits in primary care increased from 4.8 million visits in 2007 to 5.8 million visits in 2012 in Stockholm County (54). Also the numbers of primary care clinics have increased following the reform.

3.3 PREVIOUS RESEARCH ON EQUITY IN SWEDISH HEALTHCARE

There are many aspects of whether Swedish healthcare is equitable or not. There is evidence that access to cancer treatment is quite equitable (55), however there are socioeconomic differences in cancer survival (56, 57) and cancer screening (58, 59) Maternal- and postpartum care are regarded quite equitable in Sweden and there are almost no socioeconomic differences in infant mortality (55), however there seems to be inequalities in terms of ethnic differentials (60). A study on a Swedish Quality Register on stroke (Riksstroke) suggested that there was inequality in both survival and treatment of stroke patients (61), however inequalities in access to stroke unit care seemed to decrease over time (62). Some inequalities exist in survival after treatment for acute myocardial infarction (63), however geographical differences between counties seems to be minor (64).

In order to limit the scope of the literature search of this field, only studies published after 2000 were considered. The studies had to be concerned with socioeconomic differences in healthcare utilisation or differences in healthcare utilisation based on country of birth in the general population (not specific patient groups), where healthcare need in some ways have been taken into account. On this topic studies were more scarce especially studies in more recent time (for search-string see Appendix A).

According to the studies found on differences in healthcare utilisation based on country of birth (one from Region Skåne, one from Västra Götaland and one covering whole Sweden) there seemed to be agreement that healthcare is being delivered in a fairly equitable way (65-67). However, another study from Region Skåne, found that women born outside Europe more often reported that they lack access to a regular doctor (68) and two studies (also from Region Skåne) suggested that initial access to the Swedish healthcare system might be more difficult for foreign born individuals (69) and their children(70); although once a person has accessed the healthcare system ethnicity might no longer be relevant in describing differences in healthcare expenditures (69).

Regarding socioeconomic differences, the studies we found all showed some kind of inequity in healthcare utilisation. In a study of older adults, Wastesson et al. found inequity in use of outpatient care and these inequities were stable over a 19 year period (1992-2011) (71).

However, there was no inequity in hospital admissions (71). At the same time, a study based on data from Stockholm County concluded that there was inequity in public expenditures on healthcare in the last year of life (72). From an earlier literature search, we have studies based on data from the 1980s and 1990s indicating that inequalities in healthcare utilisation were not apparent in the 1980s (or there were pro-poor inequities) but appeared during the 1990s (9, 73, 74). Some European comparative studies on horizontal equity in healthcare utilisation also suggested that Sweden had a more inequitable utilisation of healthcare services than other European countries, based on data from 1991 (75) and 2001 (76).

Another aspect of equity in access to healthcare is whether there are differences in unmet needs. Refraining from seeking medical care in spite of a perceived need is consistently associated with lower socioeconomic position in studies based on nation-wide survey data (77-80). However, as healthcare is the responsibility of the county councils, analyses based on national data can conceal geographical variations in equity it is therefore also important to investigate whether these differences persist also on a county level.

3.3.1 Equity impact of the primary care reform in Sweden

Several Swedish reports have evaluated the primary care reform from an equity perspective (54, 81-88); however a limited amount of scientific studies have evaluated equity aspects of this reform. From a search on PubMed and Web of Science we found two articles that covered the equity impact of the primary care reform: one from Malmö, Skåne (11) and one covering data from whole Sweden (89). We also found one article investigating how the equity impact was articulated in the political debate prior to introducing the reform (90) (for a description of the search string go to Appendix A). One qualitative study on how managers of publicly owned primary healthcare centres in Gothenburg perceived the changes was also found relevant for this overview (91).

We restricted the search of 'grey literature' to reports covering primary care data from Stockholm County. Through a search of publications from relevant public agencies in Sweden, we found nine relevant reports covering some equity aspects of the introducing of the primary care reform in Stockholm in 2008. Five reports were based solely on data from Stockholm (54, 82, 84-86). Four of these reports were produced on behalf of Stockholm County Council from a research group at Karolinska Institutet (54, 82, 84, 85). We also found four reports investigating data from Stockholm along with data from other county councils (81, 83, 87, 88), two of them from The Swedish Agency for Health and Care Services Analysis (SAHCSA) in collaboration with the research group from Karolinska Institutet (81, 83) one from The Swedish National Audit Office (87) and one from Swedish Association of Local Authorities and Regions (SALAR) (88).

3.3.1.1 Results from the studies and reports

In Region Skåne, free choice of provider and free establishment for providers was introduced in 2009, but in contrast to Stockholm County where the emphasis in the reimbursement system was on fee-for-service, the reimbursement system in Region Skåne was based almost

solely on capitation (adjusted for individuals' diagnosis, using ACG, and socioeconomic indicators) (11, 53). The study from the city of Malmö, Region Skåne found that the reform increased access in all groups, however, individuals from families with income above the median had had a higher increase of access (measured as number of visits and the probability of having a visit) (11).

Another aspect of access is service availability, and this was investigated in a study by Isaksson et al (89) which analysed whether the right of free establishment for providers had affected equity in service availability across geographical areas. Data on new establishments were collected from all over Sweden. The study analysed whether these new clinics were established in different areas than the 'old' clinics. In the study, it was concluded that, in general there were only minor negative effects on equity (89). Contrary to the study by Isaksson et al. (89), the Swedish National Audit Office found that the new establishments primarily have been in populous areas with high median income, high proportion of individuals with high levels of education and a low proportion of individuals above 70 years of age. Areas with decreasing service availability have also been in populous areas but with a high degree of healthcare needs and/or low median income. However, they also conclude that in most counties there have been very small changes in the number of primary care clinics and that the changes they find are in Skåne, Stockholm and Västra Götaland, also where the three largest cities in Sweden are located, both regarding positive and negative changes.(87)

Results from the reports produced by the research group at Karolinska were summarised in the latest by Dahlgren et al (54). Analyses were on an area level and showed that all areas had increased their number of visits to primary care regardless of level of income, level of education or prevalence of individuals born outside Sweden. However, the author suggested that there was a risk for ecological fallacy as analyses on individual level showed that it is primarily individuals with high income living in areas with low median income that have increased their number of visits. (54)

When it comes to differences in resource allocation, the findings in the report by Dahlgren et al. indicate that in general areas with lower median income have received relatively less resources after the reform than before (54). None of the other studies or reports have further investigated this issue.

In one of the reports from SAHCSA concerning vertical equity, healthcare utilization among individuals with diagnoses indicating higher healthcare needs was compared with the rest of the population. This report found differences between the county councils. In Skåne, individuals with none of the diagnoses indicating high healthcare need had increased their visits more, in Östergötland less and in Stockholm there were no differences between the two groups, regarding visits to primary care. However, there were differences between different types of visits. In Stockholm, individuals with one of the diagnoses had a relatively lower increase of visits to doctors, a relatively lower decrease in visits to nurses and a large increase in home visits. These results were confirmed in another report from the same agency where they instead used the Charlson index (83, 92) to

differentiate between groups with high and low healthcare needs (83). In a report from SALAR these results are supported by the results of a survey among doctors in charge of primary healthcare clinics. Only about 1-2 percent of the respondents believed that the present system favoured groups with greater need and about 78 percent believed that the system pushed aside groups with greater need (88). These findings were also supported by a qualitative study about how managers of primary healthcare centres in Gothenburg perceive the transition of primary care due to the reform (91). In this study, the authors conclude that the financial incentives introduced with the reform lead to prioritisation conflicts between patient with high needs and patients with high demands (91).

3.3.2 The effects of healthcare reforms on health inequalities in an European perspective

The lack of scientific studies on the equity impact of healthcare policies and healthcare reforms is not just evident for Sweden. A systematic review of the effects of healthcare reforms on equity in health in Europe found that there was a lack of research literature in most countries and that the quality of the existing literature was poor; e.g. only two articles were longitudinal, giving the opportunity to investigate changes in trends. (14)

A recently published systematic review on the effect of reimbursement systems in primary care on equity in healthcare came to similar conclusions. There were generally very few articles and almost all the European ones were from the UK evaluating the Quality and Outcomes Framework (93) introducing more pay-for-performance to primary care. (94)

3.4 KNOWLEDGE GAPS

In general, there is a lack of scientific studies investigating equity aspects of health policies. Especially in regards to changes in reimbursement systems affect equity in health and healthcare utilisation (14, 94). Although there is a strong emphasis on equity in the Swedish Healthcare Act, equity aspects were not part of the political debate in the lead up to the recent healthcare reform (90). To date, only a very limited number of scientific studies have investigated how the reform has affected equity in healthcare and no studies have investigated equity aspects of this reform based on data from Stockholm County. As the agreements on assignments in primary care are designed differently in different counties, especially when it comes to the design of the reimbursement system it is relevant to assess how the primary care reform and the change in reimbursement system have affected groups with different levels of need of healthcare in each county.

There are several studies on Swedish data investigating equity aspects of specific parts of the healthcare system in relation to drug use or different treatments, however there are few studies investigating equity aspects of the general delivery and utilisation of healthcare, especially in recent time.

Many studies investigating socioeconomic differences in healthcare utilisation use health surveys and base the analyses on self-reported data on healthcare utilisation. This introduces

the risk of recall bias. It can also be difficult to distinguish between primary care and other types of healthcare and when data on health status and healthcare utilisation is collected simultaneously, it is difficult to distinguish between initial health status and health effects of healthcare utilisation which can also introduce bias (26).

In the Scandinavian countries and other countries with high quality healthcare register data, healthcare utilisation is often taken from registers, however when not combined with health surveys, register based studies lack information on self-reported health status, and are limited in terms of data to measure need and other health related factors. Analysing survey respondents instead of the total population may on the other hand introduce a risk of bias as non-responders and responders may differ significantly in relation to the variables studied.

The difference in response rates is known from earlier studies to be associated with health status (95) and may imply a risk of underestimating effects of socioeconomic status on poor health and healthcare utilisation. This is, however, much less investigated in the literature than biases on health and healthcare estimates in general and results are inconsistent. We therefore found it relevant to investigate whether survey non-response could bias the estimates of socioeconomic gradient in healthcare utilisation.

4 AIM AND RESEARCH QUESTIONS

4.1 AIM

The main aim of this thesis is to increase knowledge on equity in outpatient healthcare focusing on data from Stockholm County and the implications of data sources used.

4.2 RESEARCH QUESTIONS

- 1) How does differential non-response in health surveys affect analyses of socioeconomic differences in outpatient healthcare utilisation?
- 2) How does the socioeconomic gradient in use of outpatient services change when taking need into account?
- 3) How has the 2008 primary care reform affected equity in utilisation of primary care?
- 4) How are changes in allocation of resources to primary care related to changes in rates of visits to emergency wards and rates of hospitalizations due to ambulatory care sensitive conditions?

5 OVERVIEW OF THE FOUR STUDIES IN THIS THESIS

In this chapter the four studies, which the results and conclusion of this thesis is based upon, will be presented. Figure 2 gives an overview of how the research questions of the thesis is related to the four studies and the data material that the analyses are based upon in each study.

