

**A Comparison of Compliance in Medicaid versus Non-Medicaid
Orthodontic Patients**

BY

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THESIS

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This thesis is dedicated to my husband and parents for their endless love and support.

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LIST OF ABBREVIATIONS

IDHFS = Illinois Department of Health and Family Services

EPSDT = Early and Periodic Screening, Diagnostic and Treatment

PP = Private Practice

UIC = University of Illinois at Chicago

SUMMARY

Access to care is a significant issue faced by the Medicaid dental population, especially Medicaid orthodontic patients. One of the most significant factors affecting access to care is provider participation. Very few orthodontists are currently participating in the Medicaid program. Orthodontists perceive Medicaid patients as uncooperative and cite their belief that Medicaid patients are more likely to fail appointments, show up late for appointments, and cancel at the last minute as some of the reasons they chose not to participate in the Medicaid program. However, few studies have been conducted to determine if these orthodontist perceptions regarding compliance in the Medicaid program are justified.

The purpose of the current study was to determine if the perceived problems with the orthodontic Medicaid population are justified. The null hypothesis tested was that there is no difference in patient compliance regarding appointment keeping behavior, broken appliances, wearing orthodontic auxiliaries, or oral hygiene maintenance in the Medicaid and non-Medicaid orthodontic populations studied.

A retrospective chart review was conducted at two sites: 1) Wicker Park Orthodontics – a private orthodontic practice in northwest Chicago and 2) the University of Illinois at Chicago Orthodontic Clinic. Charts of 30 Medicaid and 30

SUMMARY (continued)

non-Medicaid patients were reviewed at each site. From each chart, the following information was recorded: the mean percentage of failed and late appointments the number of broken appliances, auxiliary wear, and oral hygiene maintenance. The student t-test and Chi-square tests were performed to determine if there were any statistically significant differences in the aforementioned categories between the Medicaid and non-Medicaid orthodontic patients.

Based on the results of the student t-test, there were no statistically significant differences between the two groups with regards to the mean percentage of late and failed appointments ($p = 0.107-0.393$). Cross tabulation and Chi-square results also showed no statically significant differences between the two groups with regards to the number of broken appliances, auxiliary wear, and oral hygiene. The range of p-values for the three Chi-square tests was 0.075-0.600.

The results of this study indicate there is a lack of evidence behind orthodontists' perceptions that Medicaid orthodontic patients are less compliant than non-Medicaid orthodontic patients. While there are still some difficulties in treating Medicaid patients, such as low fee reimbursement and cumbersome paperwork, the current study will hopefully alleviate some of the

SUMMARY (continued)

doubts practitioners may have regarding this population's compliance making them more open to participating in the Medicaid program to help reduce the access to care issue faced by these patients.

I. INTRODUCTION

A. History of Medicaid

Medicaid was enacted on July 30, 1965 in an effort to provide health care services to low-income families, individuals with disabilities, and the elderly (Centers for Medicare & Medicaid Services Website, Feb. 2011). Medicaid is a needs-based insurance and is funded jointly by the United States Federal Government and the individual states. While state participation in the Medicaid program is voluntary, all states have participated since 1982. Each state privately manages their own Medicaid, however all states are monitored on the Federal level by the Centers for Medicare and Medicaid Services (Centers for Medicare and Medicaid Services Website, April 2011).

B. Medicaid in Illinois

In Illinois, the Medicaid program is managed by the Illinois Department of Health and Family Services (IDHFS). IDHFS is currently the largest insurer in the state of Illinois - approximately 2.54 million people are enrolled. Of those enrolled, more than one-half are children (1.58 million) (Quinn and Maram, 2010). There has been a steady increase in the number of enrollees since the year 2000. Some of the Medicaid programs operating in Illinois are All Kids, Family Care, and Moms and Babies (Illinois Department of Healthcare and Family Services, 2005).

1. **Eligibility**

States are responsible for determining Medicaid eligibility requirements and these requirements vary by state. However, there are certain members of society in which the federal government has mandated Medicaid coverage. These include limited income families with children, recipients of Supplemental Security Income, infants who are born to Medicaid-eligible women, pregnant women and children under the age of 6 whose family income level is at or below 133% of the federal poverty level, and individuals who receive adoption or foster care assistance (Centers for Medicare & Medicaid Services, 2005).

In addition to those with mandated Medicaid coverage mentioned above, each state is able to provide Medicaid coverage to other “categorically needy” groups at their own discretion. Examples of categorically needy groups may include (Centers for Medicare & Medicaid Services, 2010):

- Certain low-income children
- Blind, disabled, or elder adults with incomes above the levels for mandatory coverage but below the Federal poverty level
- Pregnant women and infants up to age one with family income levels below the Federal poverty level but above the level for mandatory coverage
- Institutionalized individuals with a limited income
- Uninsured, low-income women diagnosed through the Center for Disease Control Breast and Cervical Cancer Early Detection Program to be in need of treatment for breast or cervical cancer

2. **Services**

Services covered by Medicaid are outlined below (Illinois

Department of Healthcare and Family Services, 2005):

- Chiropractic Care
- Dental Care (limited for adults)
- Doctor's Services
- Eye Care
- Family Planning
- Help for substance and alcohol abuse
- Hospice Care
- Laboratory Tests
- Medical Equipment and Supplies
- Medical Transportation
- Nursing Care
- Podiatry
- Prescription Drugs
- Radiographs
- Rehabilitation Assistance
- Renal Dialysis
- Second opinions for surgery
- Special appliances and Devices

a. **Dental Services Covered**

In 1967, the Early and Periodic Screening, Diagnostic, and Treatment (EPSDT) comprehensive health services benefit was established by the Federal Government. The focus of EPSDT is on “prevention, early diagnosis, and treatment of medical conditions” (Centers for Medicare & Medicaid Services, April 2011). A component of this benefit is the requirement that dental services be a mandatory service for individuals under the age of 21 who are eligible for Medicaid. Dental services cannot be limited to emergency treatment; at a minimum, relief of pain, treatment of infections, restoration of

teeth, and dental health maintenance must be provided to those eligible for Medicaid. Any service determined to be medically necessary must be covered. It is up to each state to determine what is medically necessary and what specific dental services will be provided (US Department of Health and Human Services, 2004).

In the state of Illinois, exams, cleanings, and x-rays are covered services. In addition, sealants, restorations, crowns, root canal therapy, and extractions are also covered services (Illinois Department of Healthcare and Family Services, 2010). DentaQuest serves as the third-party administrator of Medicaid dental services in the state of Illinois (DentaQuest, 2009).

b. Orthodontic Coverage

Occasionally comprehensive orthodontic care is “medically necessary” for certain individuals. In response to this issue, in 1966, a task force from the American Dental Association recommended that treatment of malocclusions should be included as part of covered treatment services. They recommended that priority should be given for “interceptive service and disfiguring or handicapping malocclusions” (Im et al., 2007). Variations on eligibility for coverage of orthodontic treatment exist from state-to-state. Several indices exist that are utilized by states to determine the severity of a person’s malocclusion. Examples of these include the Grainger Orthodontic Treatment

Priority Index and the South Carolina Orthodontic Screening Index (US Department of Health and Human Services, 2004).

In the state of Illinois, children and adolescents from age 2-20 with “severe, dysfunctional, handicapping malocclusion” may qualify for orthodontic coverage (Doral Dental Services of Illinois, LLC, 2006). Typically crowding is not enough alone for a patient to qualify. Until recently, the Modified Salzmann Index was utilized as a method to score the severity of a patient’s dentition. Points are accumulated based on certain criteria such as crowding, overbite, overjet, and esthetic handicaps. A total score of 42 points or greater using the Modified Salzmann Index was required in order for an individual to qualify for Medicaid coverage in Illinois (Doral Dental Services of Illinois, LLC, 2006).

On July 1, 2010 new guidelines were implemented for determining an Illinois Medicaid patient’s eligibility for orthodontic coverage. The new guidelines state that a person exhibiting at least one of the following criteria may be eligible (DentaQuest, 2009):

- Deep overbite with the majority of lower incisors showing palatal impingement that causes tissue trauma
- An anterior openbite, not including incisors that have not fully erupted or only one or two teeth out of alignment
- Posterior openbite including several teeth (Not involving only partially erupted teeth)
- Anterior crossbite involving more than two teeth or in cases where gingival defects are developing from the crossbite that are not correctable by limited orthodontic treatment

- Several teeth involved in a posterior crossbite (one tooth must be a molar)
- A large anterior-posterior discrepancy (i.e. a full step Class II or Class III malocclusion)
- Impacted anterior teeth that will not erupt without orthodontic or surgical intervention (Does not include teeth that will erupt ectopically)
- Crowding in either arch of 7-8 mm
- Overjet in excess of 9 mm
- Dentition profoundly impacted from congenital or developmental disorder
- Facial asymmetry requiring orthodontics and orthognathic surgery for correction

If the patient does not meet any of the above criteria, a Modified Salzmann Index is performed and the individual's initial malocclusion must score a 42 or greater in order for Medicaid orthodontic coverage. In addition to the aforementioned requirements, the patient must also have no primary teeth remaining to be considered for qualification. Documentation that the "malocclusion is an impairment of, or a hazard to the ability to eat, chew, or breathe" is also probable grounds for orthodontic coverage (Doral Dental Services of Illinois, LLC, 2006). Interceptive coverage is not covered by Illinois Medicaid. If the patient qualifies for orthodontic coverage by Medicaid, coverage will include orthodontic treatment only once in a patient's lifetime.

II. STATEMENT OF THE PROBLEM

A. Medicaid Enrollment

Recently, in conjunction with the rise in unemployment, there has been a steady increase in the number of individuals enrolled in Medicaid. It has been reported that the national enrollment levels of Medicaid have grown at levels not seen since the 1960s when the program was first implemented. An increase in monthly enrollment of 7.5% (3.29 million) occurred from June 2008 to June 2009. Consistent with the national increase in Medicaid enrollment, all participating states have also seen an increase in enrollment. The majority of the increase in enrollees, on both the state and national level, has been children (Henry J. Keiser Family Foundation, 2010). In the year 2006, approximately 1.3 million Illinois children (52.5% of total enrollees) under the age of 19 were enrolled in Medicaid. (Child Welfare League of America, 2010). From 2004 to 2009 in Illinois, there was an increase in children on Medicaid by approximately 300,000 (Centers for Disease Control and Prevention, 2010).

B. Increase in the Number of Individuals Qualifying for Orthodontic Coverage Under Illinois Medicaid

Previously in Illinois the number of orthodontic patients whose treatment was covered by Medicaid was much lower than the 1.5 million children enrolled in the state's Medicaid program as of January 2010 (Quinn and Maram, 2010). The discrepancy is due in part to the high severity of malocclusion required by the state, prior to July 1, 2010, to qualify for orthodontic coverage. Compared

with other states that also use the Modified Salzmann Index to determine eligibility for orthodontic coverage under their state Medicaid program, Illinois's threshold of a 42 or greater requires an individual's malocclusion to be more severe than other states' eligibility requirements. Wisconsin (Wisconsin Department of Health Services, 2011) and Utah (Utah Division of Administrative Rules, 2011), for example, require a score of 30 or more on the Modified Salzmann Index for an individual's malocclusion to be considered severe enough to be covered by Medicaid. Tennessee (TennCare, 2010) requires a score of 28 or more, while Virginia only requires a Modified Salzmann Index score of 20 (Metcalf, 1996).

However, due to the revised malocclusion requirements in July 2010 for Medicaid orthodontic coverage in Illinois, it is anticipated that the number of patients whose treatment is covered by Medicaid will increase dramatically. In addition to the overall rising Medicaid population, there will be an even greater increase in the number of orthodontic patients whose treatment is covered by Medicaid in the next few years thereby increasing the demand for orthodontists to treat these patients.

C. Access to Care

While enrollment in Medicaid is on the rise, access to care remains a significant issue within the Medicaid dental population. Access to orthodontics is

even more of a problem than access to general dental care. Provider participation is one of the most significant factors affecting access to care. Overall, there is a general lack of orthodontists treating Medicaid patients in their practices. In addition, there is a poor distribution of Medicaid patients among practitioners. "About 1/4 of Washington state orthodontists participated in Medicaid in 1999, but most treated only a few patients" (King et al., 2006). Also in the state of Washington, King et al. found "ten orthodontists provided approximately 81% of the orthodontic treatment statewide, excluding those for patients with cleft lip and palate" (King et al., 2006). A similar situation was found in North Carolina where it was found that only ten orthodontists also provided over 80% of the statewide Medicaid orthodontic treatment (Horsley et al., 2007).

D. Reasons for Low Provider Participation

Even with low provider participation initially, provider participation in Medicaid has been declining (Horsley et al., 2007). Several reasons for low provider participation have been proposed. Some reasons for low orthodontic participation include the following (King et al., 2006):

- Low fee reimbursement
- Difficulty collecting fees from Medicaid
- Delays in receiving payments
- Prior authorization required
- Potential of loss of coverage during treatment
- High patient non-compliance rates
- Patients not showing for appointments
- Patients showing up late to appointments
- Patients cancelling appointments at the last minute

Broken/cancelled appointments and poor patient compliance are cited as some of the top reasons pedodontists choose not to participate or limit their participation in Medicaid (Venezie and Vann, 1993; Morris et al., 2004; Dickens et al., 2008). An existing study conducted by Iben et al. has shown that pediatric Medicaid dental patients truly miss significantly more appointments than non-Medicaid patients (Iben et al., 2000).

E. Perceptions of Practitioners

As previously mentioned, broken and cancelled appointments as well as poor patient compliance have been repeatedly cited as reasons for lack of provider participation in Medicaid programs. A survey of Louisiana general and pediatric dentists showed that broken appointments are perceived as the most prevalent problem with their Medicaid patient population. Patient non-compliance was viewed to be the third most common problem (Shulman et al., 2001). Similar results were reported from surveyed Texas pediatric and general dentists who all reported broken appointments and patient non-compliance as their major areas of dissatisfaction of this patient population (Blackwelder and Shulman, 2007). General dentists in California also say that broken appointments, low fees, and denial of payment are the biggest problems associated with treating Medicaid patients (Damiono et al., 1990). Interestingly, practitioners not participating in Medicaid tend to be more concerned about broken appointments than those currently accepting Medicaid (Damiono et al., 1990; Im et al., 2007).

