

# The Effect of Dental Insurance on the Ranking of Dental Treatment Needs in Older Residents of Durham Region's Homes for the Aged

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## A b s t r a c t

*The effect of dental insurance on the ranking of dental needs in older adults has not been reported previously. We examined this effect using data obtained from a cross-sectional survey of older adults living in homes for the aged in Durham Region, Ontario. History of dental insurance was obtained during interviews. Dental needs, assessed during clinical examinations, were ranked from no need to urgent need according to the guideline of the American Dental Association. The associations between the rank of dental needs, dental insurance and other factors were analyzed with the Kruskal–Wallis test,  $\chi^2$  test, analysis of variance and multiple logistic regression. Of the 252 participants, 80 (31.7%) had been insured continuously since 1974, 69 (27.4%) had no need for dental treatment and 59 (23.4%) needed urgent dental care. More of the continuously insured than the uninsured residents were dentate (46/80 [57.5%] vs. 75/172 [43.6%],  $p = 0.04$ ). Ranking of the need for care was not significantly influenced by dental insurance; need of any kind was explained by being dentate (odds ratio 12.3, 95% confidence interval 5.6–27.3).*

**MeSH Key Words:** dental care for aged; insurance, dental; needs assessment

© J Can Dent Assoc 2002; 68(7):412  
This article has been peer reviewed.

The effect of dental insurance on the oral health status of people 80 years of age and older is unknown. The RAND Health Insurance Experiment provided evidence that reducing the level of coinsurance paid by families increased the probability of any use of dental services, the mean number of visits per person and the mean expenditure per person 64 years of age or younger.<sup>1</sup> Insured patients received better care than uninsured patients: they had higher odds of receiving preventive care, crown and bridge treatment, and endodontic treatment and lower odds of having dental extraction.<sup>2</sup> Hart and Fields<sup>3</sup> have shown that a patient's acceptance of the "best treatment plan" was directly related to the availability of financial subsidy to pay for the treatment. On the basis of clinical outcome measures of oral health,<sup>4</sup> the RAND study

also showed that reducing coinsurance improved oral health status among those younger than 35 years of age.<sup>5</sup>

Survey findings on the effect of dental insurance on utilization of dental services by elderly people are inconsistent. Gift and Newman<sup>6</sup> found that availability of dental insurance positively influenced the use of dental services, especially the initial contact.<sup>7</sup> Reviews of universal dental plans in Alberta<sup>8</sup> and Sweden<sup>9</sup> showed that dental insurance improved the use of dental services, especially among edentulous patients. Yet other researchers have reported that dental insurance was not an important contributor to the use of dental services by the elderly when the analysis was controlled for dental status.<sup>10-12</sup>

Later trend analysis in Sweden pointed to an improvement in oral health status, measured as the proportion of those with teeth having few or no fillings.<sup>9</sup> The prevalence

of edentulism also declined between 1968 and 1991, especially among those 50 years of age or older.<sup>13</sup> In the United States, edentulism was 9% lower among insured patients 65 years of age or older.<sup>14</sup> The effects of dental insurance on oral health status assessed by means of patient-based measures have also been equivocal.<sup>11,15-17</sup>

Nonetheless, there is a consensus that there is a high level of unmet needs among the elderly, especially those living in institutions.<sup>18-25</sup> These needs are higher among people who have used dental services irregularly<sup>25,26</sup> and those who have not visited the dentist within the previous year.<sup>19,27</sup>

The American Dental Association (ADA) scheduling guideline for the elderly population is based on the following priorities of care (from highest to lowest): relief of pain, elimination of pathosis, elimination of irritating conditions, management of bone and soft-tissue conditions, repair of teeth and restoration of function.<sup>28</sup> This guideline is consistent with clinical decision principles, where emergency care and scheduling of continuing care is based on the extent to which a clinical condition is serious or life threatening.

Dental insurance minimizes financial barriers to dental care by reducing direct patient costs. Therefore, insured patients would be expected to accept "best care" recommendations, which should result in fewer needs or needs of lower priority relative to uninsured patients.

