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## Dental Service Utilization in an Academic Setting: An Analysis for Improved Oral Health

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*University of Kentucky*

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# Dental Service Utilization in an Academic Setting

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*An Analysis for Improved Oral Health*

**Paula R. Sandford**

Public Administration Capstone  
Martin School of Public Policy and Administration  
University of Kentucky  
April 22, 2011

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## Executive Summary

The National Oral Health Surveillance System (NOHSS) is the result of a collaborative effort between the Centers for Disease Control and Prevention and the Association of State and Territorial Dental Directors which is designed to monitor aspects of oral health and disease on both a national and state level. The NOHSS ranks Kentucky at or near the bottom in most oral health indicators. The primary message of the Surgeon General's May 2000 report on Oral Health in America was to emphasize the link between oral health and overall health including the effect on day-to-day activities such as work and school attendance.

As one of the University of Kentucky's six healthcare colleges, the College of Dentistry's mission focuses on improving oral health within Kentucky and beyond. This is accomplished through a multi-pronged mission including research, outreach, education of future dentists, and providing patient care to the citizens of the Commonwealth. The College also administers a self-funded dental insurance product, UK Dental Care, which is offered to the University's employees and their families.

The focus of this paper is on the College of Dentistry's provision of dental services and how the analysis of this utilization data can aid the College in fulfilling its mission of improving oral health. Data were extracted from axiUm, the College of Dentistry's dental patient management software, which contained the frequency of treatment encounters between July 1, 2009 and June 30, 2010 for patients in one of four payor groups. The data also included the age, gender and treatment cost for each encounter as well. The dataset was subdivided into adult and child datasets and further divided into age groups.

Research has shown that receiving preventive dental services decreases the need for more expensive services in the future. It has also been shown that individuals with dental insurance are more likely to seek dental services than those who are uninsured and those who are female are more likely to report a visit to the dentist than males. While additional analysis is needed to evaluate the effect of early preventive services on this population, it was shown that the frequency of treatment encounters for both females and the insured were higher than for males and the uninsured.

The results of this analysis led the author to make the following recommendations. Additional data analysis is needed to understand the characteristics and utilization patterns of the 25% of child treatment encounters which were uninsured and to evaluate the benefits and feasibility of the University fully or partially funding dental insurance benefits for its employees. Conducting an access-to-care analysis would inform the College's administration of the current state of appointment availability and the potential impact of increasing volumes resulting from patient education and marketing. Lastly, additional financial resources should be allocated to fund a full-time dedicated manager for the College's self-funded dental insurance product, UK Dental Care.

## Definition of the Problem

The Centers for Disease Control and Prevention’s Oral Health Division and the Association of State and Territorial Dental Directors’ (ASTDD) collaborative efforts have resulted in the National Oral Health Surveillance System or NOHSS. This system “is designed to monitor the burden of oral disease, use of the oral health care delivery system, and the status of community water fluoridation on both a national and state level”.<sup>1</sup> NOHSS ranks Kentucky at or near the bottom in most indicators of oral health. These oral health indicators include such things as the number of adults, who have visited a dentist, received a teeth cleaning, lost 6 or more teeth or have complete tooth loss resulting from decay or gum disease. In children, the oral health indicators are the percentage with either treated or untreated tooth decay or having received dental sealants.

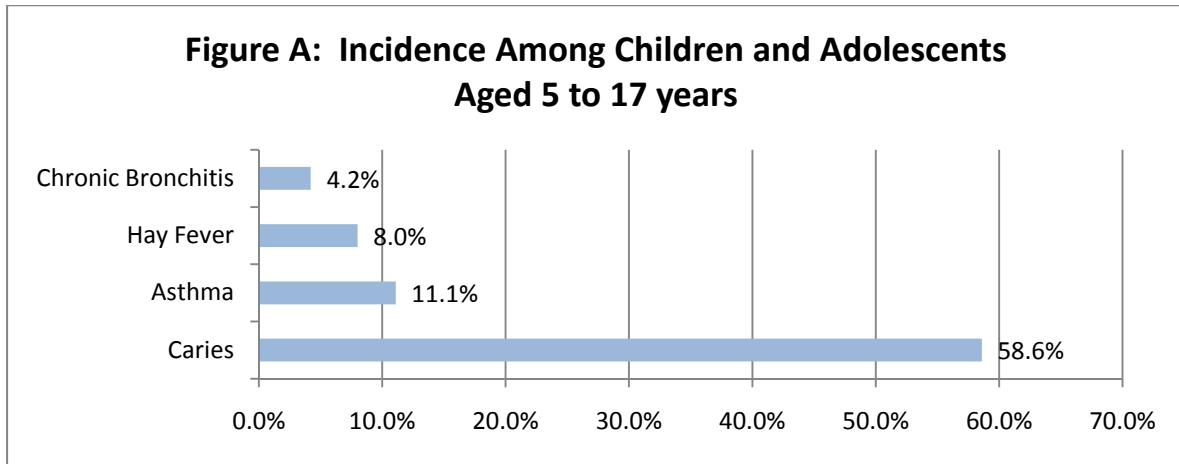
Published in the December 2000 issue of the *Journal of the American Dental Association*, “The Surgeon General’s Report on America’s Oral Health: Opportunities for the Dental Profession” reported dental caries, or cavities, as one of the most common childhood diseases.<sup>2</sup> At a rate of 58.6% among children and adolescents aged 5 to 17 years, caries far exceeded other childhood diseases such as asthma, hay fever, and chronic bronchitis (Figure A). Ten years later, the Academy of General Dentistry published “Caries risk assessment, prevention, and management in pediatric dental care” reporting that dental caries is still “the most

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<sup>1</sup> National Oral Health Surveillance System website, <http://www.cdc.gov/nohss/about.htm>. About NOHSS.