F. Lack of Compliance Studies in the Orthodontic Patient Population

To date, the few studies conducted on Medicaid orthodontic patient compliance have yielded varying results and most have been limited to institutional settings. "The average broken appointment rate nationwide in Medicaid dental clinics is 30%" (Horsley, 2007). Horsley et al. found the failure rate of Medicaid orthodontic patients to be lower than the nationwide average for Medicaid dental clinics, suggesting a better compliance rate among orthodontic Medicaid patients compared to other dental Medicaid patients (Horsley, 2007). Because orthodontic patients in general do not follow the appointment behavior of traditional dental patients, it cannot be inferred conclusively that the appointment keeping behavior and compliance levels of orthodontic Medicaid patients will follow the behavior seen in pediatric and general dental Medicaid patients.

G. Purpose of the Study

The purpose of this study is to examine whether patients whose orthodontic treatment is covered by Medicaid are late to appointments more often, have more missed appointments, more broken appliances and are less compliant with orthodontic auxiliaries wear and oral hygiene maintenance than patients who are paying for orthodontic services themselves. The goal of this study is to determine if the perceived problems with the orthodontic Medicaid population are justified. If the biases against this population are not justified,

hopefully this will encourage more orthodontic providers to participate in state Medicaid programs thereby reducing the issue of access to care. If the study finds evidence in support of these biases, problems with the Medicaid orthodontic patient population will be positively identified and possible solutions to these issues can be sought.

H. Null Hypothesis

There is no difference in patient compliance regarding appointment keeping behavior, broken appliances, wearing orthodontic auxiliaries, or oral hygiene maintenance in the Medicaid and non-Medicaid orthodontic populations studied.

III. REVIEW OF RELATED LITERATURE

A. Compliance in Orthodontic Patients

1. Appointment Keeping Behavior

To date, only a few studies have been conducted comparing compliance levels in Medicaid and non-Medicaid orthodontic patients. The primary objective in the majority of these studies is not to solely investigate compliance differences. For example, while assessing the effectiveness of early orthodontic treatment in Medicaid patients and non-Medicaid patients at the University of Washington, Mirabellie et al. also assessed patient compliance in the two populations. The total numbers of missed appointments of each patient were tallied. The numbers of missed appointments were then placed into 4 categories: no missed appointments, 1-2 missed appointments, 3-4 missed appointments, >5 missed appointments. Chi-Square tests were performed to evaluate for any significant differences between the two patient populations. It was found that the Medicaid population missed significantly more appointments than the non-Medicaid population. However, it is important to note that the majority of both Medicaid and non-Medicaid patients missed two or fewer appointments (Mirabellie et al., 2005), suggesting that “few patients miss the majority of the appointments, skewing the data” (Fisher and Mascarenhas, 2008). In addition, this study evaluated patients undergoing Phase I who are younger and often have shorter treatment times than patients undergoing one phase of comprehensive orthodontic treatment.

Similarly, in 2008 Dickens et al. reported on the treatment results of Medicaid and non-Medicaid orthodontic patients as well as the compliance levels of the two groups. Private practice orthodontists in North Carolina were asked to submit the initial models, final models, and progress notes of their last five completed Medicaid cases and five non-Medicaid cases of similar initial treatment complexity. There was a low response rate to the authors' request; out of fifty-five orthodontists contacted, only nine responded to the request. To assess patient compliance, the progress notes were reviewed. The number of broken appointments for each patient was tallied. The mean number of broken appointments for the Medicaid sample population and the non-Medicaid sample population were then calculated. The mean number of broken appointments was found to be the same for the Medicaid and non-Medicaid sample populations. In addition, there was only a minor difference between the two populations when comparing the percentage of cases with greater than three failed appointments (Medicaid: 44%, Non-Medicaid: 43%). It is important to note that no statistical tests were run in this study. Contrary to the results reported by Mirabellie et al., the authors concluded that there were no clinically important differences in the mean number of broken appointments between the two patient populations (Dickens et al., 2008).

In 2007, Horsley et al. performed another study examining appointment keeping behavior in the Medicaid orthodontic population. They examined all

appointments scheduled for one year at Virginia Commonwealth University's Department of Orthodontics in an effort "to determine whether a difference in appointment-keeping behavior exists between Medicaid and non-Medicaid orthodontic patients" (Horsley et al., 2007). The number of kept and broken appointments was tallied for 707 active university orthodontic patients. Medicaid patients were found to have an appointment failure rate of 15.4% and non-Medicaid patients had an appointment failure rate of 8.3%. The authors concluded that Medicaid orthodontic patients have a significantly higher rate of appointment failures than non-Medicaid patients (Horsley et al., 2007).

It is important to note that the way in which Horsley et al. determined the failure rates did not take into account whether the failed appointments were the result of multiple failures for the same patients or the result of 707 different patients. For this reason, as well as others, an article in the Journal of Evidence-Based Dental Practice stated that the Horsely et al. study does not adequately "address the purpose of the study because the authors did not analyze the data in a manner that would allow them to report on the rate of broken appointments" (Fisher and Mascarenhas, 2008). In their opinion, the "data are inconclusive regarding whether or not an orthodontic patient on Medicaid will break more appointments than other orthodontic patients" (Fisher and Mascarenhas, 2008).

2. Oral Hygiene

While little research has been conducted evaluating differences in appointment keeping behavior between Medicaid and non-Medicaid orthodontic patients, an even smaller amount of research has been conducted comparing the levels of oral hygiene behavior in these two patient populations. In 2005, Mirabellie et al. assessed orthodontic patient compliance with adequate oral hygiene maintenance in patients treated at the Odessa Brown Children's Clinic in Seattle, WA in order to determine if there was a difference between the Medicaid and non-Medicaid patients. A retrospective chart review was performed. Based on the chart entries, each patient was placed into one of three oral hygiene categories: good, fair, or poor. Using Chi-Square tests, they found Medicaid patients had significantly poorer oral hygiene (Mirabellie, 2005). However, the sample in this study consisted of patients undergoing Phase I treatment. With an average age at the start of treatment of 10.2 years for Medicaid and 10.4 years for non-Medicaid, age may play a factor in the results seen and may not translate directly to older adolescent patients treated with a single phase comprehensive orthodontic treatment.

While studying the patients of private practice orthodontists in North Carolina, Dickens et al. (2008) reported results contrasting to those reported by Mirabellie et al. A retrospective chart review was conducted in which the researcher tallied the number of poor oral hygiene comments found in the

treatment notes of the studied patients. The mean number of poor oral hygiene comments for the two groups was very similar (Medicaid: 0.9, non-Medicaid: 0.8). The authors concluded, “No clinically important differences between Medicaid and non-Medicaid patients were found with respect to...poor oral hygiene comments” (Dickens et al., 2008).

3. Broken Appliances

Only one study has been conducted looking into any differences in the rate of broken appliances between Medicaid and non-Medicaid orthodontic patients. In their 2008 study, while simultaneously evaluating for any differences in appointment keeping behavior and oral hygiene between Medicaid and non-Medicaid patients, Dickens et al. also evaluated for any differences in the number of broken appliances between Medicaid and non-Medicaid patients. The authors categorized “any fixed orthodontic attachment noted as loose or completely debonded, broken archwires, or damaged attachments to bonded appliances” as broken appliances (Dickens et al., 2008). The authors were unclear as to whether they were including fixed appliances other than brackets and bands, i.e. Forsus, Herbst, rapid palatal expanders, etc. in the broken appliance category. Descriptive statistics only were used and the authors concluded there were no clinically relevant differences in the number of broken appliances between Medicaid and non-Medicaid patients (Dickens et al., 2008).

4. Auxiliary Wear

Orthodontists rely heavily on auxiliaries such as headgears and elastics to treat patients. No studies have been conducted evaluating for differences in compliance during comprehensive orthodontic treatment with these auxiliaries between Medicaid orthodontic patients and non-Medicaid orthodontic patients.

B. Compliance in Other Dental Patient Populations

In 2000, Iben et al. conducted a prospective study to compare the appointment keeping behavior of pediatric dental patients enrolled in Medicaid and those not-enrolled in Medicaid. For one calendar month, appointments were tracked in three Eastern Iowa dental offices: a university pediatric dental clinic, a public health dental clinic, and a private pediatric dental office. All scheduled appointments were marked as on time, failure, late notice cancellation, or tardy. Using Chi-Square analyses, the failed appointments, late notice cancellation, and tardiness of the pediatric patients enrolled in Medicaid were evaluated. The Medicaid rates were compared among the three different clinical sites, as well as compared to non-Medicaid patients at these sites (Iben et al., 2000).

The authors found the pediatric patients on Medicaid in the study had higher rates of appointment failure, late notice cancellation, and tardiness than the non-Medicaid patients at the three sites studied. However, only at the dental

school clinic and private pediatric dental clinic were the Medicaid appointment-keeping behavior rates significantly more than the non-Medicaid pediatric patients (Iben et al., 2000).

The design of this study stands apart from the orthodontic studies evaluating differences in patient compliance between Medicaid and non-Medicaid patients in that it evaluates patients in different types of clinical settings. All of the previous orthodontic studies assessing Medicaid patient compliance were set in only one type of clinical setting, i.e. university clinic or private practice. University clinics and private practices all have their own unique problems that may contribute to increased failure in compliance. If poor compliance is greater in one clinical setting than another, it might be inferred that perhaps it is poor patient management, rather than the characteristics of a specific patient population, leading to the poor compliance seen.

IV. METHODS

A. Design

A retrospective study examining orthodontic patient charts and initial dental models from the private orthodontic practice of Wicker Park Orthodontics in northwest Chicago and the University of Illinois at Chicago Orthodontic Clinic was performed.

The initial research protocol was submitted to University of Illinois Institutional Review Board (IRB) asking for exemption on November 4, 2010. After supplying additional information, exemption was granted from IRB on November 23, 2010 (Research Protocol Number: 2010-0871).

B. Sample

1. Sample Size

With sixty subjects in each group the study can detect a between-group mean difference of approximately one-half of the standard deviation (0.50) with a power of 80%.

2. Private Practice Orthodontist Sample

Since there are multiple practitioners in the private orthodontic practice of Wicker Park Orthodontics, only patients treated by Dr. Barbara Siargos were examined. The sample was collected by formulating a list of

patients who began¹ orthodontic treatment by Dr. Siargos between August 1, 2007 and August 1, 2009 (See Figure 1).

Working prospectively, the first thirty patients whose orthodontic treatment was covered by Medicaid were included in the final sample from this office. Every effort was made to include an equal number of males and females in the sample.

In addition, non-Medicaid patients from the same time frame were examined. The initial stone models of these non-Medicaid patients' dentition were scored by the Primary Investigator with the Modified Salzmann Index as outlined by in the Doral Dental Services Dental Office Manual. See Appendix B for the Modified Salzmann Index score sheet that was utilized. Prior to beginning data collection, the Private Investigator tested for intra-reliability in calculating the Modified Salzmann Index Score. Ten random models were scored by the Private Investigator and then scored again two weeks later. A student paired t-test was performed to evaluate for intra-reliability.

The non-Medicaid patients at the private practice orthodontist's office, on average, had less severe malocclusions than the patients whose treatment is covered by Medicaid. It was therefore not feasible to expect to collect a sample of non-Medicaid patients where all patients included in the sample had a

¹ Treatment was considered initiated when any bracket, band, or appliance had been cemented.

malocclusion severe enough to have a Modified Salzmann Index score of 42 or greater. In an effort to eliminate individuals with only minor malocclusions, only the first thirty self-paying patients whose initial dental models received a score of 25 or greater on the Modified Salzmann Index were included in the sample. As with the private practice's Medicaid sample, every effort was made to include an equal number of males and females in the sample.