We found no studies comparing dental needs of insured and uninsured elderly people. In Durham Region, Ontario, a large industry introduced dental insurance in 1974, and this insurance continues as a benefit after retirement. We anticipated that a substantial proportion of elderly people living in institutions in Durham Region would have this coverage. The aim of this study was to examine the effects of dental insurance and other factors on the rank of dental needs among older adults.

## Methods

Residents of Durham Region's homes for the aged served as the study population. Ethical approval for this study was granted by the University of Toronto's Ethics Review Board.

Permission for a structured face-to-face interview with residents or, for cognitively impaired residents, a telephone interview with health care substitute decision-makers was sought from all 788 residents of these institutions or their substitutes. Trained staff of Durham Region's Dental Division carried out the interviews and requested consent to perform a clinical examination. All clinical examinations were carried out within one month of the interview by a single trained examiner. A high level of agreement was achieved between the examiner and the training dentist.<sup>17</sup>

## Outcome Variable

Dental needs were based on information obtained during the clinical examination, which followed methods set out by the World Health Organization,<sup>29</sup> in which treatment

required for each observed condition is recorded at the time of examination. A need for dentures was recorded only when the participant agreed with the identified clinical need. We used an algorithm that determined the highest level of need for each participant<sup>28,30</sup> to rank participants' needs. Absence of need for dental treatment was ranked as 0, and the highest-ranking need (5) was for soft-tissue surgery or urgent dental treatment (because of pain or lesions likely to cause pain within one month) or a history of dental pain within the 2 weeks preceding the interview.

## Independent Factor — Dental Insurance

The residents' history of dental insurance was obtained during the interview. Three categories were identified — never insured, previously insured but coverage lapsed upon retirement and continuously insured since the 1970s.

## Other Independent Factors

The effects of a variety of other factors — age, sex, marital status, education, occupation, activities of daily living, cognitive status, perceived need for dental care, oral health beliefs, time since last dental visit and dental status — were also examined.

There are no standard measures of an individual's beliefs about oral health, so we developed a composite index.<sup>31</sup> Residents who agreed with all 3 of the following statements — older adults can influence their own health, visiting the dentist will prevent an older adult from having dental problems, and dental health is high on the list of priorities — were given a score of 2; those who disagreed with all statements were given a score of 0. All other responses were scored 1.

## Statistical Analysis

The Kruskal-Wallis test was used to assess the influence of dental insurance and other independent factors on the ranking of needs. The Kendall coefficient of concordance was used to assess the degree of correlation between the ranking of dental needs and each independent factor. Bivariate association between dental insurance and other potential independent factors was examined with the  $\chi^2$  test or analysis of variance (ANOVA).

Before the assessment of confounding, the ranking of needs was collapsed into 2 categories (needing no care = 0, needing any care = 1) so that the effect of other factors could be analyzed with logistic regression analyses. Factors were then identified to explain the need for dental care among participants. All data were analyzed with SAS Version 8.<sup>32</sup>

## Results

Of the 788 residents, 504 were interviewed and 275 participated in both an interview and a clinical examination. However, we excluded from the analysis all participants who were either younger than 65 years of age

**Table 1** Characteristics of 450 elderly residents of Durham Region's homes for the aged in relation to participation in clinical exam<sup>a</sup>

