ORAL HEALTH-RELATED QUALITY OF LIFE
AND PATIENT PAYMENT SYSTEMS
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ORAL HEALTH-RELATED QUALITY OF LIFE AND PATIENT PAYMENT SYSTEMS

A study of Contract and Fee-for-service care in a county in Sweden

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PREFACE

This thesis is based on the following papers:


The first and second papers are reprinted with permission from Community Dental Health and Swedish Dental Journal, respectively.
ABSTRACT

Since 1999, the Public Dental Health Service in Värmland has two alternative patient payment systems: Fee-for-service and Contract care. In Fee-for-service, the patient pays per provided service, after treatment. In Contract care, the patient enters a contractual agreement with the Public Dental Health Service, pays a fixed fee for a fixed period of time, and then receives all dental care needed and covered by the contract, without additional costs.

The overarching aim was to investigate if the assumed different treatment philosophies in Contract and Fee-for-service care would lead to different outcomes, with patients in Contract care having better oral health-related quality of life than patients in Fee-for-service care.

Study I was a literature review of previous research, with material gathered through searches in different databases. Studies II, III and IV were conducted on material gathered through a postal questionnaire in 2003, sent to 1,200 randomly selected patients in each patient payment system in the Public Dental Health Service in Värmland, in all 2,400 patients.

Study I. There were indications of more preventive services, and in the long run, of decreased need for restorative care in capitation, compared to in fee-for-service. Regarding productivity, dentists’ satisfaction with their work and patients’ satisfaction with provided care, there was too little information to draw conclusions.

Study II. The patients in Contract care were younger, better educated, to a larger extent married or living with somebody, born in Sweden, and had better general health and oral health-related
quality of life, than the Fee-for-service care patients. On the other hand, the latter felt a higher degree of social affinity with their housing area.

*Study III.* Controlling for possible confounding factors in hierarchical multiple regression analysis, oral health-related quality of life was associated with patient payment systems: patients in Contract care had significantly better oral health-related quality of life than had the patients in Fee-for-service care.

*Study IV.* In path analyses, using structural equating modeling, there were indications of different underlying mechanisms in the patient payment systems. In Fee-for-service care, the patient’s perception of the caregiver’s patient-centred stance was associated with oral health-related quality of life: the more patient-centred stance, the better the oral health-related quality of life. This relationship was not present in Contract care. There patient-centredness was associated with how much the patient was prepared to pay: the more she was prepared to pay, the higher she ranked her caregiver as being patient-centred. This was not found in Fee-for-service care. What the patient had paid for dental care the previous year was associated with a decrease in oral health-related quality of life in both systems. However, the association was twice as strong in Fee-for-service care, compared to Contract care.

In conclusion, there were differences between the patient payment systems, influencing oral health-related quality of life. Even though selection bias cannot be excluded, the fact that the bivariate differences regarding e.g. education and age did not remain in the multivariate analyses indicated that the differences found in oral health-related quality of life probably are due to the payment systems themselves. This conclusion was strengthened by the fact that the differences found in underlying mechanisms in the systems were not related to background variables, but to variables associated with the dental care situation.

Det övergripande syftet var att undersöka om de förmodade olika behandlingsfilosofierna i Kontrakt- och Styckepristandvård leder till olika utfall, med bättre oralhälso-relaterad livskvalitet hos patienter i Kontraktstandvård, än hos patienter i Styckepristandvård.

Studie I var en litteraturgenomgång av tidigare forskning, med material insamlad genom databassökningar. Studie II, III och IV bestod av material insamlad genom en postenkät under 2003. Enkäten sändes till 1 200 slumpvis ut valda patienter i varje system i Folk tandvården Värmland, totalt 2 400 patienter.

**Studie I.** Det fanns indikationer på mer preventiv värd, och i det långa loppet också på minskat behov av restorativa åtgärder i kapitering, jämfört med i fee-for-service. Det fanns för lite material för att kunna dra några slutsatser om produktivitet, tandläkarens tillfredsställelse med sitt arbete och patientens tillfredsställelse med erhållen värd.

**Studie II.** Patienterna i Kontraktstandvård var yngre, hade högre utbildning, var i större utsträckning gifta eller sammanboende, födda i Sverige, och hade bättre allmänhälsa och oralhälso-relaterad livskvalitet än Styckepristandvårdspatienterna. De senare
upplevde å andra sidan en högre samhörighet med sitt bostadsområde.

**Studie III.** När andra faktorer kontrollerades i hierarkisk multipel regression fanns ett samband mellan oralhälso-relaterad livskvalitet och tandvårdssystem: Kontraktstandvårdspatienterna hade en signifikant bättre oralhälso-relaterad livskvalitet än Styckepristandvårdspatienterna.


Sammanfattningsvis fanns det skillnader mellan tandvårdssystemen som hade samband med den oralhälso-relaterade livskvaliteten. Selektionsbias, dvs att olika individer söker sig till olika system, kan inte helt uteslutas, men avsaknaden av multivariata samband mellan exempelvis utbildning, ålder och oralhälso-relaterad livskvalitet indikerar att skillnaderna mellan systemen troligen beror systemfaktorer. Denna konklusion styrktes av att de skillnader som fanns mellan systemen inte var relaterade till bakgrundsvariabler.
INTRODUCTION

The mouth is an essential part of our being. With the mouth we eat and drink, communicate, express our emotions, and entertain our social relationships (1). For all these activities, oral health is vital. The impact of oral conditions can have physical, psychological, emotional and social consequences. The importance of the mouth and oral health is substantial.

In 1946, the World Health Organization’s defined health as:

“a state of complete physical, mental and social well-being, and not merely the absence of disease or infirmity” (2).

The definition has influenced the view on oral health and its impact on health-related quality of life. As in the health definition, the interrelations between physical, psychological and social aspects are central to oral health-related quality of life.

A major influence on oral health-related quality of life research has been the work of David Locker. In 1988, he proposed a conceptual framework of oral health impact, based on the World Health Organization’s International Classification of Impairments, Disabilities and Handicaps (ICIDH) criteria (3). The model linked physical and psychological ramifications of oral disease with consequences on function, behaviour and ability to fulfil social roles. The conceptual framework has generated several instruments to measure oral health-related quality of life (4).
Oral Health and Oral Health-Related Quality of Life

The concept of oral health-related quality of life refers to the relationship between oral health and quality of life. Regarding the general concept of health-related quality of life, there is no consensus definition, but several aspects are generally agreed upon. It is regarded to be a multidimensional and dynamic concept referring to a subjective experience, to include both a cognitive and an affective component, and to appraise both positive and negative aspects of a situation (5). The aspects are equally important and applicable for oral health-related quality of life.

The oral health-related quality of life is a complex concept, with strong similarity and association to the concept of oral health.

The oral health concept refers to assessment of oral health status. The oral health status assessment entails both a clinical, biomedical, assessment of health by a professional, and an assessment of the patient’s subjective experience of her health (6). Both assessments contribute with unique insight into health and disease (7). Drawing upon the disease-illness-sickness triad (8), oral health status refers to what Hofmann & Eriksen define as disease and illness. Disease is characterised by the professional sphere and constitutes the biomedical aspect of health,

“a bodily or mental occurrence that tends to reduce the capacity of the organism” (8, p. 5).

Illness, on the other hand, is characterised by the personal sphere and is

“a subjective negative experience that tends to reduce the capacity of the person” (8, p. 5).

As such, the oral health concept captures the physical impact of health status, but does not capture how it affects other dimensions of the patient’s life.

The concept of oral health-related quality of life, on the other hand, aims to capture how oral health affects all dimensions of life. Returning to the applicability of health-related quality of life in general, the dimensions of health-related quality of life includes
"physical, emotional, psychologic, social, functional, and, more recently, spiritual domains of well-being" (5, p. 49).

Further, as the oral health-related quality of life concept captures impacts on dimensions of life that the oral health concept does not, it cannot be assessed by anybody but the patient herself. Each patient is a unique individual who will appraise the impact on her life from her own unique set of standards. A low concordance has been found between caregivers and patients assessments of the patients' oral health-related quality of life. The median OHIP-14 scores for the patients' assessments of their oral health-related quality of life was 3.0, while the caregivers’ assessments of the patients oral health-related quality of life had a median score of 9.0, p<0.001 (9). The range of the OHIP-14 is 0 to 56.

Oral health has, on the other hand, traditionally been assessed in research only by clinical measurements (10), i.e. through assessments of a professional. Although clinical measurements do not capture the entire picture of oral health, they can be used to assess oral disease.

The relationship between the oral health and oral health-related quality of life concepts is depicted in figure 1. The lower half of the figure represents the oral health concept, and the interrelationship between the clinical and subjective aspects of oral health. The oral health concept captures what happens inside the individual, which in the model is labelled as “intrapersonal dimension”, to include all subjective experiences of oral health. These subjective experiences affect how the individual reacts to and interacts with what happens outside her, here labelled as “interpersonal dimension”, to include all domains of the individual’s life. The interpersonal dimension is captured by the oral health-related quality of life concept. Further, the figure depicts how oral health is an integral part of the oral health-related quality of life concept.

**Dental Care in Sweden**

In Sweden, the Public Dental Health Service has a legal responsibility for providing dental care to the population (11), but the patient is free to choose a private practitioner for her
dental care. The Public Dental Health Service is run on a regional level by county councils. There are in total 21 county councils, of which 18 are counties, two are regions and one is a municipality (12).

Since 1974, all dental health care for children and adolescents is free of charge, until the calendar year they turn 20 years old (13). For children and adolescents, the caregiver is usually reimbursed with a capitated fee (14), funded by income taxes (12).

Also in 1974, a national dental insurance was implemented to subsidize dental care for adults (13), irrespective of which sector the dental caregiver works in. The national dental insurance is a national social insurance, and funded by employer payroll fees (12). The national dental insurance has undergone several reforms during the years. The latest was implemented the first of July in 2008. In 2003, when this study was conducted, the national dental insurance subsidized dental health care with specific amounts for specific services and treatments (15). The patient paid most of the cost, with out-of-pocket payments, and the caregiver was then reimbursed for the subsidy (16) by the Swedish Social Insurance Agency.