<sup>2</sup> Evans, C., Kleinman, D., The Surgeon General’s Report on America’s Oral Health: Opportunities for the Dental Profession. *Journal of the American Dental Association*. December 2000, Vol. 131.

prevalent chronic childhood disease in the U.S., five times more common than asthma and seven times more common than hay fever”.<sup>3</sup>



Source: Evans, C., Kleinman, D., The Surgeon General’s Report on America’s Oral Health: Opportunities for the Dental Profession. *The Journal of the American Dental Association*, December 2000, Vol. 131.

As one of the six healthcare colleges on the University of Kentucky campus, the College of Dentistry’s mission focuses on improving oral health within Kentucky and beyond. This is accomplished through a multi-pronged mission including research, outreach, education of future dentists, and providing patient care to the citizens of the Commonwealth. Kentuckians seeking dental treatment from the UK College of Dentistry may receive services from faculty, student dentists, postdoctoral graduate students or staff hygienists. The College of Dentistry provides dental services to individuals with or without dental insurance.

Research has linked oral health to the overall health of an individual. In May 2000, *Oral Health in America: A Report of the Surgeon General* was released by the Office of the Surgeon General. The primary message of this report was “oral health is essential to the general health

<sup>3</sup>Ramos-Gomez, F., Crystal, Y., Ng, M., Tinanoff, N., Featherstone, J., Caries risk assessment, prevention, and management in pediatric dental care. *General Dentistry*, November/December 2010.

and well-being of all Americans and can be achieved by all Americans.”<sup>4</sup> The report goes on to describe how oral health problems can affect many aspects of an individual’s life including self-esteem, participation in daily activities such as work and school and even basic life functions such as eating, speaking and breathing.<sup>5</sup> Further research has shown that receiving preventive dental services decreases the need for more complex and expensive services. The results of a recent study published in the *American Journal of Public Health* showed that individuals “who used preventive dental care had more dental visits but fewer visits for expensive non-preventive procedures and lower dental expenses” than those who only sought dental treatment for acute problems.<sup>6</sup> It is important to understand the utilization patterns of patients receiving dental services from the College of Dentistry in order to assess how the mission to improve the oral health of Kentuckians is being achieved.

In a time of repeated budget cuts, the College of Dentistry continues to become more and more reliant on income from clinical operations to support its mission. Understanding the number and type of dental services being delivered as well as the payor source is critical to sustainability as well as decisions about furthering the mission. The Kentucky Department for Medicaid Services recently announced it may need to cut the dental reimbursement rate by 35% in the fourth quarter of FY2011. This is significant considering the Medicaid reimbursement rate currently averages approximately 47% of the College of Dentistry’s usual

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<sup>4</sup>US Department of Health and Human Services. *Oral Health in America: A Report of the Surgeon General—Executive Summary*. Rockville, MD: US Department of Health and Human Services, National Institute of Dental and Craniofacial Research, National Institutes of Health, 2000.

<sup>5</sup> US Department of Health and Human Services. *Oral Health in America: A Report of the Surgeon General—Executive Summary*. Rockville, MD: US Department of Health and Human Services, National Institute of Dental and Craniofacial Research, National Institutes of Health, 2000.

<sup>6</sup> Moeller, J., Chen, H., Manski, R. Investing in Preventive Dental Care for the Medicare Population: A Preliminary Analysis. *American Journal of Public Health*, November 2010, Vol. 100, No. 11.

and customary fee. This new cut would bring the reimbursement rate for patients with Kentucky Medicaid down to an average of 30%. During the fourth quarter of FY2010, this cut would have translated to just under \$230,000 for the College of Dentistry. This may not sound like a significant amount of money. However, the loss of these funds could mean the potential loss of faculty and/or staff positions. Fortunately, this additional cut in reimbursement from Kentucky Medicaid was avoided for the time being. However, the College must prepare for the possibility of such a cut being implemented in the future.

The following sections of this report will provide background information on the College of Dentistry and its mission, elaborate on the importance of access to preventive dental services and describe the characteristics of the College of Dentistry's self-funded dental insurance product, UK Dental Care. This will be followed by a review of relevant literature and a discussion of the outcome of analyzing the treatment encounter data from axiUm, the College of Dentistry's dental patient management software. Recommendations for future actions resulting from the analysis will be offered as well as suggestions for further analysis and applicable caveats. The report will conclude with a summary.

