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WORKSHOP IN HEALTH ADMINISTRATION STUDIES

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"Targeting High Risk Populations: Issuss of Oral Health Promotion Research"

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DISCUSSION OF ALTERNATIVE APPROACHES TO ANALYSIS FOR TARGETING IN HEALTH PROMOTION ACTIVITIES

SEMINAR PRESENTATION

DECEMBER 1, 1988

CENTER FOR HEALTH ADMINISTRATION STUDIES
UNIVERSITY OF CHICAGO

HELEN C. GIFT, Ph.D.

DISCUSSION OF ALTERNATIVE APPROACHES TO ANALYSIS FOR TARGETING IN ORAL HEALTH PROMOTION ACTIVITIES

INTRODUCTION

This presentation will consider several descriptive approaches, and discuss the relative value of these, for identifying and targeting high risk populations using socioeconomic and demographic variables. Additionally, consideration will be given to whether descriptive associations among socioeconomic and demographic variables and oral diseases provide enough differentiation to target audiences for an oral health promotion program within worksites. For example, which of several approaches to analyses would help determine the appropriateness of a proposed education program to improve the knowledge and attitudes of lower socioeconomic groups about self-care for oral hygiene? Can analysis help decide whether the activity is best directed toward the individual, the profession or the environment? Can data presentation help determine which subgroups have the greatest 'problem', thus permitting resources to be allocated for the largest return? Can data analysis help in determining which stages of intervention provide the most return? Based on the selection of the dependent variable and the type of analyses, can we determine whether it is better to direct a program toward those who already have a problem, which requires remedial action, e.g. tooth loss, or to direct a program toward prevention of tooth loss, e.g. address those who are exposed to

more risk factors, or some combination of these? Clearly the preventive approaches give a greater appearance of mutability, but do we know enough about risk factors and how to reduce them to focus at this level?

Many issues must be considered for targeting prevention and health promotion activities, including selection of dependent variables, method of data presentation, and use of practical versus statistical significance. The purpose of this discussion is not to present data analyses which are already being used in targeting program development, but rather to use an example to illustrate the kinds of problems and issues which must be addressed. Are different questions raised or answers provided using different approaches? Many measures of oral health exist, but for purposes of illustration the most extreme outcome--loss of teeth or total loss of teeth--has been chosen. The process also would apply, however, to any other dental outcome, for example, caries or periodontal diseases. Likewise, it would apply in making decisions regarding care in hospitals, risk factors and cancer, or any other health care decision.

Before beginning, a short overview of oral health status and data available will be presented.

BACKGROUND

Recent evidence suggests that the oral health status of the nation's children and adults is improving, as reflected in measures such as the proportion who are keeping their teeth, the the prevalence of caries and periodontal diseases. (See Attachment One for definitions.) The National Survey of Oral Health in U.S. Employed Adults and Seniors: 1985-86, conducted by the National Institute of Dental Research (NIDR), found that 37 percent of the employed population between 18 and 64 years of age had all 28 of their teeth. A total of 49 percent had at most one tooth missing, and 4 percent were edentulous. (See Attachment Two for description of sample and measurements.)

Overall, in 1985, the working adult population had an average of 3.2 missing teeth, which may or may not have been replaced. The average number of missing teeth increased with age, with a pronounced jump in the 35-44 year age group. The average number of missing teeth was inversely related to education and income, both overall and within age groups, except among the 18-24 year age group where no notable differences among education and income groups were seen. On average, blacks had more missing teeth than whites in all age and income groups except among employed adults under age 25 and among those with lower income in the 55-64 year age group.

Overall, in 1985-86, 4 percent of the employed U.S. adult population had no teeth. Edentulousness is rare among persons under 35 years of age. Edentulouness is inversely related to both income and education, but is positively associated with age. Within age groups, edentulousness decreases with education. In the lowest education group, even among higher income categories, there was a high prevalence of edentulousness. Although in the older age groups, whites appear to have a higher prevalence of edentulousness than blacks, in general there was no distinct difference between blacks and whites with regard to edentulousness.

In 1985-86 employed adults had 9.8 decayed and filled teeth (DF teeth), and there were minimal differences between males and females. DF teeth increased with education. Whites had more DF teeth than blacks. The trend for whites to have higher average number of DF teeth than blacks persisted even after controlling for age and income. In general, the highest average DF score (11+) was seen in the upper income and education group among persons 35 years of age and over. Even without further analyses, it is evident that there is a greater accumulation of disease and restorative treatment among older persons in these income and education groups.

Among the dentate, the proportion of decayed teeth to decayed and filled teeth (D/DF) is an expression of untreated disease. Overall, in 1985-86, among the working adult population, 13

percent of the DF teeth were decayed. Based on this measure of need, one would infer from the 1985-86 data that untreated disease was greater among persons in families with low income, persons with low education and among blacks than it was among their counterparts in the employed population 18-64 years of age. These race and education differences persisted even when age and income were controlled. The greatest need-for-treatment (D/DF) exists in the low income/low education and black/low income groups, particularly in the 19-24 year age group.

With upcoming cohorts, it is anticipated that the overall oral health status of the nation will continue to improve. It has been suggested, however, that within the adult population there are still groups of individuals with poor oral health status and that it is these groups toward which preventive efforts, early diagnosis and treatment should be directed. For example, Indian Health Service data illustrate disease prevalence rates which differ from those of U.S. national data, and information from local studies has identified subgroups with levels of oral health poorer than the national average.

