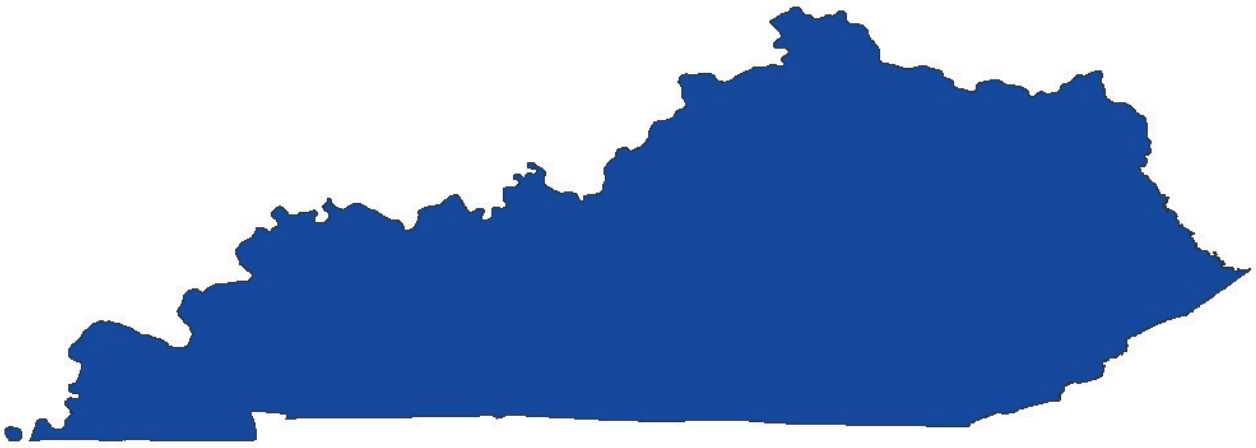
2016



Oral Health in Kentucky

CHWS
Center for Health Workforce Studies

School of Public Health
University at Albany, State University of New York

Oral Health in Kentucky

February 2016

Center for Health Workforce Studies
School of Public Health, University at Albany
State University of New York
1 University Place, Suite 220
Rensselaer, NY 12144-3445

Phone: (518) 402-0250
Web: http://chws.albany.edu
Email: chws@health.ny.gov

PREFACE

This report, *Oral Health in Kentucky*, summarizes relevant literature and data describing the oral health of Kentucky's population including oral health status of particular populations, oral health service delivery in safety net settings, and the supply and distribution of the oral health workforce in Kentucky.

This report was prepared by Simona Surdu, Margaret Langelier, Bridget Baker, Shen Wang, Nafin Harun, and Debra Krohl at the Center for Health Workforce Studies (CHWS). Layout design was completed by Leanne Keough and Rachel Carter at CHWS. This report is funded in part by The Pew Charitable Trusts. The findings and conclusions are exclusively the work of CHWS and do not necessarily reflect the views of Pew or represent the positions or policies of the School of Public Health, University at Albany, or SUNY.

Established in 1996, CHWS is a not-for-profit research organization, based at the School of Public Health, University at Albany, State University of New York (SUNY). The mission of CHWS is to provide timely, accurate data and conduct policy relevant research about the health workforce. The research conducted by CHWS supports and promotes health workforce planning and policymaking at local, regional, state, and national levels. Today, CHWS is a national leader in the field of health workforce studies, and the only center with a focus on the oral health workforce.

February 2016

ACKNOWLEDGEMENTS

The authors wish to acknowledge the research advisory committee that was convened in Kentucky to guide this research project. Special thanks are extended to to Drs. Raynor Mullins, Jeffrey Ebersole, and the Appalachian research team at the Center for Oral Health Research, University of Kentucky who shared a considerable volume of work on oral health in Kentucky to provide context to past and present efforts to improve oral health outcomes in the state.

Suggested citation:

Surdu S, Langelier M, Baker B, Wang S, Harun N, Krohl D. *Oral Health in Kentucky*. Rensselaer, NY: Center for Health Workforce Studies, School of Public Health, SUNY Albany: February 2016.

TABLE OF ACRONYMS

ACA	Affordable Care Act
ACS	American Community Survey
ADA	American Dental Association
ADD	Area Development District
ARC	Appalachian Regional Commission
ARDEP	Appalachian Rural Dental Education Partnership
BRFSS	Behavioral Risk Factor Surveillance System
CDC	Centers for Disease Control and Prevention
CHWS	Center for Health Workforce Studies
CODA	Commission on Dental Accreditation
DHPSA	Dental Health Professional Shortage Area
DPPO	Dental Preferred Provider Organization
ECC	Early Childhood Caries
EPSDT	Early Periodic Screening, Diagnostic and Treatment
FPL	Federal Poverty Level
FQHC	Federally Qualified Health Center
FTE	Full-Time Equivalent
HPSA	Health Professional Shortage Area
HRSA	Health Resources and Services Administration
KCHIP	Kentucky Children's Health Insurance Program
KDHC	Kentucky Dental Health Coalition
MCH	Maternal and Child Health
MCO	Managed Care Organization
NADP	National Association of Dental Plans
NSCH	National Survey of Children's Health
PRAMS	Pregnancy Risk Assessment Monitoring System
SOAR	Shaping Our Appalachian Region
SUNY	State University of New York
UK	University of Kentucky
US	United States

TABLE OF CONTENTS

TABLE OF FIGURES

TABLE OF TABLES

Executive Summary

BACKGROUND

In 2015, the Center for Health Workforce Studies (CHWS), School of Public Health, University at Albany conducted a review of oral health in Kentucky. The study was funded in part by The Pew Charitable Trusts and guided by a research advisory group constituted of stakeholders in Kentucky with an interest in oral health.

The research project entailed:

- An extensive literature review to understand current and past initiatives to improve access to oral health services in the Kentucky;
- Analyses of secondary data obtained from national and state surveillance and reporting systems to understand oral health status and oral health outcomes of the state's population; and
- Interviews of oral health stakeholders to understand the barriers and facilitators to service utilization, especially for populations experiencing difficulty accessing oral health services.

This report describes the findings from the literature review and the analyses of secondary data about the oral health status of population cohorts in Kentucky. A separate report to the advisory group provides a summary of common themes from the interviews conducted in the state.

Kentucky, which is known as the Bluegrass State, is located in the east south central region of the United States (US). Kentucky is bordered by seven states. Three of the state's borders are marked by rivers which form contiguous boundaries to the west, north, and east. Kentucky is second only to Alaska in the length of navigable waterways within the state. A large portion of eastern Kentucky is part of the Appalachian Mountain Range. In 2014, there were over 4 million people living in 120 counties in the state, placing it at 26th in population compared to other states. Kentucky's population is mainly White but other racial and ethnic groups are represented variously in the state.

Much of the economic growth in Kentucky in recent years was concentrated in the Golden Triangle which is the region including and surrounding Covington, Lexington, and Louisville. In other areas of the state, economic recovery and industrial development after the most recent economic recession are slower; many regions in the state continue to suffer from the demise of the coal mining and tobacco growing industries. The rates of joblessness or of underemployment and the prevalence of populations living in poverty are higher now than when these industries were prospering.

Downstream impacts from loss of industry include job loss with an associated decline in the number of people with employer sponsored health insurance. The implementation of the Affordable Care Act (ACA) in 2014 and the expansion in eligibility requirements for the state's Medicaid program provided opportunities for many of the uninsured including the unemployed or underemployed to purchase or obtain health insurance and/or dental insurance coverage.

Kentucky stakeholders have concerns about health and oral health outcomes for the state's population. When benchmarked to other states on a range of health indicators, Kentucky ranks quite high in rates of chronic disease, infant mortality, substance abuse, oral cancer, and edentulism in the population. Kentucky is second in the nation in the incidence of oral and pharyngeal cancers. Conversely, Kentucky ranks first in the nation in the percentage of people on community water supplies who receive fluoridated water. Water fluoridation is a strategy to decrease rates of caries in the population that is widely regarded as an important public health intervention.

KEY FINDINGS

The literature review and data analyses for this study found evidence of ongoing efforts in Kentucky to improve oral health outcomes in the population. The key findings included that:

- Kentucky has been proactive in addressing identified deficiencies in oral health access through state level policy initiatives and funding for oral health services and programs.

- Despite statewide initiatives to improve oral health status in Kentucky's population, there remain populations with poor oral health outcomes attributed to a lack of oral health literacy, residence in rural areas, and limited resources to pay for care.

- Particular population groups appeared to be at greatest risk for poor oral health outcomes. These included children and adults from lower socioeconomic groups, the elderly, pregnant women, and others.

- Increasing the number of people with Medicaid insurance improved the opportunity for many to receive dental services. However, the large number of the newly insured, their generally poor oral health, a limited network of participating providers, and the transition of the Medicaid program to managed care auspices is challenging the capacity of the oral health care delivery system in Kentucky.

- The safety net for oral health services in Kentucky has grown rapidly in recent years but the safety net is not yet as robust as in some other states.

- The supply of oral health workforce in Kentucky is stabilized and renewed by the presence of two dental schools and several training programs for dental hygienists and dental assistants. The supply of oral health workforce appears adequate on a per population basis but it is not evenly distributed with the population.

The following paragraphs summarize these bulleted findings. This executive summary is followed by a comprehensive technical report with several appendices that provide data to support these conclusions and further discussion of findings.

Kentucky has been proactive in addressing identified deficiencies in oral health access through state level policy initiatives and funding for oral health services and programs.

Beginning as early as 1990, Kentucky stakeholders formed an oral health coalition to advocate for improved oral health in the Commonwealth. The coalition sponsored a dental access summit which provided a forum for participants from government, education, the dental and medical professions, health and oral health provider organizations, and consumer advocacy groups to provide input to the development of a plan to improve oral health service delivery in the state and oral health outcomes in the population.

In 2006, the Kentucky Department for Public Health published a strategic oral health plan which was developed with consensus from a broad range of stakeholders. This plan described discrete actions to improve the availability of oral health services, increase the oral health literacy of the population, and educate an appropriately prepared and well distributed workforce to improve oral health in the population. Over ensuing years, a variety of stakeholders in collaboration with government and private entities conducted surveys of children, adults, elders, and pregnant women to collect baseline data and build a surveillance system to understand the oral health of these particular populations and of the Kentucky population in general.

In recent years, Kentucky has implemented both regulatory change and programmatic strategies to increase access to oral health services:

- Kentucky embraced the Medicaid expansion available through the provisions of the ACA. As a result, more than 560,000 people enrolled in health insurance on KYNECT with many also qualifying for dental insurance as a benefit from Medicaid eligibility.

- Policymakers in Kentucky supported and funded an adult dental benefit in Medicaid that permits preventive and restorative services.

- Legislators in the state enabled the practice of public health dental hygiene. Local and regional health departments are now able to expand dental outreach programs especially for children.

- The state provided supportive funding for dental loan repayment (Shaping Our Appalachian Region (SOAR)) and for dental professional pipeline development (Appalachian Rural Dental Education Partnership (ARDEP)). These programs encourage practice in Appalachian Kentucky and enable potential dental students from the region to meet application criteria for the two Kentucky dental schools.

In addition to these strategic initiatives at the state level, a number of regional and local initiatives and collaborations have positively impacted both the availability and delivery of oral health services in Kentucky, particularly in areas that were historically underserved. Some examples of these initiatives are:

- The Northern Kentucky Health Department was the first in the state to provide services in schools and to also employ public health dental hygienists to work in their school linked oral health programs. Public health dental hygienists provide education, prevention and prophylactic services to children with compromised access to oral health services in multiple counties. The program has been very successful in helping children to establish dental homes in their local communities and is currently expanding to enable more comprehensive outreach.

- Cumberland Family Medical Centers is a Federally Qualified Health Center (FQHC) that serves people in 17 counties in south central and north central Kentucky at 46 clinic locations. Its mobile dental outreach program works successfully in collaboration with local schools and local dentists in each of the communities where children are treated to provide services and help children build dental homes.

- The University of Kentucky College of Medicine and College of Dentistry mobile vans and fixed dental clinic programs have been remarkably successful in mediating significant oral disease in populations in areas served by the programs. The UK North Fork Valley Community Health Center and the Western Kentucky Dental Outreach Program in Madisonville are among the University of Kentucky programs that have improved access in notable ways for both children and adults in their catchment areas.

Despite statewide initiatives to improve oral health status in Kentucky's population, there remain populations with poor oral health outcomes attributed to a lack of oral health literacy, residence in rural areas, and limited resources to pay for care.

While enhancement in access to oral health services and improved oral health outcomes were observable in the data about Kentucky, many historically underserved populations in the state remain at risk for compromised access to care. The reasons are complex and difficult to mediate. Remote geography, low levels of education, limited oral health literacy, and socioeconomic factors all contribute to poor oral health for some populations in Kentucky.

Kentucky is a largely rural state and also mountainous. Economic disparities in the eastern, western, and southern regions contrast with noticeable prosperity in central and northern regions of Kentucky. Parts

of Appalachian Kentucky are among the most economically depressed areas in the US. Poverty in some regions is 63.8% higher than the national average. More than a quarter of the people in Appalachian Kentucky lived below the federal poverty level (FPL) between 2009 and 2013.

Some oral health disparities are attributed to the lack of available oral health services in areas of the state. While there appeared to be a sufficient supply of dentists and dental hygienists on a per population basis in Kentucky, these workforces were unevenly distributed and mainly concentrated in the metropolitan areas of the state. The state continues to have many whole county dental professional shortage areas (DHPSAs), special population DHPSAs, and facility DHPSAs as a result of shortages of oral health workforce. A limited supply of dentists in a local or regional area is problematic for the population generally. However, the publicly insured may encounter additional difficulty when the supply of dentists is further restricted to area dentists who participate with all or any of the managed care insurance products that now cover Medicaid enrollees and by the service limits for adults that are publicly insured.

Particular population groups appeared to be at greatest risk for poor oral health outcomes. These included children and adults from lower socioeconomic groups, the elderly, pregnant women, and others.

Disparities in oral health status in particular population cohorts were noted in the data analyses conducted for this project. Data about Kentucky were benchmarked to national and other state data to describe oral health status. Poor children, poor adults, the elderly, and certain special populations exhibited oral health utilization patterns that differed from the population generally. The following positive and negative indicators of oral health status are provided in this summary to illustrate disparities in the populations receiving oral health services in Kentucky.

Children in Kentucky are currently receiving more oral health services than in the past.

- The most noticeable increase over time was in the percentage of Medicaid eligible children who received a preventive service each year. In 2000, just 14.7% of eligible children had a preventive oral health service while in 2014, 38.1% of eligible children received a preventive service.

- Medicaid eligible children between the ages of 3 and 14 years were more likely to have any dental service, a preventive service, or a treatment service than younger or older children who were also Medicaid eligible. Children ages 6 to 9 years exhibited the highest utilization rates among all children insured by Medicaid.

- The percentage of Medicaid eligible children in any age group receiving sealant services between 2011 and 2014 was low. However, the data counts only new sealants placed during a year and does not account for the number of previously sealed teeth in the population. The low percentage of annual sealant placement might reflect the success of prior sealant efforts or it may be an indicator of limited availability of sealant services in the state.

- Between 2008 and 2014, Kentucky data tracked very closely with national rates of children insured by Medicaid who received any dental service in each service year. In 2014, 43.4% of Medicaid insured children in Kentucky received a dental service. In that year, 44.1% of Medicaid insured children in the US received a dental service.

- Kentucky mandates a dental assessment for each child entering public school. In the 2015 academic year, just 52.1% of 5 or 6 year old students entering public school had a documented dental screening. The average rate of dental examination/screening at school entrance ranged from 62.7% in the Northern Kentucky Cooperative for Educational Services to 32.9% in school districts not affiliated with an educational corporation or cooperative. These data suggested some geographic disparities among children who were screened for dental conditions.

- A study of school health services during the 2008 to 2009 academic year in Kentucky found that 72% of schools responding to the study's survey reported offering some oral health services to patients. The dental health services offered were mainly oral health screenings and prevention counseling (48%); less than a quarter of the school districts offered dental services that included cleanings, X-rays, fillings, and extractions. Almost half of the school districts provided oral health screenings in elementary schools, while only 15% provided screenings to middle school students and only 8% to high school students.

Adults in Kentucky exhibited higher rates of not visiting a dentist, of having any permanent teeth extracted or of having six or more permanent teeth extracted due to decay or disease, and of edentulism than adults nationally.

- According to the Behavioral Risk Factor Surveillance System (BRFSS) data, in 2012, the percentage of the population of adults aged 18 years and older in Kentucky who had not visited a dentist or dental clinic in the past year (39.7%) was higher than the percentage of adults in the US (34.5%) without a dental visit in the same period.

- Racially and ethnically diverse populations, males, adults with less than a high school education and adults with lower incomes were less likely than others in Kentucky to have visited a dentist in the prior year according to the 2012 BRFSS.

- In 2012, Kentucky ranked 10th highest among states in the US for the percentage of the adult population without a dental visit within the prior year.

- According to data from the 2012 BRFSS, Kentucky ranked 8th highest in the nation for the percentage of adults ages 18 and older who had any permanent teeth extracted due to tooth decay or gum disease.

- State specific BRFSS data estimates were available for Kentucky for 2014 although national estimates from the BRFSS for 2014 were not yet publicly accessible. In 2014, eastern Kentucky had the lowest percentage of adults in all regions of the state who visited a dentist or dental clinic in the past year. Low percentages were found in Cumberland Valley (45.6%), Big Sandy (50.5%) and Lake Cumberland (50.8%) where only about half of adults accessed oral health services in the prior 12 months. At the state level, about 3 in 5 (61.0%) adults visited a dentist or dental clinic in 2014.

- The 2013 Kentucky Health Issues Poll asked adults about utilization of oral health services. Poll respondents were mainly White and insured through commercial carriers or self-paid for health services. Just 7% were insured by Medicaid and 7% were covered by both Medicare and Medicaid. Half (50.0%) of adults aged 18 years and older who resided in the Eastern Kentucky Region in Appalachia and responded to the survey had not visited a dentist in the past year.

- In the 2013 poll, 53.7% of responding adults with less than a high school education indicated they had not utilized dental services in the previous year.

- The 2013 poll prevalence of adults who had not visited a dentist in the year prior increased with increasing levels of poverty; adults with an income at 138% or below FPL had the highest prevalence (51.8%) of not visiting a dentist while those with an income more than 200% FPL had the lowest prevalence (19.1%) of no dental visit in the previous year.

People aged 65 years and older in Kentucky were at risk of poor oral health outcomes because of progressive chronic disease, mobility limitations, limited transportation, and lack of dental insurance.

- Between 2002 and 2005, the University of Louisville School of Dentistry and the Kentucky Office of Oral Health of the Department for Public Health collaborated on a survey of elder oral health. Statewide, more than half (56.5%) of the elders participating in the survey in Kentucky reported no dental insurance and nearly two-thirds (64.6%) indicated they had not visited a dentist in the past year.

- According to the 2012 BRFSS, adults aged 65 years and older in Kentucky (51.5%) were more likely than those in the US (39.6%) to have had 6 or more permanent teeth extracted, placing Kentucky at 5th highest in the nation on this negative measure of oral health.

- Kentucky also ranked 5th highest in the nation for the percentage of adults aged 65 years and older who had all their natural teeth extracted (24.8%). The national rate of edentulism was 16.2%.

- There were regional differences in rates of tooth loss. The 2014 data from the Kentucky BRFSS evidenced that adults aged 65 and older in 3 Area Development Districts (ADDs) in eastern Kentucky (the Kentucky River ADD (40.7%), the Gateway ADD (37.5%) and the Cumberland Valley ADD (36.2%)) were more likely than adults in Kentucky generally (23.9%) to have had 6 or more permanent teeth extracted.

- In the Kentucky Health Issues Poll of 2013, the prevalence of adults who had not visited a dentist in the year prior increased by age. Younger adults aged 18 to 24 years had the lowest prevalence (30.7%) and older adults aged 65 years and older had the highest prevalence (47.3%) of not utilizing dental services in the previous year.

- In the Kentucky Elder Oral Health Survey conducted between 2002 and 2005, nearly a quarter (23.5%) of elders in Kentucky reported having untreated dental caries and nearly half (46.2%) reported being edentulous. About 1 in 5 Kentucky elders also reported oral pain within the past 3 months (19.3%), a problem with the ability to chew food (22.1%), or dissatisfaction with the appearance of their teeth or dentures (23.2%).

Special populations were also of concern in Kentucky, especially pregnant women.

- The Pregnancy Risk Assessment Monitoring System (PRAMS) pilot study conducted in Kentucky in 2007 indicated that only 44.2% of Kentucky mothers consulted a dentist during their pregnancy. The PRAMS pilot study in Kentucky also revealed that the rate of pregnant women with a dental problem who subsequently received dental care was just 16.3%.

- Younger mothers aged less than 20 years (39.8%) or those aged 20 to 24 years (36.2%), those who were African American (40.4%), or unmarried (38.8%) were less likely than other pregnant women to have visited a dentist during pregnancy. Older women aged 25 years or older (48.5%-51.6%), Whites or women in other racial groups (44.6%) and married mothers (48%) were more likely to have visited a dentist during pregnancy.

Populations abusing substances were also of special concern in Kentucky because of the serious implications of abuse on the oral cavity.

- In 2014, Kentucky was 4th among all states in the rate of drug overdose deaths (24.7 deaths per 100,000 population) after West Virginia (35.5), New Mexico (27.3), and New Hampshire (26.2). The number and rate of opioid drug overdose deaths in Kentucky increased from 2013 to 2014 resulting in a 4.2% increase in the age-adjusted mortality rate per population.

Increasing the number of people with Medicaid insurance improved the opportunity for many to receive dental services. However, the large number of the newly insured, their generally poor oral health, a limited network of participating providers, and the transition of the Medicaid program to managed care auspices is challenging the capacity of the oral health care delivery system in Kentucky.

Kentucky experienced significant increases in enrollment in Medicaid when it implemented Medicaid expansion in accordance with provisions in the ACA. According to the Centers for Medicare & Medicaid Services (CMS), among the half million people who qualified for Medicaid under new eligibility guidelines in Kentucky, approximately 30,000 qualified for Medicaid at pre-ACA eligibility limits but were unaware of their eligibility until they accessed the state exchange.

The Kentucky Medicaid program faced a change in administrative oversight to include more managed care organizations just prior to and coincident with increasing enrollment in the program. Both the administrative conversion and expanded enrollment in the program impacted access to oral health services for a time. The administrative transition to managed care auspices was fully implemented by 2012. However, just prior to the opening of the state exchange, Kentucky increased the number of insurers contracted with the Medicaid program to oversee payment for health and oral health services.

The new insurance products were available on the state exchange and in many cases, before an adequate dental provider network for each plan was in place, especially in the rural areas of the state. This was especially problematic because two-thirds of those eligible for Medicaid insurance resided outside the Central Triangle. In many of those areas, the supply of dentists was already limited. While many dentists

in rural areas participated with fee for service Medicaid or with the limited Managed Care Organization (MCO) network that was already in place, many were not enrolled with the newly contracted managed care plans at the time the marketplace opened for enrollment.

An analyses of Medicaid payment data about utilization of oral health services by Medicaid enrolled people comparing utilization in the first year after managed care was fully implemented (2012) with the previous year (2011) showed drops in utilization of oral health services by Medicaid enrollees. In 2012, just 31% of enrollees in Kentucky received any oral health service compared to 34% in 2011. There was geographic variation in the decreases in utilization. Only 27% of Medicaid insured people in the Mississippi Delta received an oral health service in 2012 versus 32% in 2011 (a decrease of 5%). Utilization of oral health services by Medicaid insured patients dropped by 2% in the Central Triangle from 35% in 2011 to 33% in 2012.

While utilization rates of oral health services for Medicaid enrollees improved in subsequent years, difficulties in locating service providers for patients with Medicaid remain an issue. In interviews conducted for this project, dentists, especially those in rural areas, reported that patients visiting the dentist for the first time after enrolling in Medicaid presented with high rates of caries and complicated disease. This complexity increased demand for specialty dental services and exacerbated existing difficulty with finding specialty dental services, especially pediatric and oral surgery services, in rural areas of Kentucky.

The safety net for oral health services in Kentucky has grown rapidly in recent years but the safety net is not yet as robust as in some other states.

A compilation of safety net resources gathered by researchers at the University of Kentucky suggested that there were oral health safety net providers in 100 of the 120 counties in the state. However, in many cases, service availability in the safety net is limited and in some cases, available only to particular population groups such as children. While nationally, approximately 77% of FQHCs provided dental services onsite or portable services in 2013, only 52% of the 22 FQHCs with 134 delivery sites in Kentucky in that year offered onsite or portable oral health services. In addition many of these clinics are located in southern and eastern Kentucky, with low numbers of FQHCs located in central and western Kentucky.

Safety net programs across Kentucky have implemented innovative local and regional collaborations to deliver oral health services. For example the University of Kentucky Schools of Dentistry and Medicine and several FQHCs coordinate dental outreach programs for both children and adults in the state. The review of safety net programs suggested that children enrolled in schools throughout Kentucky are increasingly benefitting from school linked and school based oral health services. However, even these services are limited by insufficient funding and workforce to permit service expansion to address still unmet need.

Private practice dentists in many rural areas of Kentucky constitute the safety net for oral health services. General dentists practicing in small towns and rural areas of Kentucky offer a broad range of services to their communities and expedite referrals to specialty providers whenever and wherever possible. However, the number of private practice dentists in many of these areas is decreasing and their practices are not being replaced. In addition, the population of dentists in rural areas is aging. While population in many of these areas is also decreasing, retirements or relocations of rural dentists will continue to impact availability of services.

The supply of oral health workforce in Kentucky is stabilized and renewed by the presence of two dental schools and several training programs for dental hygienists and dental assistants. The supply of oral health workforce appears adequate on a per population basis but it is not evenly distributed with the population.

According to the American Dental Association (ADA), the ratio of dentists in clinical practice to population increased in the US from 57.5 dentists per 100,000 population in 1993 to 59.2 in 2011. While the number of dentists providing clinical care in Kentucky rose from 2,012 in 1993 to 2,268 in 2011 the per population ratio actually fell over the time period from 52.8 dentists providing clinical care per 100,000 population in Kentucky in 1993 to 51.9 in 2011 due to more rapid growth in the state's population than in the supply of clinically active dentists. While this is a seemingly adequate ratio of dentists to population, the distribution of dentists in Kentucky did not coincide with the distribution of the population.

In 2015, the statewide ratio of dentists to 10,000 population based on licensure data was 6.0. In 24 of the 120 counties (mainly in eastern and western Kentucky) there were fewer than 1.7 dentists per 10,000 population (17 per 100,000 population). In some counties, the absolute number of dentists was quite small (eg, 17 counties had no dentists or only 1 dentist). A study sponsored by the Appalachian Regional Commission (ARC) in 2012 found an oversupply of dentists proportionate to the population in the Central Triangle with notable deficits in supply in the Appalachian Region and the Mississippi Delta. While 27.2% of the population in Kentucky lives in Appalachia only 19.2% of general dentists in the state practice in that region; 11.5% of the population lives in the Delta but only 8.0% of the general dentists in Kentucky practice in the area. Specialty dentists appeared to be abundant in the Central Triangle but much less available in the other regions of the state.

The two dental schools in Kentucky generate most of the supply of new dentists in the state. In the 2014 to 2015 academic year, 90 first year dental students with a primary residence in Kentucky enrolled in a dental education program. Of these, 41 were enrolled at the University of Kentucky College of Dentistry and 45 were enrolled at the University of Louisville School of Dentistry. According to interview informants, many new graduates remain in the state to practice after graduation, providing a consistent supply of dentists to fill new jobs or to replace departing professionals.

An emerging concern is the aging of the dental workforce, particularly in rural areas of Kentucky. Possible departures from dental practice in the foreseeable future threaten to further compromise the supply of appropriately prepared workforce to provide dental services. Data from the American Community Survey (ACS) of the US Bureau of the Census indicate that over 42% of dentists in Kentucky are 55 years of age or older.

In the analyses of dental demographics by region accomplished for the ARDEP, 70.8% of dentists practicing in the Central Kentucky Triangle were younger than 55 years of age. In the Appalachian Rural Commission (ARC) region of Kentucky, only 58.3% of dentists in the area were younger than 55 years of age. The aging workforce in small towns and rural areas in Kentucky coupled with a limited supply of general dentists and an inadequate supply of dental specialists is a concern. Interviews conducted for this study provided validation of an aging workforce; stakeholders expressed concern that dentists in small towns and rural areas were retiring and there were few younger dentists replacing them in practice.

The distribution of dental hygienists across Kentucky was also variable. The ratio of professionals to population differed by county and ranged from no dental hygienists to 10.9 dental hygienists per 10,000 population in counties. Dental hygienists provide preventive oral health services so their absence or limited supply in a county suggests limited access to preventive care for populations residing in those places.

CONCLUSIONS

The research conducted for this project found that Kentucky and its stakeholders have made notable efforts to address oral health disparities in the state. Many of the oral health programs and policy initiatives in Kentucky represent the collaborative efforts of myriad partner organizations and statewide engagement with the need to improve oral health service delivery and address poor oral health outcomes.

Oral health disparities in Kentucky coincide with health disparities in the population, especially in certain regions of the state. The generally poor health and oral health outcomes among Kentucky's rural populations imply that public efforts to improve health literacy and knowledge of oral health would be beneficial. Individual patient engagement with personal health and oral health is essential to improvement in population oral health. The linkages between oral and systemic health status suggest that strategies selected to address poor outcomes should encourage integration of oral health care and primary health care service delivery and foster the building of strong referral networks between clinical disciplines.

Policy and program initiatives to improve the percentage of the population with health and dental insurance in Kentucky are laudable. Medicaid expansion and the availability of the state marketplace contributed to significant improvement in the percentage of the population in Kentucky with dental insurance. Dental insurance is a useful tool for increasing oral health service utilization and encouraging quality oral health outcomes. Legislative support for an adult dental benefit in the Medicaid program is also commendable.

Initially, administrative changes in the Medicaid program appeared to have negative impacts on utilization and availability of oral health services. The data comparing utilization in the first full year of implementation of managed care auspices with the previous year demonstrated declining rates of dental service utilization by Medicaid insured people in many areas of the state. The reasons ascribed to the decline included insufficient provider networks and provider disenchantment with administrative processes. Providers and insurers are currently engaged in efforts to address the issues attendant to the changes in program administration. The oral health delivery system, especially the safety net for oral health services, is now attempting to accommodate high demand for complex oral health services from newly insured people with serious health and oral health issues.

It was apparent that the safety net for oral health services in the state, inclusive of many private practice dentists in rural areas and inner cities, is challenged to meet growing demand for oral health services because of inadequate structural and workforce capacity. The number of safety net provider organizations offering onsite oral health services in Kentucky is limited, especially for adults with Medicaid

insurance. The safety net for oral health services was observed to be growing in Kentucky but it was still not as developed as in some other states.

People insured by Medicaid and the uninsured heavily depend on safety net providers for oral health services because many private practice dentists either do not participate with Medicaid or limit the number of patients with Medicaid on their caseloads. Approximately one quarter of the population in Kentucky is insured by Medicaid so the safety net is an important consideration when contemplating strategies to broaden access to oral health services. The federal government recently announced funding for oral health service infrastructure expansion in FQHCS. Hopefully, community health centers in Kentucky will have an opportunity to access this funding.

Although the oral health workforce in Kentucky appears to be adequate on a per population basis, it is not evenly distributed with demand for services in the state. In addition, limitations in allowable supervision in various service settings and in tasks permitted without prior dental authorization restrain the effective use of dental auxiliaries. While Kentucky has made progressive change in scope of practice for dental hygienists and dental assistants, there appear to be limitations in practice that inhibit direct access to preventive services. The use of dental hygienists in expanded roles has proven to be a positive strategy in other states to encourage utilization of preventive services and to increase the settings in which oral health services are available.

Incipient concerns about future workforce adequacy suggest the need for innovative service delivery programs and changing roles for oral health workforce. Nationally, there is increasing recognition that engaging teams of oral health professionals with a variety of skills and competencies contributes to improved access and outcomes. Those who participated in the interviews for this project discussed the utility of expanded duty dental assistants in increasing capacity and the impact of public health dental hygienists and their outreach services on case finding and referral. However, the limitations on supervision impact the extent of impact of these team members. Existing models of school based and school linked service delivery might be expanded in the regions where they offer services and replicated in others where these services are not yet available. Both program funding and capable workforce would be required to successfully duplicate these models.

Policy that is informed by data is more likely to be effective in meeting the needs of the population. One observation from this comprehensive review of oral health in Kentucky is that state specific data about the oral health of particular populations, about oral health outcomes from programmatic initiatives, and about the demographic and practice characteristics of the oral health workforce were either quite dated or generally lacking in Kentucky. Future initiatives focused on improving oral health in Kentucky would benefit from systematic data collection to inform policy and program in the state.

In conclusion, researchers observed many positive trends in oral health outcomes in Kentucky and noted increases over time in the number of providers and programs delivering oral health services. While recognizing that improvements in population oral health are not yet at desired levels, stakeholders in Kentucky should be encouraged by the noticeable progress over recent years in the number of people with access to dental insurance and to safety net oral health services.

Technical Report

BACKGROUND

Kentucky, known as the Bluegrass State, is located in the east south central region of the US. Kentucky is bordered by seven states: on the north by Illinois, Indiana, and Ohio, on the east by West Virginia and Virginia, on the south, by Tennessee, and on the west by Missouri. Three of the state's borders are marked by rivers which form contiguous boundaries to the west, north, and east, the Mississippi River flows on the western border, the Ohio River on the northern border, and the Big Sandy River and Tug Fork on the east. Kentucky is second only to Alaska in the length of navigable waterways within the state.[1] A large portion of eastern Kentucky is part of the Appalachian Mountain Range. Kentucky is also home to the largest cave system in the US—Mammoth Cave National Park.

In 2014, there were over 4 million people living in 1 of the 120 counties in Kentucky, placing the state at 26th in population compared to other states. Kentucky's population is mainly White, but other racial and ethnic groups are represented variously throughout the state.

The state is organized as a Commonwealth, 1 of only 4 states so constituted. Kentucky was originally part of the state of Virginia, which is also a commonwealth. Kentucky's legislature consists of a 38-member senate and a 100-member House of Representatives. A governor leads the executive branch of government. Unlike many other states in the US, Kentucky holds state elections every 4 years in odd numbered years. A new governor and legislature were elected in 2015.

Kentucky is widely known for its production of horses, bourbon whiskey, and tobacco. Ninety-five percent of the world's bourbon is produced in the state by companies including Jim Beam®, Maker's Mark, Wild Turkey, and Four Roses. Manufacturing in Kentucky produces 18% of the state's gross domestic product.[2] The automotive industry in Kentucky is the third largest producer of cars and light trucks in the nation with 4 automotive plants located in central and Northern Kentucky—2 Ford plants, 1 Toyota plant, and 1 General Motors Plant. Corvettes are among the automobiles produced in the state, which also houses the National Corvette Museum. Jobs in this sector are also offered in parts manufacturing, supplies for the automotive industry, and aluminum producers manufacturing lightweight automotive parts.

The aerospace industry in Kentucky is the third largest in the US, exceeded only by Washington and California. Aerospace was the largest export industry in the state in 2014, and includes parts manufacturing, supply, nano satellite technology, and space research.

[1] Wilbur Smith Associates. Kentucky water transportation corridors, public riverport development and intermodal access. February 2000. http://transportation.ky.gov/Riverports/Documents/Kentucky%20Water%20Transportation%20Corridors.PDF.

[2] Kentucky Cabinet for Economic Development. Kentucky Economic Development Guide. 2015. http://siteselection.com/cc/kentucky/.

Kentucky is also home to the logistics industry including DHL, which has its global hub at Cincinnati/ Northern Kentucky airport, and UPS, which located its international world port air hub in Louisville. Louisville Airport is within a two-hour flight from 75% of the US population and within a four-hour flight of 95% of the US population.

Much of the economic growth that has occurred in Kentucky in recent years has been concentrated within the area known as the Golden Triangle that encompasses Covington, Lexington, and Louisville. Other areas of the state, while experiencing some economic development, are still suffering from the demise of the coal mining and tobacco growing industries. As a result, the rates of joblessness, underemployment, and populations living at a lower socioeconomic status, are higher in many areas than when these industries were prospering. The downstream impact of job loss on loss of employer sponsored health insurance was a significant issue in many areas. The implementation of the 2014 ACA and the expansion of Medicaid eligibility requirements in the State, provided opportunities for many uninsured people to purchase or obtain health insurance coverage, including dental insurance.

METHODS AND LIMITATIONS

The following narrative and data presentations were composed after an extensive literature review of both state and national reports regarding oral health in Kentucky. National and state surveillance data were also accessed to provide information about oral health in Kentucky. This report is a compilation of available resources describing the oral health status of Kentucky's people.

A number of data challenges and limitations were encountered during the preparation of this report impeding current estimates of the oral health status of Kentucky's population. In some cases, the surveillance data about particular populations was dated or limited. In addition, data about the demographic and practice characteristics of the oral health workforce in Kentucky were unavailable. These limitations should be considered when interpreting the results of this report.

FINDINGS

I. Geographic and Demographic Characteristics of Kentucky's Population

In 2014, the estimated population of Kentucky in 2014 was 4,413,457 (Table 1). The population was 88.3% White, 8.2% Black or African American, 0.3% American Indian and Alaska Native, 1.4% Asian, 0.1% Native Hawaiian and Other Pacific Islander, and 1.8% two or more races. Approximately 3.4% of the population was of Hispanic or Latino origin.

Table 1. Demographic characteristics of the population in Kentucky and the US, 2014

Demographic Characteristics	Kentucky	United States
Population estimates, 2014		
All persons	4,413,457	318,857,056
Age		
Under 5 years	6.3%	6.2%
Under 18 years	22.9%	23.1%
65 years and over	14.8%	14.5%
Gender		
Female	50.8%	50.8%
Race and Hispanic Origin		
White alone	88.3%	77.4%
Black or African American alone	8.2%	13.2%
American Indian and Alaska Native alone	0.3%	1.2%
Asian alone	1.4%	5.4%
Native Hawaiian and Other Pacific Islander alone	0.1%	0.2%
Two or More Races	1.8%	2.5%
Hispanic or Latino	3.4%	17.4%
Health Insurance and Poverty		
Without health insurance, under age 65 years	9.8%	12.0%
Persons in poverty	19.1%	14.8%
Data Source: US Census Bureau.		

Jefferson County, population 746,580, was the largest and most diverse of the 120 counties in the state with a population that was 73.5% White, 20.6% Black or African American, 0.2% American Indian and Alaska Native, 2.3% Asian, 2.6% two or more races, and 4.5% Hispanic or Latino (See Appendix A: Table 1).

The Appalachian Mountain range stretches from southern New York to northern Mississippi covering over 200,000 square miles in 420 counties in 13 states; 55 of those counties are in Kentucky.[3] The Appalachian region is known for high rates of unemployment, poverty and low levels of educational attainment with inhabitants of the region classified as disproportionately low income. Between 2009 and 2013, the poverty rate was 10.8% higher in the entire Appalachian Region and 63.8% higher in Appalachian Kentucky compared to the national average (Table 2). The poverty rate was also 22.5% higher in Kentucky as a whole compared to the national average.

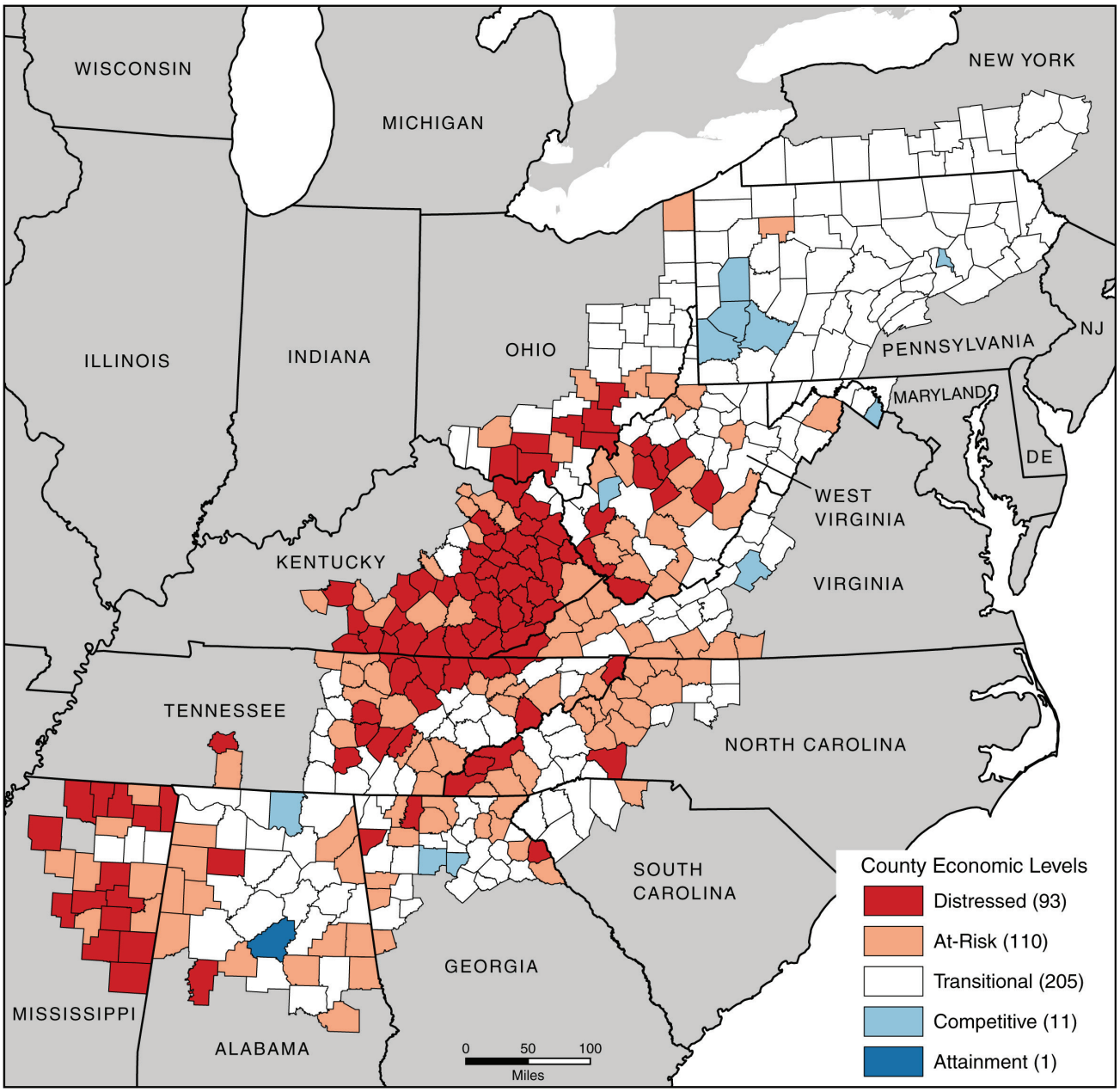
Table 2. Socioeconomic characteristics of the population in Appalachian Kentucky, Kentucky, Appalachian Region, and the US

Socioeconomic Characteristics	Appalachian Kentucky	Kentucky	Appalachian Region	United States
Population and Land Area				
Population, April 1, 2010	1,184,278	4,339,367	25,243,456	308,745,538
Land Area (square miles), 2010	18,230.7	39,486.3	204,452.1	3,531,905.4
Persons Per Square Mile, 2010	65.0	109.9	123.5	87.4
Income and Unemployment				
Per Capita Income, 2013	$29,103	$36,214	$36,608	$44,765
Per Capita Income, Percent of U.S. Average, 2013	65.0%	80.9%	81.8%	100.0%
Per Capita Market Income, Percent of U.S. Average, 2013	50.5%	75.1%	75.4%	100.0%
Unemployment Rate, 2013	10.3%	8.3%	7.6%	7.4%
Unemployment Rate, Percent of U.S. Average, 2013	139.3%	112.1%	102.6%	100.0%
Three-Year Average Unemployment Rate, Percent of U.S. Average, 2011–2013	125.3%	106.9%	100.5%	100.0%
Poverty Indicators				
Persons Below Poverty Level, 2009–2013	287,655	796,202	4,176,072	46,663,433
Poverty Rate, 2009–2013	25.2%	18.8%	17.0%	15.4%
Poverty Rate, Percent of U.S. Average, 2009–2013	163.8%	122.5%	110.8%	100.0%
Education				
Percent Completed High School Diploma or More, 2009-2013	74.8%	83.0%	84.6%	86.0%
High School Completion, Percent of U.S. Average, 2009-2013	87.0%	96.5%	98.3%	100.0%
Percent Completed Bachelor's Degree or More, 2009-2013	13.3%	21.5%	21.7%	28.8%
College Completion, Percent of U.S. Average, 2009-2013	46.1%	74.6%	75.2%	100.0%
Data Source: Appalachian Regional Commission (ARC)				

During each fiscal year, the ARC evaluates each of the counties in Appalachia based on three economic indicators, per capita market income, 3-year average unemployment rate, and poverty rate, and classifies the economic level for each as distressed, at-risk, transitional, competitive, or attainment. A distressed designation indicates that the county is among the the top 10% of the most economically depressed counties in the nation. In fiscal year 2015-2016, more than one-third (39 out of the 93) of the economically distressed counties in the Appalachian region are in eastern Kentucky (Figure 1).

[3] Appalachian Regional Commission. The Appalachian Region. http://www.arc.gov/appalachian_region/TheAppalachianRegion.asp.

Figure 1. Economic level of counties in the Appalachian Region, Appalachian Regional Commission, 2015-2016



Created by the Appalachian Regional Commission, March 2015
Data Sources:
Unemployment data: U.S. Bureau of Labor Statistics, LAUS, 2011–2013
Income data: U.S. Bureau of Economic Analysis, REIS, 2013
Poverty data: U.S. Census Bureau, American Community Survey, 2009–2013

Effective October 1, 2015
through September 30, 2016

II. History of Oral Health in Kentucky

Oral health remains one of the more prevalent unmet healthcare needs for residents of Kentucky. There is a lengthy history of stakeholder involvement in Kentucky in various oral health initiatives. The following summaries describe efforts to identify barriers to access and utilization of oral health services and to design and implement programs to increase their availability and to improve oral health outcomes for Kentucky's people.

History of the Kentucky Oral Health Plan

Kentucky Dental Health Coalition
May 24 to 25, 2001
Kentucky's Dental Access Summit

Kentucky Dental Health Coalition (KDHC) was formed in 1990 as a collaborative to advocate for improved dental health in the Commonwealth through improvements in access to care, promotion of oral health education for patients, and programming to increase understanding of the importance of oral health. In 2001, KDHC co-sponsored the first Kentucky Dental Access Summit to increase awareness about the importance of oral health and to identify barriers to accessing oral health services in Kentucky.[4] The Kentucky Dental Access Summit offered a forum for state health officers, legislators, health policy-makers, state dental leaders, educators, advocates, and consumers to consider strategies and solutions to improve oral health in the state. The summit included keynote addresses by prominent oral health advocates in the US and was comprised of 4 workgroup sessions over a two-day period. Workgroups considered policy in three areas:

- Public awareness and education
- Dental service delivery models
- Dental education initiatives.

Each of the following high level recommendations included specific action items to achieve the recommended goal.

- *Assure that eligibility for oral health care benefits translates to access to care. Strategies to achieve this goal included:*
    - Raise Medicaid fees.
    - Provide anesthesia benefits for children during hospital located services.

[4] Henry R. Kentucky's Dental Access Summit, May 24-25, Lexington, KY. Kentucky Dental Health Coalition. May 2001. http://www.astdd.org/docs/KentuckySummitReport.pdf.

- Mandate dental exams for children upon entrance to school and for the elderly upon entrance to long-term care facilities.
- Remove carbonated beverages from schools.
- Increase dental support for denture access programs for the indigent.
- Proposed workforce strategies to enable the goal included legislating general supervision for dental hygienists and expanded duties for dental assistants.

- *Increase awareness and education in oral health so the citizens of Kentucky value and demand good oral health:*
  - Stakeholders suggested targeting awareness campaigns at policymakers and legislators, health care providers and educators, community groups, and individual patients.

- *Create efficient oral health service delivery models:*
  - Enable participation in National Health Service Corps and loan repayment programs.
  - Implement a statewide sealant program.
  - Offer financial incentives to encourage providers to locate in underserved areas.
  - Incorporate oral health assessments in well baby care.
  - Use existing networks and coalitions to meet oral health goals.
  - Expand volunteer dental programs.
  - Medicaid reform to improve reimbursement and administrative processes.

