Preferences for Oral Health States in a US Community-Dwelling Functionally Impaired Older Adult Population: 2000-2001

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Abstract

Objectives: *To determine whether and how much time in a state of ill oral health an older person would be willing to trade for optimal oral health.* ***Methods:*** *This is a cross-sectional observational study of 76 subjects (52 female, 24 male) ages 47-93 (mean 75.2) recruited from a Medicare demonstration. Subjects had to need or receive help with 2+ activities of daily living (ADLs) or 3+ instrumental ADLs plus had to have had recent significant healthcare services use. A Time Trade-Off (TTO) approach was used. TTO utility is defined as the amount of symptom-free time (i.e., the optimal oral health state) divided by the amount of time with symptoms (either their current oral health state or the worst imaginable oral health state, depending on the scenario), at the point of indifference (the point past which the person is unwilling to trade additional life expectancy).* ***Results:*** *When starting from their current oral health state, 39% of the subjects were willing to exchange time resulting in a shorter life with optimal oral health. They were willing to trade 14.0 months of life on average and valued each year in their current oral health state as 91% of a year in optimal oral health. When starting in the poorest oral health state, 79% of the subjects were willing to accept a shorter life. They were willing to trade 33.7 months of life on average, and valued the poorest state as worth 79% of a year in optimal oral health.* ***Conclusions:*** *Dentists should take into consideration this group's preference for optimal oral health.*

Key Words: Time Trade-Off, Oral Health Related Quality of Life, older adults, aged

Introduction

Recently there has been an increased interest in Oral Health Related Quality of Life (OHRQOL) in older adults. Studies have found that individuals with fewer teeth or a removable partial denture were less satisfied with their dental state (1), that poor self-perceived oral health was associated with poor quality of life (2), that nearly half of edentulous study participants felt that they had difficulty coming to terms with the loss of their teeth (3), and that community-dwelling older adults with complete dentures were more likely to indicate poor health status (4).

OHRQOL is often assessed with patient profile measures (5, 6). Profile measures typically are a series of questions covering current perceptions of physical, mental, and social functioning. Examples are the Oral Health Impact Profile (OHIP) (7, 8) and the General Oral Health Assessment Index (GOHAI) (9).

Preference or utility assessment reflects an individual's preference or value for a given health state rather than the specific health-related effects of that state. An individual aggregates all of the aspects of preference internally and then gives a single number expressing degree of preference. One measure of preference or utility is the Time Trade Off (TTO) technique.

The TTO method (10) directly assesses how much time in a state of ill health a subject would be willing to trade for optimal health. TTO utility is defined as the amount of symptom-free time (i.e., the optimal oral health state) divided by the amount of time with symptoms (either their current oral health state or the worst imaginable oral health state, depending on the scenario) at the point of indifference (the point past which they are unwilling to trade additional life expectancy) (11). TTO has been used successfully for older adults (12).

A variety of OHRQOL studies have been conducted in older adult populations (5, 13). The standard gamble method has been used to assess utilities for various tooth health states (14, 15) and for health states related to oral cancer (16). However, to the authors' knowledge there have been no studies in dentistry of preference or utility assessment in older adult populations. Researchers cannot use data from profile measures as summary preference scores because they say nothing explicit about how health states are valued by subjects. Additionally, none of the preference/utility studies completed thus far focuses on older adults.

Specific Aims

The purpose of this study was to determine the importance of good oral health to a group of cognitively intact older adults utilizing a TTO methodology. This approach has been previously validated for older adults (12). The study reported here addressed the following four research questions: 1. What proportion of older adults, if any, is willing to trade some of the length of their life in order to be in an optimal oral health state? *We hypothesized that some older adults would be willing to do so since a British study found*

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that 72% of people aged 65+ indicated that oral health was important to their quality of life (17) and the Surgeon General's Report on Oral Health also indicated that oral health is important (18).

