

IOWA SURVEY OF DENTAL HEALTH: STEPWISE REGRESSION RESULTS

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Introduction

Over the years states have suffered from a lack of information about oral health conditions and utilization of dental care suitable for statewide planning. In 1980 the Department of Preventive and Community Dentistry, the College of Dentistry, the University of Iowa developed a survey instrument to help provide this information. The survey was in two parts: (1) A telephone interview that asked questions about utilization of dental care, attitudes toward dental care, reasons for going or not going to the dentist and sociodemographic data; and (2) an oral examination done in the home by a local dentist who was trained and calibrated in survey examination techniques.

The purpose of the Iowa Survey of Dental Health were:

1. To assess the prevalence of dental caries, periodontal disease, oral hygiene and oral lesions in the state;
2. To assess and estimate dental treatment needs in the state;
3. To estimate the utilization of presently available dental services; and
4. To assess the social, economic and behavioral characteristics of the population regarding utilization of dental services.

North Carolina was the only other state that had attempted a similar survey. A statewide survey had been conducted in 1960-63 and repeated in 1976. One of the major differences between the North Carolina survey¹ and the Iowa survey was the source of funding and personnel. North Carolina had state funding, Kellogg Foundation support and the use of state employees while Iowa used small grants from several sources and volunteer help. The sources of funding and participation in Iowa were:

1. The Iowa Dental Association for funding and volunteer help;
2. College of Dentistry faculty for volunteer help;
3. State Department of Health for planning;
4. Department of Biostatistics, College of Medicine for sample selection; and
5. Dows Institute for Dental Research for funding.

Methods

The survey was designed to use a multistage stratified, cluster sample. The strata chosen were:

1. Three areas of the state
2. Urban-Rural
 - a. SMSA
 - b. Towns 10,000-49,999
 - c. Towns 2,500-9,999
 - d. Areas less than 2,500
3. Age: 0-11, 12-20, 21-44, 45-64, 65+

The sample contained occupied households in Iowa and did not include any institutionalized populations. It was felt that the three sections of the state had different socioeconomic characteristics and that there might be utilization differences due to urban-rural residence. The age groupings were used in some national surveys of oral health and are important because dental conditions do vary by age.

In order to make driving times shorter for volunteer dentists who were going to do the oral examinations the areas were clustered. For an area considered rural, all the names of persons to be interviewed were selected from one telephone book.

When deciding on sample size, not only were the strata effects taken into account, but compensation was made for similarity of individuals characteristics within households and the need for adequate sampling in the greater than 65 age group. The needed sample size within a stratum was determined to be 196. With fifteen strata the total sample size needed was calculated to be 2,940. When the compensating factors were added a sample size of 3,600 was needed. This was estimated to be 1,200 households or clusters of 40 households in each 30 urban or rural locations in the three geographic areas of the state.

The specific households sampled were determined from a list of computer generated random numbers. One hundred households were identified in each area and the numbers were called until forty households had been interviewed. Household members included all the persons, without regard to relationship, living together with a common household arrangement. Questions asked during the telephone interview included demographic items, attitudinal and knowledge items, preventive dental behavior items and utilization items. Table 1 lists the specific areas covered by the telephone interview.

TABLE I
Items on Telephone Questionnaire

<u>Sociodemographic Items</u>	
Town	Cost of dental care last year
Year of Birth	Dental insurance
Sex	Occupation
Marital Status	Years worked
Family Size	Smoking history
Education Level	Ambulatory status
Relationship in Family	Income of family
<u>Attitudinal and Knowledge Items</u>	
Definition of dental emergency	Nine attitudinal questions
When should children first go to dentist	Type of dental insurance
Fluoride in drinking water	
<u>Preventive Dental Behavior Items</u>	
Use of floss	Use of fluoride toothpaste
Use of fluoride rinse	

Utilization Items

Reason for last visit to dentist	Type of dentist (general or special)
Waiting time for appointment	How do you get to the dentist
Satisfaction with waiting time to appointment	How long does it take to get to the dentist
Waiting time for emergency	When was last dental visit
Length of wait in office for appointment	When was next to last dental visit
Satisfaction with waiting time in office	Currently have an appointment
Reason for not going to dentist more often	Perceived present dental needs
Reasons for going to dentist	Discuss fees with dentist
Have you changed dentist	Satisfaction with dental fees
Reason change	

The households that were represented in the telephone interview were contacted again and asked to participate in the oral examination part of the survey. These oral examinations were to be done by a volunteer dentist from their community. Thirty-three percent of the subjects interviewed had an oral examination.

