

A population-based study of health care utilisation according to care level, socio-economic group, and continuity of primary care

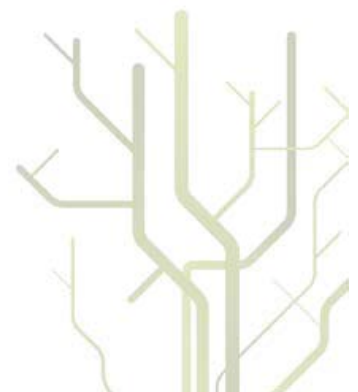
The Tromsø Study



Anne Helen Hansen

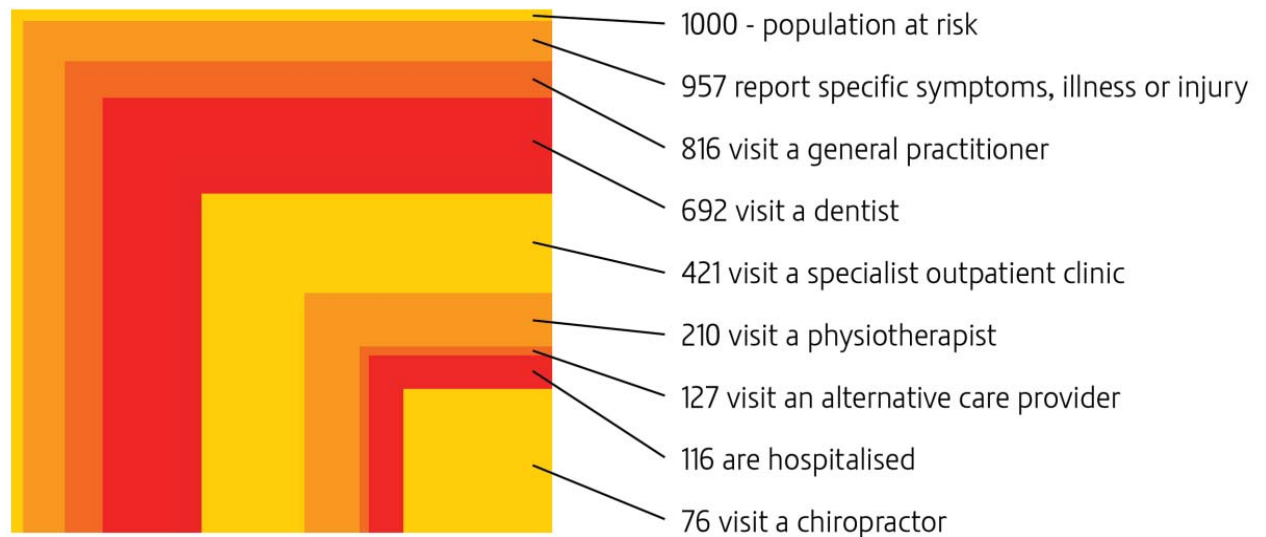
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Tromsø 2013

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Acknowledgements

When I by summer 2012 still had not published anything Karsten Isachsen reached me with the words: Think, thank and rejoice! A PhD process involves some thinking! And now time has finally come to express the thanks that I have felt and rejoiced through this process.

Thanks to Toralf Hasvold and the University Hospital of Northern Norway who gave me the opportunity to break out from executive public health practice into a researcher's silent area. Together with funding from the Northern Norway Regional Health Authority and the University of Tromsø this made my start and my fundament.

I thank Tor Anvik for sharing his thoughts with me, thus generating the basic idea for the content of this project.

From the time I got started, Olav Helge Førde has been my main supervisor. I thought he was more than tough, and he is, although his toughness is combined with an outstanding ability to listen and to lead, gently and safely, tailor made for the one to be led. With his deep interest in health services research, his overview and laid-back confidence, he has been an invaluable support, and cooperation has been a pure pleasure.

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book and Paul Simon or Mark Knopfler, is a pleasure. He is my main confidante, an interested and interesting interlocutor regardless of issue, and a place for calmness and rest.

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Last but not least, I am grateful to the Tromsø Study and the Tromsø residents who took part. This research could not have been performed without their contribution. The words of Virchow, one of the fathers of community medicine (it seems strange, but community medicine has only got fathers....), fits the Tromsø population and the Tromsø Study:

“It certainly does not detract from the dignity of science to come down off its pedestal – and from the people science gains new strength.” (Rudolf Virchow, 1958)

Tromsø, mai 2013
Anne Helen

Summary

Research on utilisation of health care services has not been a priority in Norway. Hence evidence on patterns of utilisation in different population groups is sparse. In three separate studies we aimed to estimate the overall utilisation of seven different health care services, to investigate utilisation in different socio-economic groups, and to test the association between continuity of general practitioner (GP) care and the utilisation of specialist health services. Questionnaire data from the cross-sectional population-based Tromsø Study (2007-8) made it possible for us to analyse self reported utilisation both in primary and secondary care.

The results from the first study showed that most residents visited a general practitioner once or more in a year. Yet there were high rates of inpatient and outpatient specialist utilisation, and the consultation rates to specialist outpatient services were approximately half of the corresponding GP rates. Women used most health care services more than men. We concluded that even if most residents visit a GP at least once a year this might not necessarily keep patients out of specialist care and hospitals.

The second study revealed that the poorer and lower educated, with presumably the greatest health care needs, were more likely to visit a GP, whereas the richer and better educated had higher probability of specialist health care utilisation.

The main finding in the third study was an association between a longstanding relation to the same GP and reduced specialist health care utilisation.

This thesis adds knowledge that statutory rights are challenged by unequal utilisation of health care services according to gender, age, income, education, and continuity of GP care. Our findings may be indications of overuse, underuse, and wrong use since there are other than need related factors associated with health care utilisation.

Sammendrag

Forskning på bruk av helsetjenester har ikke vært høyt prioritert i Norge. Kunnskap om forbruksmønstre i ulike befolkningsgrupper er derfor begrenset. I tre separate studier ønsket vi å estimere forbruket av sju ulike helsetjenester, utforske forbruket av helsetjenester i ulike sosioøkonomiske grupper, samt teste assosiasjonen mellom kontinuitet i fastlegerelasjonen og bruk av spesialisthelsetjenester. Spørreskjemadata fra den populasjonsbaserte Tromsøundersøkelsen (2007-8) muliggjorde tverrsnittsanalyser av selvrappert forbruk, både i primærhelsetjenesten og spesialisthelsetjenesten.

Den første studien viste at de fleste innbyggerne besøkte fastlegen en eller flere ganger i løpet av et år. Likevel fant vi høye rater for polikliniske spesialistbesøk og innleggelse. Ratene for poliklinisk besøk hos spesialist var omtrent halvparten av de tilsvarende ratene for besøk hos fastlegen. Kvinner brukte de fleste helsetjenester mer enn menn. Vi konkluderte med at selv om de fleste konsulterte fastlegen er det ikke nødvendigvis slik at de derved unngår besøk i spesialisthelsetjenesten.

I den andre studien fant vi at det er større sannsynlighet for et besøk hos fastlegen for de med lav inntekt og utdanning, hvor behovet for helsetjenester sannsynligvis er størst, mens det er de med høy inntekt og utdanning som lettest kommer til spesialist.

Hovedresultatet i studie 3 var den positive sammenhengen mellom en langvarig relasjon til den samme fastlegen og redusert bruk av spesialisthelsetjenesten.

Denne avhandlingen har vist at lovbestemte rettigheter blir utfordret av ulik bruk av helsetjenester knyttet til kjønn, alder, inntekt, utdanning og kontinuitet i fastlegerelasjonen. Våre funn kan indikere overforbruk, underforbruk og feil bruk av helsetjenester siden det er andre faktorer enn behovsindikatorer knyttet til forbruk.