2. How much of their life, if any, are older adults willing to trade in order to be in an optimal oral health state? *While it was hypothesized that older people would be willing to trade some amount of time because oral health was important to their quality of life (17, 18), the authors were unable to hypothesize the extent of time that they would be willing to trade because of the absence of prior studies on this issue in this population.*

3. Is there a difference in oral health utility scores based on the state in which the subject starts? *It was hypothesized that those starting from a worse subjectively-defined oral health state would be willing to trade more time than someone starting in a better oral health state. Intuitively, those in good oral health states should be more satisfied with their oral health and less likely to give up years of their life.*

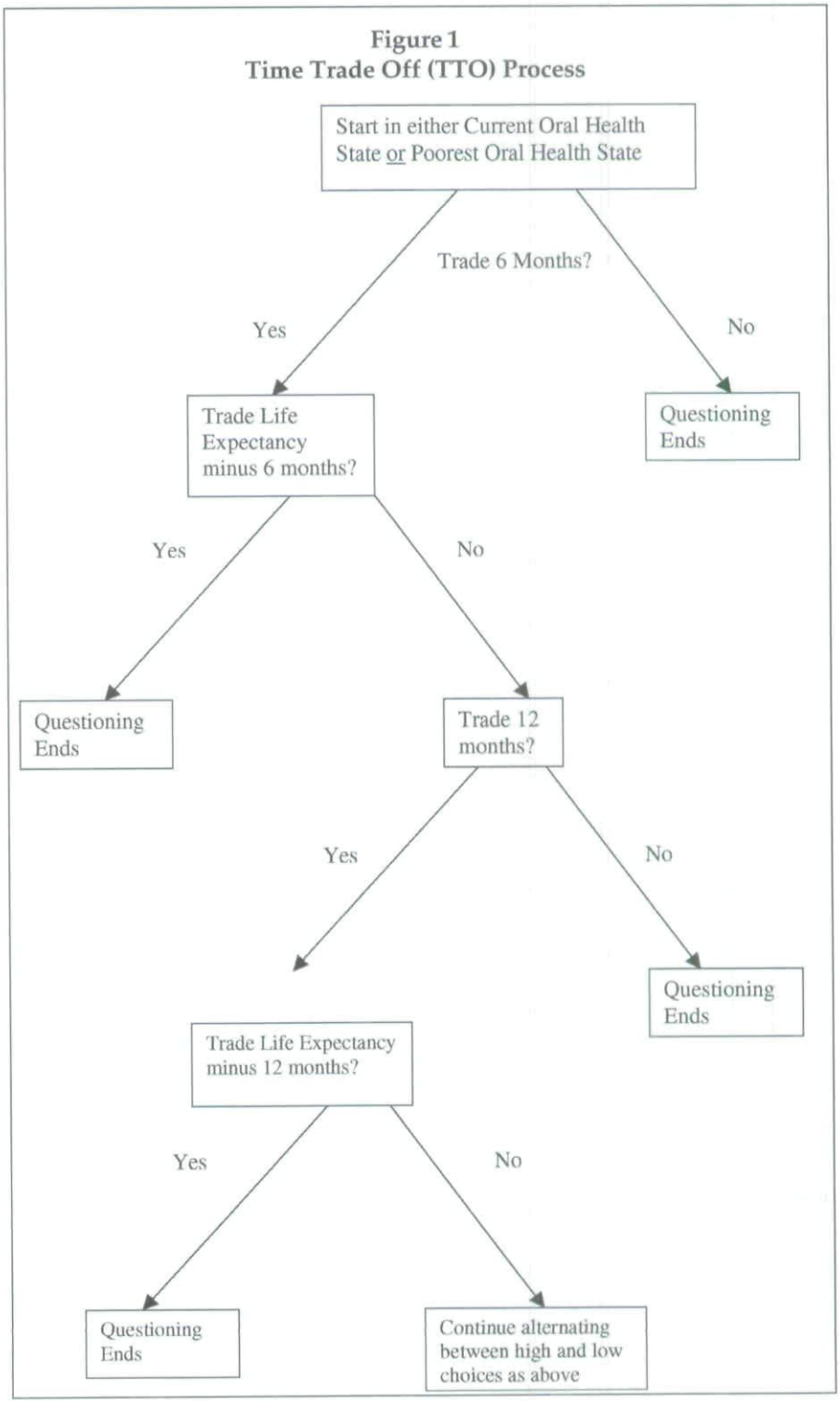
4. What is the relationship between Self-Reported Oral Health status and the subject's oral health utility? *It was hypothesized that those with the poorest Self-Reported Oral Health would value good oral health more and therefore be willing to trade more time for being in an optimal oral health state. We are not aware of any research on this question.*