Efforts to reduce oral diseases would be most effective if they were directed toward eliminating risk factors. Risk factors for caries include the presence of pathogens, susceptible tooth structure and a suitable substrate for the pathogens. These are reflected in high counts of microflora, absence of fluoride, inappropriate diet and/or plaque retention. Similarly, risk

broader general sample as well as the addition of physical, behavioral and disease-related identifiers which might expand the potential for targeting high-risk individuals.

This presentation is based on a preliminary investigation of the NIDR data on employed adults. Beyond providing a view of a major portion of the U.S. adult population as a precursor to analyzing a data set with more identifiers, this data base allows us to consider the appropriateness of target audience identification within the working population. One major approach for health promotion is a worksite program. Many worksite programs are directed toward all employees, while others are available simply for those who are interested. While limited resources often preclude providing education and/or services to an entire work group, targeting within the employee pool at one location, or targeting selected industries, might be feasible. Screening all employees on some health characteristic in order to reach the appropriate audience would be one method to achieve this. Yet another would be to begin the screening, education and services within subgroups of the employee pool thought to be at higher risk.

SELECTED DATA ANALYSES ISSUES FOR TARGETING

Variable Selection

Analyses of data for the purpose of program planning may require a different focus than traditional epidemiological analyses. If the ultimate purpose is to make a difference in the oral health status of a group of individuals the very selection of the dependent and independent variables may be critical in directing the effort. Sometimes variables of intellectual interest may be of little value for program planning. Using existing variables/measures may be appealing. Focusing on clearly visible factors has more intuitive appeal for targeting than those which are masked. Depending on the program interest, population/environmental level variables may be more useful than individual level ones. Addressing mutable factors would appear to have more value; yet, by emphasizing those, the analyst ignores the other factors to which we need to adapt or adjust in the long run, such as the age/sex/race structure of the population.

Decisions addressing these variable selection issues are critical. For example, in considering the lifetime expression of caries, epidemiologists frequently use DMFT, DFT, DMFS, or DFS. (See Attachment A for definitions.) A filled tooth, while at one point diseased, is considered to have been restored to function thus requiring no particular intervention at the current time.

In contrast, a decayed tooth reflects active disease and requires intervention. Missing teeth reflect the ultimate sequelae of oral diseases and treatment alternatives. The composite measure reflects many steps in the process of dental diseases and may be too gross to be useful in planning. Yet it can be separated to emphasize different points. D/DF would reflect the amount of untreated disease. Missing (M) reflects the most compromised dentition. Characterizing individuals with considerable or total tooth loss with an eye toward targeting a health education or promotion activity might be addressing the problem after it has occurred. This might not be as appropriate as characterizing individuals prior to or during active disease states so tooth loss can be prevented. On the other hand, characterizing individuals with extensive tooth loss with the assumption that younger individuals with the same characteristics might follow in this pattern, might be a useful strategy; or one might want to direct a program toward the needs of those with tooth loss.

Descriptive Presentation of Data for Alternate Approaches

Four descriptive approaches were selected to illustrate differences in tooth loss among socioeconomic groups:

1) Percentage distributions
2) Quartile Analysis
3) Correlations
4) Stepwise Regression Analysis

It is self-evident that each of these approaches provides the 'same answer', yet they may vary in their usefulness for visualizing differences and making decisions. Also, it is obvious that more multivariate approaches and sophisticated modeling approaches could be used, as well as more variables. Those discussed today illustrate the first logical step in a more complex process of identifying significant associations among tooth loss and other variables. Also, in fact, actual program targeting can usually be made on only one or two factors regardless of how much more sophisticated we actually can get in statistical data analyses.

1) Percentage Distributions

The question being asked determines the analytical status of any variable, thus the same set of numbers can be percentaged in different directions to provide the distribution more germane to the issue being addressed. Such percentage distributions provide differentiated descriptions using a set of numbers. If the percentaging is done on the condition, this illustrates the distribution of subgroups within the 'condition' and allows us to make the statement that 'most of those with X condition are in Y subgroup'. If the percentaging is done on the socioeconomic variables, this illustrates the distribution of the condition within the socioceonomic group. Given that we are interested in the practical value in making program decisions, it is useful to

see the differences using these two presentation styles.

Figure One illustrates how edentulousness increases with age (from Brown) and the first part of Table One shows the percent of edentulous employed adults by age and race. (The portion of the table not shown is the dentate column.) These illustrations indicate that edentulousness increases with age in both racial groups, and that there is little practical difference within any age group between the races. (Given the large sample size, however, these percentages are probably statistically different in the upper age groups.) Based on this presentation, aging appears to be the most important factor.

In contrast, the second part of Table One illustrates the distribution of race and age within the edentulous population. Of those who are edentulous, most are middle age, white individuals (33%, +39%). Looking at this table, if one were developing a program to encourage individuals who were totally edentulous to buy their product or visit the dentist, there would appear to be a greater return on targeting such a program toward the middle age white individual. (This is in large part because this is a larger portion of the population.) Another task, of course, would be to identify a mechanism of isolating those who were edentulous, since a very large number of whites in these age groups do have their teeth.