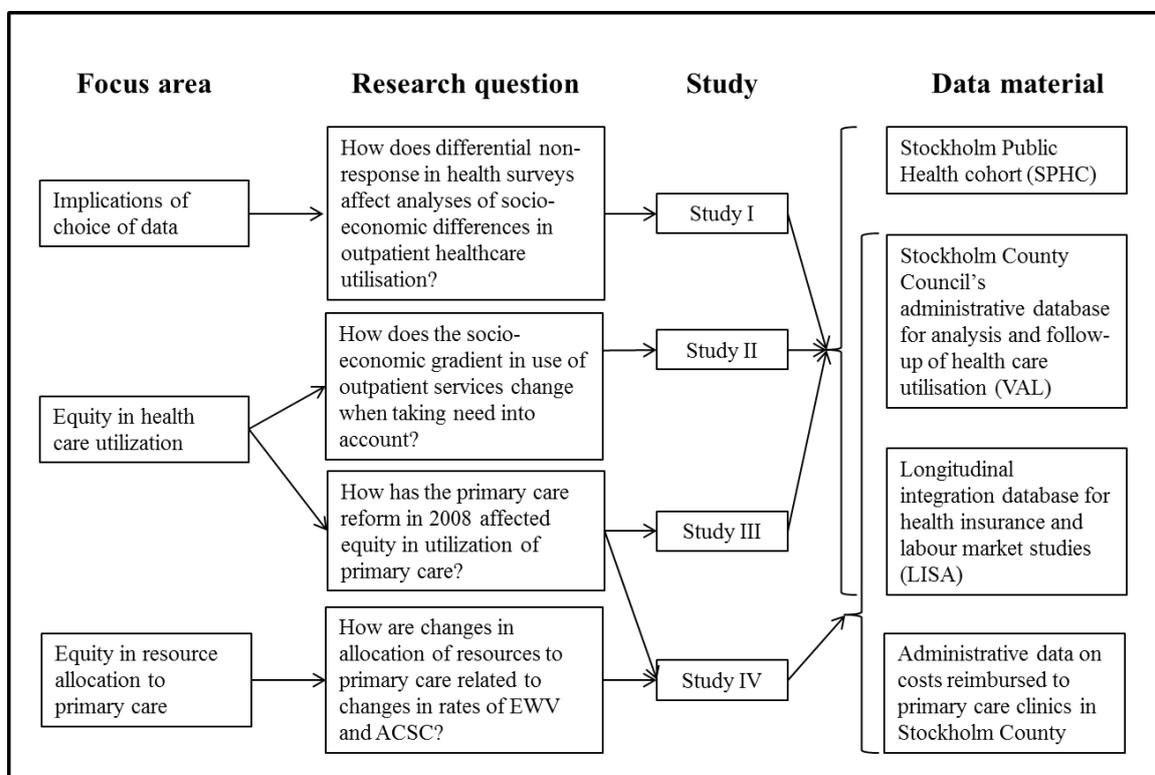


Figure 2 Overview of the research questions and the four studies

In Study I, we investigated the non-response bias in a health survey with respect to socioeconomic differences in healthcare utilisation by comparing data from a health survey with data of the general population in Stockholm County. This knowledge may be relevant when studying healthcare utilisation using health survey data, but as healthcare utilisation can be thought of as a proxy for health status we believe that the results of this study could also be relevant for researchers using survey data to investigate socioeconomic differences in health in general.

In Study II, we investigated how much the income gradient in healthcare utilisation changed when taking need into account. We did this by first investigating socioeconomic differences in healthcare utilisation in Stockholm County, using only register data on healthcare consumption and sociodemographic background characteristics. Next we investigated socioeconomic differences using register data combined with survey data on self-rated health status variables in order to control for need-related factors. Results are methodologically important for studies analysing socioeconomic differences in healthcare utilisation using only register data.

In Study III we compared socioeconomic differences in healthcare utilisation in Stockholm County before and after the introduction of a primary care reform focusing on free choice of

provider and free establishment for providers along with a change in reimbursement system from a capitation based system to a system based primarily on fee-for-service. This knowledge may be relevant for understanding how changes in the structure and reimbursement of primary care affect equity in healthcare utilisation.

In Study IV, we investigated how resources have been allocated to primary care clinics in areas with different levels of median income over a period of nine year and whether the introduction of the 2008 primary care reform changed the trends in resource allocation. We also investigated whether a change in resource allocation was associated with changes in rates of ambulatory care sensitive conditions and utilisation of the emergency ward in areas with a decrease and increase of resources, respectively. This knowledge may be relevant for understanding how changes in the structure and reimbursement of primary care affect resource allocation to areas with different levels of need and how such a change in resources affects quality of care in that area.

6 MATERIALS AND METHODS

This section provides a description of the data material, measures and statistical methods used in the four studies of this thesis.

6.1 MATERIALS

6.1.1 Stockholm Public Health Cohort

In the first three studies, we used data from the Stockholm Public Health Cohort (SPHC). The SPHC is a population-based cohort study, commissioned by Stockholm County Council, surveying health status and living conditions of the population in Stockholm County. Since 2002 the survey has been sent out every fourth year (2002, 2006, 2010 and 2014). In addition to following up previous participants a new sub-cohort is sampled and added every fourth year. In 2014 the survey was sent to around 123,000 individuals (data and data collection methods is described elsewhere (96)). Data from SPHC was used as explanatory and confounding variables in the analysis in Study I-3.

The 2006 sub-cohort

In Study II and III we used the 2006 sub-cohort. In 2006 the sampling frame consisted of individuals registered in the total population register aged 18-84 years of age and resident in Stockholm County on the 31st of December 2005; in total 1,450,501 individuals. A sample, stratified on geographical area, of 57,009 persons was drawn from the register. Of these 357 were either deceased or had emigrated and the net sample was 56,634. Of these 34,707 answered the survey corresponding to a response rate of 61% (97). In both Study II and III, we restricted the analyses to individuals between 25–84 years ($n = 31,848$).

The 2010 sub-cohort

In Study I and III, we used the 2010 sub-cohort. In 2010, the sampling frame consisted of individuals registered in the total population register who were aged 18 years or above and resident in Stockholm County on the 31st of December 2009; in total 1,601,300 individuals. A sample, stratified on geographical area, of 56,037 persons was drawn from the register. Of these 696 were either deceased or had emigrated and the net sample was 55,341. Of these 30,767 answered the survey corresponding to a response rate of 56%.

In Study III we used both the 2006 and the 2010 cohort to investigate the change in socioeconomic differences in healthcare utilisation before and after the introduction of the 2008 primary care reform. Since the sampling frame in 2006 was limited to individuals aged up to 84 years of age, we excluded the individuals aged 85 or above from the 2010 sub-cohort in Study III. We also excluded individuals below the age of 25 leaving a final study population from the 2010 sub-cohort of 27,217 individuals.

6.1.2 The VAL-databases

Healthcare data was obtained from the Stockholm County Council's administrative database for analysis and follow-up of healthcare utilisation (VAL), which contains information on all registered outpatient and inpatient care financed by Stockholm County Council.

Every provider with an engagement with the county council is obligated to deliver administrative healthcare data electronically to the VAL system. The VAL system consists of several databases that are updated on a monthly basis. Every individual is identified with a unique ID-number which makes it possible to follow individuals over time and in different databases. (98) The data are anonymized through encrypted personal identity numbers, but can be linked with both the SPCH-data and other register based data.

In all four studies, healthcare data from VAL was used as the dependent variable in the statistical analyses. There are several different registers in the VAL database. The registers used for the studies in these theses were

- The outpatient care register (OVR) - has information on all registered visits in outpatient care financed by the Stockholm County Council; both public and private outpatient care clinics and primary care facilities.
- The inpatient care register (SLV) - has information on all registered visits in inpatient care financed by the Stockholm County Council; both in public and private hospitals.
- The register for private specialist (ARV) - has information on all registered visits to private specialists and physiotherapists in Stockholm County.

6.1.3 Longitudinal integration database for health insurance and labour market studies (LISA by Swedish acronym)

The LISA database is a collection of variables from different population registers linked individually through encrypted personal identity numbers. We used the database for data on sociodemographic background characteristics and disability pension.

6.1.4 Costs

Data on costs were used only in the fourth study and made available by Stockholm County Council's 'Health and Healthcare Administration' where the total amount of funds reimbursed from the County Council per clinic and year are registered. For the purpose of this study we have looked at the total amount of funds reimbursed to the primary care clinics within a district/municipality for general practitioners (GP) activities, excluding reimbursement for specialist training for resident doctors, for the years 2005 to 2013. In order to take into account price and salary adjustments over the years the costs are indexed according to the prices in 2005 using the "Income and price-index" developed by the Swedish Association of Local Authorities and Regions (99). All costs are divided by the total number

of individuals living in the district/municipality to obtain an average cost per inhabitant in thousands SEK.

6.2 OUTCOME MEASURES

The primary outcome in all four studies has been healthcare utilisation measures derived from different registers from the VAL database; either linked individually or aggregated to district/municipality level. All outcome measures are defined under respective study.

6.2.1 Study I

In Study I, we had two different outcome measures:

- 1) The proportion of people with at least one visit to a doctor in outpatient care in 2010 in the total population and among the respondents to the SPHC 2010 survey.
- 2) The average number of visits to doctors in outpatient care in 2010 in the total population and among the respondents to the SPHC 2010 survey.

The data was derived from the outpatient register in VAL (OVR). In all the studies where we looked at visits to doctors in outpatient care we excluded all visits to other healthcare providers than doctors as well as visits to doctors registered as not being healthcare, visits where the patient did not show up and visits concerning technical aids (98).

6.2.2 Study II

In Study II, we had three different outcome measures:

- 1) The total number of visits to GPs in 2007 (the year after the 2006 sub-cohort of SPHC answered the survey).
- 2) The total number of visits to private specialists in 2007.
- 3) The total number of visits to doctors in outpatient care in 2007

The data on visits to GPs and the total number of visits in outpatient care could be derived from the outpatient register in VAL (OVR) and the number of visits to private specialist was derived from the database for private specialists and physiotherapists (ARV).

6.2.3 Study III

In Study III, we looked at the change in socioeconomic differences in visits to general GPs before and after the introduction of the 2008 primary care reform. We used data from OVR from 2007 for the 2006 sub-cohort to estimate the socioeconomic differences in GP visits before the reform, and data from OVR from 2011 for the 2010 sub-cohort to estimate socioeconomic differences in GP visits after the reform. From 2007, a new way of registering different types of care was introduced; however, it took some years before the new variable was complete. Therefore we had to code GP visits a bit different in 2007 compared to 2011 as the new way of registering was not reliable in 2007 and the old way no longer possible in 2011 (See Appendix B).

6.2.4 Study IV

Study IV has two parts; one that describes the changes in cost reimbursed to primary clinics over the timespan 2005-2013 and one that describes the changes in emergency ward visits (EWW) and Ambulatory Care Sensitive Conditions (ACSC) for areas with a decrease respective increase in primary care resources in the years after the 2008 primary care reform compared to before.

For the first part of the study, we used costs reimbursed from the county council to primary care clinics aggregated on area level for each year during 2005-2013 as the outcome measure.

For the second part we used two different outcome measures:

- 1) The rate of EWW for every municipality and city district in the years 2005-2013.
- 2) The rate of inpatient stays for ACSC for every municipality and city district in the years 2005-2013.

EWW and ACSC are used as indicators of service availability and quality of primary care clinics and the hypothesis is that if the decrease in costs reimbursed to primary care is related to a decrease in service availability and/or the quality of primary care one would expect an increase in e.g. EWW and ACSC.

Emergency Ward Visits (EWW)

The EWW was derived from the OVR (See Appendix C), summed on area level and reported as rates of EWW per 10.000 inhabitants in each area.

We know that a fair percentage of the EWW is thought to be unnecessary and should have been taken care of in primary care (100, 101) we hypothesised that a decrease in costs reimbursed to primary care could influence the access to primary care and could potentially lead to an increase in EWW instead.

Ambulatory Care Sensitive Conditions (ACSC)

ACSC refers to hospitalizations for conditions that would have been possible to avoid by timely and effective use of primary care and includes both chronic diseases and acute diseases (102). ACSC was derived from the SLV register and coded using a categorisation adapted from the categorisation used by the British National Health Services (103). This categorisation has also been used in a Finish study (104). ACSC in the categorisation used in this study included the following conditions: Acute Bronchitis, Angina, Asthma, Bacterial Pneumonia & Influenza, Chronic Obstructive Pulmonary Disease, Cellulitis, Congestive Heart Failure, Convulsions, Dehydration, Dental Conditions, Diabetes Complications, Epilepsy, Gangrene, Gastroenteritis, Hypertension, Immunization-Related and Preventable Conditions, Iron Deficiency Anaemia, Kidney and Urinary Tract Infections, Nutritional Deficiencies, Pelvic Inflammatory Disease, Perforated or Bleeding Ulcer, Severe ENT infection (For coding see Appendix C). The outcome was summed on area level reported as rates of ACSC per 10.000 inhabitants in each area.