**Figure 1. The relationship between the concepts of oral health and oral health-related quality of life. Adjusted from Axtelius and Söderfeldt (7).**
Patient Payment Systems in Dental Care

The traditional adult patient payment system in Swedish dental health care is fee-for-service, also known as fee-per-item. In this system, the patient pays for provided services, after completed treatment.

Background - Premietandvård

In the early 1990's a proposal of an alternative patient payment system was discussed in the Swedish government. In 1993, the Ministry of Health and Social Affairs presented a Government report on the dental care insurance, where the traditional fee-for-service system was scrutinized. The report found that two of the main problems with the fee-for-service system were that it:

“does not reward dental health and dental health work”, and
“contains a risk for or actually leads to overconsumption/overproduction of restorative services” (17, p. 28, translated by the author).

The report argued that there were no incentives for preventive work – or high quality - in a fee-for-service system, as it would reduce future incomes. In a fixed-fee-system, on the other hand, reconstructive services would be only one of several treatment options available.

Another argument was that payment was connected to the time of treatment in the fee-for-service system:

“[costs] will be discussed at the point in time when the treatment is needed, that is to say, when the patient is most vulnerable and least likely to question the cost” (17, p.50, translated by the author).

In a fixed-fee-system, on the other hand, the patient would be less vulnerable and more in control, as no treatment in particular would be needed at the point in time when the costs were discussed.
As an alternative to the traditional fee-for-service system, Premietandvård (“Premium Dental Care”) was proposed. An inspiration to the proposal was the Denplan system in Great Britain.

In the system of Premietandvård, the patient would enter an insurance agreement, with a fixed prepaid fee for dental care based on a risk assessment performed by the caregiver, and with capitated remuneration for the caregiver (17). The proposal of Premietandvård was put forward in two Government bills. The first bill (1993/94:221: Ersättningssystemet för vuxentandvård) was rejected by the Swedish Riksdag in June 1994, while the second bill (1995/96:119: Reformerad tandvårdsförsäkring) was withdrawn in February 1996, before being voted on in the Swedish Riksdag (18).

Subscription Care
In 1998, a patient payment system similar to Premietandvård was proposed in a new Government bill (1997/98:112: Reformerat tandvårdsstöd): subscription care. The bill passed and subscription care was implemented in January 1999 (19). In this patient payment system, the patient pays in advance a fixed fee for a fixed period of time, during which she receives oral health care without additional costs. The fee is determined by an assessment of the patient’s oral health and care needs for the fixed period, a risk classification. Before the dental care reform of 2008, the general dental care insurance subsidized subscription care with a fixed fee of 200 SEK per year and person enrolled, regardless of risk classification or provided services (15).

The private practitioners have for various reasons been hesitant to subscription care (14), and to my knowledge no private practitioner presently offers this form of payment system.

In the Public Dental Health Service, implementations of subscription care have varied. The Public Dental Health Service in the county council of Värmland was the first one to implement it, in 1999 (20,21). As of 2007, it had been implemented in 16 county councils (14), while the remaining five were, or still are, in the process of implementation.
Presently, the form of the subscription care also varies between the county councils, but the different Public Dental Health Services are working on a common form. In 2008, the Public Dental Health Service of all 21 county councils agreed upon the name *Frisktandvård* (“Dental Care for Health”) (22) instead of subscription care. In Swedish, the name reflects that the system is regarded as a care system with a specific form of payment, not as a payment system in itself. Underlying the care system is the preventive treatment philosophy of “the undone filling”, promoting prophylactic and preventive work to, as far as possible, avoid restorative treatments.

As of yet, there is no satisfying English term agreed upon for Frisktandvård. At the moment it is called “Preventative Dental Care” (23), a term that does not fully capture the meaning of the system. Throughout this thesis, the term Frisktandvård will be used when discussing the care system in general, and “Contract care” when discussing the specific system of Frisktandvård in Värmland. Further, the fee-for-service care system in Värmland will be referred to with a capital letter: “Fee-for-service care”.

**Frisktandvård as a Health Insurance**

In essence, the system of Frisktandvård is a health insurance:

> “a full-coverage private dental insurance provided by a public monopolist” (21, p. 7).

There are three parties involved in Frisktandvård, as it is offered by the Public Dental Health Service. The first party is the one offering the health insurance, the insurer, taking the financial risk if unforeseen incidents (covered by the contractual agreement) would occur during the fixed period of time for which the patient’s fee already have been set. As for Frisktandvård, the insurer is the Public Dental Health Service. The insurer receives the payment from the patient and remunerates the caregiver.

The second party is the enrollee of the insurance, the insured, in this case a patient of the Public Dental Health Service. To enrol in the health insurance, the patient undergoes a risk assessment
performed by a caregiver, and then enters a contractual agreement with, and pays the fixed fee to, the Public Dental Health Service.

The third party is the caregiver working within the insurance scheme. Upon enrolment in subscription care, the caregiver performs the risk assessment on which the patient’s fee will be determined, and then provides oral health care within the given frames of the contractual agreement. The caregiver is remunerated by the Public Dental Health Service by salary, regardless of whether the patients pay per provided service or by fixed fee.

**Contract Care in the Public Dental Health Service in Värmland**

As previously mentioned, the Public Dental Health Service in Värmland was the first Public Dental Health Service to introduce Frisktandvård to their patients. With an exemption granted by the Ministry of Health and Social Affairs, subscription care for patients’ 20 years old was introduced in Värmland, September 1st 1998. In January 1999, when the reform was implemented by the Government, it was introduced for all adult patients, under the name Contract care (20,21).

**Influential Research**

The Contract care system was influenced by the work of Per Axelsson. In the 1970’s, the highest caries prevalence in Sweden was found in the county of Värmland (24). In the same decade, several trials of professional prophylactic measures were conducted in Karlstad, Värmland, with successful results both for children, adolescents and adults (24-27). Over 30 years, the mean number of new decayed surfaces in the adult sample (20-65 years-old in 1972; 50-95 years-old in 2002) varied between 0.7 and 2.1, while the overall plaque scores reduced from around 50-60% in 1972 to below 20% in 2002. Sites in need of periodontal therapy were reduced from around 27% to 1% (28). In all, Axelsson showed that caries and periodontal diseases are not only treatable, but most importantly very preventable, with proper maintenance by the individual and regular support from the profession.
Risk Classification
Risk classification, the basis on which the patients’ needs were assessed and her fee determined, was not only used in Contract care, but also in the Fee-for-service care system to monitor the populations’ dental health status (21). The risk was assessed in four categories: general, technical, caries and periodontal risk, see table 1. Each category was classified from “no risk” (0) to “severe risk” (3), giving a total of four possible values per category (20).

Table 1. The risk indicators of each category in the risk classification’. Reprinted with the permission from Swedish Dental Journal.

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<thead>
<tr>
<th>General risk (G)</th>
<th>Technical risk* (T)</th>
<th>Caries risk (C)</th>
<th>Periodontal risk (P)</th>
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<td>General disease</td>
<td>Morphological occlusion</td>
<td>Activity/prophylactic needs</td>
<td>Activity/prophylactic needs</td>
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<tr>
<td>Occlusion</td>
<td>Attrition</td>
<td>Saliva</td>
<td>Difficulty scaling</td>
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<tr>
<td>Dental Anxiety</td>
<td>Fillings</td>
<td>Prevalence</td>
<td>Prevalence</td>
</tr>
<tr>
<td>Cancellations/failed attendance</td>
<td>Endodontics</td>
<td>Diet</td>
<td>Smoking</td>
</tr>
<tr>
<td>Communication/ cooperation</td>
<td>Fixed prosthodontics</td>
<td>Oral hygiene</td>
<td>Oral hygiene/ gingivitis</td>
</tr>
<tr>
<td>Use of tobacco</td>
<td>Post</td>
<td>Other</td>
<td>Other</td>
</tr>
<tr>
<td>Oral mucosa</td>
<td>Removable prosthodontics</td>
<td>Other</td>
<td>Other</td>
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<tr>
<td>Other, age</td>
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Technical risk, foremost assessing past restorative treatments, was considered a more severe risk for future oral health and care needs, than were the other three categories. It was therefore weighted by two when summarizing the categories to a total risk assessment. Thus, the formula for risk assessment used was: general risk + technical risk*2 + caries risk + periodontal risk. The total number of risk classes was 16, ranging from 0 to 15 (20).

To each of the 16 risk classes, a fee schedule was linked. In 2004, the fee schedule ranged from 472 SEK per year for the lowest risk category (class 0), to 15,086 SEK per year for the highest risk category (class 15) (29). The general dental care insurance subsidized Contract care with a fixed fee of 200 SEK per year and person enrolled (15).

The Contractual Agreement
The contractual agreement between the patient and the Public Dental Health Service in Värmland was signed for two years (30)
and encompassed all basic dental care services, as regulated by law (15). In short, the contract covered:

- examinations, diagnostics and counselling
- preventive treatments
- oral surgical treatments, e.g. extractions
- pulp surgical treatments, i.e. root treatments
- restorative treatments, i.e. fillings
- other treatments, e.g. custom-fitted tray
- emergency treatments (30, p. 2, translated by the author).

Further, the contract also covered “odontologically necessary prosthodontics and orthodontics” (30, p. 2, translated by the author).

When this study was conducted in 2003, the Contract care system was available for all adult patients, i.e. there was no upper age limit. The Contract care system was voluntary for the patient. It was also voluntary for the caregiver to work within the Contract care system (31).
AIMS

Overarching Aim
The underlying assumption was that the different economical conditions in the two patient payment systems in the Public Dental Health Service in Värmland would foster different treatment philosophies and lead to different outcomes in terms of oral health-related quality of life. In Contract care, a health oriented and preventive treatment oriented approach would dominate, while a disease oriented and restorative treatment approach would dominate in Fee-for-service care. This was hypothesized to be related to different outcomes, with patients in Contract care having better oral health-related quality of life than patients in Fee-for-service care.