Figure Three illustrates the associations as well as interactions

among tooth loss, education and age. The older poorly educated individuals are disproportionately represented. (from Brown)

Table Two shows the distributions for edentulousness, race and education. As might be expected from previous tables, the first part of the table shows the stronger impact of education than race in relation to tooth loss. (High school graduates are not shown in the table, rather only the two extremes.) Persons with less than high school are disproportionately represented irrespective of race, although there is a larger proportion of whites who are edentulous than blacks. While a difference beween 10 and 15 percent is statistically significant, is it a large enough difference to justify a separate target, particularly when we multiply these percentages by size of population in the two subpopulations?

The second part of Table Two illustrates the distribution of race and education groups within the edentulous population. Again, the influence of the relative size of the population suggests that the whites, particularly those with lower education, are the larger target.

Figure Four illustrates the interaction of age and income, with those in the lowest income bracket and the oldest age group being far more likely to be edentulous. For the low income group, edentulousness appears to become an issue from the age of 35, doubling again by the age group 55-64. In contrast, in the upper

income group, the proportion edentulous never reaches that seen in the lower income/age 35-44 group. This distribution raises interesting questions about the causes of edentulousness. Do these individuals value their teeth less, have poorer biological dentition, or get differential treatment when they visit a dentist? Each of these questions leads to additional research needs. Any hypothesis regarding which of the possible causes has the greatest likelihood of being correct, also leads to different directions for intervention.

Table Three illustrates the income, race and edentulous associations. As can be seen in the first part of this table, while statistical differences occur which reflect that certain income/race subgroups are disproportionately represented, there is little practical difference between the 1-6% seen in the table. Within the edentulous population (seen in the second part of Table Three), the majority of individuals are white, middle income (as defined by this survey).

2) Quartile Analysis

Frequently, data are presented as means or medians and tested for statistical differences. Quartile analysis has the advantage of illustrating the distribution and therefore provides a closer look at differences among subgroups.

Number of teeth present is used to illustrate this approach.

Figures Five to Seven show number of teeth by education, income and race (from Brown). Among the upper education individuals, (Figure Five), although the average number of teeth changes only by four over age groups, it is clear that total loss of teeth is greater in the older age group. Contrasting the upper to lower education groups, it is apparent that the average number of teeth decreases more rapidly and to an absolute lower level in the less educated group. Also, however, it is apparent that there is far more distribution around the median in the lower education age groups, with the bottom quartile being zero teeth in the lowest education/oldest group. In contrast, the bottom quartile of the older age/higher education group is 17 or fewer teeth and the lowest quartile of the young/well-educated group is 27 or fewer teeth.

The quartile distribution is similar for upper and lower income groups by age, as can be seen in Figure Six. An interesting illustration of the value of quartile analysis can be seen in the oldest two age groups of the lower income group. Based on the median alone, one might judge the 45-64 year age group to be 'worse off', yet quartile analysis shows that the lowest quartile is 8 or fewer teeth while for the 55-64 year age group, all persons in the lowest quartile have no teeth. For this particular measure, it is unlikely that one would judge those with 8 or fewer teeth to be an inappropriate target compared to those with 0 teeth, but this illustration exhibits the refinement in targeting which might be possible using this visualization.

It points out the difference and allows for a decision of whether to address the program to those in the lowest quartile (however defined) or those below the population median or a specific subgroup median (however defined).

Tooth loss, comparing whites and blacks, is shown in Figure Seven. In no age group are the differences as great as they are for education or income, but the pattern of earlier and more extensive tooth loss for blacks is seen, showing up most in the 45-54 year age group.

3) Correlation

Table Four illustrates the correlations of the socioeconomic variables with total tooth loss. Age is the most highly correlated, followed by education, yet all of the variables are statistically correlated with total tooth loss. What is the recommendation for targeting--use a combination of all socioeconomic variables since they are significantly associated with tooth loss, or base the targeting on those most highly correlated? What is the cutoff point? Is this decision made based on ease in identifying those individuals with a characteristic or on the simple fact that there is a correlation? Is this statistical presentation more or less useful in determining who needs to be targeted?

4) Stepwise Regression

Given the exploratory and descriptive purpose of this exercise, a stepwise regression was selected to illustrate a multivariate approach. As can be seen in Table Five, age contributes the most to explaining the variance in tooth loss, followed by education. While statistically signigicant, the other four variables contribute less to the explanatory power of the model. This approach tells us the same thing the other ones did, that tooth loss is highly associated with age and education. While this exploratory multivariate approach may provide guidance for additional model development, it appears to have no advantage over simple descriptive statistics for simple targeting of a health education or promotion program.

DISCUSSION

The above set of tables and figures illustrates different ways of viewing the associations of socioeconomic/demographic factors with tooth loss. These analyses suggest that age, education and income are important to furthering our understanding of tooth loss. If the intent is to direct a program toward those who have already lost their teeth, the next logical step might be to analyze data which include a broader range of socioeconomic groups to confirm these findings, and to develop programs to address the problem which can be demonstrated and tested. If the intent, however, is to prevent tooth loss, one of two approaches could be taken. Further analyses of factors associated with

tooth loss can be pursued, on the assumption that since tooth loss progresses with age, programs which target those younger socioeconomic groups which at later ages become edentulous will address the problem. Alternately, one might study the socioeconomic/demographic factors associated with other oral health status measures and treatment approaches (e.g. D/DF, measures of periodontal diseases, access to routine dental care and preventive and early treatment services) that precede tooth loss to determine if a program would be different if targeted to these factors.