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List of papers

This thesis is based on the following papers:

1. Hansen AH, Halvorsen PA, Førde OH. The ecology of medical care in Norway: wide use of general practitioners may not necessarily keep patients out of hospitals. *J Publ Health Research* 2012; 1:e28.
2. Hansen AH, Halvorsen PA, Ringberg U, Førde OH. Socio-economic inequalities in health care utilisation in Norway: a population based cross-sectional survey. *BMC Health Serv Research* 2012; 12:336.
3. Hansen AH, Halvorsen PA, Aaraas JJ, Førde OH. Continuity of GP care is related to reduced specialist health care utilisation. *Br J Gen Pract*. Accepted.

Abbreviations

CAM: Complementary and Alternative Medicine

CI: Confidence Interval

COC: Continuity of Care Index

COCI: Continuity of Care Index

EQ-5D: Euro Quality of Life Group five Dimensions score

GP: General Practitioner

HUNT: The Nord-Trøndelag Health Survey

KOSTRA: KOMmune STat RApportering (Municipality and State Reporting)

MMCI: Modified Modified Continuity Index

NOK: Norwegian Kroner

NPR: Norsk Pasient Register (Norwegian Patient Register)

OECD: Organisation for Economic Cooperation and Development

OR: Odds ratio

SAMDATA: Sammenligningsdata for spesialisthelsetjenesten (Comparative data for specialist health services)

SD: Standard Deviation

SES: Socio Economic Status

SLC: Survey of Living Conditions

Tromsø 6: The sixth Tromsø Study

SCOC: Sustained Continuity of Care

SECON: Sequential Continuity Index

UPC: Usual Provider Continuity

US: United States

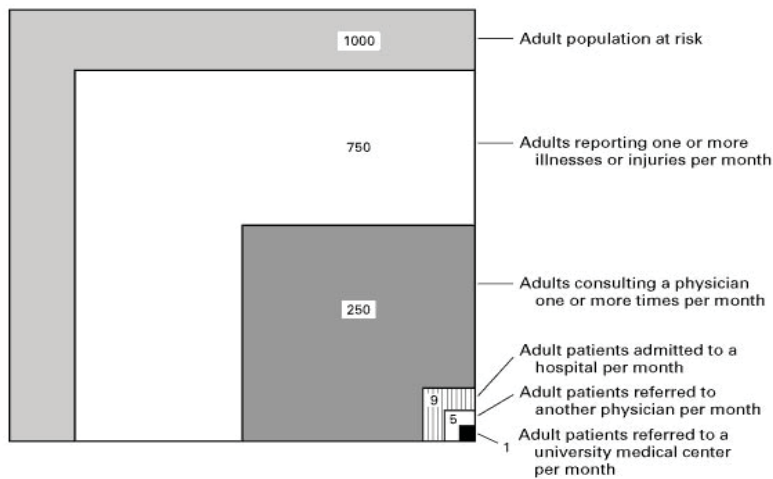
1. Introduction

1.1. How this thesis came into being and what it is about

When The University Hospital of Northern Norway offered me the opportunity to develop and run a PhD project, its content and design was influenced by my background as a social worker and a practicing doctor in clinical and community medicine both in primary and specialist care. I chose three initial criteria for the project. First, the subject area should be health services research including both primary and specialist health care. Second, I wanted it to be related to the whole population, not only to a bounded diagnostic group of patients or sick individuals. And third, if available I would like to use already collected data that were not likely to be analysed by others.

I had for a long time been reflecting on the role of health care services in people's lives, and variations between nations, health care systems, geographical areas, socio-economic groups, genders, families, individuals, and throughout a lifespan. One day a colleague pointed at the legendary health care researcher Kerr L. White, who published "The Ecology of Medical Care" in *New England Journal of Medicine* in 1961 [1]. This classic paper conveys a dedicated population-based approach. White's estimates of health care utilisation visualised as the "ecology cube" (Figure 1) emphasised the dominating role of primary health care in the population. His motivation was to demonstrate a more valid perspective of medical care use than the perspective obtained from data drawn from hospitals, out-patient clinics or general practitioners separately. He claimed that health care delivery and the training of physicians did not bear any logical relationship to the actual experience of

Figure 1. Monthly prevalence of illness in the community and the roles of various sources of health care (White et al 1961).



illness in the population, and that greater attention should be devoted to primary, continuing medical care, as opposed to more exceptional episodes of hospitalisation or consultation of specialists. White’s research has provided a framework for thinking about the organisation of health care. Gradually, it appeared to me that there might be a link between these thoughts, expressed more than 50 years ago in the United States (US), and the 2012 Norwegian coordination reform [2].

The content of this dissertation was from the start inspired by White’s research, and deals with health care utilisation in an adult population. It is based on three separate studies. The first takes a macro perspective, describing symptoms and illness, and utilisation of seven different health care services according to age and gender. The second study takes the individual and family perspective, investigating health care utilisation in different socio-economic groups. The third study takes the health care system perspective, viewing continuity of general practitioner (GP) care and the utilisation of specialist health care services.

1.2. Background and present knowledge

Equitable right to health care services

A healthy population is an important resource in a society. Norway has high scores on health parameters and is considered one of the best countries to live in [3]. Equitable access to health care regardless of age, gender, residency, economy, cultural background, and social status is a political objective and a statutory right [4-6]. Norway has universal health insurance, universal registration with a named general practitioner (GP), and a minor out-of-pocket payment for services. Access to services is considered good. Health care expenses are among the highest in the world [3]. It has been a common notion that health needs in the population are matched by health care services accordingly [7]. Nevertheless, there is little research-based evidence on whether utilisation of health care services is equitable distributed in the Norwegian population [8], and thus little evidence on whether the right to proper health care might be challenged or threatened. Most people might probably think of underuse as the main challenge in this regard. Overuse and wrong use of services has not had the same attention in the media and the general public, and has not been a central theme of debate until recently [9].

Perspectives of health care utilisation - ecology and unwarranted variation

Perspectives and understanding of health care utilisation have evolved significantly from White's ecology paper until today. Health challenges, available treatments, health care systems, economy, and societies have changed, and system differences between countries are huge. I will not here go deeply into a historic overview of this field, but rather roughly describe Whites 1961 perspective on health care utilisation in relation to one of the most

dominant current perspectives, namely John Wennberg's work on unwarranted variation and its contribution to understanding drivers and patterns of health care utilisation [10].

White used the term "ecology" in the title of his classic paper, and elaborated it as follows:

*"Each practitioner or administrator sees a biased sample of medical-care problems presented to him; rarely has any individual, speciality or institution a broad appreciation of **the ecology of medical care** that enables unique and frequently isolated contributions to be seen in relation to those of others and to the over-all needs of the community. The dimensions of these relations may be described quantitatively by estimation of the proportions of defined populations who, within the relatively short period of one month, are "sick", consult a physician, are referred by him to another physician, are hospitalised or are sent to a university medical centre. Such information could be a helpful prelude to further studies of the processes by which patients move from level to level up and down the hierarchy of medical-care resources, and of the best ways in which to relate these resources to one another"*
[1, p 188].

The "ecology" term is most commonly used about interplay and balance in nature. White suggested some kind of similar interaction between health care services, and between services and the population. He emphasised the perspective of morbidity, including all kinds of health problems and complaints. He asked if the distribution of care was "in the opinion of the consumers" [1, p 187], and if "the right patients get to the right facilities at the right time" [1, p 202]. In this way, he indicated that the system might not necessarily be properly balanced. The perspective of White's classic paper is characterised first and foremost by its broad

perspective as it describes medicine's concern about classified as well as unclassified diseases and complaints, and also that it includes both first, second, and third line health services in the same model.

White was concerned about the lack of appropriate data for health care research, and saw the ecology paper as a prelude to further studies. Later, health care research has step by step shown that there are strong forces in health care utilisation that may significantly disturb a proper balance based on population needs [10]. John E. Wennberg's approach to understanding unwarranted variation in health care utilisation includes the description of three categories of health care, namely necessary care, preference-sensitive care, and supply-sensitive care [10, p 8 et seq].