Methods

Study subjects. Data collection for the Oral Health Intervention Trial (OHIT) in Older Adults, an add-on to the Medicare Primary and Consumer-Directed (PCDC) Demonstration (19), afforded the opportunity to conduct a TTO study on the importance of good oral health to older adults. The 235 OHIT subjects were randomly selected from the 1605 Demonstration subjects and had dental exams both initially and at the conclusion of their two years in the Demonstration. The dental exams for these subjects were done in a variety of settings including medical and dental facilities. The study reported here utilized a convenience sample of 76 subjects that were cognitively intact (they passed a cognitive screen and had a Cognitive Performance Scale (20) score of <2) and signed a written consent form approved by the University of Rochester Research Subjects Review Board. While 6 of the 76 subjects were under age 60 (range: 47-56), they were similar to the other 70 subjects in terms of functional impairment.

Demonstration eligibility. To be eligible for the Demonstration, subjects had to meet one of two program criteria for functional impairment. They had to need or receive help with three or more Instrumental Activities of Daily Living (IADLs) (e.g., preparing meals, doing laundry) or with two or more of Activities of Daily Living (ADLs) (e.g., dressing, bathing). Subjects also had to meet one of the fol-

Figure 1
Time Trade Off (TTO) Process



lowing criteria for recent significant health services utilization: had been a hospital, nursing home, or Medicare home health care patient during the past year, or had at least two emergency room visits during the past six months.

Data collection. The TTO data (see below) were obtained by a dentist in an interview of the 76 study subjects at the time of their initial OHIT dental exam. While the study did not measure reliability for TTO data collection, it is believed that it should be very high because only one person obtained these data. The number of natural teeth was determined by a second experienced dentist, who was trained and calibrated, during the dental exams. The remainder of the data was collected by trained interviewers who administered the baseline Medicare PCDC Demonstration questionnaire to the study subjects.

Time Trade Off. The health value measure used for this study was the TTO score (12, 21). Figure 1 presents the TTO process that was used. The life expectancy for each subject was calculated using the IRS Life Expectancy Table (22). Subjects were told their estimated life expectancy from the IRS Life Expectancy Table and were given the option to trade 6 months of life for optimal oral health ("free of oral health concerns"). For example, if a subject had a life expectancy of 10 years she would be asked initially if she would trade 6 months of her expected life. If she declined, her TTO value would be 0 months and the process ended. If she accepted trading 6 months, she was then asked if she would trade 9 years, 6 months. If she accepted, her TTO value would be 9 years, 6 months and the process ended. If she declined, she was asked if she would trade 12 months. If she accepted, she was asked if she would trade 9 years. If she accepted, her TTO value would be 9 years and the process ended. If she declined, she was asked if she would trade 1 year, 6 months. If she declined, her TTO value would be 1 year. Each individual will remain in the chosen health state until she dies. If she did not trade any time, she will be in her starting health state for her entire life expectancy and then she would die. If she traded time, the amount of time she traded would be deducted from her life expectancy and she would stay in optimal health for her life expectancy minus the time traded.