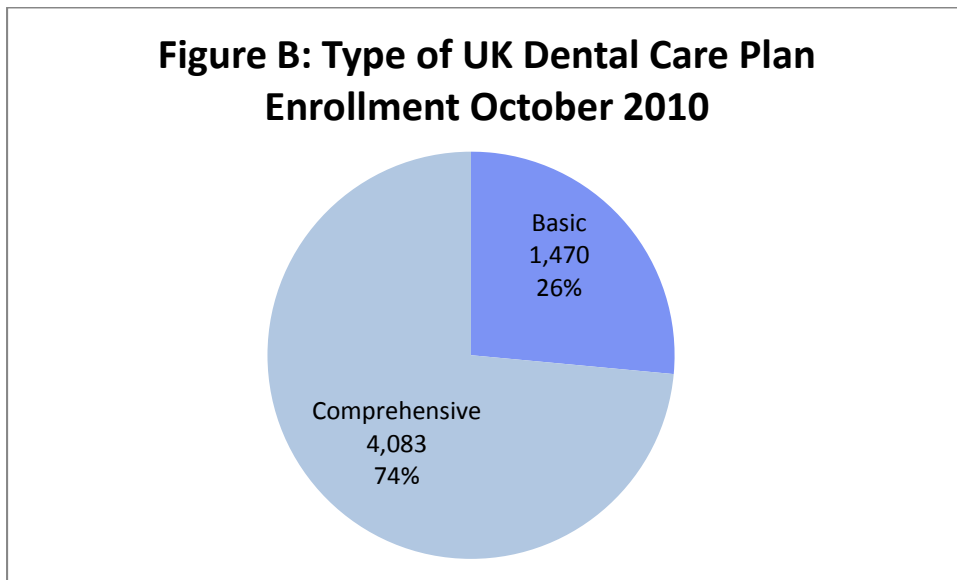
## **Discussion of the Relevant Facts**

In conjunction with its mission to educate future dentists, the University of Kentucky College of Dentistry also provides dental services to the general public. These services are performed by faculty, staff hygienists, residents and dental students. In addition to general dentistry services, the College offers specialty services in Endodontics, Oral Pathology, Oral Surgery, Orofacial Pain, Orthodontics, Periodontics, Pediatric Dentistry, and Prosthodontics. During fiscal year 2010 (July 1, 2009 – June 30, 2010), there were just under 114,000 total



patient visits across all of the College’s dental patient care facilities. This represents a 10% increase in the total number of patient visits over the previous fiscal year. It is important to analyze the nature of this clinical activity to understand what types of services are being utilized and who is paying for them.

Employees of the University of Kentucky may choose one of two dental insurance options for themselves and their families. The first option, UK Dental Care, is a self-funded dental insurance product developed and administered by the UK College of Dentistry. In the Fall of 2010, approximately 5,500, or 46.2% of the University’s more than 12,000 employees were enrolled in either the Basic or Comprehensive UK Dental Care Plan. Nearly three-fourths of those employees selected the Comprehensive Plan which provides more extensive coverage including restorations, oral surgery, and an orthodontic benefit (Figure B).



Source: UK Dental Care membership database

The Basic and Comprehensive plans combined, enroll just over 10,000 covered lives. This includes both the University's employees and their covered dependents. Approximately 2,500, or 22.7%, of the covered lives are dependents under age 21.

Employees selecting one of these two UK Dental Care plan options may only receive treatment from a provider within one of the College of Dentistry's patient care facilities. This provides a unique opportunity for evaluation of this population as the entire membership must obtain all their dental services directly from the College of Dentistry.

The other dental insurance option available to University employees is Delta Dental. While these plans are designed specifically for the University of Kentucky, members of these plans are not restricted to being evaluated and treated within the UK College of Dentistry's provider network. However, this option is available to Delta Dental plan members if they prefer to receive their dental care on campus near their workstation.

The College of Dentistry also provides dental services to the Commonwealth's Medicaid population. Beneficiaries of the Kentucky Medicaid program are primarily children and therefore, many of these patients are treated by the College's Division of Pediatric Dentistry.

As a service to its patients, the College of Dentistry files claims with third-party payors for treatment rendered and posted in axiUm, the College's dental patient management software. In order to provide accurate and consistent recording and reporting of dental treatment across all dental providers, the American Dental Association has developed a set of specific codes referred to as the "Code on Dental Procedures and Nomenclature", or CDT codes. Each dental procedure has been assigned a unique CDT code and corresponding procedure description which is used by all providers when documenting in the patient's dental

chart the treatment rendered during a visit. The CDT codes are used by the provider's billing staff when submitting claims to third-party payors for payment. This study will compare and analyze the utilization data of patients registered with one of the UK Dental Care plans, Kentucky Medicaid, one of the Delta Dental plans offered to University employees, and patients registered without dental insurance, or referred to as "Private Pay".

