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Lien Nguyen · Unto Häkkinen
National Research and Development Center for Welfare and Health (STAKES), Helsinki, Finland

Choices and utilization in dental care

Public vs. private dental sectors, and the impact of a two-channel financed health care system

The Finnish dental care system features several rather unique characteristics that can be assumed to have implications for the socioeconomic inequity in dental care utilization. First, there are two parallel delivery systems: the municipal system and the private system. Second, although public subsidies cover services provided by both public and private dental sectors, these have different remuneration systems with differences in cost sharing by patients. Third, until 2000 publicly subsidized dental care was, as per statute, provided only to adults born in or after 1956.

The public subsidy scheme for this age group was meant to improve access to dental care in both sectors (measured as a higher likelihood of having a dental visit) and to increase the amount of care consumed. Through these effects a reduction in inequities in the use of dental services was expected. However, the existence of two parallel delivery systems with multi-channel-financed services has been found to create barriers and provider-offered incentives relating to dental use for both patients and dentists, such as the availability of sector-specific dental services and the dentist's recall. The supply of dental care has been unevenly distributed between different regions in the country: the public provision has generally been rather good in small towns, whereas the private provision has been concentrated in large cities. The recall of adult clients for check-ups usually practiced by private dentists might also have implications for inequity in the utilization of dental care. In addition, the presence of different payment systems has intrinsically generated a self-selection mechanism that has led the dental sectors to serve different clienteles according to individual socioeconomic backgrounds. It was found that most of the visits to public dentists in Finland in 1996 were made by the lowest income groups, while most of those to private dentists were made by the highest income groups [1]. Moreover, over the past two decades higher income individuals in Finland have used dental care services more than their lower income counterparts [1, 2, 3, 4].

Income has been shown to have a positive effect on access to dental care [5] and to hospital care [6], on the use of medical specialists' services [7], and on the choice of a medical specialist as opposed to a general practitioner and also the subsequent choice of either public or private specialist [8]. Choices between public and private health care in the United Kingdom [9] and the choice of dental sectors in Finland [10] have been examined. However, the latter two studies considered only one decision level of the utilization process – either the contact decision or the sector choice – and thus do not allow for further study of the amount of care received from each sector. In this context, the present work complements these two studies.

The objective of this work is to investigate the determinants of the utilization of dentists' services among Finns entitled to subsidized dental care on the basis of age. This study contributes to the literature on dental care utilization in that the overall decision-making process of utilization involving three decision stages – access to dental services, the choice of a public/private dentist, and the number of visits to each chosen dentist – is examined within the framework of a three-part model. In particular, we tackle the factors affecting the choice between dental sectors. The consumer is assumed, in the spirit of Grossman's demand theory, to choose from between two dental sectors the one that has relatively better availability with relatively lower price of care, other things being the same. The study approach applied here has not been used in any earlier study of health care utilization.

The Finnish dental care system

In Finland, local authorities (municipalities) are responsible for delivering health care services for their residents and for operating primary health care centers. Public health services are financed by municipal taxes, state subsidies, and user charges. They are supplemented by private health services, which are partly reimbursed by the National Health Insurance (NHI). Oral health services are provided by both public and private dental sectors. The former also includes a small separate segment encompassing university student dental care and army dental clinics.

In 1996, children and adolescents up to their 19th birthday were entitled to free

Table 1

Main differences in the two parallel delivery systems and the age group entitled to subsidized dental care in Finland in 1996

	Public dental system	Private dental system
Patient group		
• Age 19–40 years	Eligible for subsidized dental care	60% National Health Insurance subsidy[a] (0% for orthodontics and prosthetics), in effect 35–40% reimbursement
Attribute of dental care		
• Cost	Cheaper than private dental care, low user fees	Always more expensive than public dental care, high copayments
• Availability	Restricted capacity, yet good in some rural areas	Good in urban areas and highly populated centers
• Dentist's payment system	Monthly salary	Fixed fee-for-service basis
• Dentist's recall	To those aged under 18 years	To adult clients

[a] *According to the National Health Insurance's own fixed tariffs for treatments and procedures provided by private dentists. Some private dental services are not compensated at all*

dental care, while adults born in 1956 or later were entitled to subsidized dental care at health centers. These adults could also use private dentists' services and then claim a reimbursement from the NHI. About 20% of the population lived in municipalities where health centers provided dental services for the entire population in 1996; most of these municipalities were quite small. However, intermediate-sized municipalities could cover mainly those young persons according to the statutory requirements, and the age limits for access to public dental care were even lower in larger municipalities [11]. The main differences in the two parallel systems concerning the age group used in the study are summarized in ◘ Table 1.

