Research

Insurance as a Predictor of Dental Treatment: A Pilot Study in the Savannah, Chatham County Area

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Introduction

Countries offering government funded dental insurance utilize universal databases to research public health dentistry. Studies utilizing detailed statistics on treatments and procedures administered to citizens provide insightful information in the field of dentistry. However, limited research was found that investigated insurance status as a contributing factor for treatment compliance. By using the diversity of insurance coverage in the United States, research was conducted to evaluate the influence of insurance status on a citizen's behavior to accept or reject dental treatment. Prior to conducting such a study on a national basis, this pilot study was conducted to determine if a correlation exists between one's insurance coverage and treatment compliance, and to define its limitations. The study investigated insurance status as a predictor of dental/dental hygiene treatment. The researcher utilized existing data from a 2 year time frame that was provided by a private dental practice located in Savannah, Georgia. Comparisons were made as to whether the patient elected to receive or reject the recommended dental treatment. The research question for this study was: Do insured individuals obtain dental treatment to a greater degree than the uninsured? The independent variable was insurance status, which included insured versus uninsured patients. The dependent variable was the dental treatment obtained.

Review of the Literature

Insurance coverage and/or benefits have become a growing consideration in the clinical practices of dentistry.[1] The question of whether or not insurance will provide a financial benefit appears to play an important role in the decision–making process for many patients. Different types of insurance, such as private, public and military, vary in the types of coverage that are available. While various types are discussed in each study, the basic principle of providing financial assistance for dental

Abstract

Purpose: To assess patient compliance with the treatment prescribed by the dentist.

Methods: Data, which included age, gender, insurance status and a tally of accepted and rejected procedures by use of CDT (current dental terminology) codes, was extracted from a private dental office database. All patient identifiers were removed to insure internal reliability. Thirty procedure codes were investigated for each patient to determine compliance by individual code and categories which included preventative, radiographic and restorative procedures.

Results: Results indicated that the acceptance rate of dental exams by the insured and uninsured was greater than 80%. The comprehensive oral exam was most commonly rejected. The insured population had a 90% acceptance rate for, where the uninsured population had a 74.6% acceptance rate for the oral prophylaxis procedure. Radiographic procedures had an acceptance rate of 8.3% higher by insured patients than those uninsured. Crowns, bridges and dentures showed less difference in acceptance rates.

Conclusions: A positive correlation exists between insurance status and patient acceptance of prescribed treatment.

Key Words: dental insurance, dental treatment, dental treatment and insurance

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care is shared by all.

Most available research regarding dental insurance examines who is insured and what factors influence a person's insurance coverage status. Most frequently, these factors included issues of racial, ethnic, socioeconomic and demographic characteristics. The studies were divided into groups according to age: children, adult and older adult. The purpose of this literature review was to determine the relation of dental insurance with the intention of considering the methods of data collection, trends in interest for this topic and the findings of the related studies.

Several of the studies conducted in the United States utilized data collected from previous nationally administered studies. This data allowed for better external validity with large sample populations. One frequently cited study was the NHANES, conducted by the National Center for Health Statistics.[2] The NHANES III used both a survey and a clinical exam. In 1995, the National Health Interview Survey (NHIS) study population involved 39,239 American households.[3] Stancil et al utilized this nationally representative cross–sectional survey of the United State's non–institutionalized population, as well as survey data from the Centers for Disease Control (CDC) and the NHIS. Manski et al found that the Medical Expenditure Panel Survey (MEPS) was another nationally representative source which was conducted by the Agency for Healthcare Research and Quality.[4] It used an overlapping panel design, enabling both cross–sectional and longitudinal studies to be conducted using this data.[3] Population samples used in these studies excluded the institutionalized population.[2–4]