- *Educate and involve non-oral health personnel in oral health services.*

The Kentucky Department for Public Health

2006

Statewide Oral Health Strategic Plan, the Commonwealth of Kentucky – 2006; Healthy Kentucky Smiles: A Lifetime of Oral Health

Kentucky's statewide oral health strategic plan outlined health goals to improve the oral health status of Kentucky residents. The plan was composed through a consensus development process with more than 100 experts. The plan described oral health goals and guidelines to be benchmarked annually in Kentucky. The extensive report compiled state and national oral health surveillance data to describe the burden of oral disease in Kentucky in 2006, contained baseline measures of oral health status and benchmarked the oral health of Kentucky's residents with the US population. The report discussed current challenges and needs in the population based on oral health trends, utilization of oral health services, and efforts at advocacy and coordination among state, county, and private partners and providers to improve oral health outcomes.

The strategic oral health plan provided background information on the prevalence of oral disease including edentulism, baby tooth bottle decay and early childhood caries, urgent and early care needs of children in Kentucky, periodontal disease in the adult population, and utilization of dental services by the state's population. The plan also discussed initiatives in the state to mediate poor oral health outcomes including community water fluoridation, school-based dental sealant programs, and public health education about early childhood caries.

The plan contained specific goals for improvements in oral health and strategies to advocate for better public health education and coordinated provision of services. Strategic initiatives were developed to enable achievement of each of the goals which were grouped by area as follows: advocacy, economic development, funding, partnerships and collaborations, prevention and treatment, public health education, school based coordination, or workforce. The goals in the plan included the following action items:

- Develop and administer government policy and programs related to oral health.
- Elevate the importance of oral health in public discourse about health status.
- Communicate that good oral health has economic value.
- Communicate that dentistry is a business that has an economic impact on communities.
- Build communities with high quality infrastructure to attract and retain employers.

- Grow the number of dental professionals in underserved areas.
- Increase the available funding for oral health to increase access to care.
- Solicit, develop, and nurture relationships with other organizations and associations to expand awareness of oral health.
- Assist dental professionals to recognize signs of domestic violence in patients and implement policies and procedures to reduce the burden on patients.
- Provide lifelong maintenance of oral wellness through coordinated, integrated and comprehensive services.
- Improve oral wellness through education and disease prevention.
- Increase oral wellness through coordinated state wide educational activities and media.
- Assure that all children receive regular dental education and care as part of an integrated program.
- Assess the past, present, and future status of the dental workforce in Kentucky and develop a work plan to address identified needs.
- Increase collaboration with and between dental professionals and other medical professionals in Kentucky.[5]

[5] Health Care Access Branch, Oral Health Program, Kentucky Department for Public Health. Statewide Oral Health Strategic Plan, the Commonwealth of Kentucky – 2006. May 2006. http://chfs.ky.gov/NR/rdonlyres/69AA0FAC-4479-49D4-8B5F-BD350C4E7594/0/262366UofKRoundIII.pdf.

Oral Health of Specific Populations in Kentucky

Division of Dental Public Health, College of Dentistry, University of Kentucky; Kentucky Cabinet for Public Health

2003

Kentucky Children's Oral Health Profiles 2001

The 2000 to 2001 Kentucky Children's Oral Health Survey was a cooperative effort between the Kentucky Department for Public Health, the University of Kentucky, and the University of Louisville. More than 5,600 third grade and sixth grade children received a dental screening. Parents or guardians also completed a questionnaire providing both consent and additional medical, dental, and insurance information about their children.[6] In addition to a statewide profile describing the oral health of Kentucky's children, regional baseline profiles for third, fifth, and sixth grade children were developed from the data for Central Kentucky, Eastern Kentucky, Northern Kentucky, Western Kentucky, and the Louisville regions.

Pre-school children were also surveyed. Dental and non-dental personnel in pediatricians' offices, family practice physicians' offices, pediatric dental offices, and health departments across Kentucky screened approximately 572 children between the ages of 24 months and 59 months. However, because of the small sample size, regional level data were not compiled for pre-school children.

Major findings from the screening survey were that 43% of screened children had untreated caries; 47% had caries experience; and 31% had severe caries. Among the screened children 37% needed early care; 9% needed urgent care; and 39% had never been to a dentist. In addition, 35% of the parents of children in the survey had not been to a dentist in the year prior to the survey.[7] The survey also found severe dental disease issues in the preschool population; however, researchers reported possible sample bias towards children with more need. More extensive findings from the survey are reported in Chapter III of this report.

Kentucky Children's Oral Health Survey was used to benchmark oral health status among Kentucky's school-aged children. The data collected from the survey were used as baseline data to build the Kentucky Children's Oral Health Surveillance Program. The surveillance system was designed to monitor the oral health of third grade, sixth grade, and eleventh grade students on an on-going basis. The surveillance system expected to engage approximately 30 schools and 1,000 children to track oral health status and assess trends among children and youth across Kentucky over time. Data collected from this

[6] Hardison J, Cecil J, Mullins M, et al. Final Results: 2001 Kentucky Children's Oral Health Survey: State and Regional Comparisons of Key Oral Health Measures in Kentucky. Kentucky Department for Public Health and the University of Kentucky. 2003. http://chfs.ky.gov/nr/rdonlyres/a1066bc6-7bce-4f12-ba3a-1d568af3fcdb/0/kcohsregionalprofiles_01.pdf.

[7] Hardison J, Cecil J, Mullins M, et al. The 2001 Kentucky's Children's Oral Health Survey: Findings for children ages 24 to 59 months and their caregivers. Pediatric Dentistry. 2003; 24(4):365-372. http://www.aapd.org/assets/1/25/Hardison4-03.pdf.

tracking were to be used to evaluate progress towards the Healthy Kentuckians 2010 oral health objectives. The surveillance program was implemented in 2003 by the University of Kentucky with the endorsement of the Kentucky Department of Education.

University of Louisville School of Dentistry; Office of Oral Health, Department for Public Health
July 2003
2002 Kentucky Adult Oral Health Survey

The 2002 Kentucky Adult Oral Health Survey, a telephone survey conducted in the summer and fall of 2002, included a random sample of 2,066 adults in each of five geographic regions of Kentucky. The survey process was managed by the University of Louisville School Of Dentistry in conjunction with the Office of Oral Health of the Department for Public Health, Commonwealth of Kentucky. The goal of the survey was to collect baseline data describing adult Kentuckians' assessment of their oral health status. Professional clinical assessments were conducted on 250 adults to build correction factors to account for differences between self-assessment and professional assessment of oral health status.

The survey had several objectives including to:

- Collect baseline data to build an oral health surveillance system for adult oral health status to monitor progress over time towards meeting Healthy Kentuckians 2010 outcome objectives.
- Identify problems with access to dental services.
- Describe social and demographic characteristics affecting oral health status.
- Understand the prevalence of oral disease in particular demographic groups.

An earlier survey of oral health status was conducted in 1987 so the 2001 survey also provided comparative data about oral health. Findings from the survey included that:

- Almost half of adults who responded to the survey (49.6%) had no dental insurance.
- Approximately one quarter (24.9%) had experienced oral pain in the three months immediately prior to the survey.
- One fifth (21.4%) of survey participants had untreated decay and 28.9% had gingival recession.

- Residents of the Appalachian region had the lowest rate of utilization of dental services and residents of Central Kentucky had the highest rate of utilization.

- A quarter of the state residents who had not visited a dentist in the last year cited cost as a limiting factor.

- Almost half of the survey participants saw no reason to seek dental care.

- Statewide, nearly 70% of adult residents reported having restorations to treat dental caries.

- The percentage of adults reporting presence of restorations was lower in Appalachia compared to other regions in the state.

- Poorer Kentuckians had more teeth extracted than wealthy Kentuckians.[8]

More detailed findings from this survey are described in Chapter III of this report.

University of Kentucky, College of Dentistry; Office of Oral Health of the Kentucky Department for Public Health

2005

The Kentucky Elder Oral Health Survey

The Kentucky Elder Oral Health Survey was the third oral health survey commissioned by the Office of Oral Health, Kentucky Department for Public Health. The first two surveys addressed children and then adults. The purposes of the Kentucky Elder Oral Health Survey were to assess the oral health status of state residents aged 65 years and older and to also provide benchmark data about the population's oral health status. The survey included a self-administered questionnaire and a clinical assessment of 1,386 people aged 65 or over. Data collection occurred over a three year period from May 2002 to March 2005. Data were collected from independent elders living in their own homes, homebound elders, and nursing home elders.

Specific goals of the study were to:

- Assess the oral health status and treatment needs of elders in different types of residential settings.

[8] Willis D, Butters J, Cecil J, et al. Executive Summary: 2002 Kentucky Adult Oral Health Survey. 2003. http://chfs.ky.gov/nr/rdonlyres/f3509d88-532d-4e82-b04e-31da874a890c/0/2002adultoralhealthsurveyexecutivesummary.pdf.

- Understand the perceived oral health status of Kentucky's elders based on their self-assessments of personal oral health.

- Compare both the perceived and clinical oral health status of Kentucky's elders by geographic region, by demographic groups, and by functional characteristics.

Considerable agreement was found between the self-assessment of dentate status and the clinical assessment of dentate status. As with the previously described surveys of adults and children, the data collected from the elder survey were intended to provide baseline data for a surveillance system monitoring the oral health status of elder Kentuckians. At the time of this survey, there were no definitive state data describing the oral health status of Kentucky's growing elder population. An earlier comprehensive oral health survey commissioned by the state in 1987 essentially excluded elders, especially the homebound and institutionalized populations including those living in nursing homes.

Significant connections were found between the functional ability of elders and their demographic characteristics with ability to obtain oral health services. Home-bound elders were the most likely to encounter barriers to care; however, lack of dental insurance, issues of affordability, and lack of transportation were consistently reported as barriers for all groups of elders. Dentate status was significantly associated with age, residential and functional status, level of education and income, smoking status, and marital status. Younger age, higher levels of education and income, and not smoking were associated with retention of teeth.[9] More detailed findings from this survey are described in Chapter III of this report.

The Kentucky Department for Public Health

Spring 2009

Maternal and Child Health (MCH) Needs Assessment Results, MCH Forum Findings in Brief: Dental Health

In the spring of 2009, the Kentucky Department for Public Health conducted 11 community forums throughout the state to understand issues confronting mothers and children in Kentucky. Oral health was selected as a topic for discussion in 9 of the 11 forum sites.[10] The summary of those discussions indicates that there were problems related to obtaining oral health services identified by forum participants.

[9] Henry R, Sallee N, Durham L. The Kentucky Elder Oral Health Survey: 2005 Executive Summary. Kentucky Department for Public Health. http://chfs.ky.gov/nr/rdonlyres/712d2e9b-e6c3-46ad-b705-4f0f59bde20b/0/51106executivesummarywithpagenumbers.pdf.

[10] Kentucky Cabinet for Health and Family Services, Department for Public Health. MCH Forum Findings in Brief: Dental Health, 2009. 2010. http://chfs.ky.gov/dph/mch/maternal+and+child+health+(mch)+needs+assessment+results.htm.

- Access to care was consistently identified as problematic and as the most important issue in oral health by a majority of participants. Discussants offered that insufficient numbers of dental providers, lack of extended clinic hours, lack of available emergency dental care, lack of dental insurance, and lack of transportation were among the barriers to oral health services.

- Lack of oral health literacy and the attitude of parents towards oral health including not valuing primary teeth were described as affecting whether or not parents sought services for children. The importance of prenatal and parental education about oral health of children was emphasized.

- Participants felt that more information was needed about the mandatory dental screening for children enrolling in public schools especially regarding who was authorized to perform the screening and who was required to pay for the service.

- Informants also discussed low reimbursement rates in the Medicaid program for oral health services as a deterrent to provider participation. The inability of dental hygienists to directly bill for preventive services was an additional topic of discussion.

Forum organizers offered information on current capacity and available resources for oral health services in the state including school-based dental sealant programs, the Smile KY dental mobile health unit, Head Start screening programs, health department varnish programs, the school entry screening law and community water fluoridation. These programs were described as mainly targeting children. In general, forum groups identified a lack of services for pregnant women and the adult population.

Suggestions for improving access to oral health services included increasing the availability of mobile dental clinics and parental education about dental care. Forum participants suggested that in order for schools to enforce the law requiring dental screenings, the schools should hire additional employees to provide dental screenings and the schools should also utilize volunteer services from providers. Participants also suggested that parental consent should be optional for children to obtain dental screenings in school-based programs.

Kentucky Youth Advocates

2011

Kentucky's Oral Health Outlook: Opportunities Abound for Needed Improvements

Kentucky KIDS COUNT Data Book

This paper describes the state of oral health in Kentucky, initiatives in the state to increase access to oral health services, and recommendations for policy changes to improve oral health based on the opinions of experts in Kentucky.[11] The report describes the oral health status of particular populations including children, low income and older adults and identifies various barriers to achieving optimum health in the population. These barriers include the expense of oral health services and the impact of dental insurance status on cost of care, the accessibility of oral health professionals in various regions of Kentucky and provider participation with Medicaid, and the lack of oral health literacy and personal value placed on oral health by the population.

The report cited improvement efforts including passage of a mandatory oral health screening requirement for children entering public schools by the state legislature, the Healthy Smiles initiative to improve the oral health of children in the state, the statewide oral health summit and the statewide oral health coalition which were both convened to collaborate on efforts to improve oral health education, outreach, and advocacy.

Recommendations for the future included:

- Expanding school-based oral health services,
- Improving state and county level oral health data collection,
- Increasing the number of dentists accepting Medicaid,
- Integrating oral health care into overall health care, and
- Expanding the scope of practice for dental professionals.

Kentucky Oral Health Coalition

October 2013

2014 Roadmap to Oral Health Literacy Planning Report

This report describe the goals for an oral health literacy campaign in Kentucky including the following:[12]

- To strengthen stakeholder engagement with an oral health literacy campaign;

[11] Kentucky Youth Advocates. Kentucky's Oral Health Outlook: Opportunities Abound for Needed Improvements. Kentucky KIDS COUNT Data Book. 2011.

[12] Kentucky Oral Health Coalition. 2014 Roadmap to Oral Health Literacy Planning Report. October 2013.

- To obtain an understanding of the oral health literacy landscape by conducting surveys and hosting focus groups to understand levels of oral health literacy across the state and national initiatives that are best practices in increasing literacy;

- To determine the major focus of an oral health literacy campaign in Kentucky by identifying priority issues and feasibility of projects; and

- To develop an implementation plan to include oral health literacy materials, social media campaigns, public service announcements and other media.

The oral health coalition conducted 7 focus groups with parents across the state to obtain a better understanding of oral health behaviors and beliefs regarding oral health. The results from these focus groups included that participants:

- Were knowledgeable about prevention and the importance of brushing teeth;
- Understood the barriers to care including fear of pain and cost of care;
- Acknowledged the connection between nutrition and oral health and overall health status;
- Identified the importance of oral health care but did not prioritize it;
- Discussed prioritizing oral health care for their children but not for themselves;
- Indicated learning about oral health from a number of sources including books, dentists, friends, family, pediatricians, obstetricians, birthing packets, etc.;
- Used different tools and techniques with their children including brushing, flossing, mouthwash, electric toothbrushes, etc.;
- Recognized that children who drink bottled water because they can't reach the sink may be missing the benefits of fluoridated water;
- Expressed the need for better education of pregnant women about their personal oral health;
- Described confusion about when it was best to first bring a child to a dentist;
- Lacked foundational knowledge about the benefits of sealants and fluoride varnishes; and
- Offered that it was common in some families for relatives to have dentures.

A survey of clinical providers in the state focused on knowledge and belief about relevant dental issues, practices used to educate families and children about oral health, and identifying resources for the oral health coalition to move forward with developing an oral health literacy campaign.

Foundation for a Healthy Kentucky; Interact for Health

April 2013

Kentucky Healthy Issues Poll (KHIP) 2012: "Many Lack access to dental care in Kentucky"

In early fall 2012, the Institute for Policy Research at the University of Cincinnati conducted a telephone survey of a random sample of 1,680 adults residing throughout Kentucky. Participants were polled about health issues including oral health and access to dental services. This research was funded by the Foundation for a Healthy Kentucky and the Health Foundation of Greater Cincinnati.[13] The survey included questions about dental insurance, dental visits, unpaid dental bills, and accessing or having a regular source of oral healthcare. The poll findings included that:

- 1.7 million adults (51% of the adult population in Kentucky) were without dental insurance.
- Four in 10 adults (39%) reported not having a usual source of dental care.
- Six in 10 (61%) adults in Kentucky visited the dentist within the past year compared to 70% of adults nationwide.
- More than 2 in 10 adults (21%) with a usual source of oral healthcare reported that the last time they visited a dentist was more than 5 years ago.
- Eight of 10 adults who reported no usual source of oral healthcare (79%) reported that their last dental visit was more than 5 years ago.
- Nearly all adults (92%) reported no dental debt but many were going without needed dental care services.
- Four in 10 adults (37%) reported that someone in their household skipped dental care or checkups in the last 12 months due to the cost of those services.
- Twice as many adults without dental insurance (49%) indicated foregoing oral healthcare services as did those with dental insurance.

[13] Foundation for a Healthy Kentucky and the Health Foundation of Greater Cincinnati. Kentucky Health Issues Poll (KHIP). Many lack access to dental care in Kentucky. April 2013. http://www.healthy-ky.org/sites/default/files/KHIP_Oral%20Care_FINAL_041913.pdf.

Foundation for a Healthy Kentucky; Interact for Health

March 2014

Kentucky Healthy Issues Poll 2013: "Most Kentucky adults have had dental visits in past year."

In the fall of 2013, the Institute for Policy Research at the University of Cincinnati again polled 1,551 adults residing throughout Kentucky. The project was funded by the Foundation for a Healthy Kentucky and Interact for Health. The purpose of the survey was to learn about whether adults in the state regularly visit the dentist based on their oral health status and health history.[14]

- Six in 10 adults (64%) reported visiting a dentist or a dental clinic within the past year.
- One in 6 adults (15%) had not visited a dentist or dental clinic in 5 or more years.
- Only 5 in 10 adults (48%) with incomes at or below 138% FPL reported seeing a dentist within the previous year; 6 in 10 adults (60%) with incomes between 138% and 200% FPL visited a dentist within the past year; 8 in 10 adults (81%) with incomes above 200% FPL visited a dentist within the prior year.
- Approximately 4 in 10 adults (43%) without dental insurance reported a dental visit within the past year compared with 7 in 10 insured adults (70%) in Kentucky.
- Half of surveyed adults who were living in Appalachian counties (51%) saw a dentist in the past year as compared with 7 in 10 adults (71%) living in non-Appalachian counties.
- Half of the respondents (50%) who rated their overall health as fair or poor had visited a dentist or dental clinic within the past year.
- More than 7 in 10 adults (73%) who rated their overall health as excellent or very good had been to a dentist in the prior year.
- Respondents were asked if their physician had ever discussed oral health with them and in response, 1 in 4 Kentucky adults (24%) answered yes. Younger adults were less likely than older adults to indicate that their physician asked about their oral health.
- Adults whose physicians asked them about their oral health were more likely to have visited a dentist or a dental clinic in the past year (73%) than were those who not been asked about their oral health (62%).

[14] Kentucky Youth Advocates. Kentucky Kids Count: 2015 County Data Book. Kentucky State Data Center, University of Louisville and Kentucky Youth Advocates. 2015. http://kyyouth.org/kentucky-kids-count.

Kentucky Youth Advocates and Kentucky State Data Center, University of Louisville

Kentucky KIDS COUNT 2015 County Data Book

The 2015 Kentucky KIDS COUNT County Data book is the 25th annual report of state and county data measuring each of 16 indicators of child-well-being in Kentucky inclusive of economic security, education, health, and community strength.[15] The annual data are intended to help communities identify areas of strength and areas in need of improvement. While the KIDS COUNT report does not directly focus on oral health, it does provide data on other indicators that impact oral health outcomes including the number of uninsured or underinsured children and smoking rates in expectant mothers. Children without health insurance are less apt to receive preventive or primary care and may miss more school days due to illness compared to insured children. Children in out-of-home care are at risk for not receiving oral health services. Low income families and individuals are less likely to be insured and also less likely than higher income people to access dental services.

- Between 2009 and 2013, 26% of children in Kentucky lived in poverty and 42% lived in high poverty areas in the state.
- More than 22% of pregnant mothers reporting smoking during pregnancy and nearly 1 in 10 babies born in Kentucky between 2011 and 2013 were born at a low birthweight (less than 5.5 pounds). One in every 6 births was to a mother without a high school diploma.
- Thirty seven of every thousand children in Kentucky are in out-of-home care.
- Many of the lowest ranking counties on the index of child well-being were located in the Appalachian region with Breathitt and Clay ranking the lowest.

Oral Health Workforce in Kentucky

University of Louisville Health Sciences Center

July 2007

Kentucky Dental Provider Workforce Analysis: 1998-2006

The Kentucky Dental Provider Workforce Analysis 1998 to 2006 compiled state licensure data collected over the nine year period to describe oral health workforce in Kentucky. In addition to data from licensure records, the report described data collected in a survey of licensed dentists in the state in 2005 in conjunction with the licensure renewal process. Data were analyzed statewide and by five geographic districts in Kentucky.

[15] Kentucky Youth Advocates. Kentucky Kids Count: 2015 County Data Book. Kentucky State Data Center, University of Louisville and Kentucky Youth Advocates. 2015. http://kyyouth.org/kentucky-kids-count.

The statewide ratio of licensed dentists to population in Kentucky was 7.2 dentists per 10,000 population in 2006. However, the ratio of actively practicing dentists in the state was lower at 5.6 dentists, which was slightly above the national ratio (5.5) in 2005. In three counties in Kentucky there were no practicing dentists; there was only one dentist in each of 13 counties and 12 counties reported 2 dentists each. Jefferson County had the largest number of dentists in 2006.

Geographic disparities in access to dental professionals were apparent in the regional analyses in the report. The Appalachian region had 3.8 dentists per 10,000 population and western Kentucky had 4.1 dentists per 10,000 population. In contrast, the Louisville area had 8.3 dentists per 10,000 people. In the 9 year period, the number of licensed dentists in Kentucky increased from 2,131 to 2,351. Five hundred of the dentists licensed in the state in 1998 were no longer licensed in Kentucky in 2006. Between 1998 and 2006, there was a net gain of 323 dentists; the largest influx occurred in the three-year period between 1998 and 2001 (228 dentists).

Growth was mainly among general dentists; however, the actual percentage of general dentists in Kentucky remained constant at 84% in both 1998 and 2006. There was noticeable change over the time period in the representation of particular specialty dentists including a 60% increase in the number of prosthodontists, and a 25% increase in both the number of pedodontists and oral surgeons. The report also included data about retention of in-state dental students after graduation from the two dental schools in Kentucky, showing average retention rates of between 46% and 49%.

The workforce survey revealed that in 2005, the average age of dentists was 49.7 years, with the largest number of dentists in the cohort between 50 and 59 years of age. A quarter of the dentists in the state were female and younger on average than their male counterparts. Females were more likely to be practicing in populated regions of the state including Louisville and the Central District than in Western Kentucky. Eighty percent of licensed dentists in Kentucky were either teaching or practicing in the state (others were inactive or practicing out of state). Dentists in the Appalachian region were more likely than dentists in other regions of Kentucky to serve patients insured by Medicaid or Kentucky Children's Health Insurance Program (KCHIP) (74%) or to accept new Medicaid or KCHIP patients (61%).[16] Chapter VI contains further detail on the data from this report.

[16] Peterson M, Williams J, Mundt C. Kentucky Dental Provider Workforce Analysis: 1998-2006. http://chfs.ky.gov/NR/rdonlyres/7988E4FD-E33E-4BD5-B912-3739EC00374C/0/28070DentalWorkfoceBrochuresmall1.pdf.

Kentucky Center for Economic Policy

January 2015

Developing the Healthcare Workforce: Growing Need is an Opportunity for Kentucky

This report, Developing the Healthcare Workforce: Growing Need is an Opportunity for Kentucky, discussed the changing health care landscape and growing health workforce needs in the state. Demand for health care services was expected to grow as greater numbers of people gained health insurance through provisions of the ACA and as the population in the state continued to age. In addition, other provisions of the ACA including cost-reduction imperatives and a focus on improving outcomes were reshaping how healthcare was delivered.

Health workforce shortages existed in Kentucky prior to the passage of the ACA; in 2012, 49 counties were designated by the federal government as primary care health professional shortage areas (HPSAs), with parts of many other counties also qualifying as HPSAs. Many areas of Kentucky also qualified as DHPSAs. There were 1,711 dentists in Kentucky in 2012. A report from 2013[17] found need for an additional 612 dentists, a 36% increase over the 2012 supply.

The report remarked on growth in many of the pre-baccalaureate health care professions including dental hygienists and found indications that changes after implementation of the ACA might provide greater opportunities for pre-baccalaureate healthcare workers. The increasing emphasis on team-based and coordinated care, with a focus on preventive and primary care, was expected to increase demand for these workers. According to the report, the US Bureau of Labor Statistics listed dental hygiene among 17 occupations expected to be in high demand. Jobs for dental hygienists were projected to increase by 33% with a job gain of 64,200 nationwide between 2013 and 2022. In Kentucky, there were 1,690 dental hygiene jobs in 2010; the median salary for dental hygienists in 2013 was $56,450. The number of jobs in Kentucky was expected to increase by 35% to 2,280 positions. In addition, there were 4,010 jobs for dental assistants in Kentucky in 2010 with a median salary of $31,680 in 2013. The number of jobs for dental assistants was expected to increase 28% to 5,130 by 2022.

Oral Health in Appalachia

Much of the literature describing health and oral health disparities in the Appalachian region addresses the 13-state region as a whole, with some reference to particular state based data. While not all literature is specific to Kentucky, some relevant reports are summarized in this report since much of Kentucky is considered part of the region.

[17] Deloitte Consulting. The Commonwealth of Kentucky Health Care Workforce Capacity Report. May 2013. http://healthbenefitexchange.ky.gov/Documents/KY%20Healthcare%20Workforce%20Capacity%20Report%20FINAL%205_28_13.pdf.

Appalachian Regional Commission

December 2011

An Analysis of Oral Health Disparities and Access to Services in the Appalachian Region

This report, An Analysis of Oral health Disparities and Access to Services in the Appalachian Region, compares counties and states in the Appalachian region and the US on three measures of oral health including the following:

- Prevention (the proxy measure was fluoridation of community water supply)
- Access (the proxy measure was dental visits by the population in the region in the prior year)
- Outcomes (the proxy measure was the percentage of the regional population with tooth loss).

Kentucky ranked highest in the Appalachian region under prevention in 2006 with the percentage of the population on community water supply receiving fluoridated water (99.8%) in contrast to Mississippi (50.9%) and Pennsylvania (54.2%) which both reported the lowest rates of fluoridation. Kentucky reported that 17% of the state's population was served by a self-supplied water supply in 2005. Some of these supplies provide naturally fluoridated water. In 2011, Kentucky's Department of Public Health reported providing fluoridated water to all rural schools as part of a large oral health initiative in the state.

Kentucky did not fare as well on measures of oral health access with 78.4% of children receiving a preventive dental service in 2007 placing it in the 3rd quintile of states in the Appalachian region. The mean was 79%.

Oral health outcomes in Appalachia varied. Appalachian areas generally reported more decay-related tooth loss than other areas. However, several Appalachian metropolitan areas reported better oral health outcomes for the population than their non-metropolitan counterparts in Appalachia. More than a quarter (26.5%) of people aged 65 and over in Appalachian states indicated they were edentulous. In comparison, the 2006 national average on the BRFSS was 19.3%. Seniors in southern Appalachian states, including Kentucky, were more likely to report edentulism than those living in northern Appalachian states. Almost 13% of adults aged 34 to 65 who were living in Appalachia reported having 6 or more teeth removed as a result of preventable causes compared to 10.9% reported by adults in the same age cohort in non-Appalachian areas. The report also discussed the oral health workforce in the Appalachian Region. In 2007, there were 36% more persons per dentist in Appalachia than in the US (2,103 versus 1,546 persons respectively).[18]

[18] Krause D, May W, Lane N, et al. An analysis of oral Health disparities and access to services in the Appalachian region. December 2011. http://www.arc.gov/research/researchreportdetails.asp?REPORT_ID=100.

Robert Wood Johnson Foundation

December 2012

Systematic Screening and Assessment of Workforce Innovations in the Provision of Preventive Oral Health Services: Evaluability Assessment Site Visit Summary Report: UK North Fork Valley Dental Outreach Program

This project, Systematic Screening and Assessment of Workforce Innovations in the Provision of Preventive Oral Health Services, was a collaborative effort by the Robert Wood Johnson Foundation and ICF International to identify promising oral health workforce innovations to increase access to and availability of preventive oral health services. The project released a series of reports describing 25 exemplary programs delivering oral health services in various traditional and non-traditional settings. One of the programs selected for the study was the UK North Fork Valley Community Dental Outreach Program in Hazard, Kentucky.

The University of Kentucky program began with the establishment of a fixed dental clinic in 2004 at the University of Kentucky Center for Excellence in Rural Health building in Hazard, Kentucky which also houses the North Fork Valley Community Health Center, which is a FQHC. Medical students from the University of Kentucky complete rotations at the FQHC. In 2005 the oral health program received a Care Mobile from Ronald McDonald Charities to implement a dental van outreach program. Since 2007, the program has worked with Head Start and public elementary schools in the FQHC's four county catchment area - Leslie, Knott, Letcher, and Perry - to provide oral health screening, prevention, and treatment services, especially for children.

Parents of all children in the program are asked to complete a questionnaire to provide information about dental health history, nutrition, and hygiene behaviors in the home. Parents of Head Start children are required to attend annual trainings about oral health focused on children. Children receive a comprehensive dental exam, a prophylaxis, fluoride varnish, and are each given an oral health report card, a toothbrush, and a referral for further treatment as needed.

Hazard is located in the heart of the Appalachian coal fields, in a region of Kentucky with a history of extreme poverty and deprivation. The population experiences high rates of obesity, edentulism, and substance abuse. Many of the people in the area are unemployed or have low educational attainment resulting in low paying jobs. Many children in the area are being raised by non-custodial relatives. Much of the population is eligible for Medicaid and most dentists in the area participate with the Medicaid program. Local dentists generally have a good relationship with the UK North Fork program and many accept referrals of children in need of a dental home.

Children entering the program often have untreated dental decay; therefore, in addition to providing services, the program seeks to increase compliance and dispel cultural fears about oral health treatment.

Children with urgent dental needs are referred to the fixed dental clinic at the North Fork Valley Community Health Center. The program also coordinates care with community dentists for patients who have a current dental home. Services are reimbursed through Medicaid and KCHIP with some grant-based support from the FQHC and the University of Kentucky's Medicaid Service Foundation.[19]

SOAR: Shaping Our Appalachian Region

September 2014

SOAR Health Workgroup Final Report

The collaborative SOAR sponsored a project to understand health access in the region and to aid in building collaboration across health providers to improve health outcomes in eastern Kentucky.[20] In the summer of 2014, the SOAR Health Workgroup held 16 listening sessions across eastern Kentucky to hear from the public regarding their concerns about issues related to health access. Four additional sessions were also held with leadership from the Centers for Disease Control and Prevention (CDC). Discussions with attendees focused on the perceptions and opinions of the public on health in the region.

Input from the public discussions was used to identify common themes and to prioritize topics of greatest concern to the population. The topics selected for inclusion in the final report were coordinated school health, environmental health, smoke free initiatives, substance abuse, wellness initiatives, development of a regional health clearinghouse, adverse childhood experiences, and access to oral health providers.

Children in ARC counties in Kentucky had some of the highest rates of urgent dental needs and untreated dental decay in the nation. Data from one Kentucky insurer suggested that children at age four were among the most expensive age cohorts because of the high number with severe and complex dental treatment needs. Poor outcomes in these children and others in the region suggested the need to improve oral health literacy, change the culture of oral health and personal and family oral health behaviors, and strengthen the public health and oral health care delivery systems in Appalachian Kentucky.

The workgroup created goals for improvements in oral health that included short-term, medium term, and long term goals.

[19] Hall M, Holland K. Systematic screening and assessment of workforce innovations in the provision of preventive oral health services. Evaluability assessment site visit summary report, UK North Fork Valley Dental Outreach Program Hazard, Kentucky. December 2012. https://ruralhealth.med.uky.edu/sites/default/files/FINAL_Summary_Report_UK_North_Fork_Valley_Dental_Outreach_Program_Formatted.pdf.

[20] SOAR Health Work Group. SOAR Health Work Group Final Report: Health. September 2014. http://www.soar-ky.org/wp-content/uploads/2014-SOAR-Wrk-Grp-IV-F-Health.pdf.

Short term goals to build a regional dental infrastructure (estimated for completion in a year):

1. Extend the pilot ARDEP dental pipeline programs across the region.

2. Increase access to evidence-based dental prevention and navigation services in the Appalachian region.

3. Develop dental information infrastructure (coordinated with KY Health Now objectives) for the Appalachian Oral Health Network to monitor short and long-term progress towards achieving oral health goals.

4. Prepare and implement a strategic, long-term oral health workforce plan for the region to address the supply of dentists, dental specialists, and dental auxiliaries.

Mid-term goals to increase workforce capacity in ARC counties (estimated for completion in 1 to 3 years):

1. Develop and implement regional oral health literacy campaigns on early childhood and parenting services that involved a variety of community and organizational partners.

2. Align state and Medicaid regulations, state dental practice statutes and regulations, MCO contracts and dental policies to enable utilization of public health dental hygienists and community dental health coordinators with appropriate scope of practice in new delivery models.

3. Simplify or improve administrative processes in the Kentucky Medicaid program.

4. Improve Medicaid dental reimbursement rates so that they are benchmarked to dental practice expenses.

Long-term goals (estimated for completion in 3 to 10 years):

1. Educate and place teams of community dental health coordinators and public health dental hygienists in all ARC counties.

2. Develop and evaluate new dental care models utilizing dental teams and protocols supported by tele-dentistry.

III. Oral Health of Kentucky's Population

The oral health status of a population is influenced by numerous endogenous and exogenous factors. Geography, socioeconomic conditions, oral health literacy, oral health preventive behaviors, and cultural preferences all influence a patient's interest in or ability to seek oral health services. Health behaviors including diet, smoking, and daily hygiene impact the condition of the oral cavity. In addition, use of medications, abuse of substances, and genetic factors increase the likelihood of dental disease. Data on the oral health status of the US population are sparse. Some surveillance and outcome data sources provide limited insight into population oral health at both the national and state levels.

Community Water Fluoridation

Fluoride is a naturally occurring element commonly found in water sources that is effective in preventing or controlling dental caries, especially in children. Studies show that water fluoridation reduces the rate of dental caries by about 25% over a person's lifetime.[21] The CDC recognizes water fluoridation as one of the most important public health interventions of the last century for its contribution to improved population oral health.

The amount of natural fluoride in water may not always be at the optimal level to provide the desired protective effect. As a result, many municipal water systems and other water suppliers across the US supplement water with additional fluoride to achieve an appropriate concentration. Generally, the natural level of fluoride in public water systems is assessed prior to supplementation to determine the additional amount needed to meet baseline concentration. In the past, recommended fluoride levels for drinking water varied from 0.7 parts per million (ppm) for people living in warmer climates to 1.2 ppm for people living in cooler climates. The different concentrations accommodated the tendency of people in warmer locations to drink more water.[22] In January 2011, federal guidelines for baseline fluoride levels were revised to a single baseline, 0.7 ppm, regardless of climatic conditions. Effectiveness research found that the lower fluoride concentration offered sufficient protection while also reducing the risk of fluorosis, which causes discoloration and surface irregularities on teeth, particularly among children.

Kentucky law mandates fluoridation in any community water supply serving a population of 1,500[23] or more with smaller water systems throughout the state also voluntarily fluoridating public systems. In 1951, Maysville was the first community in Kentucky to fluoridate its community water supply.

[21] Division of Oral Health, Centers for Disease Control and Prevention: Community Water Fluoridation. Fluoridation Basics. Atlanta, GA: Centers for Disease Control and Prevention. Date last modified July 28, 2015. http://www.cdc.gov/fluoridation/basics/index.htm.

[22] US Department of Health and Human Services. HHS and EPA announce new scientific assessments and actions on fluoride. January 7, 2011. Date modified May 7, 2011. http://www.rcap.org/sites/default/files/Fluoride%20and%20Chromium%206%20News.pdf.

[23] Kentucky Cabinet for Health and Family Services, Department for Public Health: Oral/Dental Health. Frankfort, KY: Kentucky Cabinet for Health and Family Services. Date last modified May 29, 2014.

The Kentucky Department of Health manages a rural school fluoridation program that began in the state in 1975 to provide schoolchildren who were living in rural areas without access to public water systems with fluoride supplemented water at school. The state provided funds to install equipment to supplement a rural school's water with appropriate levels of fluoride. At one time 150 schools serving 40,000 children participated in this program but as more communities have made public water available, the number of participating districts has declined. The program currently services 12 schools with approximately 3,000 students.[24]

In areas where children may still be using drinking water from private wells, county health departments provide fluoride supplements for children from 6 months to 6 years of age (either fluoride drops or pills, whichever is age appropriate) when private wells are tested and shown not to contain sufficient levels of naturally occurring fluoride. Dentists and physicians assist in identifying qualified children and in administering the program.

In 2012, Kentucky ranked 1st in the country in the percentage of people served by community water systems with fluoridated water (99.9%) (Table 3). There were 392 community water systems in Kentucky[25] serving approximately 4.4 million people. Some of the community water systems, private wells, and springs used for potable water supplies in the state provided water with naturally occurring fluoride at the recommended level.

[24] Kentucky Cabinet for Health and Family Services, Department for Public Health: Oral/Dental Health. Rural School Fluoridation. Frankfort, KY: Kentucky Cabinet for Health and Family Services. Date last modified May 29, 2014. http://chfs.ky.gov/dph/mch/cfhi/oralhealth.htm.

[25] Centers for Disease Control and Prevention: Oral Health. My Water's Fluoride. State Fluoridation Reports: Kentucky. Atlanta, GA: Centers for Disease Control and Prevention. https://nccd.cdc.gov/DOH_MWF/Reports/FlStatus_Rpt.aspx.

Table 3. Percentage of population receiving fluoridated water through community water systems by State, 2012

State	People served by community water systems (CWS)	People receiving fluoridated water	Percentage of people on CWS receiving fluoridated water	2012 Rank
United States	**282,534,910**	**210,655,401**	**74.6%**	
Alabama	4,822,023	3,781,607	78.4%	23
Alaska	682,528	361,240	52.9%	41
Arizona	5,536,324	3,199,068	57.8%	38
Arkansas	2,669,485	1,785,679	66.9%	33
California	38,041,430	24,215,234	63.7%	34
Colorado	5,187,582	3,757,694	72.4%	28
Connecticut	2,603,377	2,350,532	90.3%	14
Delaware	818,110	705,824	86.3%	19
District of Columbia	595,000	595,000	100.0%	
Florida	17,149,724	13,371,262	78.0%	24
Georgia	9,919,945	9,551,793	96.3%	6
Hawaii	1,290,549	139,598	10.8%	50
Idaho	1,097,332	395,863	36.1%	46
Illinois	12,875,255	12,682,543	98.5%	3
Indiana	4,582,496	4,342,273	94.8%	8
Iowa	2,778,894	2,555,593	92.0%	12
Kansas	2,702,452	1,719,503	63.6%	Tied for 35
Kentucky	**4,380,415**	**4,375,026**	**99.9%**	**1**
Louisiana	4,601,893	1,996,568	43.4%	45
Maine	664,063	527,163	79.4%	22
Maryland	5,204,155	5,060,379	97.2%	4
Massachusetts	6,646,144	4,681,038	70.4%	31
Michigan	7,999,859	7,218,670	90.2%	15
Minnesota	4,184,753	4,134,663	98.8%	2
Mississippi	2,984,926	1,738,478	58.2%	37
Missouri	5,226,360	3,994,342	76.4%	26
Montana	788,805	252,299	32.0%	47
Nebraska	1,425,664	1,015,094	71.2%	30
Nevada	2,544,079	1,870,698	73.5%	27
New Hampshire	832,631	383,333	46.0%	43
New Jersey	8,288,715	1,206,270	14.6%	49
New Mexico	1,571,600	1,210,877	77.0%	25
New York	18,094,452	12,989,488	71.8%	29
North Carolina	7,042,655	6,164,847	87.5%	18
North Dakota	633,645	612,560	96.7%	5
Ohio	10,537,957	9,716,289	92.2%	11
Oklahoma	3,548,057	2,486,718	70.1%	32
Oregon	3,688,540	833,557	22.6%	48
Pennsylvania	10,780,146	5,885,390	54.6%	40
Rhode Island	997,824	837,549	83.9%	20
South Carolina	3,839,526	3,602,956	93.8%	9
South Dakota	690,759	646,671	93.6%	10
Tennessee	5,826,866	5,229,461	89.7%	16
Texas	25,113,656	20,002,506	79.6%	21
Utah	2,676,448	1,384,638	51.7%	42
Vermont	450,483	252,920	56.1%	39
Virginia	6,416,760	6,159,737	96.0%	7
Washington	5,525,840	3,515,797	63.6%	Tied for 35
West Virginia	1,499,749	1,365,697	91.1%	13
Wisconsin	4,025,756	3,597,525	89.4%	17
Wyoming	449,223	195,891	43.6%	44

Data Source: Center for Disease Control and Prevention (CDC)

Oral Health of Children, Adolescents and Young Adults

The oral health of children is a particular concern for stakeholders because early appropriate oral hygiene behaviors and access to a dental home are predictive of good oral health outcomes over a lifetime. Children are especially vulnerable to not receiving appropriate oral health services because they are dependent on others for seeking and obtaining care. At risk children include those living in poverty, those with special healthcare needs, those living out of home, and those who live in families without dental insurance. Many at risk children have dental insurance through Medicaid programs in states that are mandated to provide specific oral health services for children through age 20 through the Early Periodic Screening, Diagnostic and Treatment Benefit (EPSDT).

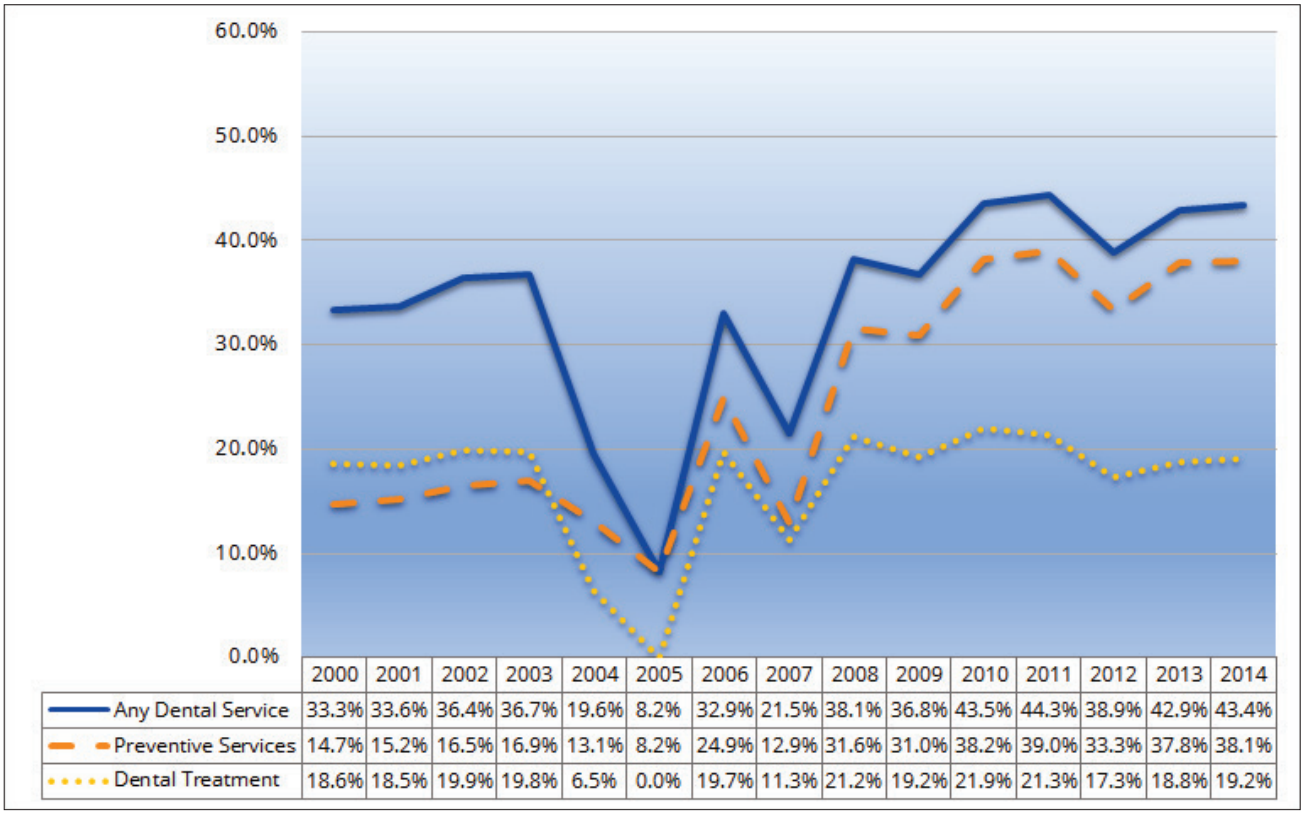
Early Periodic Screening, Diagnostic and Treatment Services

State Medicaid programs are required to complete and submit an annual survey in a standard reporting format using Form CMS-416 to describe rates of utilization and receipt of health care services, including oral health care among children eligible for mandated EPSDT services. These reports provide important information about trends in utilization of medical and dental services among children younger than age 1 to age 20.[26]

For the past 15 years, annual variation was evident in the percentage of children eligible for EPSDT services in Kentucky who received any dental services, preventive dental services, or dental treatment services (Figure 2). There were higher percentages of children receiving oral health services from 2010 to 2014 than from 1999 to 2003. However, in 2005 and in 2007, utilization rates dipped substantially in comparison to previous and subsequent years. These declines are likely data collection irregularities rather than significant decreases in actual service utilization by children in the time period. The most noticeable increase over time was in the percentage of children who received a preventive service each year. In 2000, just 14.7% of eligible children had a preventive oral health service while in 2014, 38.1% of eligible children received a preventive service.

[26] Medicaid. Early and Periodic Screening, Diagnostic and Treatment. http://www.medicaid.gov/medicaid-chip-program-information/by-topics/benefits/early-and-periodic-screening-diagnostic-and-treatment.html.

Figure 2. Percentage of children eligible for EPSDT in Kentucky ages 0 to 20 who received any dental services, preventive dental services, or dental treatment services, 2000 to 2014



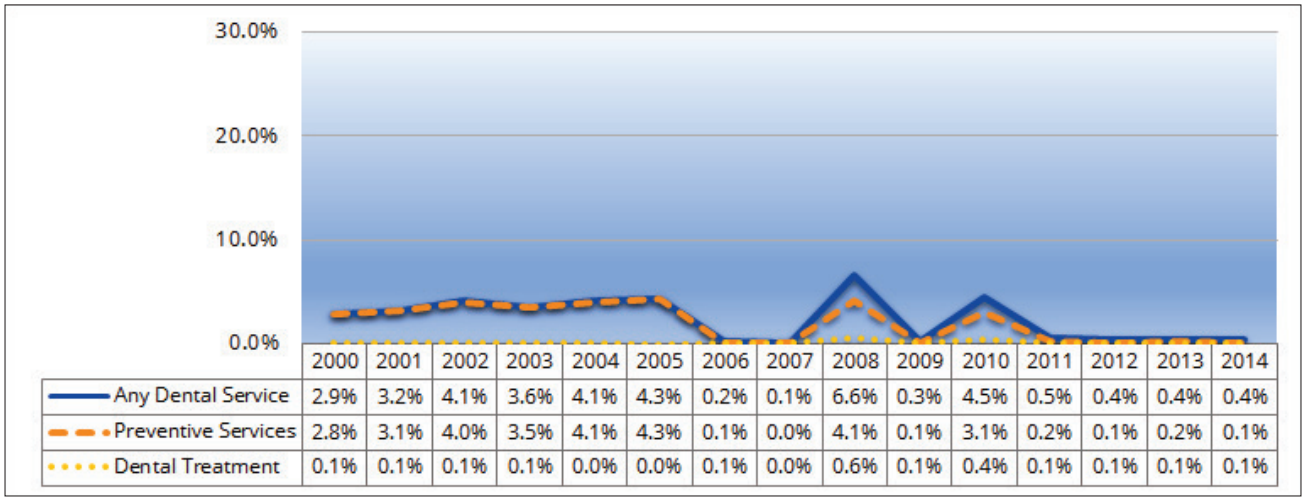
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Any Dental Service	33.3%	33.6%	36.4%	36.7%	19.6%	8.2%	32.9%	21.5%	38.1%	36.8%	43.5%	44.3%	38.9%	42.9%	43.4%
Preventive Services	14.7%	15.2%	16.5%	16.9%	13.1%	8.2%	24.9%	12.9%	31.6%	31.0%	38.2%	39.0%	33.3%	37.8%	38.1%
Dental Treatment	18.6%	18.5%	19.9%	19.8%	6.5%	0.0%	19.7%	11.3%	21.2%	19.2%	21.9%	21.3%	17.3%	18.8%	19.2%

Data Source: Center for Medicaid and CHIP Services (CMS), CMS-416 reports.