The user fees of public dental services are determined by regulation. The health centers charge dental services at fixed user fees, while there is no private dental insurance. (The central government gives recommendations on maximum user fees for dental care services, but each municipality determines its own user fees.) Prices for private dental services have not been regulated at all since the beginning of 1993. Average private service charges in health clinics or dentist's offices were on a fairly similar level across the country in 1998 [12]. User charges contributed 62% to oral health care financing in 1996, while municipalities (including state subsidies) contributed 30% and the NHI 8%. Overall half of the total number of dentists practiced in the public sector.

Theoretical and practical background

Utilization of health care can be substantially influenced by both users and providers [13]. In the analysis of dental service utilization, Grossman's demand theory has traditionally been applied on the demand side. Among theories applied to the supply side that can influence utilization, supply inducement and rationing are generally drawn upon (for a review of dental economics see [14]).

According to Grossman's [15] demand theory, the consumption of dental care services is derived from the demand for dental health. Dental care services are sought because of their potential for preventing the depletion of good oral health and improving oral health. On the constraint side, income basically determines the set of feasible choices between dental care and other goods. The theory proposes which variables should be encompassed in empirical models. On the other hand, in the literature on health economics no consensus has been reached for the so-called supplier-induced demand (SID) hypothesis due to the lack of theoretical models and problems in empirical analyses of SID (see e.g. [14]). Nevertheless, efforts to test the existence of SID have traditionally relied on the positive correlation between the dentist to population ratio and individual utilization of dental care [16, 17]. In dentistry in Finland there are empirical findings on inducement that are based on dentist's recall [5, 18]. The recall of adult clients for regular dental check-ups is a typical form of inducement usually practiced by private sector dentists in Finland. Recall was also found to have an impact on an individual's decision to contact a dentist in Sweden [19] and in Norway [20, 21], where the dental care systems closely resemble that of Finland.

The utilization of dental care in a mixed health care system is considered to be a process that involves three sequential decision stages: (a) contact, (b) choice of service-sector dentist, and (c) frequency [5]. First, individuals must decide whether to go to a dentist. Then, those who want to see a dentist must choose between public and private dentists. Lastly, the amount of dental care to be consumed is decided, in respect of the number of visits to the chosen dentist and the type of care service per visit. In terms of actual observed (realized) consumption of dental care, factors from both the demand and supply sides can influence the outcome, as well as the fact dentists themselves may also play an active role in determining the outcome at any level of the decision-making process relating to utilization.

In this work, in order to investigate the determinants of the utilization of dentists' services (hereafter "dental services") – taking account of the Finnish mixed system – we have adapted a theoretical framework that is based on a model of joint determination of dental service utilization and choice of dentists described in earlier studies [22, 23]. In this case, we have a situation with two general service-sector dentists or two dental sectors (public and private), and we assume that the choice of dentist and the choice of dental sector mean the same thing. The three decisions on the utilization of dental care are made on the basis of both the individual's and provider's characteristics. The variables relating to the individual are oral health stock, acute need of treatment, income, time, monetary and nonmonetary access costs induced by a visit to the dentist, and

other observable and unobservable characteristics. An individual may seek care as a result of dental health shock (acute random toothache or dental problems) or for a dental check-up. If individuals anticipate a positive net benefit from visiting a dentist (i.e., they expect oral health improvements that exceed the costs involved), they will go to the dentist. Having decided to see a dentist, they try to assess the utility of accessing either a public dentist or a private one and then choose the alternative which provides the highest utility. Following this stage, a decision on the number of visits to the chosen dentist is made.