Necessary care is "services known to work better than any alternative, and for which the benefits of treatment far exceeds the side effects..." [10, p 8]. Lifesaving drugs for patients with heart attack is an example, and underuse may be a problem in this category. *Preference-sensitive care* is "interventions for which there is more than one option, and where the outcome will differ according to the option used" [10, p 9]. Different kinds of surgery for breast cancer is an example, and medical evidence, supply of resources, doctor and patient preferences may have variable influence on which treatment that is chosen. Wennberg states "shared decision-making" as an ideal, meaning that clinical practice should be based on informed patient choices supervised by physicians. He argues that delegating decision making to doctors will set patients at risk of getting treatment that they would not want if they had been fully informed. White's question if the distribution of medical care is "in the opinion of the consumers" might be a similar idea from the 1960s. White also questions "the unchallenged assumption that physicians always knew what was best for the people's health" [1, p 202]. *Supply-sensitive care* is not about specific treatments, but rather about frequency of use, which is most often determined by first line physicians and specialists. Wennberg

states that “decisions regarding supply-sensitive care are strongly influenced by the capacity of the local medical market”, but that “physicians are unaware of the effect that capacity has on their decisions” [10, p 11]. Wrong use and overuse of services might be a problem in the two latter categories.

These three categories of care are likely to be present in Norway as well as in the US [11,12]. Wennberg’s and others’ research has revealed significant unwarranted variation in health care utilisation between geographical areas, variation that can not be explained by morbidity or patient preferences [10,13]. The current volume of health care services and in particular specialist services seems influenced not only by agreed and defined needs in the population, but also by medical and technological development per se, financial capacity, need for employment, and traditions [14-16]. A health care system out of ecological balance with unwarranted variation in health care utilisation may, by overuse, underuse or wrong use challenge the objective of equitable right to health care. This dissertation does not aim to define what a good balance is, nor does it address what is the appropriate use of services or determine areas of underuse, overuse, or wrong use. Rather, it describes relative utilisation differences between population groups both in primary and specialist services, differences that are not likely to be due to medical reasons alone. Thus, the perspectives represented by White and Wennberg are parts of the fundament and background for this project.

The coordination reform

Barbara Starfield’s and others’ research has repeatedly shown a relationship between more or better primary care and better health outcomes for parameters like all-cause mortality, mortality from heart disease and stroke, and self-rated health [17]. The coordination reform, named “Proper treatment – at the right place and time” aims to facilitate better coordination in health care, more prevention of disease, more treatment in primary care, and halting of the

growth in specialist care expenditure [3]. A key issue is the allocation of responsibilities between care levels. Hospitalisation rates are assumed to vary by access to primary care and continuity of GP care (inversely), access to hospital care and number of hospital beds (directly) [18-21], economic conditions in the community [22], and treatment available in outpatient and inpatient care [23]. Studies from the US and England have shown that reductions in hospitalisations are associated with high proportions of primary care physicians relative to specialists [24,25]. The proportion of primary care physicians has declined in Norway from 36 % in 1990 to 27% in 2011, mostly due to an increase in number of specialist care physicians [26].

Research on health care utilisation

Internationally, White's 1961 paper has been updated through a few studies of monthly utilisation rates in the US and Asia [27-31]. Most countries do obtain annual rates of health care utilisation, and the Organisation for Economic Cooperation and Development (OECD) has used these data for research and comparisons between member states [32,33]. Population-based health care utilisation in Norway is mainly monitored through the Survey of Living Conditions (SLC). Also, large population surveys do have questions on health care utilisation, but research on these data has been limited.

Comparative data for specialist health services (SAMDATA) are available.

SAMDATA aims to develop, analyse, and publish standardised indicators for specialist care exclusively, and examine how services work in relation to current health policy [34]. Data has been collected with the hospitals as the unit of observation. Norwegian Patient Register (NPR) data are also exclusively obtained in specialist health services, and for administrative purposes, research, quality assurance, preventive health care, and for the development of disease registers [35]. Neither SAMDATA nor NPR data are comparable to data obtained

from primary care, which are mostly obtained at a municipality level (Municipality and State Reporting – KOSTRA) [36]. Obtaining individual data from general practice in Norway is difficult, since available data are mostly limited to reimbursement bills, obtained for other purposes than research.

Due to significant challenges regarding data, methodology, and approach, it is understandable that research on utilisation of health care has been scarce in Norway. Until recently, most health care researchers and research programs have focused either specialist services or (to a lesser extent) primary health services, but seldom both. In particular, primary health care research has been restricted substantially by lack of registered data, lack of finances, and lack of organisational facilitation [37]. In addition, the close link between universities and hospitals may have contributed to the scarcity of research that includes non-hospital services.

Utilisation of health care services according to gender and age

It is a consistent finding in the literature that men report less symptoms and use most health care services less than women [38-43]. This is thought to be associated with reproduction [38,41], higher female morbidity rates [38,40], and social manifestations of gender characteristics [42]. However, hospitalisation and chiropractor utilisation rates are reported equal or higher among men [27-31,40,43-45].

Most health care services are used increasingly with higher age, but utilisation of chiropractors and complementary and alternative medical providers (CAM) is higher among relatively young people [46-48]. Dentist utilisation peaks in middle ages [49].

Utilisation of health care services according to socio-economic status

Affluent groups are shown to have better somatic and mental health and lower mortality than disadvantaged groups, and relative health differences are reported large and increasing in Norway [5,7,50]. Still, evidence on socio-economic inequalities in health care utilisation has been sparse [8]. Research from other high-income countries shows a consistent pattern that GP care is equally or pro-poor distributed while specialist outpatient care tend to favour the better-off [51]. This phenomenon seems stronger where private insurance is common and private specialists make up a significant proportion of available health care [52]. An increasing part of the Norwegian population has additional private insurance (300000 persons in 2011), mostly employer provided [53,54].

Utilisation of health care services according to continuity of GP care

A central issue is how health care system characteristics might impact inequalities in health care utilisation. The Norwegian patient list system was implemented in 2001, aiming to improve quality, accessibility, and continuity in general practice. GPs act as gate-keepers to specialist health care services. Primary care might have a crucial role in reducing unnecessary or wrong use of specialist care [17]. However, after implementation of the list system GPs have reported less attention to the gatekeeper role [55], and a recent study suggested that GPs with high referral rates might contribute to unnecessary use of specialist care [13].

Continuity of care has been defined as the relationship between a single practitioner and a patient that extends beyond specific episodes of illness or disease [56]. It is well known from medical literature that continuity of GP care is associated with reduced hospitalisations [57], but evidence on how continuity of GP care may impact the utilisation of outpatient specialist services is sparse and equivocal. [58-60]. It is of great interest whether a skew

distribution of utilisation may be associated with system characteristics facilitating for continuity of GP care.

1.3. Research questions

The present thesis deals with the following research questions:

- To what extent do people use different parts of the health care system?
- How are socio-economic inequalities associated with utilisation of health care services in Norway?
- How does continuity of general practitioner care associate to utilisation of specialist health care services?

1.4. Aims of the thesis

- To estimate the prevalence of self-reported illness and symptoms, and the prevalence of self-reported visits to different parts of the health care system in a general population in Norway
- To determine the association between socio-economic status and the utilisation of general practitioner and specialist services in a general population in Norway
- To determine the association between continuity of general practitioner care and utilisation of inpatient and outpatient specialist health care services in a general population in Norway

2. Study population and methods

2.1. The sixth Tromsø Study

Population based health surveys have been conducted regularly in the municipality of Tromsø since 1974. We used questionnaire data from the sixth Tromsø Study (Tromsø 6), conducted from October 2007 to December 2008.

All together 6929 women (53.4 %) and 6053 men (46.6 %) aged 30-87 years participated in Tromsø 6, constituting a participation rate of 65.7 %. Each participant signed a written informed consent. A slightly different number of participants appear at the Tromsø Study website due to lack of updating after two persons withdrew from participating in research. Tromsø 6 was approved by The Norwegian Data Inspectorate, and The Regional Committee of Research Ethics. Further information about Tromsø 6 is available in the papers, at the Tromsø Study website [61], and elsewhere [62].