Specific Aims
In study I, the aim was to review previous studies on whether capitation and fee-for-service remuneration had different associations with caries incidence, restorative treatments, preventive care, productivity and satisfaction.

In study II, the aims were to compare demographics, general health and oral health-related quality of life in the patient payment systems Contract and Fee-for-service care in the Public Dental Health Service in Värmland.

In study III, the aims were to study if the patient payment systems were associated with oral health-related quality of life when controlling for confounding factors, and also to investigate how the interactions of different variables were influencing associations with oral health-related quality of life.
In study IV, the aims were to investigate if the association between patient payment system and oral health-related quality of life would remain when using path analysis to model both direct and indirect effects, as well as to study if there were different underlying mechanisms in the two payment systems that might influence the association between patient payment system and oral health-related quality of life.
MATERIAL AND METHODS

In all, two different materials and methods were used in this thesis. Study I was a literature review, using a qualitative method studying previous work conducted on the topic of financial systems’ impact on dental care. Studies II, III and IV were quantitative, analyzing empirical data collected by the author.

Study I
Material
The material was collected through searches in twelve databases, using the same search terms in each database. In all, 2,507 articles were scrutinized, generating 18 articles of interest.

Method
The Cochrane Reviewers’ Handbook 4.2.0 (32) was used as a guideline to develop a format for scrutinizing the material. The format was developed in four steps, each defining an aspect of interest. First, the participants of interest were defined: patients and caregivers in capitation and fee-for-service systems. Second, the types of comparison of interest were defined: comparisons between patients, or caregivers, in capitation and fee-for-service. Third, outcomes of interest were defined: outcome of care, productivity, satisfaction with work, and satisfaction with provided oral care. Fourth, the study designs of interest were defined: clinical examinations, patient records, and interviews with patients and caregivers, preferably comparing samples from the two systems.
Study II, III and IV

Ethical Approval

The Research Ethics Committee at Lund University reviewed and approved the study, LU 568-03 (October 2003).

Participants

In 2003, nearly 80,000 patients were enrolled on a one-year basis with the Public Dental Health Service in Värmland. Of these, some 16% were enrolled with Contract care.

Names, addresses and birth dates for 1,200 patients in each patient payment system were provided by the Public Dental Health Service in Värmland. The number of participants was calculated using power analysis, set to a 95% significance level. The patients were selected using the method of a random starting point and then selecting every n:th patient, approximating simple random sample.

Three percent of the sample was unreachable, reducing the total sample to 2,320 patients, 1,158 from Contract care and 1,162 from Fee-for-service care. After three reminders, the response rate was a modest 57%. Of the respondents, 52% belonged to Contract care and 48% to Fee-for-service care. There was no significant difference in gender distributions between the patient payment systems.

Non-response

To study possible non-response bias, a logistic regression was conducted with response/non-response as dependent variable and the data obtained from the sampling frame (gender, age and patient payment system) as the independent variables. All variables were significant, $p < 0.01$. The likelihood for response was higher for women, patients in Contract care, and increased with each life year.

Since there was non-response bias, an additional non-response study was conducted. By telephone, we interviewed 40 randomly selected non-respondents in each payment system, in total 80 non-respondents, and asked them seven questions from the questionnaire:
1. Which payment system they belonged to
2. What they had paid for their dental care the previous year
3. Their level of education
4. If they had experienced pain in the mouth
5. If they had felt insecure because of their teeth or mouth
6. If they had had difficulties doing their usual jobs because of problems with their teeth or their mouth
7. If they had felt that life in general was less satisfying because of problems with their teeth or mouth

The four latter questions were fetched from the OHIP-14 measurement, described below.

Bivariately, there were differences between respondents and non-respondents. The non-respondents had experienced less pain in the mouth, less difficulties doing their usual jobs and found life more satisfying, than had the respondents.

However, controlling for the four oral health-related quality of life questions, age, gender and education in a logistic regression with response/non-response as dependent variable, only experience of pain in the mouth increased likelihood of response: odds ratio=1.69, p=0.001.

Material
The selected patients were sent a questionnaire, containing 43 questions. The questions concerned oral health-related quality of life, general health, humanism, health locus of control, sense of coherence, dental anxiety, self-esteem, demographic questions, and economical aspects. The descriptive statistics are presented in table 2.

Oral Health-Related Quality of Life
Oral health-related quality of life was measured with the Oral Health Impact Profile (OHIP). Based on Locker’s theory of different dimensions of oral impacts (3), the OHIP was created by Slade and Spencer (33) to measure how oral health impact individuals’ quality of life in seven dimensions: functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, social disability, and handicap.
In the original, long-form measurement, the dimensions are measured with 49 questions. A short form of 14 questions has been developed by Slade (34). Both versions of the measurement can be used both in its dimensions, as well as a total score index. A low score on the OHIP indicates good oral health-related quality of life.

In this thesis, the Swedish translation (35) and the short form of the OHIP were used (OHIP-14). For both the dimensions and the total score index, the additive method of calculation (36) was used.

The OHIP-14 index had a range from 0 to 56, while the dimensions ranged from 0 to 8. The index had a Cronbach’s $\alpha$ of 0.92.

**Table 2. Descriptive statistics of variables.**

<table>
<thead>
<tr>
<th>Variable</th>
<th>n</th>
<th>%</th>
<th>Range</th>
<th>Mean</th>
<th>SD</th>
<th>Median</th>
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<td>➢ Fee-for-service care</td>
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<td>-</td>
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<td>1-11</td>
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<td>3</td>
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<tr>
<td>Paid previous year</td>
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<td>98</td>
<td>1-11</td>
<td>3</td>
<td>2</td>
<td>2</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>➢ Women</td>
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<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
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<td>46</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<td>Age</td>
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<td>21-89</td>
<td>47</td>
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<td>44</td>
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<td>-</td>
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<tr>
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<td>➢ College/University</td>
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<td>-</td>
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<td>-</td>
<td>-</td>
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<td>2-10</td>
<td>6</td>
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<td>5</td>
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<tr>
<td>Dental Anxiety Scale</td>
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<td>99</td>
<td>4-20</td>
<td>8</td>
<td>4</td>
<td>7</td>
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<tr>
<td>Humanism Scale</td>
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<td>96</td>
<td>8-40</td>
<td>33</td>
<td>6</td>
<td>34</td>
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<td>Self-Esteem Scale</td>
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<td>19</td>
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<td>Multidimensional Health Locus of Control:</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>➢ Powerful Others</td>
<td>1 277</td>
<td>97</td>
<td>2-10</td>
<td>6</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>➢ Internal</td>
<td>1 279</td>
<td>97</td>
<td>2-10</td>
<td>8</td>
<td>2</td>
<td>8</td>
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<tr>
<td>➢ Chance</td>
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<td>96</td>
<td>2-10</td>
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<td>4</td>
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<td>Sense of Coherence</td>
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<td>94</td>
<td>20-91</td>
<td>68</td>
<td>12</td>
<td>69</td>
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<td>10-71</td>
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<td>10</td>
<td>53</td>
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<tr>
<td>Mental Component Summary</td>
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<td>94</td>
<td>0-70</td>
<td>48</td>
<td>11</td>
<td>52</td>
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</tbody>
</table>
**General Health**

General health was measured with the Swedish version of the Medical Outcome Study’s Short Form 36 Questions Health Survey (SF-36) (37). The SF-36 measures health in eight dimensions: physical functioning, role-physical, bodily pain, general health, vitality, social functioning, role-emotional and mental health. The scores were weighted and calculated using the software included with the Swedish manual and interpretation guide (37). After calculations, all dimensions ranged from 0 to 100, with a higher score indicating good health.

In this thesis, both the dimensions and two overall components, physical component summary (PCS) and mental component summary (MCS) were used. The range of the PCS was 10 to 71, and Cronbach’s $\alpha$ was 0.81. The MCS ranged from 0-70, and Cronbach’s $\alpha$ was 0.84.

**Humanism**

The Humanism Scale (38), was used to measure the patient’s perceptions of the caregiver, defined by that the caregiver

1. respects the patient’s viewpoints and considers his or her opinions when determining health care decisions;
2. attends to the psychological well-being of the patient;
3. regards the patient as a unique individual;
4. treats the patient in the context of his or her family and social and physical environment;
5. possesses good communication and listening skills;
6. engenders trust and confidence;
7. demonstrates warmth and compassion; and
8. is empathetic (38, p. 447).

The measurement was used as a proxy variable for the relationship between the caregiver and patient. In essence, the Humanism scale measures if the patient perceives the caregiver as being patient-centred and has a holistic perspective on the patient, as opposed to perceiving the caregiver as being disease-centred and only focused on the mouth, without taking the patient as a person and her psychosocial context into consideration.
The scale is available in two formats: a long form with 24 questions and an abbreviated form of eight items. The higher the patient’s perception of the caregiver’s humanistic qualities, the higher the score. For the purpose of this thesis, the abbreviated Humanism Scale was translated into Swedish and modified to the oral health care situation. The scale ranged from 8 to 40, and had a Cronbach’s α of 0.91.

Health Locus of Control
Locus of control, how individuals perceive if they can influence or control occurrences, was measured with the Multidimensional Health Locus of Control (MHLC) Scales (39). The MHLC scales measure health locus of control in three dimensions: internal, chance and powerful others. Internal locus of control refers to which extent individuals perceive that they can affect their health by their actions, e.g. reducing the risk for caries by oral hygiene regimes. Chance locus of control, on the other hand, refers to if they believe that health and disease are due to external factors on which they have no influence, for example that ill health and diseases are caused by bad luck, or even superstitious beliefs such as “the evil eye”. Powerful others locus of control is similar to the chance dimension in that it refers to health and illness as being affected by forces external to the individual. However, this dimension refers specifically to the influence of significant people in the individual’s life, such as family, and healthcare professionals.