The price of dental care can affect demand, and persons with different income levels can respond to different levels of cost sharing differently [5, 13, 24, 25]. The price of dental care consists of an out-of-pocket payment and other costs. The latter include not only monetary costs such as travel costs and an opportunity cost of the time devoted to dental care but also non-monetary costs such as time costs spent on a dental visit and in searching for a supplier and psychological costs due to discomforts incurred by fear of visiting a dentist and dental pain. For ethical reasons and regulation limits, advertising on prices and the quality of dental care is not allowed in many countries. In addition, quality is rather a subjective experience and consumers of dental care cannot always distinguish poor from good quality. Informational asymmetries also call for trust in the relationship between demanders and suppliers of dental care. If someone who is seeking care has experience with the delivery system through past use and decides to use the same dentist's services, he/she can easily derive the maximum level of utility according to his preference. If the care seeker has little or no information about prices, quality and availability of dental care, or the relationship between these, he/she must search for it on the basis of a priori knowledge or through relatives and friends. The costs of searching mainly reflect the value of time spent searching and are higher for some people than for others. A consumer who has used the public (or private) sector has lower search costs for public (or private) sector use. The rich would search less than the poor because time is assumed to be less valuable for the latter than for the former all other things being equal.

Data, variables, and econometric specifications

The empirical analysis is based on a sample drawn from the Finnish Health Care Survey conducted between April and June 1996. This survey provides information on health and socioeconomic status and health care utilization among the Finnish noninstitutionalized resident household population in 1996. We considered only the individuals aged between 20 and 40 years (those eligible for age-based subsidized dental care according to the statutes) who were not edentulous or did not use removable prostheses. Because public dental care was free of charge until the age of 18 years, and it was possible that some people had just had their 19th birthday, we dropped those aged 19 years. Conscripts were not considered because they have access to their own health care clinics through the army. After dropping a few observations with missing values and 26 mixed users, we had a final sample of 2,010 individuals. Data on annual income were collected from register-based tax files maintained by the tax authorities, and merged with the survey data by means of the official unique personal identification numbers. Information on the population and the number of dentists in health center districts was gathered from official registers and statistics.

All self-reported visits that were made from the beginning of the study year until the interview day were considered to belong to the same course of treatment. The utilization of dental services hypothetically depends on acute need or morbidity, oral health stock, demographic and socioeconomic factors, costs of dental care, and factors relating to the availability of dental services (Tables 2, 3). Dependent variables are (a) visiting a dentist, (b) the choice of service sector, and (c) the positive number of visits to the dentist whether public or private. The explanatory variables were based on theoretical and empirical studies on the utilization of health and dental care, especially on experience from earlier Finnish studies [5, 15, 21, 26, 27, 28, 29].

Unemployed persons can be assumed to use dental care less than their employed

Abstract

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Choices and utilization in dental care. Public vs. private dental sectors, and the impact of a two-channel financed health care system

Abstract
We examine the determinants of the utilization of dentists' services among adults entitled to age-based subsidized dental care, using data from the Finnish Health Care Survey of 1996. We apply a three-part model to investigate the care-seeking decision, the choice of a private/public dentist, and the number of visits to each chosen dentist. Seeking care is found to be determined mainly by dentist's recall and mostly deterred by the expense of private care. Insufficient public availability and recall positively affect the choice of a private dentist, whereas income and dentist density increase the number of private visits. Need and socioeconomic variables are controlled for and are also important determinants. The findings suggest that lowering copayments and user fees and increasing the public supply of dental care, accompanied by an efficient recall system, might improve access to dental care and better steer the choice between sectors.

Keywords
Dental care utilization · Choice of dental sector · Choice of service-sector dentist · Three-part model · Finland