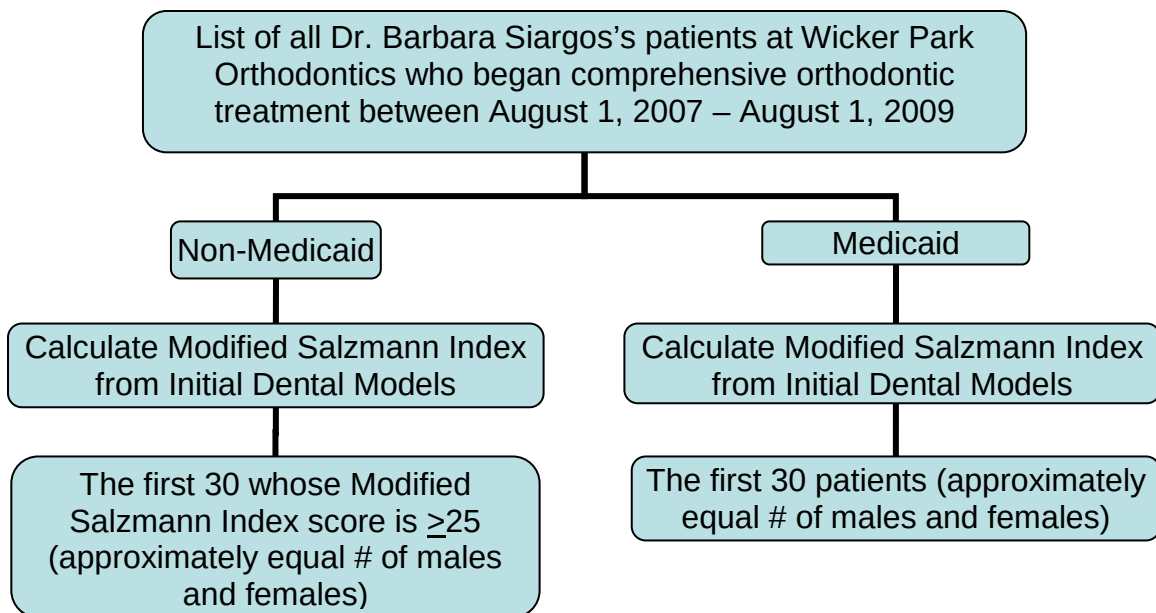


Figure 1. Private Practice Sample

3. University Clinic Sample

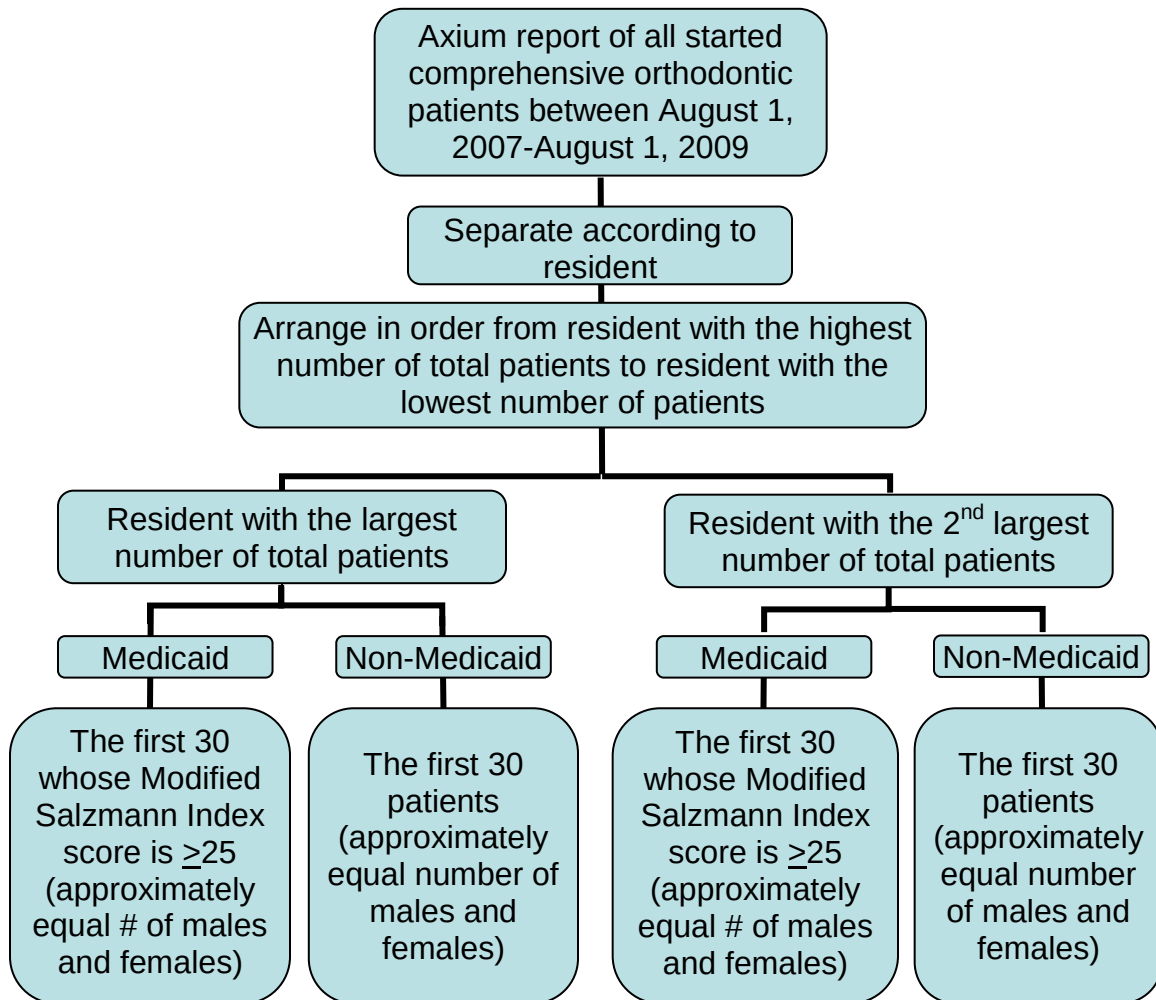
The university clinic sample was collected at the University of Illinois at Chicago (UIC). The sample was chosen by generating an Axiom®

report displaying a list of all patients who began orthodontic treatment between August 1, 2007 and August 1, 2009. The Axiom® report was broken down further to exclude patients that are inactive due to transfer of services to another provider. Patients that have completed orthodontic treatment or have been dismissed from the clinic due to poor compliance after 24 months of active treatment remained as possible candidates to be included in the sample. The list was divided into two groups: 1) patients whose orthodontic treatment is covered by Medicaid and 2) non-Medicaid patients.

As variability of recording patient compliance exists between residents, an effort was made to attempt to minimize the number of UIC orthodontic residents treating the sample of interest. The Medicaid patient list described above was further separated according to the resident providing the orthodontic treatment. Patient records for the sample were chosen in a prospective manner. Starting with the residents with the most patients whose treatment was paid for by Medicaid, a total of thirty charts of UIC orthodontic patients whose treatment is being paid for by Medicaid were examined. Every effort was made to include an equal number of males and females in the sample.

In addition to the thirty UIC Medicaid patients above, non-Medicaid patients from the Axiom® report generated earlier were examined. The sample was collected in a prospective fashion; the records of patients of the UIC

orthodontic residents whose Medicaid patients had been included in the sample were examined first. If needed, other residents' non-Medicaid patients were examined and included in the sample until the desired sample size had been identified. The initial Orthocad® models of these non-Medicaid patients' dentition were scored by the Primary Investigator with the Modified Salzmann Index utilizing the method outlined in the Doral Dental Services Dental Office Manual. Only those whose Orthocad® models score a 25 or greater on the Modified Salzmann Index were included in the sample. A total of thirty (with a relatively equal number of males and females) UIC orthodontic non-Medicaid patients' records were examined. An effort was made to keep the average of the thirty Modified Salzmann Index scores from the non-Medicaid UIC sample similar to the average Modified Salzmann Index score from the private practice non-Medicaid patients. Figure 2 outlines the sample collection method at UIC.



*Note: If there is more than one resident with the same number of total patients, the resident with the largest number of Medicaid patients will be chosen first

Figure 2. University of Illinois at Chicago Sample

C. Data Extraction

Once the samples from each site were selected, a chart review for both sites was conducted. Patients were de-identified and no protected health information was collected. Data was collected from only the first 24 months of treatment. From the charts, the following data was collected on the data extraction sheet:

- Patient age
- Patient sex
- Patient's orthodontic treatment being paid for by Medicaid (Y/N)
- Modified Salzmann Index score
- Number of missed appointments
- Number of appointments where patient was late
- Number of broken brackets requiring replacement
- Number of broken/distorted arch wires
- Was patient given any orthodontic auxiliaries (i.e., elastics, headgear, removable appliances, etc.) to wear during active treatment? (Y/N)
 - o Any notation of lack of auxiliary wear (Word-for-word)
- Any notation of improper oral hygiene (Word-for-word)

D. Data Compilation

The following categories were compared among the four groups: appointment keeping behavior, broken appliances, compliance with orthodontic auxiliaries, and oral hygiene maintenance.

1. Appointment Keeping Behavior

Most orthodontic patients are routinely seen every 4-6 weeks. Due to scheduling conflicts between the patient and the orthodontists' office hours, it is not always feasible for patients to be seen exactly in 4-6 week intervals. For this reason, it was anticipated there would be some variability among the number of scheduled appointments for the 24 month period examined in this study. To account for this variability, the percentages of failed and late appointments were recorded.

a. Failed Appointments

An appointment was considered failed if the patient failed to show for the scheduled appointment without >24 hour cancellation notice or showed up late for the appointment and were not able to be seen that day due to tardiness.

b. Late Appointments

An appointment was counted as late when the patient presented late for the scheduled appointment but was still able to be seen that day by the orthodontist.

2. Broken Appliances

Broken appliances encompassed any brackets that were debonded when the patient initially presented to the appointment as well as any orthodontic arch wires that were broken or visibly distorted. Some patients are more careless with the foods they eat and break more brackets than other patients. There are some patients who also remove brackets themselves. In an effort to prevent a few extremely careless patients from skewing the sample, the number of broken brackets during the 24 months examined were placed into one of the following categories:

- 0 broken brackets
- 1-2 broken brackets
- 3-5 broken brackets
- >5 broken brackets

The number of patients in each broken bracket category were compared among the groups of patients studied.

3. Compliance with Orthodontic Auxiliaries

The total number of comments indicating lack of adequate wear of removable orthodontic auxiliaries (i.e., elastics, headgear, etc.) was tallied for each patient. Based on the number of aforementioned comments, the patient's compliance with orthodontic auxiliaries was rated as either excellent, fair, or poor.

The following guide was used to determine which category a patient fell into:

- Excellent – 0 comments indicating lack of auxiliary wear
- Fair – 1-2 comments indicating lack of auxiliary wear
- Poor – ≥ 3 comments indicating lack of auxiliary wear

The number of patients in each category were compared among the groups.

4. Oral Hygiene Maintenance

The total number of comments indicating lack of adequate oral hygiene for each patient was tallied. Based on the number of poor oral hygiene comments, the patients' hygiene was rated excellent, fair, or poor:

- Excellent - 0 poor oral hygiene comments
- Fair - 1-2 poor oral hygiene comments
- Poor - ≥ 3 poor oral hygiene comments

The number of patients in each category were compared among the groups.

D. Statistical Analysis

Following the collection of the data from the patient records, the data was tabulated using an Excel spreadsheet and the statistical software, SPSS.

Student t-tests were performed to investigate if there were any statistically significant mean differences in appointment keeping behavior between the two groups. Cross tabulation, followed by Chi-squared tests, were also used to test for differences in broken appliances, auxiliary wear, and oral hygiene between the two groups.

V. RESULTS

A. Intra-reliability

A student paired t-test was run to determine examiner intra-reliability in computing the Modified Salzmann Index score. The coefficient of correlation, $r=0.993$, indicated a high positive correlation and provided good support to the Primary Investigator's intra-reliability.

B. Sample Demographics

Demographic data from the four study groups are shown in Appendix C.

C. Summary of Results

No statistically significant differences were seen between Medicaid and non-Medicaid patients with regards to late ($p = 0.107$) or failed ($p = 0.393$) appointments (Figure 3, Table I). The majority of both Medicaid and non-Medicaid patients studied had two or fewer broken appliances, excellent compliance with auxiliary wear, and fair-excellent oral hygiene (Figures 4-6). While there were some differences seen, Chi-square tests showed no statistically significant differences between Medicaid and non-Medicaid patients with regards to broken appliances, auxiliary wear, or oral hygiene. The range of p-values for the three Chi-square tests was 0.075-0.600 (Tables II-IV). Based on the findings described above, we fail to reject the null hypothesis.

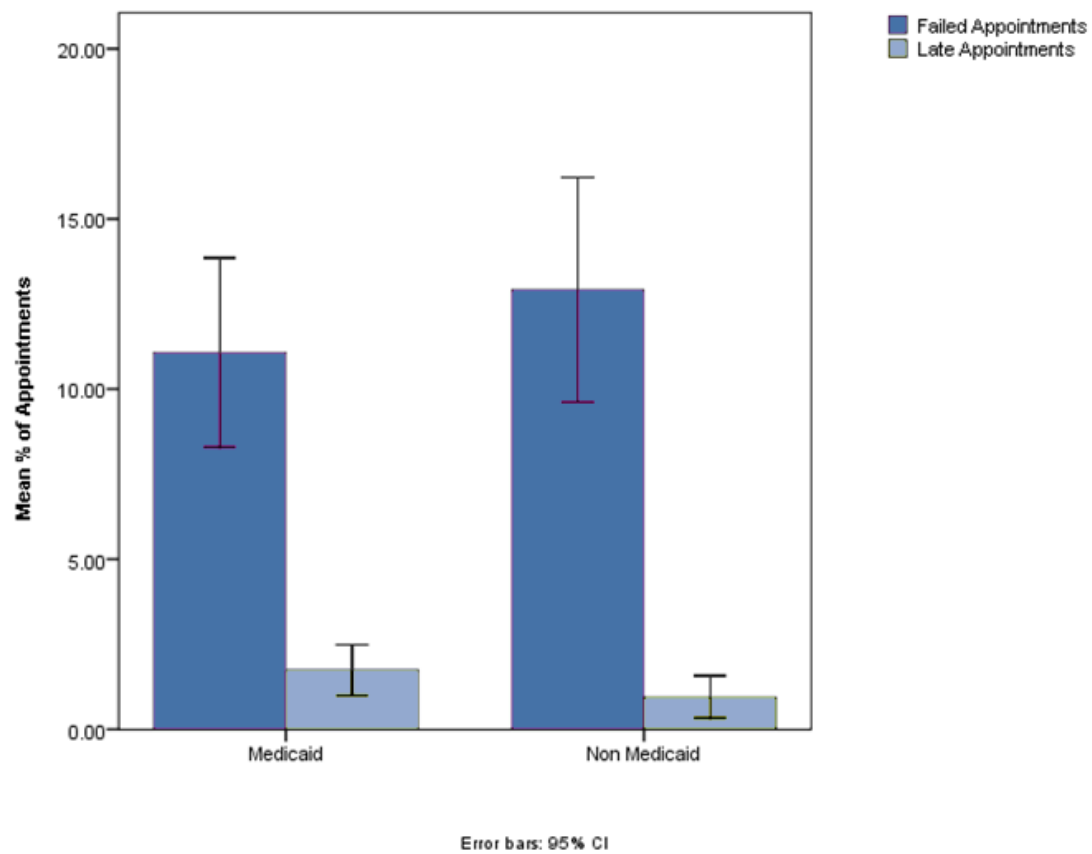


Figure 3. Appointment keeping behavior of Medicaid and non-Medicaid groups.

TABLE I

STUDENT T-TEST EVALUATING LATE AND FAILED APPOINTMENTS IN
MEDICAID AND NON-MEDICAID GROUPS

	Groups	N	Mean	Std. Deviation	t	df	Mean Diff.	p- value ^a
Failed Appt (%)	Medicaid	60	11.07	10.76	-0.857	118	-1.85	0.393
	Non-Medicaid	60	12.92	12.75				
Late Appt (%)	Medicaid	60	1.74	2.89	1.625	114.12	0.79	0.107
	Non-Medicaid	60	0.95	2.34				

^aStatistical significance at $\alpha \leq 0.05$.