2.2. Study population and design

We chose to apply for data from the Tromsø Study for several reasons. First, the study fulfilled all the criteria mentioned in the introduction section (population-based health care research on primary and specialist services with already collected data). Second, the study is well regarded and has a high participation rate. Third, the data was easily available and free of charge. And fourth, the geographical location of Tromsø, the supply of health care services, and the similarity with the rest of Norway might allow for generalisation of the research findings.

All three papers are based on questionnaire data from Tromsø 6. In paper 1 and 2, all 12982 participants were included. In paper 3, we excluded participants who reported no GP

visits the previous year (n=2226) or who failed to answer this question (n=132), in order to make sure there was an ongoing therapeutic relationship to the GP. The final sample for study 3 consisted of 10624 participants.

In all three papers we explored associations in a cross-sectional design.

Table 1. Participation in the sixth Tromsø Study (Tromsø 6) by age and gender

Age	Men invited	Women invited	Male participants	Female participants	Participation men (%)	Participation women (%)
30-39	544	541	212	297	39.0	54.9
40-49	2988	2969	1662	1912	55.6	64.4
50-59	1708	1705	1147	1289	67.2	75.6
60-69	2702	2635	1995	2108	73.8	80.0
70-79	1197	1456	841	988	70.3	67.9
80-87	492	831	196	335	40.0	40.3
Total	9625	10137	6053	6929	62.9	68.4

2.3. Outcome variables

Outcome variables in all three studies were utilisation of health care services during the previous year. Both monthly and annual rates for utilisation of GP, specialist outpatient clinic, hospitalisation, physiotherapist, chiropractor, complementary and alternative medical care provider (CAM), and dentist were obtained in the macro perspective study (study 1). For each

setting the respondents were asked whether they had used the service the previous 12 months, and if so, how many times. The participants were asked whether they had experienced a wide range of explicitly mentioned symptoms and health problems during a given period, whether they used medication, and how they evaluated their general health. For study 1, any respondent reporting health problems, medication, or bad or very bad health were counted as having had symptoms during the given period.

In study 2 and 3 the outcome variables were probability (use/no use) and frequency of use (number of visits) of primary and specialist health care services during the previous 12 months. Due to violation of assumptions for linear regression, the frequency variable was dichotomised into less frequent or more frequent use.

2.4. Exposure variables

In the first paper, age in 10 year age groups and gender were the only independent variables included.

The independent variables in study 2 were age, gender, marital status, household, income, education, self-rated status of own occupation, and self-rated health. Self-rated health was validated against the five dimension scores developed by the Euro Quality of Life Group (EQ-5D), and against dichotomous variables like musculoskeletal pain, cardiovascular diseases, and chronic diseases.

The main independent variables in paper 3 were duration of the GP-patient relationship (GP duration), and frequency of GP visits the previous year (GP frequency). The key independent variable for measuring continuity of care was GP duration, obtained from the question “For how long have you had your current GP/other doctor?” Adjustments were made for gender, age, marital status, household income, education, and self-rated health. In addition we adjusted for number of chronic diseases.

2.5. Statistical analyses

Data were analysed by descriptive statistics, two sample t-tests, and multivariate logistic regressions. Potential effect modifications were explored by introducing interaction terms in the models. Correlations between the adjustment variables in study 2 and 3 were examined. 95% confidence intervals (CI) were used throughout the study. All analyses were done in Stata, version 12.0.

3. Summary of results

3.1. Paper 1: The ecology of medical care in Norway

The aim of this study was to investigate the pattern of self-reported symptoms and utilisation of medical care, emphasizing health services' outreach in the population.

Weighted estimates of health care utilisation in a year are shown in Figure 2, and estimates for a month in Figure 3. Due to an inadvertence these images are different from the published ones regarding the size of the boxes. However, the utilisation rates are identical with the figures in paper 1. The boxes are not nested; they all have a denominator of 1000.

Figure 2. Annual prevalence estimates of self-reported symptoms and illness, and use of different health care services for persons 30 years and over.

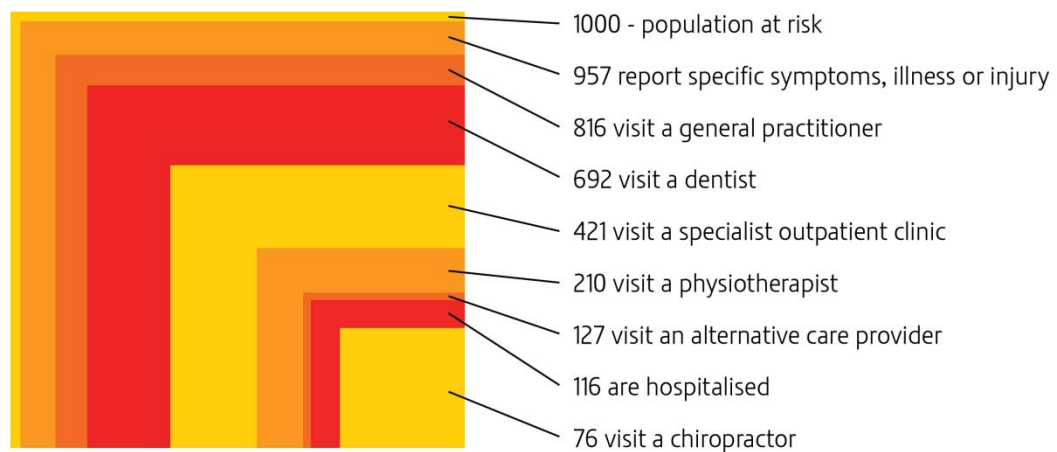
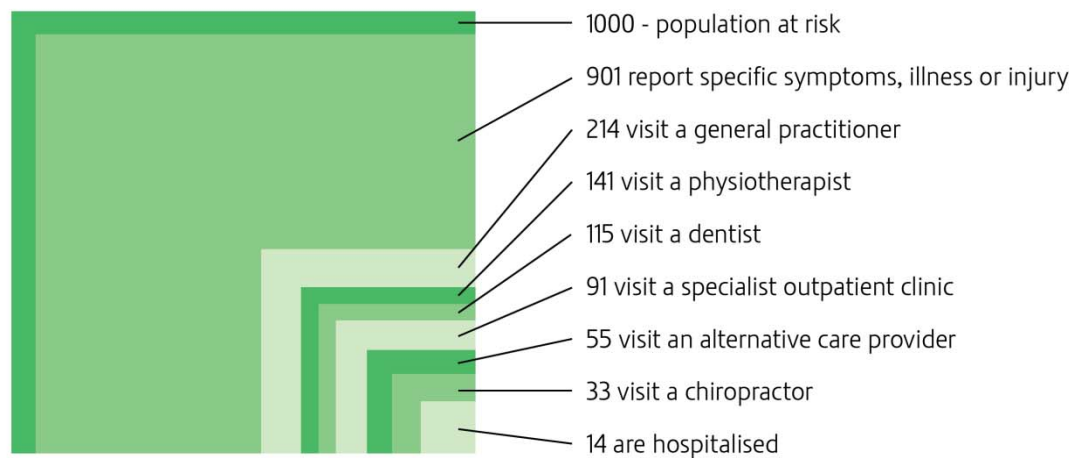


Figure 3. Monthly prevalence estimates of self-reported symptoms and illness, and use of different health care services for persons 30 years and over.



Fewer men than women reported symptoms and disease (OR 0.36, CI 0.29-0.44). Men were less likely to use health care services in all categories, except hospitalisations (OR 0.99, CI 0.89-1.10) and use of chiropractors (OR 1.12, CI 0.98-1.29). Use of GP, physiotherapist, specialist outpatient clinic, and hospitalization increased with age, while use of CAM and chiropractor decreased by age. Dentist utilization peaked in the age group 50-59.

In conclusion, the vast majority of the adult population reported symptoms or disease during the previous year, and most residents visited a GP. Yet there were high utilisation of inpatient and outpatient specialist health care services. Our results confirmed the age and gender pattern obtained from others' research.