Many people have private insurance and their records are kept as property of individual dental practices across the nation. Therefore, collecting data relating to one's dental health status and insurance status is somewhat restrictive in the United States, and findings often pose limited validity.[5] Further, the Health Insurance Portability and Accountability Act, of 1996 (HIPAA) regulations limit access to individual's records for the purpose of collecting insurance coverage data. In those countries utilizing federally funded dental insurance, a greater amount of information is available via a single database. Using databases as means of data collection was explored in one Canadian study.[6] In Canada, dental services are provided by the government. This study focused on a native population referred to as the First Nations. A First Nations dataset of 12.8 million records from 538,034 clients were examined, all from a single database.[6] The study sought to analyze expenditures (dependent variable) and identify factors influencing cost (independent variable). This research indicated that from 1994 to 2001, of those individuals receiving dental services, 36% were restorative treatments, 12.7% were diagnostic, 12.2% preventative and 8.9% orthodontics.[4]

Children: Much of the research focused on children. Chen found that results from the 2000 MEPS study revealed that 68.5% of children had private health insurance and, of these, only 56.9% had dental insurance.[7] There was a greater likelihood of African American children being provided dental insurance than Caucasian, non–Hispanic children. Moreover, it was suggested that near–poor families may be at a greater risk of being uninsured than poor–families, because the near–poor are less likely to qualify for public assistance insurance in the United States.[7] Chen cited that similar percentages existed for children who had public government funded medical insurance (18.4%) as for those children who had public assistance dental insurance (16.9%). However, there were higher percentages of children with private medical insurance (65.3%) than those with private dental insurance (44.6%).[7] The NHIS study also found that the near–poor population had the highest percentage of uninsured children, and African American children were more likely to be insured than Caucasian children.[3] A comparatively small study in Detroit of low income persons of African Americans descent found that a child's number of dental visits was significantly influenced by insurance status and also by the caregivers perception of the child's oral health.[8] Sohn et al reported that, if the caregiver perceived the child as having "fair" or "poor" oral health, the child was more likely to be taken to dental visits.[8] Further, it was indicated that caregiver education level and gender influenced whether or not children were taken to the dentist.[8] An additional study conducted a national survey of parents whose children possessed special needs to assess unmet health care needs of this population.[9] Ranking first in health services not received by this population was dentistry, with more than 3/4 of children needing dental care within the past year – nearly 1/2 of the uninsured reported needing dental services. Of those with private insurance, 5% expressed a need for services which were not obtained.[9]

Further, a cross–sectional study was conducted in Brazil which examined the associations between socioeconomic circumstances (independent variable) and oral health status (dependent variable) at 2 stages of life – birth and adolescence.[10] The findings indicated that Brazilian adolescents with high levels of material deprivation between birth and age 13 had a higher likelihood of having oral disease.[10]

Adults: A study using data collected in the NHANES III from 1988 to 1994 indicated that nearly 54% of adults over age 20 possessed private dental insurance.[2] Several studies also found that Non–Hispanic African Americans were more likely to have private dental insurance than non–Hispanic Caucasians or Mexican–Americans.[2,12,13] Further studies

indicated that the higher the education level, at least through the twelfth grade, the percentage with private insurance increased. The clinical findings also suggested that individuals with private dental insurance have better oral health status.[2,14,15] It was also revealed that privately insured people were significantly less likely than their respective counterparts to have untreated dental caries, periodontal conditions of 4 mm or more of attachment loss and missing 12 to 27 teeth.[2] The results of this study were found using a propensity score methodology that assigns a single summary score according to naturally occurring groups from background characteristics.[2]

Older Adults: Differing from the general adult population, older adults experience many changes financially with consideration for retirement and the often decreased income or loss of benefits from no longer being employed. One study explored this phenomenon using data from the 1996 MEPS by evaluating 4,272 non–institutionalized adults over the age of 55.[4] Researchers predicted that, as age increases and income decreases, dental insurance coverage will decrease. Moreover, factors such as age, income and dental insurance status are directly related to dental service usage. Results from this study showed that as adults get older, dental visits and having dental coverage decreases. It should be noted that, although the presence of teeth had a profound effect on the likelihood of a visit, it did not appear to have an effect (p>.05) on the mean number of visits or mean expenditures. Income also effected likelihood of a dental visit, but only insurance coverage appeared to have an effect (p<.05) on the mean number of visits or mean expenditures.[4,12]