## Review of the Literature

A review of the relevant literature supports the assertion that individuals who obtain preventive services are less likely to need more invasive and costly procedures in the future.<sup>7</sup> A recent study published in the *American Journal of Public Health* found that individuals who utilized preventive services made more visits to the dentist than those who only received non-preventive services. While they did have more frequent visits, the group who received preventive services had lower total dental expenses than those who only visited a dentist in response to a specific dental problem.<sup>8</sup>

The College of Dentistry utilizes axiUm, a dental patient management system, to maintain its electronic patient records including demographics, appointment schedules, radiographs, and procedures performed, billed and paid. The data for this study was extracted from the axiUm system. The de-identified data includes the frequency of each dental procedure performed during the plan year from July 1, 2009 – June 30, 2010 for patients registered in the axiUm software with one of the plan types, UK Dental Care Basic, UK Dental Care Comprehensive, Kentucky Medicaid, UK Delta Dental Basic, UK Delta Dental Enhanced, and

<sup>7</sup> Eisert, S and Gabow, P. Effect of Child Health Insurance Plan Enrollment on the Utilization of Health Care Services by Children Using a Public Safety Net System. *Pediatrics*. Vol. 110 No. 5 November 2002.

<sup>8</sup> Moeller, J, Chen, H and Manski, R. Investing in Preventive Dental Care for the Medicare Population: A Preliminary Analysis. *American Journal of Public Health*, November 2010, Vol. 100, No. 11.

Private Pay. The dataset also includes the patient’s date of birth, gender, treatment date, usual and customary fee for the procedure, the specific treatment discipline assigned to the procedure in accordance with the “Code on Dental Procedures and Nomenclature” and the estimated amounts of responsibility for the patient and third-party payor.

The dataset contains both numeric and categorical variables. The patient’s date of birth and the treatment date were used to calculate the patient’s age at the time of the procedure. The dataset was then separated into an adult group, defined as patients with a calculated age of 18 and over at the time of treatment, and a child group, including those who were 17 and under at the time of treatment. The ages were then grouped into categories for ease of analysis. A new variable was created for “payor group” to categorize the multiple system codes by parent company.

Table 1: Age Group Categories

Adult	Child
18-25	0-5
26-39	6-12
40-64	13-17
65 and over	

Source: Author created variables using data from axiUm, the College of Dentistry’s dental patient management software

Table 2: Payor Group Categories

Delta Dental
Medicaid
Private Pay
UK Dental Care

Source: Author created variables using data from axiUm, the College of Dentistry’s dental patient management software

## Report of Analysis and Findings

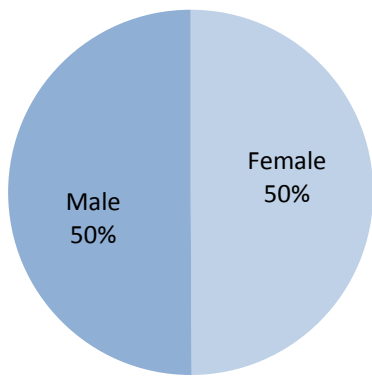
### Adults (18 and over)

The adult dataset contained the treatment encounters for individuals aged 18 and older.

The data was separated into four distinct groups as outlined in Table 1 above. An article published in the February 1998 issue of the *Journal of the American Dental Association*

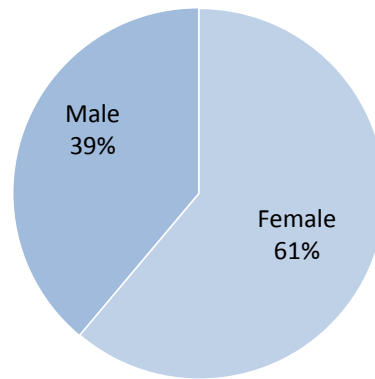
reported that, overall, females were more likely to have visited a dentist than were males.<sup>9</sup> This was true for the College of Dentistry’s population as well. There were just over 87,000 treatment encounters with 55% of those occurring with females. While the share of adult males and females without insurance were evenly split (Figure C), 61% of the insured adult treatment encounters were for females (Figure D).

**Figure C: Incidence of Uninsured Treatment Encounters Among Adult Males and Females**



Source: Author analysis of data from axiUm, the College of Dentistry’s dental patient management software

**Figure D: Incidence of Insured Treatment Encounters Among Adult Males and Females**



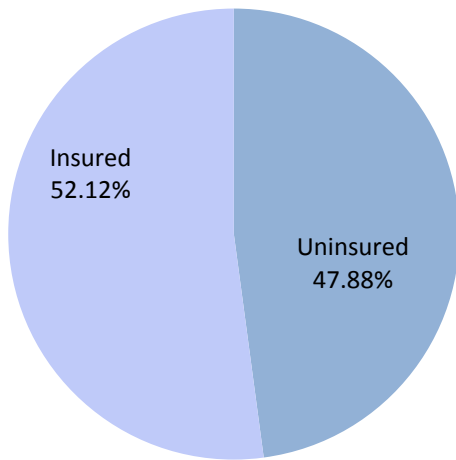
Source: Author analysis of data from axiUm, the College of Dentistry’s dental patient management software

Nearly half of the treatment encounters in the adult population were for individuals without insurance (Figure E). One might expect this group to spend more on average for dental treatment than individuals with insurance. This was, in fact, true for the College of Dentistry’s population. The mean out-of-pocket expense per procedure for adults without insurance was \$74. This was significantly higher than the \$19 per procedure expense to those patients with insurance.