Utilization of oral health services appeared to vary by age cohort. While there is increasing recognition that dental care for children should begin as soon as or before their teeth erupt, very few Medicaid-eligible children younger than age 1 received any oral health service. Recent oral health policy and program initiatives are encouraging pediatric health care professionals to include oral health screening and prevention services in their periodic examinations of infants and young children. The percentage estimates of oral health services among children ages less than 1 to 2 in Kentucky are as follows.

Fewer than 5% of eligible children younger than 1 year of age received a preventive oral health service in any given year between 2000 and 2014 (Figure 3).

Figure 3. Percentage of children eligible for EPSDT in Kentucky ages 0 to 1 who received any dental services, preventive dental services, or dental treatment services, 2000 to 2014

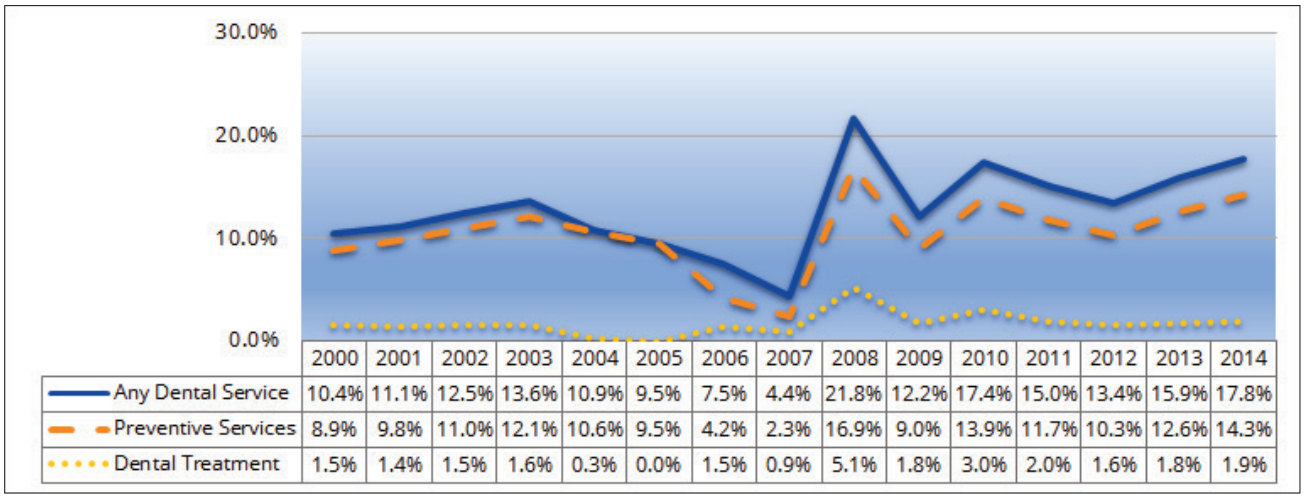


	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Any Dental Service	2.9%	3.2%	4.1%	3.6%	4.1%	4.3%	0.2%	0.1%	6.6%	0.3%	4.5%	0.5%	0.4%	0.4%	0.4%
Preventive Services	2.8%	3.1%	4.0%	3.5%	4.1%	4.3%	0.1%	0.0%	4.1%	0.1%	3.1%	0.2%	0.1%	0.2%	0.1%
Dental Treatment	0.1%	0.1%	0.1%	0.1%	0.0%	0.0%	0.1%	0.0%	0.6%	0.1%	0.4%	0.1%	0.1%	0.1%	0.1%

Data Source: Center for Medicaid and CHIP Services (CMS), CMS-416 reports.

The percentage of eligible children ages 1 to 2 who received a preventive oral health service was below 17% in any given year between 2000 and 2014, yet increased more than 60% from 2000 (8.9%) to 2014 (14.3%) (Figure 4). Annually, up to 5.1% of eligible children ages 1 to 2 also had a dental treatment.

Figure 4. Percentage of children eligible for EPSDT in Kentucky ages 1 to 2 who received any dental services, preventive dental services, or dental treatment services, 2000 to 2014



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Any Dental Service	10.4%	11.1%	12.5%	13.6%	10.9%	9.5%	7.5%	4.4%	21.8%	12.2%	17.4%	15.0%	13.4%	15.9%	17.8%
Preventive Services	8.9%	9.8%	11.0%	12.1%	10.6%	9.5%	4.2%	2.3%	16.9%	9.0%	13.9%	11.7%	10.3%	12.6%	14.3%
Dental Treatment	1.5%	1.4%	1.5%	1.6%	0.3%	0.0%	1.5%	0.9%	5.1%	1.8%	3.0%	2.0%	1.6%	1.8%	1.9%

Data Source: Center for Medicaid and CHIP Services (CMS), CMS-416 reports.

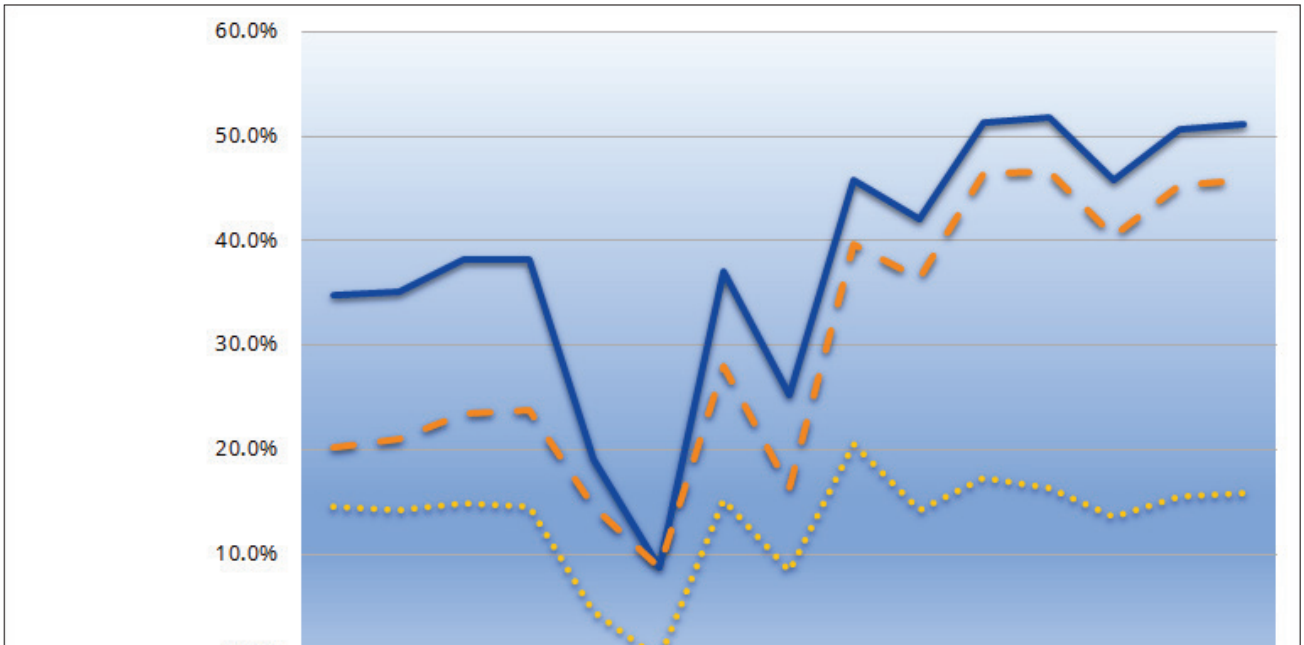
Eligible children age 3 to 14 were more likely to have a dental service, preventive service, or dental treatment service than children in all other age cohorts. The group exhibiting the highest utilization rates of oral health services included children age 6 to 9. Many school-based oral health programs target children in these age groups, providing fluoride varnish services and or dental sealants as well as prophylaxis. While data do not permit attribution of services to the actual settings in which they are

provided, it is likely that school-based programs across the state are impacting utilization of oral health services for children in these age groups.

Head Start Programs for pre-school children are also engaging more with oral health providers to help young children beginning at age 3, in these programs establish dental homes. While children in the age 15 to 18 cohort still received dental services, this age group exhibited lower rates of utilization of preventive and other oral health services than younger school children exhibited. The percentage estimates of oral health services among children ages 3 to 18 in Kentucky are as follows.

The percentage of eligible children ages 3 to 5 who received a preventive oral health service more than doubled from 2000 to 2014 from 20.2% to 45.8% (Figure 5). The utilization of dental treatment services was fairly stable at around 15%.

Figure 5. Percentage of children eligible for EPSDT in Kentucky ages 3 to 5 who received any dental services, preventive dental services, or dental treatment services, 2000 to 2014

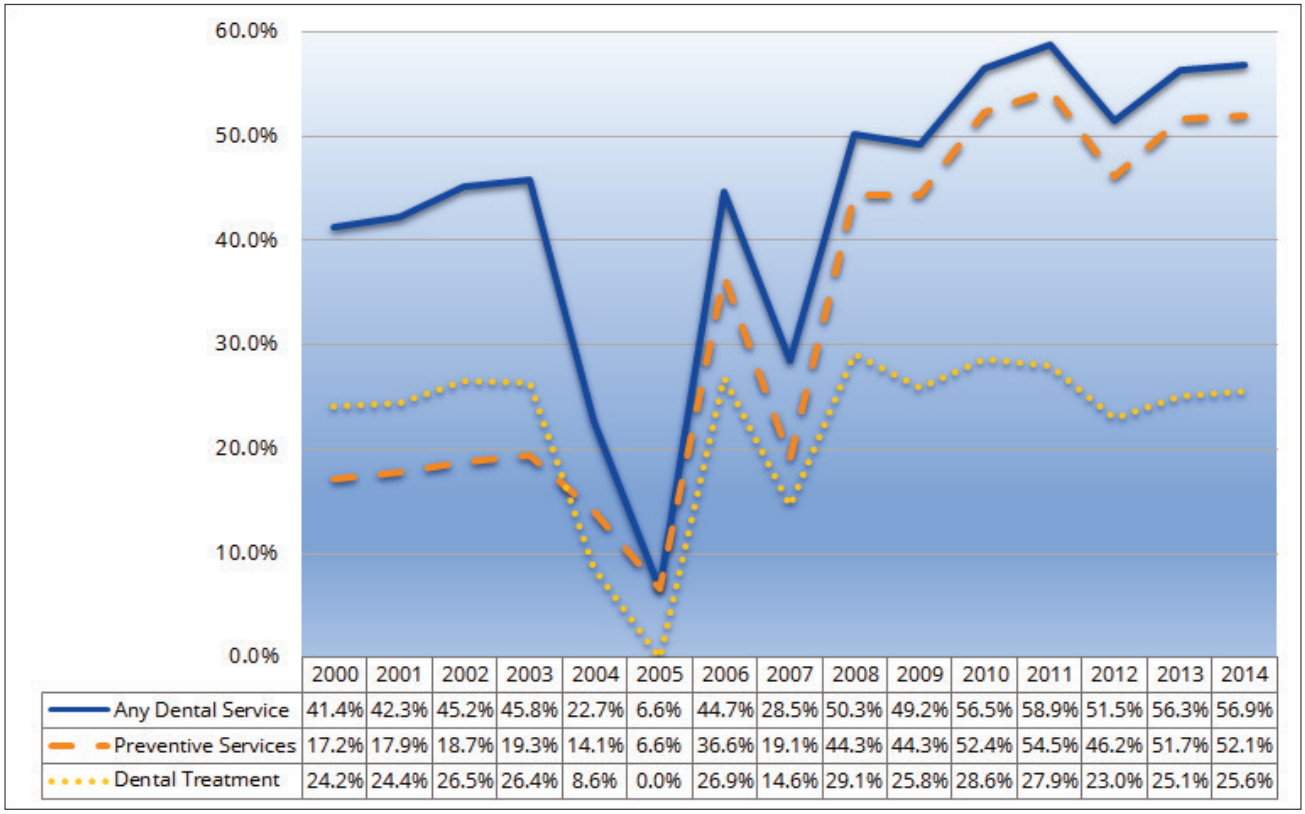


	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Any Dental Service	34.7%	35.2%	38.3%	38.3%	19.0%	8.8%	37.1%	25.2%	45.8%	42.1%	51.4%	51.8%	45.9%	50.7%	51.1%
Preventive Services	20.2%	21.0%	23.4%	23.8%	14.6%	8.8%	28.0%	16.3%	39.7%	36.4%	46.4%	46.6%	40.5%	45.4%	45.8%
Dental Treatment	14.6%	14.2%	14.8%	14.5%	4.5%	0.0%	15.2%	8.4%	20.5%	14.2%	17.4%	16.3%	13.6%	15.5%	15.8%

Data Source: Center for Medicaid and CHIP Services (CMS), CMS-416 reports.

The percentage of eligible children who received a preventive oral health service almost tripled from 2000 to 2014 from 17.2% to 52.1% for ages 6 to 9 (Figure 6), from 15.9% to 46.8% for ages 10 to 14 (Figure 7), and from 13.1% to 36.1% for ages 15 to 18 (Figure 8). The utilization of dental treatment services remained relatively constant at around 25%.

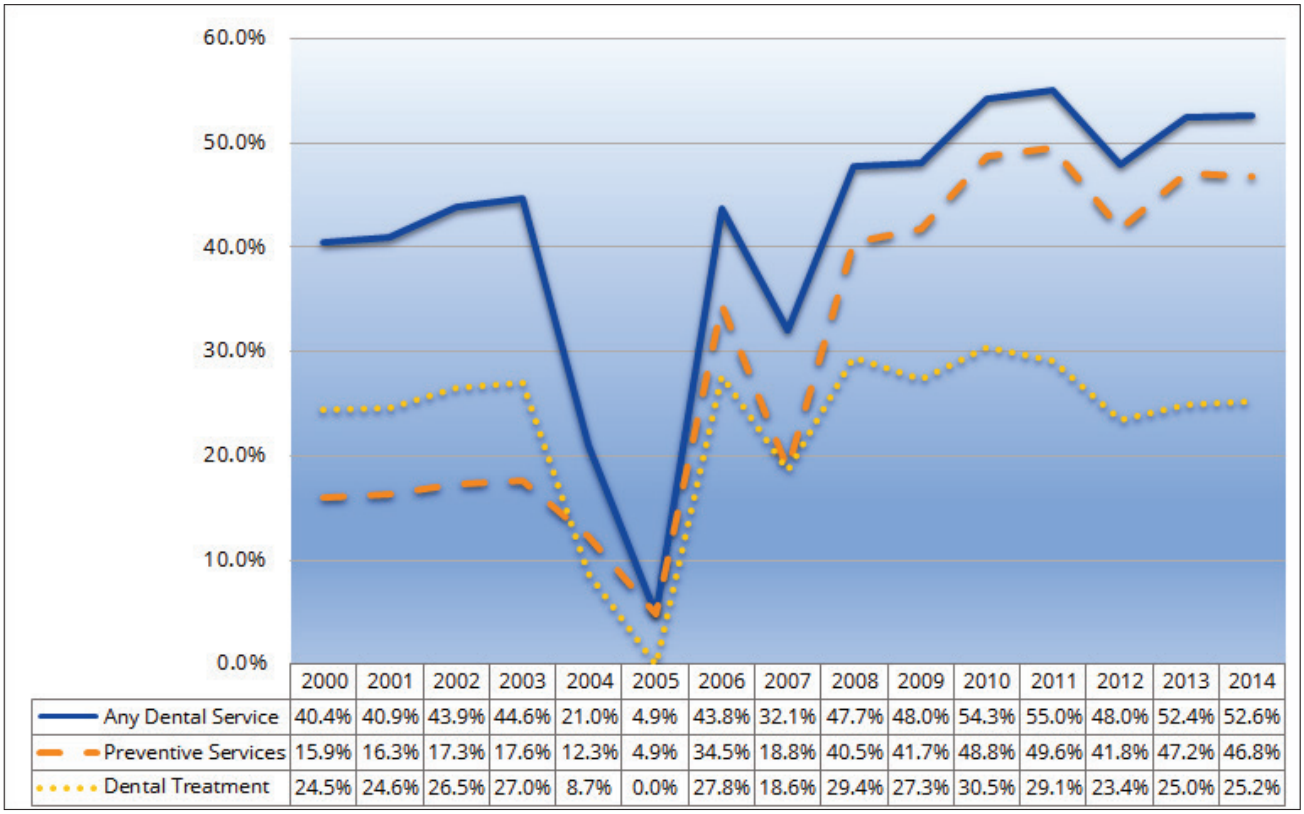
Figure 6. Percentage of children eligible for EPSDT in Kentucky ages 6 to 9 who received any dental services, preventive dental services, or dental treatment services, 2000 to 2014



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Any Dental Service	41.4%	42.3%	45.2%	45.8%	22.7%	6.6%	44.7%	28.5%	50.3%	49.2%	56.5%	58.9%	51.5%	56.3%	56.9%
Preventive Services	17.2%	17.9%	18.7%	19.3%	14.1%	6.6%	36.6%	19.1%	44.3%	44.3%	52.4%	54.5%	46.2%	51.7%	52.1%
Dental Treatment	24.2%	24.4%	26.5%	26.4%	8.6%	0.0%	26.9%	14.6%	29.1%	25.8%	28.6%	27.9%	23.0%	25.1%	25.6%

Data Source: Center for Medicaid and CHIP Services (CMS), CMS-416 reports.

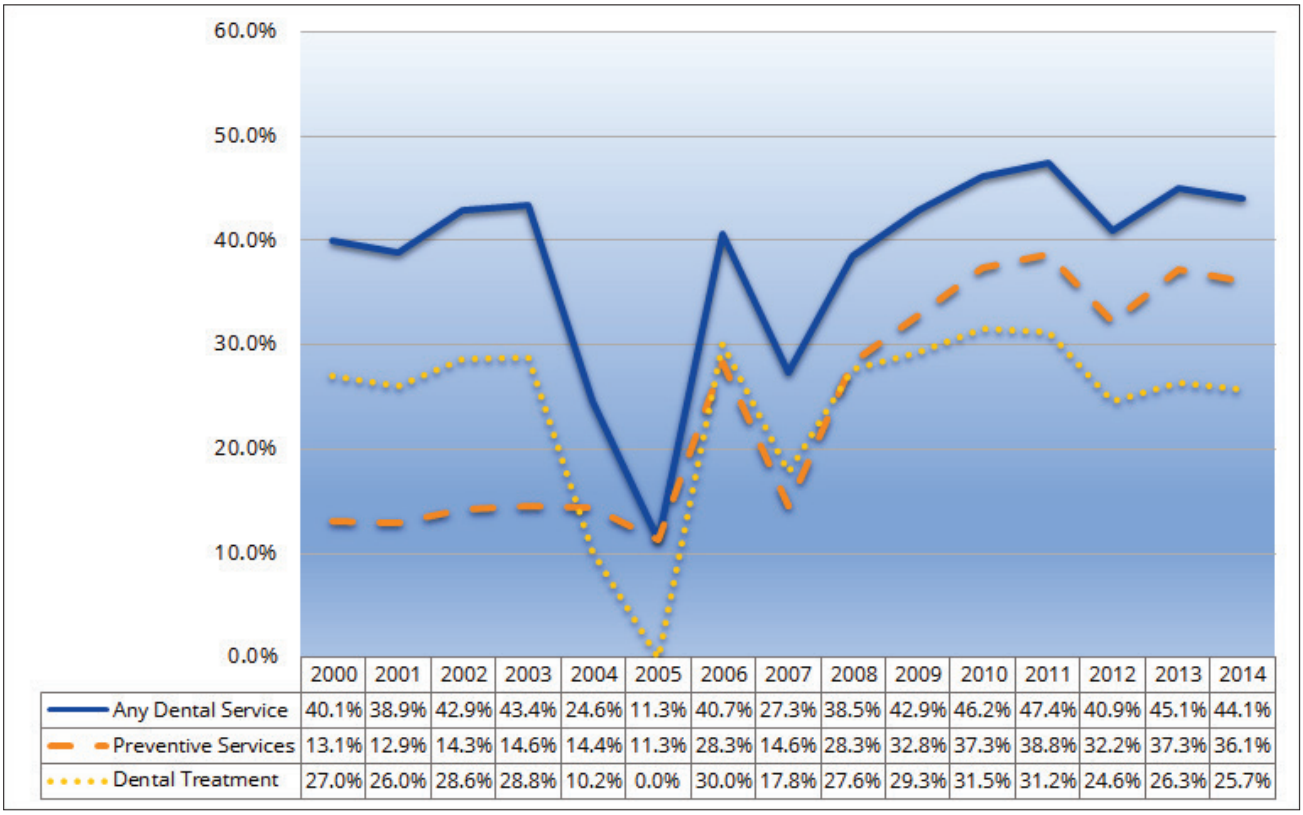
Figure 7. Percentage of children eligible for EPSDT in Kentucky ages 10 to 14 who received any dental services, preventive dental services, or dental treatment services, 2000 to 2014



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Any Dental Service	40.4%	40.9%	43.9%	44.6%	21.0%	4.9%	43.8%	32.1%	47.7%	48.0%	54.3%	55.0%	48.0%	52.4%	52.6%
Preventive Services	15.9%	16.3%	17.3%	17.6%	12.3%	4.9%	34.5%	18.8%	40.5%	41.7%	48.8%	49.6%	41.8%	47.2%	46.8%
Dental Treatment	24.5%	24.6%	26.5%	27.0%	8.7%	0.0%	27.8%	18.6%	29.4%	27.3%	30.5%	29.1%	23.4%	25.0%	25.2%

Data Source: Center for Medicaid and CHIP Services (CMS), CMS-416 reports.

Figure 8. Percentage of children eligible for EPSDT in Kentucky ages 15 to 18 who received any dental services, preventive dental services, or dental treatment services, 2000 to 2014



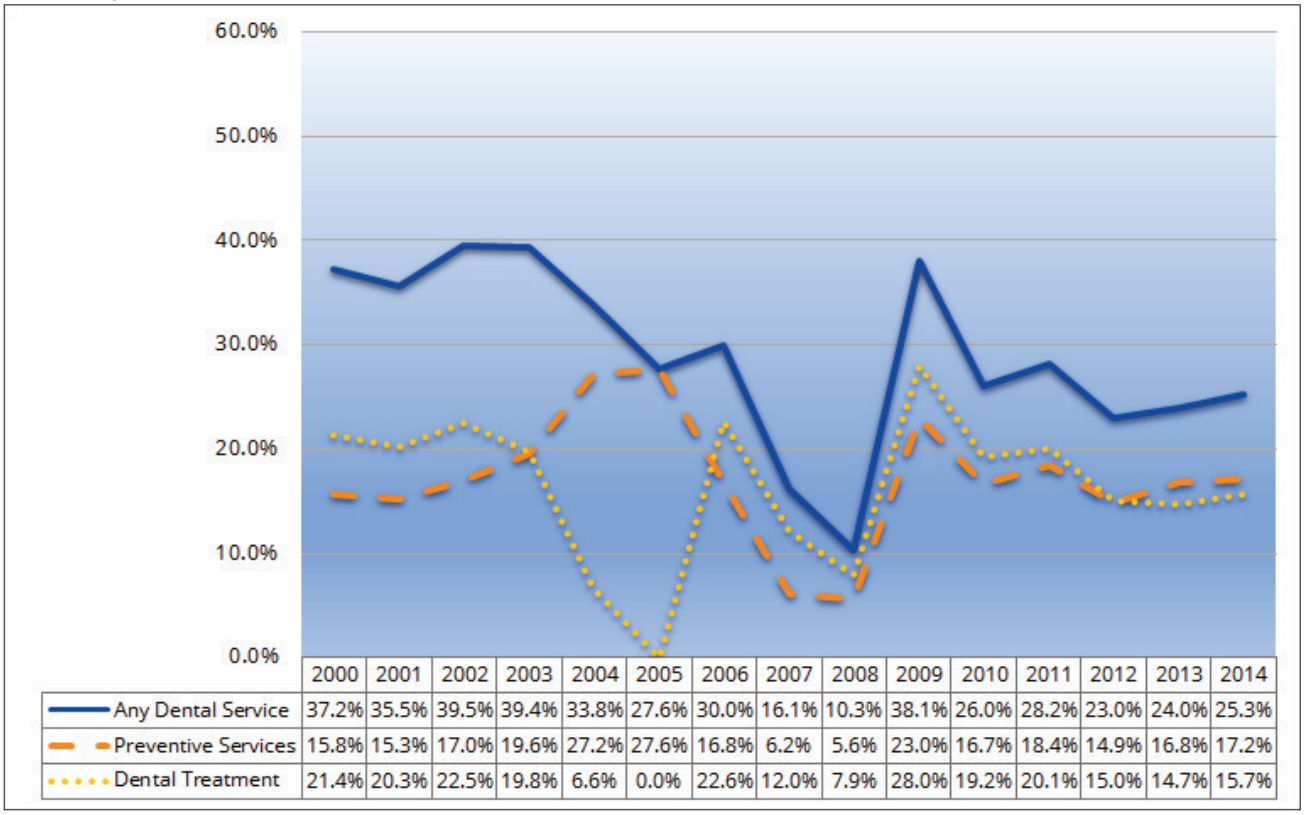
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Any Dental Service	40.1%	38.9%	42.9%	43.4%	24.6%	11.3%	40.7%	27.3%	38.5%	42.9%	46.2%	47.4%	40.9%	45.1%	44.1%
Preventive Services	13.1%	12.9%	14.3%	14.6%	14.4%	11.3%	28.3%	14.6%	28.3%	32.8%	37.3%	38.8%	32.2%	37.3%	36.1%
Dental Treatment	27.0%	26.0%	28.6%	28.8%	10.2%	0.0%	30.0%	17.8%	27.6%	29.3%	31.5%	31.2%	24.6%	26.3%	25.7%

Data Source: Center for Medicaid and CHIP Services (CMS), CMS-416 reports.

There was further reduction in utilization rates of any dental services among young people age 19 to 20 who were eligible for Medicaid services under the EPSDT program. For the most part, young people in this age group have exited formal public education, which may contribute to the decline in utilization of any dental services. The percentage estimates of oral health services among children ages 19 to 20 in Kentucky are as follows.

The percentage of eligible children ages 19 to 20 who received a preventive oral health service increased from 15.8% in 2000 to 27.2%-27.6% in 2004 to 2005 and then declined to 17.2% in 2014 (Figure 9). The utilization of dental treatment services also increased from 21.4% in 2000 to 28.0% in 2009 and then declined to 15.7% in 2014.

Figure 9. Percentage of children eligible for EPSDT in Kentucky ages 19 to 20 who received any dental services, preventive dental services, or dental treatment services, 2000 to 2014



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Any Dental Service	37.2%	35.5%	39.5%	39.4%	33.8%	27.6%	30.0%	16.1%	10.3%	38.1%	26.0%	28.2%	23.0%	24.0%	25.3%
Preventive Services	15.8%	15.3%	17.0%	19.6%	27.2%	27.6%	16.8%	6.2%	5.6%	23.0%	16.7%	18.4%	14.9%	16.8%	17.2%
Dental Treatment	21.4%	20.3%	22.5%	19.8%	6.6%	0.0%	22.6%	12.0%	7.9%	28.0%	19.2%	20.1%	15.0%	14.7%	15.7%

Data Source: Center for Medicaid and CHIP Services (CMS), CMS-416 reports.

As of 2010, the EPSDT reporting form (CMS-416) was revised to include more discrete information about oral health services provided to children in state Medicaid programs. Beginning in 2010, data were collected to describe the number of eligible children in each state who received a dental diagnostic service, a sealant on a permanent molar, and/or an oral health service from a non-dentist provider.

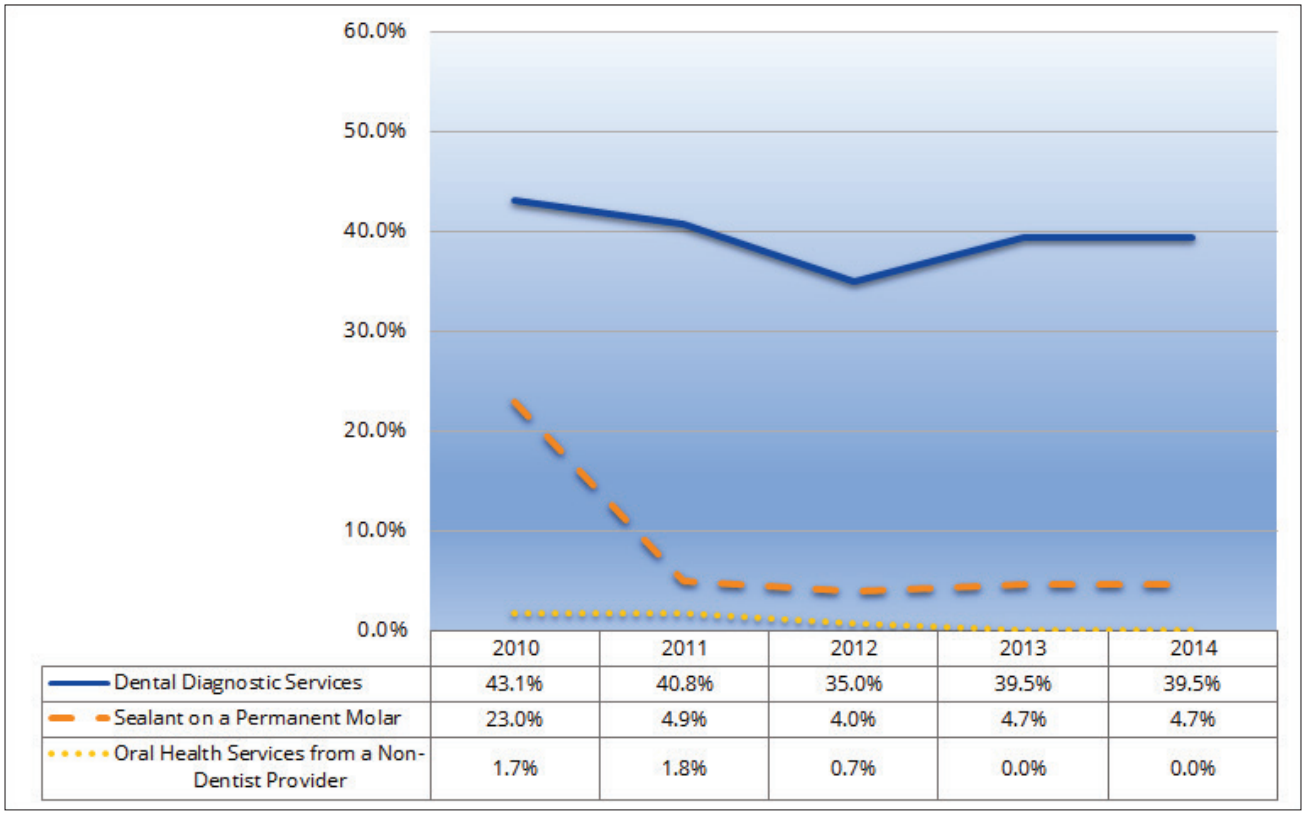
The new form also included a question about receiving any dental or oral health service from a dental provider or another health or oral health professional not working under dental supervision, including dental hygienists. Physicians, nurses and nurse practitioners, physician assistants, and others are trained in many states to provide oral health screening, prevention, and promotion services with state Medicaid programs reimbursing for these services. However, since dental hygiene services in Kentucky are generally billed through a supervising dentist, service provision by dental hygienists may not be accurately represented in this data. It is also difficult to explain from existing sources why the percentage of non-dental providers offering any oral health service declined across all age groups between 2010 and 2014 in the EPSDT data.

Another anomaly in the data is the decline in dental sealant rates over the time period for the 6 to 14 year old age groups. A high percentage of children in those age cohorts received a dental sealant in 2010

followed by a precipitous decline in the percentage of children receiving that service in succeeding years. One possible explanation is that so many children received sealants in 2010 that the need for new placement in subsequent years was reduced.

In Kentucky, the percentage of Medicaid-eligible children younger than age 1 to age 20 receiving dental diagnostic services slightly decreased between 2010 and 2014 from 43.1% to 39.5% (Figure 10).

Figure 10. Percentage of children eligible for EPSDT in Kentucky ages 0 to 20 who received dental diagnostic services, sealant on a permanent molar, or oral health services from a non-dentist provider, 2010 to 2014

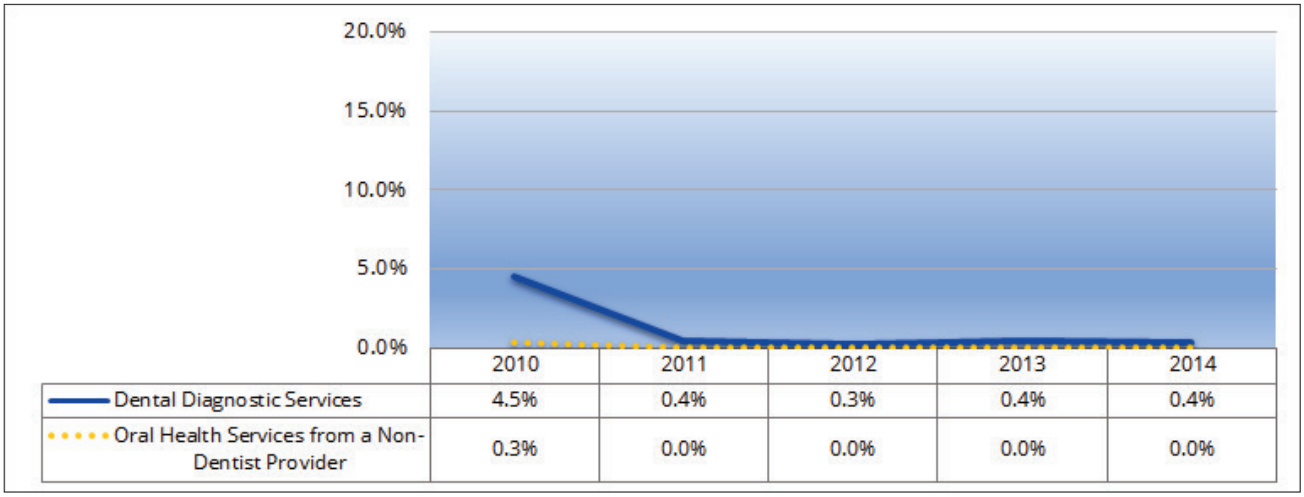


	2010	2011	2012	2013	2014
Dental Diagnostic Services	43.1%	40.8%	35.0%	39.5%	39.5%
Sealant on a Permanent Molar	23.0%	4.9%	4.0%	4.7%	4.7%
Oral Health Services from a Non-Dentist Provider	1.7%	1.8%	0.7%	0.0%	0.0%

Data Source: Center for Medicaid and CHIP Services (CMS), CMS-416 reports.

As previously discussed, there is variation by age cohort in receipt of services. There is growing realization that very young children benefit from early oral health screening and prevention services; however, the percentage of children younger than age 1 receiving dental diagnostic services, remains relatively low in Kentucky (Figure 11).

Figure 11. Percentage of children eligible for EPSDT in Kentucky ages 0 to 1 who received dental diagnostic services, sealant on a permanent molar, or oral health services from a non-dentist provider, 2010 to 2014

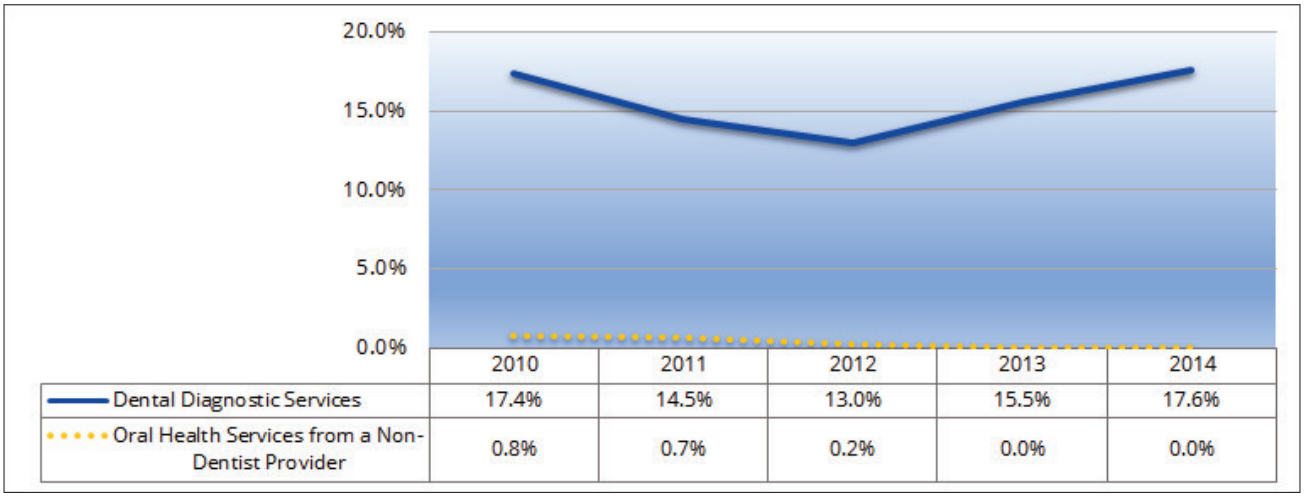


	2010	2011	2012	2013	2014
Dental Diagnostic Services	4.5%	0.4%	0.3%	0.4%	0.4%
Oral Health Services from a Non-Dentist Provider	0.3%	0.0%	0.0%	0.0%	0.0%

Data Source: Center for Medicaid and CHIP Services (CMS), CMS-416 reports.

The percent of Medicaid-eligible children ages 1 to 2 who received dental diagnostic services during the 5-year period, from 2010 to 2014, remained relatively constant around 15% (Figure 12). There is growing awareness among both dental and health care professionals of the importance of oral health screening and prevention services for this age group; however, the percentage of children in the age cohort who actually received services remains low.

Figure 12. Percentage of children eligible for EPSDT in Kentucky ages 1 to 2 who received dental diagnostic services, sealant on a permanent molar, or oral health services from a non-dentist provider, 2010 to 2014

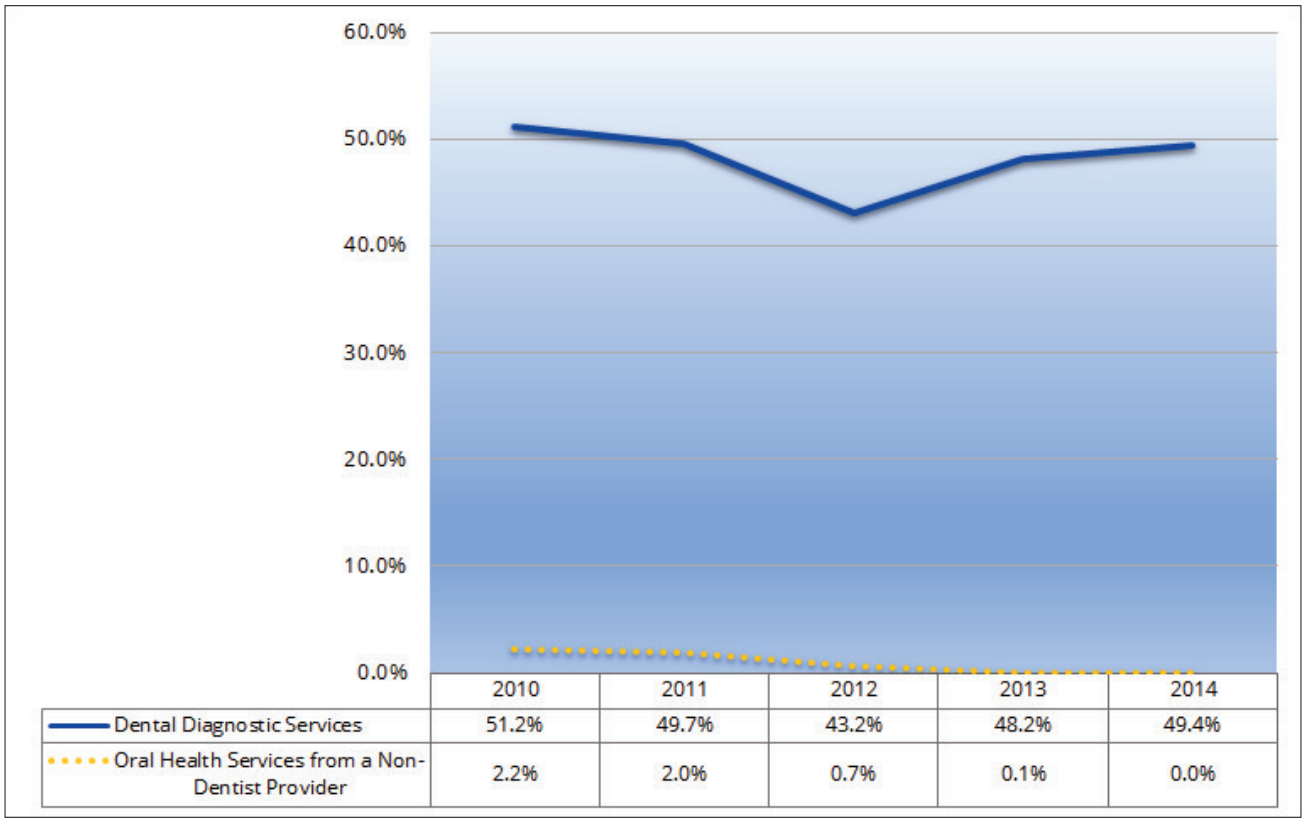


	2010	2011	2012	2013	2014
Dental Diagnostic Services	17.4%	14.5%	13.0%	15.5%	17.6%
Oral Health Services from a Non-Dentist Provider	0.8%	0.7%	0.2%	0.0%	0.0%

Data Source: Center for Medicaid and CHIP Services (CMS), CMS-416 reports.

The percentage of Medicaid-eligible children ages 3 to 5 receiving dental diagnostic services was much higher than for younger children over the 5-year period (approximately 50%), excepting 2012 when slightly fewer children (43.2%) received dental services (Figure 13). In many states including Kentucky, there has been a concerted effort in Head Start and Early Head Start programs to address the oral health of low-income children qualifying for the program. The percentage of children who received dental services from a non-dental provider from 2012 to 2014, declined from 2.2% to 0%.

Figure 13. Percentage of children eligible for EPSDT in Kentucky ages 3 to 5 who received dental diagnostic services, sealant on a permanent molar, or oral health services from a non-dentist provider, 2010 to 2014

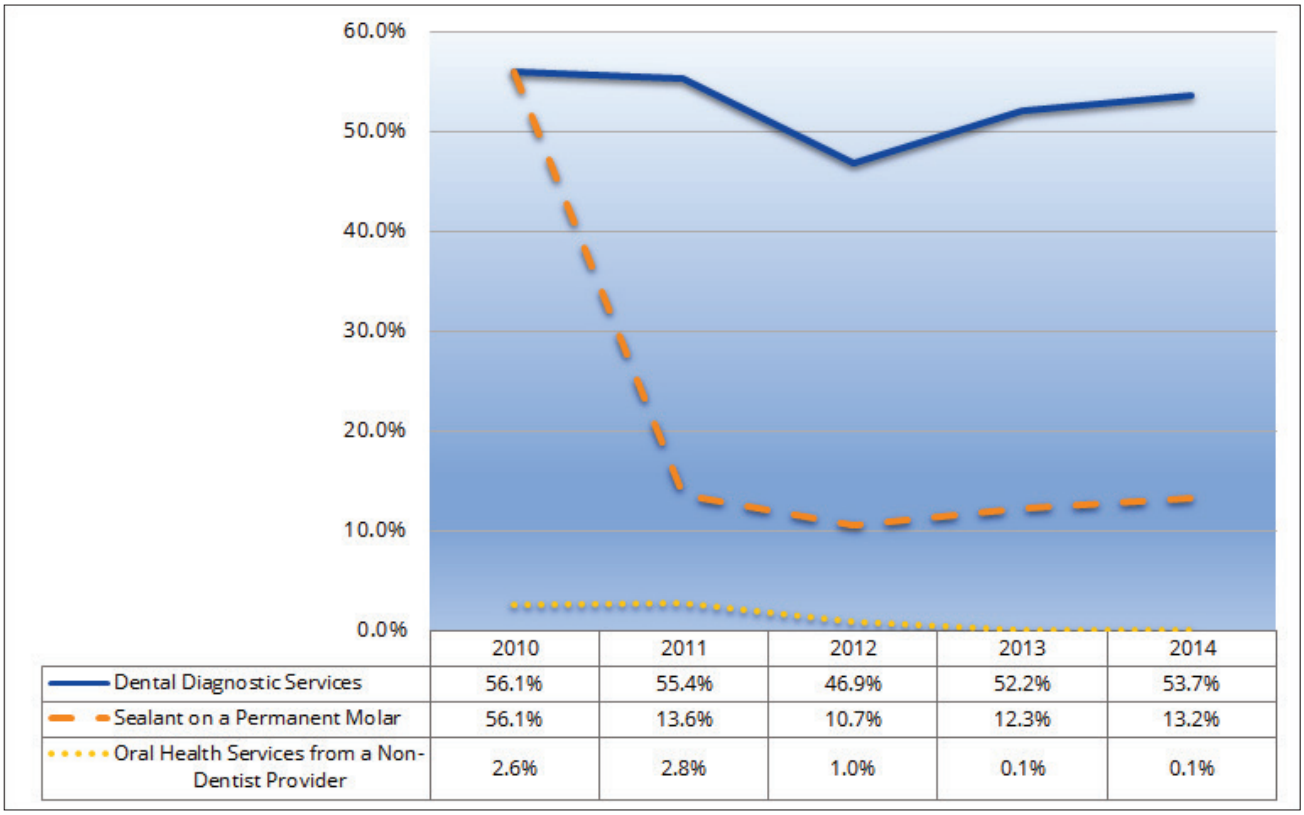


	2010	2011	2012	2013	2014
Dental Diagnostic Services	51.2%	49.7%	43.2%	48.2%	49.4%
Oral Health Services from a Non-Dentist Provider	2.2%	2.0%	0.7%	0.1%	0.0%

Data Source: Center for Medicaid and CHIP Services (CMS), CMS-416 reports.

As previously stated, Medicaid-eligible children ages 6 to 9 (55.4%) were more likely to receive dental diagnostic services than children in any other age cohort during 2010 to 2015, except 2013 when slightly fewer children (46.9%) received dental services (Figure 14). The percentage of children who received dental services from non-dental professionals decreased over the 5-year period from 2.6% to 0.1%. The low percentage of children who received sealant services in this age group between 2011 and 2014 (10.7% to 13.6%) is concerning since it is during this period that permanent molars begin to erupt. Sealants provide protective barriers that forestall decay and are therefore, an important preventive service.