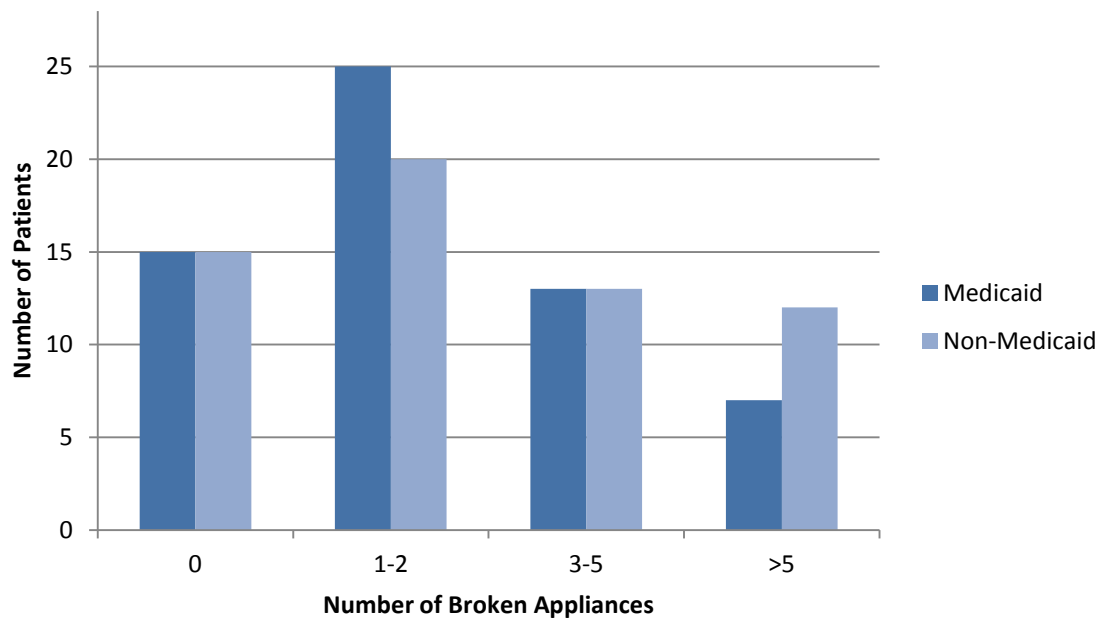


Figure 4. Distribution of broken appliances in Medicaid and non-Medicaid groups.

TABLE II

**CROSS TABULATION AND CHI-SQUARE TEST COMPARING THE NUMBER
OF BROKEN APPLIANCES BETWEEN MEDICAID AND NON-MEDICAID
GROUPS**

			Group		
			Medicaid	Non-Medicaid	Total
Number of Broken Appliances	0	Count	15	15	30
		% within Group	25.0%	25.0%	25.0%
	1-2	Count	25	20	45
		% within Group	41.7%	33.3%	37.5%
	3-5	Count	13	13	26
		% within Group	21.7%	21.7%	21.7%
	>5	Count	7	12	19
		% within Group	11.7%	20.0%	15.8%
Total	Total	Count	60	60	120
		% within Group	100.0%	100.0%	100.0%

Chi-Square Tests			
	Value	df	p-value ^a
Pearson Chi-Square	1.871	3	0.600
Likelihood Ratio	1.888	3	0.596
Linear-by-Linear Association	0.810	1	0.368
N of Valid Cases	120		

^aStatistical significance at $\alpha \leq 0.05$.

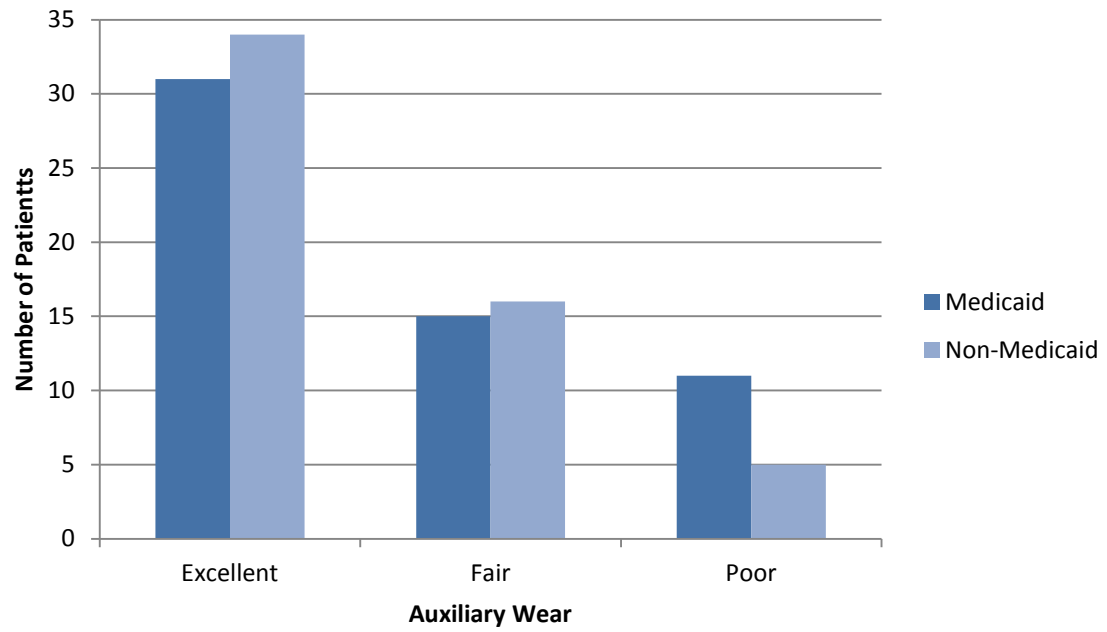


Figure 5. Auxiliary wear in Medicaid and non-Medicaid groups.

TABLE III

**CROSS TABULATION AND CHI-SQUARE TEST EVALUTING AUXILIARY
WEAR IN MEDICAID AND NON- MEDICAID GROUPS**

			Group		
			Medicaid	Non-Medicaid	Total
Auxiliary Wear	Excellent	Count	31	34	65
		% within Group	54.4%	61.8%	58.0%
	Fair	Count	15	16	31
		% within Group	26.3%	29.1%	27.7%
	Poor	Count	11	5	16
		% within Group	19.3%	9.1%	14.3%
	Total	Count	57	55	112
		% within Group	100.0%	100.0%	100.0%

Chi-Square Tests			
	Value	df	p-value ^a
Pearson Chi-Square	2.386	2	0.303
Likelihood Ratio	2.441	2	0.295
Linear-by-Linear Association	1.623	1	0.203
N of Valid Cases	112		

^aStatistical significance at $\alpha < 0.05$.

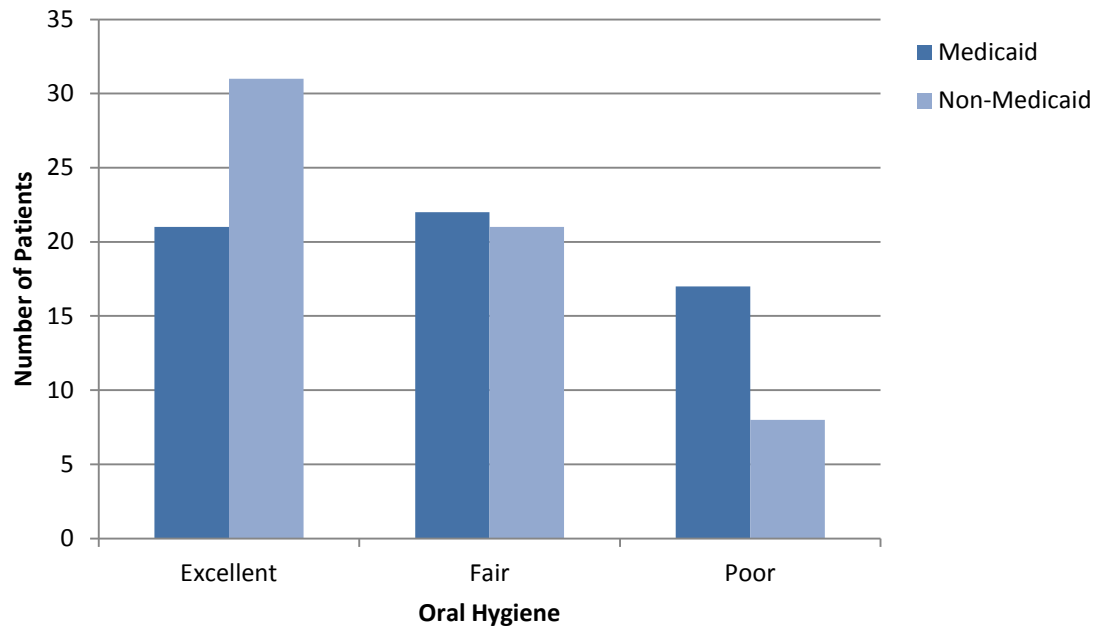


Figure 6. Oral hygiene in Medicaid and non-Medicaid groups.

TABLE IV

**CROSS TABULATION AND CHI-SQUARE TEST COMPARING ORAL
HYGIENE IN MEDICAID AND NON-MEDICAID GROUPS**

			Group		
			Medicaid	Non-Medicaid	Total
Oral Hygiene	Excellent	Count	21	31	52
		% within Group	35.0%	51.7%	43.3%
	Fair	Count	22	21	43
		% within Group	36.7%	35.0%	35.8%
	Poor	Count	17	8	25
		% within Group	28.3%	13.3%	20.8%
	Total	Count	60	60	120
		% within Group	100.0%	100.0%	100.0%

Chi-Square Tests			
	Value	df	p-value ^a
Pearson Chi-Square	5.186	2	0.075
Likelihood Ratio	5.272	2	0.072
Linear-by-Linear Association	5.047	1	0.025
N of Valid Cases	120		

^aStatistical significance at $\alpha \leq 0.05$.

D. Additional Findings**1. Individual Sites**

The appointment keeping behavior at UIC shows the mean percentage of late appointments in the Medicaid and non-Medicaid samples were very similar, yet the Medicaid sample had a larger mean percentage of failed appointments (Appendix D, Figure 7). However, the student t-tests showed no statistically significant differences in the mean proportion of late ($p = 0.254$) and failed ($p = 0.966$) appointments (Appendix D, Table VI). Although some variations were seen, the majority of Medicaid and non-Medicaid patients had few broken brackets and adequate compliance with auxiliary wear, and oral hygiene (Appendix D, Figures 9, 10, and 11). Chi-Square tests showed no statistically significant differences in broken appliances, auxiliary wear, and oral hygiene between the Medicaid and non-Medicaid groups at UIC. The p-values ranged from 0.150 to 0.379 (Appendix D, Tables VII, IX, and XI).

Similar to UIC, there was no statistically significant difference in the mean percentage of failed appointments between the Medicaid and non-Medicaid groups in the private practice, $p = 0.065$. However, the Medicaid group was late more often than the non-Medicaid group; this difference was found to be a statistically significant difference with $p = 0.041$ (Appendix D, Table VI, Figure 8). Just like at UIC, the majority of Medicaid and non-Medicaid private practice patients had few broken brackets and adequate compliance with auxiliary wear,

and oral hygiene (Appendix D, Figures 9, 10, and 11). Chi-square tests showed no statistically significant differences in broken appliances, auxiliary wear, and oral hygiene between the Medicaid and non-Medicaid groups in the private practice. The p-values ranged from 0.184 to 0.848 (Appendix D, Tables VIII, X, and XII).

2. Between Sites

In addition to evaluating for differences in patient compliance between the Medicaid and non-Medicaid groups at each site, the Medicaid and non-Medicaid patients from the two sites were examined for any potential statistically significant differences. The student t-test results show that the UIC non-Medicaid group and the private practice non-Medicaid group were significantly different from each other in the mean percentage of failed appointments, $p = 0.001$ (Appendix D, Table XIII). The patients in the private practice non-Medicaid group had a higher mean percentage of failed appointments than the patients in the UIC non-Medicaid group. No other significant differences were found with regards to failed appointments, $p = 0.591$ (Appendix D, Table XIV). No statistically significant differences were found between the two sites with regards to the mean percentage of late appointments. The p-values ranged from 0.186 to 0.397 (Appendix D, Tables XIII and XIV).

The Chi-square test shows no statistically significant differences between the two sites regarding the number or broken appliances in the non-Medicaid groups, $p = 0.731$ (Appendix D, Table XV). There is a statistically significant difference in the frequency of number of broken appliances in the Medicaid groups, $p = 0.048$ (Appendix D, Table XVI). No statistical differences were seen between the two sites regarding auxiliary wear and oral hygiene in the Medicaid and non-Medicaid groups. The p-values of the four Chi-square tests range from 0.109 to 0.353 (Appendix D, Tables XVII-XX).

VI. DISCUSSION

Lack of access to orthodontic care remains a significant issue within the Dental Medicaid population. Some orthodontists have an aversion to treating the Medicaid population because of a perception that these patients are less compliant than their non-Medicaid counterparts. The goal of this study was to determine if these perceptions are legitimate.

A. Analysis of Results

1. Medicaid vs. Non-Medicaid

Orthodontists cite high patient non-compliance rates, last minute cancellations, as well as high rates of late and failed appointments as some of the reasons they chose not to participate in the Medicaid program (King et al., 2006; Venezie and Vann, 1993; Morris et al., 2004; Dickens et al., 2008). However, this study found the majority of these concerns about the Medicaid population to be untrue.

Patients' appointment keeping behavior is a reasonable concern for orthodontists because it is essential for orthodontic patients to be seen on a regular basis to ensure timely treatment. A patient may be at an increased risk for root resorption and decalcification of enamel around the orthodontic appliances if they have prolonged treatment times. To help minimize these potential iatrogenic effects, orthodontists seek to complete treatment in a timely

manner. In order for this to occur, patients must be committed to keeping appointments every four to six weeks for monitoring and adjustment of their orthodontic appliances.

There is a perception that Medicaid patients have a high appointment failure rate and often show up late to their appointments (King et al., 2006). For these perceived reasons, orthodontists may be leery of treating Medicaid orthodontic patients. Potential lack of proper appointment keeping behavior could prevent the orthodontist from completing the treatment in a timely fashion. However, contrary to the studies by Mirabellie et al. (2005) and Horsley et al. (2007), no significantly statistical differences in the current study were found in the appointment keeping behavior between Medicaid and non-Medicaid patients. In fact, the current study found non-Medicaid patients actually had a slightly higher mean percentage of failed appointments than the Medicaid group.