A Canadian study of 788 older adults living in institutions for the aged contradicted results utilized in this review. This particular study considered the effects of dental insurance on the ranking of dental treatment needs in the elderly population.[11] It found that the rankings of the participants were not related to insurance status and claimed that none of the factors relating to gender, dental status and ability to perform daily activities confounded the effects of dental insurance on dental needs.[11] However, results indicated that insured participants were twice as likely to need new dentures as the uninsured.[11]

Referenced in many of these studies was the RAND Health Insurance Experiment, which provided a significant evolution in the study of insurance.[2] While not discussed in detail in this review, results are in the study of insurance and considered historic in nature. The RAND study assigned families at random to different levels of insurance coverage for a period of years and found that "dental insurance effects on clinical outcomes in the Rand Health Insurance Study suggest dental insurance, by reducing out–of–pocket expense, increases willingness to seek oral health care, which in turn improves oral health. These results are more pronounced in children and adolescents than adults."[2]

At any age, socioeconomic and demographic factors play a significant role in whether or not someone is insured or uninsured. The research suggests that having insurance is linked to better oral health status. These relationships are of global interest. However, in the United States, a significant limitation exists when attempting to compare insured and uninsured individuals, where results cannot yield exact datasets detailing services provided to its citizens.

Methodology

Using a longitudinal study methodology, patient behavior to accept or reject dentist recommended treatment was compiled via an existing computerized database as the research instrument. Data was extracted and entered into an Excel spread sheet. Inferential statistics were computed using the dataset. Correlations regarding insurance status, age, gender and treatment plans were considered. A single treatment plan consisted of both the accepted and rejected procedures, whereas both were prescribed based on the individual need of the patient. The Pearson's test was utilized for some of the calculations in this study, where other correlations were found using a modified Pearson's test and are considered point–biserial. The Modified Pearson's test was utilized because the correlation involved dichotomous variables, such as insurance and a continuous variable of accepted procedures. The pilot test represented a small sample which was sensitive to outliers and a level of skepticism should be observed when considering the results of this study.

Data Collection: This pilot study conducted in Savannah, Georgia utilized an existing database provided by a private dental practice that spanned over a 2 year period, from January 1, 2005 to December 31, 2007. This single blind descriptive study assessed compliance with prescribed treatment. The data set was manually extracted from the database by the office manager. All patient identifiers were removed to insure internal reliability. The dataset included: age, gender, insurance status (insured or uninsured) and a tally of accepted and rejected procedures by use of CDT (current dental terminology) codes. Thirty procedure codes were investigated for each patient. Compliance was examined by individual code and by categories: preventative, radiographic and restorative procedures.

IRB & Legal Review: Prior to beginning this research, approval was granted by the Institutional Review Board (IRB) at Armstrong Atlantic State University. Approval was issued from the board on February 15, 2008. The IRB approved the project under the provisions of Federal Regulations 45 CFR 46. All

of the patients included in this study signed a HIPAA Release Form, thereby granting informed consent. Those who refused were excluded from the sample. Patients were given the opportunity to sign the HIPAA Release Forms when filling out the initial paperwork to become involved as a new patient. The privacy policy of the office is set forth according to those guidelines established by the United States Department of Health and Human Services, Office for Civil Rights. This research abides by these terms and falls under the heading "uses and disclosures for other reasons without permission," which states: "uses or disclosures for health related research," "disclosure of de–identified information" and "disclosure of a 'limited dataset' for research, public health or health care operations." Compliance of HIPAA Laws and Regulations of this research was legally reviewed on January 29, 2008 by a licensed attorney in the state of Georgia and found in compliance with the law. Documentation of informed consent was obtained from the dental practice providing the dataset. The documentation contains the signatures from both the dentist and office manager. The office manager agreed to serve as a mediator between the existing dataset and the researcher and to exclude identifiers from the data provided. The researcher had no access to the patient's personal identifying information.