Table 1 Overview of the research questions addressed in each article and material and methods used

	Study 1	Study 2	Study 3	Study 4
Title	Comparing healthcare utilization among health survey respondents with the total population - are respondents representative?	Socioeconomic differences in healthcare utilization, with and without adjustment for need: an example from Stockholm, Sweden.	Equity impact of a choice reform and change in reimbursement system in primary care in Stockholm County Council.	Changes in resource allocation to primary care over time and the impact on ambulatory care sensitive conditions and emergency ward visits.
Design	Population based cross-sectional study	Cross-sectional study (with 1 year follow-up on health care data)	Repeated cross-sectional 2006 and 2010 (with 1 year follow-up on health care data)	Longitudinal design
Study population	Total population in Stockholm County 2010 aged 18 or above (N=1,601,300) 2010 sub-cohort of SPHC, 18 years and above (n=30,767)	2006 sub-cohort of SPHC, 25-84 years (n=31,848)	2006 sub-cohort of SPHC, 25-84 years and the 2010 sub-cohort of SPHC, 25-84 years (n=59,065)	38 of the 39 districts and municipalities in Stockholm County
Data source	SPHC (2010), LISA (2010), VAL (2010)	SPHC (2006), LISA (2006), VAL (2007)	SPHC (2006+2010), LISA (2006+2010), VAL (2007+2011)	Reimbursed costs (2005-2013), LISA (2005-2011), VAL (2005-2013)
Outcome	Number of visits to doctors in outpatient care Proportion having visits to doctors in outpatient care	Number of visits to GPs Number of visits to private specialists Number of visits to doctors in outpatient care	Differences in the relative difference in GP visits between groups over time	Costs reimbursed to primary care clinics in 2005-2013 Rates of ACSC in 2005-2013 Rates of EWV in 2005-2013
Independent variables	Age, Sex, Country of birth Income, Education, Residential area	Age, Sex Income SRH, LLI, Disability pension	Age, Sex Education, Residential area SRH, LLI, GHQ12, Disability pension	Age Area median income Financial resources/individual living in the area Time (2005-2013)
Statistical model	Negative binomial regression Logistic regression	Negative binomial regression	Negative binomial regression	Multilevel regression

6.3 INDEPENDENT VARIABLES

6.3.1 Demographic variables

All three demographic variables used in the studies have been derived from the LISA register.

Age

Age is a well-known predictor of healthcare utilisation (105, 106) and is used in Study I-III to adjust for age differences in the different categories of the explanatory variables. The age variable is derived from LISA for the relevant year.

In Study I, age is used to adjust for the different age distribution in the survey population and the total population. The age-distribution in the total population was used for the age standardization in the descriptive analyses. In the regression models, age was used as a continuous variable to adjust for variations.

In Study II, we used age to stratify analyses into two age groups (25-64 years and 65-84 years) and to adjust for age differences between the income quintiles. We used this approach because preliminary analyses showed that the association between age and number of visits was not linear across all ages. Within each age stratum, age appeared to have a linear association with the number of visits. Therefore we adjusted for age as a continuous variable in the regression analyses.

In Study III, we further investigated the association between age and number of visits. Since the age stratified analyses did not differ considerably in the results we decided to combine the age groups and instead adjust for age by centre the age variable and including two extra age variables (age^2 and age^3).

In Study IV, we did not adjust for age differences as the age distribution in the different areas did not change considerably over the time span.

Sex

Sex is seen as an important determinant of health (107); and in Study I-3 we used sex, as indicated by the personal security number in LISA, to differentiate between men and women. Furthermore men and women use the healthcare system differently (108); however, these differences are not only due to biological differences between the sexes, but are likely also to depend on different social expectations, responsibilities and experiences and could be looked upon through a more gender-based analysis (109). However, it is outside the scope of these studies to discuss the gender aspects of these differences.

Country of birth

In Study III, we investigated healthcare utilisation among respondents to a health survey and compared it to the healthcare utilisation in the general population. As response rates are lower among individuals born outside Sweden (20% lower for individuals born outside Europe) (110) and health and healthcare utilisation is associated to country of birth (111, 112) we

found it important to look at this particular group to see if the respondents were representative of the same group in the total population. For this purpose, country of birth was dichotomized into ‘*Born in Sweden*’ and ‘*Born outside Sweden*’. It is a very crude measure and we acknowledge the many variations within this group ‘*Born outside Sweden*’.

6.3.2 Socioeconomic variables

Socioeconomic position (SEP) is a well-known determinant of health (16) and refers to “*the social and economic factors that influences what positions individuals or groups hold within the structure of a society*” (113) SEP can be measured at three different and complementary levels: Individual level, household level and neighbourhood level (114). In the studies in this thesis we have used education on individual level, income on household level and area level deprivation as indicators of SEP.

Education

Educational level is related to health in several ways: it is e.g. an indicator of adult resources (both regarding status and wealth) that can be used to obtain health (113) and an indicator of cognitive resources that indirectly can influence health (113, 115). Education is a very stable indicator of SEP and the risk of health selection is lower than for other indicators of SEP, however there is a risk of a cohort effect as the level of education have increased over the years and the association between educational levels and e.g. status and wealth may differ between genders and between ethnic groups. (115)

In the two studies (I and III) where we have used educational level as an indicator of SEP we have divided education into three categories: Primary school (9-10 years of schooling or less), Secondary school (at least one year of secondary school) and Post-secondary school (at least one year of post-secondary education). In Study I education was chosen as an indicator of SEP as this has been used in several studies investigating equity and socioeconomic differences in healthcare utilisation (116-118) and we wanted to study if possible differences between health survey respondents and the general population could influence analyses of socioeconomic differences in outpatient healthcare utilisation. In Study III we investigated how the primary care reform and change of reimbursement system in 2008 affected equity in primary care consumption and used education as an indicator of SEP as the knowledge and skills attained through education could be an important factor for getting the care needed in a changing healthcare system.

Income

Income is a direct measure of potential material resources and is inversely associated with health in a dose-response relation (115). Income is not as stable an indicator of SEP as education and can change very rapidly over short time (113). Also income might be more suitable for the middle aged population as the strength of the relationship between income and health is not as strong for young and older adults (113, 115).

In the two studies (1 and 2) where we used income as a proxy for SEP, the study population was divided into five income quintiles, based on annual income, measured as net equivalised disposable household income.

In Study I, we used income as a measure of SEP since income has been used in several studies investigating equity and socioeconomic differences in healthcare utilisation (9, 72, 74-76, 119). We wanted to study if possible differences between health survey respondents and the general population could influence analyses of socioeconomic differences in outpatient healthcare utilisation. In Study II, we used income as an indicator of SEP as co-payment may act as a financial barrier for some people in regard to seeking care and income is relevant as an indicator of economic resources to overcome these barriers. In Study II, participants with no registered income or zero income were excluded from the analysis.

Disadvantaged areas

In 1998 disadvantaged residential areas with high levels of unemployment, high proportion of foreign-born residents, low level of education, in the larger Swedish cities were identified for a Metropolitan Development Initiative, a programme which increased resources from state and municipal level during the period 1998-2004 to decrease segregation and improve living conditions. In these areas health is poorer and disease strikes at younger ages (120) and could therefore be regarded as areas with greater healthcare needs. In Study I and II respondents living in the identified disadvantaged areas in Stockholm County were compared to respondents living in other areas of the county.

Area's median income

In Study IV the median income for each area was used as proxy for the healthcare needs in an area. Median income was based on annual income, measured as net equivalised disposable household income. The median income in each area in 2006 was used to divide areas into income quintiles.

6.3.3 Variables used as proxies for healthcare needs

Self-rated health

In many studies, self-rated health (SRH) is shown to be a good proxy for mortality, morbidity and healthcare utilisation (33, 121-123) and therefore can be used as a proxy for healthcare needs. We used SRH in Study II and III from the 2006 and 2010 questionnaire of the SPHC. In both the 2006 and the 2010 survey, SRH was measured using the following question:

How do you assess your overall health status?

Is it:

- 1) Excellent
- 2) Good
- 3) Fair
- 4) Poor
- 5) Very poor

There are studies suggesting that the way in which the question is collected (self-completed or interview) (124) and the sequence of preceding questions (125) are important for the way people answer. In this case, the question was placed and asked in the same manner in 2006 and 2010 making comparison between the two years possible.

In the analysis, this variable was dichotomised into: good health (Excellent and good) and less than good health (fair, poor and very poor).

Limiting Longstanding Illness

Limiting longstanding illness (LLI) is also used as a proxy for mortality, morbidity and healthcare utilisation (123). We have used this indicator in Study II and III from the 2006 and 2010 questioner of the SPHC. In both years LLI was measured using the following question:

Do you suffer from a long-term illness, health problems following an accident, disability or other persistent health problems?

- 1) No
- 2) Yes

IF YES:

Do these health problems mean that your capacity to work is reduced or that they prevent other daily tasks?

- 1) Yes, very much so
- 2) Yes, somewhat
- 3) Not at all

The variable was coded as a dichotomous variable; participants responding affirmatively to both questions were categorised as having a LLI all others as not having LLI.

General Health Questionnaire (12 questions version)

The General health questioner (GHQ12) was used in Study III to differentiate between groups with and without mental health problems. The GHQ12 is a screening instrument used to detect diagnosable psychiatric disorders (126). We used the GHQ-scoring, rating each problem as either present or absent (127) and set the threshold to 2/3, where 3 or more was coded as having mental health problems and 2 or less as having no mental health problems (127, 128).

Disability Pension

People with disability pension (DP) are known to have substantial health problems and a greater healthcare need (129). In Study II, we used DP as a proxy for healthcare needs, in an attempt to control for health status using a register variable. The variable was derived from the LISA register and does only apply to individuals below the age of 65. The variable was

dichotomous indicating either having received or not having received DP during the year and analyses were restricted to individuals between 25-64 years of age.

6.3.4 Other variables

Changes in resource allocation

In Study IV areas are divided into two groups: one group with areas where resources have increased after the introduction of the primary care reform and one group where resources have decreased after the reform. These two groups were then compared regarding changes in rates of EWV and ACSC.

Time

Study IV is a longitudinal study and time is added as a variable. We centred time between 2007 and 2008 in order to be able to include 2007 when estimating the trend before the reform and include 2008 when estimating the trend after the reform.

6.4 STATISTICAL METHODS

In this section the different statistical methods used in the four studies will be described.

6.4.1 Modelling binary variables

In Study I, we used the logistic regression model to estimate the odds of having at least one visit to the doctor in outpatient care among respondents to the SPHC survey and the general population. Logistic regression was chosen because we had a binary outcome and both categorical and continuous independent variables.

The estimates of the coefficients can be interpreted as the increase or decrease of the log-odds for every one unit increase in the explanatory variable. In order to get a more interpretable output the log-odds are transformed to odds ratios by taking the exponential function of the coefficients.(130) The odds ratio can be interpreted as the multiplied increase or decrease in odds of the outcome.

We used logistic regression in Study I to compare socioeconomic differences in healthcare utilisation (controlled for age) among survey respondents with that of the general population. The difference between regression coefficients from the model of the survey population and coefficients from the general population was assessed with the z-test (131, 132). With a z-score between -1,96 and 1,96 the coefficients were assessed as being comparable.

6.4.2 Modelling discrete variables

In Study I-III, number of visits to the doctor during one year was used as an outcome variable. We were interested in the difference in rate of visits among different subgroups and used the Negative binomial regression model (NegBin) to model this rate. NegBin is a type of generalized linear model with a negative binomial distribution. The assumption from the Poisson regression model that the conditional mean and - variance should be the same is relaxed in the NegBin and in the model we use the term $\alpha\mu^2$ is added to the variance (133).