It is frequently said that we know the lower socioeconomic groups are at higher risk to certain diseases or conditions, for example oral diseases, and therefore should be the target for health education and promotion efforts. While clearly this data base seriously underrepresents those very individuals, one can still see that it depends on how the data are presented whether one is willing to accept that 'given'. It is important to determine the purpose of the program, e.g. 1) to reach the most possible people with a condition, 2) to reach a smaller group who disproportionately have the condition, 3) to reach those who are the worst off (the lowest quartile), etc. Issues of how to define high risk become critical, e.g. whether the risk is biological, self-care, values, information, access to any treatment, access to appropriate treatment, etc. Risk could be individually, professionally or environmentally induced. In most cases it will likely be a combination of all. For example,

variation in tooth loss might be due to differentials in 1) level of appreciation of prevention and early treatment alternatives by both the individuals and health care professionals; 2) access to or provision of, preventive and early treatment services; 3) technological and therapeutic development in the environment at key points in an individual's life cycle. Clearly, before investing enormous sums into targeting high risk individuals or groups, it is necessary to understand the risk factors, ask the appropriate questions, as well as have more appropriate analyses of all relevant data bases.

There is little evidence that there is a biological difference in (predisposition to) oral diseases among socioeconomic groups. The data presented above indicate that once disease is present, however, blacks, poor, and the less educated receive extractions more than the benefit of restorations to maintain otherwise sound tooth structure. A perception may need to be created among these individuals and their dental care providers that they do have good teeth, that they can prevent the occurence of disease, and that disease which does occur can be eliminated through early treatment rather than extraction. A reorientation from extraction/dentures to restoration/natural teeth is a prerequisite for individuals in these groups as well as their providers. The apparent transition from low disease prevalence in teenage years to exceptionally high D/DF in young adult years to extraction in later years needs further investigation to determine the most appropriate way to stop this progression.

Education for reorientation of these individuals is clearly not enough. The barriers to care which they have to confront are very real. The lack of education and income represent absent resources. There is little value in providing education and reorientation toward oral health if preventive and early restorative services are unavailable for appropriate educational and income levels.

Additional research questions arise which could further impact targeting. Are oral health education and training provided at levels of understanding for high risk individuals? Are resources available for the provision of preventive and restorative services? Are the professions and the environment-at-large able to assist in achieving any changes? Do third party payers provide for appropriate services, e.g. prevention and early restoration rather than extraction? Would any of these make a difference?

CONCLUSIONS

This discussion illustrates the need to clearly define the purpose of any program prior to selecting operational variables and deciding on the appropriate analyses and presentation of data. Different descriptive approaches have unique values depending on the questions being asked and the decisions which need to be made.

Having a reasonable picture of what is expected, descriptive analyses using socioeconomic and demographic variables, appear to have value for preliminary identification of high risk audiences for targeting health education and promotion, although additional analyses would usually be needed to refine the selection, and more research would be needed to demonstrate and evaluate appropriateness of selected approaches for high risk groups.

Limiting analyses for identification of high risk groups to socioeoncomic and demographic variables runs the risk of overemphasizing the individual and lifestyles. Without attention to the social, political, and economic influences, programs which target only lifestyle changes typically do not appreciably improve health outcomes. Health education and risk reduction programs require supportive socio-structural, economic, and political conditions in order to maximize their successes.

Yet health education and risk reduction programs cannot operate on all fronts simultaneously--going against all the multicausal factors. Generally, multifactorial interventions are not representative of how prevention programs actually are designed and implemented. Also, it may not be cost effective to expend public resources for health programs in this fashion. Although it is true that oral diseases, as well as others, are influenced by many factors, rarely is it true that the needs of any target population require equal attention to all of the various

factors. For example, if a group of individuals is aware of a given health threat, education may not be the appropriate thrust, rather, some other factor such as access may need emphasis. Much more work is needed in epidemiologic, behavior, educational, and enviromental needs assessment activities for primary prevention program planning before we can benefit from a multicausal approach for risk reduction. Specifically, more analyses are needed on how the individual beliefs and behaviors act within the social, economic and environmental forces so that the appropriate responsibility--and intervention thrust--can be identified.

Attachment A

Definitions

Dental Caries: cavities, lesions in the teeth, measured by decay (active disease), filled (restoration present representing past disease), missing (no tooth, assumed to be missing due to caries)

Periodontal Diseases: bleeding gums (gingivitis), periodontitis (serious inflammation and destruction of the gums and supporting bones of the teeth), measured by pocket depth or loss of attachment

Totally Edentulous: Missing all teeth in the mouth

Dentate: Having at least one tooth; up to 28 teeth (3rd molars excluded)

Plaque: An invisable film on the teeth and gums providing a substrate for bacteria

DFT: an epidemiological measure indicating the number of teeth (T) which have a history of dental caries as reflected in active disease (D), presence of a restoration/filling (F)

DMFT: an epidemiological measure indicating the number of teeth (T) which have a history of dental caries as reflected in active disease (D), presence of restoration/filling (F) or Missing (M)

DMFS: an epidemiological measure indicating the number of surfaces on the teeth which are decayed (D), filled (F) or missing (M)

DFS: an epidemiological measure indicating the number of surfaces on the teeth which are decayed (D) or filled (F)

D/DF: the percentage of teeth with a history of dental caries which have active disease, e.g. untreated disease

Health Education: any combination of learning designed to facilitate voluntary adoption of behaviors which are conducive to health

Health Promotion: any combination of educational, organization, economic and environmental supports for behaviors conducive to health