<sup>9</sup>Manski, R. and Magder, L. Demographic and Socioeconomic Predictors of Dental Care Utilization. *Journal of the American Dental Association*, February 1998, Vol. 129.

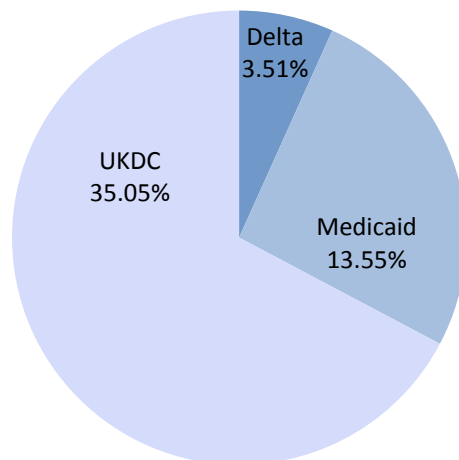
The other half of the treatment encounters in the adult population with insurance were predominantly UK Dental Care members and less than 15% to both Delta Dental and Medicaid combined (Figure F). This is the result one would expect as services under the UK Dental Care plans can only be rendered by the UK College of Dentistry.

**Figure E: Payor Group by Percent of Total Treatment Encounters**



Source: Author analysis of data from axiUm, the College of Dentistry’s dental patient management software

**Figure F: Treatment Encounters by Payor for Insured Patients**

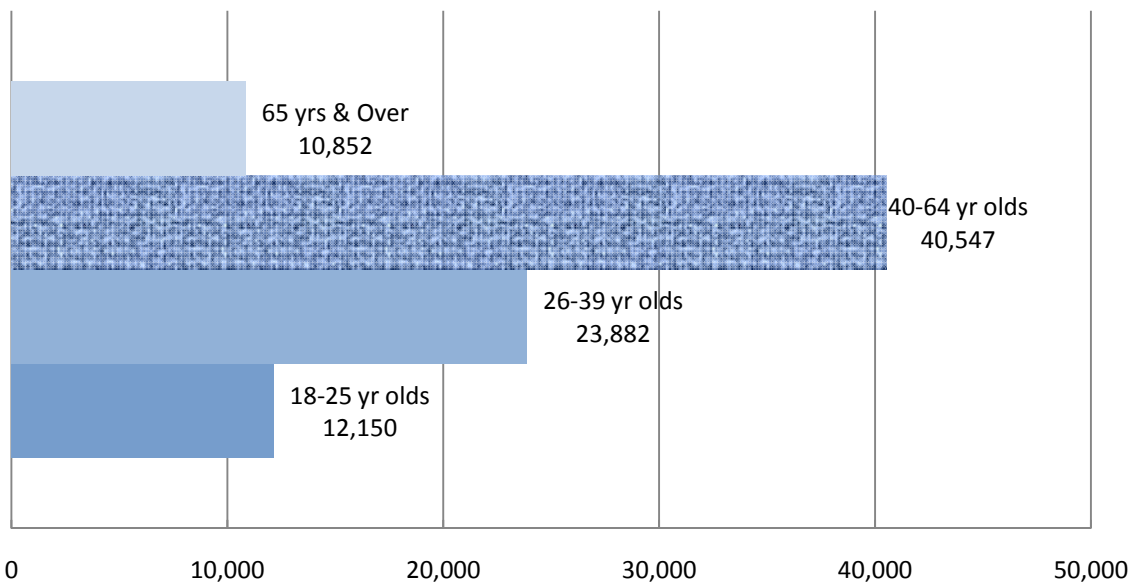


Source: Author analysis of data from axiUm, the College of Dentistry’s dental patient management software

Half of all the adult treatment encounters fell into the Diagnostic and Preventive treatment discipline categories. Diagnostic procedures include dental exams and radiographs which are used by the dentist or specialist to determine and diagnose the cause of a patient’s chief complaint or to document that there are no causes for concern at that time. Prophylaxis, or cleaning, falls into the Preventive category and is recommended every six months to prevent or slow the progression of dental disease. Of those 44,000 diagnostic and preventive services, 62.5% were received by insured persons. This is significant as one study on predictors of dental care utilization published in the *Journal of the American Dental Association* found dental

insurance status to be a significant predictor of reporting a visit to the dentist. They found uninsured individuals to be less likely to have visited a dentist than those with dental insurance.<sup>10</sup>