Table 2

Variable definitions

	Definition
Dependent variables	
Visiting a dentist	=1 if the person visited a dentist in the study year
• Choice of a private dentist	=1 if the person visited a private dentist after having decided to visit a dentist in the study year
• Number of visits	Number of visits to the chosen private or public dentist in the study year
Independent variables	
• Age	Age of the person (in years)
• Female	=1 if the person is female, otherwise 0
• Income	=Ln (monthly disposable income in Finnish marks per equivalent adult; € 1=FIM 5.95)
• Unemployment	=1 if the person is unemployed
• Student	=1 if the person is student
• Other occupation[a]	=1 if the person works or is a carer or has other occupation
• Low education	=1 if the number of years of education is <10
• Basic education[a]	=1 if the number of years of education is 10–12
• High education	=1 if the number of years of education is >12
• Pain	=1 if the person suffers from toothache or dental problems
• All natural teeth[a]	=1 if all natural teeth remaining
• Low number of missing teeth	=1 if the number of missing teeth is 1–5
• High number of missing teeth	=1 if more than 6 natural teeth missing
• Expensive public care	=1 if the person thinks that health center dentist's treatment is expensive
• Expensive private care	=1 if the person thinks that private dentist's treatment is expensive
• Fear	=1 if the person considers visits to the dentist quite or very frightening
• Sufficient public services	=1 if the person thinks that the area has sufficient public dentists' services
• Insufficient public services	=1 if the person thinks that the area has insufficient public dentists' services or has no information on the supply of public dentists' services
• No public services[a]	=1 if the person thinks that public dentists' services do not exist
• Sufficient private services	=1 if the person thinks that the area has sufficient private dentists' services
• Insufficient private services	=1 if the person thinks that the area has insufficient private dentists' services or has no information on the supply of private dentists' services
• No private services[a]	=1 if the person thinks that private dentists' services do not exist
• Recall	=1 if the person was recalled by the dentist by post or phone
• Visit time	Self-reported total time (in hours) required for a visit to the dentist, including travel, waiting and treatment time
• Dentist density	Number of dentists working in each health center district per 1000 residents
• Public care for all	=1 if the municipal health center provides dental care for the whole population
• Time of interview	=Ln (Time/145) where Time=number of days from the beginning of the year to the interview day and 145=average number of days from the beginning of the year to the data collection time period; control variable in all the models
• Midcare	=1 if the person's dental treatment is unfinished. Control variable in the truncated models

[a] *Reference category*

counterparts. The income measure is disposable household income per equivalent adult, using an OECD equivalence scale. This gives a weight of 1 to the first adult, 0.7 to the second adult, and 0.5 to each child in the household. A log transformation of equivalized income is used to smooth out the extreme values in its distribution. Students can easily access public dental care. The price of a dental visit is measured by (a) objective, relative time costs (dentist density; public care for all) and by the respondent's (b) subjective view of the price on dental treatment in each sector (expensive public/private care), (c) subjective time costs (sufficient public/private services; insufficient public/private services), (d) time cost incurred by a dental visit (visit time), and (e) psychological cost (fear). Because "public care for all" refers to the additional availability of municipal dental services, those municipalities giving dental care to the whole population are expected to have given the age group used in the study easier access to care and more services. Differences in the sector-specific supply conditions are partly reflected in the variables (a), (b) and (c), and in recall. The variables (a) pick up some of the effect of access time on dental care utilization, reflecting reduced waiting time, travel time (and costs), waiting-list time or combinations of these. We have no information on the out-of-pocket payment, but we believe that it is captured by the student status and by the variables (a) and (b) as private dental care is always more expensive than public dental care.

Receiving a recall means a positive relationship to previous use. Many consumers of dental care may consider recall as an additional service that reduces the costs of making a new appointment. We assume that recall reduces patient time costs for that sector, and that it in part also diminishes psychological costs as individuals must overcome the inertial obstacle of getting into a treatment cycle. Finally, we include two control variables in the empirical models to account for differences in time as the respondents were interviewed on different dates (time of interview) and to control for a possible increase in the number of dental visits made (midcare). Because our data do not include information on supplier-specific attributes such as quality of treatment outcome, quality of