The estimates of the coefficients can be interpreted as the expected increase or decrease in the logs of expected counts for every one unit change in the explanatory variable. It can be shown that the exponentiated coefficients can be interpreted as the incidence rate ratio (134). The mean can be referred to as a rate (in our case: the number of visits to healthcare per year) and therefore the coefficients could also be interpreted as the log of the rate ratio (135). The exponentiated coefficient can then be interpreted as the factor by which the rate of visits would be expected to increase or decrease and it is the exponentiated coefficients we have chosen to present in the result section.

In Study I the z-test was used to compare estimates from the negative binomial regression models. As with the estimates from the logistic regression we wanted to assess the difference between estimates from the survey population and the general population.

In Study III NegBin was used to analyse the differences in GP visits between groups over time adjusted for covariates (136). We first estimated a model with interaction terms between

income and year. The estimates from the model were then used to calculate the linear combinations that describe the relative difference in the income gradient of visits to GP between the years, thereby obtaining the relative increase or decrease in number of visits for one group compared to another in 2011 compared with 2007.

6.4.3 Modelling time series data

In Study IV, we wanted to investigate time trends and used a hierarchical linear regression model to analyse the data; also called a random effect model or a multilevel model.

The present data have a multilevel data structure in that observations at one level of analysis (years) were nested within another level of analysis (area). Therefore, the data were analysed with a multilevel random coefficient models. Instead of dummy variables, as in a pure fixed-effects model, the variance between areas and years are incorporated in the random effects of the multilevel random coefficient model.

In this model, we wanted to fit time trends before and after the primary care reform using a two-piece linear function (137) centred between 2007 and 2008 in order to include 2007 in the trend before the reform and 2008 in the trend after the reform.

6.5 ETHICAL APPROVALS

For the data from SPHC, every participant has given consent for their personal identity number to be saved and their survey data to be linked to register data on e.g. education, income, family relations and healthcare data. The SPHC study has been approved by the Central Ethical Review Board in Stockholm (Dnr. 2010/1879-31/5; Dnr. 2007/545-31). (110)

Ethical approval for the studies in this thesis was also obtained from the Central Ethical Review Board in Stockholm, Sweden (Dnr. 2008/1542-32, and Dnr. 2013/1268-31/4). For the studies analysing effects of the primary care reform, the Central Ethical Review Board in Stockholm have decided that no ethical approval is needed as the studies can be seen as a monitoring of the County Councils activities.

7 RESULTS

7.1 HOW DOES DIFFERENTIAL NON-RESPONSE IN HEALTH SURVEYS AFFECT ANALYSES OF SOCIOECONOMIC DIFFERENCES IN OUTPATIENT HEALTHCARE UTILISATION?

In Study I we investigated whether survey responders of the SPHC survey are representative of the total population they are sampled from, in relation to outpatient healthcare utilisation; especially in regards to whether possible differences would influence analyses of socioeconomic differences in outpatient healthcare utilisation.

According to the results of this study, a greater proportion of respondents to the health survey had been in contact with doctors in outpatient care than the total population. In general, the differences between the survey respondents and the total population were greater among men than among women.

The estimates of the mean number of visits among survey respondents were closer to the mean number of registered visits in the total population and significantly different for only a few subgroups. The survey respondents had a higher proportion of people with at least one registered visit, but a lower proportion of people with more than five visits, compared to the total population. When comparing only individuals with at least one registered visit among survey respondents and the total population, the survey respondents had fewer visits to outpatient healthcare than the total population.

Table 2 Differences in outpatient care utilisation among the survey population compared to the general population

	Absolute difference in % having at least one visit among survey population compared to the general population		Absolute difference in number of visits among the survey population compared to the general population	
	Women	Men	Women	Men
Total	2.1	2.9	-0.02	0.07
18-29 years	4.3	4.6	0.14	0.20
30-39 years	2.0	2.4	0.11	-0.10
40-49 years	0.9	0.4	-0.32	-0.13
50-59 years	0.0	4.1	-0.24	0.25
60-69 years	2.8	3.3	-0.12	0.06
70-79 years	1.3	3.1	0.22	0.24
80+ years	2.1	1.3	0.37	0.38
Income group 1 (Low)	3.4	4.2	-0.01	-0.07
Income group 2	0.2	1.7	-0.26	-0.17
Income group 3	1.0	2.3	-0.01	0.10
Income group 4	-0.3	-0.4	0.06	0.09
Income group 5 (High)	0.9	2.3	0.13	0.28
Born in Sweden	0.9	0.8	-0.08	-0.06
Born outside Sweden	5.4	10.5	0.24	0.63
Non-disadvantaged areas	2.0	2.6	-0.01	0.05
Disadvantaged areas	2.2	8.2	-0.08	0.60

Socioeconomic differences in healthcare utilisation were similar among the survey respondents and in the total population. For most comparison groups, there were no significant differences between estimates of the survey respondents and of the total population.

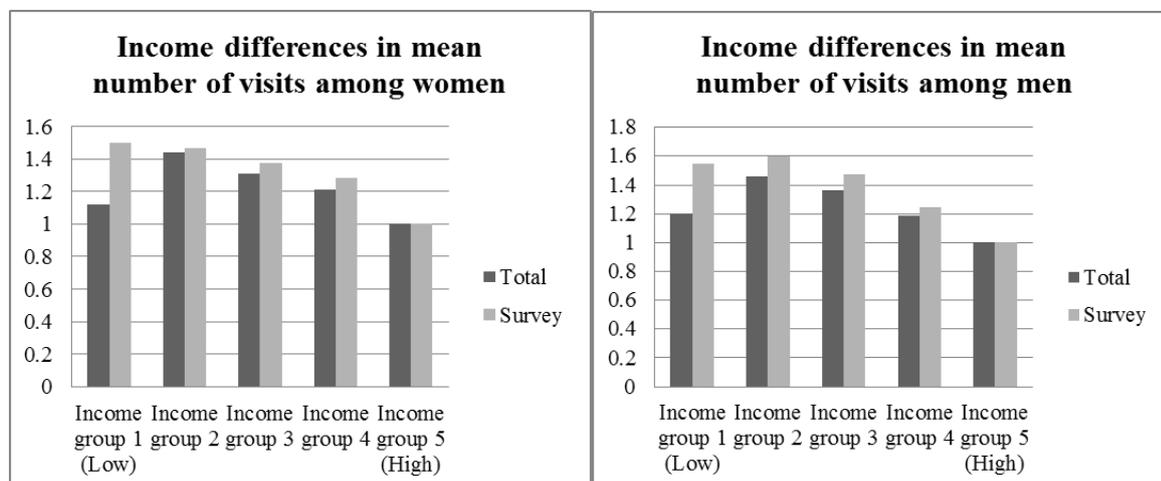


Figure 3 Social gradient in healthcare utilisation among the survey population and the general population

However, among individuals born outside Sweden, in most cases the estimates among survey respondents were not representative of the total population of individuals born outside Sweden. In some cases, the estimated number of visits relative to the Swedish born group was invert to the relation in the general population.

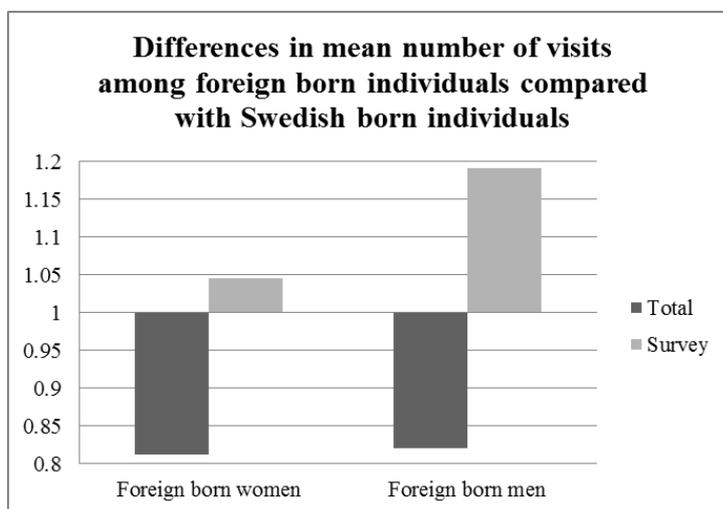


Figure 4 Relative differences in number of visits among foreign born compared to Swedish born in the survey population and general population

Among men aged 65+ years, the income gradient in the average number of registered visits among the survey respondents was less steep compared to the total population, indicating that basing the estimates only on survey respondents would underestimate the income gradient in the average number of visits in the total population.

7.2 HOW DOES THE SOCIOECONOMIC GRADIENT IN USE OF OUTPATIENT SERVICES CHANGE WHEN TAKING NEED INTO ACCOUNT?

In Study II we investigated income differentials in utilisation of outpatient healthcare services in Stockholm County and compared analysis with and without adjusting for need. The results of the analyses showed that there were different income differentials depending on whether the analyses were adjusted for health status or not. The analyses of income differentials, only controlled for age, were in favour of low income groups among women aged 25-64 years and differences in favour of high income groups among men aged 65-84 years. No significant differences were found among women aged 65-84 years. Among men aged 25-64 years, no differences were found between income group 1-4, but income group 5 had significantly less visits. When introducing the variable, disability pension, for the age group 25-64 years the differences among women diminished but were still significant. No significant differences among men were found after controlling for disability pension.

Introducing health status variables from the survey into the model altered the results significantly, showing higher number of visits to outpatient care in higher income groups among men aged 25-64 years and among both men and women aged 65-84 years. The significant differences among women aged 25-64 years between lower and higher income groups now disappeared.

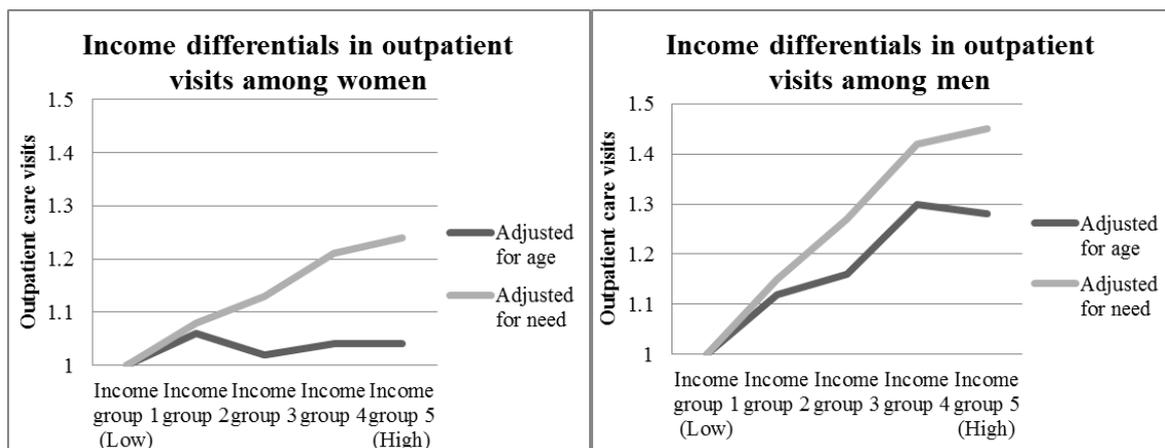


Figure 5 Social gradient in doctor visits in outpatient care with- and without adjusting for need

7.3 HOW HAS THE 2008 PRIMARY CARE REFORM AFFECTED EQUITY IN PRIMARY CARE?

In Study III, we investigated how the 2008 primary care reform and change of reimbursement affected equity in primary care consumption. We studied whether visits increased more in groups with greater healthcare needs and among individuals living in disadvantaged areas.

The results showed that the number of visits to GPs increased between 2007 and 2011 in all groups regardless of health status or area of residence. This was also true for the proportion of people making one or more visits to the GP. There was a tendency for all groups with greater healthcare needs to have a smaller increase in the proportion of people making one or more visits to the GP. Among women with and without mental health problems there were also significant differences in the increase of visits between 2007 and 2011.