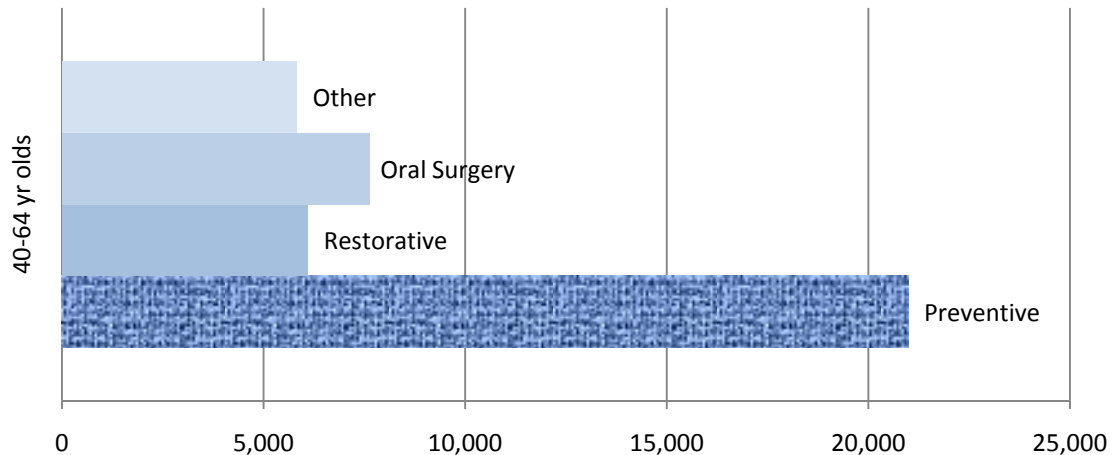
Close to half the services rendered at the UK College of Dentistry to adults between July 1, 2009 and June 30, 2010 were performed on patients in the 40-64 year old age range (Figure G). Half of those were categorized as either diagnostic or preventive services (Figure H).



**Figure G: Frequency of Adult Treatment Encounters by Age Group**

Source: Author analysis of data from axiUm, the College of Dentistry's dental patient management software

<sup>10</sup>Manski, R., Magder, L., Demographic and Socioeconomic Predictors of Dental Care Utilization, *Journal of the American Dental Association*, February 1998, Vol. 129.



**Figure H: Frequency across Treatment Disciplines for the 40-64 Age Group**

Source: Author analysis of data from axiUm, the College of Dentistry’s dental patient management software

A separate analysis of the UK Dental Care and UK Delta Dental payor groups was performed for the adult dataset. For both the UK Dental Care group and the UK Delta Dental group, 60% of the observations were with females. There were close to 34,000 observations in this subset of the data. As with the overall adult population, the majority of the observations, 52.7% fell into the 40-64 year old age group. The usual and customary fees for the UK Dental Care plans are discounted. Therefore, it is not surprising to find the mean total treatment cost for patients with UK Delta Dental to be significantly higher than for those with UK Dental Care. However, the mean out-of-pocket expense to patients with UK Delta Dental was \$30. This was significantly higher than the \$18 out-of-pocket expense to UK Dental Care members.

**Children (17 and under)**

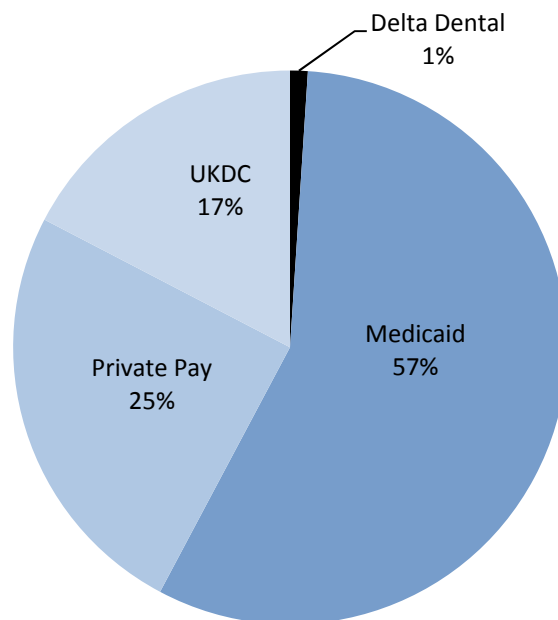
There were just fewer than 69,000 observations in the child dataset which contained the treatment encounters for seventeen year-olds and under. While the adult dataset supports the relevant literature in its assertion that females are more likely to visit the dentist than



males, the percentage of treatment encounters in the child population was slightly higher in males.

In contrast to the adult dataset, 75% of the child population was insured. However, this is not particularly surprising since the dental coverage provided under Kentucky Medicaid is primarily for children. More than half of the child treatment encounters in the dataset were billed to Kentucky Medicaid (Figure I). Given that 29% of the covered lives enrolled in either the UK Dental Care Basic or Comprehensive coverage level are children, and they can only be treated by the UK College of Dentistry, it is somewhat surprising to find that only 17% of the treatment encounters from July 1, 2009 – June 30, 2010 were attributable to UK Dental Care members. This could be an opportunity for further analysis to determine the number of UK Dental Care members who are enrolled in one of the plans but are not utilizing the services.