Attachment B

SAMPLE

This presentation is based on the employed adult portion of the NIDR National Survey of Oral Health in U.S. Employed Adults and Seniors: 1985-86. This part of the survey was designed as a cross-sectional study of employed populations, stratified by geographic regions and 5-year age intervals. The sampling frame was the list of U.S. establishments categorized according to Standard Industrial Classifications (SIC), a coding system developed by the U.S. Government along with U.S. business. Agriculture, mining, military and household domestics were excluded because of access and economic reasons. The permanently unemployed and persons who are not employed outside the home were not in the sampling frame. Lists of establishments were obtained from Duns Marketing Index, supplemented by the U.S. postal facilities and a list of owned and rented space occupied by Federal agencies. The sample of employed adults was selected through the use of a five-stage sample design: counties or groups of contiguous counties, ZIP codes, clusters of establishments, establishments within clusters, employees. The survey was conducted by field staff consisting of eight coordinating teams and eight examinations teams, trained and calibrated by NIDR staff.

MEASUREMENTS

Of the oral assessments made, number of teeth, number of missing teeth and proportion edentulous for the total sample were selected for illustrative purposes in this presentation. Missing teeth and proportion edentulous are used as a reflection of the combination of disease and treatment history (third molars excluded). Other useful measures to consider in developing education or programs addressing tooth loss might be D/DF or measures of moderate or severe periodontal diseases. D/DF and measures of periodontal diseases, as measures of need, or untreated diseases, might serve as precursor measures for tooth loss and deserve more attention in later analyses. The combination of measures should allow us to consider any observed differences among demographic and socioeconomic groups as they relate to the possibility of improved targeting for preventing or reducing tooth mortality.

The demographic and socioeconomic variables available for the analyses are age, gender, race, income and education. Overall, the sample was reasonably distributed by age and gender, but less than 10 percent Black. Overall in the sample, 58 percent of the employees examined had received some post-high school education and 21 percent completed 4 or more years of college, thus representing a generally well educated group. The household incomes of the employed adults appear to be very similar to the household incomes of U.S. households of roughly the same age range. Sixty-seven percent of employed persons had incomes of $20,000 or more. Given the few observed differences between genders, the discussion will focus on comparisons among the other groups. Analyses have been weighted so that the results provide national estimates of the working population.