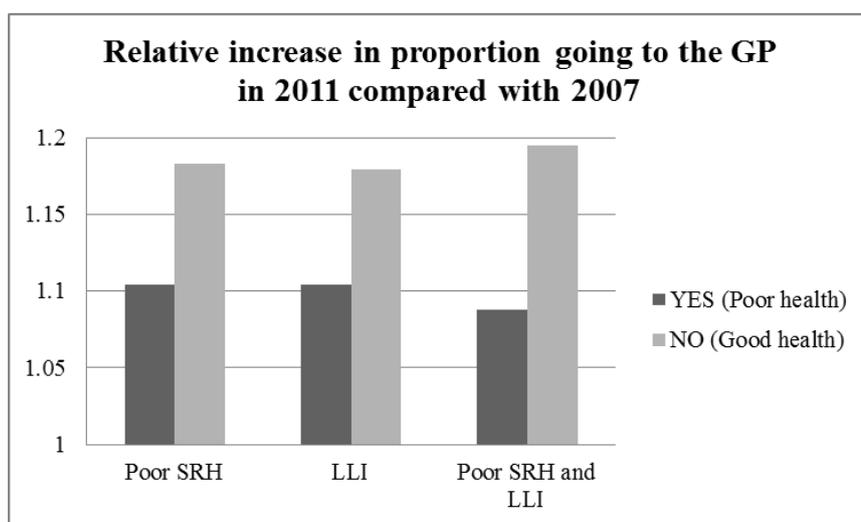


Figure 6 Relative increase in the proportion having at least one visit to primary care doctors in 2011 compared with 2007, among individuals with- and without health issues

The results of the negative binomial analysis of changes in equity in healthcare showed that women with poor health status, both physical and mental, and men with poor mental health had smaller increase in number of visits than the comparison groups. Also men in disadvantaged areas, had a smaller increase in number of visits than men in the rest of Stockholm County, suggesting that men in disadvantaged areas did not benefit from the reform as expected. When stratifying by health status these differences were only significant for individuals with poor health status, indicating some interaction between the effect of area and health status on the rate of change in visits to the GP.

Table 3 Relative change in relative differences in number of visits between groups with different health care needs in 2011 compared with 2007

	Women	Men
Poor health vs Good health	0.914*	0.987
LLI vs no LLI	0.915*	0.987
LLI and poor SRH vs No LLI and good SRH	0.881*	0.987
Poor mental health vs Good mental health	0.892*	0.987*
Disability pension vs No disability pension	0.989	0.987
Deprived areas vs rest of Stockholm County	0.900	0.987*

In Study IV, we investigated how resources have been allocated to primary care in different areas in Stockholm County over a period of nine years (2005-2013) and how the 2008 change in reimbursement system affected the allocation of resources to primary care in areas with higher respective lower healthcare needs.

In general, the results of the analyses showed that resources have been shifting from low-income areas to high-income areas between 2005 and 2013. To some extent the shift in resources from low-income areas to high-income areas was already apparent before the 2008 change of the reimbursement system, but for areas in income quintile 2 the reform seems to have further increased the differences to areas in income quintile 5. All areas except areas in income quintile 1 (lowest income) had an increasing trend before the reform in 2008. After the reform, only areas in income quintile 4 and 5 had an increasing trend. After the reform, areas in income quintile 2 had the steepest decreasing trend.

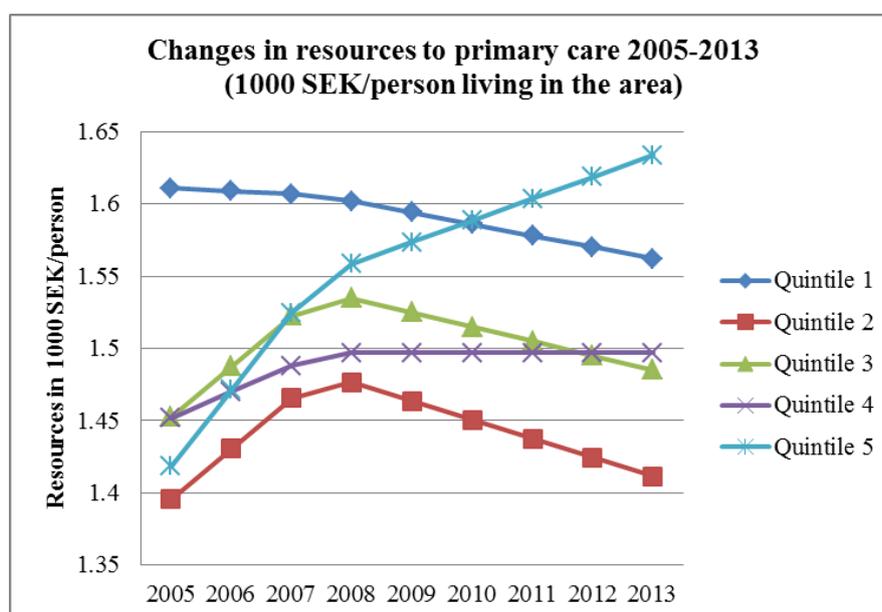


Figure 7 Changes in resources to primary care 2005-2013, based upon the estimates from the multilevel model

7.4 HOW ARE CHANGES IN RESOURCES TO PRIMARY CARE RELATED TO CHANGES IN RATES OF VISITS TO EMERGENCY WARDS AND RATES OF HOSPITALIZATIONS DUE TO AMBULATORY CARE SENSITIVE CONDITIONS?

In Study IV, we investigated if the changes in resource allocation in primary care were associated with changes in rates of ACSC and the use of EWV for both areas with an increase and a decrease in resources over time.

There were no clear relationship with changes in reimbursements to primary care and trends in EWV or ACSC. For both EWV and ACSC, there was a downward trend before 2008 and an upward trend after 2008. There was a tendency for areas with a decrease in reimbursement after 2008 to have had a steeper decrease in both EWV and ACSC before 2008, than areas with an increase in reimbursement. However, this difference in trend was not significant in the full model (model 3). After 2008 there were no significant difference in trends between areas, both in regards to EWV and ACSC.

Table 4 Fixed effects from the multilevel model of the rate of emergency ward visits

Fixed effects for EWV	Model 1			Model 2			Model 3		
	Estimates	S.E.	p-value	Estimates	S.E.	p-value	Estimates	S.E.	p-value
Constant	2604.18	54.79		2429.52	51.85		2394.63	53.37	
Years before the reform	-20.45	11.22	0.068	-20.45	11.22	0.068	-6.39	14.70	0.664
Years after the reform	52.11	5.40	<0.000	52.11	5.40	<0.001	58.59	7.09	<0.001
Areas with less resources				390.43	73.29	<0.001	468.41	79.79	<0.001
Areas with less*years before							-31.44	21.97	0.153
Areas with less*years after							-14.48	10.60	0.172

Table 5 Fixed effects from the multilevel model of the rate of ambulatory care sensitive conditions

Fixed effects for ACSC	Model 1			Model 2			Model 3		
	Estimates	S.E.	p-value	Estimates	S.E.	p-value	Estimates	S.E.	p-value
Constant	133.25	4.46		128.67	5.01		124.94	5.65	
Years before the reform	-5.35	1.07	<0.001	-5.35	1.07	<0.001	-3.98	1.39	0.004
Years after the reform	1.48	0.68	0.031	1.48	0.68	0.031	2.25	0.90	0.012
Areas with less resources				10.22	5.91	0.084	18.57	8.45	0.028
Areas with less*years before							-3.06	2.08	0.142
Areas with less*years after							-1.73	1.35	0.198

8 DISCUSSION

8.1 MAIN FINDINGS

The overall aim of this thesis was to increase knowledge on equity in outpatient healthcare and on implications of the choice of data sources used with focus on data from Stockholm County. The main findings from the four studies can be summarized as follows:

- The use of the SPHC data to investigate socioeconomic differences in healthcare utilisation are not subject to substantial non-response bias for most comparison groups. Although the respondents have a slightly higher utilisation of outpatient doctors visits than the general population, the estimated relative differences between socioeconomic groups are representative of the source population the sample is drawn from. However, respondents born outside Sweden differed to individuals born outside Sweden in the general population as the respondents had a significant higher healthcare utilisation. (Study I)
- Health status should be taken into account when analysing socioeconomic differences in healthcare utilisation. When using register based data without taking need into account there is a risk of underestimating or disregarding socioeconomic differences. (Study II)
- We found no evidence that the 2008 primary care reform increased equity in healthcare utilisation in Stockholm County. On the contrary, individuals with mental health problems and women with poor health status had a significantly smaller increase in primary care visits than their respective reference group, indicating that the reform had a negative impact on vertical equity in utilisation of primary care. (Study III)
- Allocation of financial resources to primary care in Stockholm County have shifted from low-income areas to high-income areas during 2005-2013. (Study IV)
- The changes in resource allocation did not affect rates of emergency ward visits (EWV) or rates of hospitalization due to ambulatory care sensitive conditions (ACSC). (Study IV)

8.2 IMPLICATIONS OF CHOICE OF DATA

In Study I and II we especially investigated how the use of different data sources affects analyses of equity in healthcare utilisation. In Study I we investigated whether estimates of healthcare utilisation would be representative using survey data and found that in most comparisons the respondents were representative of the general population. However, respondents born outside Sweden had higher healthcare utilisation than their comparison group in the general population.

The response rate in the health survey is lower among individuals born outside Sweden (35% among individuals born in countries outside Europe)(110) and those choosing to participate in health surveys might further be more integrated in the society and thus be more familiar

with the healthcare system than those not participating. There are studies indicating that immigrants might have difficulties in initially accessing healthcare (68, 69). Therefore, lack of proficiency in Swedish might be related to response rates and to healthcare utilisation. Studies based on health surveys (65) or diagnosed patients (66) that find no inequalities based upon country of birth could be disregarding differences.

Among men aged 65 and above the choice of reference group may have an impact on results as the highest income group (income group 5) among the respondents had significantly more visits than the same group in the general population. In Study II where we use the lowest income group (income group 1) as a reference group in the negative binomial regression analyses of income differentials, the number of healthcare visits for income group 5 among men above 65 might be slightly overestimated compared to the general population.

Using the mean number of visits, instead of the prevalence of having any visits, came closer to the true values in the general population and should in this case be preferred when wanting to describe the healthcare utilisation in a population. However, when looking at socioeconomic differences the choice of outcome measure was less important, at least in relation to its accuracy.

When using register based data a pro-poor gradient is often used as a sign of equity when need cannot be taken into account. In Study II we investigated how much the income gradient in healthcare utilisation changed when taking need into account. There were several examples of inequity in outpatient care and the pro-rich gradient increased when taking need into account. This was primarily evident in specialist care and among individuals aged 65 and above. That inequalities in healthcare utilisation among the elderly exist in healthcare have been demonstrated in several studies (71, 72). Although the main aim of Study II was not to investigate equity in healthcare, the results confirmed that inequities do exist in outpatient care in Stockholm County.

8.3 CHANGES IN EQUITY IN HEALTHCARE IN STOCKHOLM COUNTY

In Study III and IV we investigated the equity impact of the 2008 primary care reform in Stockholm County. As previously discussed, there is a strong emphasis on equity in healthcare in the Swedish Health Care Act and other health policy documents. However, when the choice reform was introduced, there was little mention of its impact on equity (90). In Study III and IV we wanted to investigate whether the reform affected this underlying value of the Health Care Act. Although some Swedish reports had addressed the equity aspect of the reform (54, 81, 87, 88) no scientifically published study had previously investigated how the reform affected equity in primary care in Stockholm County.

8.3.1 Changes in the social patterning of utilisation

In Study III we investigated whether the vertical aspect of equity in healthcare utilisation changed after the introduction of the reform. We found that some groups with greater healthcare needs did not increase their healthcare utilisation in primary care to the same

extent as individuals with lesser healthcare needs. These findings were evident for men and women with poor mental health, women with poor general health status and men living in disadvantaged areas. This was in line with the results from several of the Swedish reports (81, 83, 87), however the results from one report (81) suggests that these vertical inequalities are primarily present for visits to the doctor and not to other types of care (81).