Population: Sample selection for this study began with oversampling of the uninsured adult patients. An equal sample size was selected at random from the remaining insured adult population. This study found a difference of less than 1% in the male to female ratio of citizens seeking dental care between those insured and uninsured. The sample population consisted of 94 adult patients (30 females and 17 males, from both insured and uninsured statuses). The total population of this office consisted of 1,036 patients. With 231

uninsured patients (22.3% of the total population) and 805 insured patients (77.7%), the calculated sample size for this pilot study would include approximately 400 patients. This private practice, however, served many families. Adults over 18 years old accounted for 30.2% of the total practice population. The age of each subject was calculated as of December 31, 2007. To insure the patients were over 18 for the duration of the study, those under the age of 20 were excluded from the sample. Child populations are commonly used as a trend in insurance status studies.[6–8] IRB approval was indicated for this study, and it was advised to exclude children and to include only adults. A chart of the adult practice population can be viewed in figure 1. After the children were excluded, the insured adult populations included 266 patients (168 females, 98 males) and the uninsured adult population included 47 patients (30 females, 17 males). For this comparative study, equal sample sizes were taken from each group.
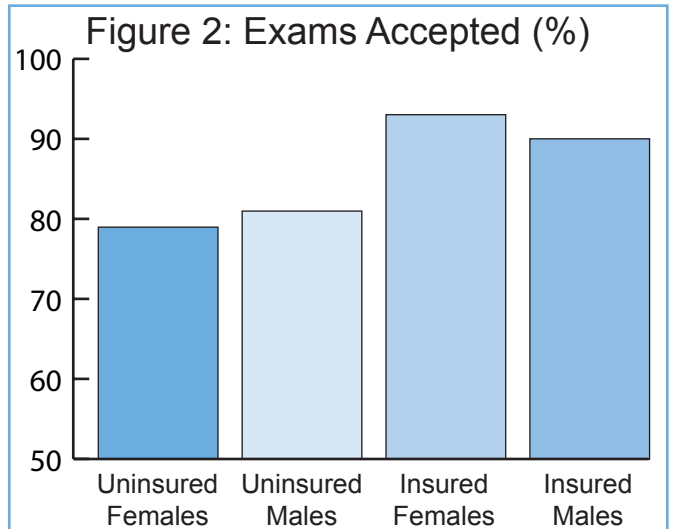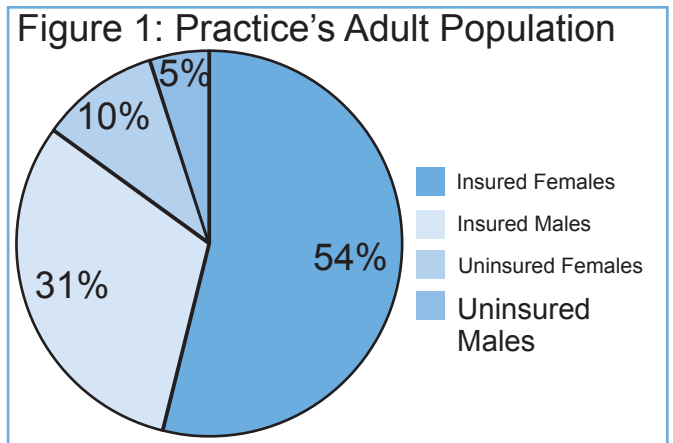
Age: Once the sample of 94 patients was selected, age groups were investigated in keeping a common trend in insurance study. In ascending order, based on percentage of the whole, the sample was as follows: 50–59 year olds (13%), 40–49 year

Figure 1: Practice's Adult Population

- Insured Females 54%
- Insured Males 31%
- Uninsured Females 10%
- Uninsured Males 5%

Figure 2: Exams Accepted (%)

	Uninsured Females	Uninsured Males	Insured Females	Insured Males
%	79	81	93	90

olds (16%), 20–29 year olds (18%), 30–39 year olds (21%) and 60 years and older (32%), creating the largest percentage of the study population.