Figure 14. Percentage of children eligible for EPSDT in Kentucky ages 6 to 9 who received dental diagnostic services, sealant on a permanent molar, or oral health services from a non-dentist provider, 2010 to 2014

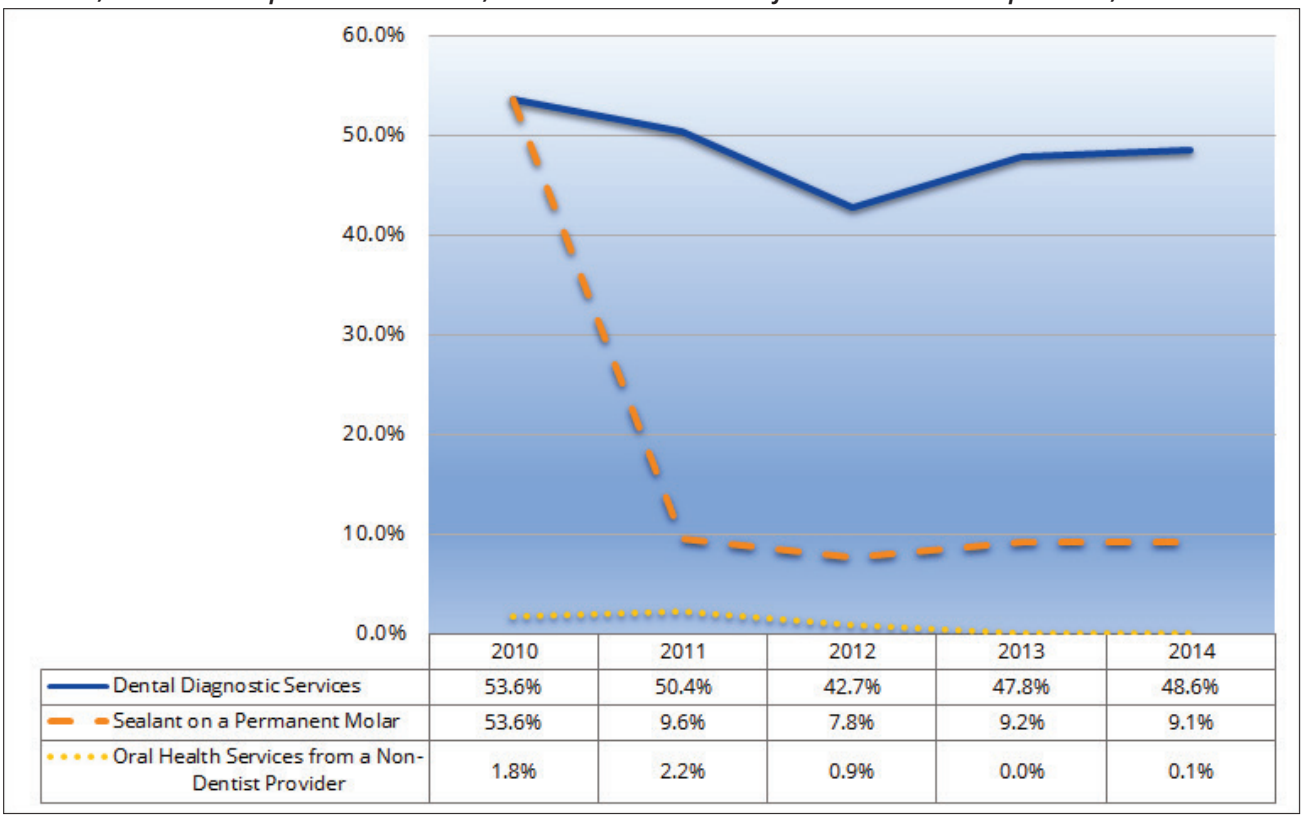


	2010	2011	2012	2013	2014
Dental Diagnostic Services	56.1%	55.4%	46.9%	52.2%	53.7%
Sealant on a Permanent Molar	56.1%	13.6%	10.7%	12.3%	13.2%
Oral Health Services from a Non-Dentist Provider	2.6%	2.8%	1.0%	0.1%	0.1%

Data Source: Center for Medicaid and CHIP Services (CMS), CMS-416 reports.

More than half of Medicaid-eligible children ages 10 to 14 received a dental diagnostic service in 2010 (53.6%) and 2011 (50.4%), while in 2012 the percentage decreased to 42.7% followed by an increase to 47.8% in 2013 and 48.6 in 2014 (Figure 15). The percentage of children who had sealants placed on a permanent molar was lower than expected (below 10% between 2011 and 2014) especially since children in this age group have permanent molars. The data on sealants describe only those children who had a new sealant placed during the year and do not include those children with existing retained sealants. Therefore, it is likely that higher percentages of children have sealants than these data indicate.

Figure 15. Percentage of children eligible for EPSDT in Kentucky ages 10 to 14 who received dental diagnostic services, sealant on a permanent molar, or oral health services from a non-dentist provider, 2010 to 2014

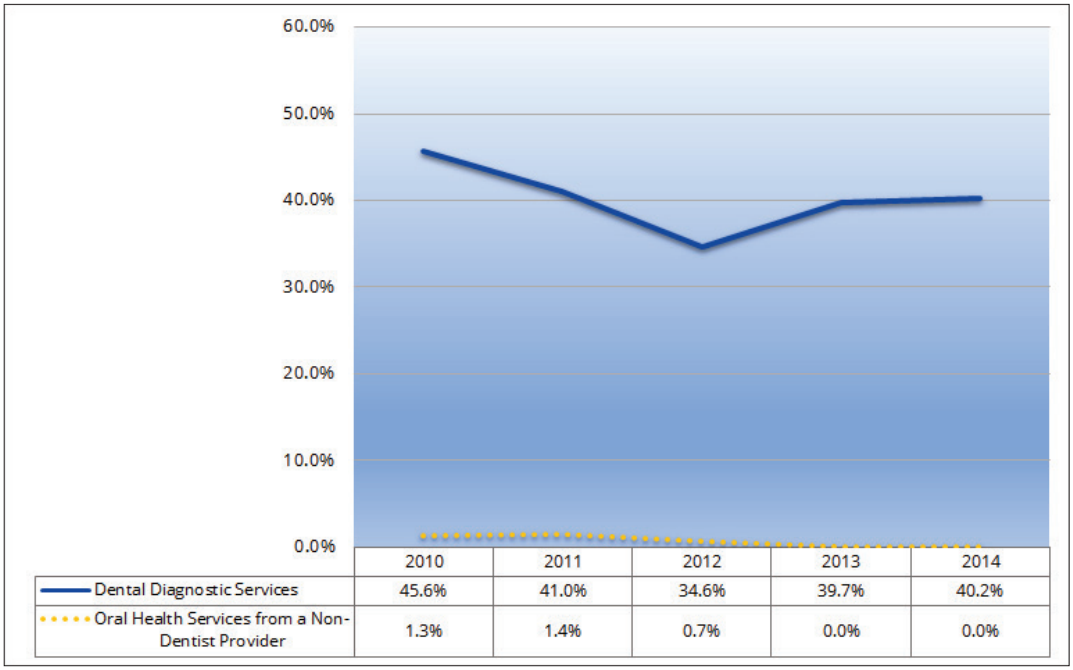


	2010	2011	2012	2013	2014
Dental Diagnostic Services	53.6%	50.4%	42.7%	47.8%	48.6%
Sealant on a Permanent Molar	53.6%	9.6%	7.8%	9.2%	9.1%
Oral Health Services from a Non-Dentist Provider	1.8%	2.2%	0.9%	0.0%	0.1%

Data Source: Center for Medicaid and CHIP Services (CMS), CMS-416 reports.

There was a decrease among Medicaid-eligible children age 15 to 18 receiving dental diagnostic services between 2010 and 2014 from 45.6% to 40.2% (Figure 16). When compared to younger cohorts (ages 3 to 5, 6 to 9, and 10 to 14), this group was less likely to have received dental services.

Figure 16. Percentage of children eligible for EPSDT in Kentucky ages 15 to 18 who received dental diagnostic services or oral health services from a non-dentist provider, 2010 to 2014

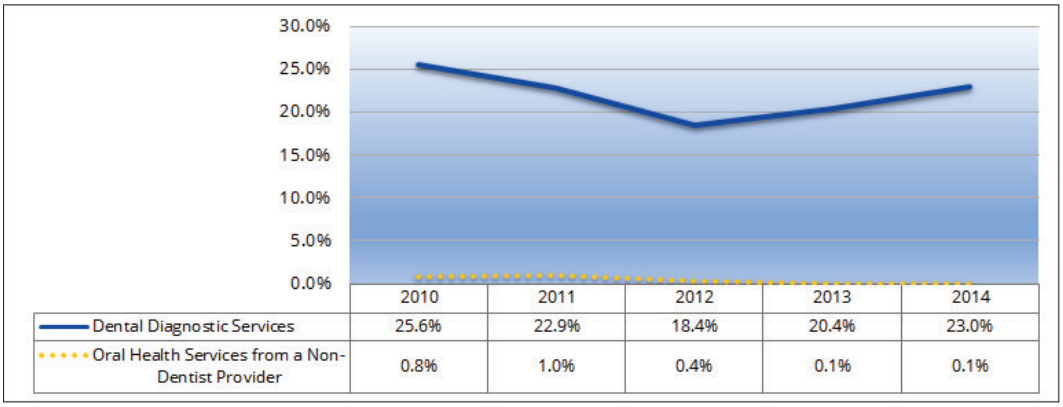


	2010	2011	2012	2013	2014
Dental Diagnostic Services	45.6%	41.0%	34.6%	39.7%	40.2%
Oral Health Services from a Non-Dentist Provider	1.3%	1.4%	0.7%	0.0%	0.0%

Data Source: Center for Medicaid and CHIP Services (CMS), CMS-416 reports.

The percentage of children receiving dental diagnostic services in the age 10 to 14 group declined after 2010 with some rebound in later years; there was a similar decline for 15 to 18 year olds and a commensurate rebound in later years; there were smaller declines among the age 19 to 20 group with 25.6% receiving a diagnostic service in 2010 and 23.0% in 2014 (Figure 17).

Figure 17. Percentage of children eligible for EPSDT in Kentucky ages 19 to 20 who received dental diagnostic services or oral health services from a non-dentist provider, 2010 to 2014

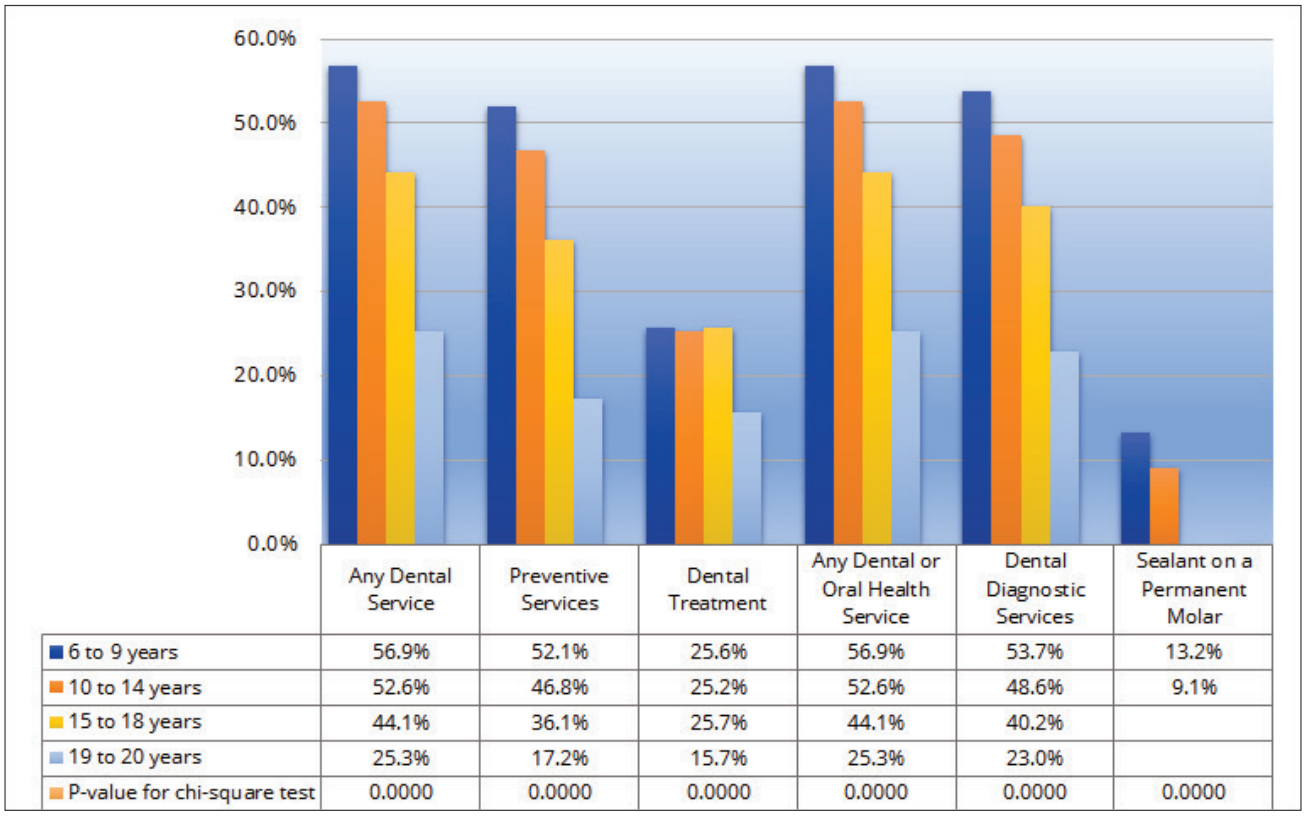


	2010	2011	2012	2013	2014
Dental Diagnostic Services	25.6%	22.9%	18.4%	20.4%	23.0%
Oral Health Services from a Non-Dentist Provider	0.8%	1.0%	0.4%	0.1%	0.1%

Data Source: Center for Medicaid and CHIP Services (CMS), CMS-416 reports.

A chi square test was completed using the 2014 data from form CMS-416 report for children ages 6 to 20 to help understand whether variation in receipt of dental or oral health services across age cohorts was meaningful (Figure 18). The p-values were highly significant ($p<0.00001$) and indicated an inverse relationship between the percentage of children receiving Medicaid dental services and their age, with older children being significantly less likely to receive any dental service compared to the younger children. Similar trends were also observed in the previous years including 2010, 2011, 2012 and 2013.

Figure 18. Percentage of Medicaid-eligible children receiving dental services in 2014 by age cohort

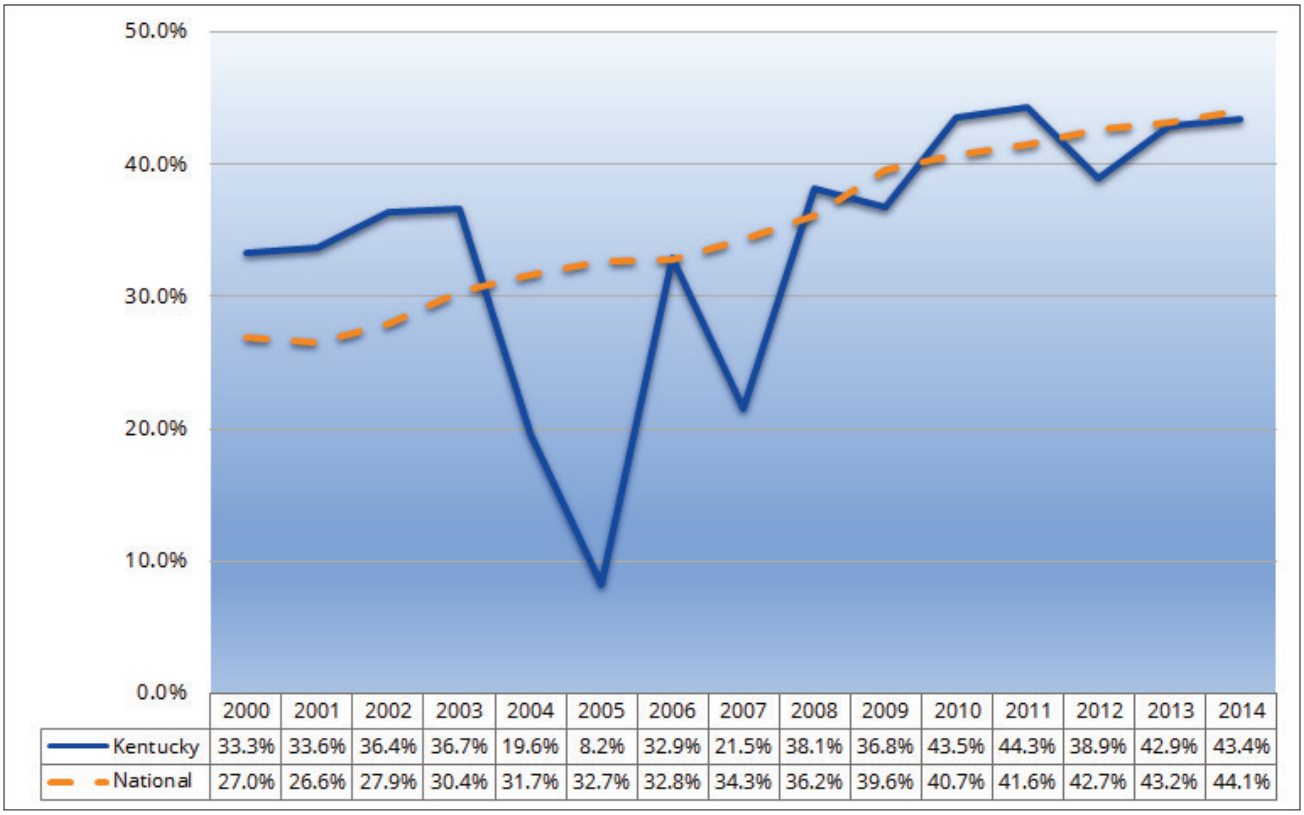


	Any Dental Service	Preventive Services	Dental Treatment	Any Dental or Oral Health Service	Dental Diagnostic Services	Sealant on a Permanent Molar
6 to 9 years	56.9%	52.1%	25.6%	56.9%	53.7%	13.2%
10 to 14 years	52.6%	46.8%	25.2%	52.6%	48.6%	9.1%
15 to 18 years	44.1%	36.1%	25.7%	44.1%	40.2%	
19 to 20 years	25.3%	17.2%	15.7%	25.3%	23.0%	
P-value for chi-square test	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Data Source: Center for Medicaid and CHIP Services (CMS), CMS-416 reports.

Benchmarking the delivery of oral health services to Medicaid-eligible children in Kentucky with the national average for oral health services is an instructive exercise. Over the 15 years from 2000 to 2014, Kentucky tracked closely or exceeded the national average in the percentage of Medicaid-eligible children who received any dental service in early (2000 to 2003 and 2006) and later years (2008 to 2014). However, in 2004, 2005, and 2007, the percentage of children receiving services dropped substantially in Kentucky (Figure 19). This drop is difficult to explain from existing data sources but it may be related to data collection and reporting anomalies. In Kentucky, the percentage of Medicaid-eligible children who received any dental services increased from 33.3% in 2000 to 43.3% in 2014, while the percentage in the US increased over the same 15-year period from 27.0% to 44.1%.

Figure 19. Percentage of Medicaid-eligible children younger than age 21 receiving any dental service in Kentucky and in the US, 2000-2014

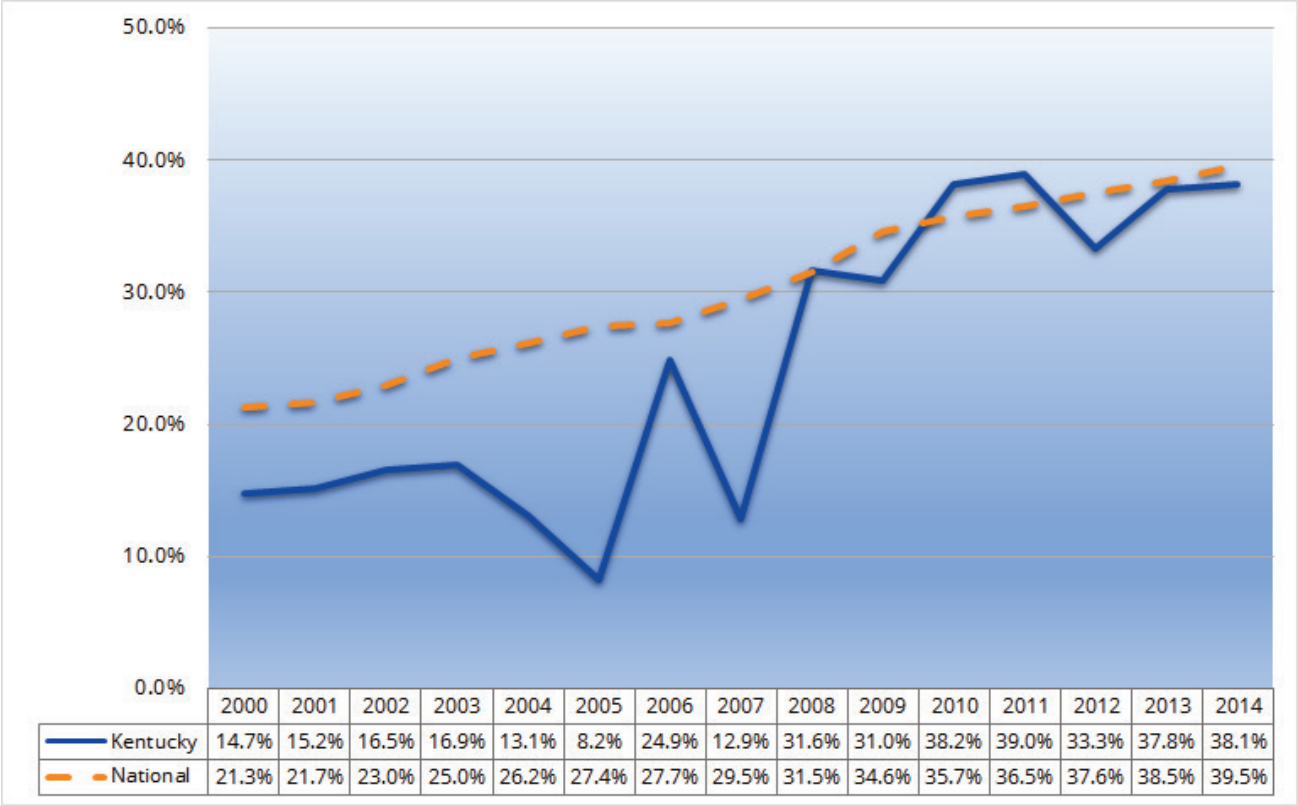


	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Kentucky	33.3%	33.6%	36.4%	36.7%	19.6%	8.2%	32.9%	21.5%	38.1%	36.8%	43.5%	44.3%	38.9%	42.9%	43.4%
National	27.0%	26.6%	27.9%	30.4%	31.7%	32.7%	32.8%	34.3%	36.2%	39.6%	40.7%	41.6%	42.7%	43.2%	44.1%

Data Source: Center for Medicaid and CHIP Services (CMS), CMS-416 reports.

The percentage of Kentucky's Medicaid-eligible children receiving preventive oral health services from 2000 to 2014 was lower than the national percentage of Medicaid-eligible children receiving preventive services, except 2010 and 2011 (Figure 20). The percentage of eligible children receiving services in Kentucky fell precipitously below the national rate in 2005 and 2007. In Kentucky, the percentage of Medicaid-eligible children who received preventive dental services increased overall during the 15-year period from 14.7% in 2000 to 38.1% in 2014 and in the US from 21.3% to 39.5%.

Figure 20. Percentage of Medicaid-eligible children younger than age 21 receiving preventive dental services in Kentucky and in the US, 2000-2014

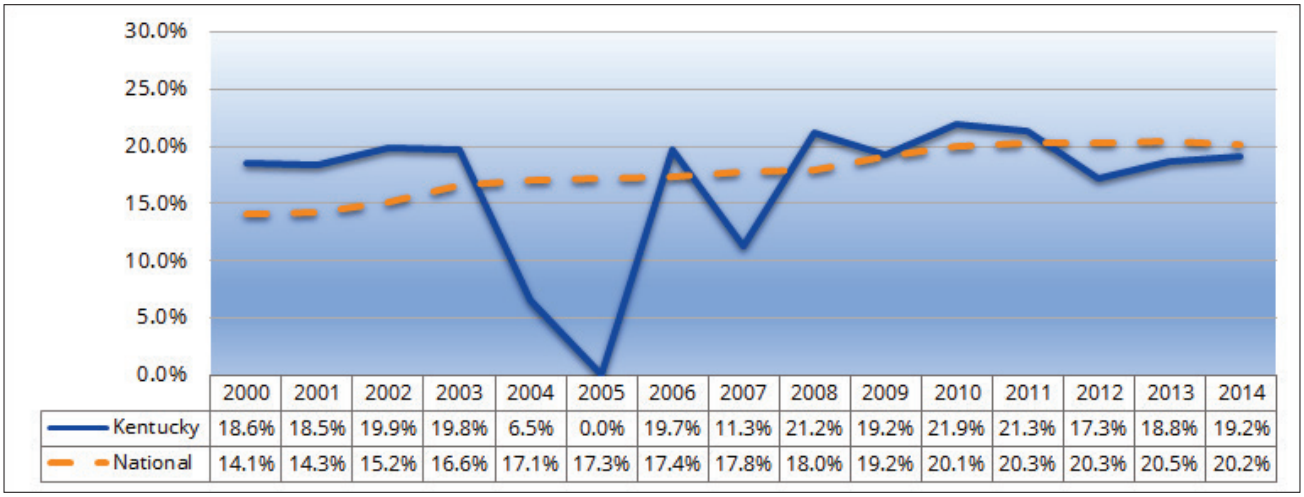


	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Kentucky	14.7%	15.2%	16.5%	16.9%	13.1%	8.2%	24.9%	12.9%	31.6%	31.0%	38.2%	39.0%	33.3%	37.8%	38.1%
National	21.3%	21.7%	23.0%	25.0%	26.2%	27.4%	27.7%	29.5%	31.5%	34.6%	35.7%	36.5%	37.6%	38.5%	39.5%

Data Source: Center for Medicaid and CHIP Services (CMS), CMS-416 reports.

A low rate of dental treatment services can be desirable as an indicator of lack of need for restorative or therapeutic services and an appropriate oral health outcome; however, it may also be an indicator of lack of access to treatment services and an indicator of unmet need. Medicaid-eligible children nationally and in Kentucky were mostly unlikely to have received any dental treatment services annually (Figure 21). Medicaid-eligible children in Kentucky were even less likely than children nationally to receive treatment services in 2012 to 2014 and in 2005 and 2007. The percentage of children receiving dental treatment services in Kentucky was constant during the time period at around 20% (except in 2004 and 2005), while the US percentage increased from 14.1% in 2000 to 20.2% in 2014.

Figure 21. Percentage of Medicaid-eligible children younger than age 21 receiving dental treatment services in Kentucky and in the US, 2000 to 2014



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Kentucky	18.6%	18.5%	19.9%	19.8%	6.5%	0.0%	19.7%	11.3%	21.2%	19.2%	21.9%	21.3%	17.3%	18.8%	19.2%
National	14.1%	14.3%	15.2%	16.6%	17.1%	17.3%	17.4%	17.8%	18.0%	19.2%	20.1%	20.3%	20.3%	20.5%	20.2%

Data Source: Center for Medicaid and CHIP Services (CMS), CMS-416 reports.

National Survey of Children's Health

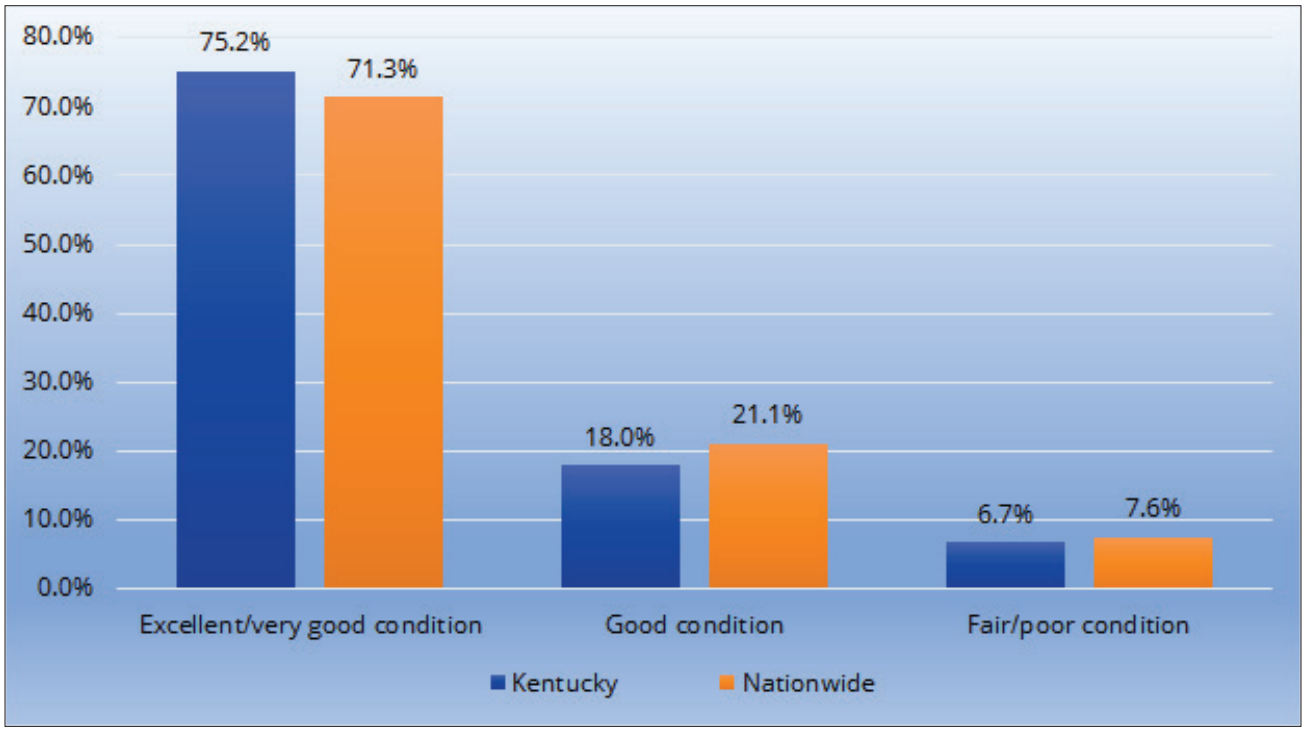
The National Survey of Children's Health (NSCH), sponsored by the US Department of Health and Human Services' MCH Bureau of the Health Resources and Services Administration (HRSA), is a survey of the health and well-being of non-institutionalized children ages 1 to 17. The NSCH is conducted every 4 years (2003 to 2004, 2007 to 2008, and 2011 to 2012) and provides national- and state-level estimates (50 states and Washington, DC) of children's health, including several oral health indicators.[27]

In the 2011 to 2012 NSCH, parents were asked to appraise the overall condition of their children's dental health if their children had natural teeth. A higher percentage of parents of children in Kentucky (75.2%) indicated that their children had excellent or very good dental health than parents nationally (71.3%) (Figure 22). A smaller percentage of children in Kentucky (18.0%) indicated that their children had good

[27] Child and Adolescent Health Measurement Initiative. The National Survey of Children's Health. Data Resource for Child and Adolescent Health. 2013. http://www.childhealthdata.org/learn/NSCH.

dental health than parents nationally (21.3%). A similar percentage of parents in Kentucky (6.7%) and nationally (7.6%) reported that their children's teeth were in fair or poor condition.

Figure 22. Parents' appraisal of overall dental health of children in Kentucky and in the US ages 1 to 17, National Survey of Children's Health, 2011 to 2012



Data Source: National Survey of Children's Health (NSCH).

A smaller proportion of parents of children with special health care needs in Kentucky (64.6%) indicated that their children had excellent or very good dental health than parents of children without special health care needs (79.3%) (Table 4). About 1 in 10 children with special health care needs in Kentucky (9.4%) had fair or poor dental health, as reported by their parents, with an almost 2-fold higher percentage compared to that in children without special health care needs (5.7%).

Table 4. Overall dental health of children ages 1 to 17 in Kentucky by their special health care needs status, National Survey of Children's Health, 2011 to 2012

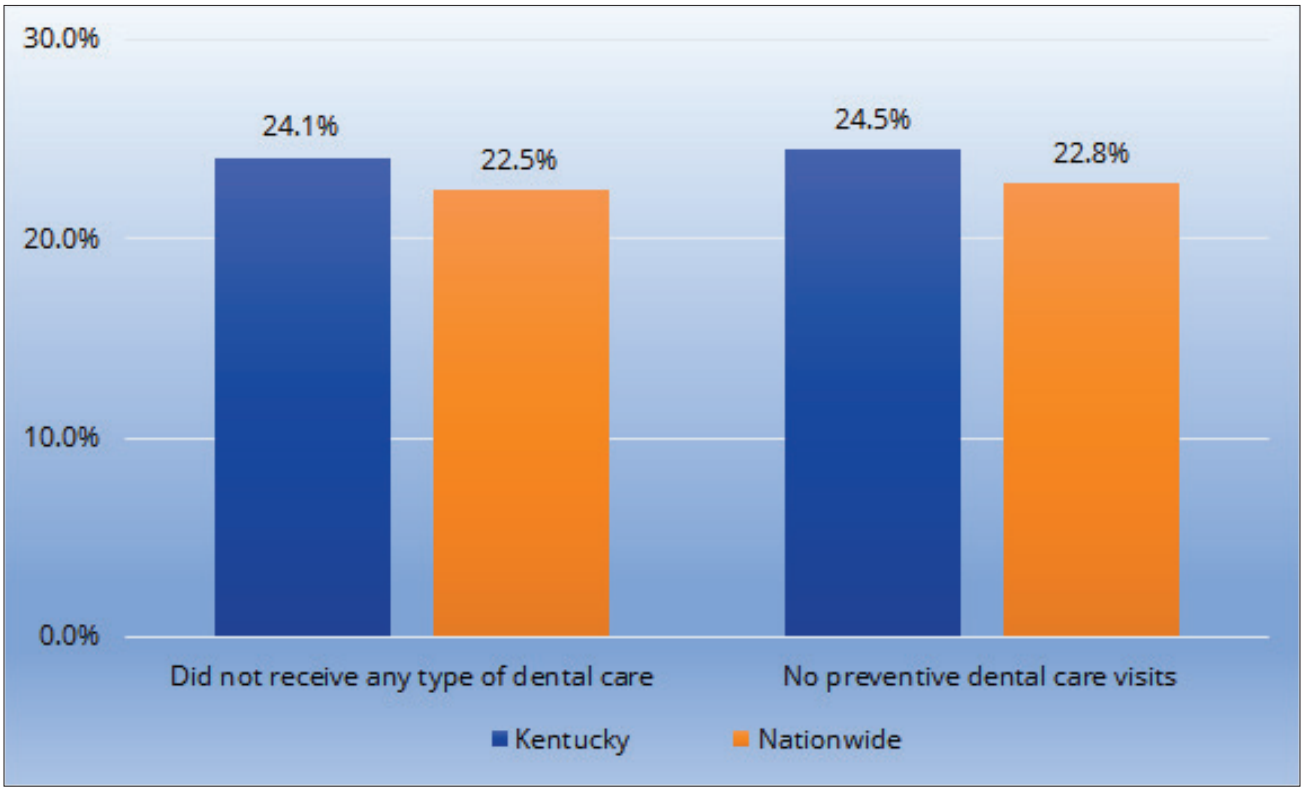
Overall condition of children's teeth	Non-CSHCN		CSHCN	
	%	95% Confidence Interval	%	95% Confidence Interval
Excellent/very good condition	79.3%	76.1%-82.5%	64.6%	58.5%-70.7%
Good condition	15.0%	12.2%-17.8%	26.0%	20.3%-31.8%
Fair/poor condition	5.7%	3.8%-7.6%	9.4%	5.7%-13.0%
Total	**100.0%**		**100.0%**	

Data Source: National Survey of Children's Health (NSCH).

CSHCN - Children with Special Health Care Needs.

Parents of children in Kentucky (24.1%) were slightly more likely than parents nationally (22.5%) to indicate their children had not received any type of dental care, including screening, diagnostic, preventive, or therapeutic services in the previous year (Figure 23). Parents of children in Kentucky (24.5%) were also slightly more likely than parents of children nationally (22.8%) to indicate that their child had not received a preventive oral health service such as check-ups and dental cleanings in the previous year.

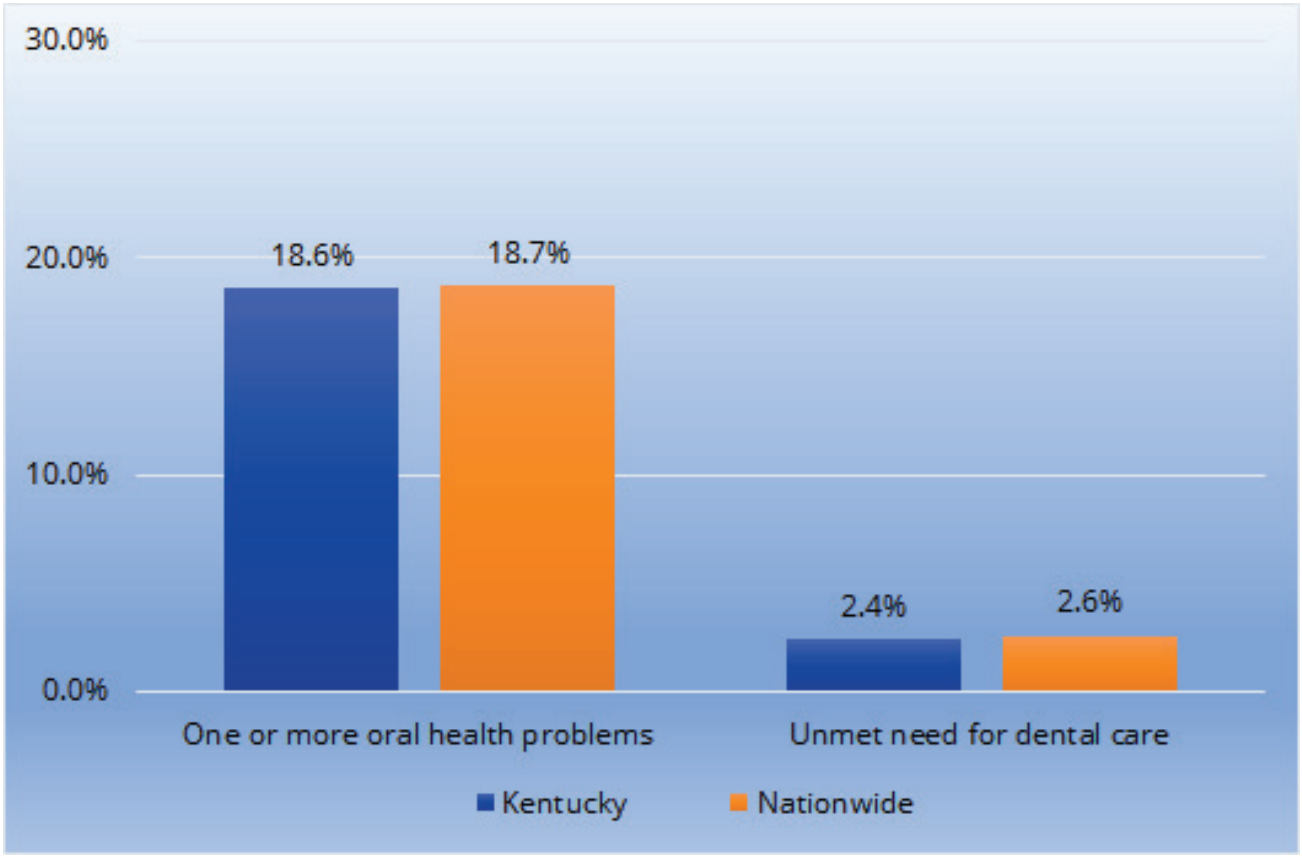
Figure 23. Percentage of children in Kentucky and in the US ages 1 to 17 who did not receive any dental service or any preventive dental care during the past 12 months, National Survey of Children's Health, 2011 to 2012



Data Source: National Survey of Children's Health (NSCH).

Nearly one-fifth of parents in Kentucky (18.6%) as well as nationally (18.7%) indicated the presence of one or more oral health problems such as tooth decay or tooth pain in their children during the previous year (Figure 24). Parents were also asked to indicate if during the past year there was any time when needed oral health care was delayed or not received. A very low percentage of parents in Kentucky (2.4%) and nationwide (2.6%) observed any delayed care or unmet need for dental care in the past year.

Figure 24. Percentage of children in Kentucky and in the US ages 1 to 17 who had one or more oral health problems or had unmet need for dental care during the past 12 months, National Survey of Children's Health, 2011 to 2012



Data Source: National Survey of Children's Health (NSCH).

Annual Dental Exams and Dental Screenings in Kentucky Schools

Preventative health examinations including physical, vision, and dental screenings are required by the Kentucky Board of Education upon initial enrollment to kindergarten and upon reaching 6th grade in Kentucky public schools.[28] School districts also have the option to require other preventative health examinations.

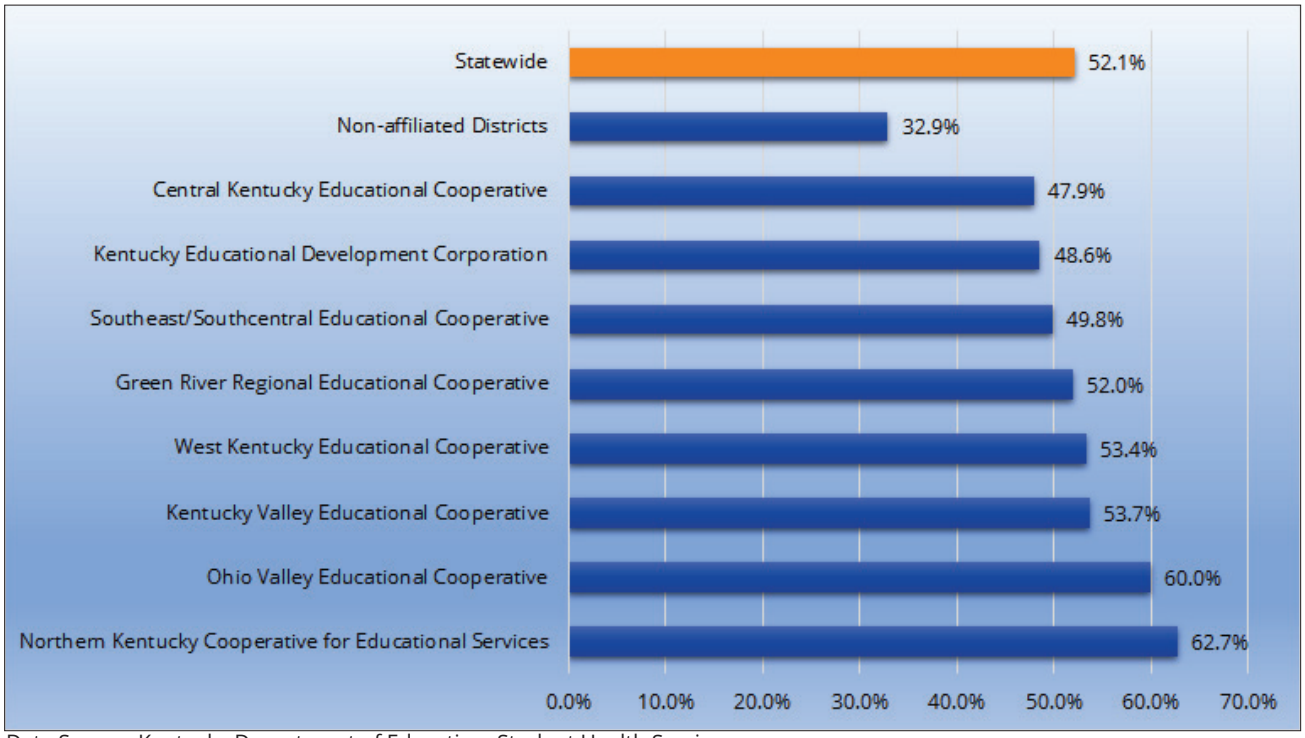
[28] Kentucky Department of Education: Student Health Data. Frankfort, KY: Office of Guiding Support Services/General Counsel, Division of Communications, Kentucky Department of Education. Date last modified October 2, 2015. http://education.ky.gov/districts/SHS/Pages/Student-Health-Data.aspx.

Dental screenings or examinations were required for every 5 or 6 year-old student beginning in the 2010-2011 school year.[29] A dentist, dental hygienist, physician, registered nurse, advanced practice registered nurse, or physician assistant may perform dental screening or examination. However, when a dental screening or examination, not performed by a dentist, identifies the possibility of an oral health problem, the student must be referred to a licensed dentist. According to the Kentucky law (KRS 156.160), dental examination or screening data must be entered in a dental form and reported yearly.

Kentucky has 173 public school districts (120 county school districts and 53 independent school districts), and a total of 1,233 public schools.[30] The public school districts are grouped in 8 educational cooperative regions (Appendix A: Table 2).

Findings from the Kentucky school district reports on school health services in the 2014-2015 academic year show that on average, 52.1% of 5 or 6 year-old students received a dental examination or screening (Figure 25). The average rate of dental examination and/or screening ranged from 62.7% in the Northern Kentucky Cooperative for Educational Services to 32.9% in school districts not affiliated with an educational corporation or cooperative.

Figure 25. The percent of students who received a dental examination or screening by educational cooperative region, school year 2014 to 2015



Data Source: Kentucky Department of Education. Student Health Services.

[29] Kentucky Department of Education. 156.160 - Promulgation of Administrative Regulations by Kentucky Board of Education. http://www.lrc.ky.gov/Statutes/statute.aspx?id=40139.

[30] Kentucky Department of Education: Student Health Services. About Schools and Districts. Frankfort, KY: Office of Guiding Support Services/General Counsel, Division of Communications, Kentucky Department of Education. Date last modified July 2, 2013. http://education.ky.gov/comm/schdist/Pages/default.aspx.

A report describing health services in Kentucky School Districts presented the findings of a study of school health services offered in Kentucky school districts during the 2008 to 2009 school year.[31] The study included physical, dental, and mental health and/or substance abuse services provided in Kentucky school districts including services offered, supportive funding, and service providers.

The results of the report stated that 72% of the 137 respondent school districts (174 total school districts) provided dental health services to their students. The dental health services offered were mainly oral health screenings and prevention counseling (48%); fewer than a quarter of the school districts offered dental services that included cleanings, X-rays, fillings, and extractions. Almost half of the school districts provided oral health screenings in elementary schools, while only 15% provided screenings to middle school students and only 8% provided screenings to high school students.

A Study of Children's Oral Health in South Central Kentucky

A research study was conducted in south central Kentucky to evaluate the percent of untreated dental caries among school children aged 6 to 15 years.[32] Between 2006 and 2011, more than 2,000 school children participated in a dental sealant program and received dental examinations and preventive dental services at no cost to their parents. Mobile Dental United operated by the Institute for Rural Health at Western Kentucky University provided dental services.

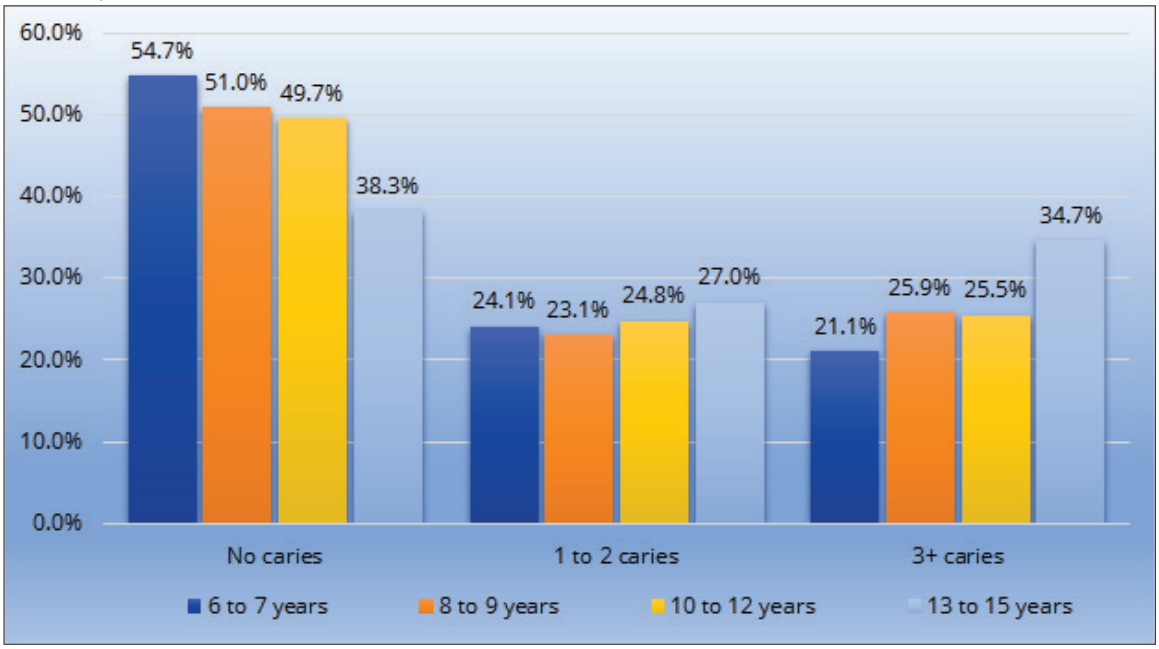
A total of 2,453 school children were included in the study. The majority were 6 to 9 years old (85.2%), White (82.2%), and living in a rural area (57.8%). Many had dental insurance: 44.7% had private dental insurance; 38% had public insurance (eg, Medicaid, KCHIP); and 10.7% had no insurance. Findings included that socioeconomic characteristics had a significant impact on untreated dental caries in school age children in south central Kentucky. The main findings are presented below in charts describing the severity of untreated caries (no caries, 1 to 2 carious lesions, and 3 or more carious lesions) in the study population.

Analyses of the data included age cohort and presence or absence of oral disease. Children in the two youngest age cohorts were more likely than older children to have no caries experience. A corollary finding was that children in the oldest cohort (13 to 15 years) were significantly more likely than other children to have three or more carious lesions (Figure 26).