Figure Three

Percent of Edentulous Employed Adults in 1985, By Age and Education

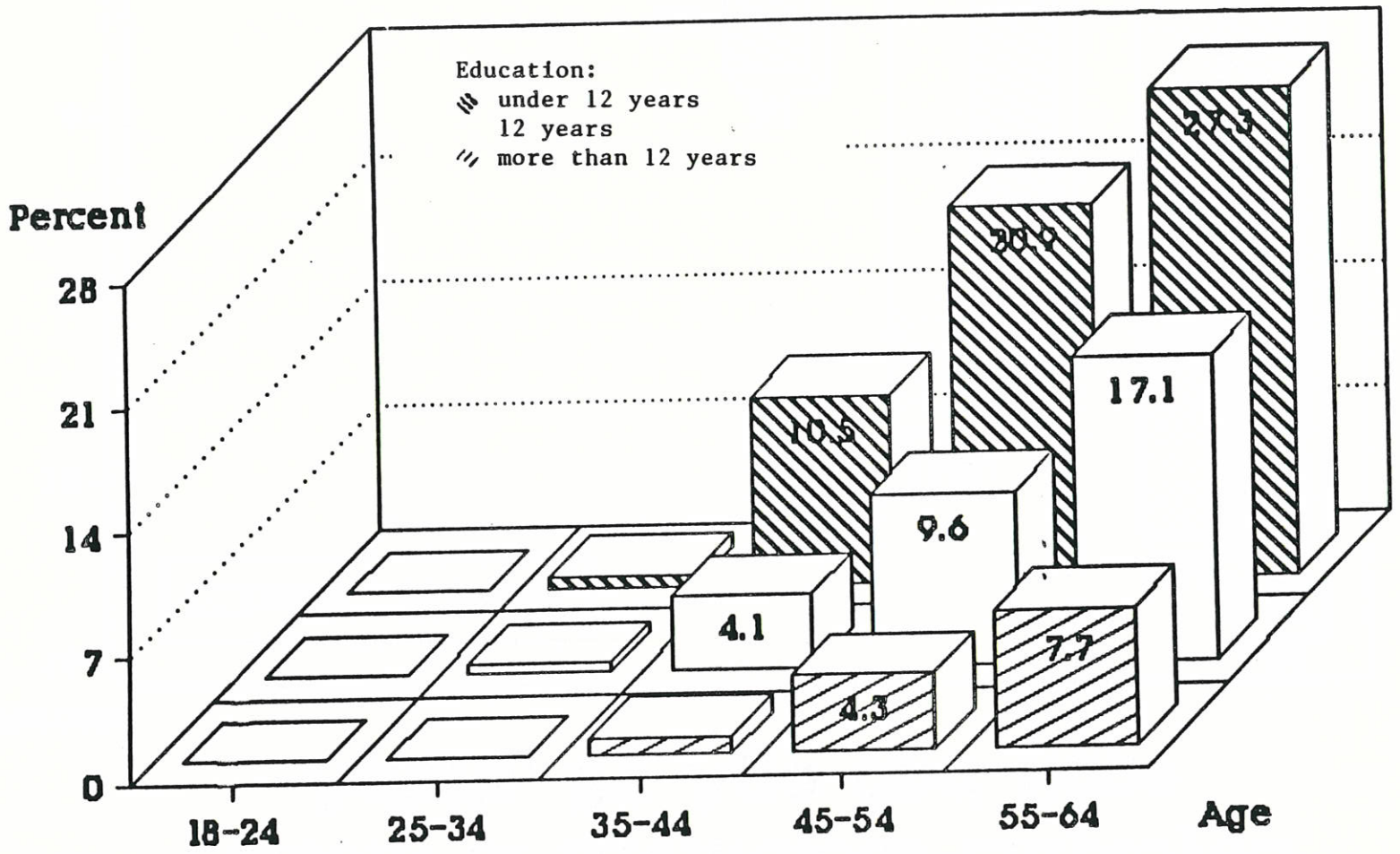


Figure Four

Percent of Edentulous Employed Adults, By Age and Income

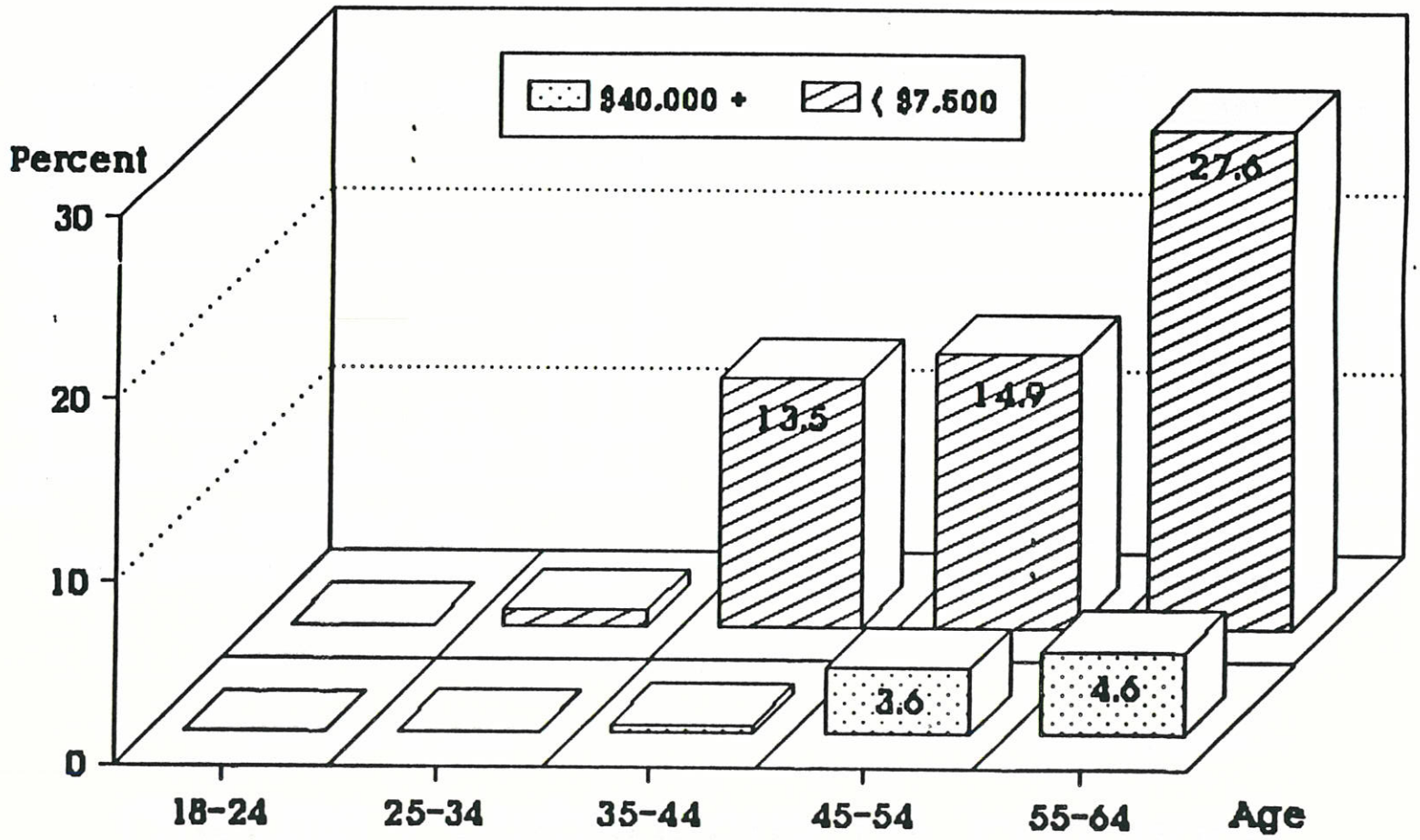
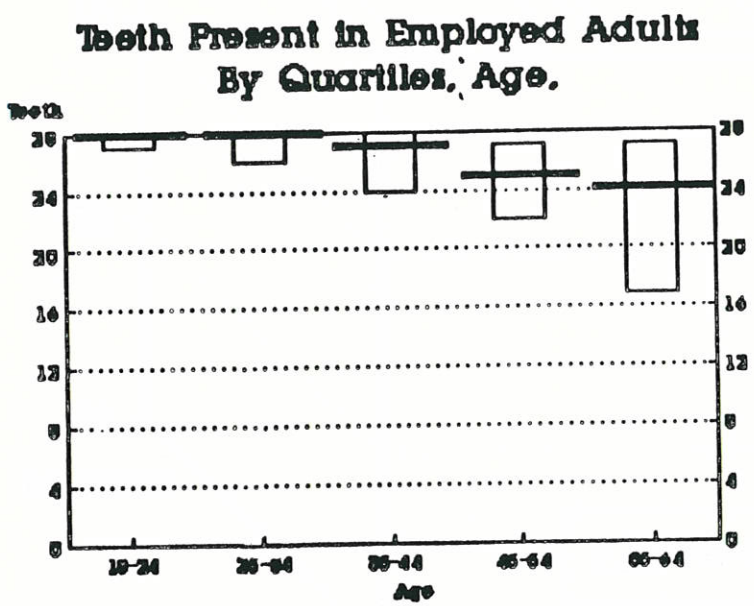