Table 1
Results of Time Trade Off (TTO) interview

	Starting from Current Oral Health State	Starting from Poorest Oral Health State
Percent willing to trade time	39%	79%
· When Self Reported Oral Health rated as Excellent, Very Good or Good	26%	77%
· When Self Reported Oral Health rated as Fair or Poor	58%	82%
MEAN MONTHS		
Mean number of months willing to trade	14 (SD = 49) (Range 0-354)	34 (SD = 60) (Range 0-354)
MEDIAN MONTHS		
Median number of months willing to trade:		
· When Self Reported Oral Health rated as Excellent, Very Good or Good	6	12
· When Self Reported Oral Health rated as Fair or Poor	0	12
Among subjects willing to trade time, median number of months willing to trade:		
· When Self Reported Oral Health rated as Excellent, Very Good or Good	12	12
· When Self Reported Oral Health rated as Fair or Poor	12	30
MEAN UTILITY		
Mean Utility Scores (possible range 0-1.0):	0.92	0.79
· When Self Reported Oral Health rated as Excellent, Very Good or Good	0.92	0.81
· When Self Reported Oral Health rated as Fair or Poor	0.92	0.76
SPEARMAN CORRELATION		
Spearman Correlation of Self Reported Oral Health with amount of time willing to trade	0.38	0.20

Starting health states. Subjects performed this trade-off for 2 starting health states: the state they were actually in, and the poorest state of oral health. These states could conceivably be the same. In that case we would expect that the amount of time that the individual was willing to trade would be equal for each scenario. The poorest oral health state was described to the participants as having a poorly functioning, sometimes painful and unaesthetic oral status. The TTO methodology does not require that any criteria be specified for each person to define either their "actual" or the "poorest" oral health state. It is sufficient that each subject perceives the actual or the poorest health status according to her own criteria, whatever those might be. The starting oral health state for the first TTO question was rotated for each new subject.

Self-Reported Oral Health was obtained by having the subjects rank their general oral health status as excellent, very good, good, fair, or poor.

Other variables. Data collected by subject or caregiver self-report for the PCDC Demonstration baseline questionnaires included demographic characteristics (age, gender, race/ethnicity, education, household income, marital status, living arrangement, rural/urban) and health status measures (self-rated health status, presence or absence of 13 chronic conditions, and dependence in ADLs (23) and IADLs (23)). These data were used to describe the study sample.

Not all subjects are described as being dependent in 2+ ADLs or 3+ IADLs because (a) data on baseline

Figure 2
Time willing to trade starting in the poorest oral health state

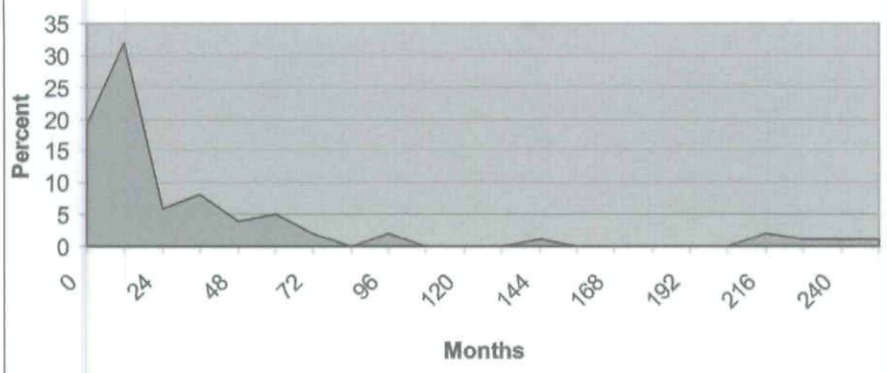
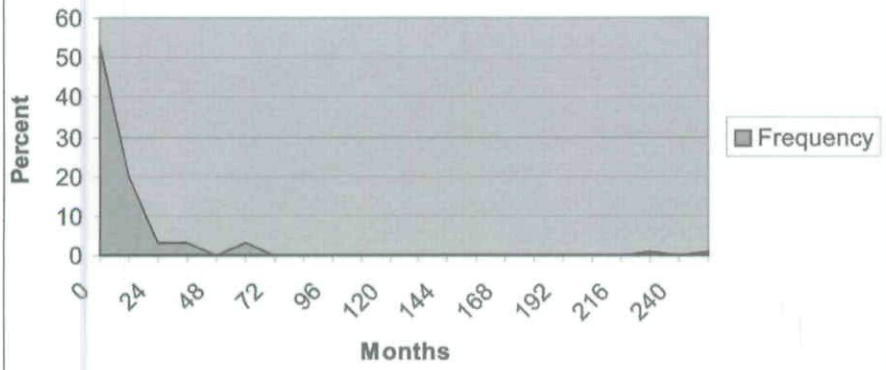