Results

Preventative Examinations: The study reviewed 3 specific dental examination codes commonly used in dental practice. They were: D0120, a periodic oral evaluation for established patients; D0140, a limited oral evaluation that is problem focused and D0150, a comprehensive oral evaluation for new or established patients. Cumulatively, patient acceptance was above 80% regardless of insurance status (figure 2). The most frequently rejected exam was the comprehensive examination (D0150).

Oral Prophylaxis: D1110, preventative dental cleanings, account-

ed for 145 performed procedures in this sample. The insured population had an acceptance rate of 90% for prophylaxis procedures, whereas the uninsured population acceptance was 74.6%. The correlation coefficient between insurance status and the percentage of accepted prophylaxis was $r=0.28$.

Advanced Hygiene Procedures: D4341, periodontal scaling and root planing per quadrant, was applicable to only 5 individuals, even though it included 11 prescribed treatments due to multiple quadrants prescribed per patient. The uninsured sample accounted for 4 accepted quadrant treatments while the insured sample included 3 rejected and 4 accepted D4341 treatments. Overall, 2 of the 5 patients rejected this treatment.

Radiographs: Of this sample, there were 8.3% more patients with insurance accepted radiographic procedures than those without insurance. A significant correlation ($r=0.21$) was found between insurance status and the percentage of accepted radiographic procedures. The radiographic procedures rejected by both the insured and the uninsured were the bitewing and full mouth series radiographs.

Types of Radiographs and Compliance: Full Mouth Series (FMX), D0210: The total prescribed full mouth series of radiographs accounted for 50 procedures. A total of 68% were accepted. Insured patients accepted 77.4% of the recommended FMX. Uninsured acceptance was 24.8% less than the insured.

Bitewing radiographs, D0272 (2 films) and D074 (4 films): The insured population accepted 94% of the advised bitewings. The uninsured population accepted 75% of this procedure.

Panoramic, D1330: Panoramic radiographs only accounted for 3 procedures received by the entire adult population with 100% acceptance.

Periapicals, D0220 & D0230: Similar to the panoramic, no PAs radiographs were rejected.

Restorative Treatment: Individual dentist preference affected the type of restorative procedures provided in the practice, and is considered a limitation in data collection and affected the results of this study. Amalgam type restorations were rarely placed.