There are two forms of the MHLC scales, form A and B. In both forms, six questions measure each dimension, giving a total of 18 questions. The dimensions are measured separately. The higher the score, the higher the locus of control of the dimension.

For the purpose of this thesis, the MHLC scales form A was translated into Swedish and abbreviated to eight items. Following a principal components analysis, the scales were further reduced to six items, two items for each dimension. All dimensions ranged from 2 to 10. The Internal dimension had a Cronbach’s α of 0.71, the Chance dimension one of 0.64, and the Powerful Others dimension had a Cronbach’s α of 0.47.
Sense of Coherence

The Sense of Coherence (SoC) was used to measure the salutogenic - health oriented - aspect of ability to handle life events (40). SoC is defined as:

“[-] a global orientation that expresses the extent to which one has a pervasive, enduring though dynamic feeling of confidence that (1) the stimuli deriving from one's internal and external environments in the course of living are structured, predictable, and explicable; (2) the resources are available to one to meet the demands posed by these stimuli; and (3) these demands are challenges, worthy of investment and engagement.” (41, p.19).

As implied by the definition, there are three central themes to SoC: comprehensibility, manageability and meaningfulness. Comprehensibility refers to the ability to make sense of stimuli and occurrences, to be able to understand them. Manageability refers to the ability to cope with stimuli and occurrences, the extent to which one has resources, or the ability to gather resources, to deal with them. While comprehensibility and manageability are foremost cognitive abilities, meaningfulness is foremost an emotional one. It refers to the ability to make emotional sense of stimuli and occurrences, that what happens is worth investing and engaging in.

The central themes are intertwined and are not to be viewed as subscales. The SoC scale is used as an overall index, and a high score indicates a high SoC. The scale is available in two formats: a long form of 29 questions and a short form of 13 items.

In this thesis, the Swedish version of the short form of the SoC was used (40). The scale ranged from 20 to 91, and Cronbach’s $\alpha$ was 0.87.

Dental Anxiety

Dental anxiety was measured with Corah’s Dental Anxiety Scale (DAS) (42). The instrument measures general dental anxiety with four questions; a high score indicates a high level of dental anxiety.

For this purpose, the Swedish version (43) was used. The scale ranged from 4 to 20, and had a Cronbach’s $\alpha$ of 0.92.
Self-Esteem

A Swedish, shortened, version of the Rosenberg Self-Esteem Scale was used to assess self-esteem (44). Self-esteem, defined as “a positive or negative attitude toward a particular object, namely, the self” (44, p. 30), should not be confused with feeling superior or inferior to others. Instead, Rosenberg states that high self-esteem means

“that the individual respects himself, considers himself worthy; he does not necessarily consider himself better than others, but he definitely does not consider himself worse; he does not feel that he is the ultimate in perfection but, on the contrary, recognizes his limitations and expects to grow and improve.” (44, p. 31).

Further, low self-esteem

“implies self-rejection, self-dissatisfaction, self-contempt. The individual lacks respect for the self he observes. The self-picture is disagreeable, and he wishes it were otherwise.” (44, p. 31).

The scale ranged from 6 to 24, and had a Cronbach’s α of 0.83.

Demographics

The demography of the sample was measured with questions about birth country (Sweden, other country), marital status (married/living with somebody, unmarried/living alone), education (primary, secondary, college/university) and social affinity with neighbourhood and housing area.

The social affinity questions were used as a measurement of social anchorage, an indicator of social network (45). In this thesis, the questions were used both individually and collapsed to an index. The index ranged from 2 to 8 and had a Cronbach’s α of 0.74.

Gender, age and patient payment system were obtained from the sampling frame.
Economical Aspects

Two questions measured economical aspects. How much the participants were prepared to pay for their dental care was considered a measurement of attitude towards oral health and oral health care costs. What the patients had paid for their dental care the previous year was considered an indicator of oral health and care needs. Both questions had eleven consecutive response alternatives in intervals of 500 Swedish crowns (SEK), ranging from 0 – 5,001 SEK.

Data

The data consisted of 1,324 respondents, but full information was only available for 1,051 respondents. In study IV, where the estimation procedures did not allow for missing data, internal non-response was handled with listwise deletion.

Data were both univariately and multivariately non-normal. In attempts to normalize the distributions, log-, square root-, and inverted transformations were tested. No substantial improvements were found, and in all analyses the original, non-transformed, variables were used.

In both study III and IV, data were studied for multicollinearity, i.e. intercorrelations between independent variables. In both studies, all correlations were below 0.6 and considered moderate. Possible intercorrelations were also studied by variance inflation factors. Variance inflation factors exceeding 5 indicates severe multicollinearity (46). In both study III and IV, all variance inflation factors were lower than 2.5.

In study III, data were also studied for heteroskedasticity, i.e. unequal variance around the regression line (46). Normal probability and residual plots for the final regression analysis depicted fairly equal variance, indicating homoskedastic data. For possible improvements, outliers, i.e. extreme cases, were studied using Cook’s distance. No extreme cases were detected.

In study IV, outliers were studied with Mahalanobis distance (47). In the single sample analysis, five cases were considered outliers and deleted from the analysis. In the multiple group analysis an additional two cases, one in each payment system, were considered outliers and deleted.
Statistical Methods
In study II, the material was analysed with contingency tables $\chi^2$, independent samples t-test, Mann-Whitney non-parametric test, and logistic regression.

In study III, the material was analysed with ordinary least squares (OLS) multiple linear regression, with a hierarchical block method (48,49). The blocks of independent variables were added manually, based on theoretical considerations. The method is not to be confused with stepwise regression, where independent variables are added or removed from a regression model based on contribution to variance explanation.

In study IV, the material was analysed with ordinary least squares multiple regression for the specifications between background variables, and maximum likelihood discrepancy estimation for the path analysis. As data were non-normally distributed, a violation against the assumptions of maximum likelihood estimation (50), bootstrap means were used together with the maximum likelihood estimation. Bootstrap assesses the stability of maximum likelihood estimated parameters, by drawing subsamples from the data, assuming that data are representative of the population (47). To proximate the multiple group samples, 500 samples bootstrap was chosen. There were only small differences between bootstrap means and maximum likelihood parameters. Even when violating the normality assumption, the maximum likelihood parameters have been found to be rather robust (50-52), and in this study there was no indication of bias in the parameters.

Several fit indices were used to assess model fit. Overall fit was assessed with $\chi^2$. The error of approximation in the population was assessed with the root mean square error of approximation (RMSEA), with confidence interval (CI) and p-value for closeness of fit (PCLOSE), while the parsimony goodness of fit index (PGFI) was used to address the complexity of the model. The absolute indices used were the goodness-of-fit index (GFI) and the adjusted goodness-of-fit index (AGFI), while the incremental (comparative) indices used were the normed fit index (NFI) and the comparative fit index (CFI). The bootstrap estimate used to assess model fit was the Bollen-Stine bootstrap.
The statistical packages used were SPSS 13.0 for Windows for study II and III. In study IV, SPSS 16.0 for Windows and AMOS 16.0, included in the SPSS package, were used.
RESULTS

Study I
Aim
The aim was to review previous studies on whether capitation and fee-for-service remuneration had different associations with caries incidence, restorative treatments, preventive care, productivity and satisfaction.

Results
After scrutinizing 2,507 articles, it was concluded that there was a small, but sufficient, number of articles to limit the review to only dental care. Six questions to be answered were formulated:

1. Does capitation increase or decrease caries incidence?
2. Does capitation increase or decrease restorative treatments?
3. Does capitation increase the preventive care?
4. Does capitation increase or decrease productivity?
5. Does capitation increase or decrease the dentist’s satisfaction with his/her work?
6. Does capitation increase or decrease the patients’ satisfaction with the oral care provided?

Reviewing 18 articles on the subject of capitation and fee-for-service remuneration in dental care, the findings were inconclusive for caries incidence and prevalence in capitation. In the short time perspective, there were indications of fewer restorative treatments and more decayed teeth in capitation. However, long time data suggested a decreased need for restorative care in capitation.
Regarding preventive care, the findings pointed to more preventive treatments, mainly in the form of preventive advice and fissure sealants, with capitation. There were some contradictory findings, though.

No conclusions could be drawn about productivity in capitation, there were too few studies on the subject. Further, the studies compared capitation and salary, and not the preferred fee-for-service reimbursement. However, there were indications that productivity did not decrease.

The reviewed studies were inconclusive regarding if capitation increased or decreased the dentists’ satisfaction with their work and no conclusion could be drawn.

There was also too little information to draw any conclusions regarding patients’ satisfaction with the provided care in capitation, but it did at least not seem to decrease.
Study II
Aims
The aims of study II were to compare demographics, general health and oral health-related quality of life in the patient payment systems Contract and Fee-for-service care.

Results
Demographics
The age range was similar in the systems, but there was a significant difference in mean age. In Contract care, age ranged from 21 to 87 years old, with a mean age of 42 and a standard deviation of 13. In Fee-for-service care, age ranged from 21 to 89 years old, with a mean age of 52 and a standard deviation of 17. Thus the Contract care respondents were younger than the ones in Fee-for-service care.

The Contract care respondents were also to a larger extent born in Sweden, married or living with somebody, and had higher education, than had the Fee-for-service care respondents. However, the Fee-for-service care respondents felt stronger social affinity with their housing area, than did the Contract care respondents. All findings were significant, \( p \leq 0.05 \). There was no difference between the systems regarding social affinity with neighbourhood.

General Health
The respondents in Contract care had better general health than the Fee-for-service care respondents in half of the eight dimensions of the SF-36: physical functioning, role-physical, general health, and social functioning, see table 3.
Table 3. Statistics for the SF-36 dimensions. P-values for differences. Reprinted with the permission from Swedish Dental Journal.