Results

Table II shows the comparisons by age of 1980 Census Projections, telephone interviews and clinical examinations.

TABLE II
Comparisons of Age Distribution of Samples with 1980 Census Projections

Age	1980 Census Projections	Response from Telephone Interview	Response from Clinical Exam
0-4	7.5%	7.6%	7.5%
5-9	7.4%	8.2%	8.8%
10-19	17.0%	18.6%	19.8%
20-34	25.1%	22.8%	19.2%
35-49	15.2%	17.4%	18.6%
50-59	10.0%	10.7%	10.8%
60+	17.6%	14.4%	15.3%

Table III makes the same comparisons by gender and Table IV shows urban-rural comparisons.

TABLE III
Comparisons of Gender with Samples and 1980 Census Projections

Gender	Census Projections	Telephone Interview	Clinical Exam
Male	48.3%	49.6%	47.1%
Female	51.7%	50.3%	52.4%
Unknown		.1%	.5%

TABLE IV
Comparisons of Urban-Rural Residence with 1980 Census Projections and Samples

Residence	Census Projections	Telephone Interview	Clinical Exam
Urban	37%	38%	31%*
Rural	63%	62%	69%

*Two cities had no clinical exams

Items on the questionnaire that were analyzed at an early stage were the recency of the last visit to the dentist and the nine attitudinal questions. Table V shows the comparisons between the Iowa Survey data and ADA² data for recency of last visit to the dentist.

TABLE V
Comparisons of Recency of Last Visit to Dentist

Time Period	ADA (1978) National	1980 Iowa Survey
< 6mths	33%	46.3%
6mths-1yr	23%	31.5%
1-2 yrs	no data	10.4%
3+ yrs	22%	11.7%

This table indicates a greater percentage of persons in the Iowa Survey had been to the dentist in the last six months than the national sample surveyed by the American Dental Association.

The nine attitudinal questions that were asked are shown in Table VI.

TABLE VI
Attitudinal Questions Asked in the Iowa Survey

1. I don't have any dental problems and therefore there is no sense in seeking dental care.
2. Problems with my teeth and gums really don't affect my lifestyle very much.
3. It doesn't make sense to visit a dentist for regular check-ups since they can fix problems as they occur anyway.
4. In my experience the value of the dental services I have received justified the cost.
5. In the long run, it is better to get false teeth because they look better than natural teeth.
6. In the long run, it is better to get false teeth because once you have them, they last a lifetime and you don't need to see a dentist.
7. The money I spend on dental care could better be spent on other essentials that I need.
8. The money I spend on dental care could better be spent on extras that make our lives more enjoyable.
9. The money spent on fixing baby teeth is well spent.

Answers: Strongly agree, agree, no opinion, disagree, strongly disagree

These questions were framed in a way to encourage the respondent to think about the answer rather than give what might be an "expected" response. It should be noted that some of the questions were asked positively and some negatively.

Results - Stepwise

After the preliminary frequency analysis of the responses to the attitudes, it was decided to try a stepwise multiple regression analysis to see if the demographic variables or the attitudinal variables were of more significance in predicting the recency of the last visit. The stepwise model that was used is:

Dependent variable - Recency of last visit to dentist
 Independent variable - Nine attitudes, income, education level, and satisfaction with fees

Table VII shows the results of this analysis. About 14 percent of the variation can be explained.

TABLE VII
 Stepwise Multiple Regression of Attitudes Toward Dentist, Education, Income and Satisfaction with Fees on Length of Time Since Last Visit

	B value	F	P
Intercept	6.094		
1. Problems (att 1)	-0.1740	7.26	.0072
2. Fix problems (att 3)	-0.2325	16.63	.0001
3. False teeth (att 5)	-0.1948	12.25	.0005
4. Essentials (att 7)	-0.1790	9.63	.0020
5. Education level	-0.9528	13.92	.0002

$R^2 = .1402$ $F_{df=5,980}$ $p < .0001$

Four attitude variables come in to the equation before any demographic variables. This is a very interesting result since the traditional theory³ suggests that the demographic variables are the best predictors of dental utilization behavior. The same model was run for the population of 60+ years of age and the variables, problems (att 1), fix problems (att 3), extras (att 8), income and satisfaction with fees were shown to be the best predictors.