Anterior Restorations: Anterior restorations included all resin based composite restorations and are collective of D2330 (1 surface), D2331 (2 surfaces), D2332 (3 surfaces) and D2335 (4 or more surfaces). The insured population accepted at a rate of 22% more often than the uninsured population. The highest compliance rate was the insured males at 79.2% of the recommended treatment. Overall, 57.3% of the total 103 anterior restorations were completed (figure 3).
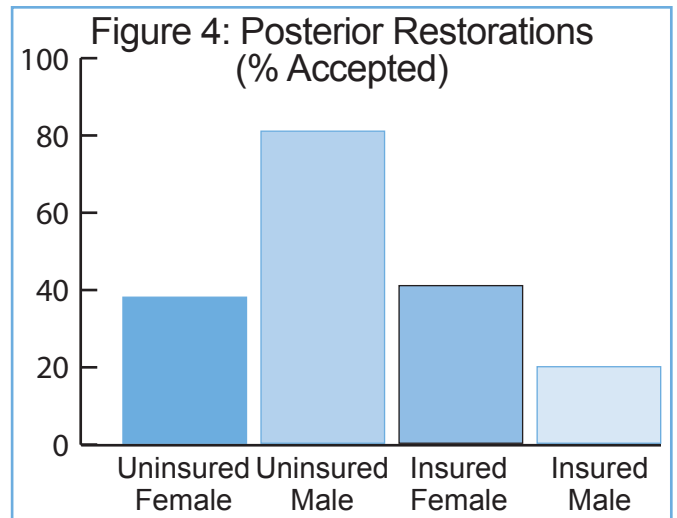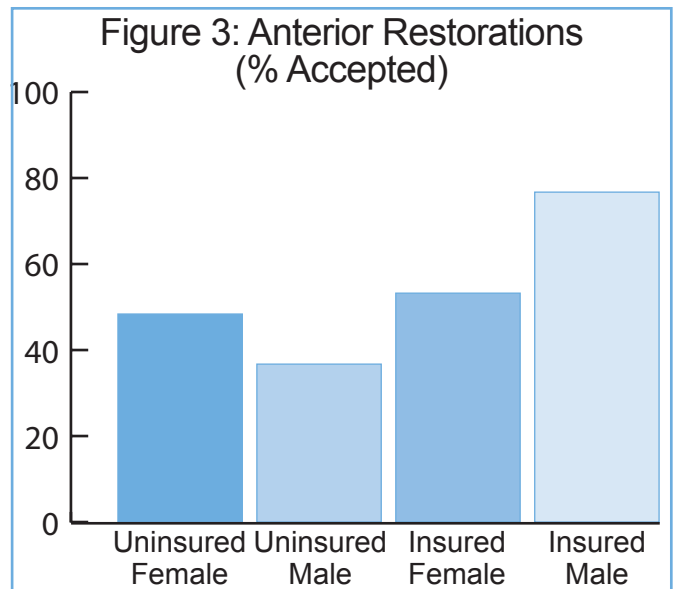
Posterior Restorations: Posterior resin based composite restorations included D2391 (1 surface), D2392 (2 surfaces), D2393 (3 surfaces) and D2394 (4 or more surfaces). Unlike with the anterior restorations, acceptance for posterior restorations was higher among the uninsured population (figure 4).

Crowns: Due to the dentist's specific preference, only porcelain fused to high noble metal, D2750, were tal- lied. The rejection rate for procedure D2750 was over 65% for both the insured and uninsured population. It should be noted that, while it appears uninsured males held a 50% acceptance rate, the data is skewed since only 2 out of the 29 crowns were prescribed for this group. Uninsured females had the most crowns prescribed.

Bridges/fixed tooth replacement: Due to the limited number of these procedures in this sample, result data in this category was not included.

Dentures/removable tooth replacement: This data included complete dentures D5110 (maxillary) and D5120 (mandibular) and partial resin

Figure 3: Anterior Restorations (% Accepted)

Figure 4: Posterior Restorations (% Accepted)

based dentures D5211 (maxillary) and D5212 (mandibular). Insured patients accepted 7.1% more removable dentures than the uninsured patients. Since these procedures were not applicable to the treatment plans of any of the insured male population the genders were combined within the same insurance status.

Overall Results: In total, 72% of all prescribed treatments were accepted. Insured patients accepted 75% of their treatment, while uninsured patients accepted 68% of their treatment. The correlation of insurance status to the number of accepted procedure was $r=0.27$. Figure 5 displays the average number of procedures per patient divided by those prescribed, accepted and rejected. The first column shows the average number of prescribed treatments per patient. Ideally, there should have been 376 prophylaxis preformed since it is recommended every 6 months, and over the 2 year period each patient would have at least 4 cleanings. Also in conjunction with cleanings, the patient must have an oral examination by a dentist, which is required by the rules and regulations for dentistry in the state of Georgia. Therefore, each patient had at least 8 prescribed procedures, which is comparable to the average number of prescribed procedures per patient (7.98). In the uninsured population, only an average of 6.87 procedures per patient was prescribed. The second column reveals the average number of accepted procedures. A significant correlation ($r=0.27$) of insurance status to the number of accepted procedures was revealed. However, this is not a strong correlation which indicates that, even though more insured individuals seek dental treatment, there is little difference between those insured and uninsured receiving the recommended treatment.