Although significant, the differences in increase of visits might not seem huge from a clinical perspective. However, these changes could indicate that the primary care system is turning in the wrong direction, i.e. working against the goal of the Health Care Act of giving healthcare on equal terms and according to need. The changes may be small for the individual; however, small changes on a large scale can be meaningful to investigate from a policy perspective. The financial incentives of the reform encourage clinics to focus on producing many visits, without acknowledging the fact that some visits may demand more time and effort. This also implies that it is more difficult for clinics in more disadvantaged areas to increase their resources as the population they serve have more complicated health issues, lower health literacy and more often face language barriers that makes it harder to communicate about health issues and understanding instructions from the healthcare staff. These circumstances make healthcare visits take more time and effort.

8.3.2 Changes in resource allocation between geographical areas

In Study IV we investigated trends in resource allocation in areas with different median income before and after the primary healthcare reform and found that areas with lower median income in general had a lower increase in resources compared to high-income areas after the reform and that more areas with lower income had a decrease in resources. This could be due to the above mentioned factors.

When introducing the reform the underlying idea was that resources should follow the patient and that high demands were equal to high needs and market mechanisms in that way would allocate resources equitably. However, as several studies have concluded those with high needs are also the ones who most often refrain from seeking care (77, 78) and in a system, where all visits are reimbursed with the same amount, it is more profitable to increase visits in the group with minor disease burden. This stands in contrast to the ethical principles of the Swedish healthcare that states that resources should be placed where needs are higher (48).

It is important to state that it is highly unlikely that doctors are consciously prioritizing patients with milder symptoms. Additionally, most doctors are still paid a fixed monthly salary and, to our knowledge, are not paid accordingly to how many patients they treat. Nevertheless, managers of primary care centres have expressed concerns about equity in relation to prioritizing among patients with different levels of need (88, 91). The fact that patients can choose freely among healthcare clinics, gives more power to the patient and as a way to satisfy the 'consumer' many primary care clinics have opened extended drop-in receptions (91). This is a good way to increase access to healthcare, however, sometimes it is patients that might not have the greatest need of healthcare that come to these drop-in hours

(91) and it becomes more difficult for the doctor to prioritize the time among patients with different level of need. These extended drop-in hours take time from the scheduled sessions and may make it even more difficult to get a scheduled appointment with your chosen GP.

8.3.3 Changes in service availability and quality of care

Another aspect of Study IV was to investigate whether the changes in resources affected service availability or the quality of care in a way that influenced the rate of EWV or admissions for ACSC. We did not find evidence that the primary care reform affected the rate of these two outcome measures. There was no increase concerning the outcomes in areas receiving less resources, nor decrease in areas receiving more resources.

Regarding ACSC, there is a risk that there could be a delayed effect as some of the diagnoses included develops over time (e.g. diabetes complications) and is not always closely related in time to a decrease or increase in quality of primary care. Another possible explanation is that we are not evaluating on the right outcome measure or that the changes are too small to influence service availability or quality of care. Another aspect is that the effect of an increase or a decrease in resources could have different impact in areas with different levels of healthcare needs. There have been reports in media about increasing pressure on emergency ward clinics over the past years and indications that a majority is coming from disadvantaged areas (138, 139). Further investigation is needed in order to fully understand the effects of moving resources from poorer to richer areas.

8.4 METHODOLOGICAL CONSIDERATIONS

In this section, methodological strengths and limitations of the four studies will be discussed.

8.4.1 Data sources

A strength of the studies in this thesis is the extensive linkages of individual-level data, between population health surveys and register based data on sociodemographic indicators and healthcare utilisation. With register based data on healthcare utilisation we avoid potential recall bias associated with using survey data for this variable. We also have the opportunity to use data on healthcare utilisation for each individual from the year after the health survey was conducted, overcoming some of the problems with cross sectional data concerning the risk of reverse causation.

8.4.2 Measures

In this thesis, equity in healthcare is investigated and equity in healthcare is defined as ‘equal access to healthcare for equal needs’. However, as stated earlier this definition is very much dependent on the definition of access and need and the operationalisation of these two concepts.

8.4.2.1 The use of visits as a measure for access

In this thesis, healthcare utilisation is used as a measure of access and more precisely visits to doctors in outpatient care, however, as described in the theoretical background there are some limitation with the use of visits when evaluating equity in healthcare.

In Study III, we address vertical equity as we investigate the increase in number of visits in groups with different healthcare needs. However, we are not looking at whether the relation between utilisation in high need- and low need groups is equitable, but whether the relation changed with the introduction of the reform. This may be a valid way to investigate changes in equity in healthcare utilisation if we assume that a visit before the reform is comparable to a visit after the reform.

However, a visit before the reform might not be the same as a visit after the reform and there are several indications on this. Firstly, the numbers of visits has increased and unless the number of doctors has also increased to the same degree, or other work load such as administrative tasks have decreased, doctors have more visits per day after the reform than before, and this should influence time spent on each patient and possibly on the quality of the visit. If this change was distributed evenly it might not affect equity in care, however, our results and other studies indicate that these changes have disproportionately affected patients with higher healthcare needs (11, 83). Qualitative studies with doctors also suggest that the primary care reform has affected their ability to provide care on equal terms and individuals with more complex health problems and higher healthcare needs are suffering from the reform (88, 91).

Intuitively this is a logical outcome of a reimbursement system that rewards higher number of healthcare visits. It is more difficult to cut time in a 5 min visit for ear infection controls than it is in a 20 min visit tackling multiple health issues. In the latter case, you can treat one of the health issues and ask the patient to come back for additional visits for the other health issues, cutting time and additionally generating more visits. On the other hand, this is costly for the patient both in time and money and the question is whether the patient, although increasing their number of visits, is actually getting the same amount and quality of care as before the reform.

This makes it very difficult to be sure that an equal increase in visits whether relative or absolute is not still affecting equity in healthcare in a negative way.

8.4.2.2 The use of self-reported health status measures as proxy for need

There are limitations to using self-reported health status measures as proxies for need. When using a measure like self-rated health as an indicator of need the assumption is that health status and need are consistently associated. Groups with the same level of self-reported health will have the same level of healthcare needs and groups with different levels of self-reported health will have accordingly different levels of healthcare needs. However, this is a strong assumption as different groups might report health status differently, e.g. older people

generally report a relatively better health status than young people taking their objectively measured health into consideration (26) and some studies suggest that there could also be cultural differences in reporting health status among groups with different ethnic background (26, 140). However, the use of SRH and LLI are highly related with healthcare utilisation and several studies have found them to be good indicators of healthcare need (26, 33, 121, 141, 142). In the studies of this thesis SRH and LLI were the best available indicators of need. They explained a large part of the variation in healthcare utilisation and were along with age consistently associated with healthcare utilisation in all sub-groups.

8.4.3 Validity

8.4.3.1 Selection bias

Since the results from two of the studies are based on health surveys the risk of selection bias must be considered. Although the sampling is based on random sampling the relatively high non-response rate (61% for the 2006-cohort and 56% for the 2010-cohort) increases the risk of non-response bias. In both cohorts, non-responders were more often men, low income, low educational level, unmarried or single, and of non-Swedish origin. Many of these indicators are also relate to health and healthcare utilisation and therefore the risk of bias is present. However, in Study I, we investigated the risk of non-response bias when analysing socioeconomic differences in healthcare utilisation and found that although responders had slightly higher healthcare utilisation the relative differences between subgroups were comparable to the relative differences in the source population. Therefore we argue that the results from Study II and III are reliable and not an artefact of non-response bias.

8.4.3.2 Confounding

Since we used a health survey data to study socioeconomic differences in healthcare utilisation, we were able to take many potential confounders into consideration in the analyses; however there could still be residual confounding affecting the results. This applies especially to Study II were we looked at socioeconomic differences in healthcare utilisation controlling for need. In the final analyses, we used two health status measures as a proxy for healthcare need; self-rated health and limiting longstanding illness. We tested models with chronic diseases such as diabetes, chronic obstructive lung disease and high blood pressure and lifestyle factors such as alcohol consumption and smoking but found that these variables added very little to the models. However, there could still be unmeasured confounding factors, such as social support and health literacy that we have not been able to control for.

8.4.3.3 Misclassification

The risk of misclassification of outcome is highly unlikely as we use register based data of high quality. For specialized outpatient and inpatient care several studies have been conducted on the national patient register, is updated with data from the regional databases, that all found the quality of the register to be of high quality especially for utilisation data (143, 144).

Misclassification of exposure could be a problem in Study II where we use income as an indicator of SEP. Although we use register based data there is a risk that parts of an individual's disposable income can come from sources not registered in Sweden, or individuals can have moved from Sweden without being registered as emigrated and for that reason we have chosen to exclude individuals with a disposable income of 0 SEK. However, some individuals categorised as having a low income could potentially have more economic resources than registered and this could lead to bias. If these individuals were also utilizing healthcare to lesser degree this could potentially explain some of the inequalities found in Study II. In order to do a sensitivity analysis and investigate if the inequalities found could be due to differential misclassification we did the analyses with socioeconomic index (SEI) (145) instead of income. However, the data on SEI were collected 1990 and we were only able to do the analyses on the individual living in Stockholm and above the age of 15 in 1990. Nevertheless, the results were in line with our results using income. We therefor concluded that the risk of bias by misclassification of income was not likely to be significant.

8.4.4 Generalisability

The results of Study I may be informative for other studies investigating socioeconomic differences in healthcare utilization using health survey data. Our results are in line with similar studies based on other survey data and from other contexts, so we assume that the results from this study can be generalised also to other contexts.

The results from Study II may be of methodological importance for studies analysing socioeconomic differences in healthcare utilisation using only register data. Generalisability depends, however, partly on whether the way of assessing health status can be assumed to be comparable in other settings. At least in a European setting self-rated health assessments are probably comparable across cultures (146).

There are several factors that complicate generalisability of the Study III and IV. These studies investigate the effect of a very specific change in the way primary care is organised in Sweden. Further, the way primary care is organised in Stockholm County differs from how it is organised in other counties and the changes made in Stockholm are different to the changes made in other counties. However, the changes made in the healthcare system in Sweden are not isolated, but are part of a global trend (43). Globally, performance-related payment and separation of provider and purchaser functions is encouraged and the role of private sector agents are increasing (43). In the light of these general trends, the results from our studies might be useful also in other context.

9 CONCLUSION

Using health survey data to investigate equity in healthcare utilisation allows adjusting the analyses for differences in healthcare needs. In the studies of this thesis, we have used health status measures from a health survey as a way to assess the healthcare need. This is not possible when using only register based data. The results of this thesis suggests that, when analysing socioeconomic differences in healthcare utilisation without adjusting for need there is a risk of underestimating or disregarding such differences.

The use of health survey data to assess equity in healthcare utilisation proved to be representative of the source population, in the case of the Stockholm Public Health Cohort data. However, groups with very low response rates could differ significantly from the same group in the source population. The results suggested that healthcare utilisation among foreign born respondents differs significantly from this group in the source population making comparisons based on country of birth biased.

The results of the studies, investigating the equity impact of introducing a market-oriented healthcare reform in primary care, showed that groups with higher healthcare needs have not particularly benefitted from the extended choice and competition in primary care. On the contrary there seems to be a decline in vertical equity in primary care in Stockholm from 2007 to 2011. This is evident among women with different types of poor health and men with poor mental health as well as men living in disadvantaged areas. Further, resources have been shifting from areas with populations with higher healthcare needs to areas with populations with lesser healthcare needs in the same period (2005-2013). We were not able to investigate how this shift in resources affected equity in neither health nor healthcare. However, we did analyse the effect on health in general in the areas and did not find an association between changes in resources and changes in emergency ward visits or ambulatory care sensitive conditions.