3.2. Paper 2: Socio-economic inequalities in health care utilisation in Norway

In the second study, our aim was to investigate the association between socio-economic inequalities and the utilisation of general practitioner, somatic and psychiatric specialist outpatient services.

Self-rated health was the dominant predictor of health care utilisation. Women's probability of visiting a GP did not vary by socio-economic status, but high income was associated with less frequent use (OR for trend 0.89, CI 0.81-0.98). In men, high income predicted lower probability and frequency of general practitioner utilisation (OR for trend 0.85, CI 0.76-0.94, and 0.86, 0.78-0.95, respectively). Women's probability of visiting a somatic specialist increased with higher income (OR for trend 1.11, CI 1.01-1.21) and higher education (OR for trend 1.27, CI 1.16-1.39). We found the same trends for men, though significant only for education (OR for trend 1.14, CI 1.05-1.25). The likelihood of visiting psychiatric specialist services increased with higher education and decreased with higher income in women (OR for trend 1.57, CI 1.24-1.98, and 0.69, 0.56-0.86, respectively), but did not vary significantly by socio-economic variables in men. Higher income predicted more frequent use of psychiatric specialist services in men (OR for trend 2.02, CI 1.12-3.63).

We concluded that there are important inequalities in the utilisation of health care services in Norway.

3.3. Paper 3: Continuity of GP care is related to reduced specialist health care utilisation

The aim of the third study was to test the association between continuity of GP care and utilisation of outpatient specialist health care services and hospitalisations.

A total of 10624 eligible GP users were identified, of whom 85% had seen the same GP for more than two years. The probability of visiting outpatient specialist services was significantly lower among these participants compared to those with a shorter GP relationship (OR 0.81, CI 0.71-0.92). We made similar findings for hospitalisations (OR 0.76, CI 0.64-0.90). Stratified analyses revealed that these associations sustained regardless of self-rated health status.

In conclusion, continuity of GP care was associated with reduced utilisation of outpatient specialist services and hospitalisations.

3. Discussion of methodology

Error and bias is common in science, but their effect can be minimised (rather than fully controlled) by good scientific techniques. Bias can be defined as the result of a systematic error in the design or conduct of a study [63, p 109], or as error which applies unequally to comparison groups [64, p 84]. The term bias does not include random variation. Selection bias, information bias and confounding is a common categorisation, and is often referred to as the internal validity of a study. The external validity of a study refers to the generalisability of the results beyond the source population.

4.1. Selection bias

“Selection bias is present when individuals have different probabilities of being included in the study sample according to relevant study characteristics - namely, the exposure and outcome of interest” [63, p 110]. In this project, selection of research field, non-attendance, and incomplete responses are of particular interest.

Selection of research field

The question on whether bias may be present in the process of choosing the research field and developing the research project deserves to be raised (research question bias) [64, p 87 et seq]. Traditionally, more resources are allocated to research in specialist care than in primary health care in Norway [37,65], generating a bias in research strength, knowledge, and general focus on the two separately financed health care systems and the populations using them. Lack of funding and a good framework for primary health services research is not logical according to the wide use of primary health care in the population, nor does it underpin the aims of the

coordination reform [2]. By the choice of focus on both primary and specialist health care services this traditional bias should not affect the current project.

Non-attendance and incomplete responses

It is well known that women, married/cohabitants, healthier persons, and higher socio-economic groups are more likely to participate in population surveys [66]. After the population-based second HUNT survey, a non-participation study was done (participation rate 47.6%) [67]. For the age group 20-69 years, the main reasons for non-participation were lack of time, that they were busy in job, or had forgotten the invitation. For the age group 70 years and over, many reported to have a regular follow-up by a doctor, and therefore did not need to attend the survey. About 10 % of the non participants did not attend because of immobilization due to disease [67].

In Tromsø 6, attendees were older, and the proportions of married/cohabitants and women were higher than in non-attendees [61,62]. It is conceivable that hospitalised patients, people in nursing homes and prisons, very sick people receiving home care or mental care, drug addicts etc were less likely to attend or to fill in the questionnaire properly. This may affect the outcome as well as the exposure. However, the direction of a possible bias from these factors is not obvious, and might vary for the different health care services and for the research question of interest. Higher age and female participation might lead to inflated estimates of health care utilisation. On the other hand, higher study participation by healthy individuals might lead to lower health care utilisation estimates. It remains unknown whether the overall estimates and the age and gender trends reported in paper 1 may partly be due to selection bias. Utilisation rates (paper 1) might be more affected by non-response bias than the associations studied in paper 2 and 3. In sum, the possibility of selection bias in our

studies can not be ruled out, but the validity of our main conclusions is hardly threatened.

Incomplete responses and missing values is a challenge in all quantitative research. In multiple logistic regression analyses (study 1-3), all subjects with missing values in one of the variables in either model were excluded. In order to assess whether the distribution of missing values was biased, we also performed analyses using imputation techniques as reported in paper 2. This allowed for including more subjects, but did not change our findings. Consequently, we do not regard it likely that missing values have biased our main results to a significant extent.

4.2. Information bias

“Information bias results from a systematic tendency for individuals selected for inclusion in the study to be erroneously placed in different exposure/outcome categories, thus leading to misclassification” [63, p 110]. Misclassification can be non-differential or random (the same degree of bias in comparison groups) or differential (different degree of bias in the groups compared). Information bias can be due to imperfect definitions of study variables, or improper data collection. The problem will be over-reporting or under-reporting, leading to false results based on exposure or outcome information, or both [63, p 122 et seq].

Misclassification is an important issue when assessing health care behaviour from questionnaire data. Recall bias or reporting bias results from inability or lower ability among study participants to recall and report correct information [63, p 110 and 117 et seq]. Questions concerned with minor events and distant past will generate more of this bias, regardless of whether the participant is conscious about it [68]. The effect of recall bias will vary for the different health care settings. Most people would probably remember a hospitalization, but not necessarily a visit to a GP during the last year. In all three papers this

may cause under-reporting of GP visits and other more commonly used services. Further, it is likely that some older participants and some with psychiatric diagnoses might not remember events. This may lead to under-reporting that affects study subgroups unequally. Monthly rates of utilisation might be preferable to annual rates as far as recall bias is concerned.

The first phase in defining the study variables was the construction of the Tromsø 6 questionnaires. The second phase was a more integrated part of this study, and includes assessment of how to measure the expositions of interest from the available data. The questionnaires were not designed for the purpose of this particular project. In the following sections I will illuminate how challenges regarding measurements, precision, nuances in language, and answering alternatives might have affected our study.

Validity of health care status assessments

The terms “need” and “need adjustments” are often used in connection with health services research [51,69]. What is need for health care, and how could it possibly be measured? The assessments will be different for different health care services, and depend on whether judgement is made by the individual or by medical staff. Decisions about health care utilisation includes both individual and system factors. [70]. The list of possible risk factors at the individual level for visiting a GP will not only include symptoms, disease and injury, but also prevention, screening programs, administrative reasons, concern about other people, desire for a health cheque, etc [71]. Although there seem to be no convenient and satisfactory definition of the concept of need, aspects of it can possibly be measured through “need equivalents”. For study 1 we constructed the very wide variable “symptoms, illness or injury.” The Tromsø 6 data also provides information about “need equivalents” like self-rated health, EQ-5D [72], and chronic diseases. Despite limitations we have used the variable self-rated health as the best available “need equivalent” in study 2 and 3, well aware that it is an

imprecise measure based on subjective judgement by the study participants. On the other hand, the subjectivity of this measure may not necessarily be viewed as a limitation, since the subjective individual view might be the more important and valid view when it comes to seeking health care, at least in first line services. In addition, self rated health is shown to be a valid indicator of morbidity and mortality [73,74], and agreement with register-based utilisation measures are generally high. [68]. According to these perspectives it might be irrelevant to discuss a possible misclassification of individuals into different health status groups. However, one should be aware of the possibility that thresholds of recognising and reporting symptoms and health problems might be related to gender and age [39,43].