Discussion and Limitations

A limiting factor influencing the acceptance rate is the communication among the dental staff about the

Figure 5: Average Number of Procedures Per Patient

treatment. Additionally, the efforts of the office administrator, with regard to accommodating schedules and financing, could have been a factor (Vaccari, personal communication, April 2008). The result regarding completed procedures is most likely due to improved recording of treatment recommendations in the patient's record. Another factor affecting why the uninsured had less prescribed treatment may be attributed to a higher dropout rate of these patients when compared to those insured patients (Vaccari, personal communication, April 2008). It is therefore recommended that in a future study a record of patient dropout rate would be beneficial.
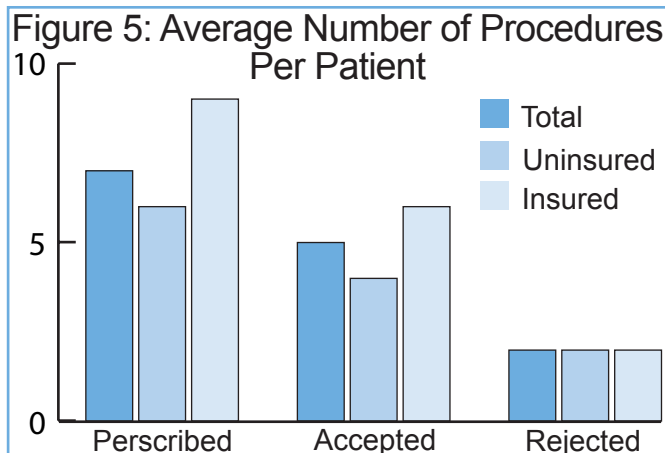
A primary limitation for this study was the participation of only 1 dental practice for this investigation. The office was a newly established practice with 1 dentist and 1 hygienist. The use of multiple offices would have allowed for greater external validity. The data is reflective of the phenomena preferences and operations of this single practice only. It presented restrictions on the dataset procedure selection and the population size. The general age of the patients in this specific dental office also created a limitation in the sample size for this study. Families accounted for much of the office's population. Patients under the age of 18 years comprised 2/3 of all registered patients. The inclusion of children in this study would have been preferred. It would have not only provided a larger sample but would have allowed more age comparisons and investigation into additional procedures such as sealants. The IRB approval for using minors in this research would have

been more difficult.

A major limitation was the small number of uninsured people seeking dental treatment. Since this was a comparative study, the population was directly affected by the limited number of uninsured adults registered within this private practice. Other factors about the practice, such as their fees, could contribute to why the office attracts so few uninsured patients. It may be conjectured that uninsured patients seek treatment in offices with comparatively lower prices since the patient is accepting full responsibility for any cost incurred. A study investigating ratios of insured and uninsured populations among several offices with variations in fee schedules may help determine this possibility.

To explain why a stronger correlation between insurance status and patient acceptance of procedures was not found may be due to the fact that significantly fewer uninsured patients are seeking dental care. Those who express enough of a concern to schedule and arrive for a dental appointment may account for the population who has a greater value assigned to dental health than those without insurance not seeking treatment. It can be assumed that if the person is concerned enough to seek treatment, they will be increasingly likely to accept prescribed treatment.

A consideration for future research should be the variations

among insurance providers and plans to establish if a correlation exists between the two. Incorporation of a survey that would provide patients the opportunity to express why they chose to reject or accept the treatment may be beneficial. The NHANES, as discussed previously, used both clinical evidence and a survey to find results. This information further explains why the rejection rate of certain procedures is present within the insured population, especially those where insurance covers only a portion of the cost. Considering that only 1 office was used in this study, the results for the insured populations were likely influenced by the specific HMO/DHMO or EPO accepted at this office.