Figure Five

Quartile Comparisons By Education

More than 12 Years



Under 12 Years

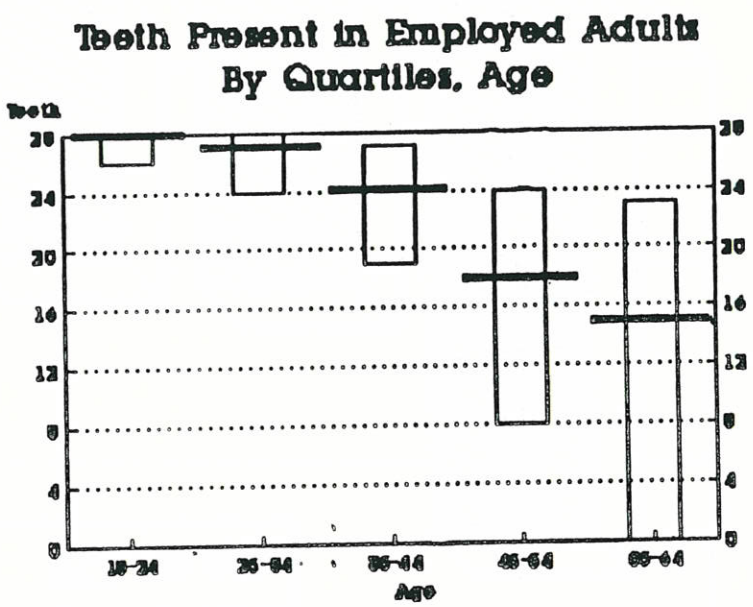
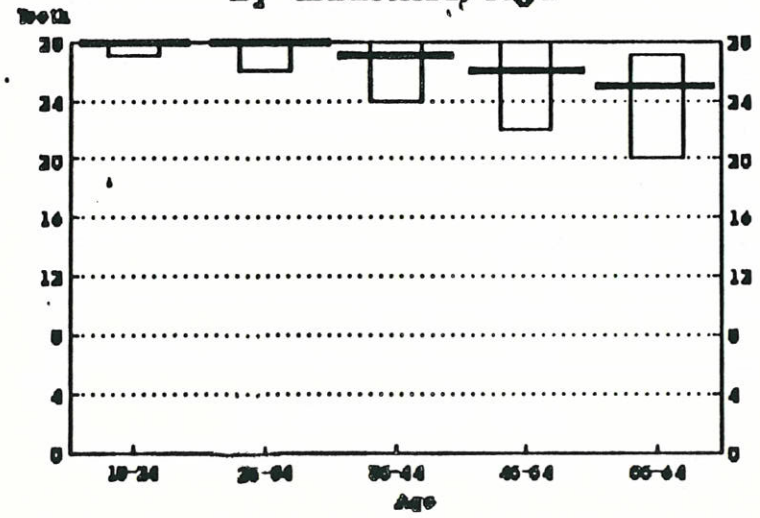


Figure Six

Quartile Comparisons By Income

$40,000 or more



Less than $7,500

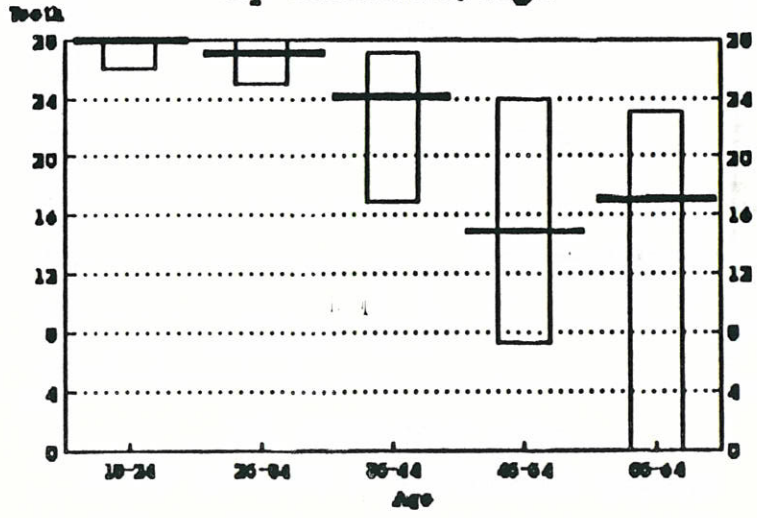
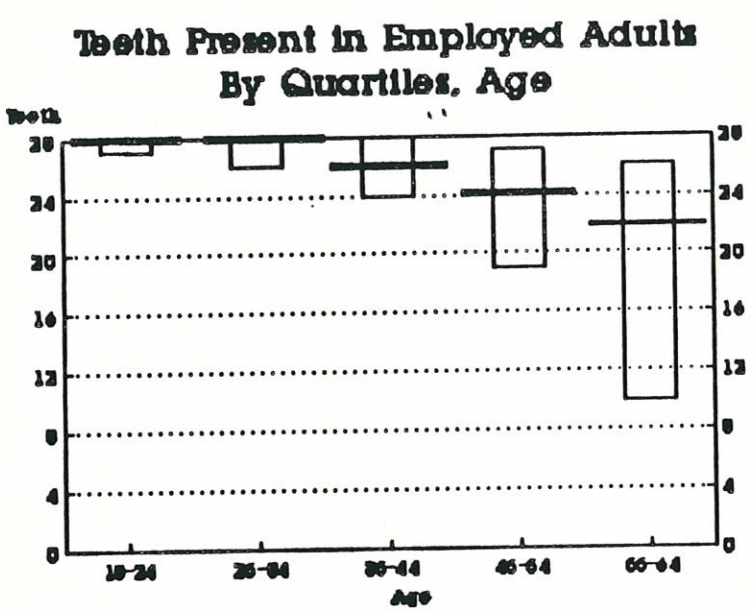