Characteristic	Residents who participated in clinical exam	Residents who did not participate in clinical exam	All residents <sup>b</sup>	<i>p</i> value $\chi^2$ test
Age (no. and % $\geq$ 80 years old)	160/252 (63.5)	142/198 (71.7)	302/450 (67.1)	0.06
Sex (no. and % female)	195/252 (77.4)	160/198 (80.8)	355/450 (78.9)	0.38
Marital status (no. and % married) <sup>c</sup>	66/214 (30.8)	NA	NA	NA
Educational status (no. and % with at least a high school education) <sup>c</sup>	33/214 (15.4)	NA	NA	NA
Occupational status (no. and % who retired from an unskilled occupation)	92/252 (36.5)	117/198 (59.1)	209/450 (46.5)	< 0.0001
Oral health beliefs (no. and %)				0.54
Agreed with all statements	55/215 (25.6)	31/151 (20.5)	86/366 (23.5)	
Agreed with 1 or 2 statements	140/215 (65.1)	106/151 (70.2)	246/366 (67.2)	
Disagreed with all statements	20/215 (9.3)	14/151 (9.3)	34/366 (9.3)	
Time since last dental visit (no. and %)				0.55
< 1 year ago	78/227 (34.4)	52/176 (29.6)	130/403 (32.3)	
1–2 years ago	52/227 (22.9)	46/176 (26.1)	98/403 (24.3)	
> 2 years ago	97/227 (42.7)	78/176 (44.4)	175/403 (43.4)	
No. (and %) with perceived need for care	72/250 (28.8)	35/193 (18.1)	107/443 (24.2)	0.009
Dental status (no. and %)				
Dentate <sup>c</sup>	121/252 (48.0)	NA	NA	NA
Reported being dentate in interview	119/251 (47.4)	65/194 (33.5)	184/445 (41.3)	0.003
Cognitive status (no. and % cognitively competent)	127/252 (50.4)	90/196 (45.9)	217/448 (48.4)	0.35
No. and % able to perform all activities of daily living <sup>d</sup>	30/246 (12.2)	10/190 (5.3)	40/436 (9.2)	0.01
Dental insurance status (no. and % continuously insured)	80/252 (31.7)	48/198 (24.2)	128/450 (28.4)	0.08

NA = data not available

<sup>a</sup>Participants whose dental insurance coverage had lapsed upon retirement and those who were younger than 65 years of age were excluded from analyses

<sup>b</sup>All residents who participated in the interview

<sup>c</sup>Information obtained during clinical examination

<sup>d</sup>Able to take care of oneself in the toilet; eat; dress, undress, and select clothing from wardrobe; bathe; and walk about the home without assistance

or whose dental insurance coverage had lapsed upon retirement; therefore, 54 and 23 participants were excluded from the 2 groups, respectively. Those who participated in the clinical examination were significantly more likely to have retired from a skilled occupation, to perceive a need for care, to report being dentate and to be able to carry out all activities of daily living; there was also a trend in this group toward being younger than 80 years (Table 1).

### **Dental Insurance Coverage**

Among the 275 participants who had participated in both an interview and a clinical examination, 173 participants (62.9%) had never had any dental insurance coverage, 17 (6.2%) had had dental coverage that paid for some or all of their dental treatment during their working years, and the remaining 85 (30.9%) had dental insurance that continued into their retirement years. Eighty (31.7%) of

the 252 residents for whom we analyzed interview and examination data had been continuously insured.

The mean age of the 252 participants was 83.5 years (standard deviation 7.8 years), and there was no significant difference in age between the continuously insured and never-insured groups. Those with continuous dental insurance were significantly more likely than those who had never had insurance to be male, to be married, to agree with all 3 statements about dental beliefs, to have visited the dentist more recently, to be dentate, to have more teeth remaining in the mouth and to be able to carry out all activities of daily living (Table 2). Although being continuously insured was associated with being dentate and with the number of teeth remaining in the mouth, there was no association between insurance status and number of teeth remaining among dentate participants.

**Table 2 Characteristics of 252 elderly residents of Durham Region's homes for the aged who participated in an interview and a clinical examination in relation to continuous dental insurance<sup>a</sup>**