As with many studies investigating insurance, the socioeconomic status of the person should also be considered. Another consideration is that cost and financial aid may not be the only reasons a person rejects treatment. It should be considered that some individuals may have dental insurance made available to them, but elected not to have insurance. Instead, they prefer to pay directly for their dental care. Another influencing factor could be a scheduling conflict on the part of the individual or the office, or it could also have to do with anxiety and a fear of the dental treatment.

A challenge in the statistical analysis of the dataset was that not all procedures were indicated for every patient, especially when considering restorative procedures. Using a small sample resulted in some procedures being applicable to as few as 1 person. Such cases would result in skewed data whereby any finding would be inconclusive. The researchers were sensitive to this situation and any findings deemed to be not reflective of the entire sample were excluded from the results.

Since this study only examined 1 dental practice, the limitation arose in the types of procedures that could be investigated. The ADA CDT codes

that were the most often applied in this office were used. Due to dentist preference, certain procedures would have been skewed. The dentist at this practice preferred composite restorations over amalgam as discussed previously regarding restorations.

Procedures that were referred to dental specialists for specific treatments were eliminated from this study. The dental practice used for this study refers out all endodontic, orthodontic and oral surgery (including extractions) to specialized practices. Since these procedures were referred outside the private practice, they were unable to be used in this study. The office does keep track of the correspondence with the specialized practices regarding the referrals, but this information would be from a secondary source. The possibility exists that not all correspondence were maintained, and it was decided to exclude these procedures from the dataset.

There is also the chance that patients chose an alternative treatment than the one presented by the dentist. For example, if a patient were advised to have a root canal and crown to save a tooth, the patient may have elected to have the tooth extracted. Gilmore et al found contrary results, in that most patients choose the treatment recommended by the dentist.[16] However, in the dataset utilized for this investigation, it appeared that the patient did not comply with restorative recommendations. Moreover, if initial treatment for the removal of tooth decay was not received, the decay continued to spread, thereby resulting in a larger restoration. In this case, the dataset might show a rejected 2 surface restoration but acceptance of a 3 surface restoration. Consideration for this phenomenon would need to be addressed in software preparation for a larger study. Perhaps the software can check the individual tooth number and cancel a rejected procedure should an accepted treatment occur on the given tooth.

There were limitations encountered in extracting the dataset because of the restrictions of the software. The office used EagleSoft 11.0 software designed for dental practices. The software was not capable of removing identifying information so that this would be a blinded study. Instead, the office manager undertook the time consuming task of manually extracting the data. As with any research where humans are entering data, a chance of error exists. Since the data had to be manually extracted and then reentered manually into Excel, the likelihood of human error was increased. This was a limitation with the particular software program at this office, but the office manager, who is familiar with many other dental practice software programs, stated other programs are capable of producing the data set automatically.

A major limitation for this study was time constraints and a lack of funding for data collection, analysis and written review of the findings. This created many restrictions in research modifications. More conclusive results would be possible if given proper funding, corporation from multiple dental practices, a larger sample and an extended period of time for research (Beiter, personal communication, April 2008).

In review, the limiting factors applicable to a larger modification of this study include: the limited uninsured population seeking dental care, not all patients are candidates for every procedure, dentist's preference, referred procedures, patient scheduling, the fee schedule of the dental practice, variations in coverage amounts among insurance plans and providers and extraneous factors influencing patients' decisions.

Conclusion

In accord with previous research, this study found that significantly more insured patients sought dental treatment than those uninsured. Of this sample, 85% of adults seeking

dental care were insured. Using a modified Pearson's test, a significant correlation was found between insurance status and the percentage of accepted procedures for examinations (r=0.27), oral prophylaxis (r=0.28) and radiographs (r=0.21). Correlations with restorative procedures were either inconclusive or had a correlation coefficient of less than 0.20. In total, 72% of all prescribed treatments were accepted. Insured patients accepted 75% of their treatment, while uninsured patients accepted 68% of their treatment. The resulting correlations merit further investigation into insurance status as a predictor of dental treatment.

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