[31] Kentucky Youth Advocates and the University of Louisville. A Picture of Health: A Report of Kentucky's School Districts' Health Services. Foundation for a Healthy Kentucky. March 2011. http://www.healthyky.org/sites/default/files/Kentucky%20Youth%20Advocates%20School%20Health%20Services%20Report-FINAL.pdf.

[32] Dawkins E, Michimi A, Ellis-Griffith G, et al. Dental caries among children visiting a mobile dental clinic in South Central Kentucky: a pooled cross-sectional study. BMC Oral Health. 2013; 13(1):19. http://www.biomedcentral.com/content/pdf/1472-6831-13-19.pdf.

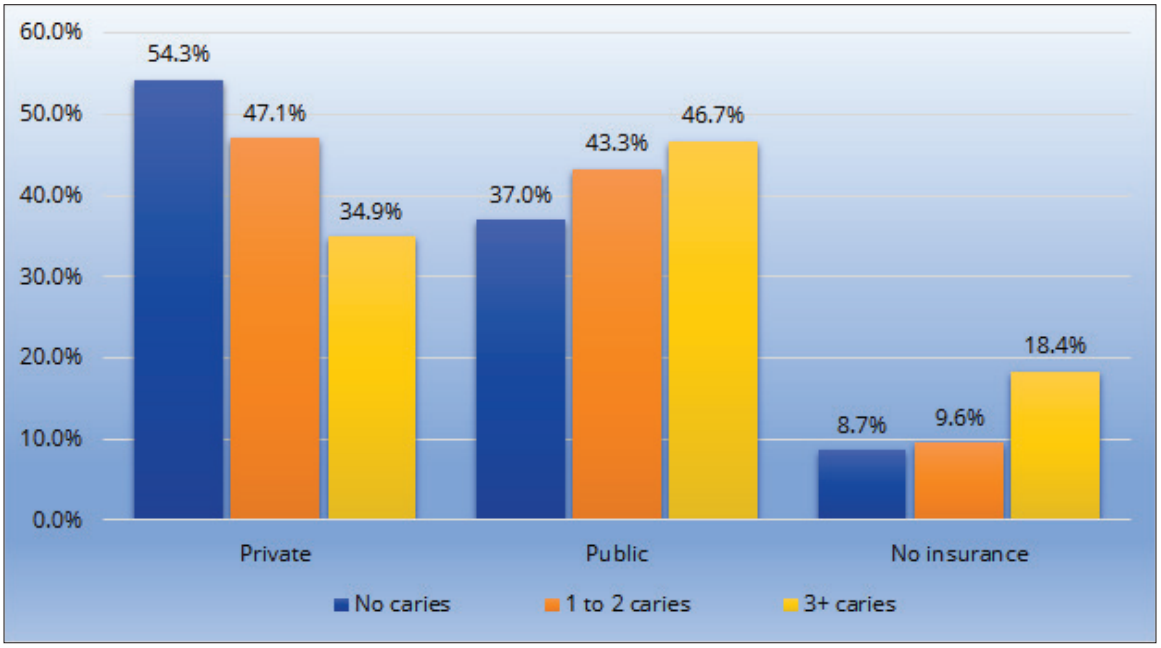
Figure 26. Percentage of school children by age and number of untreated carious lesions in South Central Kentucky, 2006 to 2011



Data Source: Dental caries among children visiting a mobile dental clinic in South Central Kentucky.

The analysis of insurance coverage found that children with private insurance experienced a significant decrease in severity of untreated caries (54.3%, 47.1%, 34.9%) and those with public insurance experienced increasing severity of untreated caries (37.0%, 43.3%, 46.7%). Increasing severity of caries was also evidenced in children with no insurance (8.7%, 9.6%, 18.4%) (Figure 27).

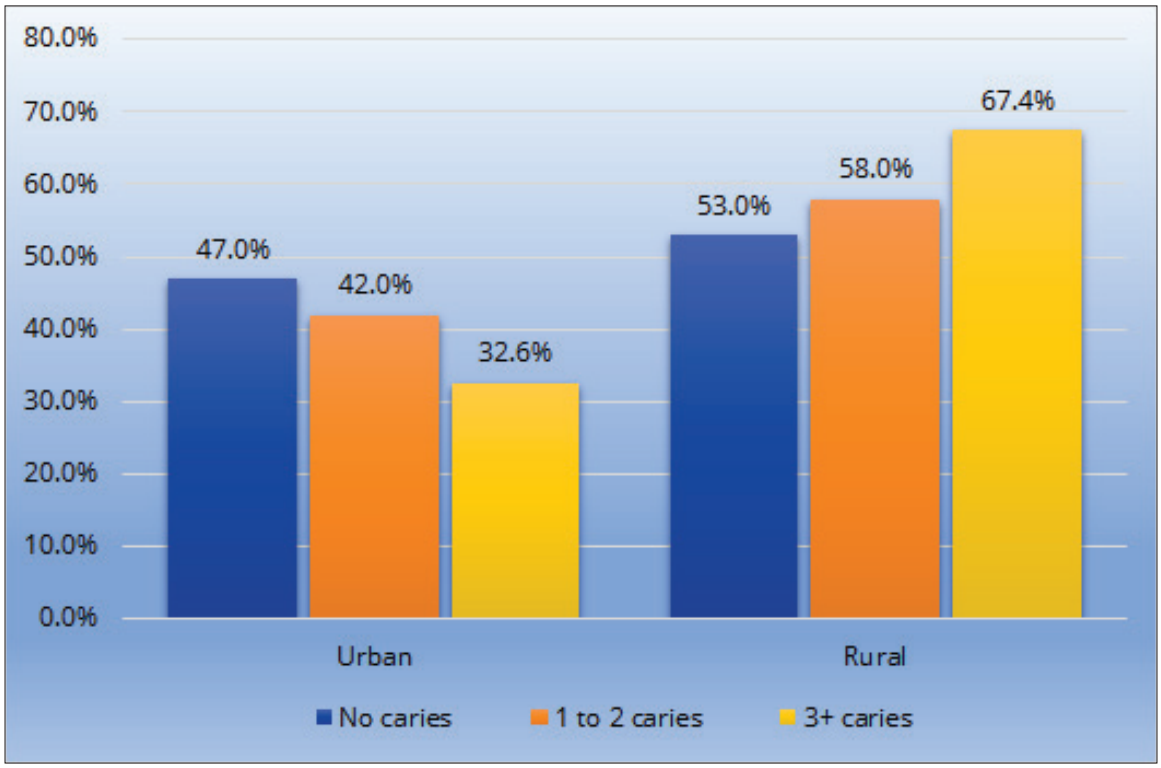
Figure 27. Percentage of school children by insurance coverage and number of untreated caries in South Central Kentucky, 2006 to 2011



Data Source: Dental caries among children visiting a mobile dental clinic in South Central Kentucky.

Analysis of the data by urban or rural location of residence showed a significant decrease in the proportion of children with untreated caries among school children living in urban areas (47.0%, 42.0%, 32.6%), and an increase in the proportion of children with untreated caries among school children living in rural areas (53.0%, 58.0%, 67.4%) (Figure 28).

Figure 28. Percentage of school children by urban or rural residence location and number of untreated caries in South Central Kentucky, 2006 to 2011



Data Source: Dental caries among children visiting a mobile dental clinic in South Central Kentucky.

Kentucky Children's Oral Health Survey

In the 2000 to 2001 academic year, the Kentucky Department for Public Health in cooperation with the University of Kentucky and the University of Louisville conducted an oral health screening survey of more than 5,600 3rd grade and 6th grade children across Kentucky.[6] Health and oral health professionals surveyed 600 preschool children (aged 2 to 4 years) using clinical examination to assess their oral health status. The results from the oral health screening examinations of these children as well as findings from a parent completed questionnaire about access to care and utilization of oral health services are summarized below.

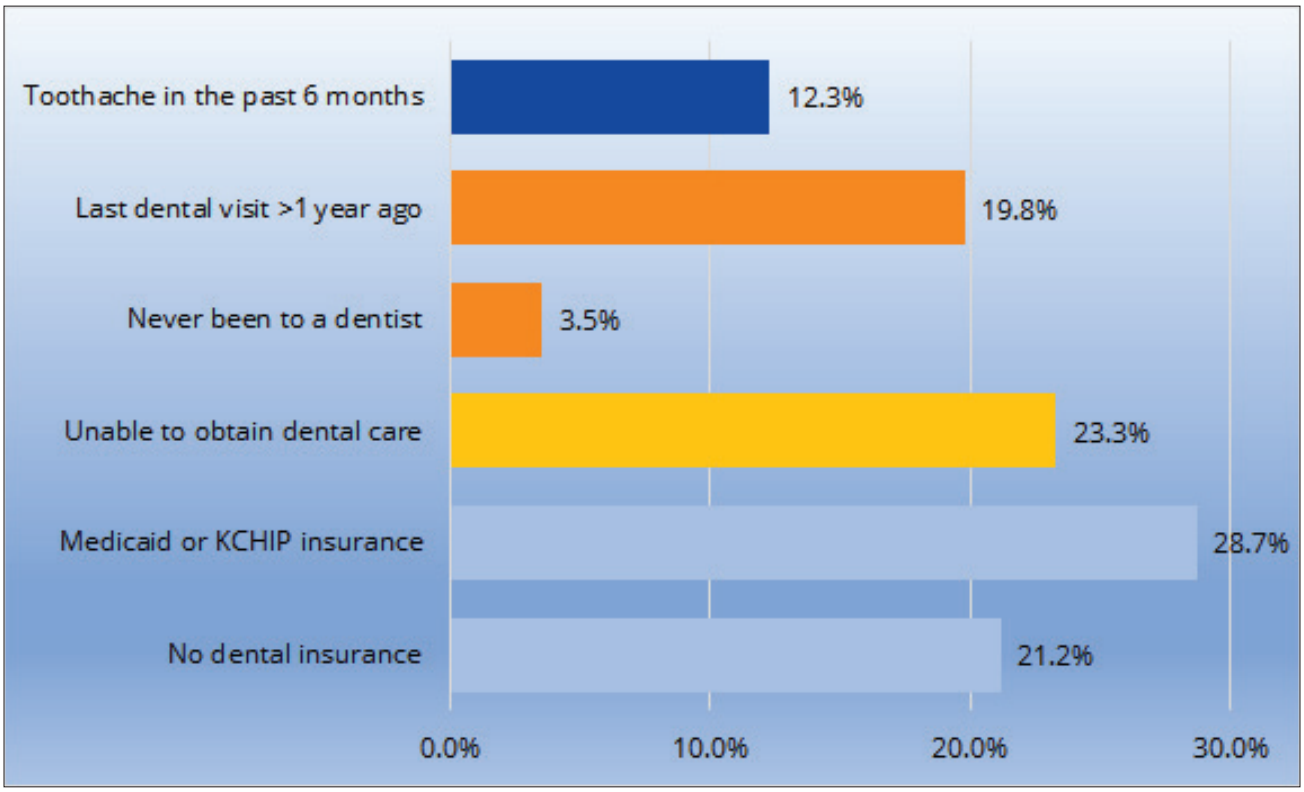
Figure 29 illustrates the findings from the parental questionnaire. Parents indicated that 12.3% of school children in 3rd grade and 6th grade had a toothache in the past 6 months. Nearly one-fifth (19.8%) of children had not been to a dentist in more than 1 year and 3.5% had never been to a dentist. Parents

indicated their inability to obtain dental care for about a quarter (23.3%) of the children needing dental care.

There was geographic variation in the ability of parents to find dental services for their children. More of the parents in the eastern (24.1%) and northern (26.8%) regions reported an inability to obtain oral health care for their children than did parents statewide or in other regions.

More than a quarter of the children in the study (28.7%) had Medicaid or KCHIP insurance and 21.2% had no dental insurance. Children in eastern Kentucky were more likely to be insured by Medicaid (23.2%) than children in other regions of the state.

Figure 29. Access to care and utilization of oral health services by school children in 3rd grade and 6th grade in Kentucky as reported by their parents, Kentucky Children's Oral Health Survey, 2000 to 2001



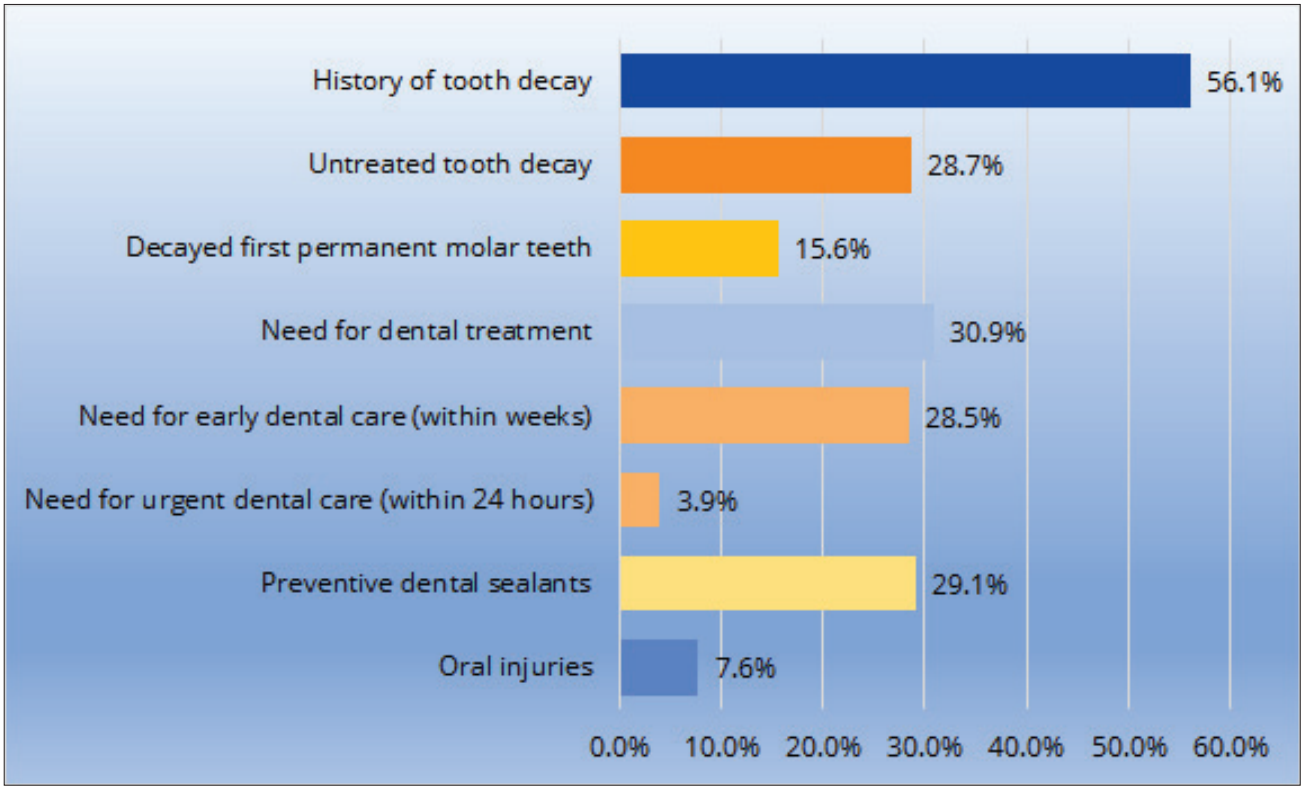
Data Source: Kentucky Children's Oral Health Survey.

Figure 30 presents the findings from the dental screening portion of the study. School children in 3rd grade and 6th grade in Kentucky were included as the study group. Statewide, more than half (56.1%) had caries experience (defined as a history of 1 or more treated or untreated carious lesions) and more than a quarter (28.7%) had untreated dental caries. Almost 1 in 6 children (15.6%) had a decayed permanent first molar. Nearly one-third (30.9%) of children in this report needed dental care.

The urgency of needed dental treatment by children varied. More than one-quarter (28.5%) needed early dental care and 3.9% of children needed urgent dental care as a result of pain, infection, or swelling. About one-third (29.1%) of the screened children had preventive dental sealants and 7.6% of children had oral injuries.

There was geographic variation in oral health status. The percentages of children with caries experience (60.5%), untreated tooth decay (32.6%), and a need for urgent dental care (7.7%) were the highest in eastern Kentucky. Oral health status of children also varied by age group. The percentages of children with caries experience (59.8%), and untreated tooth decay (34.6%) were the highest in the 3rd grade cohort of students in Kentucky.[33]

Figure 30. Findings from the dental screenings of school children in 3rd grade and 6th grade in Kentucky, Kentucky Children's Oral Health Survey, 2000 to 2001

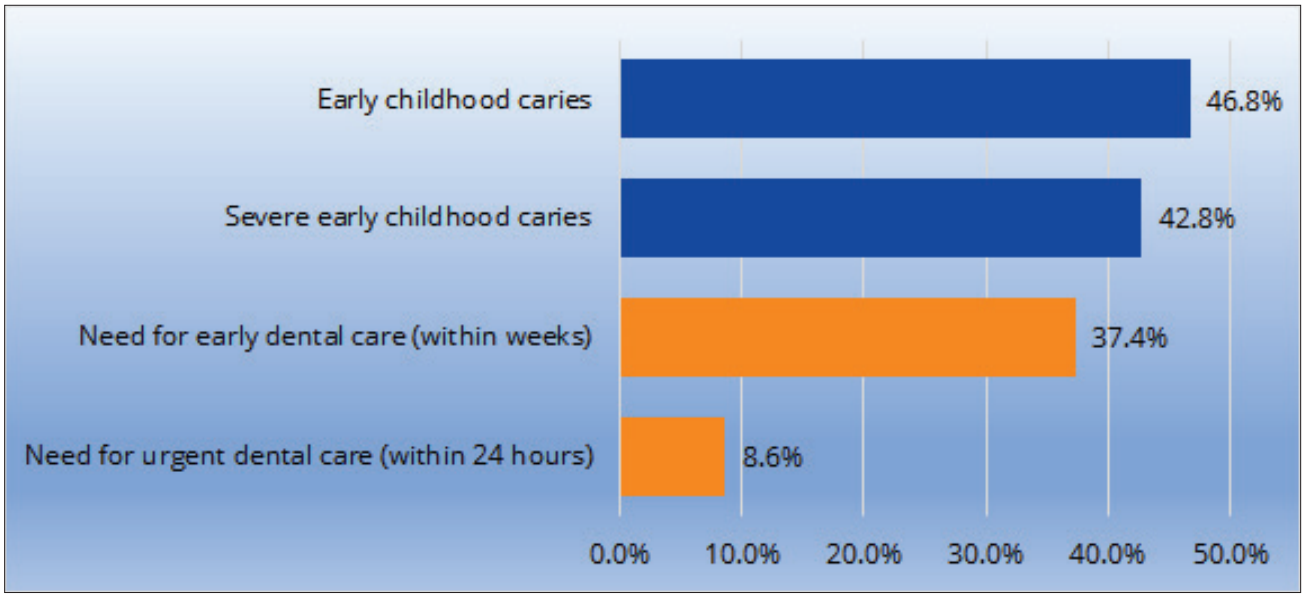


Data Source: Kentucky Children's Oral Health Survey.

[33] Centers for Disease Control and Prevention: Oral Health Data. Atlanta, GA: Centers for Disease Control and Prevention. Date last modified April 1, 2015. http://www.cdc.gov/oralhealthdata/.

Figure 31 presents the findings from the dental screening of preschool children. Throughout Kentucky, a high percentage of preschool children had early childhood caries (ECC) experience (46.8%), and severe ECC experience (42.8%). Four year old preschoolers had the highest prevalence of ECC (55.5%), and severe ECC (47.0%). More than one-third (37.4%) of preschool children needed early dental care (within weeks) and 8.6% needed urgent dental care. No regional level data were available for preschool children because of the small sample size.

Figure 31. Dental screening findings for preschool children 2 to 4 years old in Kentucky, Kentucky Children's Oral Health Survey, 2000 to 2001



Data Source: Kentucky Children's Oral Health Survey.

The findings from the parental questionnaire completed by parents of preschool children ages 2 to 4 years showed that 39.3% of these children had never been to a dentist. According to parents, the majority of preschool children had Medicaid or KCHIP (53.9%) insurance, while 13.1% had no dental insurance.

Healthy People 2020

Healthy People 2020 is a set of 10-year objectives for improving the health of the US population.[34] Healthy People 2020 sets goals for prevention activities and priorities to reduce chronic disease incidence in the population. These health targets allow states to benchmark progress in improving population health. Healthy People 2020 goals include several related to oral health.

One of the oral health goals of Healthy People 2020 is to reduce the proportion of children ages 6 to 9 with dental caries experience in their primary or permanent teeth. The National Health and Nutrition Examination Survey found that 54.4% of children in the US in this age group had caries experience in the baseline years (1999 to 2004) and 57.7% of children had caries experience in the final years (2011 to 2012). The goal for 2020 is to reduce the proportion of children ages 6 to 9 with dental caries experience to 49.0% nationally. In 2000-2001, 56.1% of children in Kentucky, 59.8% of students enrolled in third grade, and 60.5% of children in eastern Kentucky in the third grade and sixth grade survey had caries experience in their primary or permanent teeth. These results were above the national proportion of children with caries experience (54.4%) in the baseline years (1999 to 2004).

Healthy People 2020 includes a goal to reduce the proportion of children age 6 to 9 with untreated dental caries in their primary or permanent teeth from the baseline years (1999 to 2004) from 28.8% to 25.9%. The percentage of children with untreated decay in Kentucky was above the baseline in the eastern region (32.6%) and among students enrolled in third grade (34.6%).

Healthy People 2020 also includes an oral health goal to reduce the proportion of preschool children aged 3 to 5 years with dental caries experience in their primary teeth from a baseline in 1999 to 2004 of 33.3% to 30.0%. About half (46.8%) of preschool children aged 2 to 4 years in the Kentucky Oral Health Survey had caries experience.

Smile Kentucky Program

The Smile Kentucky program was created in 2002 to increase access to preventive and restorative oral health services for children from low-income families.[35] From 2002 to 2013, the program provided free dental screenings to 39,000 children and oral health treatment to over 3,000 children in third grade and six grade across 12 counties in Kentucky using volunteer dentists. Data collected in 2008 were analyzed

[34] Healthy People, Office of Disease Prevention and Health Promotion. Oral Health. Date last modified January 12, 2016. http://www.healthypeople.gov/2020/topics-objectives/topic/oral-health/objectives#4993.

[35] Smile Kentucky. 2013 Fact Sheet. http://www.smilekentucky.com/Smile%20Kentucky%20Fact%20Sheet%20January%202013.pdf.

and results published in a research article in 2012.[36] The findings indicated that 1 in 3 school children in the program had untreated caries and about 1 in 4 children needed urgent oral health care. Children residing in metropolitan areas, those without a dental visit in the past 3 years, and uninsured children were more likely to have caries than others. The prevalence of untreated caries in children screened through Smile Kentucky was similar to prevalence found among children in Kentucky in the NSCH.

Oral Health of Adults

The Behavioral Health Risk Factor Surveillance System

The CDC with cooperation from states manages the BRFSS. The BRFSS is a nationwide surveillance system that uses telephone survey research to collect data on prevalence and incidence of chronic disease, utilization of health services, and personal health behaviors, such as smoking, alcohol consumption, seat belt use, and nutritional practices that increase risk of impaired health status in the population. The BRFSS was first implemented nationwide in 1993 and consists of a fixed core of questions (including standard questions on demographics and health behaviors), a rotating core (2 sets of questions asked in alternating years), and an emerging core (questions focused on current issues) as well as optional modules and state-added questions about specific health conditions.[37] An oral health module was introduced as 1 of the rotating core modules in 1995. The most recent year for which national and state level population oral health data are available is 2012.

According to BRFSS 2012 data, the percentage of the population of adults ages 18 and older in Kentucky who have not visited a dentist or dental clinic in the past year (39.7%) was higher than the percentage of adults in the US (34.5%) without a dental visit (Table 5). Kentucky ranked 10th highest in the US for the percentage of the state's adult population without a dental visit within the prior year. Kentucky ranked 8th highest in the nation for the percentage of adults ages 18 and older who had any permanent teeth extracted due to tooth decay or gum disease (50.3%); the US percentage is 44.9%. Adults ages 65 and older in Kentucky (51.5%) were more likely than those across the US (39.6%) to have had 6 or more permanent teeth extracted, placing Kentucky at 5th highest in the nation on this negative measure of oral health. Kentucky also ranked 5th highest in the nation for the percentage of adults ages 65 and older who had all their natural teeth extracted (24.8%). The national rate of edentulism is 16.2%.

[36] Kandel E, Richards J, Binkley C. Childhood caries in the state of Kentucky, USA: a cross-sectional study. BMC Oral Health. 2012; 12(1):38. http://www.biomedcentral.com/content/pdf/1472-6831-12-38.pdf.

[37] Centers for Disease Control and Prevention: Behavioral Risk Factor Surveillance System. Atlanta, GA: Centers for Disease Control and Prevention. Date last modified November 13, 2015. http://www.cdc.gov/brfss/questionnaires/index.htm.

Table 5. Prevalence of oral health indicators by state, Behavioral Risk Factor Surveillance System, 2012

Adults aged 18+ who have NOT visited a dentist in the past year		Adults aged 18+ who have had natural teeth extracted		Adults aged 65+ who have had six or more natural teeth extracted		Adults aged 65+ who have had all their natural teeth extracted	
United States	**34.5%**	**United States**	**44.9%**	**United States**	**39.6%**	**United States**	**16.2%**
Arkansas	45.1%	West Virginia	61.6%	West Virginia	65.1%	West Virginia	33.8%
Mississippi	44.6%	Mississippi	57.7%	Louisiana	56.4%	Louisiana	28.8%
Louisiana	43.9%	Alabama	54.3%	Mississippi	53.7%	Mississippi	25.0%
West Virginia	43.6%	Louisiana	54.1%	Alabama	52.3%	Missouri	24.9%
Alabama	41.4%	Tennessee	52.7%	**Kentucky**	**51.5%**	**Kentucky**	**24.8%**
Texas	41.2%	Arkansas	50.7%	Tennessee	50.3%	Tennessee	24.8%
Oklahoma	41.1%	Maine	50.6%	Missouri	49.4%	Arkansas	23.7%
South Carolina	40.4%	**Kentucky**	**50.3%**	Arkansas	48.4%	Alabama	23.6%
Florida	40.2%	South Carolina	49.5%	North Carolina	47.7%	Maine	22.1%
Kentucky	**39.7%**	Pennsylvania	49.2%	Maine	46.9%	North Carolina	21.0%
Nevada	39.2%	Oklahoma	48.9%	South Carolina	46.8%	Oklahoma	21.0%
New Mexico	39.1%	New York	48.8%	Oklahoma	46.3%	Ohio	20.3%
Montana	39.0%	Florida	48.7%	Georgia	44.1%	Indiana	19.7%
Tennessee	38.6%	Indiana	48.1%	Ohio	43.9%	South Carolina	19.5%
Arizona	38.4%	North Carolina	47.4%	Pennsylvania	43.8%	South Dakota	19.4%
Missouri	38.2%	Nevada	47.3%	South Dakota	43.7%	Kansas	18.8%
Indiana	37.4%	Missouri	47.1%	Delaware	43.4%	Georgia	18.4%
Georgia	35.9%	New Jersey	45.0%	New York	43.2%	Pennsylvania	18.2%
North Carolina	35.1%	Delaware	44.7%	North Dakota	42.7%	Montana	18.1%
Colorado	34.7%	Ohio	44.6%	Indiana	42.5%	Wyoming	17.7%
Maine	34.7%	Georgia	44.6%	Maryland	41.4%	Vermont	17.5%
Oregon	34.7%	New Mexico	44.6%	Illinois	41.2%	Iowa	17.3%
Wyoming	34.0%	Illinois	44.5%	Massachusetts	40.2%	North Dakota	17.1%
Illinois	33.1%	Arizona	44.0%	Iowa	39.2%	Delaware	16.9%
California	33.0%	South Dakota	43.8%	Montana	39.2%	New Mexico	16.2%
North Dakota	32.8%	New Hampshire	43.3%	Vermont	39.2%	Idaho	16.1%
Kansas	32.7%	Massachusetts	42.7%	Virginia	38.6%	Illinois	16.1%
Alaska	32.6%	North Dakota	42.7%	District Columbia	38.5%	Virginia	16.1%
New York	32.5%	Maryland	42.7%	New Jersey	38.5%	Florida	15.8%
Idaho	32.4%	Michigan	42.5%	Kansas	38.3%	Alaska	15.6%
Nebraska	32.4%	Kansas	42.3%	Nevada	38.3%	Massachusetts	15.5%
Ohio	32.4%	Vermont	42.2%	Florida	38.1%	Nevada	15.1%
Washington	32.4%	Montana	42.1%	Rhode Island	38.1%	New York	15.1%
Michigan	32.0%	Texas	42.1%	Wyoming	37.6%	Oregon	15.0%
Utah	31.6%	Rhode Island	41.8%	New Hampshire	37.1%	Maryland	14.5%
Pennsylvania	31.5%	Idaho	41.7%	Idaho	37.0%	New Jersey	14.0%
Delaware	30.0%	Wyoming	41.5%	New Mexico	36.9%	Connecticut	13.6%
Hawaii	29.6%	Iowa	41.1%	Alaska	36.6%	Wisconsin	13.5%
Virginia	29.6%	Virginia	41.1%	Michigan	35.8%	Nebraska	13.4%
Vermont	29.2%	California	40.7%	Connecticut	35.6%	Texas	13.4%
South Dakota	29.1%	Hawaii	40.6%	Wisconsin	35.3%	Arizona	13.3%
District of Columbia	28.9%	Connecticut	40.6%	Oregon	34.7%	Michigan	13.3%
Iowa	28.9%	Oregon	40.0%	Arizona	34.3%	District of Columbia	13.1%
New Jersey	28.8%	Alaska	39.7%	Nebraska	33.7%	New Hampshire	13.1%
Wisconsin	28.0%	Nebraska	39.3%	Texas	33.4%	Utah	12.9%
Maryland	27.3%	Wisconsin	38.2%	Colorado	32.4%	Rhode Island	12.5%
New Hampshire	26.9%	District of Columbia	37.8%	Minnesota	30.7%	Colorado	12.4%
Rhode Island	26.4%	Washington	37.8%	Washington	30.4%	Minnesota	12.0%
Minnesota	25.2%	Colorado	37.1%	Utah	29.7%	Washington	11.0%
Connecticut	23.9%	Minnesota	34.8%	California	28.8%	California	8.7%
Massachusetts	23.8%	Utah	33.3%	Hawaii	25.8%	Hawaii	7.0%

Data Source: Behavioral Risk Factor Surveillance System (BRFSS).

The oral health status of adults in Kentucky varied by race/ethnicity, socioeconomic level, and educational attainment. Adults in certain racial or ethnic groups and those with lower incomes and lower levels of education exhibited poorer outcomes on measures of oral health status than other adults in Kentucky.

The following table and charts provide information about adult oral health in Kentucky. The percentage of adults who reported no dental visit in the prior year on the BRFSS surveys experienced a net increase of 7% between 2002 and 2012 in Kentucky. The net increase in no recent dental visit was greatest in certain population groups including adults ages 35 to 44 (12.5%), men (10.1%), Non-Hispanic Blacks (13.9%), those with less than a high school education (9.9%) and those with incomes between $25,000 and $34,999 (10.0%) (Table 6).

Table 6. Time trend in the prevalence of adults ages 18 and older without a dental visit in the past year in Kentucky by demographic characteristics, Behavioral Risk Factor Surveillance System, 2002 to 2012

Demographic Characteristics	2002	2004	2006	2008	2010	2012	Net Change 2002-2012
Statewide							
All adults aged 18+ years	32.7%	30.2%	37.7%	36.1%	38.0%	39.7%	7.0%
Age							
18–24 years	32.5%	17.8%	34.5%	28.8%	40.0%	34.8%	2.3%
25–34 years	31.2%	27.1%	33.8%	35.1%	38.9%	35.7%	4.5%
35–44 years	26.8%	27.1%	36.4%	35.2%	34.9%	39.3%	12.5%
45–54 years	31.4%	30.3%	37.2%	35.6%	35.6%	39.5%	8.1%
55–64 years	35.8%	35.4%	39.5%	37.2%	36.8%	40.0%	4.2%
65+ years	41.5%	43.4%	45.2%	42.5%	42.9%	47.0%	5.5%
Gender							
Female	30.8%	29.0%	37.5%	33.0%	34.2%	34.9%	4.1%
Male	34.7%	31.6%	37.8%	39.5%	42.0%	44.8%	10.1%
Race/ethnicity							
White, non-Hispanic	32.9%	30.0%	37.1%	35.7%	37.2%	38.8%	5.9%
Black, non-Hispanic	33.1%	32.5%	N/A	39.0%	42.1%	47.0%	13.9%
Hispanic	N/A	N/A	N/A	N/A	N/A	33.6%	-
Other	N/A	N/A	N/A	N/A	N/A	49.1%	-
Multiracial	N/A	N/A	N/A	N/A	N/A	51.0%	-
Education							
Less than H.S.	54.5%	58.4%	67.1%	63.4%	60.4%	64.4%	9.9%
H.S. or G.E.D.	33.5%	31.2%	40.6%	43.7%	46.6%	42.1%	8.6%
Some post H.S.	27.0%	22.1%	34.0%	30.7%	35.6%	33.9%	6.9%
College graduate	16.6%	19.3%	20.6%	19.9%	20.9%	21.5%	4.9%
Annual Household Income							
Less than $15,000	57.3%	50.3%	64.0%	61.3%	60.5%	64.6%	7.3%
$15,000 – $24,999	44.1%	44.8%	59.2%	55.2%	55.8%	53.2%	9.1%
$25,000 – $34,999	34.0%	29.9%	43.5%	42.9%	46.2%	44.0%	10.0%
$35,000 – $49,999	26.7%	25.3%	29.4%	37.2%	39.8%	33.0%	6.3%
$50,000+	17.5%	13.6%	21.1%	21.9%	21.3%	22.8%	5.3%

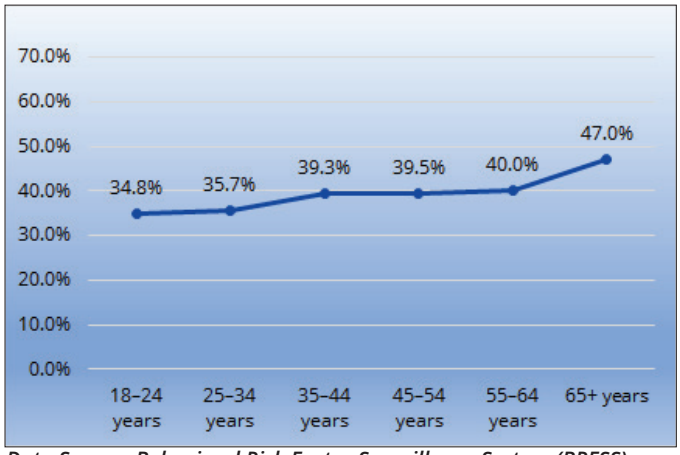
Data Source: Behavioral Risk Factor Surveillance System (BRFSS).

N/A - Not available if the unweighted sample size for the denominator was < 50 or the 95% Confidence Interval half width was > 10 for any cell, or if the state did not collect data for that calendar year.

H.S. - High School; G.E.D. - General Equivalency Diploma.

A positive indicator of utilization of oral health services and appropriate servicing of oral health needs is a report of visiting a dentist, dental hygienist, or dental clinic in the previous year. However, nearly 40% of adults in Kentucky ages 18 and older had not visited a dentist in the year prior to the 2012 BRFSS survey (Table 4). The characteristics of adults who had not visited a dentist in the previous year varied by age, gender, race/ethnicity, education, and income. The prevalence of adults ages 18 and older who had not visited a dentist in the year prior, increased by age, with younger adults ages 18 to 24 having the lowest prevalence (34.8%) and older adults ages 65 and older having the highest prevalence (47.0%) of not utilizing dental services (Figure 32).

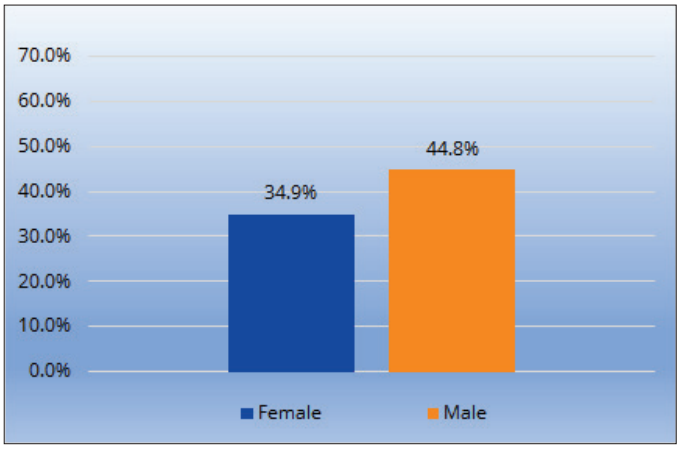
Figure 32. Prevalence of adults ages 18 and older without a dental visit in the past year in Kentucky by age, Behavioral Risk Factor Surveillance System, 2012



Data Source: Behavioral Risk Factor Surveillance System (BRFSS).

Males were more likely than females to have not visited an oral health provider in the previous year with 44.8% of male respondents indicating no utilization of dental services compared to 34.9% of female respondents (Figure 33).

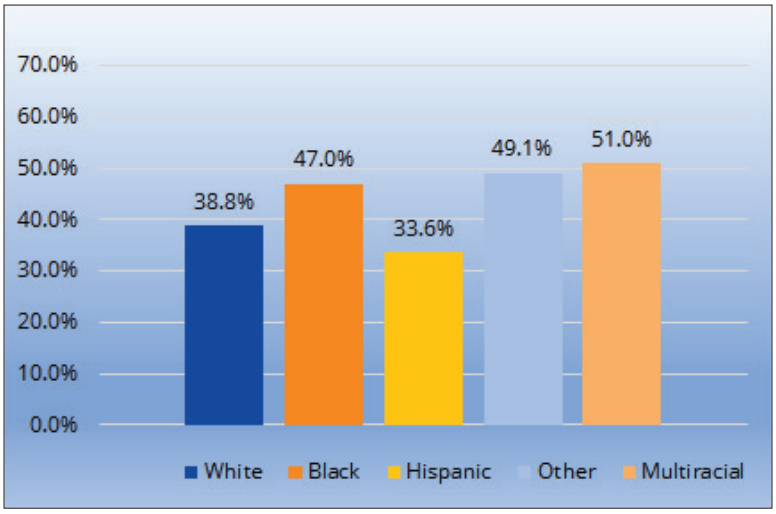
Figure 33. Prevalence of adults ages 18 and older without a dental visit in the past year in Kentucky by gender, Behavioral Risk Factor Surveillance System, 2012



Data Source: Behavioral Risk Factor Surveillance System (BRFSS).

Non-Hispanic Blacks (47.0%), other races than Whites and Blacks (49.1%) and multiracial adults (51.0%) were more likely than Non-Hispanic Whites (38.8%) or Hispanics (33.6%) to have not visited a dentist in the previous year (Figure 34).

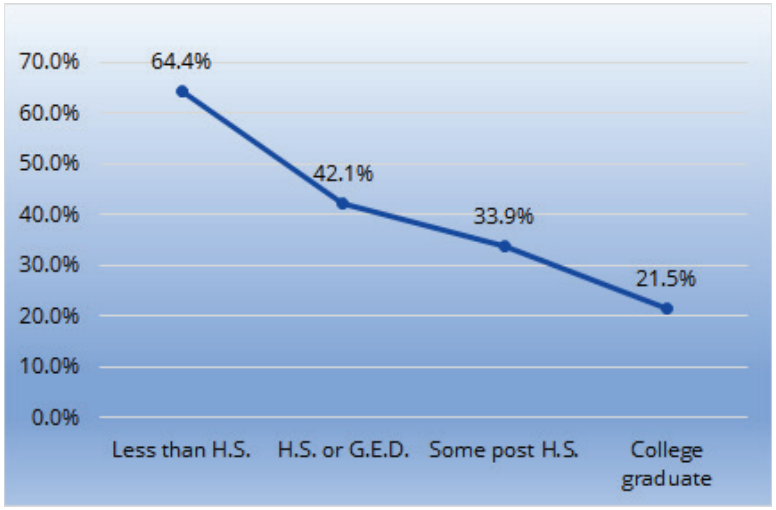
Figure 34. Prevalence of adults ages 18 and older without a dental visit in the past year in Kentucky by race/ethnicity, Behavioral Risk Factor Surveillance System, 2012



Data Source: Behavioral Risk Factor Surveillance System (BRFSS).

The prevalence of adults who had not visited a dentist in the prior year decreased with increasing level of educational attainment; adults with less than a high school education had the highest prevalence (64.4%) and college graduates had the lowest prevalence (21.5%) of not utilizing dental services (Figure 35).

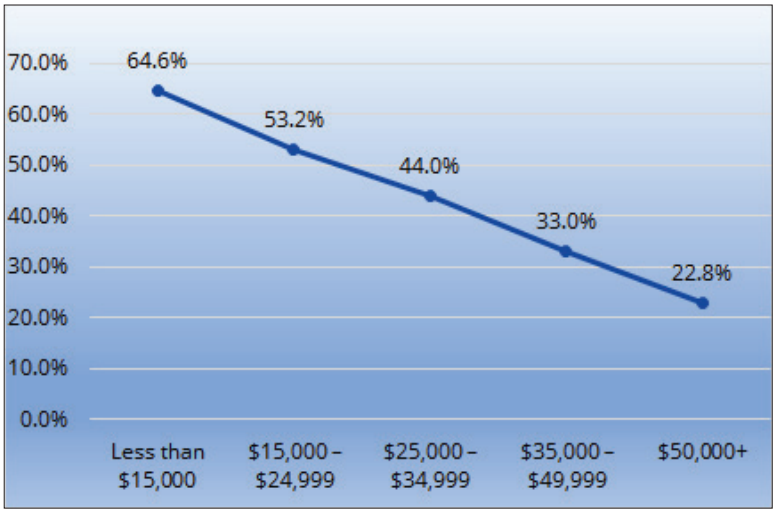
Figure 35. Prevalence of adults ages 18 and older without a dental visit in the past year in Kentucky by education, Behavioral Risk Factor Surveillance System, 2012



Data Source: Behavioral Risk Factor Surveillance System (BRFSS).
H.S. - High School; G.E.D. - General Equivalency Diploma.

The prevalence of adults who had not visited a dentist in the year prior to the survey decreased with increasing level of annual household income; adults with annual incomes less than $15,000 had the highest prevalence (64.6%) and those with incomes of $50,000 or more had the lowest prevalence (22.8%) of not visiting a dentist within the year (Figure 36).

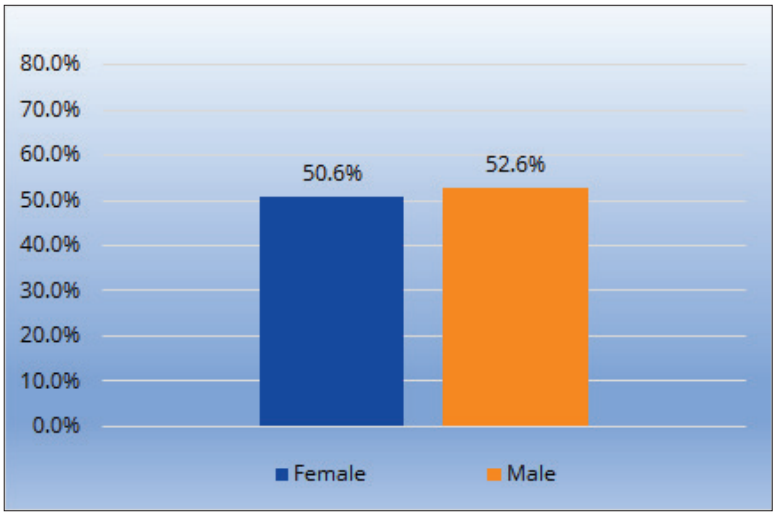
Figure 36. Prevalence of adults ages 18 and older without a dental visit in the past year in Kentucky by annual household income, Behavioral Risk Factor Surveillance System, 2012



Data Source: Behavioral Risk Factor Surveillance System (BRFSS).

More than half (51.5%) of adults ages 65 or older in Kentucky had 6 or more permanent teeth removed (including wisdom teeth) because of tooth decay or gum disease (not due to injury or for orthodontic reasons) (Table 4). The prevalence of adults with this negative oral health indicator varied by demographic characteristics. Male adults (52.6%) were slightly more likely than female adults (50.6%) to have lost 6 or more teeth due to tooth decay or gum disease (Figure 37).

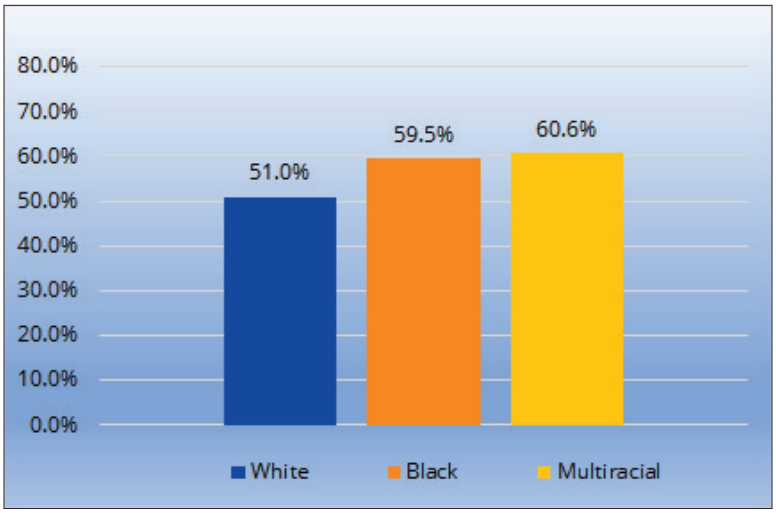
Figure 37. Prevalence of adults ages 65 and older in Kentucky who had lost 6 or more teeth due to tooth decay or gum disease by gender, Behavioral Risk Factor Surveillance System, 2012



Data Source: Behavioral Risk Factor Surveillance System (BRFSS).

The prevalence of adults who had lost 6 or more teeth due to tooth decay or gum disease increased from 51.0% in Non-Hispanic Whites to 59.5% in Non-Hispanic Blacks and 60.6% in multiracial adults (Figure 38).

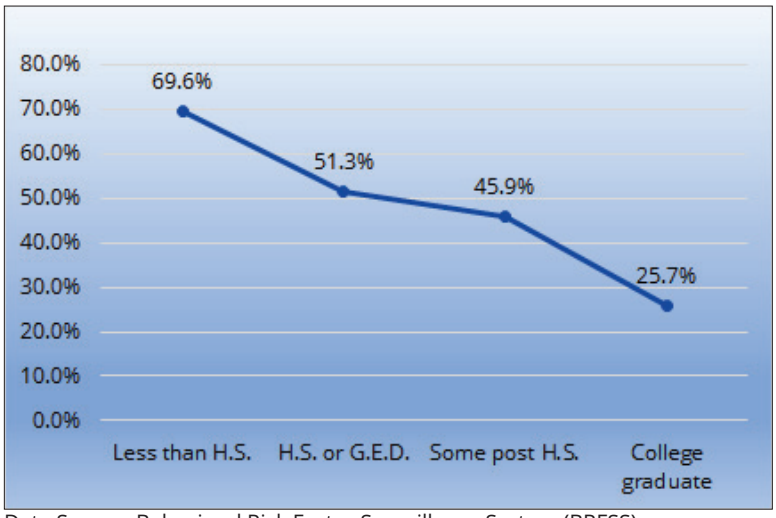
Figure 38. Prevalence of adults ages 65 and older in Kentucky who had lost 6 or more teeth due to tooth decay or gum disease by race/ethnicity, Behavioral Risk Factor Surveillance System, 2012



Data Source: Behavioral Risk Factor Surveillance System (BRFSS).

The prevalence of adults who had lost 6 or more teeth due to tooth decay or gum disease decreased with increasing level of educational attainment; adults with less than a high school education had the highest prevalence (69.6%) and college graduates had the lowest prevalence (25.7%) of loss of 6 or more teeth due to disease (Figure 39).

