



# Provider payment bares teeth: Dentist reimbursement and the use of check-up examinations



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## ABSTRACT

Oral diseases are one of the most common diseases globally, yet maximizing health benefits from available resources continues to be a pivotal challenge. Similar to recall appointments in many other medical settings, dental check-up examinations are an essential element of regular treatment. Check-ups are important for ensuring good health but their frequent consumption also implies substantial aggregate health care costs. Although it is crucial to determine appropriate utilization amounts, little is known about the role of financial incentives for both patient and provider. Our analyses relied on ten-year administrative panel data from the Scottish National Health Service including about 1.3 million dental treatment claims which were issued between January 1998 and September 2007. Controlling for unobserved heterogeneity, we estimated a series of fixed-effects models to identify the impact of changes in provider payment and patients' cost sharing on check-up utilization. A significantly higher utilization of examinations was observed if dentists were paid fee-for service compared with salary. Comparably little variation in check-up use was attributable to different extents of patient co-payment. These findings establish that different provider payment methods have a substantial impact on check-up utilization. Because recall appointments in many other medical settings have similar features as dental check-ups, these findings may be relevant for health care decision makers who seek to optimize incentive schemes for all kinds of health care.

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## 1. Introduction

Oral diseases are one of the most common and expensive diseases to treat in industrialized countries (Petersen et al., 2005). Maximizing benefits from available resources continues to be a pivotal challenge in medical and dental care; because health care resources are limited, careful choices have to be made about using whatever resources are available in ways that make greatest impact on health outcomes (Drummond et al., 2005; Listl and Birch, 2013). This particularly applies to determining appropriate utilization amounts of frequently applied treatment procedures such as dental check-up examinations.

Similar to recall appointments in many other outpatient medical settings, dental check-up examinations are an essential element of regular dental treatment. They usually involve clinical examination

of teeth and oral cavity in order to detect carious lesions, gum diseases, or other abnormalities of hard and soft tissue. The frequency with which patients should receive such examinations and the associated impacts on oral health have been the subject of an intensive debate for more than three decades (Sheiham, 1977; Beirne et al., 2009). In many countries, a universal recall interval of six months has traditionally been recommended (Kay, 1999; Frame et al., 2000). Increasingly, however, it is being recommended that recall intervals should take account of the individual patient's oral health risk (Deep, 2000; Health Development Agency, 2001). In the system which is subject to the present study – the Scottish National Health Service (NHS) – it is currently recommended that the interval between oral health reviews for adults should be between three to 24 months, to be determined according to the individual patient's oral health risk (NICE, 2004). Although requiring relatively little resource use individually, the aggregate consumption of dental check-ups in the Scottish NHS makes up at least 10% of all dental care expenditures (ISD Scotland, 2013). Check-up examinations also influence the cost of subsequent treatment because their timing defines the stage at which oral

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diseases are diagnosed. In order to determine appropriate utilization amounts, it is therefore important for health care decision makers to better understand the role of organizational circumstances within the health care system.

Treatment decisions usually involve both a patient and their dentist. Both can be influenced by characteristics of the health care system. Patients may consider the extent to which they have to contribute to the costs of dental care use. Previous evidence suggests that patients are more likely to consume dental care in the absence of patient charges (Manning and Phelps, 1979; Manning et al., 1985; Conrad et al., 1987; Mueller and Monheit, 1988; Newhouse et al., 1993; Kington et al., 1995; Milgrom et al., 1998; Matee and Simon, 2000; Cooper et al., 2012). Analogously, dentists may react to the incentives generated by how they are reimbursed. Relatively little empirical evidence exists on the impact of such provider incentives; findings from Birch (1988) suggest that fee-for-service payments may set incentives for overtreatment; Chalkley and Tilley (2006) found that self-employed dentists treat patients who are exempt from treatment charges more intensively than salaried dentists and Grytten et al. (2009) have shown that incentive-based remuneration can lead to an increase in the number of patients under supervision. Recent findings from England suggest significant changes in access to care and treatment styles in reaction to alterations in dental remuneration (Whittaker and Birch, 2012; McDonald et al., 2012).

The purpose of the present study was to identify the impact of financial incentives on utilization of dental check-up examinations. To our knowledge, the impact of provider payment on utilization of dental check-up examinations has never been investigated before. Our analyses relied on a large administrative database from the Scottish NHS which provides longitudinal information on dental care utilization over a ten year observation period. We hypothesized that fee-for-service payments imply greater utilization of dental check-up examinations than salary and, accordingly, that supply side financial incentives are an important determinant of dental care use.