Table 3

Descriptive statistics: means (standard deviations) of the variables

	Overall sample (*n*=2,010)	All users (*n*=651)	Public users (*n*=415)	Private users (*n*=236)
Dependent variables				
• Visiting a dentist	0.32 (0.47)	–	–	–
• Choice of a private dentist		0.37 (0.48)	–	–
• Number of visits to the chosen dentist	–	–	2.23 (1.71)	2.40 (1.82)
Independent variables				
• Age	30.65 (6.03)	30.95 (6.02)	29.35 (5.72)	33.70 (5.51)
• Female	0.55 (0.50)	0.60 (0.49)	0.61 (0.49)	0.58 (0.50)
• Income	8.50 (0.62)	8.52 (0.39)	8.47 (0.37)	8.62 (0.42)
• Unemployment	0.14 (0.35)	0.14 (0.34)	0.15 (0.36)	0.11 (0.31)
• Student	0.12 (0.32)	0.13 (0.33)	0.18 (0.38)	0.04 (0.19)
• Other occupation[a]	0.74 (0.44)	0.74 (0.44)	0.67 (0.47)	0.86 (0.35)
• Low education	0.12 (0.33)	0.11 (0.31)	0.09 (0.29)	0.13 (0.33)
• Basic education[a]	0.57 (0.50)	0.59 (0.49)	0.63 (0.48)	0.51 (0.50)
• High education	0.30 (0.46)	0.30 (0.46)	0.26 (0.44)	0.36 (0.48)
• Pain	0.29 (0.45)	0.53 (0.50)	0.54 (0.50)	0.52 (0.50)
• All natural teeth[a]	0.50 (0.50)	0.45 (0.50)	0.49 (0.50)	0.39 (0.4)
• Low number of missing teeth	0.48 (0.50)	0.52 (0.50)	0.49 (0.50)	0.57 (0.50)
• High number of missing teeth	0.02 (0.15)	0.03 (0.17)	0.02 (0.14)	0.04 (0.20)
• Expensive public care	0.19 (0.39)	0.18 (0.38)	0.22 (0.42)	0.10 (0.31)
• Expensive private care	0.76 (0.43)	0.73 (0.45)	0.72 (0.45)	0.74 (0.44)
• Fear	0.41 (0.49)	0.37 (0.48)	0.36 (0.48)	0.39 (0.49)
Sufficient public services	0.59 (0.49)	0.59 (0.49)	0.73 (0.45)	0.34 (0.48)
• Insufficient public services	0.20 (0.40)	0.18 (0.39)	0.07 (0.26)	0.38 (0.49)
• No public services[a]	0.21 (0.41)	0.23 (0.42)	0.20 (0.40)	0.28 (0.45)
• Sufficient private services	0.69 (0.46)	0.72 (0.45)	0.65 (0.48)	0.84 (0.36)
• Insufficient private services	0.19 (0.39)	0.17 (0.37)	0.22 (0.41)	0.09 (0.28)
• No private services[a]	0.12 (0.32)	0.11 (0.31)	0.14 (0.34)	0.07 (0.25)
• Recall	0.15 (0.36)	0.30 (0.46)	0.23 (0.42)	0.43 (0.50)
• Visit time	1.22 (0.60)	1.17 (0.59)	1.13 (0.56)	1.24 (0.62)
• Dentist density	0.96 (0.41)	0.93 (0.39)	0.89 (0.38)	1.00 (0.38)
• Public care for all	0.21 (0.41)	0.20 (0.40)	0.25 (0.43)	0.12 (0.33)
• Time of interview	–0.01 (0.11)	0.00 (0.10)	0.00 (0.10)	0.01 (0.10)
• Midcare	–	–	0.08 (0.27)	0.08 (0.27)

[a] *Reference category*

staff, range of services, and the role of the dentist in the utilization process or aspects relating to the patient-dentist relationship, all these unobservable characteristics are captured in the error terms in the econometric equations.

Various studies on health and dental care utilization have applied two-part models to model two sequential decisions such as contact and frequency [5, 21, 30, 31, 32], contact and choice of provider [33], and choice of provider and choice of service type [23]. In the present study, we applied a three-part model to model the overall decision-making process of dental service utilization. In the first two parts of the model, the binary care seeking and the binary choice of dentists are sequentially modeled by two single logit equations, while in the third part the positive number of visits to the chosen dentist is modeled by a zero-truncated negative binomial (ZTNB) or a zero-truncated Poisson (ZTP) model. All these three equations are reduced-form, and they are estimated separately by maximum likelihood.

The VIF (variance inflation factor) values of all the variables were between 1.03–2.38, and the average VIF was 1.30. In the case of public visits, when comparing the ZTNB and ZTP models, the t value for the overdispersion parameter (α=0.471) in the former was 2.92 (P=0.004) and the LR test statistic 40.85 (P=0.000) for a $\chi^2(1)$. Thus, we applied the ZTNB model to estimate the number of visits to the public dentist. In the case of private visits, the corresponding figures were α=0.208, t =1.65 (P=0.099), and LR=10.15 (P=0.001). The estimated coefficients of the explanatory variables in both models had the same signs, but those resulting from the ZTNB model were in absolute values a little higher than those resulting from the ZTP model (not reported here). However, because the explanatory variables had substantially higher standard errors in the ZTNB model than in the ZTP model, their t-values

Table 4

Estimation results for visiting a dentist and the choice of dentists and for the number of visits to the chosen dentist