Figure 39. Prevalence of adults ages 65 and older in Kentucky who had lost 6 or more teeth due to tooth decay or gum disease by education, Behavioral Risk Factor Surveillance System, 2012

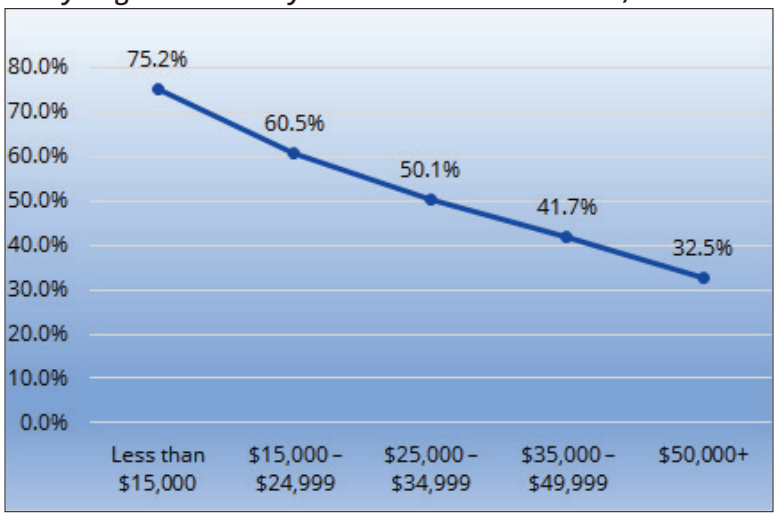


Data Source: Behavioral Risk Factor Surveillance System (BRFSS).

H.S. - High School; G.E.D. - General Equivalency Diploma.

The prevalence of adults who had lost 6 or more teeth due to tooth decay or gum disease decreased with increasing level of annual household income, adults with annual incomes less than $15,000 had the highest prevalence (75.2%) and those with annual incomes of $50,000 or more had the lowest prevalence of tooth loss due to disease (32.5%) (Figure 40).

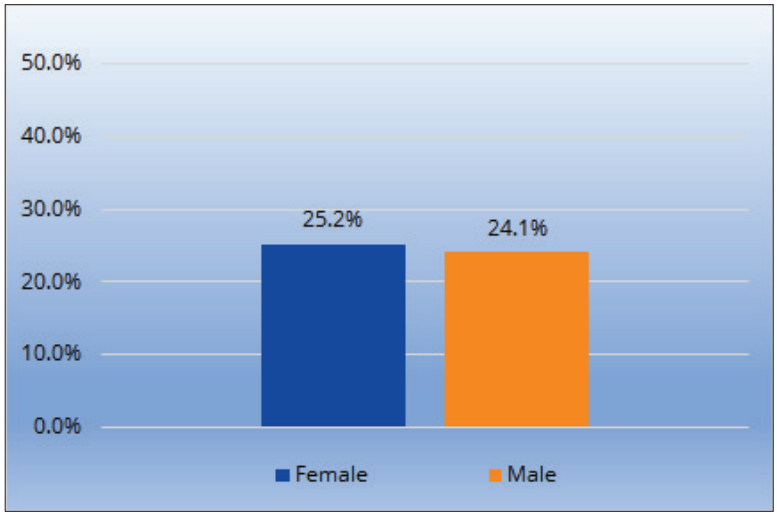
Figure 40. Prevalence of adults ages 65 and older in Kentucky who had lost 6 or more teeth due to tooth decay or gum disease by annual household income, Behavioral Risk Factor Surveillance System, 2012



Data Source: Behavioral Risk Factor Surveillance System (BRFSS).

Almost one quarter (24.8%) of the population ages 65 and older in Kentucky reported loss of all of their natural teeth due to tooth decay or gum disease (Table 4). The prevalence of edentulism in population ages 65 and older varied by gender, race/ethnicity, educational attainment, and annual income. Female adults (25.2%) were slightly more likely than male adults (24.1%) to have lost all of their natural teeth due to tooth decay or gum disease (Figure 41).

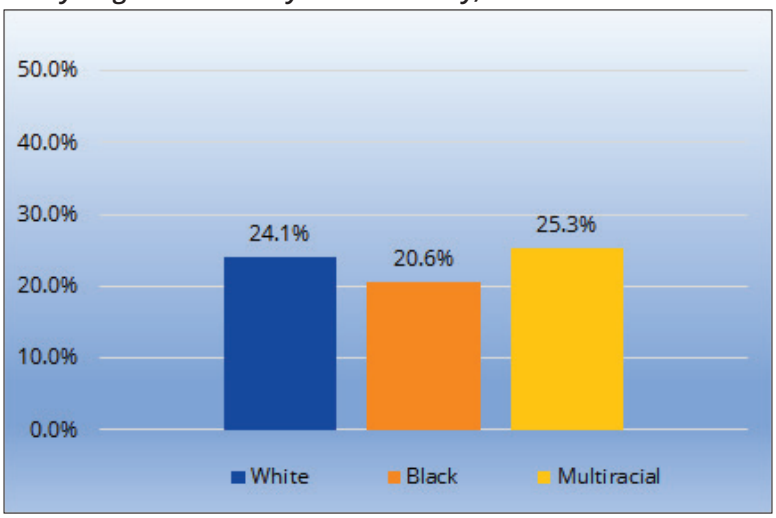
Figure 41. Prevalence of adults ages 65 and older in Kentucky who had lost all natural teeth due to tooth decay or gum disease by gender, Behavioral Risk Factor Surveillance System, 2012



Data Source: Behavioral Risk Factor Surveillance System (BRFSS).

Non-Hispanic Whites (24.1%) and Multiracial adults (25.3%) were more likely than Non-Hispanic Blacks (20.6%) to have lost all natural teeth due to tooth decay or gum disease (Figure 42).

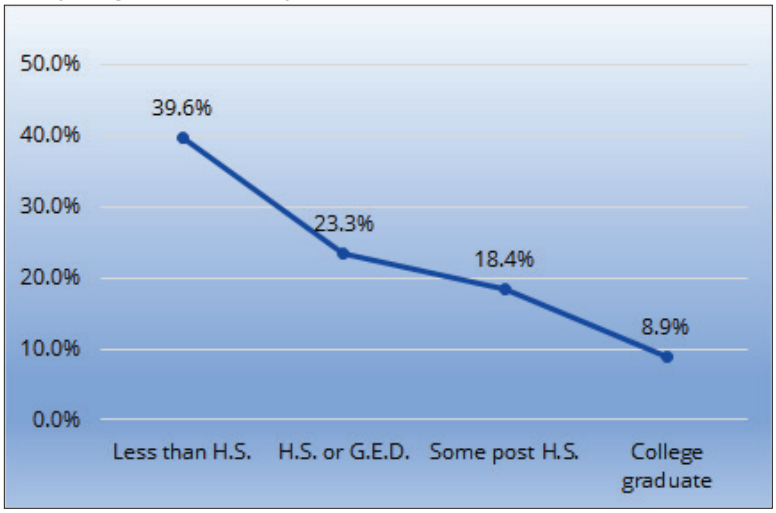
Figure 42. Prevalence of adults ages 65 and older in Kentucky who had lost all natural teeth due to tooth decay or gum disease by race/ethnicity, Behavioral Risk Factor Surveillance System, 2012



Data Source: Behavioral Risk Factor Surveillance System (BRFSS).

The prevalence of older adults who lost all of their natural teeth due to tooth decay or gum disease decreased with increasing level of educational attainment; adults with less than a high school education had the highest prevalence (39.6%) and college graduates had the lowest prevalence of edentulism due to disease (8.9%) (Figure 43).

Figure 43. Prevalence of adults ages 65 and older in Kentucky who had lost all natural teeth due to tooth decay or gum disease by education, Behavioral Risk Factor Surveillance System, 2012



Data Source: Behavioral Risk Factor Surveillance System (BRFSS).
H.S. - High School; G.E.D. - General Equivalency Diploma.

The prevalence of older adults who had lost all natural teeth due to tooth decay or gum disease decreased with increasing level of annual household income; adults with annual incomes less than $15,000 had the highest prevalence (42.7%) and those with annual incomes of $50,000 or more had the lowest prevalence of edentulism due to disease (12.0%) (Figure 44).

Figure 44. Prevalence of adults ages 65 and older in Kentucky who had lost all natural teeth due to tooth decay or gum disease by annual household income, Behavioral Risk Factor Surveillance System, 2012

Data Source: Behavioral Risk Factor Surveillance System (BRFSS).

Kentucky Behavioral Risk Factor Surveillance

As previously stated, national data from the BRFSS is only available for 2012. However, 2014 state level data from the Kentucky BRFSS for submission to the 2014 national surveillance system were available in a 2015 publication from the Kentucky Department for Public Health.[38] The publication presented the data by ADDs. The 120 counties in Kentucky were divided into 15 ADDs (Appendix A: Table 3). The oral health status of Kentucky adults varied by ADD.

In 2014, adults ages 65 and older in 3 ADDs in Eastern Kentucky, the Kentucky River ADD (40.7%), the Gateway ADD (37.5%) and the Cumberland Valley ADD (36.2%) were more likely than adults in Kentucky generally (23.9%) to have had 6 or more permanent teeth extracted (Table 7). All areas of eastern Kentucky as well as northern Kentucky had a higher percentage of adults ages 65 and older who had 6 or more permanent teeth extracted than the statewide average. Eastern Kentucky also had the lowest percentage of adults who visited a dentist or dental clinic in the past year, particularly Cumberland Valley (45.6%), Big Sandy (50.5%), and Lake Cumberland (50.8%) where only about half of adults accessed oral health services in the last 12 months. At the state level, about 3 in 5 (61.0%) adults visited a dentist or dental clinic in 2014.

[38] Kanotra S. Kentucky Behavioral Risk Factor Surveillance (KyBRFSS) Data. Department for Public Health, Cabinet for Health and Family Services. 2014. http://chfs.ky.gov/NR/rdonlyres/CC7425CB-575C-4C47-8B80 E499FCBE9CC2/0/2015BRFSSProfiles.pdf.

Table 7. Prevalence of oral health indicators by region and area development districts, Kentucky Behavioral Risk Factor Surveillance, 2014

Region and Area Development District	Adults aged 65+ who had all their natural teeth extracted		Adults who visited dentist or dental clinic in past year	
	Percentage	95% Confidence Interval	Percentage	95% Confidence Interval
Kentucky	23.9%	21.7% – 26.1%	61.0%	59.4% – 62.5%
Eastern Kentucky Region				
Big Sandy	26.6%	17.8% – 35.3%	**50.5%**	44.8% – 56.1%
Buffalo Trace	24.4%	16.4% – 32.5%	60.7%	55.2% – 66.2%
Cumberland Valley	**36.2%**	27.3% – 45.1%	**45.6%**	39.8% – 51.3%
Five County (FIVCO)	26.5%	18.2% – 34.7%	55.1%	49.0% – 61.2%
Gateway	**37.5%**	28.5% – 46.5%	56.1%	49.7% – 62.5%
Kentucky River	**40.7%**	30.7% – 50.7%	54.1%	48.8% – 59.5%
Lake Cumberland	29.6%	22.4% – 36.8%	**50.8%**	45.1% – 56.5%
Greater Lexington Region				
Bluegrass	23.0%	15.3% – 30.8%	62.6%	58.5% – 66.7%
Greater Louisville Region				
Kentuckiana Regional Planning & Development Agency (KIPDA)	14.0%	8.9% – 19.1%	67.3%	63.2% – 71.3%
Northern Kentucky Region				
Northern Kentucky	32.9%	25.4% – 40.4%	63.8%	59.6% – 67.9%
Western Kentucky Region				
Barren River	26.5%	19.2% – 33.7%	61.4%	55.8% – 67.0%
Green River	13.7%	8.9% – 18.5%	61.6%	55.0% – 68.2%
Lincoln Trail	27.6%	19.6% – 35.6%	59.2%	53.1% – 65.2%
Pennyrile	19.2%	13.1% – 25.3%	59.2%	52.5% – 65.8%
Purchase	23.6%	17.1% – 30.1%	66.8%	61.2% – 72.5%

Data Source: Kentucky Behavioral Risk Factor Surveillance (KyBRFS).

Kentucky Health Issues Poll

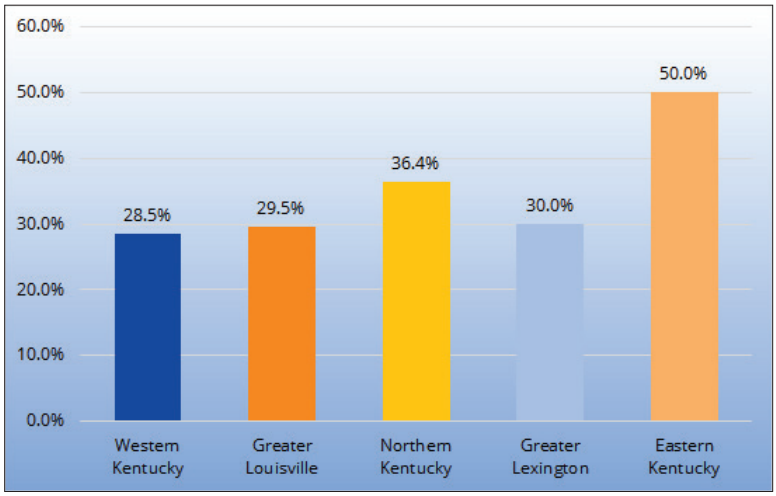
The Kentucky Health Issues Poll is conducted annually since 2008 to provide information on various health-related topics affecting the adult population in Kentucky.[39] The most recent survey year for which oral health data were available was 2013. The majority of the 1,551 adult respondents were Whites (92.1%) and Non-Hispanics (99.3%). Only 6.8% of adult respondents had Medicaid insurance and 6.8% had both Medicare and Medicaid insurance. According to the data collected in 2013, the percentage of the population of adults aged 18 and older in Kentucky who had not visited a dentist or dental clinic in the past year was 35.5% which was a slightly lower percentage than reported in the 2012 BRFSS (39.7%).

[39] Foundation for a Healthy Kentucky and Interact for Health. Kentucky Health Issues Poll (KHIP). http://healthy-ky.org/presentations-reports/reports/kentucky-health-issues-poll.

The oral health of Kentucky adults, as reported by poll participants, varied among population groups. The following charts provide information about the population with or without a dental visit in the past year by geographical region, age, gender, education, poverty level, cigarette smoking, and whether a family physician inquired about their oral or dental health.

Half (50.0%) of adults ages 18 and older residing in the Eastern Kentucky Region in Appalachia had not visited a dentist in the past year. The prevalence of adults who had not visited a dentist in the past year was much lower, between 28% and 36%, in the geographical regions of Kentucky including Western Kentucky (28.5%), Greater Louisville (29.5%), Greater Lexington (30.0%) and Northern Kentucky (36.4%) (Figure 45).

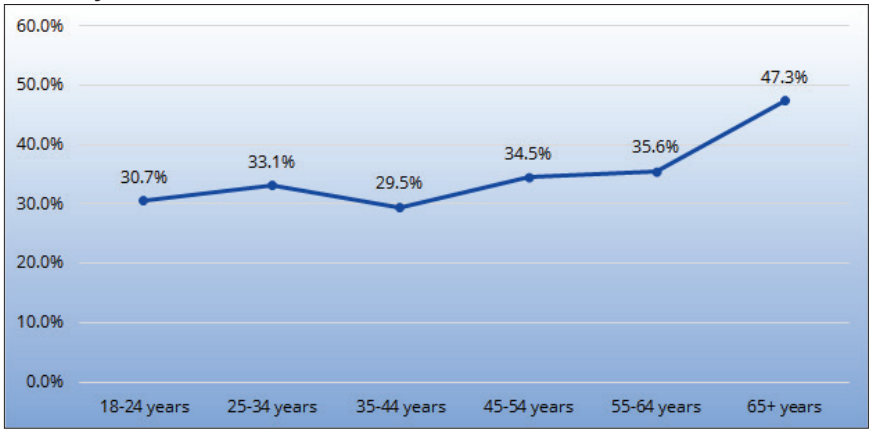
Figure 45. Prevalence of adults ages 18 and older in Kentucky without a dental visit in the past year by geographical region, Kentucky Health Issues Poll, 2013



Data Source: Kentucky Health Issues Poll.

The prevalence of adults who had not visited a dentist in the prior year increased by age. Younger adults ages 18 to 24 years had the lowest prevalence (30.7%) and older adults ages 65 and older had the highest prevalence (47.3%) of not utilizing dental services (Figure 46).

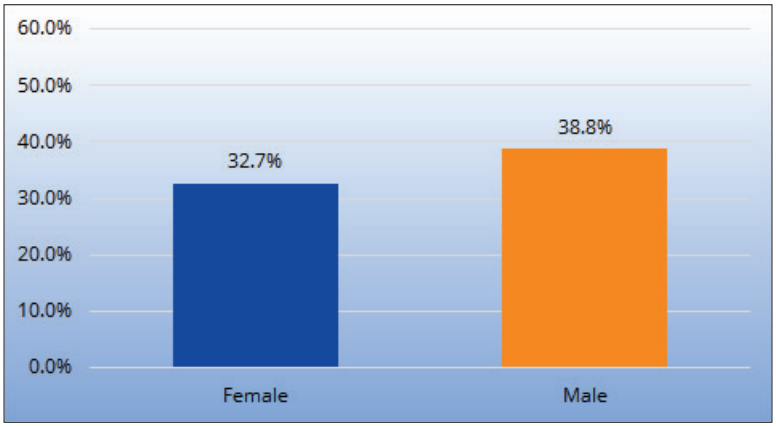
Figure 46. Prevalence of adults aged 18 and older in Kentucky without a dental visit in the past year by age, Kentucky Health Issues Poll, 2013



Data Source: Kentucky Health Issues Poll.

Males were more likely than females to not have visited an oral health provider in the previous year with 38.8% of male respondents indicating no dental visit compared to 32.7% of female respondents (Figure 47).

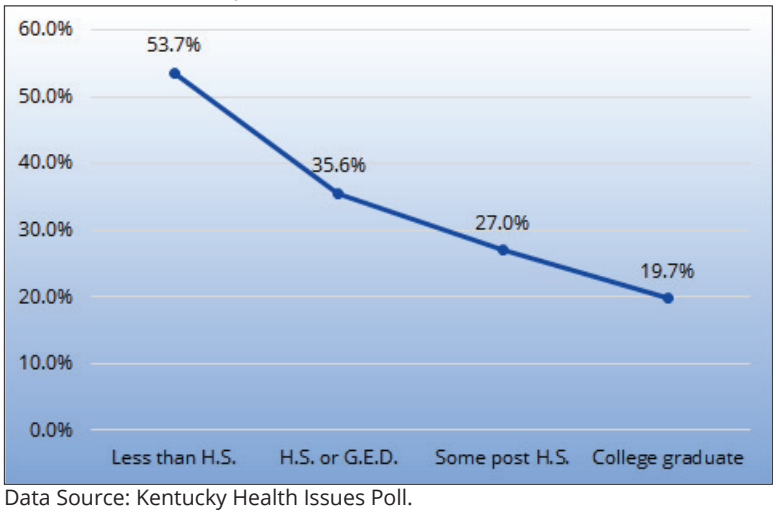
Figure 47. Prevalence of adults aged 18 and older in Kentucky without a dental visit in the past year by gender, Kentucky Health Issues Poll, 2013



Data Source: Kentucky Health Issues Poll.

The prevalence of adults who had not visited a dentist in the prior year decreased with increasing level of educational attainment; adults with less than a high school education had the highest prevalence (53.7%) and college graduates had the lowest prevalence (19.7%) of not utilizing dental services (Figure 48).

Figure 48. Prevalence of adults aged 18 and older in Kentucky without a dental visit in the past year by education, Kentucky Health Issues Poll, 2013

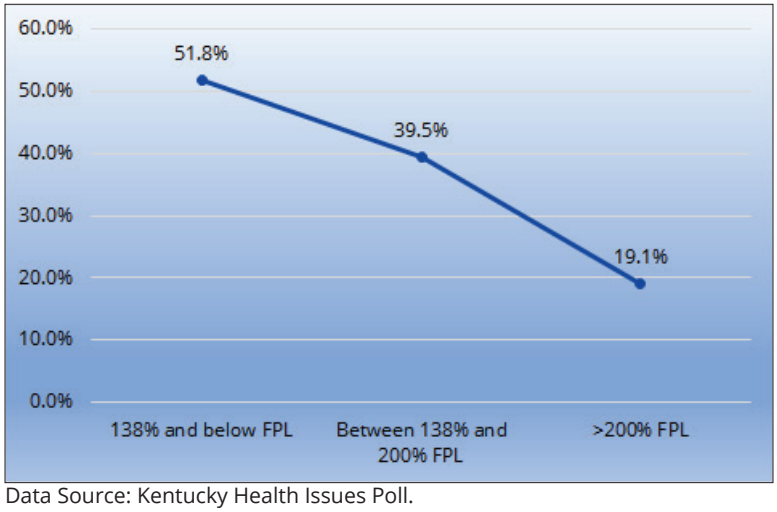


Data Source: Kentucky Health Issues Poll.
H.S. - High School; G.E.D. - General Equivalency Diploma.

The prevalence of adults who had not visited a dentist in the prior year decreased with decreasing level of poverty; adults with an income at 138% or below FPL had the highest prevalence (51.8%) while those

with an income more than 200% FPL had the lowest prevalence (19.1%) of no dental visits in the past year (Figure 49).

Figure 49. Prevalence of adults aged 18 and older in Kentucky without a dental visit in the past year by poverty level, Kentucky Health Issues Poll, 2013

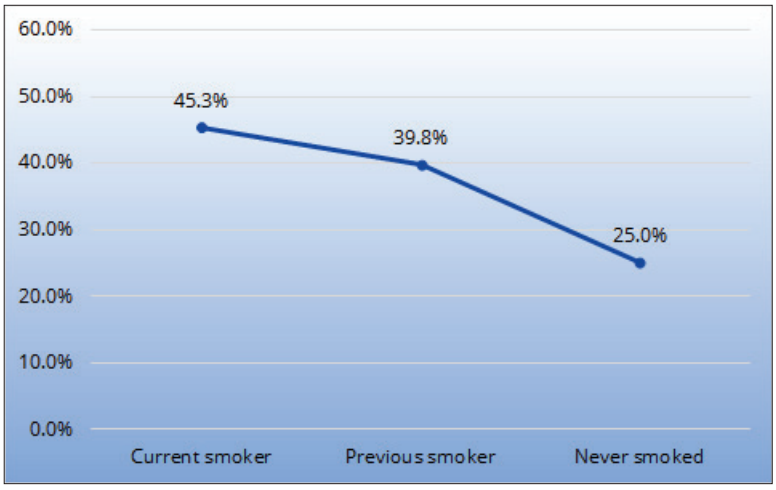


Data Source: Kentucky Health Issues Poll.

FPL - Federal Poverty Level.

The prevalence of adults who had not visited a dentist in the prior year was the highest in current smokers (45.3%), followed by previous smokers (39.8%), and then by those who never smoked cigarettes (25.0%) (Figure 50).

Figure 50. Prevalence of adults aged 18 and older in Kentucky without a dental visit in the past year by cigarette smoking, Kentucky Health Issues Poll, 2013

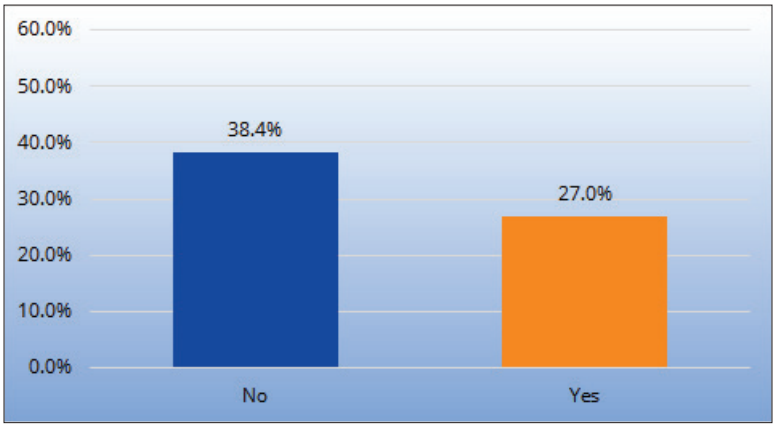


Data Source: Kentucky Health Issues Poll.

Adults whose physicians had never asked about their oral health (38.4%) were more likely to have not visited a dentist in the past year than were those who reported that their physicians had inquired about

their oral health (27.0%) (Figure 51). This finding emphasizes the importance of integration of oral health assessment and primary health care as a way to encourage dental visits for preventive interventions and early detection and treatment of oral health problems in adults.

Figure 51. Prevalence of adults aged 18 and older in Kentucky without a dental visit in the past year by primary care physician inquiry about oral health, Kentucky Health Issues Poll, 2013



Data Source: Kentucky Health Issues Poll.

Kentucky Adult Oral Health Survey

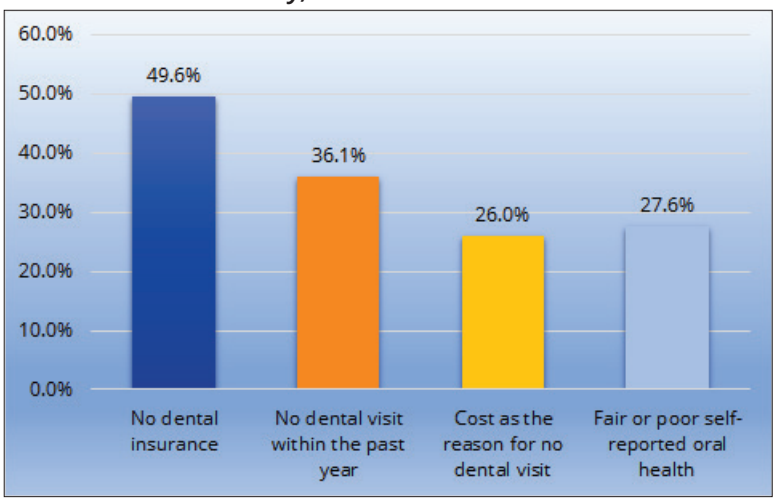
The Kentucky Adult Oral Health Survey was conducted in 2002 to evaluate the oral health of adults aged 18 years and older in Kentucky.[8] The major survey findings are summarized below.

In 2002, nearly half (49.6%) of adults in Kentucky had no dental insurance and more than one-third (36.1%) of adults had not visited a dentist in the past year (Figure 52). One-quarter (26.0%) of adults who reported no dental visits in the previous year noted cost as the primary reason for not seeking dental services. Lack of dental insurance and out-of-pocket costs for oral health services were major barriers in access to care.

More than one-quarter (27.6%) of adults in Kentucky reported that their oral health was either "fair" or "poor" at the time of the survey. There were noticeable geographical disparities in access to care; adults residing in the Appalachian Region had the lowest utilization rates of oral health services and the highest self-reported "fair" or "poor" oral health.

[8] Willis D, Butters J, Cecil J, et al. Executive Summary: 2002 Kentucky Adult Oral Health Survey. 2003. http://chfs.ky.gov/nr/rdonlyres/f3509d88-532d-4e82-b04e-31da874a890c/0/2002adultoralhealthsurveyexecutivesummary.pdf.

Figure 52. Access to care and oral health status of adults aged 18 years and older in Kentucky, Kentucky Adult Oral Health Survey, 2002

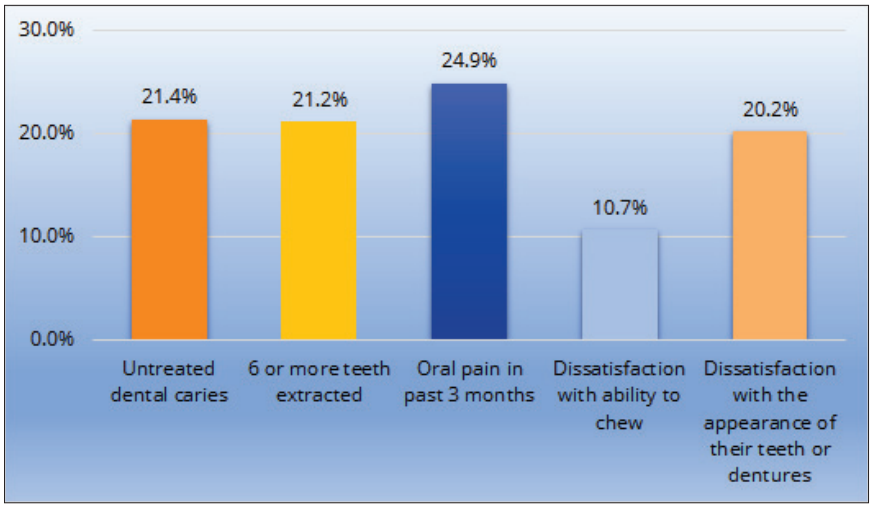


Data Source: Kentucky Adult Oral Health Survey.

Approximately 1 in 5 (21.4%) adults in Kentucky reported untreated dental caries; approximately 1 in 5 (21.2%) adults reported 6 or more extracted teeth due to tooth decay or gum disease (Figure 53). Nearly 1 in 4 (24.9%) adults in Kentucky had oral pain within the 3 months immediately prior to the survey.

Poor oral health impairs functional status and reduces quality of life including ongoing pain and difficulties in eating. One in 10 (10.7%) survey participants reported problems with their ability to chew food, and 1 in 5 (20.2%) were dissatisfied with the appearance of their teeth or dentures. Decay and tooth loss affect nutritional status, general health, and employability.

Figure 53. Oral health problems among adults aged 18 years and older in Kentucky, Kentucky Adult Oral Health Survey, 2002



Data Source: Kentucky Adult Oral Health Survey.

Oral Health of Pregnant Women

Pregnancy Risk Assessment Monitoring System

Gum disease, gingivitis, and dental caries are relatively common in pregnant women due to a number of factors: fluctuating hormonal levels; heightened inflammatory responses to oral disease; changes in immune response; and changes in oral flora, such as increased acidity in the mouth, which affects oral health.[40]

Nationwide from 2007 to 2009, 56% of pregnant women did not visit a dentist during their most recent pregnancy.[41] Socioeconomic and racial/ethnic disparities among pregnant women impact utilization of oral health services during pregnancy. Poor pregnant women are less likely than those with higher incomes to receive dental care; Non-Hispanic Black and Hispanic women are less likely to have their teeth cleaned during pregnancy than are non-Hispanic White women.

The PRAMS is a population-based surveillance project that was conducted by the CDC with the goal of obtaining information related to maternal health risk behaviors, access to care, quality of care, and health status indicators that might be associated with adverse birth outcomes.[42]

A PRAMS pilot study was completed in Kentucky in 2007 and a summary of study findings was published in 2008.[43] The results indicated that only 44.2% of Kentucky mothers consulted a dentist during their pregnancy. The PRAMS pilot study also revealed that the rate of pregnant women with a dental problem who received dental treatment was 16.3%.

Demographic characteristics, education, insurance, and income status influenced the utilization of dental services during pregnancy. Mothers who were younger (39.8% age less than 20 and 36.2% ages 20 to 24), African American (40.4%), or unmarried (38.8%) were less likely than other pregnant women to have visited a dentist during pregnancy: 48.5% to 51.6% of those ages 25 or older; 44.6% of Whites or other race groups; and 48% of married mothers visited a dentist during pregnancy (Figure 54).

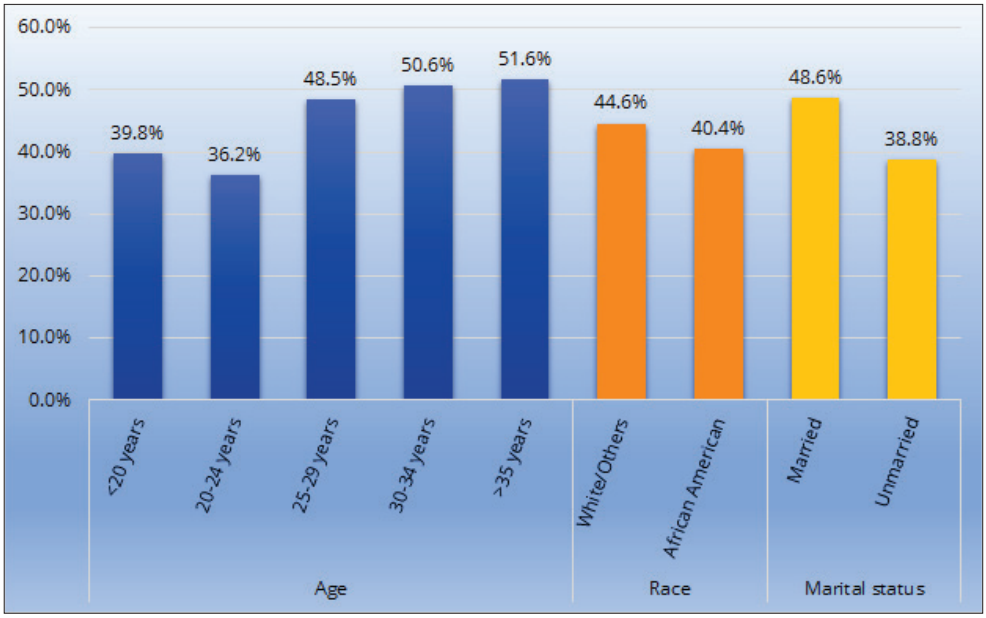
[40] American College of Obstetricians and Gynecologists. Oral health care during pregnancy and through the lifespan. Committee Opinion No. 569. *Obstet Gynecol*. 2013; 122:417-22. http://www.acog.org/-/media/Committee-Opinions/Committee-on-Health-Care-for-Underserved-Women/co569.pdf?dmc=1&ts=20151214T1111143843.

[41] American College of Obstetricians and Gynecologists and the California Dental Association Foundation. Oral health during pregnancy and early childhood: evidence-based guidelines for health professionals. J Calif Dent Assoc. 2010; 391-403, 405-40. http://www.cdafoundation.org/Portals/0/pdfs/poh_guidelines.pdf.

[42] Centers for Disease Control and Prevention: The Pregnancy Risk Assessment Monitoring System (PRAMS). Atlanta, GA: Centers for Disease Control and Prevention. Date last modified May 14, 2015. http://www.cdc.gov/prams/index.htm.

[43] Anderson, A, Jewell T, Jones K, et al. Kentucky Pregnancy Risk Assessment Monitoring System (PRAMS) Pilot Project 2008 Data Report. Division of Maternal and Child Health, Kentucky Cabinet for Health and Family Services. http://chfs.ky.gov/NR/rdonlyres/888F8BBC-3DF7-47A4-B34E-8BD7BABA1E09/0/PRAMSREPORT08finalwithcovers.pdf.

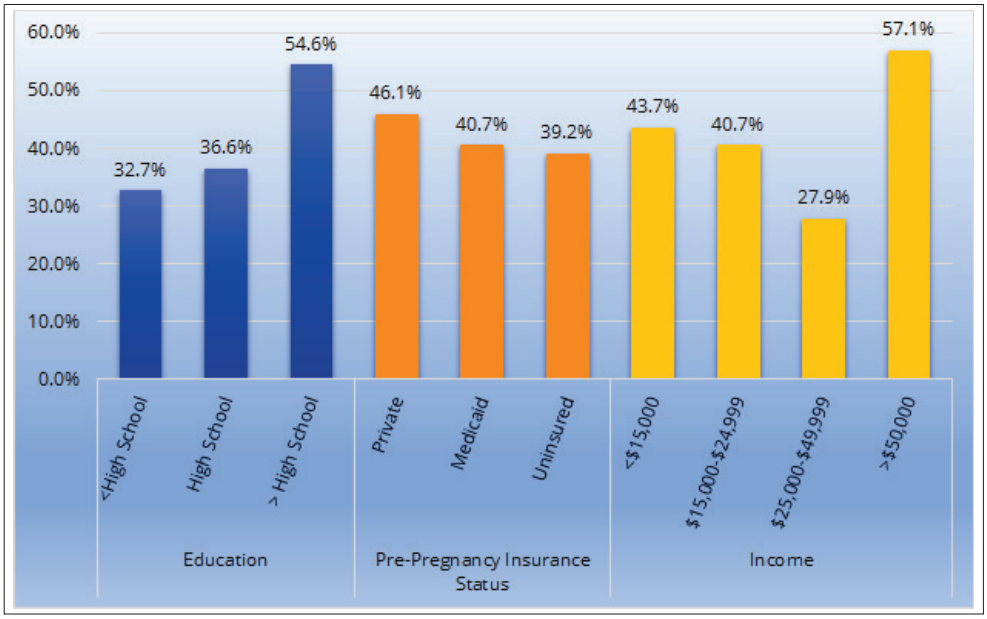
Figure 54. Percentage of pregnant women in Kentucky with a dental visit during pregnancy by demographic characteristics, Pregnancy Risk Assessment Monitoring System, 2008



Data Source: Kentucky Pregnancy Risk Assessment Monitoring System (PRAMS).

New mothers with a high school education (36.6%) or less (32.7%), without insurance (39.2%), or with Medicaid insurance prior to pregnancy (40.7%), and mothers with annual incomes lower than $50,000 (27.9% to 43.7%) were less likely than other new mothers to receive a dental service during pregnancy. In contrast, 54.6% of mothers with more than high school education, 46.1% of mothers with private health insurance, and 57.1% of mothers with incomes greater than $50,000, received a dental service during pregnancy (Figure 55).

Figure 55. Percentage of mothers in Kentucky with a dental visit during pregnancy by education, pre-pregnancy insurance status and income in Kentucky, Pregnancy Risk Assessment Monitoring System, 2008



Data Source: Kentucky Pregnancy Risk Assessment Monitoring System (PRAMS).

The oral health of pregnant women is important for the mother and the unborn infant. Poor oral health in the mother is linked to a higher risk of preterm birth and lower birth weight babies. In addition, the bacteria responsible for dental caries can be transmitted from a mother to her infant, placing children of mothers with poor oral health at risk for early onset of caries. The Kentucky PRAMS survey found that mothers who reported not visiting a dentist during their pregnancy had a higher prevalence of gestational diabetes (19.5% vs. 9.9%), fetal macrosomia (13.9% vs. 5.9%) and low birth weight babies (9.3% vs. 2.7%), compared to mothers who accessed dental services during pregnancy.

Oral Health of Older Adults

Kentucky Elder Oral Health Survey

Oral health care for older adults (ages 65 and older) is a concern since many elders do not benefit from employer-sponsored insurance plans that include dental coverage. At age 65, many older Americans become insured by Medicare, which has no dental insurance benefit. The likelihood of utilization of oral health services is linked to having dental insurance;[44] therefore, older adults without coverage are at risk of having unmet oral health needs.

Community dwelling older adults are more likely than elders living in skilled nursing facilities or other communal residences to receive regular oral health services. Many dentists treat adults ages 65 and older in their practices; however, these patients are typically well older adults.[45] Few dentists provide services in nursing homes. Older adults living in long-term care facilities or those confined to home are at increased risk for poor oral health status due to restricted resources, limited mobility, complex health comorbidities, and cognitive impairments.[46]

The oral health status of Kentucky elders ages 65 and older was surveyed between 2002 and 2005 using both a self-administered questionnaire and a clinical screening examination by an oral health clinician.[9] The questionnaire collected data on demographics, general health, oral health, utilization of oral health services and barriers to care. The major results of the questionnaire are presented below.

[44] Isman R, Isman B. Oral health America white paper: Access to oral health services in the United States 1997 and beyond. *Oral Health America*. 1997.

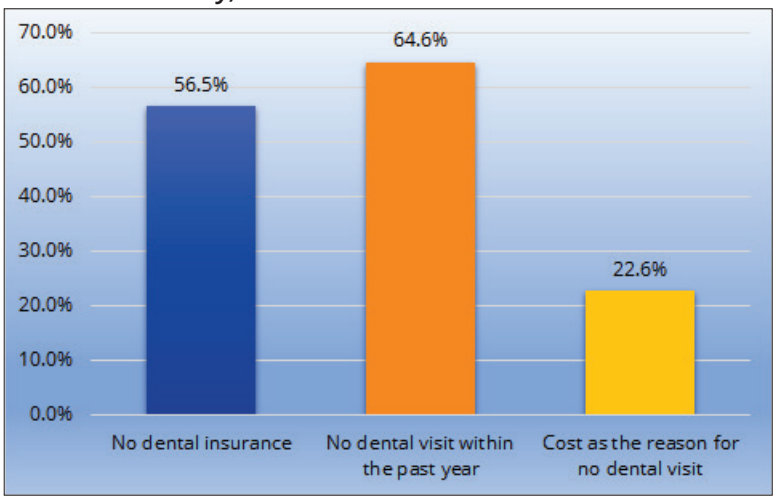
[45] Smith B. The next crisis: elder oral health care. PowerPoint presentation for the American Dental Association. 2010. http://www.nationaloralhealthconference.com/docs/presentations/2010/Barbara%20Smith%20-%20The%20Next%20Crisis%20-%20Elder%20Oral%20Health%20Care.pdf.

[46] Stein P, Aalboe A, Skelton J, et al. Meeting oral health challenges in long-term care facilities. *Annals Long Term Care*. 2012; 20(9):30-34. http://www.annalsoflongtermcare.com/article/meeting-oral-health-challenges-long-term-care-facilities.

[9] Henry R, Sallee N, Durham L. The Kentucky Elder Oral Health Survey: 2005 Executive Summary. Kentucky Department for Public Health. http://chfs.ky.gov/nr/rdonlyres/712d2e9b-e6c3-46ad-b705-4f0f59bde20b/0/51106executivesummarywithpagenumbers.pdf.

More than half (56.5%) of the Kentucky elders participating in the survey reported having no dental insurance and nearly two-thirds (64.6%) indicated they had not visited a dentist in the past year (Figure 56). The percentage of older adults in Kentucky reporting lack of access to care is considerably higher in elders than in all adults ages 18 and older in Kentucky (36.1%) surveyed in the 2002 Kentucky Adult Oral Health Survey. Approximately 1 in 5 (22.6%) elders reported cost of dental care as the primary reason for not visiting a dentist in the past year.

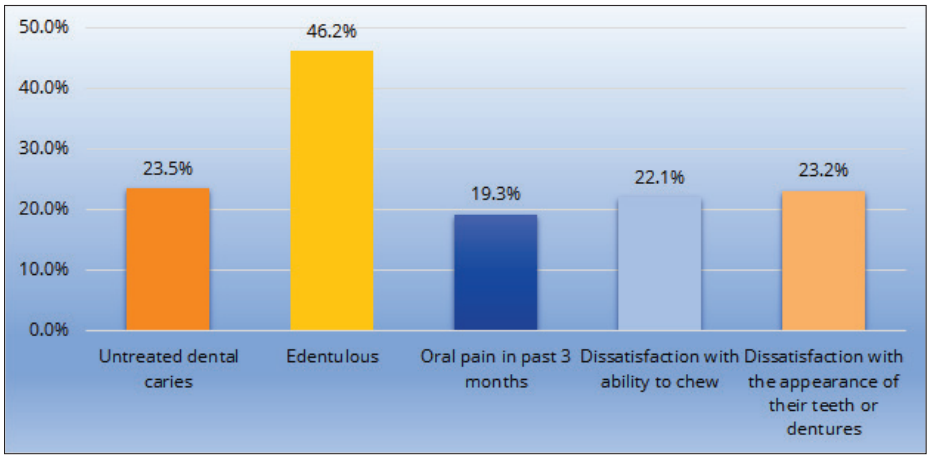
Figure 56. Barriers to access to oral health services for Kentucky adults 65 years and older, Kentucky Elder Oral Health Survey, 2002 to 2005



Data Source: Kentucky Elder Oral Health Survey.

Almost one quarter (23.5%) of elders in Kentucky reported having untreated dental caries and nearly half (46.2%) of elders reported being edentulous (Figure 57). About 1 in 5 Kentucky elders also reported oral pain within the past 3 months (19.3%), problems with their ability to chew food (22.1%), or dissatisfaction with the appearance of their teeth or dentures (23.2%). The poor oral health status of elders in Kentucky could potentially lead to impaired nutritional status and general health problems.

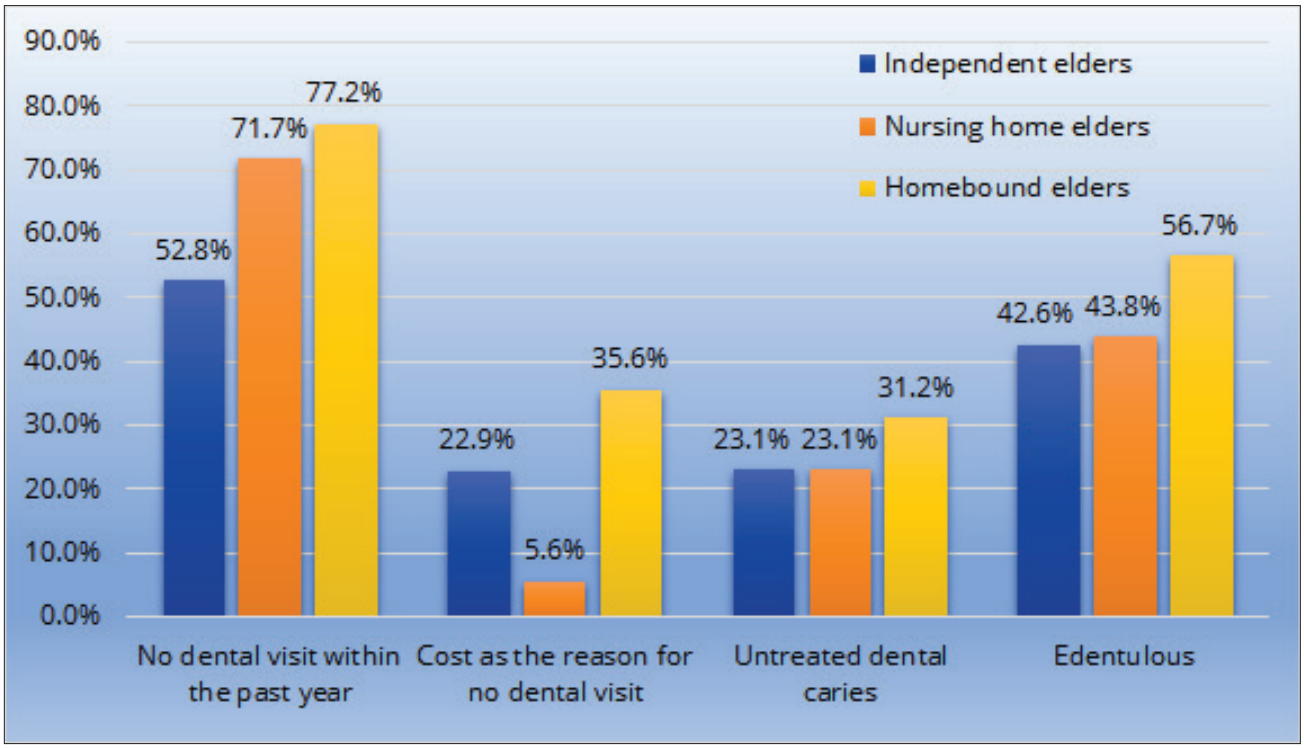
Figure 57. Oral health status of Kentucky adults 65 years and older, Kentucky Elder Oral Health Survey, 2002 to 2005



Data Source: Kentucky Elder Oral Health Survey.

The prevalence of utilization of services and oral health status of elders in Kentucky varied by type of residential settings (Figure 58). Homebound elders (77.2%) (defined as elders confined to their homes and unable to provide their own transportation to obtain services) and nursing home elders (71.7%) were less likely to visit a dentist in the previous year than independent elders living in their own homes (52.8%). Homebound elders (35.6%) were more likely than independent elders (22.9%) to indicate cost of dental care as the main reason of no dental visit within the past year. Homebound elders were also more likely to have untreated dental caries (31.2%) and to be edentulous (56.7%) than nursing home elders (23.1% dental caries, 43.8% edentulous), or independent elders (23.1% dental caries, 42.6% edentulous).

Figure 58. Access to care and oral health status of Kentucky adults ages 65 and older by type of residential settings, Kentucky Elder Oral Health Survey, 2002 to 2005



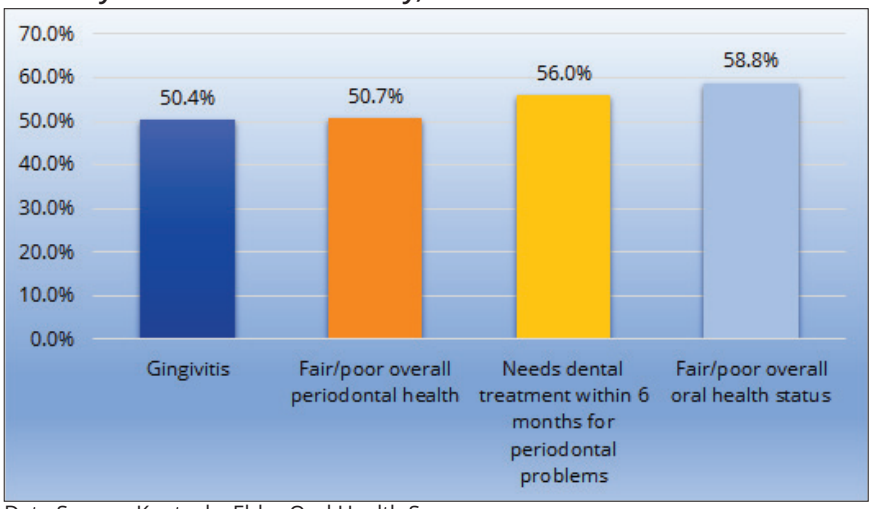
Data Source: Kentucky Elder Oral Health Survey.

