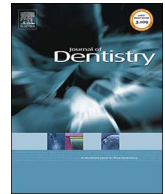




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## Review article

## Critical review of willingness to pay for clinical oral health interventions

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## ABSTRACT

**Objectives:** This critical review aimed to identify, consolidate and evaluate the quality of Willingness to Pay (WTP) studies applied to clinical contexts in the field of dentistry.

**Methods:** PubMed and Web of Science databases were systematically searched for relevant publications. Screening and data extraction was then performed. Primary literature in English-language were included to assess the WTP for oral health interventions, when the valuations were applied to a clinical measure. Twenty-six publications met the inclusion criteria.

**Results:** WTP was elicited mainly via face-to-face interviews (13 publications) and questionnaires (12 publications). The majority (24) of publications selected an out-of-pocket payment vehicle. Eleven publications adopted a bidding method, nine publications adopted an open-ended format, and the remaining six studies adopted a payment card or choice method. Pre-testing was reported in only nine publications, and few studies accounted for starting point bias. Eight of 11 publications found that higher incomes were associated with higher WTP values. The female gender, a younger age and higher education levels were associated with a higher WTP in select studies.

**Conclusions:** Only a small minority of the studies used strategies to avoid well documented biases related to WTP elicitation. Cost versus benefit of many clinical scenarios remain uninvestigated.

**Clinical significance:** WTP studies in dentistry may benefit from pre-testing and the inclusion of a script to minimise hypothetical bias. They may also be better conducted face-to-face and via a shuffled payment card method. Income levels, and potentially education levels, gender and age, should be assessed for their influence on WTP values.

## 1. Introduction

Expenditure on dental care is substantial globally [1–3]. This expense is financed through insurance, government funding, out-of-pocket payments by individuals or a combination of these [4]. Given that financial resources are limited, it is important that they are used efficiently. Economic evaluation can help ensure efficiency especially when prioritizing the care delivered with the available resources. In order to undertake economic evaluations, it is necessary to obtain an accurate and reliable measurement of the value placed on dental procedures.

Many studies have attempted to determine valuations in healthcare [5,6]. These valuations include willingness to pay (WTP), Health Years Equivalent (HYE), Quality-adjusted tooth years (QATY) and Quality-adjusted life years (QALY). As there is a lack of preference based measures (such as QALY) [7], WTP remains an important measure of valuation that is applicable and available to dentistry that allows for

economic evaluations that enable meaningful comparisons across various healthcare provision scenarios.

Willingness to pay (WTP) is a popular approach to the valuation of healthcare benefits [6]. Willingness to pay refers to the maximum amount in monetary terms that an individual would be willing to sacrifice in order to obtain the benefits of a program [8]. It may be elicited through a revealed preference approach, i.e. observed consumer choices, or through an expressed or stated preference approach – the contingent valuation method (CVM) [9]. CVM allows for estimation of individuals' WTP even in the absence of actual markets, such as in the valuation of public goods or new product developments. In principle, WTP allows us to capture the full economic value including non-use and passive benefits, and opportunity costs of an intervention; reflects individuals' treatment preferences among potential alternative uses of monetary resources, and permits comparisons across interventions with entirely different outcome natures [10]. WTP also allows for a direct cost-benefit analysis (CBA). When the costs and benefits of each

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intervention are known and correct decision making framework is applied, a thorough CBA aids resource allocation with maximisation of benefits out of a fixed budget [11]. WTP may also be used in pricing and demand forecasts for individual healthcare services, or to determine the viability of healthcare programmes when used in conjunction with cost-effectiveness and cost-utility analyses (e.g. WTP per QALY) [12].

Despite its strengths, WTP has its share of criticisms [13]. WTP elicitation is susceptible to biases, such as hypothetical bias, compliance bias, strategic bias, warm glow effect, yea saying bias, starting point bias and range bias. These are explained in detail elsewhere [14]. Carson [15] elaborated on the need for well-designed contingent valuation studies control for biases and yield more reliable measurements [15]. Content validity in WTP studies, or the provision of adequate information to ensure respondents understand correctly what is asked of them, may be improved by providing a detailed description of the intervention, the objective of the WTP question, and pre-testing. Piloting of the survey ensures that respondents understand the benefits of the intervention, and give their true WTP value rather than a fair price of the intervention (incentive compatibility) [16]. Other study parameters include an appropriate sample size and demographic distribution, acceptability to respondents, internal consistency, and reproducibility. WTP measures have been shown to have acceptable temporal stability over a short term and variable longer term stability [17,18]. The sampling frame also requires consideration, as patients may have more familiarity with procedures, while the general population may provide a less biased perspective for the overall population. [19,20].