	Logit model Visiting a dentist (I)		Logit model – Choice of dentists			Zero-truncated negative binomial model				Total effect: I+II+III	
			Public (II)	Private (II)		Public visits (III)		Private visits (III)		Public use	Private use
	Elasticity, %-change	t	Elasticity, %-change	Elasticity, %-change	t	Elasticity, %-change	t	Elasticity, %-change	t	Elasticity, %-change	Elasticity, %-change
Time of interview	0.847 [a]	3.20***	0.200 [a]	−0.384 [a]	−0.78	1.178 [a]	2.88**	0.788 [a]	1.48	2.224 [a]	1.251
Income	0.103 [a]	2.05*	−0.120 [a]	0.230 [a]	1.84	−0.057 [a]	−0.56	0.295 [a]	2.35*	−0.074 [a]	0.627 [a]
Age	0.364 [a]	2.14*	−0.826 [a]	1.588 [a]	5.48***	0.304 [a]	1.25	−0.208 [a]	−0.69	−0.159 [a]	1.743 [a]
Visit time	−0.143 [a]	−2.33*	−0.065 [a]	0.126 [a]	1.45	−0.004 [a]	−0.06	0.044 [a]	0.46	−0.212 [a]	0.027 [a]
Dentist density	−0.216 [a]	−2.81**	−0.044 [a]	0.084 [a]	0.67	−0.121 [a]	−0.87	0.276 [a]	2.15*	−0.381 [a]	0.144 [a]
Female	18.3 [b]	3.20***	0.7 [b]	−1.4 [b]	−0.16	−11.8 [b]	−1.23	0.8 [b]	0.07	5.2 [b]	17.6 [b]
Unemployment	3.3 [b]	0.37	−3.8 [b]	7.2 [b]	0.51	3.5 [b]	0.31	1.1 [b]	0.08	3.0 [b]	12.0 [b]
Student	25.8 [b]	2.37*	24.5 [b]	−47.1 [b]	−2.26*	6.2 [b]	0.63	4.9 [b]	0.20	66.3 [b]	−30.2 [b]
Low education	−13.0 [b]	−1.45	−3.8 [b]	7.4 [b]	0.60	7.2 [b]	0.55	−2.3 [b]	−0.16	−10.3 [b]	−8.8 [b]
High education	−1.3 [b]	−0.19	−2.1 [b]	4.0 [b]	0.41	−1.0 [b]	−0.11	−3.8 [b]	−0.38	−4.2 [b]	−1.2 [b]
Pain	117.9 [b]	15.80***	−5.5 [b]	10.6 [b]	1.15	47.6 [b]	2.53*	51.5 [b]	3.03**	203.8 [b]	265.1 [b]
Low number of missing teeth	12.1 [b]	1.99*	−4.4 [b]	8.5 [b]	0.97	13.5 [b]	1.44	25.9 [b]	2.20*	21.6 [b]	53.2 [b]
High number of missing teeth	31.0 [b]	1.50	−1.5 [b]	2.9 [b]	0.11	53.5 [b]	1.59	49.8 [b]	2.84**	98.1 [b]	101.9 [b]
Fear	−19.1 [b]	−3.18***	−5.9 [b]	11.4 [b]	1.20	6.9 [b]	0.79	−9.5 [b]	−1.01	−18.7 [b]	−18.4 [b]
Expensive public care	−1.8 [b]	−0.24	6.6 [b]	−12.6 [b]	−1.07	25.2 [b]	2.52*	5.9 [b]	0.41	30.9 [b]	−9.1 [b]
Expensive private care	−23.6 [b]	−3.48***	0.3 [b]	−0.5 [b]	−0.05	−13.6 [b]	−1.80	34.9 [b]	1.87	−33.9 [b]	2.4 [b]
Sufficient public services	−6.9 [b]	−0.86	22.5 [b]	−43.3 [b]	−3.89***	−19.9 [b]	−1.75	−12.7 [b]	−1.00	−8.6 [b]	−54.0 [b]
Insufficient public services	−18.6 [b]	−1.96*	−52.2 [b]	100.5 [b]	5.99***	−4.0 [b]	−0.24	−18.1 [b]	−1.44	−62.7 [b]	33.6 [b]
Sufficient private services	1.3 [b]	0.13	−18.5 [b]	35.6 [b]	2.23*	16.0 [b]	1.02	10.8 [b]	0.53	−4.2 [b]	52.2 [b]
Insufficient private services	−8.5 [b]	−0.73	16.5 [b]	−31.8 [b]	−1.57	9.3 [b]	0.69	2.6 [b]	0.09	16.6 [b]	−36.0 [b]
Recall	109.1 [b]	10.85***	−18.1 [b]	34.8 [b]	3.44***	−5.6 [b]	−0.47	−5.0 [b]	−0.38	61.7 [b]	167.6 [b]
Public care for all	−12.4 [b]	−1.50	8.2 [b]	−15.8 [b]	−1.17	−14.2 [b]	−1.05	22.2 [b]	1.63	−18.7 [b]	−9.9 [b]
Midcare	–	–	–	–	–	−2.8 [b]	−0.27	8.8 [b]	0.44	−2.8 [b]	8.8 [b]
Alpha	–		–	–		0.470		0.222		–	–
Log likelihood	−1005.60		–	−288.33		−595.87		−350.54		–	–
Model	347.10, $\chi^2(22)$ [c]		–	118.19, $\chi^2(22)$ [c]		78.49, $\chi^2(23)$ [c]		69.45, $\chi^2(23)$ [c]		–	–
Pseudo-R^2 [c]	0.203		–	0.327		0.062		0.090		–	–
Correctly classified	76.87%		–	80.65%		–		–		–	–
• D^e=0	80.28%		–	80.94%		–		–		–	–
• True D^e	67.42%		–	79.89%		–		–		–	–