Clinical examination findings indicated that statewide, more than half of dentate elders had the following oral health problems (Figure 59):

- Gingivitis (50.4%);
- "Poor" or "fair" overall periodontal health (50.7%), including gingival inflammation, recession, presence of calculus, tooth mobility and gingival bleeding;
- Needed dental treatment within 6 months for periodontal problems (56.0%);
- "Poor" or "fair" overall oral health status (58.8%), including poor or fair periodontal health and teeth with caries.

The prevalence of oral health problems of Kentucky elders also varied by residential setting, with homebound elders and nursing home elders having the highest prevalence of poor oral health indicators (Figure 59).

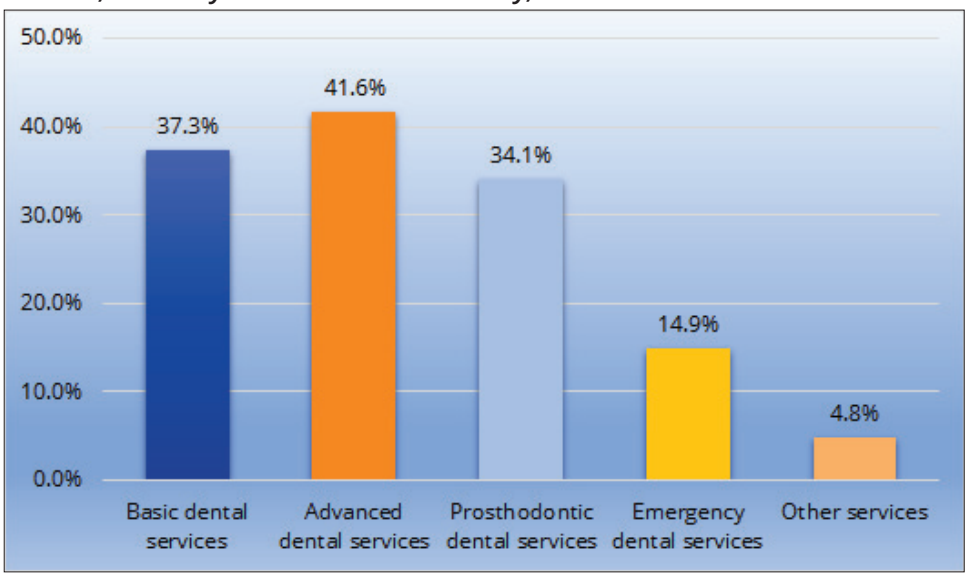
Figure 59. Dental screening findings for Kentucky adults ages 65 and older by type of residential settings, Kentucky Elder Oral Health Survey, 2002 to 2005



Data Source: Kentucky Elder Oral Health Survey.

Throughout Kentucky, 40.6% of elders reported that they had barriers to obtaining oral health care. More than one third of elders reported difficulty in obtaining basic (37.3%), advanced (41.6%), and prosthodontic (34.1%) dental services (Figure 60). Additionally, 14.9% of Kentucky elders reported difficulty in obtaining emergency dental services.

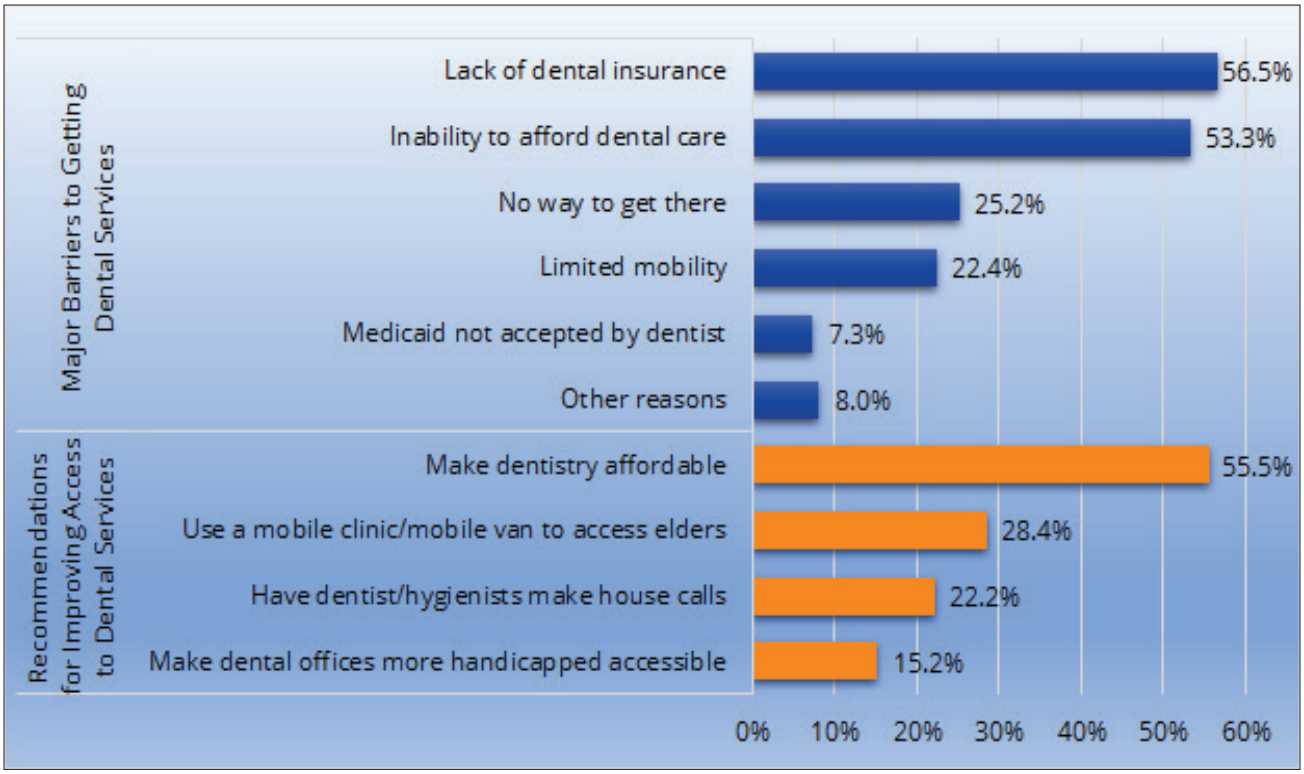
Figure 60. Percent of Kentucky adults ages 65 and older by self-reported difficulty in obtaining oral health services, Kentucky Elder Oral Health Survey, 2002 to 2005



Data Source: Kentucky Elder Oral Health Survey.

The major barriers in obtaining dental services reported by Kentucky elders included: lack of dental insurance (56.5%), inability to afford dental care (53.3%), lack of transportation (25.2%), limited mobility (22.4%), and Medicaid insurance not being accepted by dentist (7.3%) (Figure 61). Kentucky elders offered recommendations for improving access to dental care including making dentistry affordable (55.5%), using a mobile clinic or mobile van to access elders (28.4%), having dentists and dental hygienists make house calls (22.2%), and making dental offices more handicapped accessible (15.2%).

Figure 61. Percent of oral health status of Kentucky adults ages 65 and older by perceived barriers to obtaining oral health services and recommendations for improving access to care, Kentucky Elder Oral Health Survey, 2002 to 2005



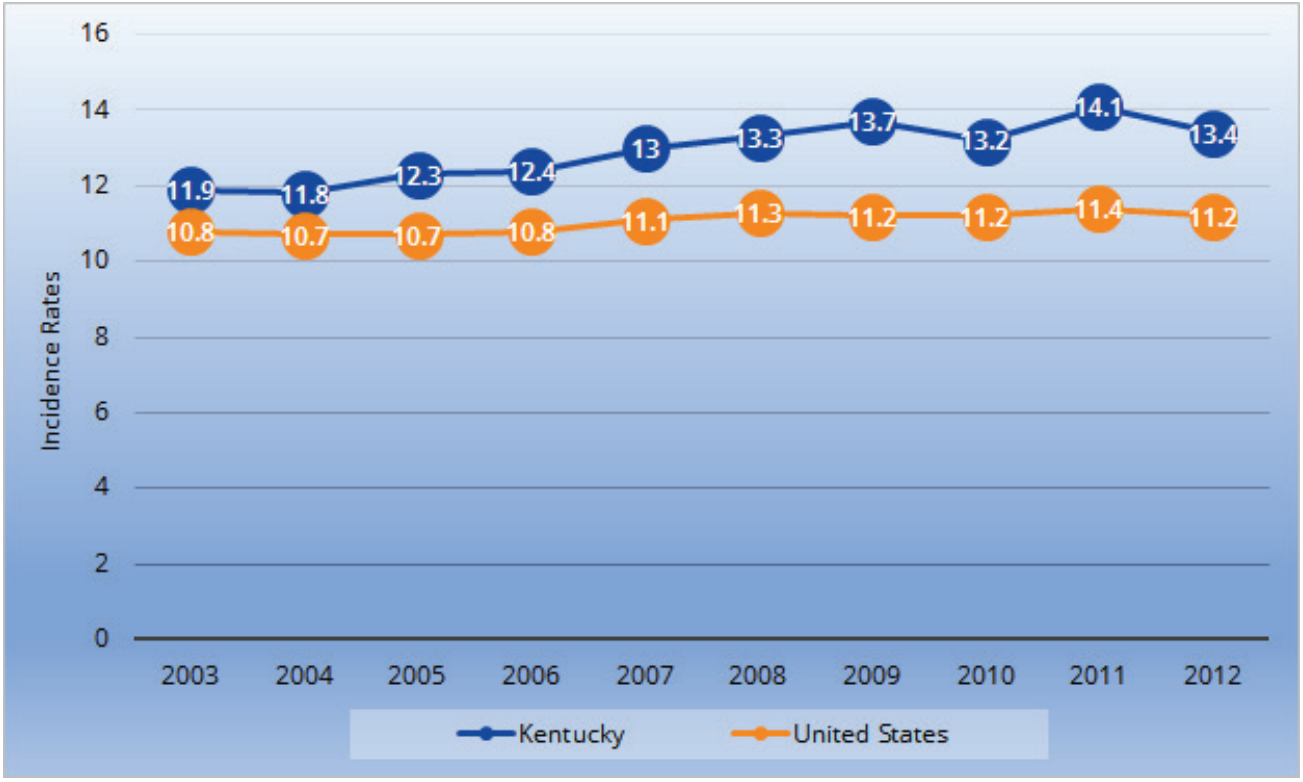
Data Source: Kentucky Elder Oral Health Survey.

Oral Cancer

Oral Cancer in Kentucky

The age-adjusted incidence rate for cancer of the oral cavity and the pharynx rose in Kentucky from 11.9 cases per 100,000 population in 2003 to 13.4 cases per 100,000 population in 2012 (Figure 62). Throughout the 10-year period, from 2003 to 2012, the annual incidence rates of oral cancer in Kentucky were above the incidence rates of oral cancers nationally in all years, particularly in 2011 (14.1 in Kentucky vs. 11.4 nationally).

Figure 62. Incidence rates of oral cavity and pharynx cancer in Kentucky and in the US, National Cancer Institute, State Cancer Profiles, 2003 to 2012



Data Source: National Cancer Institute, State Cancer Profiles.
Note: Incidence rates (cases per 100,000 population per year) are age-adjusted.

In 2012, Kentucky had the 2nd highest age-adjusted incidence rate of oral cancer in the US with 13.4 cases per 100,000 men and women (Table 8). The 2012 national incidence rate was 11.2 oral cancer cases per 100,000 people.

Table 8. Incidence rates of oral cavity and pharynx cancer by state, National Cancer Institute, State Cancer Profiles, 2012

State	Incidence Rates of Oral and Pharynx Cancer (2012)	Lower 95% Confidence Interval	Upper 95% Confidence Interval
United States	**11.2**	**11.1**	**11.3**
Alaska	13.5	10.7	16.8
Kentucky	**13.4**	**12.4**	**14.5**
Alabama	13.2	12.3	14.2
Hawaii	13.0	11.2	14.9
Maine	12.9	11.3	14.7
Oklahoma	12.8	11.8	14.0
Massachusetts	12.7	11.9	13.5
North Carolina	12.5	11.8	13.1
Florida	12.5	12.0	12.9
Louisiana	12.4	11.4	13.4
South Carolina	12.4	11.5	13.4
Tennessee	12.4	11.6	13.2
District of Columbia	12.3	9.7	15.5
Arkansas	12.2	11.0	13.4
Iowa	12.1	11.0	13.3
Mississippi	12.1	10.9	13.4
Georgia	11.9	11.3	12.6
Illinois	11.8	11.3	12.4
Vermont	11.8	9.5	14.5
Missouri	11.7	11.0	12.6
South Dakota	11.7	9.7	14.1
Pennsylvania	11.7	11.2	12.2
Kansas	11.7	10.5	12.9
Indiana	11.6	10.8	12.4
Oregon	11.5	10.6	12.6
Connecticut	11.5	10.5	12.6
Wisconsin	11.5	10.7	12.4
West Virginia	11.4	10.1	12.9
Washington	11.4	10.6	12.2
Idaho	11.3	9.8	13.1
Minnesota	11.2	10.3	12.1
New Hampshire	10.9	9.4	12.7
Ohio	10.9	10.4	11.5
Montana	10.8	9.0	12.8
North Dakota	10.8	8.6	13.3
Delaware	10.7	8.8	12.8
Rhode Island	10.6	8.9	12.7
Michigan	10.6	10.0	11.2
Maryland	10.5	9.7	11.3
Texas	10.5	10.1	10.9
New York	10.4	10.0	10.9
California	10.2	9.9	10.6
Virginia	10.1	9.4	10.8
New Jersey	10.0	9.4	10.7
Colorado	9.6	8.8	10.5
Nebraska	9.5	8.2	11.0
Utah	9.5	8.3	10.8
Wyoming	9.2	7.0	12.0
New Mexico	9.1	7.9	10.4
Arizona	8.2	7.5	8.9

Data Source: National Cancer Institute, State Cancer Profiles.

Notes:

Incidence rates (cases per 100,000 population per year) are age-adjusted.
Data for the United States does not include data from Nevada.

The age-adjusted incidence rate of oral cancer was slightly higher in the Appalachian Region of Kentucky than in Non-Appalachian Kentucky (Table 9). The number of new cases of oral and pharynx cancer was 13.7 per 100,000 people per year (2008 to 2012) in the Appalachian Region and 13.5 per 100,000 people per year in Non-Appalachian Kentucky.

Table 9. Incidence rates of oral cavity and pharynx cancer in Kentucky by region, National Cancer Institute, State Cancer Profiles, 2008 to 2012

Appalachian Region	Incidence Rates of Oral and Pharynx Cancer (2008-2012)	Lower 95% Confidence Interval	Upper 95% Confidence Interval
Kentucky	**13.6**	**13.1**	**14.0**
Appalachia	13.7	12.9	14.6
Non-Appalachia	13.5	12.9	14.0
Data Source: National Cancer Institute, State Cancer Profiles.			
Note: Incidence rates (cases per 100,000 population per year) are age-adjusted.			

Data Source: National Cancer Institute, State Cancer Profiles.

Note: Incidence rates (cases per 100,000 population per year) are age-adjusted.

During the 2008 to 2012 time period, age-adjusted, oral cancer incidence rates varied noticeably by county in Kentucky with the highest incidence rates in Bracken and Cumberland counties (Table 10). The oral cancer incidence rate of 35.2 in Bracken was 2.5 times higher than the state incidence rate; the incidence rate of 24.7 in Cumberland was almost twice the state incidence rate of 13.6 per 100,000 people per year.

Table 10. Incidence rates of oral cavity and pharynx cancer in Kentucky by county, National Cancer Institute, State Cancer Profiles, 2008 to 2012

County	Incidence Rates of Oral and Pharynx Cancer (2008-2012)	Lower 95% Confidence Interval	Upper 95% Confidence Interval
Kentucky	**13.6**	**13.1**	**14.0**
Bracken	35.2	20.3	57.1
Cumberland	24.7	11.8	46.4
Rockcastle	22.9	14.6	34.6
Robertson	~	~	~
Harrison	21.8	14.0	32.6
Hopkins	21.6	16.6	27.8
Caldwell	21.0	11.7	35.0
Spencer	20.7	12.6	32.5
Larue	20.4	11.5	33.6
Magoffin	19.3	10.7	32.5
Nicholas	18.2	7.8	37.0
Mason	18.1	10.6	29.0
Bourbon	18.1	11.4	27.6
Butler	17.8	9.9	30.1
Powell	17.5	9.1	30.7
Taylor	17.4	11.5	25.5
Simpson	17.4	10.2	27.9
Boyd	17.2	13.0	22.5
Webster	17.1	9.2	29.3
Rowan	17.0	10.3	26.5
Perry	16.9	11.1	24.6
McCracken	16.8	13.1	21.3
Marion	16.8	10.1	26.6
Livingston	16.8	8.8	30.6
Meade	16.8	10.7	25.1
Campbell	16.4	13.1	20.5
McCreary	16.4	9.7	26.5
Bath	16.3	8.4	29.3
Nelson	16.3	11.5	22.5
Johnson	16.2	10.1	24.7
Clinton	16.1	8.0	30.0
Morgan	15.9	8.4	27.9
Letcher	15.9	10.0	24.3
Fulton	15.9	6.8	33.3
Carter	15.8	10.3	23.5
Garrard	15.7	8.9	26.0
Harlan	15.7	10.1	23.2
Ballard	15.6	6.4	32.4
Henry	15.1	8.5	25.3
Pulaski	15.1	11.4	19.5
Christian	15.0	11.0	19.9
Boyle	15.0	9.7	22.3
Adair	15.0	8.8	24.2
Pendleton	14.7	7.4	26.2
Anderson	14.7	8.6	23.5
Pike	14.5	10.9	19.0
Henderson	14.5	10.3	19.9
Lewis	14.4	7.3	25.8
Mercer	14.3	8.4	22.8
Lee	14.2	5.4	31.1
Green	14.1	7.0	26.3
Metcalfe	14.0	6.3	27.6
Casey	14.0	7.9	23.4
Grant	13.9	8.0	22.5
Franklin	13.9	10.0	18.9
Clark	13.7	9.2	19.8
Ohio	13.5	8.0	21.5
Owsley	~	~	~
Russell	13.4	7.6	22.5
Fayette	13.4	11.5	15.4
Jackson	13.3	6.5	24.6
Calloway	13.3	8.8	19.4
Jefferson	13.2	12.1	14.4
Monroe	13.2	6.0	25.8
Washington	13.2	5.5	26.3
Marshall	13.1	8.6	19.4
Floyd	13.1	8.8	18.8
Hart	13.0	7.1	22.3
Logan	12.8	7.9	20.0
Whitley	12.8	8.3	19.0
Kenton	12.8	10.5	15.5
Lincoln	12.7	7.4	20.2
Bell	12.6	7.9	19.2
Scott	12.6	8.1	18.5
Madison	12.5	9.3	16.5
Daviess	12.4	9.6	15.8
Bullitt	12.3	9.1	16.4
Woodford	12.1	7.1	19.5
Lawrence	12.0	6.1	21.8
Breckinridge	12.0	6.7	20.3
Breathitt	12.0	5.6	22.7
Montgomery	12.0	7.0	19.2
Warren	11.9	9.1	15.2
Knox	11.9	7.5	18.2
Oldham	11.8	8.1	16.7
McLean	11.8	5.0	24.7
Graves	11.7	7.6	17.3
Knott	11.5	5.8	20.8
Boone	11.4	8.8	14.7
Trigg	11.4	6.0	20.8
Hardin	11.3	8.7	14.5
Laurel	11.2	7.8	15.6
Grayson	11.1	6.5	17.9
Leslie	11.0	4.2	23.4
Wayne	10.9	6.0	18.6
Muhlenberg	10.8	6.6	16.9
Menifee	~	~	~
Clay	10.8	5.8	18.6
Owen	10.6	4.2	22.7
Shelby	10.3	6.7	15.4
Union	10.3	4.6	20.2
Fleming	10.2	4.6	19.9
Jessamine	10.1	6.6	14.8
Carroll	9.9	3.6	22.1
Greenup	9.9	6.3	15.0
Barren	9.7	6.3	14.6
Gallatin	9.2	3.0	23.0
Carlisle	~	~	~
Crittenden	9.1	3.3	21.2
Lyon	8.9	2.8	22.9
Todd	8.8	3.2	19.4
Edmonson	8.8	3.4	19.2
Elliott	~	~	~
Wolfe	~	~	~
Martin	6.6	2.1	16.1
Allen	6.3	2.5	13.2
Hickman	~	~	~
Trimble	~	~	~
Estill	~	~	~
Hancock	~	~	~

Data Source: National Cancer Institute, State Cancer Profiles.

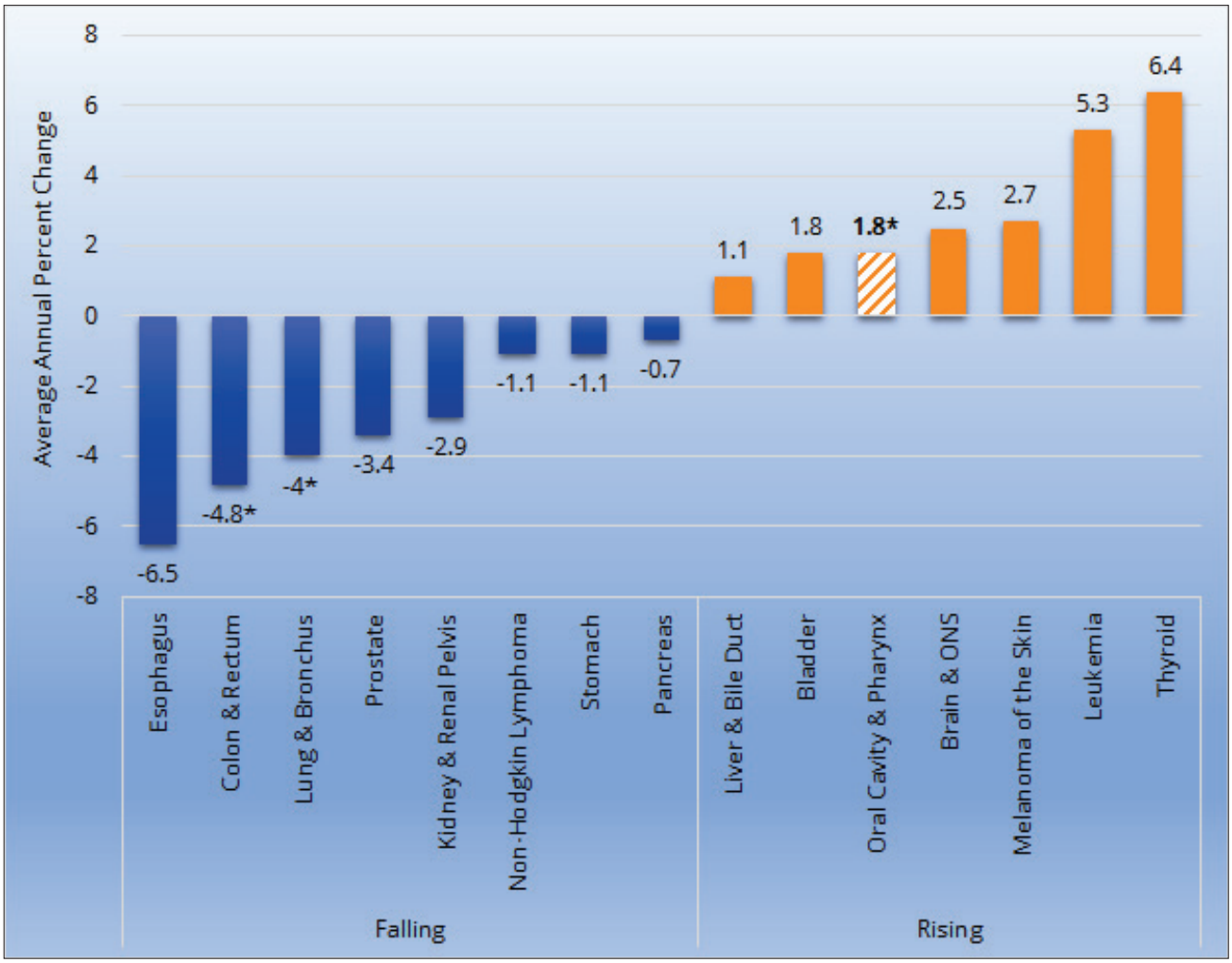
Notes:

Incidence rates (cases per 100,000 population per year) are age-adjusted.

~ Average annual counts fewer than 16 cases over rate period.

The incidence rate of many cancers declined among Kentucky's population from 2008 to 2012; however, oral cancer was rising in the male population ages 65 and older, with a significantly increasing trend of 1.8% during the 5-year period (Figure 63). Oral cancer was more common in men than women, and in older rather than in younger people.

Figure 63. Incidence rate changes of oral cavity and pharynx cancer and other types of cancer in Kentucky, National Cancer Institute, State Cancer Profiles, 2008 to 2012



Data Source: National Cancer Institute, State Cancer Profiles.

Note: * The annual percent change is significantly different from zero ($p<0.05$).

Tobacco use is linked to the incidence of oral cancers. Smoking cigarettes and other tobacco products, including cigars or use of smokeless tobacco puts users at risk for developing oral cancers over their lifetimes. Smokeless tobacco use increases the risk of cancers of the mouth and gums, and cigar use is linked to cancers of the larynx, mouth, esophagus, and lungs.[47]

[47] Healthy People 2020, Office of Disease Prevention and Health Promotion. Tobacco Use. Overview. Washington, DC: Office of Disease Prevention and Health Promotion. Date last modified January 12, 2016. https://www.healthypeople.gov/2020/topics-objectives/topic/tobacco-use.

The BRFSS asks questions regarding tobacco use and exposure to secondhand-smoke in the household or work environment. In 2013, the percentage of Kentucky adults who smoked (26.5%) was much higher than the percentage of adults in the US who smoked (19.0%), ranking Kentucky second highest in the nation (Table 11). The percentage of Kentucky adults who smoked was more than twice the Healthy People 2020 target of 12.0%. Current smoking in adults ranged from 10.3% in Utah to 27.3% in West Virginia (27.3%).

Table 11. Current smoking among adults by state, Behavioral Risk Factor Surveillance System Survey, 2013

State	Prevalence (2013)
United States	**19.0%**
West Virginia	27.3%
Kentucky	**26.5%**
Arkansas	25.9%
Mississippi	24.8%
Tennessee	24.3%
Oklahoma	23.7%
Louisiana	23.5%
Ohio	23.4%
Alaska	22.6%
Missouri	22.1%
South Carolina	22.0%
Indiana	21.9%
Alabama	21.5%
Michigan	21.4%
North Dakota	21.2%
Pennsylvania	21.0%
Wyoming	20.6%
North Carolina	20.3%
Maine	20.2%
Kansas	20.0%
Delaware	19.6%
South Dakota	19.6%
Iowa	19.5%
Nevada	19.4%
New Mexico	19.1%
Montana	19.0%
Virginia	19.0%
District of Columbia	18.8%
Georgia	18.8%
Wisconsin	18.7%
Nebraska	18.5%
Illinois	18.0%
Minnesota	18.0%
Colorado	17.7%
Rhode Island	17.4%
Oregon	17.3%
Idaho	17.2%
Florida	16.8%
Massachusetts	16.6%
New York	16.6%
Vermont	16.6%
Maryland	16.4%
Arizona	16.3%
New Hampshire	16.2%
Washington	16.1%
Texas	15.9%
New Jersey	15.7%
Connecticut	15.5%
Hawaii	13.3%
California	12.5%
Utah	10.3%

Data Source: Behavioral Risk Factor Surveillance System Survey (BRFSS)

The prevalence of several other indicators of smoking was much higher in Kentucky that nationwide; current cigarette smoking among women in Kentucky ages 18 to 44 was 30.8%. The national rate was 20.5%. Current use of smokeless tobacco among adults ages18 and older was 7.0% in Kentucky and 4.3% nationally (Table 12). In addition, the percent of "quit attempts" in the past year among current smokers was lower in Kentucky (50.1%) than in the US (59.4%).

Table 12. Indicators of smoking among adults, Behavioral Risk Factor Surveillance System Survey, 2013

Indicators of Smoking (2013)	Kentucky	United States
Current smoking among adults aged ≥18 years	26.5%	19.0%
Current cigarette smoking among women aged 18-44 years	30.8%	20.5%
Current smokeless tobacco use among adults aged ≥18 years	7.0%	4.3%
Quit attempts in the past year among current smokers	50.1%	59.4%
Data Source: Behavioral Risk Factor Surveillance System Survey (BRFSS)		

Data Source: Behavioral Risk Factor Surveillance System Survey (BRFSS).

The Youth Risk Behavior Surveillance System monitors risky behaviors among 9th through 12th grade students in the US including tobacco, alcohol, and drug use.[48] The CDC collects these data every two years. The results of the 2013 survey were published in a 2014 summary report.[49] Certain findings on tobacco use in Kentucky as well as nationwide[50] are presented below.

In 2013, the prevalence of cigarettes use, as well as other tobacco products was higher in young people in Kentucky (26.3%) than in young people nationally (22.4%); the difference was borderline statistically significant (Table 13). The use of smokeless tobacco products was especially concerning because of the heightened risk of developing oral cancers. In 2013, young people in Kentucky (13.2%) were significantly more likely to be users of snuff or other chewing tobacco products than young people nationally (8.8%). High school students in Kentucky were also more likely than those nationwide to have:

- Ever tried cigarette smoking, even one or two puffs;
- Smoked a whole cigarette before age 13 years for the first time;
- Ever smoked at least one cigarette every day for 30 days;
- Smoked cigarettes on all 30 days, during the 30 days before the survey.

[48] Centers for Disease Control and Prevention. Youth Risk Behavior Surveillance System. http://www.cdc.gov/healthyyouth/data/yrbs/overview.htm.

[49] Kann L, Kinchen S, Shanklin S, et al. Youth risk behavior surveillance--United States, 2013. MMWR Surveill Summ. 2014; 63(4):1-168. http://www.cdc.gov/mmwr/pdf/ss/ss6304.pdf.

[50] Centers for Disease Control and Prevention (CDC). Youth Online: High School YRBS. Kentucky 2013 and United States 2013 Results. https://nccd.cdc.gov/youthonline/App/Results.aspx?TT=G&OUT=0&SID=HS&QID=QQ&LID=KY&YID=2013&LID2=XX&YID2=2013&COL=&ROW1=&ROW2=&HT=QQ&LCT=&FS=S1&FR=R1&FG=G1&FSL=&FRL=&FGL=&PV=&C1=KY2013&C2=XX2013&QP=G&DP=1&VA=CI&CS=N&SYID=&EYID=&SC=DEFAULT&SO=ASC&pf=1&TST=True.

Table 13. Percentage of high school students who used tobacco in Kentucky and in the US, Youth Risk Behavior Survey, 2013

Tobacco Use (2013)	Kentucky[a]	United States[a]	p-value
Currently used tobacco (current cigarette use, current smokeless tobacco use, or current cigar use)	26.3 (22.6–30.5)	22.4 (19.9–25.0)	0.09
Currently smoked cigarettes (on at least 1 day during the 30 days before the survey)	17.9 (15.0–21.2)	15.7 (13.5–18.1)	0.24
Currently used smokeless tobacco (chewing tobacco, snuff, or dip on at least 1 day during the 30 days before the survey)	13.2 (10.4–16.7)	8.8 (7.3–10.6)	0.01
Currently used cigars (cigars, cigarillos, or little cigars on at least 1 day during the 30 days before the survey)	13.3 (11.4–15.6)	12.6 (11.4–13.9)	0.56
Ever tried cigarette smoking (even one or two puffs)	47.1 (42.1–52.1)	41.1 (38.4–43.8)	0.04
Smoked a whole cigarette before age 13 years (for the first time)	14.2 (11.7–17.0)	9.3 (7.8–11.1)	0.00
Currently smoked cigarettes frequently (on 20 or more days during the 30 days before the survey)	7.3 (5.7–9.4)	5.6 (4.4–7.1)	0.12
Smoked more than 10 cigarettes per day (among students who currently smoked cigarettes on the days they smoked during the 30 days before the survey)	10.9 (8.1–14.5)	8.6 (6.6–11.2)	0.24
Ever smoked at least one cigarette every day for 30 days	13.5 (11.3–16.0)	8.8 (7.2–10.8)	0.00
Smoked cigarettes on all 30 days (during the 30 days before the survey)	5.6 (4.3–7.2)	4.0 (3.0–5.3)	0.08
Data Source: High School Youth Risk Behavior Survey (YRBSS).			
Note: [a] Percentage (confidence interval).			

Substance Abuse

Substance Abuse in Kentucky

In 2015, the CDC analyzed and published findings regarding the current trends in drug overdose deaths, including opioid pain relievers (natural and semisynthetic opioids, methadone, and other synthetic opioids) and heroin.[51] In 2014, a total of 47,055 drug overdose deaths occurred in the US. The rate of opioid drug overdose deaths increased significantly from 13.8 deaths per 100,000 persons in 2013 to 14.7 deaths per 100,000 persons in 2014 (6.5% increase).

The number and rate of opioid drug overdose deaths in Kentucky increased from 2013 to 2014 resulting in a 4.2% increase in the age-adjusted mortality rate per population (Table 14). In 2014, Kentucky had the 4th highest rate in the nation of drug overdose death, (24.7 deaths per 100,000 population) after West Virginia (35.5), New Mexico (27.3), and New Hampshire (26.2).

[51] Rudd R, Aleshire N, Zibbell J, et al. Increases in Drug and Opioid Overdose Deaths — United States, 2000–2014. *MMWR Morb Mortal Wkly Rep.* 2015; 64. http://www.cdc.gov/mmwr/pdf/wk/mm64e1218.pdf.

Table 14. Number and mortality rates of drug overdose by state (sorted descending by 2014 mortality rates)

State of residence	2013 n	2013 Drug-induced mortality rate	2014 n	2014 Drug-induced mortality rate	% change from 2013 to 2014[a]
United States	43,982	13.8	47,055	14.7	**6.5**
West Virginia	570	32.2	627	35.5	10.2
New Mexico	458	22.6	547	27.3	**20.8**
New Hampshire	203	15.1	334	26.2	**73.5**
Kentucky	1,019	23.7	1,077	24.7	4.2
Ohio	2,347	20.8	2,744	24.6	**18.3**
Rhode Island	241	22.4	247	23.4	4.5
Utah	594	22.1	603	22.4	1.4
Pennsylvania	2,426	19.4	2,732	21.9	**12.9**
Delaware	166	18.7	189	20.9	11.8
Oklahoma	790	20.6	777	20.3	-1.5
Tennessee	1,187	18.1	1,269	19.5	7.7
Wyoming	98	17.2	109	19.4	12.8
Massachusetts	1,081	16.0	1,289	19.0	**18.8**
Nevada	614	21.1	545	18.4	-12.8
Arizona	1,222	18.7	1,211	18.2	-2.7
Missouri	1,025	17.5	1,067	18.2	4.0
Indiana	1,064	16.6	1,172	18.2	**9.6**
Michigan	1,553	15.9	1,762	18.0	**13.2**
Connecticut	582	16.0	623	17.6	10.0
Maryland	892	14.6	1,070	17.4	**19.2**
Louisiana	809	17.8	777	16.9	-5.1
Alaska	105	14.4	124	16.8	16.7
Maine	174	13.2	216	16.8	**27.3**
Colorado	846	15.5	899	16.3	5.2
Alabama	598	12.7	723	15.2	**19.7**
Wisconsin	856	15.0	853	15.1	0.7
South Carolina	620	13.0	701	14.4	10.8
District of Columbia	102	15.0	96	14.2	-5.3
New Jersey	1,294	14.5	1,253	14.0	-3.4
Vermont	93	15.1	83	13.9	-7.9
North Carolina	1,259	12.9	1,358	13.8	7.0
Idaho	207	13.4	212	13.7	2.2
Washington	969	13.4	979	13.3	-0.7
Florida	2,474	12.6	2,634	13.2	4.8
Illinois	1,579	12.1	1,705	13.1	**8.3**
Oregon	455	11.3	522	12.8	13.3
Arkansas	319	11.1	356	12.6	13.5
Montana	137	14.5	125	12.4	-14.5
Georgia	1,098	10.8	1,206	11.9	**10.2**
Kansas	331	12.0	332	11.7	-2.5
Virginia	854	10.2	980	11.7	**14.7**
Mississippi	316	10.8	336	11.6	7.4
New York	2,309	11.3	2,300	11.3	0.0
California	4,452	11.1	4,521	11.1	0.0
Hawaii	158	11.0	157	10.9	-0.9
Texas	2,446	9.3	2,601	9.7	4.3
Minnesota	523	9.6	517	9.6	0.0
Iowa	275	9.3	264	8.8	-5.4
South Dakota	55	6.9	63	7.8	13.0
Nebraska	117	6.5	125	7.2	10.8
North Dakota	20	2.8	43	6.3	**125.0**

Data Source: Centers for Disease Control and Prevention, National Vital Statistics System, Mortality.

Notes:

Mortality rates (cases per 100,000 population per year) are age-adjusted.

[a] Bolded results shows statistically significant changes from 2013 to 2014.

IV. The Impact of Dental Insurance on Access to and Utilization of Oral Health Services

Improving access to oral health services is a policy goal with many dimensions. One primary issue is identifying barriers to oral health services and then implementing strategies to reduce these barriers and improve the ability of the population to obtain services. Barriers to access may differ substantially by individual or population group. Sociodemographic, educational, environmental, and structural factors may influence a person's or a population's ability to access care, and other factors, especially cultural beliefs and oral health literacy may affect an individual's willingness to do so. While access to oral health services may be available and even unimpeded, appropriate utilization of oral health services may not. Ignorance of the importance of oral health, fear of dental procedures, or cultural preferences may discourage individuals from pursuing even routine care. Enabling conditions such as convenient hours at dental practices and possessing dental insurance promote appropriate utilization. An often-cited barrier to improving oral health is the lack of financial access for some populations, including the uninsured and underinsured who cannot afford personal financial contributions to the cost of care.

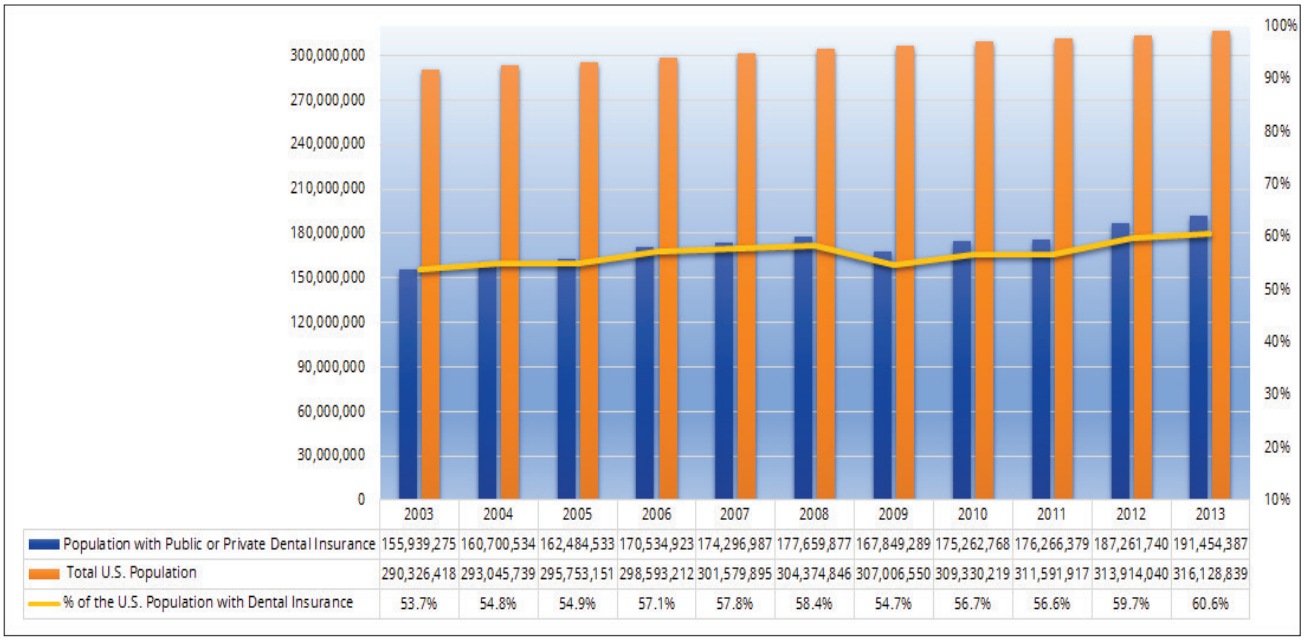
Dental Insurance

Dental insurance status is predictive of utilization of oral health services. Having dental insurance coverage is estimated to increase the probability of utilization of preventive oral health services by 19% and the use of restorative services by between 11% and 16%.[52] People without dental insurance are more likely than others to have extractions and dentures, less likely to receive restorative care or treatment for gum disease and have higher incidences of chronic illness including heart disease and diabetes.

According to data from the National Association of Dental Plans (NADP), there is an upward trend in people with dental insurance in the US (Figure 64).

[52] Meyerhoefer C, Zuvekas S, Manksi R. The demand for preventive and restorative dental services. *Health Economics.* 2014; 23(1):24-32. http://onlinelibrary.wiley.com/doi/10.1002/hec.2899/pdf.

Figure 64. Percent of US population with public or private dental insurance coverage, 2003 to 2013



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Population with Public or Private Dental Insurance	155,939,275	160,700,534	162,484,533	170,534,923	174,296,987	177,659,877	167,849,289	175,262,768	176,266,379	187,261,740	191,454,387
Total U.S. Population	290,326,418	293,045,739	295,753,151	298,593,212	301,579,895	304,374,846	307,006,550	309,330,219	311,591,917	313,914,040	316,128,839
% of the U.S. Population with Dental Insurance	53.7%	54.8%	54.9%	57.1%	57.8%	58.4%	54.7%	56.7%	56.6%	59.7%	60.6%

Data Source: National Association of Dental Plans (NADP).

The NADP found that at the end of 2014 about 64% of the US population (approximately 205 million people) were covered by a private or public dental insurance plan and about 114 million Americans (67.7 million of whom were under 65 years of age) had no dental insurance benefits.[53] About twice as many people under 65 years of age lack dental insurance as lack medical insurance.[53]

The percentage of the population with dental benefits through public or private insurance plans varied over the last decade with a significant drop in 2009 during the recent economic recession. There has been a steady increase in the proportion of the population with dental insurance during post-recession economic recovery.

According to the ADA, the percentage of Americans with private dental insurance benefits declined between 2000-2011 resulting in more uninsured adults and more children moving to public dental insurance programs.[54] The decline in private dental benefits affected utilization rates of oral health services especially among adults some of whom qualified for Medicaid coverage in their states.

The NADP reports that in 2013 (prior to ACA implementation) an estimated 2,370,002 residents of Kentucky or approximately 54% of the state's population had dental insurance benefits (Table 15).[55] Of

[53] National Association of Dental Plans. Who has dental benefits? http://www.nadp.org/Dental_Benefits_Basics/Dental_BB_1.aspx.

[54] Yarborough C, Nasseh K, Vujicic M. Key differences in dental care seeking behavior between Medicaid and Non-Medicaid adults and children. Health Policy Institute, American Dental Association. September 2014. http://www.ada.org/~/media/ADA/Science%20and%20Research/HPI/Files/HPIBrief_0814_4.ashx.

[55] National Association of Dental Plans. Kentucky Dental Benefits Fact Sheet. 2015. http://www.nadp.org/researchpublications/reportvault.aspx.

these 566,878 people were insured by Medicaid and 35,539 people were insured through other public insurance according to NADP. While 56% of the national population with dental insurance had annual incomes of less than $50,000, only 48% of those with dental insurance in Kentucky had annual incomes less than $50,000. This data suggests that lower income people in Kentucky were less likely than lower income people in the US to have dental insurance coverage at that time.

Table 15. Percent of Kentucky population with public or private dental insurance coverage, 2013

Type of Dental Insurance	Number of People Enrolled	Totals	Number of Plans Offered	Number of Dentists Participating
Dental Health Maintenance Organization	76,804		8	154
Dental Preferred Provider Organization	1,528,937		23	2,123
Dental Indemnity Plan	123,018		16	
Other Private Dental Insurance (Including Discount Plans)	38,826		14	1,418
Total Population with Private Dental Insurance		**1,767,585**		
Medicaid/ CHIP	566,878			
Other Public	35,539			
Total Population with Public Dental Insurance		**602,417**		
Total Population with Any Dental Insurance Coverage		**2,370,002**		
Total Population in Kentucky 2013		**4,380,415**		
Percent of Kentucky's Population with Any Dental Insurance Coverage		**54.1%**		
Percent of Kentucky's Population Covered by Private Dental Insurance		**40.3%**		
Percent of Kentucky's Population Covered by Public Dental Insurance		**13.8%**		
Data Source: National Association of Dental Plans (NADP).				

Dental Coverage in Medicaid Plans

While adult Medicaid enrollment increased over the decade beginning in 2000 due to the number of adults in reduced economic circumstances, adult utilization of dental services declined. Some states offer no adult dental benefit in their Medicaid programs or coverage is limited to emergency dental services only.

In 1997 Kentucky implemented the Kentucky Health Partnership which was a risk based managed care program for Medicaid eligible people that covered primary care, acute care, and specialty services for beneficiaries using regional networks of providers.[56] The program was gradually extended to include most Medicaid beneficiaries so that by 2011, about ninety percent of Medicaid enrollees in Kentucky were enrolled in managed health care. Passport Health Plan was one of the MCOs partnering with the state in this effort.

Over time, the state expanded managed care statewide and implemented a mandatory risk based managed care program with commercial MCOs to cover health, behavioral health and dental services.

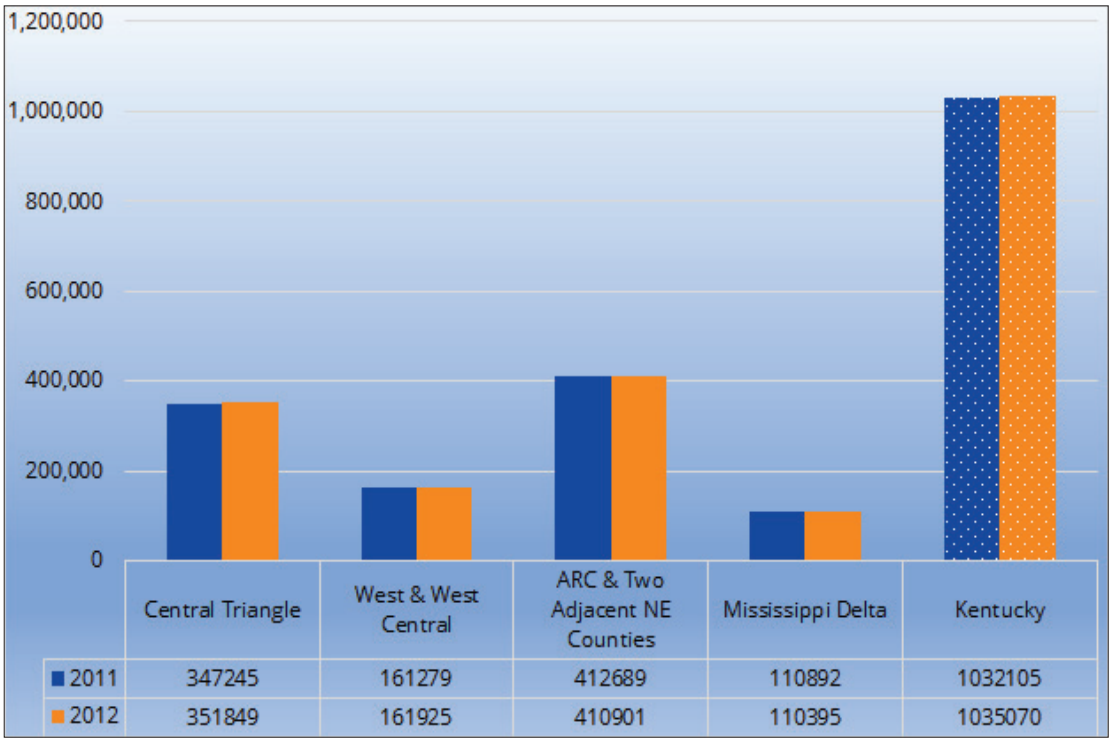
[56] Centers for Medicare and Medicaid. Managed Care in Kentucky. https://www.medicaid.gov/medicaid-chip-program-information/by-topics/delivery-systems/managed-care/downloads/kentucky-mcp.pdf.