Figure 3
Time willing to trade starting from current oral health state



characteristics were collected an average of several months after the applicants were screened for Demonstration eligibility and some subjects improved in ADL and/or IADL status over that time period, and (b) for study eligibility ADLs and IADLs were defined in terms of needing or receiving help but they were measured in terms of difficulty or dependence for the baseline questionnaire. For the present study we used dependence because it is more restrictive than the other two measures of ADLs and IADLs.

Data analysis. The Chi Square Test was employed to test differences in the proportion of subjects willing to trade time for a shorter life with optimal oral health. The distribution of the number of months subjects were willing to exchange was so skewed that it precluded meaningful comparison of mean number of months using t tests. Therefore the Mann-Whitney U Test was utilized to test differences in median number of months. A Spearman correlation was used to calculate the association between Self-Reported Oral Health and the amount of time subjects were willing to trade. While it is customary to define a p-value of .05 or lower as statistically significant, in this study p = .10 or lower was used. Because this is the first study of TTO relating to older adult oral health, we are willing to take the chance of being wrong 10% of the time if we reject the true null hypothesis in order to identify a potential relationship for future research (24).

Results

Subject characteristics. At baseline the average age of the 76 study subjects was 75.2, two-thirds were female, and 10% were nonwhite. One-fifth had not graduated from high school and about one-third had an annual household income of less than $10,000. Slightly over half resided in rural areas. About half rated their health status as fair or poor. The subjects reported being dependent in a mean of 1.4 ADLs and 2.5 IADLs. The 76 subjects had a mean of 9.9 teeth (SD=8.7) (range 0-26) per person. One-third (24 or 31.6%) were edentulous. About 43% of the subjects rated their oral health as fair or poor.

Health utilities. Table 1 presents the TTO results. A total of 39% of the subjects were willing to exchange time for a shorter life with optimal oral health when starting from their *current* oral health state, and 79% were willing to give up time when starting from the *poorest* oral health state. Subjects starting in the *poorest* oral health state were willing to trade, on average, about 2.4 times as many months for optimal oral health than they would when starting in their *current* state, 33.7 versus 14.0 months. The time subjects were willing to trade was skewed to the left, towards lower values (see Figures 2 and 3).

When subjects started in their *current* oral health state, over twice as many of those who rated their oral health as fair or poor were willing to trade time than those who ranked it as excellent, very good, or good, 57.6% versus 25.6% (Chi Square Test p=.005). However, there was little difference in willingness to trade time when subjects started in the *poorest* oral health state, with 76.7% of subjects who ranked their oral health as excellent, very good, or good and 81.8% of those who rated their oral health as fair or poor being willing to do so (p=.6).

Among subjects who were willing to trade time, when they started in their *current* oral health state (n=30) there was no statistically significant difference in the time they were willing to trade between those who rated their oral health as fair or poor (median=12 months) and those who ranked it as excellent, very good, or good (median=12 months) (Mann-Whitney U Test p=.6). When subjects started in the *poorest* oral health state (n=60), the median number of months they were willing to trade was 30 months among those who rated their oral health as

fair or poor versus 12 months for those who ranked their oral health otherwise (p=.211).