** P<0.05, ** P<0.01, *** P<0.001; [a] Elasticity; [b] Percentage change; [c] P=0.000; [d] Pseudo-R^2 or McFadden's likelihood ratio index LRI=1−lnL /lnL_0. LnL is the maximized value of the log likelihood function for the current model, lnL_0 is the log likelihood computed with only a constant term, and n is the sample size; [e] D is the dependent variable in each logit model; true D is defined as the dependent variable being equal to 1*

for the former were much lower than the corresponding *t*-values for the latter. This meant that the ZTP model had one determinant that was statistically significant at a level of 5% more than the ZTNB model. Due to this sensitivity and since the resulting LR-test statistic supported the ZTNB model over the ZTP model, the former was also chosen to model the number of visits to the private dentist.

To take account of the sampling design of the Finnish Health Care Survey, we used cross-sectional sample weights in all computations to make the results more representative of the country's population. Because autocorrelation and heteroskedasticity in the error terms are possible for the individuals within the households, robust standard errors were obtained by adjusting the standard errors for clustering on the household level. The models were estimated by the Stata 8 package [34]. The estimation results are presented as elasticities for the continuous variables and as percentage changes for the dummy variables. The latter indicate the way in which a change in a certain dummy variable's value from 0 to 1 affects (increases or decreases) dental use all other things being equal.

Results

Table 4 presents all estimation results for the three decision stages: the results for the contact decision are in model I, those for the choice of dentists in model II, and those for the frequency decision in model III. The pseudo-R^2 of model I and that of model II indicate that the choice of dentists is explained very well and much better than the probability of visiting any dentist. Both logit models are significant and predict 77–81% of observations correctly. However, model I correctly classifies 0s as 0s (80%) better than 1s as 1s (67%), while for model II the correct classifications of the observations are 81% and 80%, respectively. On the other hand, both models in the third part with their pseudo-R^2 show that the number of private visits is explained a little better than that of public visits.

The probability of visiting any dentist is positively related to pain, a low number of missing teeth, recall, age, and income (model I). Women and students are more likely to contact a dentist. The effects of variables measuring price (visit time, expensive private care, insufficient public services), psychological cost (fear) and availability (dentist density) on care seeking are significantly negative.

The choice of a private dentist is positively associated with the perception of insufficient public services, age, recall, and the perception of sufficient private services (model II). Students and those having a perception of sufficient public services are less likely to choose a private dentist. Among public users, the amount of dental care used is positively associated with pain and the perception of public care as being expensive (model III). Among private users, the number of dental visits is increased by need and oral health stock (pain, the number of missing teeth), income, and dentist density.

The final results for the total numbers of dental visits to each sector based on three separate models are illustrated in the last two columns of **Table 4**. A 10% increase in an equivalized income leads to a 6.3% increase in the expected total number of private visits and to a 0.74% decrease in the corresponding total number of public visits. While total use of public care is 62% greater for those who were recalled than for those who were not, the corresponding figure for the total use of private care is 2.7 times higher.