<table>
<thead>
<tr>
<th></th>
<th>Contract care (678≤n≤685)</th>
<th>Fee-for-service care (604≤n≤628)</th>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td>Median</td>
</tr>
<tr>
<td>Physical Functioning</td>
<td>92.7 (13.6) 100</td>
<td>84.6 (21.8) 95</td>
<td>&lt;0.001</td>
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<tr>
<td>Role-Physical</td>
<td>84.5 (29.6) 100</td>
<td>77.0 (36.6) 100</td>
<td>0.002</td>
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<td>Bodily Pain</td>
<td>77.1 (24.1) 84</td>
<td>74.5 (26.8) 84</td>
<td>0.221</td>
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<tr>
<td>General Health</td>
<td>78.0 (19.1) 82</td>
<td>72.4 (21.9) 77</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Vitality</td>
<td>64.6 (23.2) 70</td>
<td>65.3 (24.9) 73.3</td>
<td>0.267</td>
</tr>
<tr>
<td>Social Functioning</td>
<td>87.8 (19.6) 100</td>
<td>84.9 (22.4) 100</td>
<td>0.045</td>
</tr>
<tr>
<td>Role-Emotional</td>
<td>84.7 (30.3) 100</td>
<td>83.1 (32.9) 100</td>
<td>0.570</td>
</tr>
<tr>
<td>Mental Health</td>
<td>79.0 (18.2) 84</td>
<td>78.5 (18.9) 84</td>
<td>0.962</td>
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</tbody>
</table>

Oral Health-Related Quality of Life
The oral health-related quality of life measurement used in this study was the OHIP-14, range 0 to 56, with a lower score indicating better oral health-related quality of life. With that in mind, the respondents had very good oral health-related quality of life in both payment systems.

However, there was a difference (Mann-Whitney non-parametric test, p=0.019) between the patient payment systems in overall oral health impact. The Contract care respondents had a mean overall score of 4.9 with a standard deviation of 5.3, while the Fee-for-service care respondents had a mean overall score of 6.9 with a standard deviation of 8.3. Both payment systems’ median score was 4.0. Mean rank (Mann-Whitney test) for Contract care was 616.3, while mean rank for Fee-for-service care was 664.4.

There were also differences between the systems regarding the dimensions of OHIP-14, see table 4. The patients in Contract care
had better oral health-related quality of life than had the Fee-for-service patients on all dimensions but psychological discomfort.

**Table 4.** Statistics for the OHIP-14 dimensions. P-values for differences. Reprinted with the permission from Swedish Dental Journal.

<table>
<thead>
<tr>
<th></th>
<th>Contract care (680≤n≤684)</th>
<th>Fee-for-service care (616≤n≤624)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td>Median</td>
</tr>
<tr>
<td></td>
<td>Median</td>
<td>Median</td>
<td></td>
</tr>
<tr>
<td>Functional Limitation</td>
<td>0.3 (0.8)</td>
<td>0.6 (1.3)</td>
<td>0</td>
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<tr>
<td>Physical Pain</td>
<td>1.9 (1.5)</td>
<td>2.2 (1.8)</td>
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</tr>
<tr>
<td>Psychological Discomfort</td>
<td>1.1 (1.5)</td>
<td>1.4 (1.9)</td>
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<td>Physical Disability</td>
<td>0.3 (0.8)</td>
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<td>Psychological Disability</td>
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<td>Social Disability</td>
<td>0.2 (0.7)</td>
<td>0.4 (1.0)</td>
<td>0</td>
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<td>Handicap</td>
<td>0.3 (0.8)</td>
<td>0.6 (1.2)</td>
<td>0</td>
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</table>
Study III
Aims
The aims of study III were to study if the patient payment systems were associated with oral health-related quality of life when controlling for confounding factors, and also to investigate how the interactions of different variables were influencing associations with oral health-related quality of life.

Results
The main finding was that patient payment system was associated with oral health-related quality of life: respondents in Fee-for-service care had worse oral health-related quality of life than respondents in Contract care.

Oral health-related quality of life was also associated with what the respondent had paid for dental care the previous year, with being born in another country than Sweden, dental anxiety, the perceived patient-centredness of the caregiver (humanism), ascribing health and illness to chance, sense of coherence and general health, see model 6 in table 5.

Further, with our method of entering variables to the regressions in a specific order, we could clearly see how the independent variables were affected by confounding factors. In particular, a previous association between oral health-related quality of life and education (model 4) turned out to be a spurious relationship, affected by confounding factors. When controlling for psychological factors, the association disappeared.
Table 5. The regression models with the OHIP-14 as the dependent variable. A higher score indicates worse oral health-related quality of life. P≤0.05 marked in bold. Reference category or range in brackets.

<table>
<thead>
<tr>
<th>Variable (Ref. Cat./Range)</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
<th>Model 5</th>
<th>Model 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>B0</td>
<td>2.98</td>
<td>1.70</td>
<td>1.92</td>
<td>-2.74</td>
<td>4.23</td>
<td>13.49</td>
</tr>
<tr>
<td>Financial system</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Financial System: Fee-for-service care (Contract care)</td>
<td>1.95</td>
<td>1.40</td>
<td>1.62</td>
<td>1.28</td>
<td>0.89</td>
<td>0.92</td>
</tr>
<tr>
<td>Economic factors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prepared to pay (11 categories) *</td>
<td>-0.26</td>
<td>-0.24</td>
<td>-0.20</td>
<td>0.00</td>
<td>0.04</td>
<td></td>
</tr>
<tr>
<td>Paid previous year (11 categories) *</td>
<td>0.96</td>
<td>1.00</td>
<td>0.97</td>
<td>0.74</td>
<td>0.70</td>
<td></td>
</tr>
<tr>
<td>Individual factors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender: Women (Men)</td>
<td>0.55</td>
<td>0.54</td>
<td>-0.11</td>
<td>-0.02</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (21-89)</td>
<td>-0.02</td>
<td>-0.03</td>
<td>-0.02</td>
<td>-0.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social factors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Birth country: Other Country (Sweden)</td>
<td>4.11</td>
<td>2.97</td>
<td>2.90</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marital status: Unmarried or living alone (Married or living with somebody)</td>
<td>0.75</td>
<td>0.89</td>
<td>0.40</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education: Secondary (primary, university)</td>
<td>-1.11</td>
<td>-0.87</td>
<td>-0.65</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education: University (primary, secondary)</td>
<td>-0.77</td>
<td>-0.15</td>
<td>0.14</td>
<td></td>
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</tr>
<tr>
<td>Social anchorage (2-8)</td>
<td>0.30</td>
<td>0.17</td>
<td>0.10</td>
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<td></td>
</tr>
<tr>
<td>Psychological factors</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dental Anxiety Scale (4-20)</td>
<td>0.37</td>
<td>0.25</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Humanism Scale (8-40)</td>
<td>-0.09</td>
<td>-0.09</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Self-Esteem Scale (6-24)</td>
<td>-0.37</td>
<td>-0.13</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>MHLC – Powerful Others (2-10)</td>
<td>0.14</td>
<td>-0.01</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>MHLC – Internal (2-10)</td>
<td>0.01</td>
<td>0.15</td>
<td></td>
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<tr>
<td>MHLC – Chance (2-10)</td>
<td>0.23</td>
<td>0.21</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health factors</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sense of Coherence (20-91)</td>
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<td></td>
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<td></td>
<td>-0.08</td>
<td></td>
</tr>
<tr>
<td>Physical Component Summary (9.51-71.04)</td>
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<td></td>
<td></td>
<td>-0.08</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mental Component Summary (-0.12-69.66)</td>
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<td></td>
<td></td>
<td>-0.08</td>
<td></td>
<td></td>
</tr>
<tr>
<td>n</td>
<td>1 277</td>
<td>1 239</td>
<td>1 239</td>
<td>1 195</td>
<td>1 098</td>
<td>1 051</td>
</tr>
<tr>
<td>Adj R²</td>
<td>0.02</td>
<td>0.08</td>
<td>0.08</td>
<td>0.11</td>
<td>0.18</td>
<td>0.23</td>
</tr>
<tr>
<td>F</td>
<td>25.64</td>
<td>36.93</td>
<td>36.17</td>
<td>15.81</td>
<td>15.57</td>
<td>17.57</td>
</tr>
<tr>
<td>Df 1/2</td>
<td>1/1 275</td>
<td>3/1 235</td>
<td>5/1 233</td>
<td>10/1 184</td>
<td>16/1 081</td>
<td>19/1 031</td>
</tr>
<tr>
<td>p</td>
<td>≤0.001</td>
<td>≤0.001</td>
<td>≤0.001</td>
<td>≤0.001</td>
<td>≤0.001</td>
<td>≤0.001</td>
</tr>
</tbody>
</table>

* Reference category: “0-500”. Range: blocks of 500 SEK up to “5 001 crowns or more”
Study IV
Aims
The aims of study IV were to investigate if the association between patient payment system and oral health-related quality of life would remain when using path analysis to model direct and indirect effects, as well as to study if there were different underlying mechanisms in the two payment systems that might influence the association between patient payment system and oral health-related quality of life.

Development of the Path Model
The path analysis model was built in two steps. The first step was to specify relationships between variables that were of central interest. These relationships were specified from theoretical considerations, as stated below. The second step was to specify relationships between background, confounding, variables. These relationships were based on empirical findings, both from study III and from multiple regression analyses performed during this model building.

Relationships between Variables of Central Interest
The relationships between five variables were of central interest in this study: patient payment system (referred to as FS in the model), oral health-related quality of life (OHIP), the perceived patient-centredness of the caregiver (Humanism), what the patient was prepared to pay for her dental care (PrepPay), and what she had paid for her dental care the previous year (PaidPrevYear).

One variable in the model was only endogenous (dependent): oral health-related quality of life, measured by the OHIP-14. Patient payment system was the only exogenous (independent) variable, while the economical factors and the perceived patient centredness of the caregiver where both endogenous and exogenous, i.e. mediating variables.