9.1 FUTURE STUDIES AND IMPLICATIONS OF THE FINDINGS

Investigating equity in healthcare is complex and there are many aspects to consider when evaluating whether healthcare is being delivered in an equitable way. Often utilisation measured as number of visits is used to evaluate equity. However, this has some obvious limitations and future studies should consider complementing with other aspects such as quality of care, health outcomes, continuity of care and experienced barriers to care. This is more difficult to investigate and most often not possible to do using only administrative data.

The studies of this thesis raised concern about horizontal equity with regard to some types of outpatient care, especially in the elderly population. Since the elderly is a group with high healthcare consumption it is important to follow up these results and investigate the explanations for this inequality.

Although we could not link the changes in resource allocation with changes in emergency ward visits or ambulatory care sensitive conditions further investigations are needed in order

to establish that the change in resource allocation is not adversely affecting equity in health and healthcare. There could be a delayed effect on the patients' health; perhaps a change in financial resources at first hand affects the working environment and the conditions for the staff working at the healthcare clinics.

In January 2016 a new reimbursement system was introduced in Stockholm in order to mitigate some of the inequity in resource allocation following the changes in 2008. In the new reimbursement system more emphasis is put on capitation (60%) and part of this capitation (20%) is adjusted according to the healthcare need. Continued monitoring of changes in resource allocation from an equity perspective is essential for policy makers.

According to the WHO's Commission on Social Determinants of Health new policies should always be evaluated for their impact on health equity. As most health policy documents furthermore underline the importance of equity and providing services according to need, healthcare reforms should always be evaluated from an equity perspective. Sometimes political ideologies and goals can be in conflict with the underlying values of the welfare state and this needs to be clarified and highlighted in order to be able to prioritize between different political goals.

In general more knowledge is needed on the equity impact of healthcare reforms in order to be able to inform policy makers on possible impacts and to avoid aggravating inequalities in health and healthcare. Effects of policy changes may be very dependent on the context in which they are implemented; however, it is possible to make some inferences based upon studies in other contexts. Implementing reforms in healthcare should always be based upon best available evidence, also when studies in a specific context are lacking, and hopefully the conclusions of this thesis may be useful to policy makers both in Sweden and in other contexts.

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12 APPENDIX A

12.1 SEARCH STRING

Search for studies on equity in Swedish healthcare (30 september 2016)

On PubMed:

(((((("delivery of healthcare"[MeSH Terms] OR ("delivery"[All Fields] AND "health"[All Fields] AND "care"[All Fields]) OR "delivery of healthcare"[All Fields] OR ("health"[All Fields] AND "care"[All Fields]) OR "healthcare"[All Fields]) OR ("primary healthcare"[MeSH Terms] OR ("primary"[All Fields] AND "health"[All Fields] AND "care"[All Fields]) OR "primary healthcare"[All Fields] OR ("primary"[All Fields] AND "care"[All Fields]) OR "primary care"[All Fields]) OR ("ambulatory care"[MeSH Terms] OR ("ambulatory"[All Fields] AND "care"[All Fields]) OR "ambulatory care"[All Fields]) OR ("ambulatory care"[MeSH Terms] OR ("ambulatory"[All Fields] AND "care"[All Fields]) OR "ambulatory care"[All Fields] OR ("outpatient"[All Fields] AND "care"[All Fields]) OR "outpatient care"[All Fields])) AND (("utilisation"[Subheading] OR "utilisation"[All Fields] OR access[All Fields] OR ("utilisation"[Subheading] OR "utilisation"[All Fields] OR "use"[All Fields]) OR visits[All Fields] OR ("delivery of healthcare"[MeSH Terms] OR ("delivery"[All Fields] AND "health"[All Fields] AND "care"[All Fields]) OR "delivery of healthcare"[All Fields]))) AND (equity[All Fields] OR equality[All Fields] OR inequity[All Fields] OR ("socioeconomic factors"[MeSH Terms] OR ("socioeconomic"[All Fields] AND "factors"[All Fields]) OR "socioeconomic factors"[All Fields] OR "inequality"[All Fields]) OR inequitable[All Fields] OR (socioeconomic[All Fields] AND ("Differences"[Journal] OR "differences"[All Fields]))) AND ("sweden"[MeSH Terms] OR "sweden"[All Fields])) AND ("2000/01/01"[PDAT] : "3000/12/31"[PDAT])) AND (("2000/01/01"[PDAT] : "3000/12/31"[PDAT]) AND "humans"[MeSH Terms])

Search for studies on equity aspects of the primary care reform in Sweden

(20 september 2016)

On PubMed:

((("ambulatory care"[MeSH Terms] OR ("ambulatory"[All Fields] AND "care"[All Fields]) OR "ambulatory care"[All Fields] OR ("outpatient"[All Fields] AND "care"[All Fields]) OR "outpatient care"[All Fields]) OR ("primary healthcare"[MeSH Terms] OR ("primary"[All Fields] AND "health"[All Fields] AND "care"[All Fields]) OR "primary healthcare"[All Fields])) AND (("health equity"[MeSH Terms] OR ("health"[All Fields] AND "equity"[All Fields]) OR "health equity"[All Fields]) OR ("socioeconomic factors"[MeSH Terms] OR ("socioeconomic"[All Fields] AND "factors"[All Fields]) OR "socioeconomic factors"[All Fields]) OR "health inequality"[All Fields] OR "health inequalities"[All Fields] OR "socioeconomic differences"[All Fields] OR "Socioeconomic disparities"[All Fields] OR "Inequalities"[All Fields] OR "inequity"[All Fields]) AND ("reimbursement

mechanisms"[MeSH Terms] OR ("reimbursement"[All Fields] AND "mechanisms"[All Fields]) OR "reimbursement mechanisms"[All Fields]) OR ("health policy"[MeSH Terms] OR ("health"[All Fields] AND "policy"[All Fields]) OR "health policy"[All Fields]) OR ("healthcare reform"[MeSH Terms] OR ("health"[All Fields] AND "care"[All Fields] AND "reform"[All Fields]) OR "healthcare reform"[All Fields])) AND ("sweden"[MeSH Terms] OR "sweden"[All Fields])

On web of science:

TOPIC: (outpatient care OR Primary Healthcare) AND TOPIC: (health Equity OR Socioeconomic Factors OR "health inequality" OR "health inequalities" or "socioeconomic differences" OR "Socioeconomic disparities" or "Inequalities" OR "inequity") AND TOPIC: (Reimbursement Mechanisms OR reimbursement system OR Health policy OR Healthcare Reform) AND TOPIC: (Sweden)

Timespan: 2008-2016. Indexes: SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI.

13 APPENDIX B

13.1 CODING OF HEALTHCARE VISITS IN STUDY III

Description of the codes can be found in VAL-Handboken (98)

Number of visits to primary care in 2007 is derived from OVR

The variable UPPDRTYP ('133', '221', '300' '134', '146', '190', '308') was used to identify primary care

As 27% of registered visits in OVR had a missing value in UPPDRTYP we used the variables SPEC and KLIN to identify primary care where UPPDRTYP was missing (SPEC=801 and KLIN=010, 011, 012, 013, 015)

The variable VDG1 (01-69) was used to identify visits to a doctor in primary care

Visit registered as not being care, visits where the patient did not show up and visits about technical aid was deleted (BTYP=3,5,7)

Some clinics are excluded:

Saltsjöbaden, Barnakuten DS (inr='11330' or (inr='97944' and klin='010'))

Specialistvård på Nacka Närsjukhus (inr='11014' and klin='046' and avd not in('001' '002'))

Globen Heart, T Ansved neurolog (inr in('90423' '90801'))

Ultra-Gyn, RFSU (inr in('96570' '98039'))

Arbeterapi Norra psyksktorn (inr='10011' and klin='555' and avd='M01')

Psyksoterapi Farsta (inr='18104' and klin='950' and avd in('P01' 'P02'))

Number of visits to primary care in 2011 is derived from OVR

The variable UPPDRTYP ('133', '221', '300' '134', '146', '190', '308') was used to identify primary care visits

The variable VDG1 (01-69) was used to identify visits to a doctor in primary care

Visit registered as not being care, visits where the patient did not show up and visits about technical aid was deleted (BTYP=3,5,7)

In 2011 UPPDRTYP was of such quality that only 536 visit would have been added by including spec=801 and KLIN=(010, 011, 012, 013, 015).

14 APPENDIX C

14.1 CODING OF EMERGENCY WARD VISITS

Data on emergency ward visits are derived from OVR. Hospitals with emergency wards are selected by the variable FTG:

Emergency ward hospitals (excl Norrtälje):

Danderyd: FTG=1310, 8510

Karolinska: FTG=1320, 1325, 1350, 8550, 1210)

Södersjukhuset: FTG=1270, 8570

S:t Göran: FTG=8060

S:t Erik: FTG=1331, 8530

Södertälje: FTG=1180, 1280, 1285, 8580

AVDTYP=43 or KLIN=046 or TYP=A is used to identify an emergency ward.

14.2 CODING OF AMBULATORY CARE SENSITIVE CONDITIONS

Ambulatory care sensitive conditions was derived from the inpatient care register (SLV) from 2005-2013 using the following diagnose codes:

Name	ICD 9	ICD 10	Definition notes
Acute Bronchitis	4660A	J20	Only when primary diagnose and J41-J44 or J47 as a secondary diagnose
Angina	4110, 4111, 413	I20, I24.0, I24.8, I24.9	Primary diagnose only, exclude cases with surgical procedures (A)
Asthma	493	J45, J46	Primary diagnose only
Bacterial Pneumonia & Influenza	481, 4822A, 4823A, 4824A, 4829X, 483, 485, 487	J10, J11, J13, J14, J15.3, J15.4, J15.7, J15.9, J16.8, J18.1, J18.8	In any diagnosis field, do not accept if D57 is as a secondary diagnose.
Chronic Obstructive Pulmonary Disease, (COPD)	491, 492, 494, 496	J41, J42, J43, J44, J47	Primary diagnose only
Cellulitis	681, 682, 683, 6860A-6868X	L03, L04, L08.0, L08.8, L88, L98.0	Primary diagnose only, exclude cases with other surgical procedures than skin procedures (B)
Congestive Heart Failure	4029B, 428	I11.0, I50, J81	Primary diagnose only, exclude cases with cardiac procedures (C)
Convulsions	7803A	R56	Primary diagnose only
Dehydration	2765A	E86	Primary diagnose only
Dental Conditions	101, 521, 522, 523, 525, 528	A69.0, K02-K06, K08, K09.8, K09.9, K12, K13	Primary diagnose only
Diabetes Complications	2501-2508	E10.0-10.8, E11.0-E11.8, E12.0-E12.8, E13.0-E13.8, E14.0-E14.8	In any diagnosis field
Epilepsy	345, 6426	G40, G41, O15	Primary diagnose only
Gangrene	7854A+2506	R02	In any diagnosis field
Gastroenteritis	5583A, 5589X	K52.2, K52.8, K52.9	Primary diagnose only
Hypertension	401, 4029A	I10, I11.9	Primary diagnose only, exclude cases with cardiac procedures (C)
			Primary diagnose only
Immunization-Related and Preventable Conditions	032, 033, 037, 045, 055, 056, 0703A, 072, 3200A	A35, A36, A37, A80, B05, B06, B16.1, B16.9, B18.0, B18.1, B26, G00.0, M01.4	In any diagnosis field
Iron Deficiency Anaemia	280	D50.1-D50.9	Primary diagnose only
Kidney and Urinary Tract Infections	5900A, 5901A	N10, N11, N12, N13.6	Primary diagnose only
Nutritional Deficiencies	260, 261, 262, 2680A, 2681A	E40, E41, E42, E43, E55.0, E64.3	Primary diagnose only
Pelvic Inflammatory Disease	614	N70, N73, N74	Primary diagnose only
Perforated or Bleeding Ulcer	5310B-5310C, 5311B-5311C, 5312B-5312C, 5313B-5313C, 5314B-5314C, 5315B-5315C, 5320B-5320C, 5321B-5321C, 5322B-5322C, 5323B-5323C, 5324B-5324C, 5325B-5325C, 5340B-5340C, 5341B-5341C, 5348B-5348C	K25.0-K25.2, K25.4-K25.6, K26.0-K26.2, K26.4-K26.6, K27.0-K27.2, K27.4-K27.6, K28.0-K28.2, K28.4-K28.6	Primary diagnose only
Severe ENT infection	0340, 382, 462, 463, 465, 4721A	H66, H67, J02, J03, J06, J31.2	Primary diagnose only