## 2. Methods

### 2.1. Institutional background

The delivery of dental care in Scotland is accomplished via private providers and the NHS. More than 60% of Scottish adults have been reported to be registered with the NHS (NHS Scotland, 2011). Most NHS dental services are delivered by providers within the General Dental Services (GDS) which contracts with the majority of Scottish dentists. The present paper concentrates on the GDS wherein the reimbursement of dentists takes two different forms; salaried GDS dentists receive a fixed monthly payment whilst self-employed GDS dentists receive a fixed payment for every person registered with them and a fee for every treatment procedure performed. Such fee-for-service payments applied throughout the entire study period. For example, the dentist's fee for a dental check-up examination was £7.05 in 2004 (Scottish Government, 2004). This procedure could only be reimbursed once per six months for each patient seen by the same dentist (Scottish Government, 2004).

Dental care is not generally free for patients. Patients partially finance their treatment through a fee-for-item charge. For example, non-exempt patients paid 80% of all treatment fees up to a limit of £378 per treatment course in 2004 (Scottish Dental Practice Board, 2005). However, there are several categories of patient exemption from charges (age below 18 years; in full-time education if aged 19; receiving benefits such as income support or family credit or job-seeker's allowance and being pregnant or a nursing mother). From

the beginning of the study period, patient charges applied for regular check-up examinations. For example, patients were charged £5.64 per check-up in 2004 (Scottish Government, 2004). Throughout the entire study period charges were also in effect for consecutive procedures such as X-rays, scaling, polishing, periodontal treatment, orthodontic treatment, tooth restoration, tooth replacement, extractions etc. (Scottish Government, 2004). Starting from April 1st 2006, however, the patient charge for dental check-ups was abolished (Scottish Executive, 2006).

### 2.2. Dataset

The data used for this study originate from the Management Information and Dental Accounting System (MIDAS). This database includes claims by Scottish GDS dentists for the services they have delivered to NHS patients. For the purposes of our analysis we obtained a 5% random sample of all claims made by Scottish GDS dentists in the time period January 1998 to September 2007 inclusive. In total, our sample contains 1,294,012 claims for treatment of persons aged 18 years or older. Because there are specific regulations for traumatic treatment and treatment of persons younger than 18 years, respective claims are not considered. The database provides the advantage of following individual patients, dentists, and patient/dentist pairs over multiple treatment episodes. These panel characteristics enable us to examine the impact of changes in patients' exemption status and dentist's method of remuneration on utilization. Over the study period, almost 19% of patients had a transition in co-payment status and more than 3% of dentists had a transition in reimbursement status.

### 2.3. Dependent and explanatory variables

A binary variable indicating whether or not a dental check-up examination was carried out during the treatment course was used as the dependent variable. This refers to position 0101 according to the Statement of Dental Remuneration which is described as "clinical examination, advice, charting (including assessment and recording of any malocclusion and monitoring of periodontal status) and report including the examination of a patient in connection with trauma, where the patient is in a capitation or continuing care arrangement with the dentist" (Scottish Government, 2004).

Explanatory variables for financial incentives capture the following four combinations of patient and doctor financial incentives: (1) the patient is not exempt from treatment charges and the dentist is paid fee-for-service remuneration (we use this as reference category); (2) the patient is not exempt from treatment charges and the dentist is paid salary; (3) the patient is exempt from treatment charges and the dentist is paid fee-for-service remuneration; (4) the patient is exempt from treatment charges and the dentist is paid salary.

Besides patient and dentist incentives we expect the particular circumstances of the patient, the dentist, and the course of treatment to affect the incidence of check-ups and we therefore included a number of other variables in the regressions – indicated in the following by “.”. For capturing demographic characteristics of patients, we included “patient's age” and a proxy variable for “deprivation category”. The latter is coded with reference to DEPCAT which is a commonly used deprivation measure in Scotland comprising seven categories (Carstairs and Morris, 1991). Our control variable “deprivation category” ranges from code 1 (most affluent; corresponding to DEPCAT categories 1 and 2) to code 3 (least affluent; corresponding to DEPCAT categories 6 and 7). Our deprivation measure relates to the postcode of the dental practice but the assumption that most patients utilize dental care close to

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