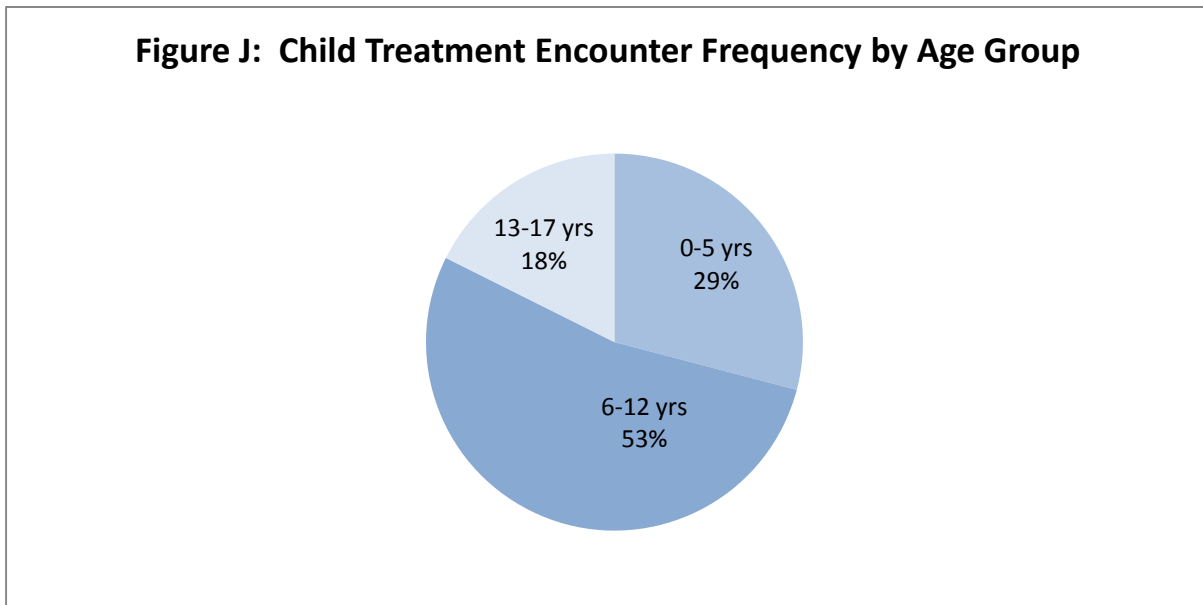
**Figure I: Frequency of Child Treatment Encounters by Payor**



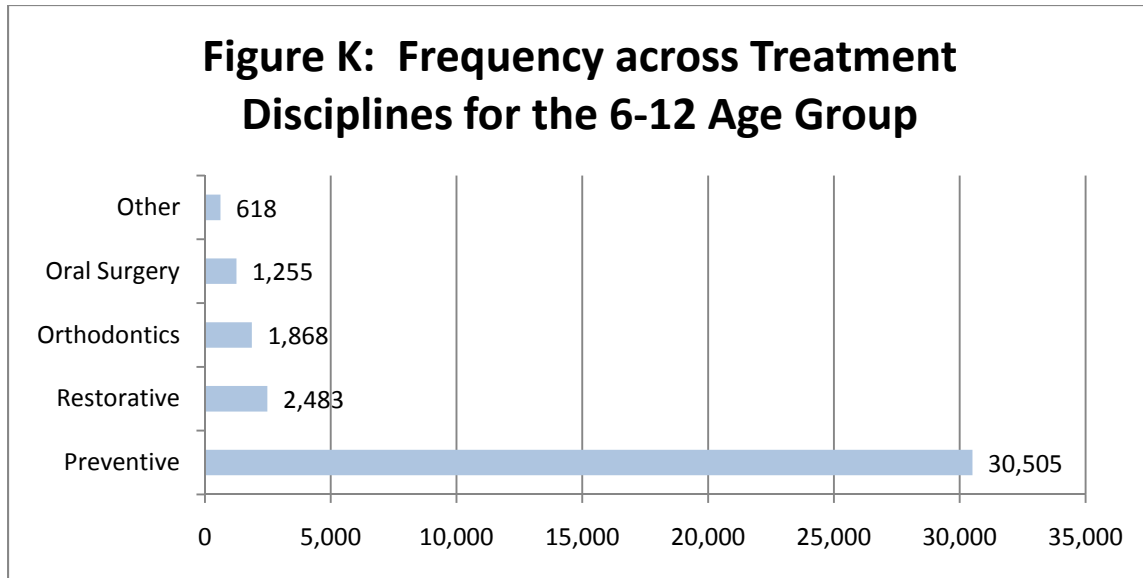
Source: Author analysis of data from axiUm, the College of Dentistry's dental patient management software

Approximately 55,000, or 79.8%, of the treatment encounters in the child population were for diagnostic and preventive services.

The data were divided into three age groups, as outlined in Table 1. Just over 50% of the child dataset belonged to the 6-12 year old age group. The smallest age group was the 13-17 year olds with only 18% of the encounters (Figure J). As with the adult population, the majority of services delivered to the larger group were in the Diagnostic and Preventive treatment discipline categories (Figure K).



Source: Author analysis of data from axiUm, the College of Dentistry's dental patient management software



Source: Author analysis of data from axiUm, the College of Dentistry's dental patient management software

## Recommendations

As long as there are individuals without dental insurance, the College of Dentistry's mission to improve oral health will suffer during times of economic distress. A 2007 article published by the American Dental Association reported the results of a study of the impact of dental insurance on preventive dental care visits by U.S. children. The study concluded that children who lacked dental insurance were less than half as likely to receive preventive dental care.<sup>11</sup> In keeping with its mission to improve oral health for all Kentuckians, the College of Dentistry has focused on education and prevention for children as evidenced by the multiple school-based and mobile dental outreach programs currently in place. Continuing to work toward this goal, I would recommend the College focus on understanding the characteristics and utilization patterns of the 25% of the child treatment encounters which were uninsured.