Characteristic	Residents who were continuously insured	Residents who were never insured	All residents	p value
Age (no. and % ≥ 80 years old)	49/80 (61.2)	111/172 (64.5)	160/252 (63.5)	0.61 <sup>b</sup>
Sex (no. and % female)	54/80 (67.5)	141/172 (82.0)	195/252 (77.4)	0.01 <sup>b</sup>
Marital status (no. and % married)	31/73 (42.5)	36/150 (24.0)	67/223 (30.0)	0.005 <sup>b</sup>
Educational status (no. and % with at least a high school education)	12/72 (16.7)	20/140 (14.3)	32/212 (15.1)	0.65 <sup>b</sup>
Occupational status (no. and % who retired from an unskilled occupation)	56/80 (70.0)	104/172 (60.5)	160/252 (63.5)	0.14 <sup>b</sup>
Oral health beliefs (no. and %)				0.002 <sup>b</sup>
Agreed with all statements	29/72 (40.3)	26/143 (18.2)	55/215 (25.6)	
Agreed with 1 or 2 statements	38/72 (52.8)	102/143 (71.3)	140/215 (65.1)	
Disagreed with all statements	5/72 (6.9)	15/143 (10.5)	20/215 (9.3)	
Time since last dental visit (no. and %)				0.004 <sup>b</sup>
< 1 year ago	34/72 (47.2)	44/155 (28.4)	78/227 (34.4)	
1–2 years ago	18/72 (25.0)	34/155 (21.9)	52/227 (22.9)	
> 2 years ago	20/72 (27.8)	77/155 (49.7)	97/227 (42.7)	
No. (and %) with perceived need for care	24/80 (30.0)	48/170 (28.2)	72/250 (28.8)	0.77 <sup>b</sup>
Dental status				
No. (and %) dentate	46/80 (57.5)	75/172 (43.6)	121/252 (48.0)	0.04 <sup>b</sup>
Mean no. of teeth present (and SD)	8.3 (9.2)	5.5 (8.0)	6.4 (8.4)	0.01 <sup>c</sup>
Mean no. of teeth present among dentate subjects (and SD) <sup>d</sup>	14.5 (7.6)	12.4 (7.8)	13.2 (7.7)	0.15 <sup>c</sup>
Cognitive status (no. and % cognitively competent)	39/80 (48.8)	88/172 (51.2)	127/252 (50.4)	0.72 <sup>b</sup>
No. and % able to perform all activities of daily living <sup>e</sup>	15/77 (19.5)	15/169 (8.9)	30/246 (12.2)	0.02 <sup>b</sup>

<sup>a</sup> Participants whose dental insurance coverage had lapsed upon retirement and those who were younger than 65 years of age were excluded from analyses

<sup>b</sup>  $\chi^2$  test

<sup>c</sup> Analysis of variance (ANOVA)

<sup>d</sup> Dentate subjects consisted of 46 participants who were continuously insured and 75 who were uninsured

<sup>e</sup> Able to take care of oneself in the toilet; eat; dress, undress, and select clothing from wardrobe; bathe; and walk about the home without assistance

**Table 3 Rank of dental needs among participants related to history of dental insurance<sup>a</sup>**

Rank of dental need	No. (and %) of residents		
	Continuously insured (n = 80)	Never insured (n = 172)	Total (n = 252)
0. No treatment needed	19 (23.8)	50 (29.1)	69 (27.4)
1. Need for periodontal treatment (CPITN score > 0) or denture reline or repair	25 (31.2)	55 (32.0)	80 (31.7)
2. Need for new dentures	13 (16.2)	14 (8.1)	27 (10.7)
3. Need for restorations	5 (6.2)	9 (5.2)	14 (5.6)
4. Need for extraction	1 (1.2)	2 (1.2)	3 (1.2)
5. Need for urgent dental treatment	17 (21.2)	42 (24.4)	59 (23.4)
Sum of ranks	10,422	21,456	
Mean rank	130.28	125.74	
Kruskal–Wallis $\chi^2$		0.34 (p = 0.56)	

CPITN = Community Periodontal Index of Treatment Needs

<sup>a</sup> Participants whose dental insurance coverage had lapsed upon retirement were excluded from analyses