The WTP elicitation format may also influence the reliability of results. Contingent valuation can be carried out in a few ways, namely: (1) Open-ended format (OE), (2) Bidding game format (BG), (3) Payment card format (PC), (4) Dichotomous-choice format (DC) and (5) Double-bounded dichotomous-choice format (DBDC) [21]. OE valuations are unrealistic and predisposed to strategic bias [22], while DC methods are susceptible to “yea-saying” bias [23], and have not been widely used in healthcare as they require a large and costly sample size [24]. Alternatively, WTP can be determined using conjoint analysis as part of a Discrete Choice Experiment. The modes of WTP elicitation include survey questionnaires – mailed, online, paper copy, phone interviews, and face-to-face interviews. Besides critiquing elicitation methods such as open ended questions, Arrow et al. [22] recommended the adoption of in-person interviews by experienced professional interviewers to motivate respondents to pay close attention to the details of WTP scenarios [22].

Studies pertaining to oral healthcare involve the elicitation of WTP values for periodontal treatments, orthodontic appliances, prosthodontic tooth replacements, oral medicine and oral surgery interventions, preventive care, as well as novel dental products and services. While the scope and number of dental-related WTP studies has expanded in recent years, there is a lack of studies that summarise and examine the quality of these WTP studies. This review therefore seeks to identify, consolidate, and evaluate the existing literature on Willingness to Pay applied to clinical contexts in the field of dentistry.

## 2. Methodology

This study reports a critical review that utilized a systematic search. It sought to identify and evaluate publications that assessed willingness to pay for oral health interventions in a clinical context.

### 2.1. Inclusion and exclusion criteria

Only original, English-language publications that included a primary study to assess WTP for oral health interventions applied in a clinical context were selected. Here the clinical context was operationalized as the administration of oral healthcare by oral health professionals in a healthcare facility. Reviews, including systematic and literature reviews, were examined to identify additional clinical

publications and references, but were not included in the list of publications selected. Case reports, case studies, poster presentations, conference presentations, letters, news and editorials were similarly excluded. Studies that relied on simulations with hypothetical WTP values, without a direct WTP elicitation from respondents, were also excluded.

Various methods of measuring WTP were included in this review. They included, but were not limited to, direct measurements of WTP, conjoint analyses, discrete choice experiments, and contingent valuation. Valuations of benefit, in the form of WTP, made by direct recipients and/or payors (e.g. parents of school children) of oral health interventions were accepted. WTP elicitation from healthcare providers was also considered for inclusion. The payment vehicles included payment out-of-pocket, insurance payments and contributions to public tax-funded programmes.

### 2.2. Search strategy

An initial search was conducted on 2nd June 2016 to identify the relevant keywords. Searches for relevant publications were carried out using PubMed (MEDLINE) and Web of Science (WOS) databases. The PubMed database was searched using a combination of Medical Subject Headings (MeSH) terms, and general search terms/keywords in “All Fields” (non-field restricted search). The search strategy used the following search query: “Willingness to pay” OR WTP OR “Cost benefit analysis” (MeSH) OR “Time trade off” OR TTO OR “Discrete choice experiment” OR DCE OR “Conjoint analysis” AND “Dentistry”(MeSH) OR “Dent\*”. Web of Science was searched using “All Databases”. The search query used was: (“Willingness to pay” OR WTP OR “Cost benefit analysis” OR “Time trade off” OR TTO OR “Discrete choice experiment” OR DCE OR “Conjoint analysis”) AND TOPIC: (Dent\*). Time span was set to include “All years”, and the search language was English.

### 2.3. Management of records

The search results from each database were downloaded and imported in to EndNote X7.3.1. Duplicate records were removed, and relevant publications were retrieved. The selection of publications for inclusion was conducted first by title and abstract screening. If any publication did not have an abstract, the full article was used for screening. Titles and abstracts were reviewed by ST. Publications that met all the inclusion criteria were selected. For publications that met some, but not all the inclusion criteria, or were thought to be of questionable relevance, a second reviewer (RN) conducted an independent review and a consensus was sought. Full texts were retrieved for the selected publications and independently reviewed by the reviewers for inclusion. A final decision of the inclusion or non-inclusion of the publication was finalised thereafter, and the reasons for exclusion were recorded.

### 2.4. Selection of studies

A total of 2434 publications were identified, out of which 1246 were from PubMed, and 1188 from WOS. After removing duplicates, 1498 publications remained. Forty one publications were selected after the title and abstract screening. Nineteen publications were short-listed for a second review by RN. The full-text for these publications were extracted, and examined. ST and RN came to a consensus on the exclusion of 15 of the 19 publications and including the rest of the publications (Fig. 1). Three publications [25–27] appeared to have used the same data set of WTP values. The publications originated from a survey of 205 parents of primary school children in Thailand. As two of the publications analysed different aspects of WTP – the influence of dental setting and treatment modality, a sub-column was included to present the separate result findings in Table 1. The third publication [25] was excluded. Two publications in Canada also appeared to interview a

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