Repeated broken orthodontic appliances, such as lose brackets and distorted archwires, is often another perceived concern practitioners have with treating Medicaid patients. This is of concern to orthodontists because multiple occurrences of appliance breakage can prolong treatment. Because they are being treated at no cost to the patient, some practitioners believe that orthodontic patients whose treatment is covered by Medicaid lack responsibility and a sense of ownership of their braces, resulting in a more lax attitude towards the

appliances and the guidelines set in place to minimize breakage to the appliances (i.e., careful eating habits and complying with restricted foods). The results of the current study show that the majority of both Medicaid and non-Medicaid patients had two or fewer broken appliances during the first twenty-four months of treatment which would have a minimum effect, if any, on overall treatment time. There were no statistically significant differences between the two groups with regards to the number of broken appliances. These results support the findings of Dickens et al. (2008), who concluded there are no clinically significant differences in the number of broken appliances between Medicaid and non-Medicaid patients. Based on these findings, the validity of using the excuse that Medicaid patients have more broken appliances as a reason not to treat them must be questioned.

Orthodontics is unique in the field of dentistry in that it often relies heavily on patient cooperation for successful treatment. Patients are given orthodontic auxiliaries, such as headgears, face masks, and/or elastics, and are asked to wear these somewhat uncomfortable appliances multiple hours a day for months during treatment. Lack of wear can complicate and disrupt treatment. This often compels the orthodontist to change the treatment plan and have to resort to placing other appliances that do not depend on the patient's compliance. However, these appliances create more expenses for the orthodontist and can disrupt the normal flow of a practice if breakage occurs. For these reasons,

orthodontists may be hesitant to treat Medicaid patients if they believe they are less likely to comply with auxiliary wear compared to the non-Medicaid patients. As stated previously, belief in high patient non-compliance rates in the Medicaid population are one of the main reasons practitioners chose to limit their treatment of Medicaid patients (King et al., 2006). Prior to the current study, no studies have been conducted evaluating differences in compliance with auxiliaries between Medicaid orthodontic patients and non-Medicaid orthodontic patients to determine if these practitioner concerns are justified.

It is important to note that not all patients examined in this study were given orthodontic auxiliaries to wear during the first twenty-four months of treatment, but the majority of patients were. Because the severity of malocclusions in Medicaid patients is often greater (due to qualification requirements) than non-Medicaid patients, it was anticipated that more Medicaid patients than non-Medicaid patients would be asked to wear orthodontic auxiliaries as part of their treatment. Fifty-seven of the 60 Medicaid patients and 55 of the 60 non-Medicaid patients were asked to wear some type of orthodontic auxiliary during the first twenty-four months of treatment.

The current study found the majority of both Medicaid and non-Medicaid patients had excellent compliance with their auxiliary wear. While Medicaid patients did have a larger percentage of patients with poor orthodontic auxiliary

wear than non-Medicaid patients, the difference was not statistically significant. The difference noted, while not significant, may be due, as stated earlier, to the fact that Medicaid patients examined had more severe malocclusions which is reflected in their higher average Modified Salzmann Index score of 44.2, compared to an average Modified Salzmann Index score of 31.3 in the non-Medicaid group. The increased severity of their malocclusions may have led to the Medicaid patients being asked to wear more complicated auxiliaries for a longer period of time, potentially yielding less compliance.

Adequate oral hygiene is of utmost importance in orthodontic patients. Not only are patients at risk for active decay if oral hygiene is inadequate, they are also at risk for areas of decalcification around the orthodontic brackets. Unless they chose to have them restored, these areas remain discolored throughout a patient's life. After significant time and money have been invested in orthodontics, debonding day can be disappointing for a patient who can now clearly see the areas of unsightly decalcification.

Those orthodontists who perceive Medicaid patients to have worse oral hygiene than non-Medicaid patients and, wishing to avoid the situations described above, may be deterred from treating this population. This study found the majority of Medicaid and non-Medicaid patients had fair-to-excellent oral hygiene. While more Medicaid patients were found to have poor oral hygiene

than non-Medicaid patients, these differences were not found to be statistically significant. These results support the findings by Dickens et al, who found there to be no clinically significant differences in the oral hygiene between Medicaid and non-Medicaid patients.

However, the results are in contrast to Mirabellie et al. who found Medicaid patients to have a statistically significant poorer oral hygiene. Mirabellie et al.'s study was performed in Phase I patients where the average age of patients studied was between 10.2-10.4 years. The average age of patients in Dickens et al. study ranged from 13.6 in Medicaid patients to 15 years in non-Medicaid. The average age in this study was 14.2 years for Medicaid and 13.9 years for non-Medicaid patients. The older age group in these last two studies is more representative of patients undergoing a single comprehensive phase of orthodontic treatment. Mirabellie et al.'s results could have been affected by the lack of maturity in patients only ten years old. This younger age group may also be more dependent on parental guidance and monitoring. While as patients age and mature, they begin to take these responsibilities more on themselves.

Orthodontists have an aversion to treating the Medicaid population because of unsupported claims that these patients were less compliant. However, this study shows no statistically significant differences between Medicaid and non-Medicaid orthodontic patients with regards to appointment

keeping behavior, broken appliances, compliance with orthodontic auxiliaries, and oral hygiene. No evidence was found in this study to support the notion that non-Medicaid orthodontic patients are less compliant. Orthodontists should not hesitate to treat this patient population solely out due to trepidation of lack of patient compliance.

2. Additional Findings

Every orthodontic practice is different and has something unique to offer patients, however they also have their own inherent problems. Due in part to different systems implemented in each practice, differences among practices could potentially cause a discrepancy in patient compliance among sites. An example of one such system is the method in which patients are reminded of their upcoming appointments. The sites examined in this study had similar methods of reminding patients of their upcoming appointments. Automated systems contacting the patient the day before their next scheduled appointment were used at both sites. An automated text was sent to patients in the private practice, while an automated audible message was delivered to the UIC patients. The similarities between sites with the use of automated appointment reminders may be responsible for the lack of statistical significant differences in the mean percentage of failed appointments in the Medicaid groups between the two sites.

Payment schedules are another example of how systems may differ among orthodontic offices. The difference in fee collection between UIC and the private practice may have attributed to the fact that the non-Medicaid group in private practice had a significantly higher percentage of failed appointments than the UIC non-Medicaid group. UIC requires payment in full prior to placing any orthodontic appliances, whereas the private practice offers payment plans to their patients.

While payment plans may make orthodontic treatment more affordable to patients who do not have large sums of money to pay before orthodontic treatment is initiated, it can create a problem if a patient does not have money for their monthly payment. It is possible that more non-Medicaid patients failed their appointments in the private practice than at UIC because they did not have the money to pay their monthly payment. Patients may have a tendency to think that if they are not seen by the orthodontist that month, they do not have to pay their monthly bill. This train of thought might have led patients at the private practice to skip their monthly adjustment appointment if they had insufficient funds that month. The UIC non-Medicaid patients may have had fewer failed appointments than those at the private practice because they paid their balance in full at the onset of treatment and did not have monthly payments.

Different orthodontic practices also have different bonding procedures set in place. The private practice examined in this study primarily direct bonded all orthodontic cases. At UIC, a variety of bonding methods were utilized, i.e. indirect bonding and direct bonding. In addition, because the patients examined at UIC were treated by several providers, more human variability was introduced into the bonding technique. A statistically significant difference was found between the UIC Medicaid and the private practice Medicaid in the number of broken appliances. Overall, UIC had more patients with broken brackets. In addition to carelessness on behalf of the patients, there is a greater chance of an iatrogenic component at UIC. The residents at UIC are still in the beginning phase of learning the proper bonding techniques, while the orthodontist in private practice has more experience in the proper bonding technique. The UIC residents' lack of experience could have potentially led to mistakes in the bonding technique, ultimately leading to an increased bracket bond failure rate.

The location of orthodontic offices differs among practices. Proximity to public transportation is extremely important in large cities, such as the city of Chicago. It can be especially crucial to lower socioeconomic groups, such as those on Medicaid, who are unable to afford the high costs associated with having a personal automobile in the city. The differences in office location and proximity to public transportation may have played a role in why Medicaid patients had a higher mean percentage of late appointments than non-Medicaid

patients in the private practice and no difference between the Medicaid and non-Medicaid patients with regard to late appointments was found in the university clinic. Since the university clinic is located in the vicinity of several hospitals and medical complexes, there is better access to public transportation than the private practice. The closer proximity to more public transportation routes at the university clinic may make it easier to be on time for those patients who took public transportation to their appointments, than those traveling by public transportation to the private practice.

Additionally, because there are few orthodontists treating Medicaid patients, these patients often find themselves with a limited choice of orthodontist practices where they are able to receive treatment. The limited availability of practitioners may result in Medicaid patients traveling further to get to their orthodontist's office, ultimately making it more challenging to make it to their appointments on time.

As previously mentioned, every orthodontic office has positive and negative attributes. These differences must be taken into account when examining differences in patient behavior between different practices.

B. Significance of Current Study

With a steady increase in the number of individuals enrolled in Medicaid, over half of whom are children, the demand for orthodontists to treat these patients is on the rise (Quinn and Maram, 2010). As a result of the change in the state of Illinois's orthodontic qualification guidelines in 2010, more of these patients are qualifying for orthodontic coverage. With the increase in patients covered by Medicaid, access to care continues to be a significant issue in the orthodontic Medicaid population and unfortunately dental provider participation in Medicaid has been declining (Horsely et al., 2007). In addition to cumbersome paperwork and low fee reimbursement, orthodontists cite perceived high patient non-compliance rates, last minute cancellations, and high rates of late and failed appointments as some of the reasons they choose not to participate in the Medicaid program (King et al., 2006; Venezie and Vann, 1993; Morris et al., 2004; Dickens et al., 2007).

Many of these preconceived notions arise from a general perception of these patients' compliance levels in other fields of dentistry. In fact, practitioners who have no personal experience with this population and are not currently participating in Medicaid tend to be more concerned about broken appointments than those currently accepting Medicaid (Damiono et al., 1990; Im et al., 2007). However, orthodontists cannot assume that because Medicaid patients may be less compliant in other areas of dentistry that this behavior will translate directly

into orthodontics. The average broken appointment rate in Medicaid dental clinics nationwide has been estimated by the American Dental Association to be around 30%. The current study found the mean percentage failure rate for Medicaid and non-Medicaid orthodontic patients to be 11.01% and 12.92%, respectively. These findings demonstrate that orthodontic Medicaid patients do not follow the same appointment keeping behavior as Medicaid patients in traditional Medicaid dental clinics. Orthodontists, therefore, cannot assume that the poor compliance seen in other areas of dentistry will automatically be seen in orthodontics.

In 2006, King et al. cited perceived high non-compliance rates, patients failing or showing up late to their appointments, and last minute cancellations as reasons practitioners limited their participation in the Medicaid program. However, based on the findings of the current study, these concerns appear to be misconceptions about this patient population. While there are still some difficulties in treating Medicaid patients, such as low fee reimbursement and cumbersome paperwork, the current study should alleviate some of the doubts practitioners may have regarding compliance in this population. It is hoped the findings of this study dissipate some of the negative ideas regarding patient compliance of this population and will encourage more practitioners to treat Medicaid orthodontic patients. If the low fee reimbursement and system hassles are still significant enough to limit practitioner participation in treatment of these

patients, it is recommended that an increased action by orthodontists should be taken to address these concerns through appropriate legislative channels.

Current efforts are under way to help improve the access to care issue. In 2009, the American Association of Orthodontists began a program, entitled Donated Orthodontic Services (DOS), requests orthodontists to treat a few patients a year pro bono. These patients have been pre-screened by the Dental Lifeline Network and must come from a family demonstrating financial need. Hopefully, the results of the current study will alleviate hesitations orthodontists may have treating low-income patients regarding potential patient compliance and encourage more practitioners to participate in the DOS program.

C. Strengths of Current Study

This study is unique in that it evaluated patient compliance in two different settings: a university clinic and a private practice. Each is unique and has its own strengths and weaknesses. The majority of previous studies have been conducted only in academic settings. Academic settings are learning institutions and are typically managed differently than private practice. Alone, they may not provide an adequate portrayal of how patients behave in private practice. Examining compliance in two settings hopefully provides a better view of patient compliance in the Medicaid population.

Another strength of this study is that it is the first study to examine differences in patient compliance with orthodontic auxiliaries between the Medicaid and non-Medicaid orthodontic patient populations. Because successful finishing of orthodontic treatment often relies heavily on patient compliance with orthodontic auxiliaries, this is an important aspect of patient compliance to evaluate.

The manner in which the data was analyzed is another strength of this study. Not all patients had exactly twenty-four visits during the twenty-four month period studied. To account for the differences in the total number of appointments for each patient, the percentage of failed appointments for each patient was calculated. This allowed for a more realistic portrayal of individual patients' appointment keeping behavior. The variation between patients in a group could be observed; the variation seen gives an indication on whether any differences observed were due to only a few poorly cooperating patients or the group as a whole.

In addition, by placing broken appliances into categories rather than simply comparing the tallies of the total number of broken appliances, the possibility of skewing the data with a few number of patients with extremely high numbers of broken appliances was avoided. Similarly, the number of comments pertaining to poor oral hygiene and lack of auxiliary wear were divided into

categories, again preventing a few patients with a significant amount of poor compliance comments from skewing the data.

Examining multiple practitioners' patients was beneficial to this study. This balanced out any individual orthodontist's strengths and weaknesses in their ability to motivate their patients to brush better or to stress the importance of wearing auxiliaries. Also by examining multiple practitioners, the possibility that the orthodontist studied was not liked by his/her patients was minimized. The likeability of an orthodontist may play a role in a practice's patient compliance levels; patients could be more willing to comply with instructions if they come from someone they like.

Finally, the length of time examined in this study was one the study's strengths. Only the first twenty-four months of treatment were examined, not the entire length of treatment. This helped to ensure that patient burn-out did not play a large role in patient compliance but still examined an acceptable length of treatment to ensure that most patients examined had begun some type of auxiliary wear.