Originally, it was assumed that the perceived patient-centredness of the caregiver (Humanism) would influence the economical factors (PrepPay, PaidPrevYear), and that the economical factors would influence what patient payment system one belonged to (FS). However, when applying the Lee-Herschberger replacing
rules (50) to test equivalent models, there were substantially stronger empirical indications of the reversed relationships. The empirical findings were also theoretically logical and the model was revised in accordance with the findings. The revised relationships between the central variables are depicted in figure 2.

\begin{figure}
\centering
\includegraphics[width=\textwidth]{image}
\caption{Specifications between the variables of central interest in the single sample analysis model.}
\end{figure}

The model specified that the economical factors (\textit{PrepPay, PaidPrevYear}) covaried, as they were assumed to tap into the same area of measurement. They were also specified to mediate influence from patient payment system (\textit{FS}) and directly influence oral health-related quality of life (\textit{OHIP}) and the perceived patient-centredness of the caregiver (\textit{Humanism}). Perceived patient-centredness (\textit{Humanism}) was specified to mediate influence from patient payment system (\textit{FS}), with a direct influence on oral health-related quality of life (\textit{OHIP}). Finally, patient payment system (\textit{FS}) was specified to influence oral health-related quality of life (\textit{OHIP}) directly, as found in study III, and indirectly, through \textit{Humanism, PrepPay, and PaidPrevYear}.

\textbf{Relationships between Background Variables}
The relationships between background variables were empirically derived. To specify relationships between the background
variables, multiple regression analyses were performed. The variables were grouped into three categories: health, psychological and social pattern variables. To minimize complexity in the model, no influences were specified within the categories. Further, the categories were assumed to influence each other only in a specific direction.

The social pattern variables (Age, BirthCountry, MaritalStatus, Education, SocAnchorage) were assumed as exogenous variables, only influencing other variables. The psychological variables (SoC, MHLCLInternal, MHLCLChance, DAS, Selfesteem) were assumed to be influenced by social pattern variables, and in turn influence the health and central variables. The health variables (PCS, MCS) were specified to influence the central variables, but also to covary, as they have been found to be mutually dependent (53).

When initially assessing the model, modification indices (MI) were specified. Among the modifications proposed to improve the model, two modifications would substantially improve the model: a direct influence of Age on Education (MI: 150), and a covariance between Selfesteem and SoC (MI: 269). Both proposals were logically and empirically motivated, and the model was modified.

Results
The fit of the model was found adequate. It was assumed that if also mediating the relationship between patient payment system and oral health-related quality of life through perceived patient-centredness of the caregiver (Humanism), the significant association found in study III would disappear. This turned out not to be the case. In single sample analysis, the relationship was still significant (p≤0.05): Fee-for-service care respondents had worse oral health-related quality of life also when modelling both direct and indirect effects. Further, patient payment system had no significant association with the perceived patient-centredness of the caregiver (Humanism).

To study underlying mechanisms, the patient payment system variable was deleted from the model, and a multiple group analysis was conducted. The model fit was also here found adequate. The relationships of central interest were now between four variables: oral health-related quality of life (OHIP), perceived patient-
centredness of the caregiver (Humanism), what the patients were prepared to pay for their dental care (PrepPay), and what they had paid the previous year (PaidPrevYear).

In all, there were more similarities than differences between the systems. Of 50 regression paths and three covariances, differences between the systems were found in 15, most of them minor. All differences but one found between the payment systems regarding background variables were not related to differences in associations with oral health-related quality of life. The only background variable with different associations with oral health-related quality of life was being foreign born, that was associated with decreased oral health-related quality of life only in Fee-for-service care. All significant paths from the multiple group analysis are depicted in figure 3.

**Figure 3.** Significant paths and covariances from the multiple group path analysis. Black arrows indicate significance in both systems. Green arrows indicate significance only in Fee-for-service care, while red arrows indicate significance only in Contract care. Error terms only included for covariances.
The prominent differences were found in the variables of central interest. In figure 4, the results for the variables of central interest are presented separately for each payment system. In Fee-for-service care, the perceived patient-centredness was associated with oral health-related quality of life: the more the patient perceived the caregiver as having a patient-centred and holistic perspective, the better the oral health-related quality of life she had. This relationship did not exist in Contract care. In Contract care on the other hand, the perceived patient-centredness was associated with how much the patient was prepared to pay: the more she was prepared to pay, the higher she ranked her caregiver as being patient-centred. This was not found in Fee-for-service care.

![Figure 4](image)

**Figure 4.** Results for the variables of central interest, presented separately for Contract and Fee-for-service care. Significant weights marked in bold, non-significant weights marked as “ns”.

What the patient had paid for dental care was associated with oral health-related quality of life in both payment systems: the more the patient had paid the previous year, the worse oral health-related quality of life she had. However, the association was twice as strong in Fee-for-service care, compared to Contract care. All differences were significant, p≤0.05.

In conclusion, the differences found between the systems in the multiple group path analysis seem to indicate that there were different mechanisms underlying the previously found association between oral health-related quality of life and patient payment system. However, the prominent differences were not related to
background variables, but to variables associated with the dental care situation. Thus, our hypothesis of the characteristics of the payment systems influencing oral health-related quality of life was not disconfirmed.
DISCUSSION

Methodological Discussion
Design
This study had a natural groups design, as enrolment in the payment systems was self-selected. Research with natural groups designs has been criticised for problems in drawing conclusions about effects (54). As enrolment in the groups is not random, the researcher has limited control over confounding factors and other possible explanations to differences in effects. Natural groups designs foremost suffer from the possibility of selection bias, i.e. that the different groups attract different types of people, which may produce inherent group differences unrelated to the phenomenon the researcher wishes to study. In this thesis, a selection bias was found. The patients in the Contract care system were younger, higher educated, to a higher extent married or living with somebody, and more often born in Sweden, than were the patients in Fee-for-service care. However, in multivariate analyses, age, gender, education and marital status were not associated with oral health-related quality of life, indicating that there were other things than selection bias behind the association between patient payment system and oral health-related quality of life.

The study design was cross-sectional, which also poses limitations when it comes to drawing conclusions regarding causal processes in the payment systems. To establish certainty about cause and effect of the payment systems effects on oral health-related quality of life, longitudinal data are needed, with baseline information regarding oral health-related quality of life.
Non-response
The response rate in this study was a modest 57%, after three reminders. Non-response is associated with the problem of introducing bias in the study. However, bias is not simply related to the rate of response, reliable results have been found even with high non-response (55-57). On the contrary.

“non-response bias is a possibility whatever the response rate and should not be ruled out or assumed by investigators until non-response bias analysis has been undertaken”
(55, p.112).

In this thesis, two non-response analyses were undertaken. The first was conducted on the data known from the sampling frame: age, gender and payment system. The analysis established that non-response was not random: response rates were significantly higher for women, for each additional life year and for Contract care patients. The second non-response analysis was conducted with additional data, gathered through telephone interviews with a sample of non-respondents. In multivariate analysis, the results indicated a possible bias with respondents having experienced somewhat more pain than had the respondents.

Several factors have been found to influence response rates. Among other things, monetary incentives, short questionnaires, pre-notification contacts, follow-up contacts, and additional questionnaires in postal follow up have been found to increase response (58,59). In this survey, the length of the questionnaire was probably an important contributing factor to the rate of non-response. This survey was extensive, with 14 pages of questions, which was stated as reason for non-response by non-respondents in contact with the author. To increase response, follow-up contacts were conducted in the form of three reminders. The first contained only a pamphlet, while the following two also contained new questionnaires.

Low response rates are an increasing problem in mail surveys, and an issue that may be further aggravating. Studying response in two respiratory symptoms surveys, Hazell et al (60) found increased non-response in 2004 compared to 2001. They discuss
that reductions in response rates likely are a multifactorial effect, but specifies that increases in the number of conducted surveys and unsolicited mail may be contributing factors.

The OHIP-14 Measurement
The outcome measurement OHIP-14 contains methodological issues. First, the measurement suffers from a so called “floor effect”, i.e. that

“many scores pile up at the low end [of the scale] because it is impossible to have a lower score” (61, p. 20).

As a lower score indicates better oral health-related quality of life in the OHIP-14 measurement, a floor effect means that the measurement has a limit in its ability to discriminate differences in health. It has, on the other hand, the ability to discriminate poor health. The floor effect raises the question as to whether the short form of the Oral Health Impact Profile actually measures health impact, or rather measure disease impact.

The floor effect of the OHIP-14 is related to a skewed distribution of scores, which necessitates either statistical transformation to normalize the distribution, or the use of non-parametric tests if normal distribution cannot be obtained. In this thesis, the distribution was skewed and had a distinct floor effect. In an attempt to normalize the distribution, log, square root, and inverted transformations were applied. Neither transformation method produced a shape approaching a normal distribution.

Due to the floor effect, the OHIP-14 may not be able to detect improvements in oral health-related quality of life if used in longitudinal or other repeated measures studies. Locker at al (62) found that 19% of elderly respondents stating that their oral health was fair or poor had a total OHIP-14 score of zero. A possible improvement in their oral health could not have been detected with the OHIP-14. Allen and Locker (63) found that the OHIP-14 was poor in detecting improvements in oral health-related quality of life of edentulous people after prosthodontic treatment, compared to the long form (OHIP-49) and a modified short version (OHIP-EDENT). It has, on the other hand, been found to discriminate
between groups: dentate/edentulous, dentate with/without partial dentures, groups with/without xerostomia, and between groups with/without chewing difficulties (64).

The OHIP measurement, both in the long and short form, is assumed to be a multidimensional measure. Baker et al (65), applied structural equation modeling to the OHIP-49 to address the issue. Using confirmatory factor analysis, they found that the measurement indeed was multidimensional, but the specified dimensional construct was not validated (65). Similar results have been shown with exploratory factor analysis (66). The findings suggest that the OHIP measurement could be used as a total score index, but that the dimensions of the measurement should not be used, as it is questionable if the dimensions measure what they are assumed to.