**Table 4 Rank of dental needs related to independent factors<sup>a</sup>**

Independent factor	Rank of dental need; % of participants						n	p value <sup>b</sup>
	0	1	2	3	4	5		
<b>Age</b>								0.25
≥ 80 years	31.2	28.8	10.6	5.6	1.2	22.5	160	
65–79 years	20.6	37.0	10.9	5.4	1.1	25.0	92	
<b>Sex</b>								0.06
Male	35.1	33.3	8.8	7.0	0.0	15.8	57	
Female	25.1	31.3	11.3	5.1	1.5	25.6	195	
<b>Marital status</b>								0.86
Married	26.9	28.4	17.9	6.0	3.0	17.9	67	
Unmarried	27.6	35.3	7.0	5.1	0.6	24.4	156	
<b>Educational status</b>								0.96
At least high school	28.1	31.2	12.5	6.2	0.0	21.9	32	
Less than high school	28.3	31.1	10.6	5.6	1.7	22.8	180	
<b>Occupation before retirement</b>								0.47
Skilled and higher occupation	28.3	25.0	13.0	6.5	1.1	26.1	92	
Unskilled or not in labour market	26.9	35.6	9.4	5.0	1.2	21.9	160	
<b>Oral health beliefs</b>								0.32
Agreed with all statements	25.4	30.9	7.3	9.1	1.8	25.4	55	
Agreed with 1 or 2 statements	29.3	31.4	9.3	5.7	1.4	22.9	140	
Disagreed with all statements	15.0	30.0	20.0	0.0	0.0	35.0	20	
<b>Time since last dental visit</b>								0.13
< 1 year ago	16.7	39.7	9.0	7.7	0.0	26.9	78	
1–2 years ago	28.2	31.8	9.4	8.2	1.2	21.2	52	
> 2 years ago	37.5	26.6	10.9	1.6	1.6	21.9	97	
<b>Perceived need for care</b>								< 0.001
Yes	13.9	23.6	13.9	4.2	1.4	43.1	72	
No	32.6	35.4	9.6	6.2	1.1	15.2	178	
<b>Dental status</b>								< 0.001
Dentate	6.6	34.7	9.9	11.6	2.5	34.7	121	
Edentulous	46.6	29.0	11.4	0.0	0.0	13.0	131	
<b>Cognitively competent</b>								< 0.05
Yes	23.6	29.9	11.0	6.3	0.8	28.4	127	
No	31.2	33.6	10.4	4.8	1.6	18.4	125	
<b>Activities of daily living</b>								0.09
Performs all <sup>c</sup>	13.3	33.3	13.3	13.3	3.3	23.3	30	
Does not perform all	30.1	31.5	10.6	3.7	1.0	23.2	216	
<b>Overall</b>	27.4	31.7	10.7	5.6	1.2	23.4	252	

<sup>a</sup> Participants whose dental insurance coverage had lapsed upon retirement were excluded from analyses

<sup>b</sup> Kruskal–Wallis  $\chi^2$  test

<sup>c</sup> Able to take care of oneself in the toilet; eat; dress, undress, and select clothing from wardrobe; bathe; and walk about the home without assistance

### **Ranking Participants' Need for Dental Care**

Urgent treatment was needed by 59 (23.4%) of the participants, and 69 (27.4%) needed no treatment (Table 3). The ranking of participants' need was not related to dental insurance status (Kruskal–Wallis  $\chi^2 = 0.34$ ,  $p = 0.56$ ). However, insured participants' need for new dentures was twice that of uninsured participants.

Participants with higher needs were significantly more likely to perceive a need for dental care, to be dentate and to be cognitively competent (Table 4). There was a moderate, statistically strong association between being dentate

and having needs of higher ranking (Kendall's tau  $b = 0.41$ ,  $p < 0.001$ ) (data not shown). There were trends toward needs of higher rank among female participants and those who were able to perform all activities of daily living.

We observed potential for the relationship between dental insurance and the ranking of residents' needs to be confounded by sex, dental status and ability to perform all activities of daily living (Tables 3 and 4). However, logistic regression showed that none of these 3 factors nor any one-way interaction terms confounded the effect of dental insurance on dental needs. Thus, the only factor significantly

related to needs of any kind was being dentate. Participants who were dentate were more than 12 times more likely to need dental care (odds ratio 12.3, 95% confidence interval 5.6–27.3). The sensitivity of the model was 100% when applied to the population of older adults in Durham's homes for the aged. However, according to this model 27.4% of residents would be falsely classified as needing dental care.

## Discussion

We examined the relationship between dental insurance status and rank of dental needs among residents in Durham Region's homes for the aged. Nearly 3 of every 4 participants (72.6%) had a need for dental care, and nearly one-quarter (23.4%) had the highest-ranked need. Almost a third (31.8%) of participants who underwent the clinical examination had been insured continuously since 1974. However, being dentate was the only factor that explained having any need for dental care. Both bivariate and stratified analyses indicated that the rank of dental needs was not related to dental insurance status.