D. Limitations of Current Study

There were some limitations of this study requiring notation. For example, when comparing patient compliance with orthodontic auxiliaries, it was not taken

into account what type of orthodontic auxiliaries the patient was asked to wear. Some auxiliaries, like a facemask, may be more uncomfortable for patients than other auxiliaries, like elastics. Even among a singular category like elastics, there are differences in the ease of auxiliary placement and patient comfort level. The discomfort level experienced and the placement difficulty of the auxiliaries might have played a role in how compliant patients were with wearing them.

Another limitation was that no consideration was given in this study to the length of time a patient was asked to wear the auxiliaries. One patient may have been asked to wear an auxiliary for only a couple of months, while another patient may have been asked to wear an auxiliary for a year. The greater the amount of time a patient is asked to wear these auxiliaries, the greater the likelihood their compliance may diminish.

Further, the fact that charts of different residents in the UIC clinic were examined also posed as a limitation to the study. There was no standardized method of note entry in the UIC charts. Also, diligence in recording lack of compliance may have varied among residents. In addition to differences in diligence in recording, there may have been a certain level of bias on part of the practitioners. The practitioners at both sites know which patients are Medicaid and which are non-Medicaid. If they had a preconceived notion that Medicaid patients are less compliant than non-Medicaid patients, they may more readily

record any sign of non-compliance in Medicaid patients and more willing to let initial signs of non-compliance go undocumented in non-Medicaid patients.

There were only a few previous studies that have been conducted examining patient compliance in appointment keeping behavior, oral hygiene, and appliance breakage in the Medicaid orthodontic population. None of these published studies showed the standard deviation, so a power analysis could not be performed. In addition, there have been no previous studies examining differences in patient compliance with auxiliaries in Medicaid and non-Medicaid patients. So again, no power analysis could be conducted to determine the appropriate sample size needed. It is possible that more statistically significant differences may have been seen in the current study if the sample size was larger.

E. Future Studies

While the current study did examine more than one site, both sites were still located in the city of Chicago. This study could be expanded to include sites in other areas of Illinois and the United States. In doing so, a better indication of patient compliance in these groups as a whole might be gained.

A future study, designed along the parameters of the current study, could examine a larger number of sites treating Medicaid patients. The differences in

patient compliance between the sites could then be evaluated. By examining the differences in the systems set in place at each site a determination could be made for which systems are effective in running a successful Medicaid practice. A model practice management plan could be proposed based on these findings.

Proposed systems to examine include:

- Appointment reminders
- Failed and late appointment policies
- Initial oral hygiene instruction delivery
- Poor oral hygiene warnings
- Auxiliary wear instructions
- Broken appliance policy

The majority of private practice non-Medicaid patients in the current study came from families receiving some financial assistance, but their malocclusions were not severe enough to receive Medicaid orthodontic coverage. A similar situation was noted at UIC. For this reason, it can be assumed that there was not a significant socioeconomic difference between the non-Medicaid and Medicaid groups evaluated. A study designed along the parameters of the current study could be conducted comparing patient compliance in the Medicaid patients at a private practice treating primarily Medicaid patients to the non-Medicaid patients in a private practice that treats only non-Medicaid patients. Socioeconomic differences might be greater than in the current study and it would be interesting to see if any significant differences were seen.

None of the previous studies conducted evaluating patient compliance in the orthodontic population have published all of the information necessary to conduct a power analysis. The results of this study would, therefore, be useful in conducting a power analysis in the above proposed studies or in other studies on patient compliance to determine the necessary sample size.

F. Conclusions

- No statistically significant differences were seen between the Medicaid and non-Medicaid groups with regards to late appointments, failed appointments, broken appliances, auxiliary wear, and oral hygiene.
- No statistically significant differences were seen between the UIC Medicaid and non-Medicaid groups with regards to late appointments, failed appointments, broken appliances, auxiliary wear, or oral hygiene.
- The Medicaid group in the private practice had a statistically significant larger mean proportion of late appointments than the non-Medicaid group. No statistically significant differences were seen between the private practice Medicaid and non-Medicaid groups with regards to broken appliances, auxiliary wear, or oral hygiene.
- The private practice non-Medicaid groups had a statistically significant larger mean percentage failed appointments than the UIC non-Medicaid group. A statistically significant difference was found in the number of broken appliances between the UIC and private practice Medicaid groups. No other

statistically significant differences were found between the two sites in either group.

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APPENDICES

APPENDIX A

UNIVERSITY OF ILLINOIS
AT CHICAGO

Office for the Protection of Research Subjects (OPRS)
Office of the Vice Chancellor for Research (MC 672)
203 Administrative Office Building
1737 West Polk Street
Chicago, Illinois 60612-7227

Request for Modification and/or Information
Initial Review - Claim of Exemption

November 4, 2010

* 20100871

-56885-

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20100871-56885-1

Mary Ellen Dobbs, DDS
Orthodontics
900 S Clark St Apt 2008
M/C 841
Chicago, IL 60607
Phone: (865) 776-2632

RE: Research Protocol # 2010-0871
“A Comparison of Compliance in Medicaid Versus Non-Medicaid
Orthodontic Patients”

Dear Dr. Dobbs:

Your request for a Claim of Exemption to your research protocol was reviewed on November 4, 2010. It was determined that the following is required:

1. Regarding investigator training: Please have the following individuals complete HIPAA Research Training: Mary Ellen Dobbs and Robert Manasse. Link to HIPAA Research Training:

APPENDIX A (continued)

<http://tigger.uic.edu/depts/ovcr/research/protocolreview/irb/education/2-2-2/HIPAAonline.shtml>

2. Please provide a Letter of Support from Wicker Park Orthodontics. The Letter of Support should minimally: 1) indicate support for the research; 2) document agreed upon research-related activities to be conducted by office staff; and 3) document their institutional HIPAA determination.

When submitting your response provide **1 original and 2 copies** (3 packets total) of the following collated materials:

1. A cover letter that references this letter and that responds item by item to each specific issue listing the IRB's requirements from that letter followed by your response. Please use the same numbering system as in the IRB's letter.
2. A copy of this letter so that the bar code on the letter can be scanned.
3. For modifications that involve the research protocol and/or research protocol application:
 - a. Provide the revised research protocol, and/or research protocol application with the modifications and information incorporated.
 - b. **Please highlight** or shade the additions and ~~strike through~~ the deletions on **each of the three (3) copies**.
 - c. Include the next sequential **version number and date on each page**.
4. For modifications that involve questionnaires, survey instruments, interview questions, data collection instruments, consent documents and/or recruitment materials:
 - a. Provide **one original and two (2) copies** of each revised item.
 - b. On **two (2) copies**, please **highlight** or shade the additions and ~~strike through~~ the deletions.
 - c. Include a **short descriptor** (to describe each document and differentiate among various documents in the same research protocol) in the footer of each page.
 - d. Include the next sequential **version number and date** in the footer of each page.
 - e. Be sure the pages are numbered: Page 1 of #, Page 2 of #.

It has been determined that your response to these required modifications may be reviewed under exempt review procedures. Based on your response, the OPRS has the authority to ask further questions, seek additional information, require further modifications, or refer the research for IRB review.

APPENDIX A (continued)

Please note that you ***may not*** implement your research until you receive a ***written notice of IRB approval***.

If you do not respond to the IRB's request within 90 days of this letter, the submission may be withdrawn from the review process and the IRB will not take any further action.

If you have any questions or need further help, please contact the OPRS office at (312) 996-1711 or me at (312) 355-2908. Please send any correspondence about this protocol to OPRS at 203 AOB, M/C 672.

Sincerely,

Charles W. Hoehne, B.S., C.I.P.
Assistant Director, IRB # 2
Office for the Protection of Research

Subjects

Enclosure(s): None

cc: Budi Kusnoto, Orthodontics, M/C 841
Carlotta A. Evans, Orthodontics, M/C 841

APPENDIX A (continued)

UNIVERSITY OF ILLINOIS
AT CHICAGO

Office for the Protection of Research Subjects (OPRS)
Office of the Vice Chancellor for Research (MC 672)
203 Administrative Office Building
1737 West Polk Street
Chicago, Illinois 60612-7227

Exemption Granted

November 23, 2010

Mary Ellen Dobbs, DDS
Orthodontics
900 S Clark St Apt 2008
M/C 841
Chicago, IL 60607
Phone: (865) 776-2632

RE: Research Protocol # 2010-0871
“A Comparison of Compliance in Medicaid Versus Non-Medicaid Orthodontic Patients”

Dear Dr. Dobbs:

Your Claim of Exemption was reviewed on November 23, 2010 and it was determined that your research meets the criteria for exemption. You may now begin your research.

Please note the following regarding your research:

<u>Exemption Period:</u>	November 23, 2010 – November 22, 2013
Sponsor:	None
Performance Site(s):	UIC
Number of Subjects:	200
Subject Population:	Axium dental charts and OrthoCad dental models of patients seen in the UIC Orthodontic Department and orthodontic charts and dental models treated by Dr. Barbara Siargos at Wicker Park Orthodontics

APPENDIX A (continued)

The specific exemption category under 45 CFR 46.101(b) is:

(4) Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available or if the information is recorded by the investigator in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects.

UIC HIPPA Determination:

The IRB has determined that the request for a waiver of authorization satisfies the criteria for a waiver of authorization in accordance with 45 CFR Part 164.512.

You are reminded that investigators whose research involving human subjects is determined to be exempt from the federal regulations for the protection of human subjects still have responsibilities for the ethical conduct of the research under state law and UIC policy. Please be aware of the following UIC policies and responsibilities for investigators:

1. Amendments You are responsible for reporting any amendments to your research protocol that may affect the determination of the exemption and may result in your research no longer being eligible for the exemption that has been granted.
2. Record Keeping You are responsible for maintaining a copy all research related records in a secure location in the event future verification is necessary, at a minimum these documents include: the research protocol, the claim of exemption application, all questionnaires, survey instruments, interview questions and/or data collection instruments associated with this research protocol, recruiting or advertising materials, any consent forms or information sheets given to subjects, or any other pertinent documents.
3. Final Report When you have completed work on your research protocol, you should submit a final report to the Office for Protection of Research Subjects (OPRS).

Please be sure to:

→ Use your research protocol number (2010-0871) on any documents or correspondence with the IRB concerning your research protocol.

We wish you the best as you conduct your research. If you have any questions or need further help, please contact the OPRS office at (312) 996-1711 or me at (312) 355-2908. Please send any correspondence about this protocol to OPRS at 203 AOB, M/C 672.

APPENDIX A (continued)

Sincerely,

Charles W. Hoehne, B.S., C.I.P.
Assistant Director, IRB # 2
Office for the Protection of Research

Subjects

Enclosure(s): None

cc: Carlotta A. Evans, Orthodontics, M/C 841
Budi Kusnoto, Orthodontics, M/C 841
Privacy Officer, Health Information Management Department, M/C 772

APPENDIX B

Malocclusion Severity Assessment By J.A. Salzmann, DDS, F.A.P.H.A.

Participant Name: _____ Date of Birth: _____

Case Name: _____ Dentist's Name: _____

Examiner: _____ Date: _____

Records Received:

Models	CEPH	PANO	Intra-Oral X-Rays	Photos Fees	Photos Intra

Quality:

Models	CEPH	PANO	Intra-Oral X-Rays	Photos Fees	Photos Intra

A. INTRA-ARCH DEVIATION

Score Teeth Affected Only	Missing	Crowded	Rotated	Spacing Open	Spacing Closed	No.	Point Value	Score
Maxilla	Ant						X2	
	Post						X1	
Mandible	Ant						X1	
	Post		0				X1	

Total Score _____

Ant. = anterior teeth (4 incisors)
Post. = posterior teeth (include canine, premolars and first molar).
No. = number of teeth affected
P.V. = point value

B. Inter-Arch Deviation

1. Anterior Segment

Score Maxillary Teeth Affected Only Except Overbite	Overjet	Overbite	Crossbite	Openbite	No.	P.V.	Score
						X2	

Total Score _____

*Score maxillary or mandibular incisors.

2. Posterior Segment

Score Teeth Affected Only	Related Mandibular to Maxillary Teeth				Score Affected Maxillary Teeth Only				No.	P.V.	Score
	Distal		Mesial		Crossbite		Openbite				
	Right	Left	Right	Left	Right	Left	Right	Left			
Canine											
1 st Premolar											
2 nd Premolar											
1 st Molar											

Total Score _____

Add 8 points when intra- and intra-arch maxillary incisors score 11 or more to denote esthetic handicap _____

Grand Total _____

C. Dentofacial Deviations

The following deviations are scored as handicapping when associated with malocclusion: Score 8 points for each deviation.