A final consideration about the OHIP-14 measurements concerns comparisons with other findings. Besides issues regarding, for example, cultural differences in views of oral health, or nuance differences in translations, there is also the issue regarding calculation method to consider. There are three methods to calculate scores: simple count, additive, and weighted-standardised (36). As the different calculation methods lead to different overall scores, comparisons between different findings of the OHIP-14 can be made only across studies using the same calculating method. In this thesis, the additive method, where the scores simply are summed to a total score, was used. The additive method has been found to perform as well as the weighted-standardized method (36,67), and better than the simple count method (36).

**Statistical Methods**

In the third study of this thesis, multiple regression analyses were used. In the final model, an $R^2$ of 0.23 was obtained, i.e. the model explained 23% of the variance. Whether the fit is satisfactory or not cannot be determined by any simple method (46). It is not uncommon with this size of variance explanations in social sciences. However, the reason for using multiple regression analysis in this thesis was not variance explanation, but interest in the independent variables. With the hierarchical block method the interference of uncontrolled variables on the association between a
specific independent and the dependent variable could be studied, providing a better understanding of interactions between different factors.

In the fourth study in this thesis, path analysis, a member of the structural equation family, was used. An ongoing debate within the structural equation modeling field is the practice of treating categorical variables as being continuous. It has been reported that few categories and highly skewed data can lead to inflated Pearson correlations, underestimation of factor loadings and correlations, and low standard errors (47). A minimum of four categories has been suggested, with increasing number of categories minimizing the problem. Variables with two categories, skewness exceeding 1.0 and especially skewness in opposite directions seem to affect the analyses most. In this study, variables with two or three categories were included, which may have impacted parameter estimates and model fit.

Consistency between a model and data does not entail anything about the model’s correspondence to reality (68). At best, the model approximates reality. Further, to a good fitting model, there are always other equally possible models. Therefore, the results found in Study IV should be regarded as explorative.

**Factual Discussion**

**Findings**
The first empirical paper (Study II) pointed to differences between the enrollees in the payment systems: the patients in Contract care were younger, better educated, to a higher extent married or living with somebody, born in Sweden, and healthier - both in terms of general health and oral health-related quality of life. On the other hand, the Fee-for-service patients experienced stronger social affinity with their housing area. The findings indicated selection bias, i.e. that the different payment systems attracted different types of people.

The second empirical paper (Study III) challenged the indications of the descriptive findings. As there were differences between the patients in the systems, it was expected that these differences would be associated with oral health-related quality of life; that age, education, marital status, birth country and health would be
significantly associated with the OHIP, but that the patient payment system variable would not. This turned out not to be the case. Oral health-related quality of life turned out not to be associated with age, gender, education nor marital status, when including psychological and health factors. Payment system, on the other hand, was significantly associated with oral health-related quality of life, other factors being controlled for. The findings from these analyses suggested that there may be differences inherent in the care systems influencing oral health-related quality of life. The possibility of a selection bias could not be disregarded due to the cross-sectional design of the study, but the argument of selection bias was weakened. As most imaginable selection factors like age, education and attitudes were controlled, bias appears less likely.

In the third empirical paper (Study IV), the ambition was to study if there were different underlying mechanisms in the two systems, which may explain the association between oral health-related quality of life and patient payment system. The multiple group analysis, where the same model was tested simultaneously for both systems, did indeed indicate different underlying mechanisms. While there was a significant association between the perception of the caregiver's patient-centredness (Humanism) and oral health-related quality of life in Fee-for-service care, there was no such relationship in Contract care. In Contract care, on the other hand, there was a significant association between how much the patient was prepared to pay and how patient-centred she perceived the caregiver to be.

What the patient had paid for dental care the previous year was associated with a decrease in oral health-related quality of life in both systems. However, the association was twice as strong in Fee-for-service care, compared to Contract care.

As for associations between background variables and oral health-related quality of life, there was one noteworthy difference between the systems: being born outside of Sweden was associated with a decrease in oral health-related quality of life in Fee-for-service care, but not in Contract care. The result could be due to that there were more foreign-born participants in Fee-for-service care, compared to Contract care. When conducting the multiple regression analyses in Study III, it was suggested that the inclusion
of participants born outside of Sweden might be distorting the results. To investigate that possibility, the analyses were conducted excluding all participants born outside of Sweden. Except for minor variations in regression weights, which would be expected when one variable and a part of the sample is eliminated, there were no differences in significant associations. Thus, the inclusion of foreign born was not found to distort the results and therefore it was also included in the path analyses. As the main differences found between the systems were not related to background variables, the findings do not disconfirm that the previously found association between patient payment system and oral health-related quality of life was due to characteristics of the payment systems themselves. However, the results from this study should be regarded as explorative.

In conclusion, there were differences between the patients in Contract and Fee-for-service care, associated with oral health-related quality of life. Even though selection bias cannot be excluded, the fact that the bivariate differences between the payment systems regarding education and age did not remain in the multivariate analyses indicate that the differences found in oral health-related quality of life may be due to the payment systems themselves. This was also indicated by the fact that the differences found in underlying mechanisms in the patient payment systems were not related to background variables, but to variables associated with the dental care situation.

Other Research about Contract Care in Värmland

In 1999 to 2001, a health economic study of the Contract care system in Värmland was conducted (21). Focusing on the aspect of the system as a health insurance, adverse selection, dropout, and moral hazard were investigated (21).

Grönqvist found that adverse selection was concentrated to the higher risk classes: in these classes individuals enrolling in Contract care had higher past dental care costs than had individuals with the same risks who did not enrol. On the other hand, there was advantageous selection in the low-risk classes. Here, the individuals that enrolled in Contract care had lower past dental care costs than
had individuals who stayed in Fee-for-service care. In all, adverse selection seemed to be balanced out at an aggregated level (21).

As for dropout, Grönqvist found that asymmetric information problems between caregivers and patients might be underlying dropout. If the enrollees were reclassified to a higher risk class when the contract expired, or had lower care consumption than expected, they were more inclined to drop out. It seemed that higher reclassification was not perceived as fair risk assessments, but as higher prices. Grönqvist concludes:

“The results show that patients respond to economic circumstances in the decision on whether to leave the insurance. Patients are more prone to opt out when reclassified into higher premium classes, or when they have an unexpectedly low dental consumption. They are more responsive to higher premiums than to reduced expected costs.” (21, p. 67).

The results touch on that found in Study IV of this thesis: that what the patient in Contract care was prepared to pay was associated with her perception of the caregiver’s patient-centred stance. A possible explanation for the association is that the patients in Contract care view the system primarily as a payment system, and not as a care system aiming at promoting oral health and preventing future disease. Also, if the patient does not perceive higher risk classification as a fair assessment, it may indicate problems for the caregiver in communicating the factors and risks affecting oral health.

Moral hazard, i.e. increased demand when insurance leads to decreased costs (69,70), seemed to be present in the Contract care system in Värmland, with dental costs increasing between 51% and 84% (percentage dependent on estimator used) (21). However, whether increased utilization was due to increased demand or to the preventive orientation of the system was difficult to establish. The highest increase in costs concerned prevention, but there was also an increase in examinations and other services such as restorations, dentures and acute treatment.
Grönqvist writes:

“The increased utilization is partly driven by the way the insurance is run, as there is an explicit strategy for avoiding costly treatment by detecting dental problems at an early stage of progression and investing in prevention. It is therefore difficult to determine to what extent the estimated increase in examinations and prevention is due to changes in demand, and to what extent it is driven by the program [i.e. the Contract care system, authors note].” (21, p. 92).

Increased utilization could be a possible explanation to the Contract care – better oral health-related quality of life association found in this thesis. However, as the issue was not explored in this thesis, the possibility remains only a speculation.

In all, the findings from Grönqvist’s study in Värmland provide little information as for the patient payment system and oral health-related quality of life association. Although the findings of advantageous selection in Contract care give support to a possible selection bias influencing the results, the possibility of better oral health-related quality of life as a result of increased utilization must also be considered.

At the conference on Frisktandvård in Luleå, Sweden, in September 2008, the Public Dental Health Service in Värmland presented results from a retrospective comparative study over nine years, of patients enrolled in Contract or Fee-for-service care since they were 20 years old in 1998. The groups were matched regarding caries risk, clinic and caregiver. Studying clinical records and x-rays, there were significant differences between the systems regarding caries progression. In Fee-for-service care, more patients had decay that had progressed from class 1 to class 2, or from class 2 to class 3 over the nine years, than in Contract care. In Contract care, on the other hand, there were more patients with decay remaining as class 1 over the years. The results indicated better maintenance of oral health in Contract care and faster rate of decay in Fee-for-service care (71).
Other Research about Dental Care

Research with Similar Arrangements

There is research on payment and insurance systems within dental health care. However, research on different patient payment systems where the caregiver is remunerated by salary seems to be scarce. There are only a few studies where the arrangements were similar to that of Contract care, both for patient and caregiver.

In the United States, an employer-provided dental benefit program was compared to a fee-for-service plan in the 1960’s (72,73). Compared to the fee-for-service plan, the utilization rate was higher and more prophylaxis and partial dentures were provided in the employer-provided benefit program. However, there were similar extraction rates, and rates of crown and bridges, and similar percentage of services performed over three years (73).

In Sweden, a trial of capitated patient payment was conducted in a public dental service clinic in Gothenburg in the early 1990’s (74). The patients were classified into one of three risk groups, each with a set fee. The capitated plan included examinations, general dental treatment, an individual preventive programme (including prescriptions) and treatment of causes of disease. If not complying with the terms of the plan, e.g. adhering to the self-care preventive measures or not showing up at appointments, the patient would be dismissed from the plan. It was found that the periodontal conditions improved in all risk groups, and the main reason for restorative treatments was due to problems with old restorations. In a sample of patients enrolled for six years, one third of the performed restorations were performed due to caries. The enrollees’ attitudes to the capitation plan was positive; of the 83% responding to a questionnaire, 98% preferred the plan before the traditional fee-for-service system, and they claimed increased awareness of hygiene, diet and home care (74). Comparing the capitation plan enrollees to a sample of fee-for-service enrollees with similar socio-economic background, the capitation enrollees had less caries activity, less average number of bleeding pockets, and less average number of pockets \( \geq 6 \text{ mm} \). However, it should be noted that the capitation enrollees also had a lower DMFS at baseline, compared to the fee-for-service patients (74).
In 2004, a pilot project of subscription care was initiated in Gothenburg, Sweden. In a retrospective study using register data, Berggren (75) found that patients in the subscription care project received significantly more examinations and preventive treatments, than did a matched group of fee-for-service patients. On the other hand, the fee-for-service patients received significantly more restorative treatments.