Discussion

We investigated the utilization of dental services among the adults entitled to age-based subsidized dental care, using the Finnish Health Care Survey of 1996. In particular, to take into account the dual-channel financing of dental care system we applied a three-part model for the overall utilization process. We found that the choice between dental sectors is influenced by users' knowledge of the extent of dental services supplied by each sector, a relationship with past use through recall, occupational status, and age. Our results seem to be in accordance with the earlier Finnish study [10]. However, in our study the effects of the variables such as the sector-specific availability, age and recall system on the private sector choice are made more clear.

The finding of a positive association of age with the choice of a private dentist concurs with the other studies on choices of providers and service sectors [8, 23]. Being regularly recalled by the dentist was found to be more important than public subsidy as a means of increasing demand [21]. Our results further indicate that dentist's recall effectively increases the utilization of private dental care as it raises both the probability of care seeking and that of selecting a private dentist. With the majority of recalls supposedly coming from the private sector, and given that this sector provides a larger range of services and more costly, higher quality procedures than the public one, our finding suggests that the parallel public and private systems with different supplier incentives may have led to the segmentation of the dental care system. Since the health centers generally care for the poor and needy but the private dentists treat the rich and solvent, the dental sectors actually serve potential users and treat patients according to individual socioeconomic backgrounds. In such a segmented service system, the key health policy objective in many OECD countries including Finland of aiming to provide an adequate access to health care with respect to need for all people would not be easily achievable.

On the other hand, both of our findings – the positive effect of income on seeking care and the number of private visits, and the negative effect on seeking care of perceptions of the expense of private care and the insufficient public availability – support earlier studies on the impact of variables such as income, supply, and price of dental care, and changes in levels of cost sharing on demand for dental care. Further, the positive relationship between the selection of a private sector and the perception of an insufficient public availability reflects the actual role of the private sector that it has supplemented the public sector. In addition, since the decision to make contact and the choice of sectors can be considered as being made together, the utilization of private dental care is thus dependent upon income. The findings suggest that lowering copayments or user charges and increasing the public supply would increase dental service use evenly across both dental sectors, as a result of which inequality and inequity in the use of dental services may be reduced.

The negative association between seeking care and dentist density could be part-

ly explained by the low need of care as most of the study individuals had a healthy mouth. Dentist density could presumably increase the care seeking of the other age groups not investigated in this study. However, this negative association – although statistically insignificant – was also found in our earlier study, in which the entire sample was analyzed [29]. In this study, visit time varied with travel and waiting time, mostly with the former, as an appointment with the dentist is usually made in advance and treatment time is generally fixed. It could then be argued that higher visit time results in a lower propensity of visiting a dentist among these people because the opportunity cost related to their traveling is high.

We found a statistically significant positive association between the number of private dental visits and dentist density among those who visited the private dentist (i.e., in the third part of the three-part model). This association could be interpreted as evidence of the existence of SID in the light of theory. In addition, an increase in the dentist to population ratio seems to raise the total use of private dental care and reduce that of public dental care at the same time with the total elasticity for the latter is, in absolute values, higher than that for the former. The finding also indicates that an increase in the number of private dental visits associated with a higher dentist to population ratio seemed to offset the low propensity to seek care within the private sector. (This can be inferred from the signs of the effects of dentist density on the three different decision levels of the utilization; see **Table 4**).

The results of this study have some implications for public health policy. First, the recall system seems to be very efficient at stimulating individuals to seek care. Second, lowering copayments and user fees and improving the availability of public dental services aimed at helping the poor and vulnerable populations would increase dental service use in both sectors and as a result enhance equity in the use of dental services. Third, the mixed dental care system could become segmented due to the self-selection mechanism driven by different supplier incentives. This adverse effect would call for a reassessment of the reasons for justifying a health care system financed by both public and private channels. Especially, when considering the ongoing dental care reform in Finland implemented in 2002 that has extended the public subsidy scheme to the entire adult population, both the detriments and benefits stem from the two parallel systems should be carefully gauged.

Corresponding author

Lien Nguyen

Center for Health Economics (CHESS),
National Research and Development
Centre for Welfare and Health, Helsinki, Finland
e-mail: lien.nguyen@stakes.fi

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