For subjects starting in their *current* oral health state, they valued each year in that oral health state as 91% of a year in optimal oral health (utility score = 0.91). When starting in the *poorest* oral health state, subjects valued that state as worth 79% of a year in optimal oral health (utility score = 0.79). Current state utility was .92 for both Self-Reported Oral Health categories. Poorest state utility was .81 for those who rated their oral health as excellent, very good, or good versus .76 for those who rated it as fair or poor.

The amount of time subjects are willing to trade was significantly correlated with Self-Reported Oral Health for both starting in their *current* oral health state ($r = 0.38$; $p<.001$) and starting in the *poorest* state ($r = 0.20$; $p=.08$). Further, when starting in their *current* oral health state, people with fair or poor Self-Reported Oral Health indicated that they would trade significantly more months than those with excellent, very good, or good Self-Reported Oral Health, a median of 6 versus 0 months (Mann-Whitney U Test p=.01). When starting in the *poorest* oral health state, those who rated their oral health as fair or poor would be willing to trade a median of 12 months, the same as those who rated their oral health otherwise (p=.21).

Discussion

Many subjects in this study of predominantly functionally impaired Medicare patients with recent significant health services use were willing to trade a substantial percentage of their remaining life for a shorter life with optimal oral health. In a study of hospitalized older adults (12), 59% were willing to exchange time in their current state of health for a shorter life in excellent health. In that study, the mean TTO utility score was 0.81, which is about the same as the utility score for subjects in our study who started in the *poorest* oral health state (0.79) but lower than for subjects starting in their *current* oral health state (0.92). The hospitalized sample was presumably acutely ill, which likely colored their desire for excellent health. Our study sample consisted of older adults with varying degrees of oral health impairment. What is remarkable is that when the individuals in the sample were asked to imagine themselves in the poorest oral health state, they valued their oral health similarly to the acutely ill population's value of their general health. Our study implies that the oral health care needs of older adults whose subjective oral health status is poor may be as important to those persons as the acute needs of hospitalized patients. Thus, health care policymakers should consider oral health care needs of older adults.

Disease-specific utilities. Table 2 compares our study's findings with selected TTO health state utilities reported by Tengs and Wallace (25). In our study subjects' utility for their *current* oral health state was 0.92. This is about the same as reported for cancer, acute myocardial infarction with no angina and no congestive heart failure, and New York Heart Association Class I myocardial infarction. Subjects' utility for the *poorest* oral health state was 0.79, which is similar to the utility estimates for AIDS, breast cancer with a mastectomy and unilateral good physical/mental health, and acute myocardial infarction with severe angina and congestive heart failure. The utilities for current and poorest oral health state in the present study are considerably higher than those reported for hip replacement for osteoarthrosis 12 months after surgery (0.49), major stroke (0.30), and accident requiring hospitalization (0.09). The study's population had a generally high preference for optimal oral health, and considers poor oral health in a similar light as chronic conditions such as AIDS and symptomatic cardiovascular disease.

Self-Reported Oral Health. We believe that this is the first study that reports how Self-Reported Oral Health status is related to oral health utility. Our study found that Self-Reported Oral Health was significantly correlated with the amount of time subjects are willing to trade for optimal oral health. Further, subjects who indicated fair or poor oral health were willing to exchange more months of life than subjects who reported excellent, very good, or good health. Subjects who started from the poorest oral health state were willing to trade more months than those who started in their current state. These results make intuitive sense and agree with the study's hypothesis for Specific Aim #4. However, one might also postulate that those in the poorest oral health are in that health state because they place less value on oral health and therefore would be willing to trade less time for optimal oral health. The results of the study would indicate that those in the poorest health state do not place less value on oral health. In fact, they infer just the opposite. Thus, there are likely other reasons for self-reported oral health to be worse in this group. It may be that this group has higher standards for what they consider good oral health, or it may be that the barriers that prevent them from achieving good oral health are too high for them to surmount.