A new study of subscription care is being undertaken in the county of Västra Götaland (76). Results from the study had not yet been published when this thesis was written. However, results regarding provided treatments were presented in a poster session at the Annual Congress of the European Association of Dental Public Health in Tromsø, Norway, in September 2009. Comparing patients with capitated payment with a sociodemographically matched sample of fee-for-service patients, interim results of provided treatments showed that there were no significant differences in number of treatments between capitation and fee-for-service patients. The patients in capitation had fewer visits with dentists, but more with dental hygienists, than the fee-for-service patients had. The capitation patients also received fewer restorative treatments and more preventive services (77).

In line with the assumption underlying this thesis, all studies point in the same direction: that fixed-fee patient payment increases preventive services. The same indications have been found in studies focusing on capitation and fee-for-service remuneration for caregivers.

Research with Other Types of Arrangements

In a capitation trial for children and adolescents in Great Britain in the 1990’s, there were indications of more decayed and less filled teeth in capitation in the short run (78,79). There were also indications that more preventive services were provided in capitation, mainly in the form of advice on how to control disease with hygiene routines and diet. However, there was ambiguous evidence on whether the preventive advice given had an effect or not. Further, the recording of preventive advice in patient records was inadequate in both systems (80).
In the long run, there was a decrease in number of examinations, visits and x-rays (81,82). Fewer fillings and more fissure sealants were provided (81-84), and both caries prevalence and experience had decreased. However, the decrease was mainly due to the decrease in number of filled teeth, while the level of decay had slightly increased (82-84). There was also an increase in preventive advice (81,82).

In a small study of solo practices, Rosen and Sussman (85) found indications of a “prevention-oriented style” of treatment in capitation compared to in fee-for-service care. Even though there were variations between the three participating dentists, patients in capitation received significantly more prophylactic services (cleanings), non-significantly more diagnostic care and had a somewhat higher continuity of care. The provision of fillings was also lower in capitation, but the average number of extractions was the same in both systems (85).

Even though these studies indicate increased preventive strategies in capitation, evidence on the long-term efficiency of such strategies is still lacking. However, the ongoing insurance study in Västra Götaland, Sweden, is longitudinal and will also assess oral health-related quality of life.

Contradictory Findings
However, all studies have not found evidence in favour of capitation. There are also studies with contradictory results.

In a comparison of capitation and fee-for-service in a dual choice dental care program in California in the 1970’s, Olsen and Chetelat (86) found only two services more often in capitation than in fee-for-service care: x-rays and removable partial dentures. Besides the amount of provided prophylactic services (cleanings), which was the same in both systems, all other services were more frequent in fee-for-service care. The authors concluded that the findings may be due to the fact that the dentist had sole risk responsibility:

“It appears that when the element of dentist risk is removed under the fee-for-service approach, practitioners are more likely to perform work in keeping with higher professional standards
and provide more comprehensive care” (86, p.50).

Beazoglou et al (87), studying a free-choice dual option dental benefit plan, found that fee-for-service patients received more prophylaxis than capitation patients. The total expenditures for diagnostic and preventive services per subscriber were also higher for fee-for-service than capitation patients. They argue that the fixed capitation fee might reduce the caregivers possibilities to meet other dental needs if preventive services are provided, an argument in line with that of Olsen and Chetelat (86), mentioned above.

Coulter and colleagues, comparing capitation and fee-for-service dental benefit plans, found that fee-for-service enrollees were older (88), reported having better oral health status (88,89) and fewer teeth with decay, than did the capitation enrollees (88). The fee-for-service enrollees where also more satisfied with their plans and their dentist, than were the capitation enrollees (88,90).

In all, the findings on capitation and fee-for-service are mixed. However, it should be noted that the findings favouring fee-for-service emanate from the United States, which have a wide array of dental care delivery systems and insurance plans. The diversity in plans may be a contributing factor to the differences in results.

The RAND Health Insurance Experiment

The most well-known study of the relationship between payment and care is the RAND Health Insurance Experiment, studying the impact on dental care of free, intermediate (25% and 50%), and extensive (95%) cost-sharing (out-of-pocket payment) fee-for-service plans (91-93). Although the experiment did not address the issue of capitation and fee-for-service in dental care, the findings provide insight into the workings of insurance and fixed costs that is relevant for this thesis. As mentioned in the introduction, the Contract care system in Värmland is in essence a health insurance, where the fee is paid in advance of care. As payment is unrelated to provision of services, the situation resembles that of the RAND insurance plan with zero cost-sharing (free plan). The Fee-for-service patients have on the other hand a situation similar to the cost-sharing plans, where out-of-pocket-payments were paid at the time of service.
The RAND Health Insurance Experiment found that free dental care was associated with better oral health. There was less decay (91-93), more filled teeth (93) and better periodontal status (91,93).

“Subjects with moderate to advanced periodontal disease, poorer oral hygiene, and two or more carious teeth received more appropriate curative or preventive treatments if they were in the free rather than the pay plans” (93, p. 240).

The utilization of periodontal services was higher (94), more preventive services in the form of topical fluorides and prophylaxes were provided (91), and the free care participants brushed and flossed more, than did the participants in the co-payment plans. However, there were no differences between plans as to social impact due to teeth or mouth (91).

The findings from the Rand HIE indicated undertreatment of decay (91,93), an issue often described as a possible effect of capitation reimbursement and fixed patient payment. However, the undertreatment was less in the free plan, compared to the cost-sharing ones. In the extensive cost-sharing plan (95%), 12% of carious teeth were treated within 12 months, while 30% were treated in the free plan (93).

In sum, the RAND Health Insurance Experiment found that oral health was better in the free dental care plan, with less decay and more fillings compared to the cost-sharing plans. Further, the enrollees in the free plan received more preventive services, and also took better care of their oral hygiene. The results are in line with that of the capitation trial for children in Great Britain (79-82), and the studies by Schoen (73), Zickert et al (74), Hakeberg et al (77), and Rosen and Sussman (85).

The RAND Health Insurance Experiment also studied differences between the fee-for-service plans and a prepaid health maintenance organization plan, although not on dental health indicators. Two groups were studied in the health maintenance plan: one group with patients that were assigned to the plan (experimental), and one with patients that were already enrolled with the health maintenance organization plan (control). Both
health maintenance organization groups were more satisfied with their costs than were the fee-for-service plan patients, but the fee-for-service participants were more satisfied with their care than were those in the experimental health maintenance organization plan. The control group was on the other hand more satisfied than the experimental group. Further, the fee-for-service patients were more satisfied with the time they had to wait to get an appointment to a physician, while both health maintenance organization groups were more satisfied with the waiting time in the office. As for physiological outcomes for the average person, health habits, or measures of general health, no differences were found between the fee-for-service and health maintenance organization plans (93).

Other Research - Concluding Remarks
Although there are contradictory findings, the main body of research has found increased preventive services in capitation, and in fixed-fee patient payment, compared to fee-for-service. In the long run, there are indications on decreased restorative treatments. However, as long-term research is scarce, there are no definite results on the efficiency of the preventive strategies.

A Note on the Issue of Over and Undertreatment
As mentioned in the introduction, fee-for-service systems have been criticised for fostering incentives for overproduction (17). Capitated and fixed-fee systems have on the other hand been criticised for fostering incentives for undertreatment. Overtreatment may be difficult to discover, as the evidence is ruined during treatment (17). Undertreatment, on the other hand, can be discovered and rectified. In the literature review (Study I), undertreatment could not be established in capitation systems. On the contrary, there were indications of a different treatment philosophy of giving preventive treatments a chance to work before turning to restorative treatments. However, Karin Ridell found that unrestored dentine lesions, and deep dentine restorations were common among 15-year-olds in Malmö, Sweden (95). This indicates undertreatment in the free dental care system for children.
and adolescents, where the caregiver usually is reimbursed by a capitated fee.

However, in relation to over and undertreatment it must be noted that treatment decisions are not only affected by economical aspects. Lotte Bøgh Andersen has studied how professional norms and economical incentive affect choice of treatment (96). She found that when there were strong professional norms, as giving tooth brushing instructions to children, there were no differences between privately or publicly employed dentists. With fissure sealants, where there were no strong professional norms, the publicly employed dentists provided significantly more sealants than did the privately employed dentists. This indicated that the dentists behaved differently depending on economical incentives when there were no strong professional norms.
CONCLUDING REMARKS

• This thesis found that there was an association between patient payment system and oral health-related quality of life, when other factors were controlled for. Other research has found that fixed-fee patient payment, as in Contract care, increase preventive treatments. As the research by Per Axelsson has shown, preventive treatments can in the long run maintain oral health and decrease the need for restorative treatments. However, more research is needed before definite conclusions regarding long-term effects of fixed-fee patient payment will be possible.

• On a general level, this thesis points to two important issues of relevance to research in general. First, the findings from Study III showed the importance of not only including background and possible confounding variables when analysing associations, but also to investigate the interactions between independent variables to gain a fuller understanding of the complex interactions of different factors in social science. Second, this thesis shows the importance of analysing results with different statistical methods, to twist and turn the material, for better understanding of mechanisms behind associations. In the end, results may not always turn out to be what they first seem.
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REFERENCES


(10) Reisine S, Locker D. Social, psychological, and economic impacts of oral conditions and treatments. In: Cohen LK, Gift HC, editors. Disease
prevention and oral health promotion: socio-dental science in action


(22) Personal communication. 4:e Nationella Frisktandvårdskonferensen, Luleå, Sverige 3 - 4 september, 2008.


APPENDIX

Study I
Study II
Study III
Study IV
Questionnaire