Figure 7

Quartile Comparisons By Race

White



Black

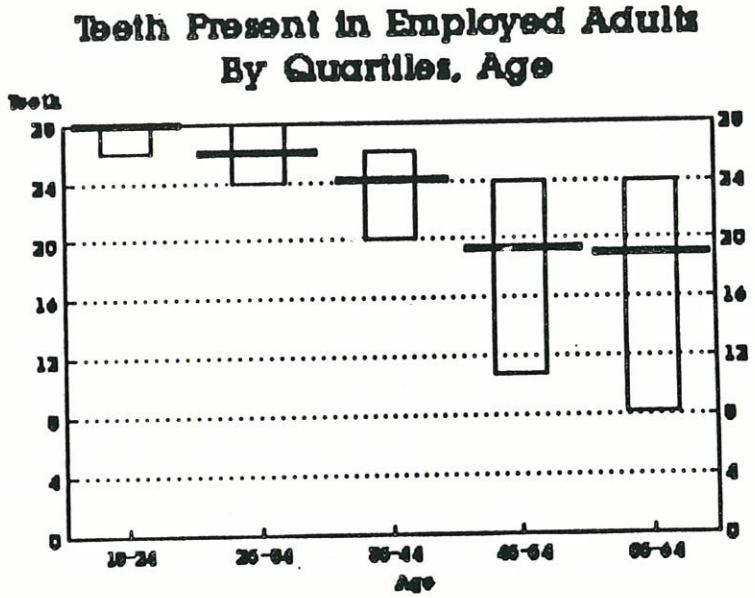


Table One

Proportion Edentulous by
Race and Age
(Percentaged on Race/Age)

Race/Age	Percent Edentulous
White/18-34	0
White/35-44	3
White/45-54	9
White/55-64	15
Black/18-34	0
Black/35-44	1
Black/45-54	11
Black/55-64	13

Racial and Age Descriptors of Edentulous Individuals
(Percentaged on Edentulous/Non-Edentulous)

Race/Age	Percent Edentulous	Percent Non-Edentulous
White/18-34	2	45
White/35-44	17	22
White/45-54	33	14
White/55-64	39	9
Black/18-34	0	5
Black/35-44	1	2
Black/45-54	5	2
Black/55-64	3	1

Table Two

Proportion Edentulous by Race and Education
(Percentaged on Race/Education)

Race/Education	Percent Edentulous
White/Less than High School	15
Black/Less than High School	10
White/More than High School	2
Black/More than High School	2

Racial and Education Descriptors of Edentulous Individuals
(Percentaged on Edentulous/Non-Edentulous)

Race/Education	Percent Edentulous	Percent Non-Edentulous
White/Less than High School	55	12
Black/Less than High School	7	2
White/More than High School	34	78
Black/More than High School	4	8

Table Three

Proportion Edentulous by Race and Income
(Percentaged on Race/Income)

Race/Income	Percent Edentulous
White/<$7500	6
White/$7500-19900	6
White/$19900-39900	4
White/$40000+	1
Black/<$7500	4
Black/$7500-19900	5
Black/$20000-39900	2
Black/$40000+	2

Racial and Income Descriptors of Edentulous Individuals
(Percentaged on Edentulous/Dentate)

Race/Income	Percent Edentulous	Percent Non-Edentulous
White/<$7500	7	4
White/$7500-19900	31	20
White/$19900-39900	43	39
White/$40000.	10	27
Black/$<7500	1	1
Black/$7500-19900	5	3
Black/$19900-39900	2	4
Black/$40000.	1	2

Table Four

Correlations of Socioeconomic Variables with Total Tooth Loss[1]

Variables	r	Significance
Age	,46	,001
Last Visit	,18	,001
Education	-,29	,001
Income	-,13	,001
Gender	,05	,001
Race	,03	,001

[1] Including total tooth loss

Table Five

Tooth Loss[1] and Socioeconomic Variables

Stepwise Regression Summary

Variables Entered	R^2	Significance
Age	.21	.001
Education	.27	.001
Last Visit	.30	.001
Income	.31	.001
Gender	.31	.001
Race	.31	.05

[1] Including total tooth loss