Results - Periodontal Disease

In dentistry, one of the oral conditions that is receiving a great deal of attention at this time is periodontal disease or disease of the gums. This disease is diagnosed by the presence of calculus on the teeth, the condition of the gums around the teeth (the presence or absence of pockets) and whether the gums bleed upon being probed. These conditions could be tested in a straightforward manner and a scale

of treatment needs can be assigned to the conditions found. Table VIII shows the treatment needs and the percent of the persons in the sample who fit into each category.

TABLE VIII
 Periodontal Treatment Needs of the Dentulous Population

Treatment Need	Scale	% of Population
No treatment needs	1	37.4%
Oral hygiene instruction	2	7.2%
Scaling	3	34.6%
Routine Periodontal treatment	4	19.5%
Complex Periodontal treatment	5	1.2%

A stepwise multiple regression similar to the one using recency of last visit was performed using the periodontal treatment needs. The variables used were:

Dependent variable - Perio scale
 Independent variable - Age, education, income, cost, prestige based on occupation, last visit to dentist, next to last visit to dentist, total number of teeth, floss use, 9 attitudes

The results of the stepwise multiple regression analysis is shown in Table IX. This analysis shows that the variables selected explain about 17 percent of the variance.

TABLE IX
 Stepwise Multiple Regression of Several Variables on Periodontal Treatment Needs

	B value	F	P
Intercept	1.094		
Last visit to the dentist	.113	5.32	.0213
Education	.097	10.12	.0015
Age	.240	85.31	.0001

$R^2 = .1770$ $F_{df(3,725)} = 51.97$ $p < .001$

Conclusions

The Iowa Dental Survey asked sociodemographic, attitudinal and knowledge, preventive dental behavior and dental utilization questions. The demographic items show a good fit of age, gender and place of residence in the sample with census projection data.

When various types of variables are used in a stepwise multiple regression analysis to explain last visit variance, it is found that some attitudinal questions appear as significant before the demographic variables that would be the expected result. On the other hand, when a similar analysis is performed using periodontal disease as the dependent variable, the variance is explained by the more conventional (expected) variables, age, education and last visit.

Stepwise multiple regression analysis seems to be a reasonable approach for finding explanations of the variance in survey data. It should be noted that it is believed that some of these variables are curvilinear and further analysis is being done to try to explain more of the variance of last visit and periodontal treatment needs.

Epilogue

Since this abstract was submitted the curvilinear analysis has been completed and 30 percent of the variance of last visit to the dentist can be explained using the variables that had significant F-values from an analysis in blocks. Table X shows the results when last visit to the dentist is the dependent variable

TABLE X

Stepwise Multiple Regression on Last Visit to the Dentist

Variable	B Value	F	P
R ² = .3011			
F _{df(12,386)} = 13.858			
p < .001			
Frequency of flossing	-0.3432	12.586	<.005
Agree money could better be spent on essentials (att 7)	1.1250	16.469	<.005
Last visit for check-up	-0.6586	33.458	<.005
Feel "no need" for going to dentist	0.3674	13.136	<.005
Last visit for filling	-0.5800	16.578	<.005
Last visit for cleaning	-0.7168	12.455	<.005
Don't go to dentist because of costs	0.5006	8.140	<.005
College graduate	-0.4143	5.655	<.005
Last visit for gum treatment	-1.2031	7.312	<.005
Less than 11 yr education	0.3198	3.648	<.005
Income \$10,000-29,999	-0.1864	3.607	<.005
Says town has fluoride water	0.1659	3.190	<.005

Periodontal treatment needs have also been analyzed in this manner and the amount of variance explained has not increased.

References

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2. Dental Habits and Opinions of the Public Results of a 1978 Survey. Bureau of Economics and Behavioral Research, American Dental Association, Chicago, IL, 1978
3. Douglass, Chester W. and Katherine O'Cole, "Utilization of Dental Services in the United States", Journal of Dental Education, April, 1979. Vol. 43, No. 4, pp 223-238.

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