<sup>11</sup> Lewis, C., Mouradian, W., Slayton, R., Williams, A., Dental insurance and its impact on preventive dental care visits for U.S. children. *Journal of the American Dental Association*, March 2007, Vol. 138.

This would require obtaining an additional dataset containing patient identifiers for further detailed analysis of this subset of the population. It would be informative to compare this new dataset of uninsured children 17 and under to SAP, the University's human resource and financial system, to determine what percentage, if any, are uninsured for dental care, but are enrolled in one of the health plans offered by the University.

Important to fulfilling its mission of improving oral health for all Kentuckians and beyond is to begin with the campus community. Educating employees about the benefits of improved oral health and making dental insurance a priority might be accomplished through an increased emphasis on marketing the UK Dental Care insurance plans to the University's employees. This will require the College of Dentistry to allocate additional financial resources to hire a full-time dedicated insurance plan manager to provide ongoing management and analysis of the UK Dental Care Plans. This would include responsibility for implementing a marketing strategy and performing analysis on the dental service utilization data from the College of Dentistry's patient population as well as the day-to-day operations of the plans.

As efforts to educate the community on the importance of preventive dental care are increased and marketing efforts are implemented, the anticipated positive results will certainly impact the volume of patients accessing the College of Dentistry's dental patient care facilities. Therefore, I would recommend performing an access-to-care analysis. This would include a staffing and space utilization study in each of the clinics that treat children as well as an analysis of appointment availability and wait times. This would require taking an inventory of the number of dental treatment chairs and providers in each clinic and comparing them to the number of scheduled appointments on a given day to determine the percentage of time dental

chairs in the clinic are being utilized, or filled, by patients. If such a study concludes that a clinic is operating at maximum capacity, this would provide the necessary evidence to support discussions for obtaining additional space and/or extending available clinic hours. The opportunity for weekend and/or after-hours appointments may be appealing to care-givers who cannot take time off work and don't want to take their child out of school for a non-emergent dental appointment. A patient survey may be helpful in determining if there is a demand for these options.

According to the Surgeon General's report, *Oral Health in America* published in May 2000; oral diseases may lead to other health problems such as diabetes and heart disease and could also affect everyday activities such as going to school or work.<sup>12</sup> If they are able to report to work, employees suffering from the pain associated with dental problems are likely to be less productive and may miss work all together while seeking urgent dental treatment or to recuperate. The *American Journal of Public Health* recently published an article on the use of preventive dental care by the Medicare population. The analysis concluded that "adding dental coverage for preventive care to Medicare could pay off in terms of both improving the oral health of the elderly population and limiting the costs of expensive nonpreventive dental care".<sup>13</sup> To improve the oral health and, in turn, the overall health of the University's employees and their families, I recommend the College of Dentistry initiate a similar study to evaluate the benefits and feasibility of fully or partially funding dental insurance benefits.

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<sup>12</sup> US Department of Health and Human Services. *Oral Health in America: A Report of the Surgeon General—Executive Summary*. Rockville, MD: US Department of Health and Human Services, National Institute of Dental and Craniofacial Research, National Institutes of Health, 2000.

<sup>13</sup> Moeller, J., Chen, H., Manski, R., Investing in Preventive Dental Care for the Medicare Population: A Preliminary Analysis, *American Journal of Public Health*, November 2010, Vol. 100, No.11.

## **Caveats**

Given the time constraints for this report, only selected insurance plan codes were reported and analyzed. Specifically, the UK Dental Care retiree plans were excluded from the report. Therefore, the treatment occurrences for the adult “65 & over” age group cannot be fully evaluated for this population. Any future dataset should include all treatment provided during the reporting period.

While the dataset obtained for this report contained some interesting variables, it was de-identified and therefore, could not be compared to other datasets such as the UK Dental Care membership database or the University’s employment system. The opportunity to perform this type of analysis could assist the College of Dentistry with targeted marketing efforts toward University employees without dental insurance. Or, more importantly, it could enable the College to determine the need for enhancing oral health education programs by targeting those segments of the treated population who are not maximizing the use of preventive services.

## **Summary**

The University of Kentucky College of Dentistry’s mission focuses on improving oral health within Kentucky and beyond. This is accomplished through a multi-pronged mission including research, outreach, education of future dentists, and providing patient care to the citizens of the Commonwealth.

Research has shown that receiving preventive dental services decreases the need for more expensive services in the future. This is reason enough to justify a campaign to promote the importance of accessing preventive services early and often. More importantly, the

National Oral Health Surveillance System ranks Kentucky at or near the bottom in most indicators of oral health. As a part of the Commonwealth's flagship institution, the College of Dentistry must strive to educate its community about the importance of oral health and the necessity to make it a priority. The "Big Blue Nation" won't accept a low ranking in basketball nor can we accept the lowest ranking in oral health. Our reputation and the health of our citizens depend on it.