	1. Facial and oral clefts		
	2. Lower lip palatal to maxillary incisor teeth		
	3. Occlusal interference		
Possible Surgical Indication	4. Functional jaw limitations		
Yes No	5. Facial asymmetry		
	6. Speech impairment		
	7. Total Score		
			TOTAL SALZMANN INDEX:

APPENDIX C

TABLE V

SAMPLE DEMOGRAPHICS

		PP Medicaid (n=30)	PP Non- Medicaid (n=30)	UIC Medicaid (n=30)	UIC Non- Medicaid (n=30)
Mean age at start of treatment		14.7	14	13.6	13.8
Sex	Females	18	18	16	14
	Males	12	12	14	16
Mean Modified Salzmann Score		43.4	31	44.9	31.6
Mean number of appointments		22.2	22.4	22.9	22.1
Total number of appointments		666	671	687	666
Mean number of failed appointments		2.6	4.3	2.4	1.7
Total number of failed appointments		79	128	72	52
Mean % of failed appointments		11.9	18.2	10.5	7.8
Mean number of late appointments		0.5	0.2	0.3	0.3
Total number of late appointments		15	5	9	8
Mean % of late appointments		2.3	0.7	1.3	1.2
Mean number of broken brackets and arch wires		3	2.9	1.9	3.2
Total number of broken brackets and arch wires		89	88	57	95
Number of patients given orthodontic auxiliaries		28	26	29	30
Mean orthodontic auxiliary wear (Total / Range)		Excellent-Fair (0.6 / 0.4)	Excellent (0.4 / 0.3)	Fair (1.9 / 0.9)	Fair (1.1 / 0.6)
Number of comments noting lack of orthodontic auxiliary wear		16	9	54	32
Mean oral hygiene (Total / Range)		Fair (1.5 / 0.8)	Fair (1.0 / 0.5)	Fair (2.1 / 1.1)	Fair (1.2 / 0.76)
Total number of comments noting lack of proper oral hygiene		45	29	62	36
Number of patients with additional fixed appliances		17	14	20	12
Mean number of comments noting breakage of fixed appliances		0.5	0	0.7	0.7
Total number of comments noting breakage of fixed appliances		9	0	13	8

APPENDIX D

TABLE VI

STUDENT T-TEST COMPARING PROPORTION OF LATE AND FAILED APPOINTMENTS BETWEEN UIC NON-MEDICAID AND UIC MEDICAID GROUPS

	Groups	N	Mean	Std. Deviation	t	df	Mean Diff.	p-value^a
Failed Appointments (%)	UIC Medicaid	30	10.32	9.50	-1.153	58	-2.68	0.254
	UIC Non-Medicaid	30	7.64	8.48				
	PP Medicaid	30	11.83	12.01	-1.878	58	-6.37	0.065
	PP Non-Medicaid	30	18.20	14.19				
Late Appointments (%)	UIC Medicaid	30	1.24	2.47	-0.043	58	-0.03	0.966
	UIC Non-Medicaid	30	1.22	2.35				
	PP Medicaid	30	2.24	3.23	2.093	54.163	1.55	0.041
	PP Non-Medicaid	30	0.69	2.46				

^aStatistical significance at $p \leq 0.05$.

APPENDIX D (continued)

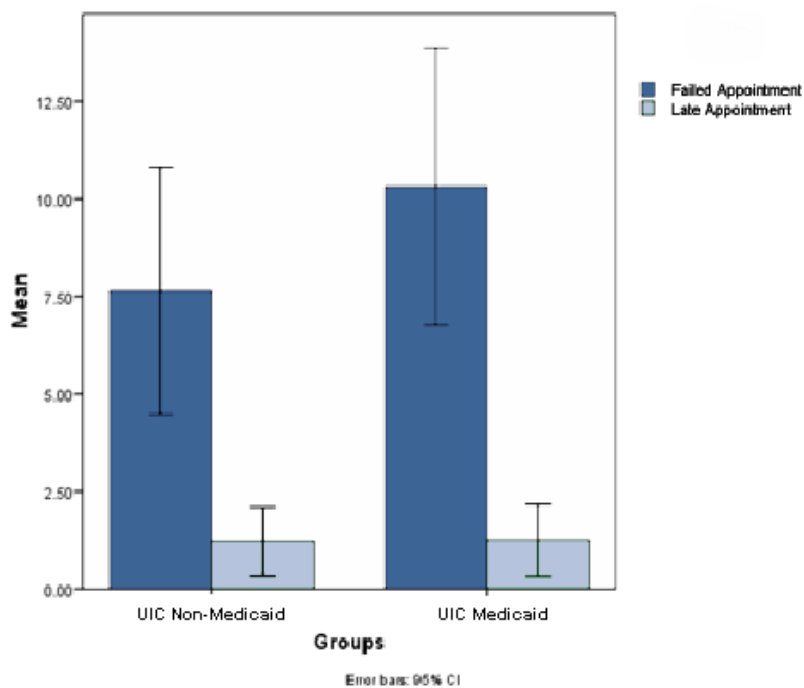


Figure 7. Mean percentage of late and failed appointments for UIC non-Medicaid and Medicaid groups.

APPENDIX D (continued)

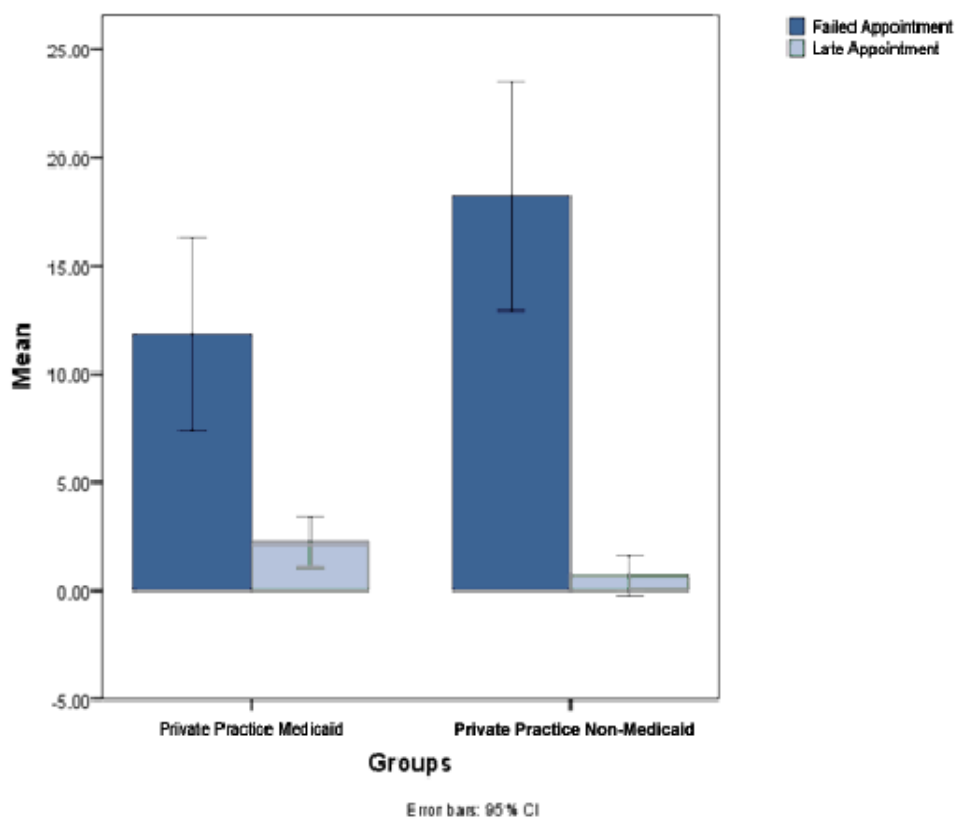


Figure 8. Mean percentage of late and failed appointments for private practice Medicaid and non-Medicaid groups.

APPENDIX D (continued)

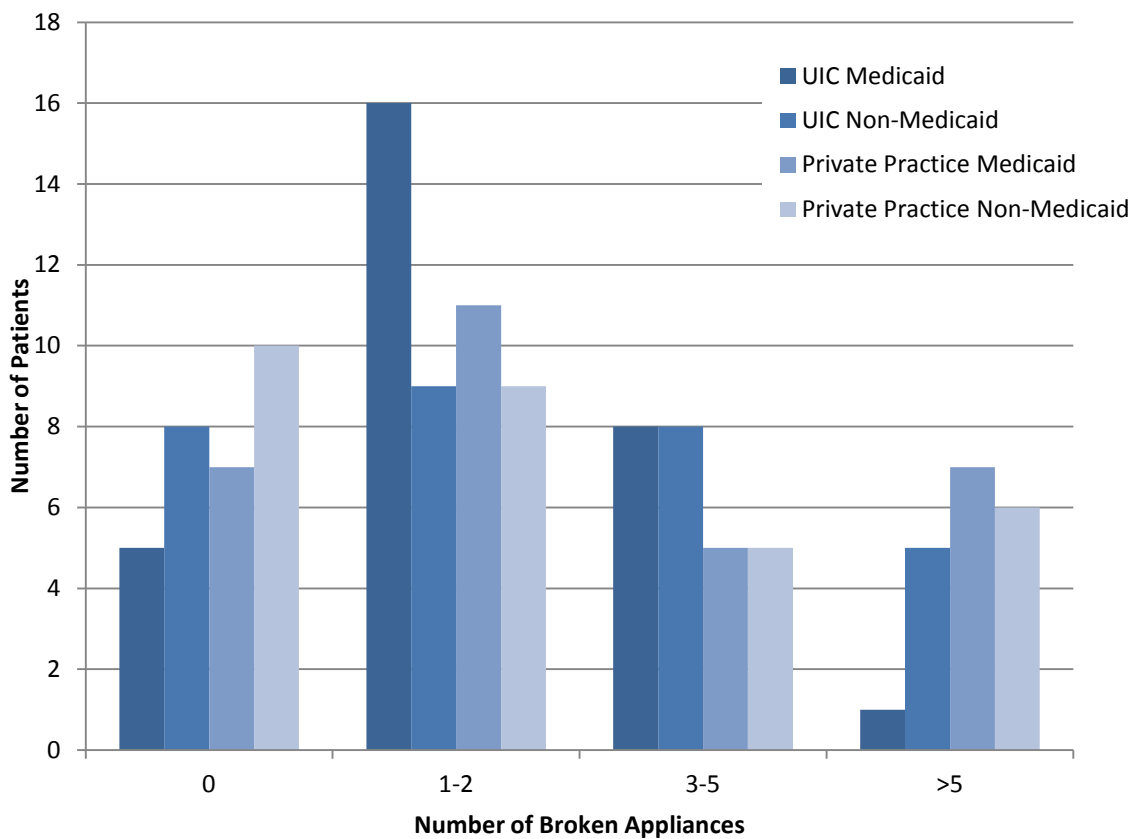


Figure 9. Number of broken appliances for non-Medicaid and Medicaid groups at UIC and the private practice.

APPENDIX D (continued)

TABLE VII

CROSS TABULATION AND CHI-SQUARE TEST COMPARING BROKEN APPLIANCES BETWEEN UIC NON-MEDICAID AND UIC MEDICAID GROUPS

			Groups		
			UIC Non-Medicaid	UIC Medicaid	Total
Number of Broken Appliances	0	Count	8	5	13
		% within Groups	26.7%	16.7%	21.7%
	1-2	Count	9	16	25
		% within Groups	30.0%	53.3%	41.7%
	3-5	Count	8	8	16
		% within Groups	26.7%	26.7%	26.7%
	>5	Count	5	1	6
		% within Groups	16.7%	3.3%	10.0%
	Total	Count	30	30	60
		% within Groups	100.0%	100.0%	100.0%

Chi-Square Tests			
	Value	df	p-value ^a
Pearson Chi-Square	5.319	3	0.150
Likelihood Ratio	5.596	3	0.133
Linear-by-Linear Association	0.499	1	0.480
N of Valid Cases	60		

^aStatistical significance at $\alpha \leq 0.05$.

APPENDIX D (continued)

TABLE VIII

CROSS TABULATION AND CHI-SQUARE TEST COMPARING BROKEN APPLIANCES BETWEEN PRIVATE PRACTICE MEDICAID AND PRIVATE PRACTICE NON-MEDICAID GROUPS

			Groups		
			PP Non-Medicaid	PP Medicaid	Total
Number of Broken Appliances	0	Count	10	7	17
		% within Groups	33.3%	23.3%	28.3%
	1-2	Count	9	11	20
		% within Groups	30.0%	36.7%	33.3%
	3-5	Count	5	5	10
		% within Groups	16.7%	16.7%	16.7%
	>5	Count	6	7	13
		% within Groups	20.0%	23.3%	21.7%
	Total	Count	30	30	60
		% within Groups	100.0%	100.0%	100.0%

Chi-Square Tests			
	Value	df	p-value ^a
Pearson Chi-Square	0.806	3	0.848
Likelihood Ratio	0.810	3	0.847
Linear-by-Linear Association	0.337	1	0.562
N of Valid Cases	60		

^aStatistical significance at $\alpha \leq 0.05$.

APPENDIX D (continued)

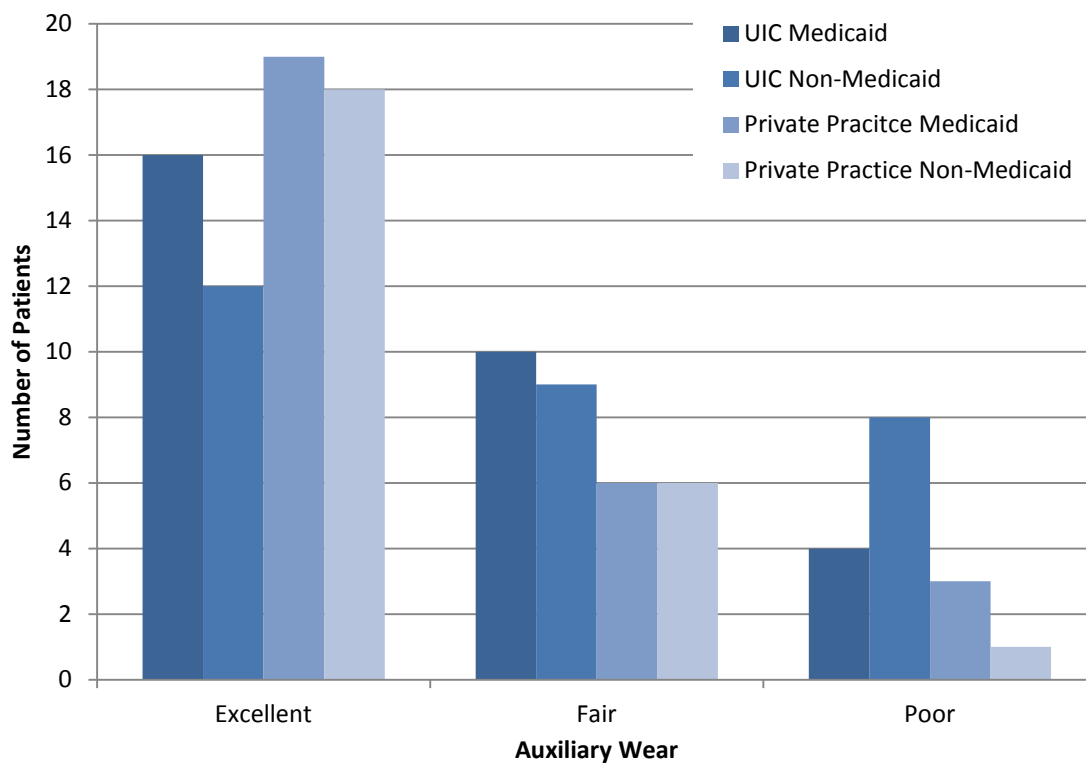


Figure 10. Auxiliary wear for non-Medicaid and Medicaid groups at UIC and private practice.