Study limitations. The data on subject sociodemographic characteristics and health status were obtained by an in-home interview. While many of the measures used were instruments and scales that have been developed for older adults and employed in numerous studies, there is always the danger that self-report data can be less valid or reliable than data collected from self-performance tests or from health care professionals. Because each individual was given two scenarios that started in different health states, the utilities obtained could not be used to compare intra-examiner reliability. An additional limitation is that the authors did not directly consider the effect of oral health variables such as removable dentures, years of denture use, structural defects, and periodontal disease on satisfaction, which likely affects quality of life. Another limitation is the small sample size. Last, while the study sample is well-defined, there may be biases in those who partici-

Table 2
Time Trade Off (TTO) utilities:
Comparison of Selected Health State Assessments from Tengs and Wallace (2000) with the present study's findings

Health State TTO Score	
Atrial fibrillation, nonvalvular, receiving aspirin	0.99
Myocardial infarction, 6 mo., treated with Streptokinase (or similar), no dyspnea	0.97
Cancer, breast, early stage, lumpectomy	0.94
Myocardial infarction, acute, no angina, no congestive heart failure	0.93
Cancer	0.92
Current Oral Health State, The Present Study	0.92
Myocardial infarction, New York Heart Association Class I	0.91
Myocardial infarction, acute, mild to moderate anxiety, 8 week rehabilitation 12 mo. after study began	0.90
Cancer, breast	0.89
Myocardial infarction, left ventricular ejection fraction <40%, no congestive heart failure	0.88
Osteoarthritis, hip replacement 24 mos. after surgery	0.87
Myocardial infection, not exercising	0.86
Osteoarthritis, hip replacement 12 mos. after surgery	0.85
Renal failure, dialysis	0.84
Angina, moderate	0.83
Cancer, ovarian	0.82
Osteoarthroses, hip mild, replacement 12 mos. after surgery	0.81
Cancer, breast, mastectomy, unilateral good physical/mental health	0.80
AIDS	0.79
Poorest Oral Health State, The Present Study	0.79
Myocardial infarction, acute, severe angina, congestive heart failure	0.78
Cancer, breast, lumpectomy, good physical/mental health	0.77
Atrial fibrillation, nonvalvular, hemorrhage (not intracranial)	0.76
Renal disease, transplant, 6 mo after surgery	0.75
Myocardial infarction, acute, mild to moderate anxiety, assigned to usual care, baseline	0.74
Renal disease, transplant, 12 mo after surgery, not diabetic	0.73
Renal disease, transplant, 3 mo after surgery	0.71
Renal disease, transplant, 24 mo after surgery	0.70
Tuberculosis, hospitalized, 3 mo	0.60
Osteoarthroses, hip moderate, replacement 12 mos. after surgery	0.49
Renal disease, dialysis, home, lifetime	0.40
Stroke, major	0.30
Osteoarthroses, hip severe	0.19
Accident requiring hospitalization	0.09

Note: Some TTO scores were rounded so that all scores would be to two decimal places.

pated in the Medicare Demonstration or the OHIT. In particular, most subjects reported functional impairment, all had recent significant health services use, and many were of low socioeconomic status. These biases may limit the generalizability of the study's results. However, there are several million Americans with self-care disabilities age 65+ (26) for whom the study results should be very important. In addition, because the analysis is relatively simple, it will be beneficial to carry out future analyses including the effects of other factors such as gender and age.

In conclusion, over one-third of the subjects in the present study would trade at least some portion of their life for optimal oral health, and three-quarters would trade time if they were in the poorest oral health state. Further study is needed to validate these results in other groups of older adults, especially those *without* functional impairment.

The importance in having TTO data is in designing and assessing programs to improve the oral health of a geriatric population. Given the building evidence that shows the multiple benefits of such programs (27-29), it is likely that the availability of such programs will increase. Researchers and policymakers will need a way to incorporate patient preferences into their assessments of these programs. Studies building on the foundation presented here may be helpful in that process.

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