Those who participated in both the interview and the clinical examination differed from those who participated in the interview only. They were more likely to be dentate, to be retired from a skilled occupation, to perceive a need for dental care and to be able to perform all activities of daily living. These factors were also highly correlated with the ranking of participants' dental needs. Continuously insured participants and those with needs of higher ranking were more likely to be dentate and to be able to perform all activities of daily living. Therefore, the uninsured participants who had a clinical examination may have been better off than uninsured residents who did not participate. This selection bias would probably decrease the difference between insured and uninsured participants and thus diminish any effect of dental insurance on the outcomes. The 2-fold greater need for dentures among insured than among uninsured participants might have been caused by those with insurance more readily admitting to a need that their insurance would cover. Thus insured participants would tend to have a higher needs score. Because the potential biases in this study operate in the same direction, the combination would tend to produce a lack of association between the rank of dental needs and dental insurance status.

Cost of treatment, although important,<sup>26,33-36</sup> is not the only barrier to the receipt of timely and appropriate care. Other serious barriers for nursing home residents<sup>26,33</sup> arise because dental insurance does not cover indirect costs. Half of our study participants were cognitively incompetent, and only 87.8% (216/246) were able to carry out all 5 activities of daily living. Out-of-pocket costs could well limit a resident's access to care if a relative has to take time off work to take the resident to the dentist.

Gift and others<sup>33</sup> described multiple barriers to dental care among nursing home residents in the United States, including chronic medical conditions, extended period without direct access to care and inability to pay for dental treatment. Older adults with limitations in their ability to carry out activities of daily living used dental services less frequently than those with no such limitations.<sup>6</sup> Dolan and Atchison<sup>26</sup> found that nursing home residents were unable to receive timely care because they had problems getting to the dental office and because dentists were unable to provide dental treatment within the nursing home setting. In contrast, MacEntee and others<sup>37</sup> reported fewer urgent needs (11% vs. our 23.4%) among participants in a long-term care institution equipped with in-house dental services. Although a private fee-for-service organization provides initial screening and periodic examination for residents of Durham Region's homes for the aged, those who require treatment must still go to a dental office for care.

We observed no significant association between rank of dental needs and time since last dental visit, even though those who had visited a dentist more recently tended to have higher needs. Locker and others<sup>11</sup> and Otchere<sup>27</sup> have reported on the limitations associated with using time since last dental visit as a predictor of elderly patients' preventive visiting patterns. Visits within the past year might also result from sporadic visits to meet urgent needs.<sup>27</sup>

Thus, our results do not support previous findings<sup>2,3,19, 25-27,38</sup> that insured people and those who have visited the dentist more frequently have lower treatment needs. Other researchers<sup>19,22,26,33,39</sup> have reported that dental conditions are worse among older adults who live in institutions than among those living independently. Our subjects were limited in their ability to leave their places of residence to receive care. Thus, non-economic barriers<sup>6,26,33</sup> probably contributed to the high levels of need found in this study. As with Otchere and others,<sup>30</sup> our findings contradict the popular belief that older adults are not aware of their dental needs, since those who perceived a need for care had higher needs.

We did not find any difference in the ranking of need between continuously insured and never-insured participants, perhaps because of biases that tended to negate the potential effect of dental insurance on needs. Being dentate was the only factor that explained need for care in these subjects. Given the generally high need in this population and given that the proportion of elderly people who are dentate is expected to rise in this millennium,<sup>17,22</sup> the Canadian dental profession needs to consider how it will address these needs. The high level of need among nursing home residents observed by us and by MacEntee and others<sup>37</sup> suggests that administrators of these facilities might consider setting up in-house dental clinics. ♦

**Acknowledgments:** Funding for this study was provided by grants from the faculty of dentistry, University of Toronto, Toronto, Ontario, and the Dental Division of Durham Region, Ajax, Ontario.

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The authors have no declared financial interest.

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