APPENDIX D (continued)

TABLE IX

CROSS TABULATION AND CHI-SQUARE TEST COMPARING AUXILIARY WEAR BETWEEN UNIVERSITY CLINIC NON-MEDICAID AND UIC MEDICAID GROUPS

			UIC Non-Medicaid	UIC Medicaid	Total
Auxiliary Wear	Excellent	Count	16	12	28
		% within Groups	53.3%	41.4%	47.5%
	Fair	Count	10	9	19
		% within Groups	33.3%	31.0%	32.2%
	Poor	Count	4	8	12
		% within Groups	13.3%	27.6%	20.3%
	Total	Count	30	29	59
		% within Groups	100.0%	100.0%	100.0%

Chi-Square Tests			
	Value	df	p-value ^a
Pearson Chi-Square	1.941	2	0.379
Likelihood Ratio	1.968	2	0.374
Linear-by-Linear Association	1.647	1	0.199
N of Valid Cases	59		

^aStatistical significance at $\alpha \leq 0.05$.

APPENDIX D (continued)

TABLE X

CROSS TABULATION AND CHI-SQUARE TEST COMPARING AUXILIARY WEAR BETWEEN PRIVATE PRACTICE MEDICAID AND PRIVATE PRACTICE NON-MEDICAID GROUPS

			Groups		
			PP Medicaid	PP Non-Medicaid	Total
Auxiliary Wear	Excellent	Count	19	18	37
		% within Groups	67.9%	72.0%	69.8%
	Fair	Count	6	6	12
		% within Groups	21.4%	24.0%	22.6%
	Poor	Count	3	1	4
		% within Groups	10.7%	4.0%	7.5%
	Total	Count	28	25	53
		% within Groups	100.0%	100.0%	100.0%

Chi-Square Tests			
	Value	df	p-value ^a
Pearson Chi-Square	0.860	2	0.651
Likelihood Ratio	0.904	2	0.636
Linear-by-Linear Association	0.396	1	0.529
N of Valid Cases	53		

^aStatistical significance at $\alpha \leq 0.05$.

APPENDIX D (continued)

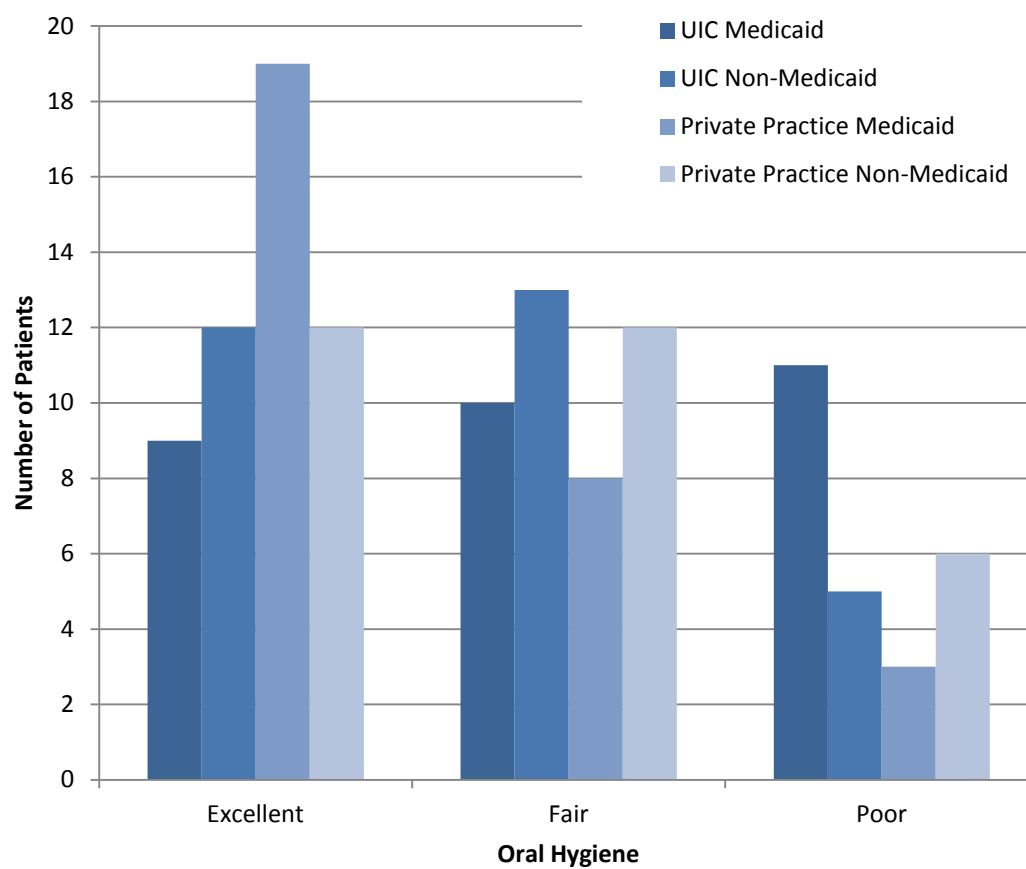


Figure 11. Oral hygiene maintenance in Medicaid and non-Medicaid groups at UIC and the private practice.

APPENDIX D (continued)

TABLE XI

CROSS TABULATION AND CHI-SQUARE TEST COMPARING PATIENTS'
ORAL HYGIENE IN UIC NON-MEDICAID AND UIC MEDICAID GROUPS

			Groups		
			UIC Non-Medicaid	UIC Medicaid	Total
Oral Hygiene	Excellent	Count	12	9	21
		% within Groups	40.0%	30.0%	35.0%
	Fair	Count	13	10	23
		% within Groups	43.3%	33.3%	38.3%
	Poor	Count	5	11	16
		% within Groups	16.7%	36.7%	26.7%
	Total	Count	30	30	60
		% within Groups	100.0%	100.0%	100.0%

Chi-Square Tests			
	Value	df	p-value ^a
Pearson Chi-Square	3.070	2	0.215
Likelihood Ratio	3.128	2	0.209
Linear-by-Linear Association	2.177	1	0.140
N of Valid Cases	60		

^aStatistical significance at $\alpha \leq 0.05$.

APPENDIX D (continued)

TABLE XII

CROSS TABULATION AND CHI-SQUARE TEST COMPARING ORAL
HYGIENE IN PRIVATE PRACTICE MEDICAID AND PRIVATE PRACTICE
NON-MEDICAID GROUPS

			Groups		
			PP Medicaid	PP Non-Medicaid	Total
Oral Hygiene	Excellent	Count	12	19	31
		% within Groups	40.0%	63.3%	51.7%
	Fair	Count	12	8	20
		% within Groups	40.0%	26.7%	33.3%
	Poor	Count	6	3	9
		% within Groups	20.0%	10.0%	15.0%
	Total	Count	30	30	60
		% within Groups	100.0%	100.0%	100.0%

Chi-Square Tests			
	Value	df	p-value ^a
Pearson Chi-Square	3.381	2	0.184
Likelihood Ratio	3.419	2	0.181
Linear-by-Linear Association	3.079	1	0.079
N of Valid Cases	60		

^aStatistical significance at $\alpha \leq 0.05$.

APPENDIX D (continued)

TABLE XIII

STUDENT T-TEST EVALUATING FOR SIGNIFICANT DIFFERENCES IN PROPORTION OF LATE AND FAILED APPOINTMENTS BETWEEN UIC NON-MEDICAID^a AND PRIVATE PRACTICE NON-MEDICAID^a GROUPS

	t-test for Equality of Means			
	t	df	p-value ^b	Mean Difference
Failed Appointments (%)	-3.501	47.360	0.001	-10.56
Late Appointments (%)	0.853	58	0.397	0.53

^an=30.

^bStatistical significance at $\alpha \leq 0.05$.

TABLE XIV

STUDENT T-TEST EVALUATING FOR SIGNIFICANT DIFFERENCES IN PROPORTION OF LATE AND FAILED APPOINTMENTS BETWEEN UIC MEDICAID^a AND PRIVATE PRACTICE MEDICAID^a GROUPS

	t-test for Equality of Means			
	t	df	p-value ^b	Mean Difference
Failed Appointments (%)	-0.540	58	0.591	-1.51
Late Appointments (%)	-1.339	58	0.186	-0.99

^an=30.

^bStatistical significance at $\alpha \leq 0.05$.

APPENDIX D (continued)

TABLE XV

CROSS TABULATION AND CHI-SQUARE TEST COMPARING THE NUMBER
OF BROKEN APPLIANCES IN NON-MEDICAID GROUP

			Groups		
			UIC Non-Medicaid	PP Non-Medicaid	Total
Number of Broken Appliances	0	Count	8	7	15
		% within Groups	26.7%	23.3%	25.0%
	1-2	Count	9	11	20
		% within Groups	30.0%	36.7%	33.3%
	3-5	Count	8	5	13
		% within Groups	26.7%	16.7%	21.7%
	>5	Count	5	7	12
		% within Groups	16.7%	23.3%	20.0%
	Total	Count	30	30	60
		% within Groups	100.0%	100.0%	100.0%

Chi-Square Tests			
	Value	df	p-value ^a
Pearson Chi-Square	1.292	3	.731
Likelihood Ratio	1.301	3	.729
Linear-by-Linear Association	0.058	1	.810
N of Valid Cases	60		

^aStatistical significance at $\alpha \leq 0.05$.

APPENDIX D (continued)

TABLE XVI

CROSS TABULATION AND CHI-SQUARE TEST COMPARING THE NUMBER
OF BROKEN APPLIANCES IN MEDICAID GROUP

			Groups		
			UIC Medicaid	PP Medicaid	Total
Number of Broken Appliances	0	Count	5	10	15
		% within Groups	16.7%	33.3%	25.0%
	1-2	Count	16	9	25
		% within Groups	53.3%	30.0%	41.7%
	3-5	Count	8	5	13
		% within Groups	26.7%	16.7%	21.7%
	>5	Count	1	6	7
		% within Groups	3.3%	20.0%	11.7%
	Total	Count	30	30	60
		% within Groups	100.0%	100.0%	100.0%

Chi-Square Tests			
	Value	df	p-value ^a
Pearson Chi-Square	7.890	3	.048
Likelihood Ratio	8.346	3	.039
Linear-by-Linear Association	0.073	1	.786
N of Valid Cases	60		

^aStatistical significance at $\alpha \leq 0.05$.

APPENDIX D (continued)

TABLE XVII

**CROSS TABULATION AND CHI-SQUARE TEST COMPARING AUXILIARY
WEAR IN NON-MEDICAID GROUPS**

			Groups		
			UIC Non-Medicaid	PP Non-Medicaid	Total
Auxiliary Wear	Excellent	Count	16	18	34
		% within Groups	53.3%	72.0%	61.8%
	Fair	Count	10	6	16
		% within Groups	33.3%	24.0%	29.1%
	Good	Count	4	1	5
		% within Groups	13.3%	4.0%	9.1%
	Total	Count	30	25	55
		% within Groups	100.0%	100.0%	100.0%

Chi-Square Tests			
	Value	df	p-value ^a
Pearson Chi-Square	2.484	2	0.289
Likelihood Ratio	2.601	2	0.272
Linear-by-Linear Association	2.435	1	.119
N of Valid Cases	55		

^aStatistical significance at $\alpha \leq 0.05$.

APPENDIX D (continued)

TABLE XVIII

**CROSS TABULATION AND CHI-SQUARE TEST COMPARING AUXILIARY
WEAR IN MEDICAID GROUPS**

			Groups		
			UIC Medicaid	PP Medicaid	Total
Auxiliary Wear	Excellent	Count	12	19	31
		% within Groups	41.4%	67.9%	54.4%
	Fair	Count	9	6	15
		% within Groups	31.0%	21.4%	26.3%
	Poor	Count	8	3	11
		% within Groups	27.6%	10.7%	19.3%
	Total	Count	29	28	57
		% within Groups	100.0%	100.0%	100.0%

Chi-Square Tests			
	Value	df	p-value ^a
Pearson Chi-Square	4.437	2	0.109
Likelihood Ratio	4.539	2	0.103
Linear-by-Linear Association	4.285	1	0.038
N of Valid Cases	57		

^aStatistical significance at $\alpha \leq 0.05$.

APPENDIX D (continued)

TABLE XIX

**CROSS TABULATION AND CHI-SQUARE TEST COMPARING ORAL
HYGIENE IN NON-MEDICAID GROUPS**

			Groups		
			UIC Non-Medicaid	PP Non-Medicaid	Total
Oral Hygiene	Excellent	Count	12	19	31
		% within Groups	40.0%	63.3%	51.7%
	Poor	Count	13	8	21
		% within Groups	43.3%	26.7%	35.0%
	Fair	Count	5	3	8
		% within Groups	16.7%	10.0%	13.3%
	Total	Count	30	30	60
		% within Groups	100.0%	100.0%	100.0%

Chi-Square Tests			
	Value	df	p-value ^a
Pearson Chi-Square	3.271	2	0.195
Likelihood Ratio	3.302	2	0.192
Linear-by-Linear Association	2.639	1	0.104
N of Valid Cases	60		

^aStatistical significance at $\alpha \leq 0.05$.

APPENDIX D (continued)

TABLE XX**CROSS TABULATION AND CHI-SQUARE TEST COMPARING ORAL
HYGIENE IN MEDICAID GROUPS**

			Groups		
			UIC Medicaid	PP Medicaid	Total
Oral Hygiene	Excellent	Count	9	12	21
		% within Groups	30.0%	40.0%	35.0%
	Fair	Count	10	12	22
		% within Groups	33.3%	40.0%	36.7%
	Poor	Count	11	6	17
		% within Groups	36.7%	20.0%	28.3%
	Total	Count	30	30	60
		% within Groups	100.0%	100.0%	100.0%

Chi-Square Tests			
	Value	df	p-value ^a
Pearson Chi-Square	2.081	2	0.353
Likelihood Ratio	2.105	2	0.349
Linear-by-Linear Association	1.668	1	0.197
N of Valid Cases	60		

^aStatistical significance at $\alpha \leq 0.05$.

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