A) Angina, no procedure field contains any of the following:

AA4WT, AA400, AA5LT, AAA-AAW, AB4AT, AB4BT, AB4CT, AB4DT, AB4FT, AB5, AB6AT, AB6BT, AB6CT, AB6DT, ABA-ABW, ACA-ACW, AD-AW, AXX90, BA3AT, BA4KT, BAA, BB2AT, BB3AT, BB4WT, BBA, BC1LT, BC2-BC4, BCA, BD-BW, CAA-CAW, CB, CCA-CCW, CD-CJ, CKA-CKW, CW, DAA-DAW, DB, DCA-DXW, DD, DEA-DEW, DFA-DFE, DFW99, DG, DHA-DLW, DMA-DPW, DQ-DW, EA, EBA-EBW, EC, EDA-EDW, EEA-EW, EF, EGA-EGW, EHA-EHW, EJ-EK, EL3AT, EL3RT, EL3YT, EL4 ,ELA-ELW, EMA-EMW, EP1AT, EP1LT, EP2AT, EP3AT, ENA-ENW, EW, FA, FBA-FBW, FCA-FCE, FD, FE1AT, FE2, FEA-FEW, FF-FL, FMA-FMW, FN1ST, FN1XT, FNA-FNW, FP-FX, GA2-GA4, GAA-GAW, GBA-GBW, GCA, GD1AT, GD1BT, GD1CT, GD1LT, GD2AT, GD2BT, GD2CT, GD3, GDA-GDW, GE1AT, GE1CT, GE1DT, GE2, GEA-GEW, GW, HA0, HA1AT, HA1DT, HA1MT, HA1ST, HA2-HA5, HAA-HAF, HW, JA1LT, JA2-JA3, JAA-JAW, JB, JCA-JCW, JDA-JDW, JE, JF3, JFA-JFW, JGA-JGW, JHA-JHW, JJ1AT, JJ2-JJ8, JJA-JJW, JK1-JK2, J3KAT, JK3BT, JK3CT, JK3FT, JK3LT, JK3NT, JK3RT, JK4-JK5, JKA-JKW, JL1-JL3, JLA-JLW, JM1AT, JM1LT, JM2, JMA-JMW, JN4LT, JW, JX1LT, JX1RT, JXA, KA2AT, KA3AT, KA3CT, KA3DT, KA3LT, KA4-KA6, KAA-KAW, KBA-KBW, KC1AT, KC2AT, KC3AT, KDA-KDW, KE1AT, KE1CT, KE2, KEA-KEW, KF1-KF7, KF8AT, KF8KT, KGA-KGW, KH1AT, KH1BT, KH1CT, KH1CT, KH1DT, KH1FT, KH1YT, KKA-KKW, KW, KX, LA1, LAA-LAW, LB1AT, LB1YT, LBA-LBW, LCA-LCW, LDA-LDW, LEA-LEW, LF-LW, LX1LT, MAA-MAW, MBA-MBW, MC-MW, NA0, NA6CT, NA7BT, NA7FT, NA7KT, NA7LT, NA9KT, NAA-NAW, NB1AT,NB1BT, NB1ZT, NB2, NBA-NBW, NCA-NCW, NDA-NDW, NEA-NEW, NFA-NFW, NGA-NGW, NHA-NHW, NJ3LT, NK1AT, NK1CT, NK1DT, NK1LT, NK2-NK3, NK4AT, NK4BT, NK5, NK6AT, NK6BT, NK6CT, NK6DT, NK6KT, NK6LT, NK7AT, NK6KT, NX, PA2ZT, PA3-PA5, PA6AT, PA8KT, PA9KT, PAA-PAW, PB1AT, PB1BT, PB1ST, PB1YT, PBA-PBW, PC2DT, PC2ET, PC5AT, PC5BT, PC5DT, PC5ET, PC5GT, PC5HT, PC5JT, PC5NT, PC5PT, PC5YT, PC6DT, PC6ET, PC6FT, PC7NT, PCA-PCW, PD1AT, PD1YT, PD2DT, PD3, PD4ST, PD5BM, PD5YT, PD6YT, PD7YT, PE-PG, PH1AT, PH1FT, PH1UT, PH2ST, PH3YT, PH4AT, PH5GT, PH6GT, PH7FT, PH7UT, PH9AT, PH9ST, PH900, PHA-PHW, PJ2AT, PJ2CT, PJ2HT, PJ3-PJ4, PJ5AN, PJA-PJW, PW, PXA-PXX, QAA-QAW, QBA-QBW, QCA-QCW, QDA-QDW, QW, QXA-QXW, QX2ZT, QX3AT, QX3CT, QX3LT, QX3YT, QX4, S, TAA-TAD, TAW99, TA100, TBA-TJF, TJG10, TJJ, TJL-TLE, TLW99, TMA-TPX, TQ, WXQ, WW20, WW30-WW31, WW40, WW50, WX100-WX105, WX140-WX144, WX7-WX9, XCC00, XFE00, XFN96, XFX00, XFX10, XFX20, XFX97, XJW99, XPX00, XPX04, XPX08, XPX99, XW000, XW1-XW5, XX1AT, XX1BT, XX1CT, XX1DT, XX1XT, XX2AT-XX2DT, XX2XT, XX3AT-XX3DT, XX3XT, XX4-XX7, Y, ZA-ZP, ZS-ZZ

B) Cellulitis, no procedure field contains any of the following:

AA4WT, AA400, AA5LT, AAA-AAW, AB4AT, AB4BT, AB4CT, AB4DT, AB4FT, AB5, AB6AT, AB6BT, AB6CT, AB6DT, ABA-ABW, ACA-ACW, AD-AW, AXX90, BA3AT, BA4KT, BAA, BB2AT, BB3AT, BB4WT, BBA, BC1LT, BC2-BC4, BCA, BD-BW, CAA-CAW, CB, CCA-CCW, CD-CJ, CKA-CKW, CW, DAA-DAW, DB, DCA-DXW, DD, DEA-DEW, DFA-DFE, DFW99, DG, DHA-DLW, DMA-DPW, DQ-DW, EA, EBA-EBW, EC, EDA-EDW, EEA-EW, EF, EGA-EGW, EHA-EHW, EJ-EK, EL3AT, EL3RT, EL3YT, EL4 ,ELA-ELW, EMA-EMW, EP1AT, EP1LT, EP2AT, EP3AT, ENA-ENW, EW, FA, FBA-FBW, FCA-FCE, FD, FE1AT, FE2, FEA-FEW, FF-FL, FMA-FMW, FN1ST, FN1XT, FNA-FNW, FP-FX, GA2-GA4, GAA-GAW, GBA-GBW, GCA, GD1AT, GD1BT, GD1CT, GD1LT, GD2AT, GD2BT, GD2CT, GD3, GDA-GDW, GE1AT, GE1CT, GE1DT, GE2, GEA-GEW, GW, HA0, HA1AT, HA1DT, HA1MT, HA1ST, HA2-HA5, HAA-HAF, HW, JA1LT, JA2-JA3, JAA-JAW, JB, JCA-JCW, JDA-JDW, JE, JF3, JFA-JFW, JGA-JGW, JHA-JHW, JJ1AT, JJ2-JJ8, JJA-JJW, JK1-JK2, J3KAT, JK3BT, JK3CT, JK3FT, JK3LT, JK3NT, JK3RT, JK4-JK5, JKA-JKW, JL1-JL3, JLA-JLW, JM1AT, JM1LT, JM2, JMA-JMW, JN4LT, JW, JX1LT, JX1RT, JXA, KA2AT, KA3AT, KA3CT, KA3DT, KA3LT, KA4-KA6, KAA-KAW, KBA-KBW, KC1AT, KC2AT, KC3AT, KDA-KDW, KE1AT, KE1CT, KE2, KEA-KEW, KF1-KF7, KF8AT, KF8KT, KGA-KGW, KH1AT, KH1BT, KH1CT, KH1CT, KH1DT, KH1FT, KH1YT, KKA-KKW, KW, KX, LA1, LAA-LAW, LB1AT, LB1YT, LBA-LBW, LCA-LCW, LDA-LDW, LEA-LEW, LF-LW, LX1LT, MAA-MAW, MBA-MBW, MC-MW,

NA0, NA6CT, NA7BT, NA7FT, NA7KT, NA7LT, NA9KT, NAA-NAW, NB1AT, NB1BT, NB1ZT, NB2, NBA-NBW, NCA-NCW, NDA-NDW, NEA-NEW, NFA-NFW, NGA-NGW, NHA-NHW, NJ3LT, NK1AT, NK1CT, NK1DT, NK1LT, NK2-NK3, NK4AT, NK4BT, NK5, NK6AT, NK6BT, NK6CT, NK6DT, NK6KT, NK6LT, NK7AT, NK6KT, NX, PA2ZT, PA3-PA5, PA6AT, PA8KT, PA9KT, PAA-PAW, PB1AT, PB1BT, PB1ST, PB1YT, PBA-PBW, PC2DT, PC2ET, PC5AT, PC5BT, PC5DT, PC5ET, PC5GT, PC5HT, PC5JT, PC5NT, PC5PT, PC5YT, PC6DT, PC6ET, PC6FT, PC7NT, PCA-PCW, PD1AT, PD1YT, PD2DT, PD3, PD4ST, PD5BM, PD5YT, PD6YT, PD7YT, PE-PG, PH1AT, PH1FT, PH1UT, PH2ST, PH3YT, PH4AT, PH5GT, PH6GT, PH7FT, PH7UT, PH9AT, PH9ST, PH900, PHA-PHW, PJ2AT, PJ2CT, PJ2HT, PJ3-PJ4, PJ5AN, PJA-PJW, PW, PXA-PXX, QAA25, QAB00-QAB05, QAB99, QAC, QAD20, QAE-QAF, QAG10-QAG99, QAJ, QBA25, QBB00-QBB05, QBB99, QBC, QBD20, QBE, QBG10-QBG99, QBJ, QCA25, QCA30, QCB00-QCB05, QCB99, QCC, QCD20, QCE-QCG, QCJ, QDA25, QDB00-QDB05, QDB99, QDC, QDD20, QDE, QDG10-QDG99, QDJ, QXA25, QXB00-QXB05, QXB99, QXC, QXD20, QXE, QXG10-QXG99, QXJ, QX2ZT, QX3AT, QX3CT, QX3LT, QX3YT, QX4, S, TAA-TAD, TAW99, TA100, TBA-TJF, TJG10, TJJ, TJL-TLE, TLW99, TMA-TPX, TQA-TQD, TQW00, TQW02, TQW30-40, TQW99, TQX00-TQX10, U, WXQ, WW20, WW30-WW31, WW40, WW50, WX100-WX105, WX140-WX144, WX7-WX9, XCC00, XFE00, XFN96, XFX00, XFX10, XFX20, XFX97, XJW99, XPX00, XPX04, XPX08, XPX99, XW000, XW1-XW5, XX1AT, XX1BT, XX1CT, XX1DT, XX1XT, XX2AT-XX2DT, XX2XT, XX3AT-XX3DT, XX3XT, XX4-XX7, Y, ZA-ZP, ZS-ZZ

C) Congestive heart failure and hypertension, no procedure field contains any of the following:

FEA-FEW, FFA00, FFA10-FFA30, FFA96, FFB-FFW, FG-FH, FJA00, FJA96, FJB-FJW, FKA-FKW, FK1BT, FLA00, FLA96, FLB-FLW, FMA-FMW, FN1AT, FN1BT, FN1ST, FN1XT, FN1YT, FNA-FNW, FPA-FPF, FPH-FPW, FQ, FXA00-FXN00, TFN10, TFN99, TFP00, TFP40-TFP59