Self-rated health was assessed at the attendance date, while health care utilisation was reported for up to a year. One should note that health might have varied during this period. In this respect, monthly rates might be preferable to annual rates.

Validity of socio-economic status measurements

Socio-economic status is traditionally evaluated by income, education and occupation.

Income was measured as self-reported household's gross income in categorical answering options in study 2 and 3. Measurement errors might have occurred. It might not be clear to all study subjects how to define household, nor how to define gross income. Moreover, we were not able to adjust for the total number of persons living in the household, only for living with a spouse or not. A possible measurement error in this aspect might not be random, but the magnitude and direction of a possible bias is difficult to evaluate.

In paper 2 we have argued that education is a very robust variable, since participants of 30 years and older most often have completed their education. In addition, education is not likely to be affected by disease to the same extent as income. Education is easier to report

than income and occupation, and even if over-reporting might occur it is reasonable to assume that bias in respect to this measure is minimal.

Occupation is often hard to categorise, and a self-assessed measure of the status of own occupation is used in study 2. This measure turned out to be of minor importance as analyses without this variable did not alter the study 2 results. As a consequence, we did not adjust for this measure in study 3.

Validity of the continuity of care measurement

Actual measures for continuity of care in the literature are Usual Provider Continuity (UPC), Modified Modified Continuity Index (MMCI), Continuity of Care Index (COC or COCI), Sequential Continuity Index (SECON) [75,76], and Sustained Continuity of Care (SCOC) [57]. Our data did not allow us to use any of these indices. Rather, the question “For how long have you had your current GP/other doctor?” was essential for the analyses in paper 3. The response options were dichotomised into two years or less and more than two years (the longest original response alternative). There are at least three methodological problems concerning this variable. First, does it measure continuity in a proper way, taking the intensity of the GP-patient relationship into account? To meet this challenge, we included only study participants reporting visits to the GP in the year prior to the study conduct, ensuring that there was an ongoing therapeutic relation. This move is not indisputable, since subjects with a longer time since the last visit might also have a therapeutic relation to the GP [17]. As expected, analyses without these exclusions made the associations stronger (data not shown), possibly due to the effects of the gatekeeper function. Moreover, the intensity of the relationship might vary considerably with type and number of visits. Second, the longest answering option was “more than 2 years”. Some participants may have doubted whether this means more than 24 months, or 3 years or more. Third, most residents are likely to have a

significantly longer relation to the same GP [77], which suggests that longer answering options might have strengthened our findings. Fourth, the term “other doctor” might have led some participants to report a specialist physician or another GP as their current doctor, for instance due to hospital treatment or various kinds of doctor’s absence. However, a recent Norwegian study of continuity reported that 78% of consultations were with the usual GP [78]. Likewise, in the 2008 SLC 92% of the population reported having a current GP that they usually consulted [46]. All in all, it seems unlikely that the results reported in paper 3 are significantly biased by the construction and use of this variable.

4.3. Confounding

Confounding may be defined as “distortion of an exposure-outcome association brought about by the association of another factor with both outcome and exposure” [79, p 39]. Confounding may lead to inducing, strengthening, weakening or eliminating an association between exposure and outcome [63, p 154], and may be taken care of by randomisation, stratification and adjustments in multivariate analytic models. In our project, all these techniques were used at different stages, randomisation only in the recruitment phase. Potential confounders were discretionary selected among factors that might be associated with both dependent and independent variables.

Seasonal confounding might be a possible distortion. For example, viral and respiratory conditions are common in general practice [71], and health care utilisation for these conditions is higher in winter than in summer [80]. Since our data was collected in October, November and December both in 2007 and 2008, it might have raised some of the utilisation rates in study 1. We therefore subsequently obtained annual utilisation rates after excluding participants attending in 2007, thus analysing attendees from the whole calendar year of 2008. The results from these analyses are discussed in section 5.1.

We found that continuity of GP care was associated with reduced inpatient and outpatient specialist utilisation. Can we trust this finding, or could it possibly be confounded by the fact that patients in poorer self-rated health were more likely to have a shorter GP relationship? Sweeney and Gray described a patient syndrome of discontinuity which they found to be associated with lower social class, relationship problems, more medically unexplained symptoms, difficult consultations, and non-attendances [59]. Our paper 3 results were adjusted for self-rated health and socio-economic variables (Paper 3, Table 4 and 6), and also stratified by self-rated health (Paper 3, Table 5). According to these results we can not completely rule out that bad self-rated health in the non-continuity group might have led to a slight strengthening of the associations between continuity of GP care and reduced specialist care utilisation. However, doctor's and patient's mobility has been the most important reasons for doctor changes in Norway. Nearly half (46%) of the changes in 2011 occurred because the doctor moved or discontinued the practice [81,82], and 13% of changes occurred because the patient moved. Figures for 2008 were 41% and 13%, respectively. Doctor's migration affects all individuals on the list equally. Statistics Norway registered that 80% of those who moved to and from Tromsø in 2007-8 were aged 30-49 years [83], which suggests that those without continuity due to their own migration were mostly younger and healthier individuals (Paper 3, Table 1). This might partly outweigh the effect of self-rated health as a possible confounding factor. The possibility of other unmeasured confounders of the associations presented in this thesis, for example characteristics of the GPs, cannot be completely excluded.

4.4. External validity

External validity is synonymous to generalisability, and depends on internal validity. We have in the previous section addressed internal validity, and in conclusion claimed that errors might

be present, but probably not major distortions affecting our main results. The question on generalisability of our papers from the Tromsø source population to the larger Norwegian population must be raised and answered. Is the study population representative for the Norwegian population, and can the revealed utilisation rates and associations be applied to the Norwegian population?

Tromsø is roughly equivalent to Norway for key parameters like unemployment, income per capita, proportion of disability pensioners, number of primary care physicians per 10000 inhabitants, and proportion living in urban areas, but Tromsø has a younger population, and the level of education is higher than the national average [84]. Utilisation rates in paper 1 are weighted for age and gender, but not for education. The differences in education might have given lower rates for GP visits and higher rates for use of specialist outpatient services in study 1, according to the results achieved in paper 2. On the other hand, the age weighting might have reduced the consequences of the education skewness, since education is higher among younger individuals. Thus, the main findings from all three papers could reasonably be generalised to a national level, although the associations in paper 2 and 3 may be easier to generalise than the rates in paper 1.

The generalisability to other Scandinavian countries, Europe, or even other geographical areas regarding health care services utilisation, depends on similarities and differences in societies, health care systems, financial structures, and cultural factors. In general, external validity when it comes to other countries is often challenging in this research field.

5. Discussion of results

The main findings of this thesis are discussed in papers 1-3. However, some issues are suitable for further discussion in order either to widen the perspective more than there was room for in the papers, or to compare our findings with the most recent research published during the conduct of our study. At the end of this section, I will go into a general discussion of the overall picture obtained by this project.

5.1. Study 1 – overview of utilisation and gender and age diversities

Since the 16 outcome variables in study 1 made it space demanding to thoroughly discuss all outcomes in the published paper, some of the findings will be discussed here.

In the 2008 SLC 6500 of 10000 invited subjects 16 years and over participated (65%). Data from the survey are entered into the Nesstar data base [85], and Table 2 is a compilation of SLC findings and our results, both with and without the 2007 attendees. For comparison with SLC rates, our rates per 1000 reported in paper 1 are converted into percentages (Table 2). Even if the data from SLC has not been subject of research like in our study, and sample age differs, the compilation is interesting. It confirms that there are no major differences between SLC and study 1 utilisation rates for most of the services. However, the differences are at largest for use of dentist, which may partly be explained by sample age. In addition, utilisation of dental services is shown to be lower in Northern Norway than in other parts of the country, probably partly due to a history of poverty in the population and lack of teeth and dentists [86,87]. Based on data from the third HUNT study (2006-8) an annual dentist attendance rate of 77% for ages 20 years and over was recently reported [88].

Table 2. Health care utilisation rates (one or more visits during the previous year) in the present study 1, in study 1 after exclusion of the 2007 attendees, and in Survey of Living Conditions 2008 (%)

	Study 1 (30 years +)	Study 1 (2007 attendees excluded)	SLC 2008 (16 years +)
GP	81.6	81.1	83.0
Specialist outpatient	42.1	41.8	40.0
Hospitalisation	11.6	11.6	10.4
Physiotherapist	21.0	21.3	17.3
Chiropractor	7.6	7.5	8.0
CAM	12.7	12.8	16.0
Dentist	69.2	68.9	75.0

SLC, Survey of Living Conditions; GP, general practitioner; CAM, Complementary and Alternative Medicine

Analyses after excluding the 2007 attendees in order to avoid a possible seasonal confounding showed no significant differences compared to the original utilisation rates published in paper 1.

Utilisation of health care services according to gender and age was in line with others findings, see section 1.2. This may mainly be a manifestation of general health and cultural conditions in most Western countries.

5.2. Study 2 – socio-economic inequalities

It is of interest whether the probability of visiting specialists was pro-rich and pro-high educated both for public and private services. Due to lack of space we did not report this in paper 2. We found that use of public/hospital somatic outpatient specialists did not vary significantly by income in either gender, while utilisation of private specialists was higher with higher income, though not significant in men (Table 3). Utilisation of both private and public services increased significantly with higher education in both genders (Table 3). However, differences between public and private services are small, and confidence intervals are overlapping, thus the similarities might be just as striking as the differences. Our results are in line with previous Norwegian studies for private specialists, while reports have not been consistent for public outpatient services [51,89-92]. Concurrently with the release of our second paper, a similar study using data from the third HUNT survey (54% participation rate) reported a pro-rich and pro-educated inequity in utilisation of both private and public/hospital outpatient specialist care [69].

For reasons of space we also did not report the probability of hospitalisations according to SES. We found a higher probability of hospitalisation with lower income and higher education. The findings were stronger for income and the association with education was not statistically significant after stratification by gender (Table 4). This diversity underlines the benefits of studying socio-economic inequalities in health care utilisation along more than one dimension. Our data did not allow us to study somatic and psychiatric hospitalisations separately.

In contrast to our results, the HUNT study [69] did not find any socio-economic gradient in utilisation of GP care or hospitalisation. The authors suggested that associations between non-response and low education/income might have led to underestimation of inequity in their study, and also that the lack of large cities in Nord-Trøndelag county might

have an impact since social inequalities are usually larger within cities and between cities and sparsely populated areas. The presence of Social Medical Centre in Tromsø, facilitating access to primary health care services for vulnerable groups, might also have contributed to the discrepancy between the studies regarding GP services. The same applies to the higher sample age in our study, since inequity is reported larger in older parts of the population [69].

In line with our findings, Statistics Norway recently reported that groups with high education use GPs less than the less educated [93]. Correspondingly, a recent study by Hetlevik and Gjesdal found that GP list populations with low SES had higher consultation rates than list populations with high SES [94].

Table 3. Utilisation of public and private somatic specialist outpatient services at least once during the previous year* (significant findings in bold)

	Women		Men		Both genders	
	Public n=4999	Private n=4971	Public n=4999	Private n=4970	Public n=9998	Private n=9941
	OR for trend (95% CI)	OR for trend (95% CI)	OR for trend (95% CI)	OR for trend (95% CI)	OR for trend (95% CI)	OR for trend (95% CI)
Household income	1.08 (0.98-1.18)	1.16 (1.04-1.29)	1.05 (0.95-1.15)	1.09 (0.97-1.23)	1.04 (0.97-1.11)	1.09 (1.00-1.17)
Education	1.20 (1.09-1.31)	1.31 (1.18-1.46)	1.12 (1.02-1.23)	1.21 (1.08-1.36)	1.18 (1.10-1.26)	1.29 (1.20-1.40)
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Household income						
Low (1)	0.72 (0.54-0.97)	0.63 (0.45-0.89)	0.74 (0.53-1.04)	0.71 (0.46-1.09)	0.78 (0.62-0.97)	0.75 (0.57-0.97)
Low middle (2)	0.90 (0.72-1.11)	0.77 (0.60-0.99)	0.98 (0.79-1.22)	0.84 (0.64-1.11)	0.98 (0.84-1.14)	0.87 (0.73-1.05)
High middle (3)	0.92 (0.77-1.09)	0.95 (0.78-1.14)	1.02 (0.86-1.20)	1.10 (0.90-1.35)	0.98 (0.87-1.10)	1.05 (0.91-1.20)
High (4)	1.00	1.00	1.00	1.00	1.00	1.00

Education						
Low (1)	0.69	0.58	0.79	0.70	0.72	0.60
	(0.58-0.84)	(0.46-0.72)	(0.66-0.96)	(0.55-0.88)	(0.63-0.82)	(0.52-0.71)
Middle (2)	0.91	0.81	0.98	0.78	0.92	0.78
	(0.78-1.07)	(0.68-0.97)	(0.84-1.15)	(0.65-0.95)	(0.83-1.03)	(0.68-0.88)
High (3)	1.00	1.00	1.00	1.00	1.00	1.00

OR, odds ratio; CI, confidence intervals

* Multivariate logistic regressions including household income, living with a spouse, education, self-rated occupational status, self-rated health and age as independent variables

Table 4. Probability of hospitalisation at least once during the previous year* (significant findings in bold)

	Women n=5157		Men n=5103		Both genders n=10260	
	OR (95%CI)	OR for trend (95%CI)	OR (95%CI)	OR for trend (95%CI)	OR (95%CI)	OR for trend (95%CI)
Household						
income						
Low (1)	1.60 (1.07-2.40)	0.83 (0.73-0.94)	1.77 (1.15-2.72)	0.82 (0.72-0.93)	1.70 (1.27-2.27)	0.81 (0.74-0.89)
Low middle (2)	1.24 (0.90-1.71)		1.45 (1.06-1.98)		1.37 (1.09-1.70)	
High middle (3)	1.12 (0.86-1.46)		1.12 (0.86-1.44)		1.12 (0.94-1.35)	
High (4)	1.00		1.00		1.00	
Education						
Low (1)	0.81 (0.62-1.06)	1.12 (0.98-1.28)	0.88 (0.67-1.14)	1.07 (0.94-1.22)	0.83 (0.68-0.99)	1.11 (1.01-1.22)
Middle (2)	0.89 (0.71-1.12)		1.01 (0.81-1.26)		0.94 (0.80-1.10)	
High (3)	1.00		1.00		1.00	

OR, odds ratio; CI, confidence intervals

* Multivariate logistic regressions including household income, living with a spouse, education, self-rated occupational status, self-rated health and age as independent variables

5.3. Study 3 – continuity of GP care

There are few Norwegian studies of continuity of GP care and specialist health care utilisation. In line with our findings, Finnvold and Svalund reported that referrals of patients with chronic conditions were reduced with increasing continuity [58]. Likewise, Iversen and Kopperud found that a personal GP and a regular health centre reduced the probability of private specialist outpatient visits. On the other hand, they found that continuity increased hospital/public specialist visits. [95]. However, their data were obtained from a smaller and younger sample at a municipality level, comparing the pilot scheme municipalities (Tromsø, Trondheim, Lillehammer, and Åsnes) with other municipalities prior to the national implementation of the patient list system. The fact that the pilot scheme municipalities were mostly cities hosting hospitals might partly explain the higher probability of hospital outpatient consultations in this study [11].

5.4. General discussion

Equitable right to health care services

This thesis has not judged what is wrong or right use of health services, and for whom.

Rather, a key issue in the three studies has been to estimate and describe the distribution of use between different services and levels of care, and between population groups. The studies add knowledge that statutory rights might be challenged by unequal utilisation of health care

services according to gender, age, income, education, and duration of relation to the same GP. Our findings may be indications of overuse, underuse, and wrong use since there are other than need-related factors associated with utilisation. Even if these challenges might essentially relate to general attitudes and conditions in society, health care services and providers at all levels should be aware of these diversities when aiming for the best possible health care for all population groups.

The decision to visit first line services is mainly made by the individual. A pro-poor and pro-low education profile of GP utilisation suggests that services are adapted to groups with the poorest health. GP services should be maintained and developed as a low-threshold service for all population groups. In this perspective there should be no reason to increase the out-of-pocket payment for services or raise the threshold of GP access in other ways. The patient list system seems to facilitate GP-patient continuity to a large extent. Nevertheless, even stronger efforts might be taken to facilitate stability of GP-patient relationships rather than stimulating competition for patients and corresponding doctor changes. One option might be to consider increasing the doctors' basic grants for each 5 years with the same list population. This might also stimulate GP stability in rural areas. Policy makers and providers might also consider facilitating even better access to first line services particularly with regard to groups who do not seem to plan their GP visits and would thus probably benefit from more GP drop-in services.

Our finding that men use most health care services less than women is in line with findings from most of the world. The higher mortality among men for leading causes of death might suggest unmet needs and possibly underuse of health care services [96-98]. This applies in particular to first line services, as this is the entrance to health care. In addition, we found that men in the lowest income group had a low probability of visiting both GPs and somatic specialists (Paper 2, Table 3). This is not likely to reflect need. Possible financial,

organisational, and cultural barriers are discussed in paper 2. Moreover, another theory in this regard is that the help consuming role might violate notions of independency, self-reliance, strength and robustness for some men. [42]. Changing the doctor-patient relationship in a direction of empowering and shared decision making [10] might ease the process of seeking care for some groups.

Also, the reasons for the diversities regarding specialist outpatient services are not identified in this cross-sectional study, but some possible explanations are discussed in paper 2. Higher utilisation among the better educated and for somatic outpatient services also among groups with higher income is a verification of the inverse care law [99]. In a gate-keeping system, it is important that GPs are aware of this. The same applies to specialists who are making priorities of referrals, thus functioning as a second gatekeeper. This may also be of interest to policy makers, health administrators, and the general public. According to Wennberg's research and findings from specialist care in Norway, the question of overuse seems relevant for specialist services, and probably more for somatic than for psychiatric services [10-12,100]. Overuse might be just as harmful to the individual as underuse [10]. Consequently, one should hesitate to stimulate more health care for the richer and more educated. This applies for instance to private insurance, private health care offers, and priorities according to employment ("Raskere tilbake") [101,102].

When health care changes and reforms are planned, the question on how they will affect continuity and distribution of care between genders, age groups, and socio-economic groups should always be raised. There should be a greater research focus on these issues, and public debate should be stimulated. After all, the general public is the key stakeholder in this regard.

Perspectives of health care utilisation - ecology and unwarranted variation

Societies and health care utilisation have changed since the 1960s. Apparently, more people report symptoms and disease today (Figure 1 and 3). We found that the monthly and annual consultation rates to specialist outpatient services were around half of the corresponding GP rates (Figure 2 and 3) whereas White estimated that referrals to another physician (5 per month) comprised only about 1/50 of the corresponding GP rate (250 per month) (Figure 1).

In contemporary western medicine, Wennberg's categories (necessary care, preference-sensitive care and supply-sensitive care) and White's idea of an ecologic interplay between health care services, and between services and the population may offer complementary perspectives on health care utilisation. The content of Wennberg's categories can be seen as signs of a system in need of a better balance than the present. According to White it is "the collective impact of actions taken by individual patients and physicians... that largely determines the demand for and utilisation of medical care resources" [1, p 187 and 188]. Wennberg's and others' research during the previous half century has made advances towards a deeper and more detailed understanding of the mechanisms behind demand for and use of health care, emphasising the effect of supply of services, professional judgements, and practice profiles. White's ecology model emphasises the outreach of the different services in the population, the crucial role of primary care, and medicine's concern about the width of symptoms and ailments in the general population. The model provides an overview of health care services including all levels of care, rather than a too narrow glance at separate entities. This might still be necessary in levelling out the apparently dominating role of hospital medicine in contemporary health care. Wennberg's perspective on unwarranted variation, categories of care, and shared decision making seem appropriate in describing current and future areas of overuse, underuse, and wrong use of health care, particularly in specialist care services. Wennberg's categories have been applied to empirical examples from Norway,

demonstrating large variation between geographical areas for treatments like for instance shoulder surgery, ablation for atrial fibrillation, outpatient visits for age-related cataract, and knee arthroscopy [11,100]. For further research, it would also be interesting to consider whether requirements for becoming a surgical specialist might associate to surgical rates. For instance, will the fact that candidates need to perform 50 tonsillectomies each in order to become an ear, nose, and throat specialist impact tonsillectomy rates [103]? Wennberg has repeatedly shown that for specialist health services more is not necessarily better (and might even be worse) when it comes to patient outcomes, a point that must not be overlooked in interpreting our results [10].

In sum, both White's and Wennberg's perspectives might be useful, but for different purposes. When it comes to the core of the attitudes and values behind their models, they do not seem that different.

The coordination reform

Starfield argues that more and better primary care is related to better health outcomes [17], a statement that neither can be confirmed nor rejected by our results. However, the finding that specialist outpatient utilisation and hospitalisation rates are high compared to other countries might support the general direction of the coordination reform that more prevention and treatment should be made in primary care. Policy makers and health administrators have started a process in order to alter the proportions of primary care providers relative to specialists in Norway [104].

There is an ongoing debate about whether more GPs and more GP consultations will help in halting utilisation and expenditure in specialist care [105]. A recent Norwegian study concluded that more GP consultations as a single measure might not decrease outpatient clinic utilisation among elderly [106]. The law of diminishing returns, if valid for primary care,

predicts that at some point there might be a break of the curve where more care is no longer better. Our finding that continuity of GP care is associated with reduced specialist utilisation might indicate that system quality matters. After all, further research and debate about the content and quality of services should be important for future development in primary and specialist care, in particular in domains where Norway is regarded average or inferior in international comparisons [107]. Among these are information sharing, communication, and coordination between different services. The coordination reform aims for improvements in these domains, and evaluation of results should not be limited to selected parts of the health care services.

6. Conclusions, implications and future research

6.1. Conclusions

These are the main conclusions of the present study:

- Norway has a high rate of inpatient specialist utilisation compared to most other countries, despite a high annual contact rate between GPs and the population
- High income and education is associated with lower utilisation of GP and higher utilisation of specialist outpatient services
- Continuity of GP care is related to reduced utilisation of outpatient specialist services and hospitalisations

6.2. Implications

- When health care changes and reforms are discussed, the question on how they will affect continuity and distribution of care between genders, age groups, and socio-economic groups should always be raised
- Policy makers, health administrators, providers, and the general public should be aware of the current differences in health care utilisation between different population groups
- Awareness that differences in health care utilisation might be due to overuse and wrong use as well as underuse should be reflected in public debate and political concern

- GPs, specialist health care providers, health administrators, and policymakers may do well in organising health care in ways that support equal rights to health care services and continuity in general practice

6.3. Future research and communication of research findings

Major health reforms have been implemented in recent years, and evidence is needed to evaluate and understand their effects. It is likely that future changes and reforms will impact different population groups differently and hence the equitable right to health care services. Health care research on modes of delivery of care should therefore be a future priority. This applies particularly to research concerning primary health care services and the interaction between primary and specialist health care, and between population subgroups and health care services. For this purpose, register based compatible data from primary- and specialist health care services are needed, in addition to data obtained from the major population studies. This field could probably benefit from more interdisciplinary research, in particular research that aims to understand behaviour related to the use of health care services.

The general population is an essential stakeholder in health services utilisation. Especially in this research area it is important that research results are communicated to the public. Cases of underuse are regularly debated in public. The possibility of overuse and potentially harmful treatments should also be a subject of public debate.

Even if more research is recommended in this field, the need for more evidence should not be an excuse not to consider measures for improvement based on the knowledge that we already have.

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Paper 1

Paper 2

Paper 3



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