This program integrated insurance for health and ancillary services and relied on statewide rather than regional networks of providers. In 2013, coincidental with the opening of the state marketplace, KYNECT, Kentucky awarded additional contracts to several MCOs including Coventry Cares Health Plan, Anthem Health Plan, Wellcare Health Plan, and Humana Care Source Health Plan to begin managing care in January 2014. Passport Health Plan remained in contract with the state.

The five MCOs subcontracted with Avesis, DentaQuest, MCNA or Passport for management of the mandated dental benefits for Medicaid beneficiaries. The state required the contracted MCOs to expand provider networks to ensure access for Medicaid beneficiaries to the full range of allowable services described in Kentucky's Alternative Benefit Plan.

In 2011 and 2012, data from Kentucky Medicaid indicated that 1,035,070 people were covered by Medicaid insurance in the state (Figure 65). Most Medicaid enrollees resided in the Appalachian Region and the two adjacent northern counties (410,901) or in the Central Triangle (351,849). In Appalachia, an almost equal number of adults (202,000) and children (209,000) were insured by Medicaid. In contrast, in the Central Triangle, two thirds of those enrolled in Medicaid were children ages 20 or younger. The number of people enrolled in Medicaid represented approximately one quarter of the state's total population. The high percentage of people with public insurance suggests that Medicaid policy, reimbursement, and benefits are an important driver of access to oral health services in the state.

Figure 65. Medicaid/KCHIP enrollment by year and region in Kentucky, Appalachian Rural Dental Education Partnership, 2011 to 2012



	Central Triangle	West & West Central	ARC & Two Adjacent NE Counties	Mississippi Delta	Kentucky
2011	347245	161279	412689	110892	1032105
2012	351849	161925	410901	110395	1035070

Data Source: Appalachian Rural Dental Education Partnership (ARDEP).

Estimates of the numbers of Medicaid insured in the previously discussed NADP data varied from state data about Medicaid enrollment. It is difficult to describe the discrepancies in counts. However, one possible reason for the variance may be the methodology used to collect data. In the NADP data, dental plans described enrollees by the particular type of dental insurance product. It might be that a portion of the population reported as enrolled in dental health maintenance organizations and dental preferred provider organizations (DPPOs) numbers in Kentucky in the NADP data were Medicaid eligible people. The number insured by public dental insurance would be reduced by that allocation. In fact 86.5% of those with dental insurance in Kentucky in 2013 were enrolled in a DPPO versus 78.9% nationally.

Utilization of Dental Services

Utilization of dental services among working age adults steadily declined in the US between 2000 and 2011 partly because of changes in dental insurance status in the population. During this period, the percentage of the population with private dental insurance declined. At the same time, a number of states reduced or eliminated adult dental coverage in Medicaid programs resulting in an erosion of adult dental benefits nationwide.[57] A national analysis examining the impact of Medicaid benefit expansion in states found that the likelihood of a low-income adult visiting a dentist increased between 16%-22% within a year of obtaining dental benefits through a Medicaid program.[58]

From 2011 to 2013, children's dental care utilization for children ages 2-18 years increased from 45.5% to 48.3%. As of 2013, children's utilization of dental care was at its highest level since the Medical Expenditure Panel Survey began tracking measurements in 1996. For the first time since 2007, in 2013 dental care utilization among working age adults (35.5%) remained stable representing a break in recent utilization trends. Among the elderly, overall dental utilization increased from 38.3% in 2000 to 42.4% in 2013.[59]

While there has been a gradual increase in the share of dental expenditures financed by public sources, especially Medicaid, over recent years, dental care is still mainly financed by private dental insurance and out-of-pocket spending. This differs greatly from financing in health care.[57] Patients are often required to pay a higher portion of the cost for dental services than for health care services and many commercial dental insurance plans have annual payment limits. As a result, patients with limited insurance coverage or high costs of participation may delay or defer care, especially when the economic climate is poor.

[57] Wall T, Nasseh K, Vujicic M. US dental spending remains flat through 2012. Health Policy Resources Center, American Dental Association. January 2014. http://www.ada.org/~/media/ADA/Science%20and%20Research/Files/HPRCBrief_0114_1.ashx; Wall T, Vujicic M. US dental spending continues to be flat. Health Policy Institute, American Dental Association. December 2015. http://www.ada.org/~/media/ADA/Science%20and%20Research/HPI/Files/HPIBrief_1215_2.ashx.

[58] Choi M. The impact of Medicaid insurance coverage on dental service use. *Journal of Health Economics*. 2011; 30(5):1020-1031. http://www.sciencedirect.com/science/article/pii/S016762961100110X#.

[59] Nasseh K, Vujicic M. Dental Care Utilization Rate Increases among Children, Holds Steady among Working-Age Adults and the Elderly. http://www.ada.org/~/media/ADA/Science%20and%20Research/HPI/Files/HPIBrief_1015_1.ashx.

Studies have shown that cost barriers are higher for dental care then for other health care services and that patients often cite lack of affordability as a primary reason for not seeking needed dental services.[60] There is a widely held misperception that dental care, especially preventive dental care, is electable and therefore deferrable when cost of care is considered prohibitive.

Although the percentage of the population reporting cost as a barrier to receiving needed dental care increased from 2000-2010, the percentage reporting cost barriers has subsequently declined, and fell again in 2013.[58] Young adults age 21-34 were the most likely group to report no cost barriers to seeking dental care.[58] Despite recent improvements, cost still remains a serious barrier to dental services utilization.[58] A study conducted on behalf of the ADA's Health Policy Institute found there were a number of reasons why adults who indicated intent to defer dental care in the coming year were electing to not seek services. Cost was a major factor and 1 of the primary barriers to obtaining oral health services. A concern is that delaying or foregoing care may result in more expensive dental care needs from progressed dental disease over the long term.

A recent study from the Commonwealth Fund also found that a percentage of the US population still identifies cost as a barrier to seeking needed health services.[61] When health insurance deductibles, co-pays, and coinsurance are high relative to total income people often elect to delay or defer services. In the study, which used a consumer survey, 46% of respondents with health insurance who were earning $23,000 or less annually indicated that they had skipped or delayed care because of the cost of deductibles, co-pays, and coinsurance for health care services.[59] Skipping care included not filling prescriptions, not obtaining a medical test or recommended follow-up care, not seeing a medical specialist as recommended, or not going to the doctor despite having a medical problem.[59] These findings suggest that even having dental insurance may not guarantee that patients with lower incomes can afford their contributions to the cost of care.

The Affordable Care Act

According to the Centers for Medicare & Medicaid Services (CMS), there were more than 560,000 additional Medicaid and CHIP enrollees in Kentucky between 2013 and 2015.[62] In 2014, after Medicaid expansion, over 100,000 more people in Kentucky, mostly adults, received dental services than in 2013.

[58] Choi M. The impact of Medicaid insurance coverage on dental service use. Journal of Health Economics. 2011; 30(5):1020-1031. http://www.sciencedirect.com/science/article/pii/S016762961100110X#.

[59] Nasseh K, Vujicic M. Dental Care Utilization Rate Increases among Children, Holds Steady among Working-Age Adults and the Elderly. http://www.ada.org/~/media/ADA/Science%20and%20Research/HPI/Files/HPIBrief_1015_1.ashx.

[60] Nasseh K, Vujicic M. Dental care utilization rate increases among children, holds steady among working-age adults and the elderly. Health Policy Institute, American Dental Association. October 2015. http://www.ada.org/~/media/ADA/Science%20and%20Research/HPI/Files/HPIBrief_1015_1.ashx.

[61] Collins S, Rasmussen W, Doty M, et al. Too High a Price: Out of Pocket Health Care Costs in the United States. The Commonwealth Fund. 2014; 29 (1784). http://www.commonwealthfund.org/publications/issue-briefs/2014/nov/out-of-pocket-health-care-costs.

[62] Centers for Medicare & Medicaid Services, Medicaid.gov. Kentucky. 2016. https://www.medicaid.gov/medicaid-chip-program-information/by-state/kentucky.html

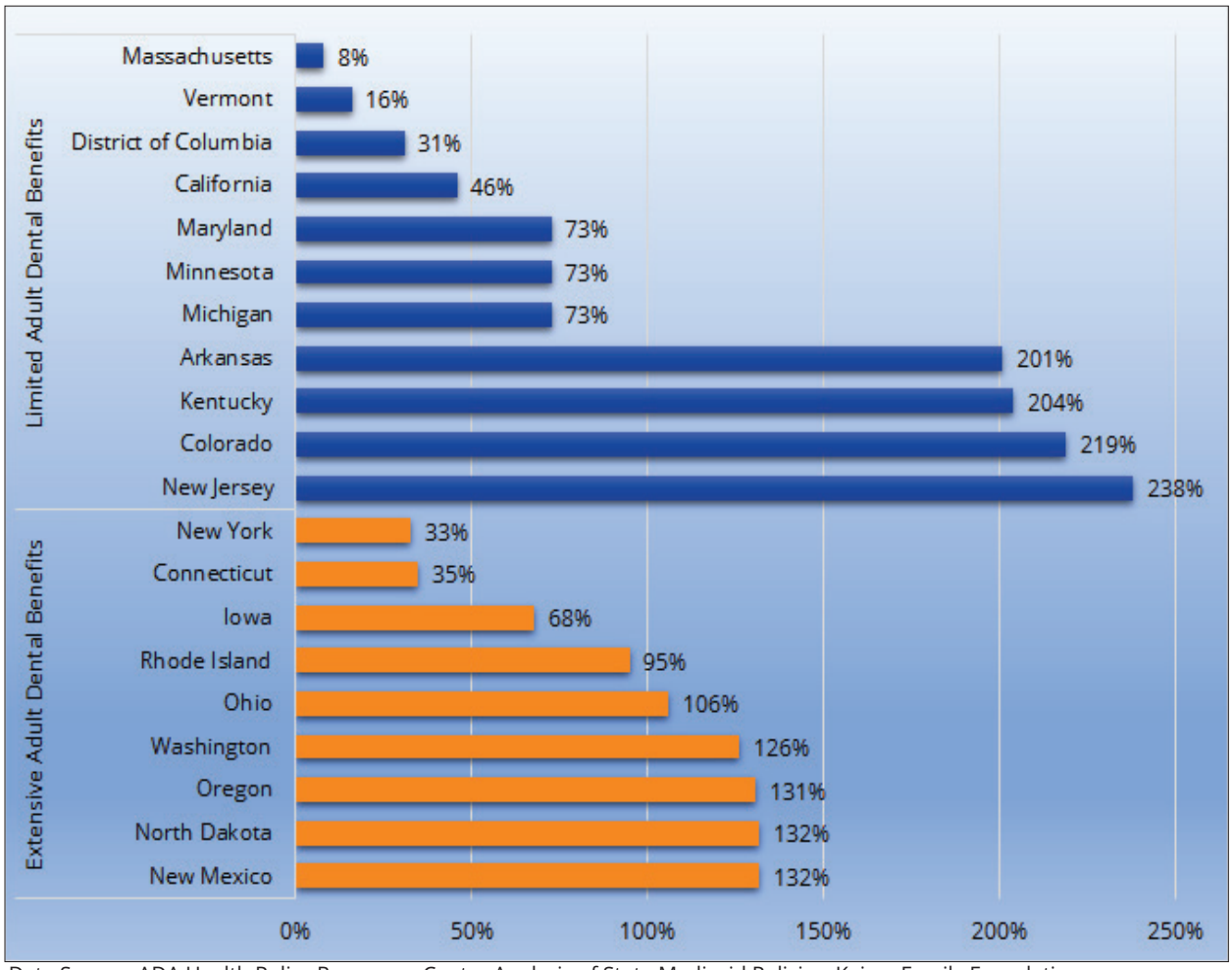
Dental benefits for children are 1 of several essential health benefits mandated in the ACA. State Medicaid programs are required to cover dental services for children ages 0 to 20 through the EPSDT benefit. The ACA mandates that pediatric dental insurance be offered in the small group and individual insurance markets across the US on federal and state insurance exchanges.

However, while commercial dental insurance for children is offered on these exchanges, the purchase of dental insurance for children is not assured, especially in the complex private market. The Internal Revenue rules providing insurance subsidies to low-income purchasers of health insurance do not include a direct subsidy for the purchase of pediatric dental insurance. In many states where medical and dental plans are sold separately, parents of children who do not qualify for public benefits must elect to purchase unsubsidized private dental plans, which increase the percentage of their income that is spent on health coverage. As a result, some parents choose not to buy dental insurance.

Many state legislatures are currently debating the advisability of embedding dental benefits in medical plans for children rather than leaving the benefit as a stand-alone purchase. Kentucky has selected to integrate health and dental insurance in their Medicaid program for both adults and children. Another positive impact of the ACA is the opportunity for states to expand eligibility for Medicaid to adults at or below 138% of the FPL. To date, 29 states including Kentucky have embraced the opportunity to use federal subsidies to expand eligibility in their Medicaid programs. However, most states still offer only a limited dental benefit to adults insured through Medicaid programs.

Kentucky was among the original group of states that expanded Medicaid eligibility under ACA guidelines (Figure 66). The expansion appreciably increased the number of adults in the state on Medicaid.

Figure 66. Increase in number of adults on Medicaid due to Medicaid expansion in states, 2014



Data Source: ADA Health Policy Resources Center Analysis of State Medicaid Policies, Kaiser Family Foundation.

In 2014, Arkansas and Kentucky reported the most notable reduction among states in the percentage of adults in the state without health insurance as a result of increased Medicaid enrollment on a state or federal marketplace (Table 16).[63]

Table 16. States with largest reductions in percentage of uninsured people, 2013 to 2014

State	Percentage of uninsured adults, 2013	Percentage of uninsured adults, 2014	Change in uninsured (% points)
Arkansas	22.5%	11.4%	-11.1%
Kentucky	20.4%	9.8%	-10.6%
Oregon	19.4%	11.7%	-7.7%
Washington	16.8%	10.1%	-6.7%
West Virginia	17.6%	10.9%	-6.7%
California	21.6%	15.3%	-6.3%
Connecticut	12.3%	6.0%	-6.3%
Colorado	17.0%	11.2%	-5.8%
Maryland	12.9%	7.8%	-5.1%
Montana	20.7%	15.8%	-4.9%
New Mexico	20.2%	15.3%	-4.9%
Data Source: Gallup-Healthways Well-Being Index.			

[63] Witters D. Arkansas, Kentucky See Most Improvement in Uninsured Rates. Gallup. http://www.gallup.com/poll/181664/arkansas-kentucky-improvement-uninsured-rates.aspx?utm_source=tagrss&utm_medium=rss&utm_campaign=syndication.

The various provisions of the ACA may have led to a decline in cost barriers to dental care, especially among low-income populations. In addition, the ACA's expanded dependent coverage was associated with increased affordability of dental care for younger adults.[64] However, it has yet to be determined if increased coverage will impact access to and utilization of dental care services. Some evidence suggests that factors such as lower dental provider reimbursement and administrative burdens may continue to limit the number of dentists participating in Medicaid.[65]

Medicaid Enrollment in Kentucky

Researchers from the University of Kentucky accessed Medicaid data from the state of Kentucky to compare enrollment in public insurance and utilization of oral health services by region in Kentucky.[66] The project was part of a needs assessment for the ARDEP to understand the feasibility of developing a collaborative rural dental education program for Appalachian Kentucky. Extensive analyses were completed with support from an ARC regional planning grant. Some of the summary findings are presented in the following pages. Enrollment in Medicaid or KCHIP in 2011 and 2012 was highest in the 54 counties in Appalachia and two additional adjacent counties in northeast Kentucky, not considered Appalachian (Figure 65). Almost 40% of all Medicaid enrollees in Kentucky resided in those 56 counties.

More than half (approximately 590,000) of the Medicaid enrollees were children ages 0 to 20 who were eligible for a full range of dental services under the mandatory EPSDT benefit in Medicaid (Figure 67).

[64] Nasseh K, Wall T, Vujicic M. Cost barriers to dental care continue to decline, particularly among young adults and the poor. Health Policy Institute, American Dental Association. October 2015. http://www.ada.org/~/media/ADA/Science%20and%20Research/HPI/Files/HPIBrief_1015_2.ashx.

[65] US General Accounting Office. Factors Contributing to the Low Use of Dental Services by Low Income Populations. September 2000. GAO/HEHS-00-149. http:///www.gao.gov/assets/240/230602.pdf.

[66] Mullins R. Comprehensive Needs Assessment: Appalachian Rural Education Partnership (ARDEP), ARC Planning Grant, 2011-2013. Morehead State University, University of Kentucky. September 2015.

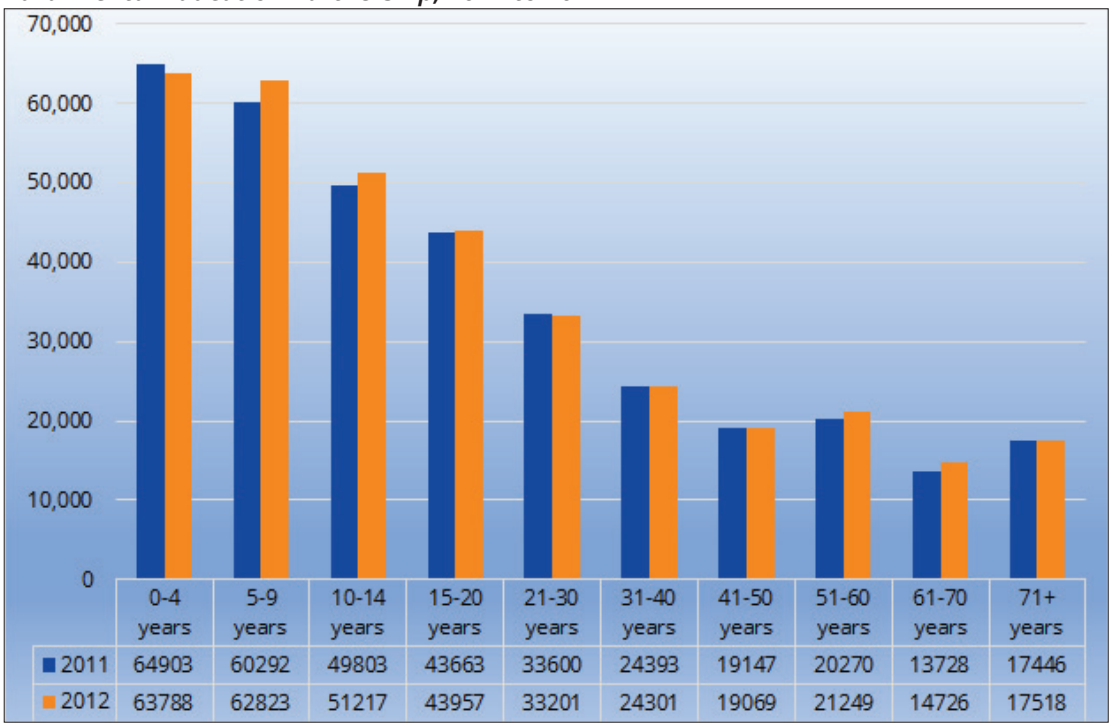
Figure 67. Medicaid/KCHIP enrollment by year and age in Kentucky, Appalachian Rural Dental Education Partnership, 2011 to 2012

	0-4 years	5-9 years	10-14 years	15-20 years	21-30 years	31-40 years	41-50 years	51-60 years	61-70 years	71+ years
2011	163304	158194	136345	129699	98771	80162	72098	73074	55453	65005
2012	160364	162922	138458	128937	96882	79248	70860	75323	57098	64978

Data Source: Appalachian Rural Dental Education Partnership (ARDEP).

The age profile of people in the Central Triangle Region who were enrolled in Medicaid mirrored the statewide age data (Figure 68). Children represented the majority of enrollees in this region.

Figure 68. Medicaid/KCHIP enrollment by year and age in Central Triangle Region of Kentucky, Appalachian Rural Dental Education Partnership, 2011 to 2012

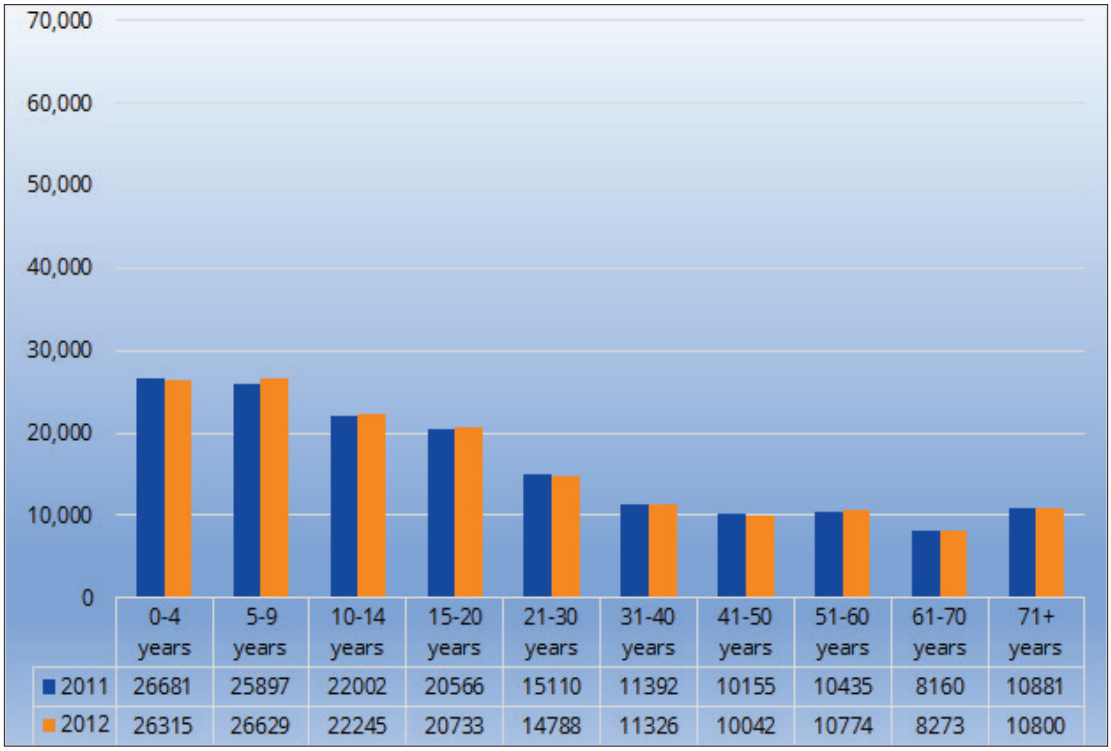


	0-4 years	5-9 years	10-14 years	15-20 years	21-30 years	31-40 years	41-50 years	51-60 years	61-70 years	71+ years
2011	64903	60292	49803	43663	33600	24393	19147	20270	13728	17446
2012	63788	62823	51217	43957	33201	24301	19069	21249	14726	17518

Data Source: Appalachian Rural Dental Education Partnership (ARDEP).

Fewer children and fewer people overall residing in the West-West Central Region of Kentucky were enrolled in Medicaid in 2011 and 2012 (Figure 69).

Figure 69. Medicaid/KCHIP enrollment by year and age in West-West Central Region of Kentucky, Appalachian Rural Dental Education Partnership, 2011 to 2012



	0-4 years	5-9 years	10-14 years	15-20 years	21-30 years	31-40 years	41-50 years	51-60 years	61-70 years	71+ years
2011	26681	25897	22002	20566	15110	11392	10155	10435	8160	10881
2012	26315	26629	22245	20733	14788	11326	10042	10774	8273	10800

Data Source: Appalachian Rural Dental Education Partnership (ARDEP).

Almost as many adults (approximately 202,000) as children (approximately 209,000) who resided in Appalachia or the two adjacent non-Appalachian counties in 2011 and 2012 were enrolled in Medicaid (Figure 70).

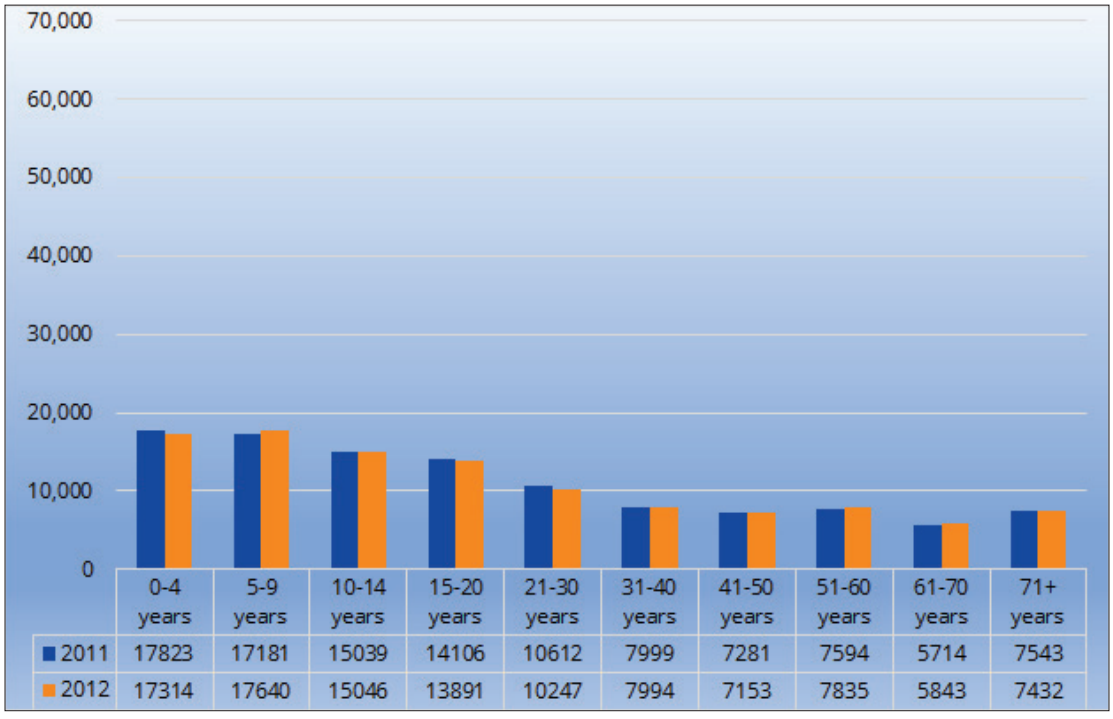
Figure 70. Medicaid/KCHIP enrollment by year and age in ARC Region and two adjacent NE Counties of Kentucky, Appalachian Rural Dental Education Partnership, 2011 to 2012

	0-4 years	5-9 years	10-14 years	15-20 years	21-30 years	31-40 years	41-50 years	51-60 years	61-70 years	71+ years
2011	53897	54824	49501	51364	39449	36378	35515	34775	27851	29135
2012	52947	55830	49950	50356	38646	35627	34596	35465	28256	29228

Data Source: Appalachian Rural Dental Education Partnership (ARDEP).

Similar to many other regions, more children than adults were insured by Medicaid in the Mississippi Delta Region (Figure 71).

Figure 71. Medicaid/KCHIP enrollment by year and age in Mississippi Delta Region of Kentucky, Appalachian Rural Dental Education Partnership, 2011 to 2012

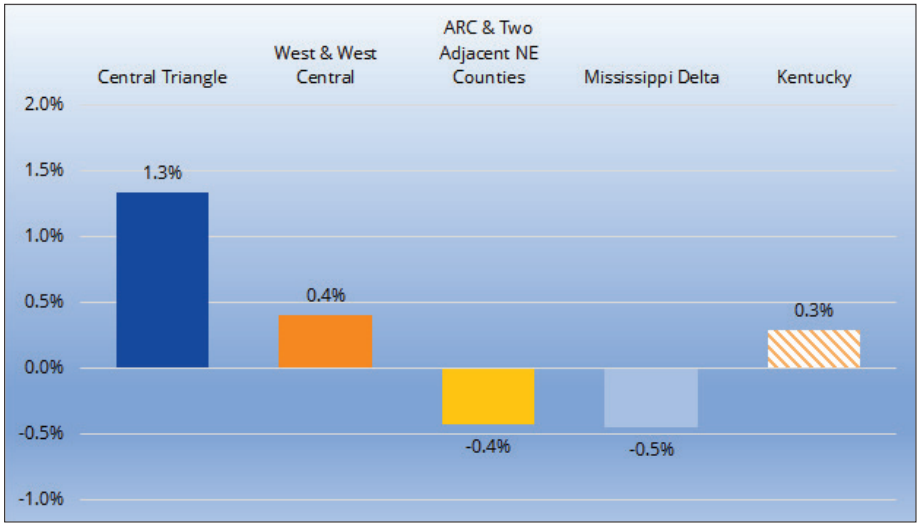


	0-4 years	5-9 years	10-14 years	15-20 years	21-30 years	31-40 years	41-50 years	51-60 years	61-70 years	71+ years
2011	17823	17181	15039	14106	10612	7999	7281	7594	5714	7543
2012	17314	17640	15046	13891	10247	7994	7153	7835	5843	7432

Data Source: Appalachian Rural Dental Education Partnership (ARDEP).

A comparison of Medicaid/KCHP enrollment data by year and by region showed a decrease in the number of people enrolled in a public insurance program from 2011 to 2012 in the Appalachian Region and the Mississippi Delta Region (Figure 72). There were increases in total enrollment in 2012 in the Central Triangle, in the West and West Central Region and in Kentucky overall.

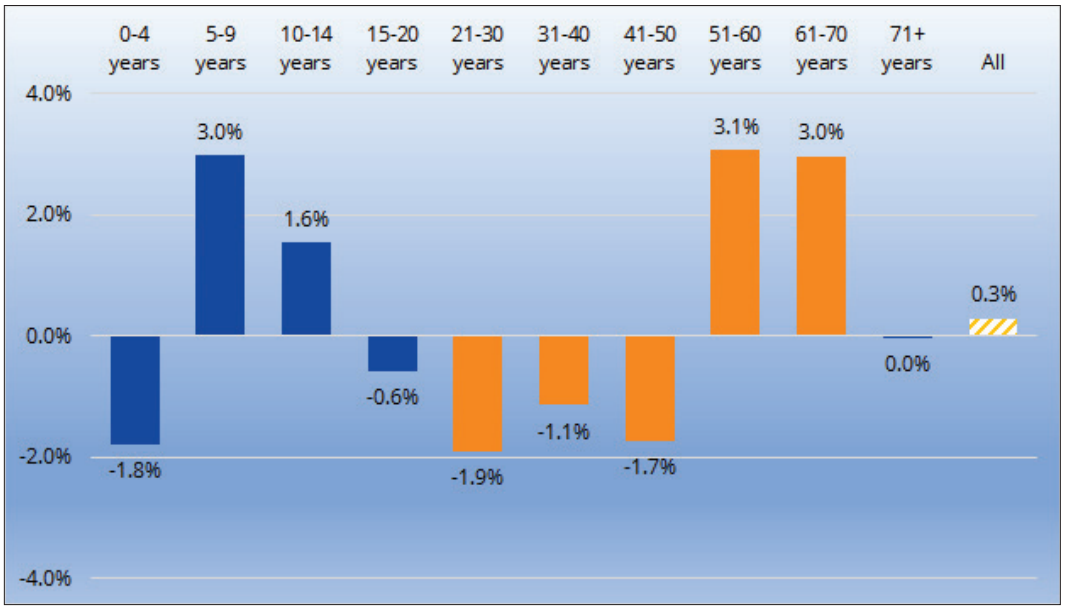
Figure 72. Percent difference 2011 to 2012 of Medicaid/KCHIP enrollment by region in Kentucky, Appalachian Rural Dental Education Partnership



Data Source: Appalachian Rural Dental Education Partnership (ARDEP).

Decreased enrollment between 2011 and 2012 appeared to occur among very young children, ages 0 to 4, and among adolescents and adults, ages 15 to 50 (Figure 73). There was increased enrollment among school age children and older adults in the same time period.

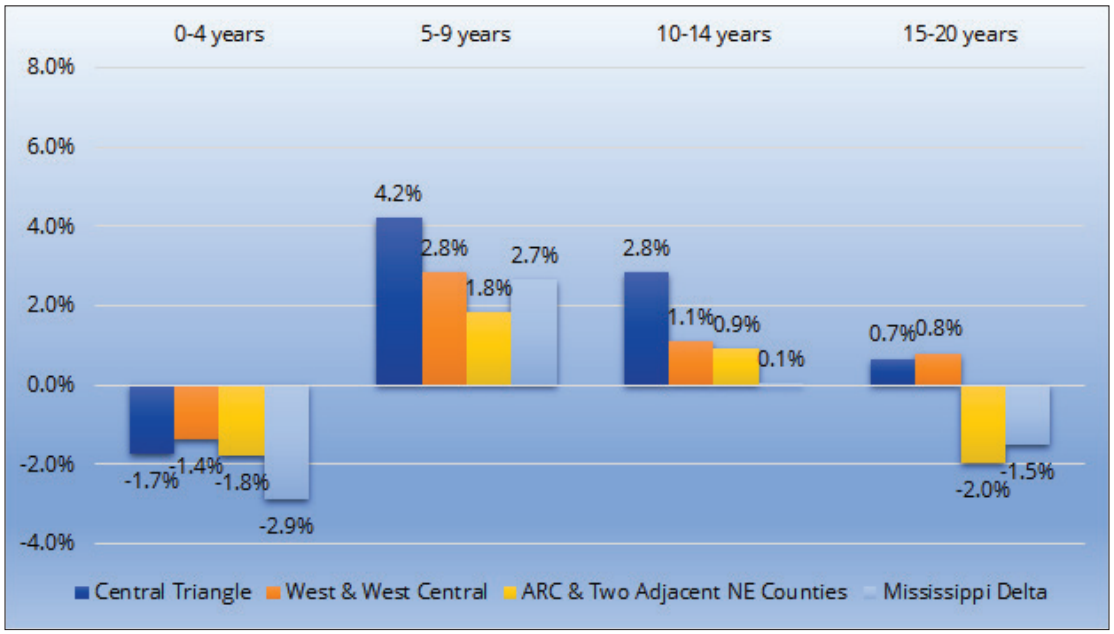
Figure 73. Percent difference 2011 to 2012 of Medicaid/KCHIP enrollment by age in Kentucky, Appalachian Rural Dental Education Partnership



Data Source: Appalachian Rural Dental Education Partnership (ARDEP).

Decreased enrollment in Medicaid/KCHIP among very young children, ages 0 to 4, was found in all regions but especially in the Mississippi Delta (-2.9%) (Figure 74). Decreased enrollment numbers in the 15 to 20 year age cohort was found in the Appalachian Region (-2.0%) and in the Mississippi Delta (-1.5%).

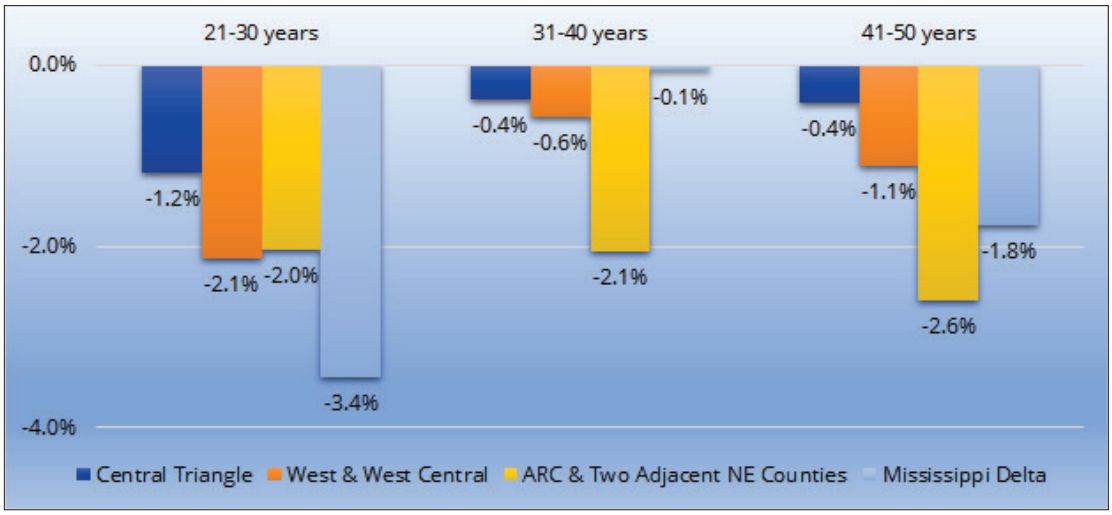
Figure 74. Percent difference 2011 to 2012 of Medicaid/KCHIP enrollment of children, ages 0 to 20 by region in Kentucky, Appalachian Rural Dental Education Partnership



Data Source: Appalachian Rural Dental Education Partnership (ARDEP).

There were also regional differences in rates of decreased enrollment among adults, ages 21 to 50 (Figure 75). The Appalachian Region and the Mississippi Delta Region appeared to experience the highest rates of decreased enrollment per population.

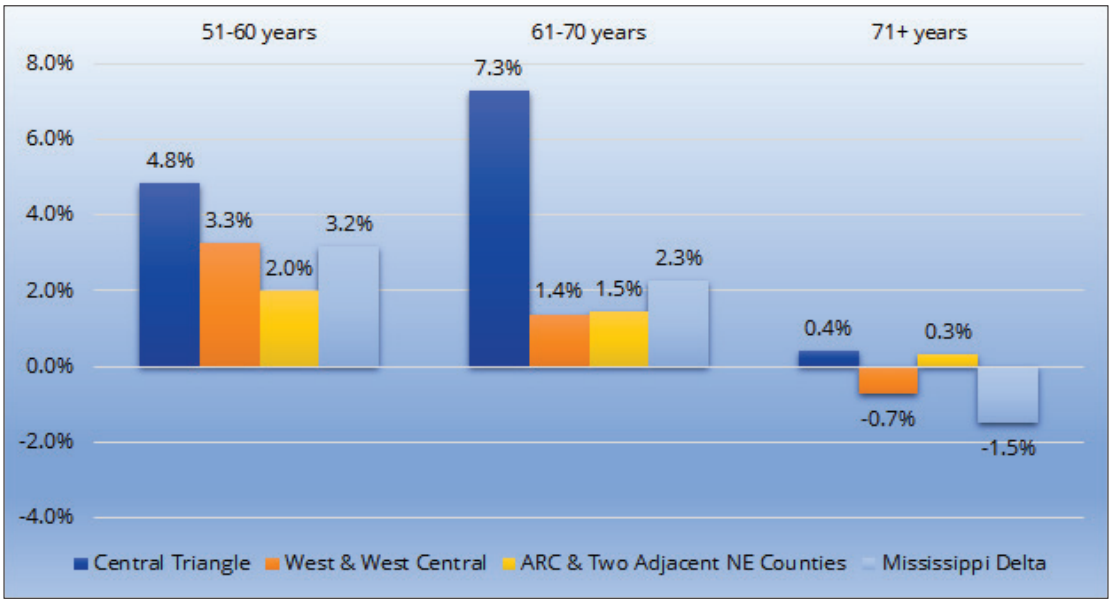
Figure 75. Percent difference 2011 to 2012 of Medicaid/KCHIP enrollment of adults, ages 21 to 50 by region in Kentucky, Appalachian Rural Dental Education Partnership



Data Source: Appalachian Rural Dental Education Partnership (ARDEP).

The Central Triangle experienced the greatest proportionate change in the percentage of the adult population ages 51 and older enrolled in Medicaid between 2011 and 2012 (Figure 76).

Figure 76. Percent difference 2011 to 2012 of Medicaid/KCHIP enrollment of adults ages 51 and older by region in Kentucky, Appalachian Rural Dental Education Partnership

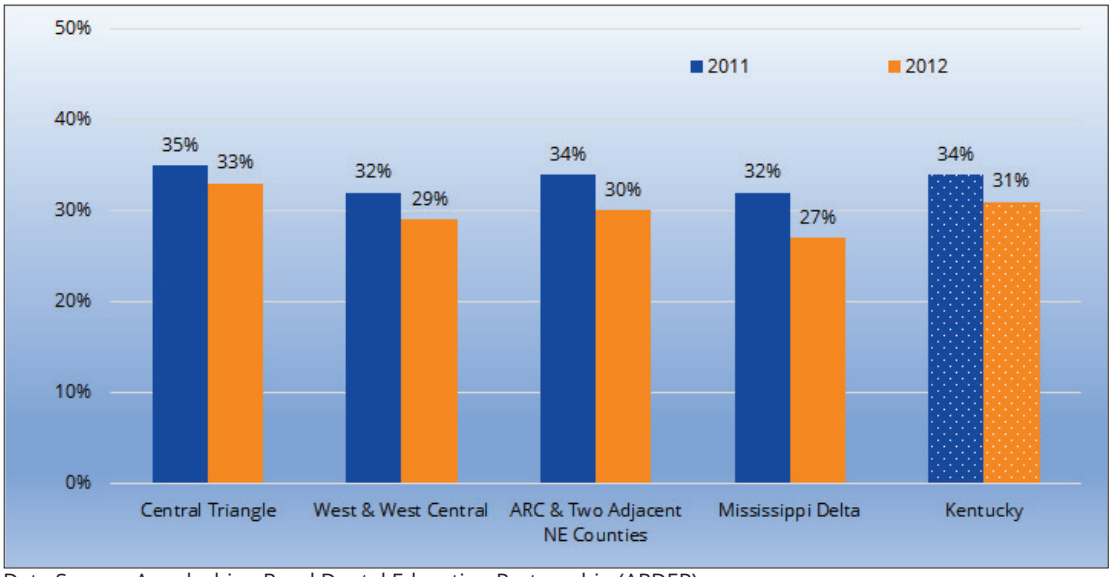


Data Source: Appalachian Rural Dental Education Partnership (ARDEP).

Utilization of Oral Health Services among Medicaid Enrollees in Kentucky

Utilization of oral health services among Medicaid/KCHIP enrollees exhibited similar patterns across the various regions of Kentucky (Figure 77). Utilization of oral health services was lower in 2012 both statewide and in every region. In 2011, about a third of Medicaid enrollees (34%) received an oral health service. However, in 2012 there was decreased utilization of oral health services (31%) with some regions, such as the Mississippi Delta Region, experiencing greater drops in utilization than others.

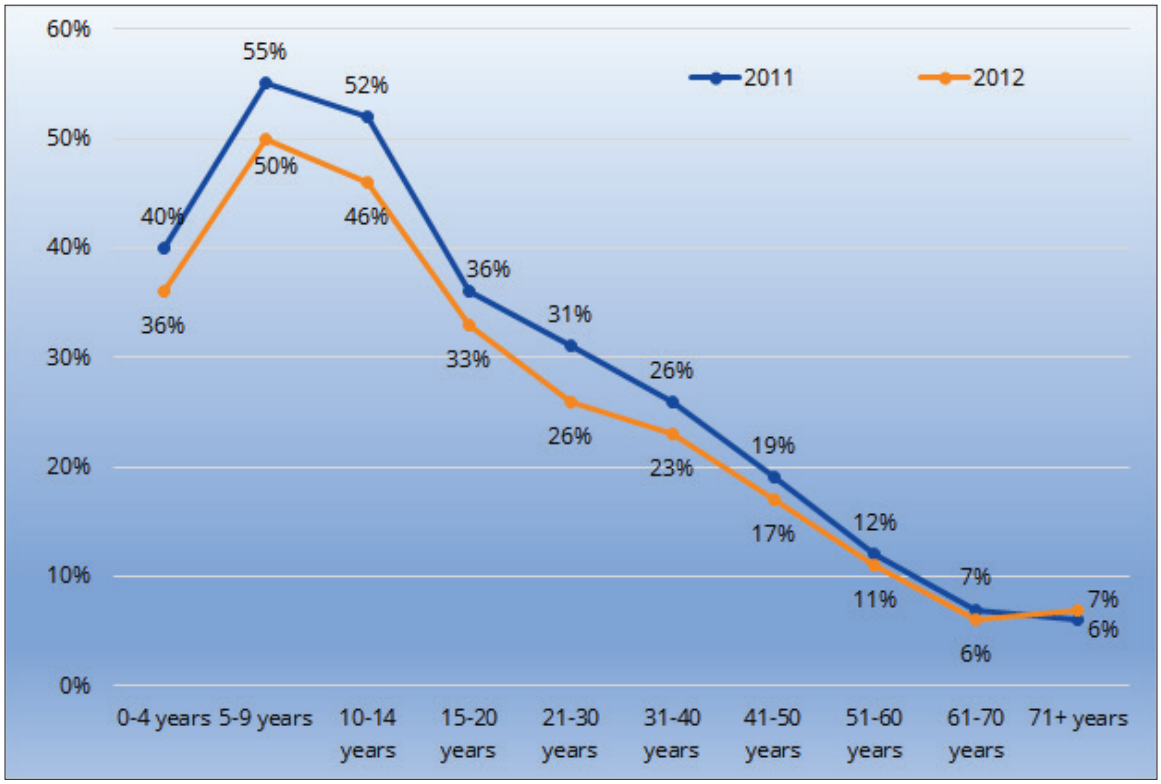
Figure 77. Utilization of oral health services among Medicaid/KCHIP enrollees by year and region in Kentucky, Appalachian Rural Dental Education Partnership, 2011 to 2012



Data Source: Appalachian Rural Dental Education Partnership (ARDEP).

In 2012, fewer people of all ages, except those ages 71 and older, received an oral health service than in 2011 (Figure 78).

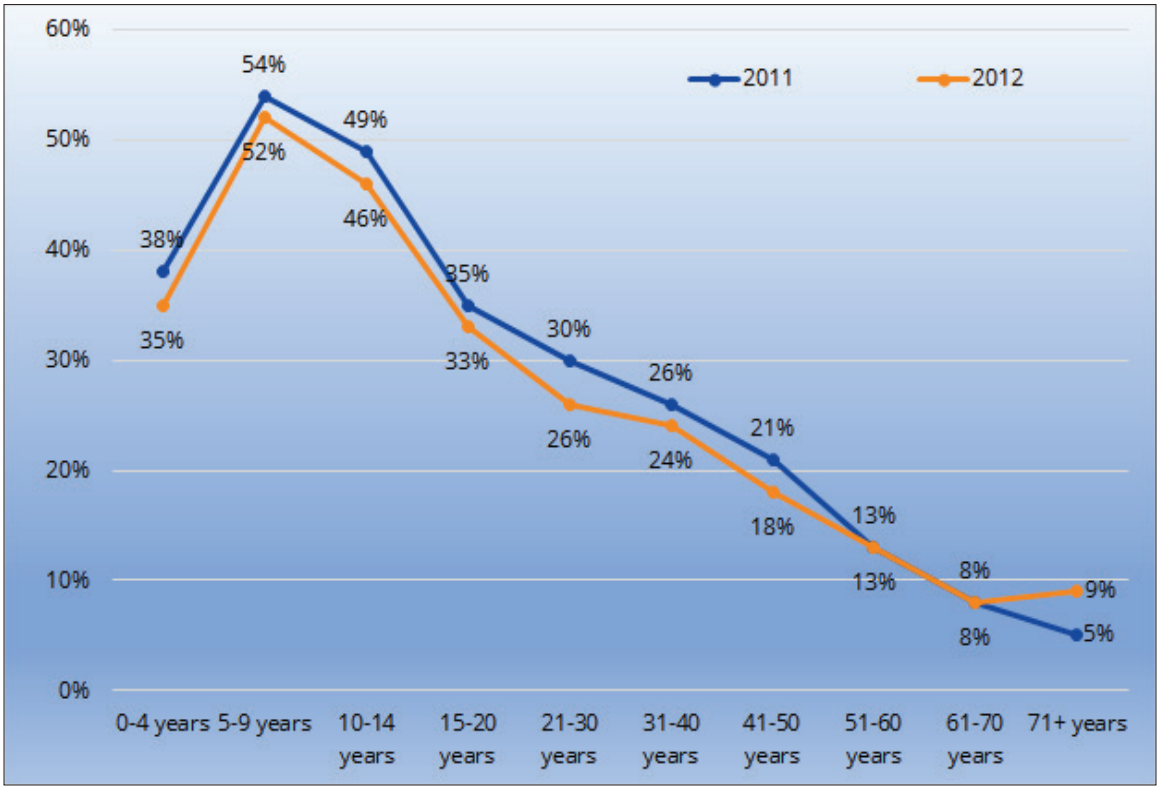
Figure 78. Utilization of oral health services among Medicaid/KCHIP enrollees by year and age in Kentucky, Appalachian Rural Dental Education Partnership, 2011 to 2012



Data Source: Appalachian Rural Dental Education Partnership (ARDEP).

Fewer people in the Central Triangle Region received oral health services in 2012 than in 2011; however, the decrease was less noticeable than in other regions in the state (Figure 79). The percent of older adults ages 71 and older receiving dental services while still small, increased appreciably between 2011 and 2012. The greatest decrease in utilization occurred in the 21 to 30 year age cohort.

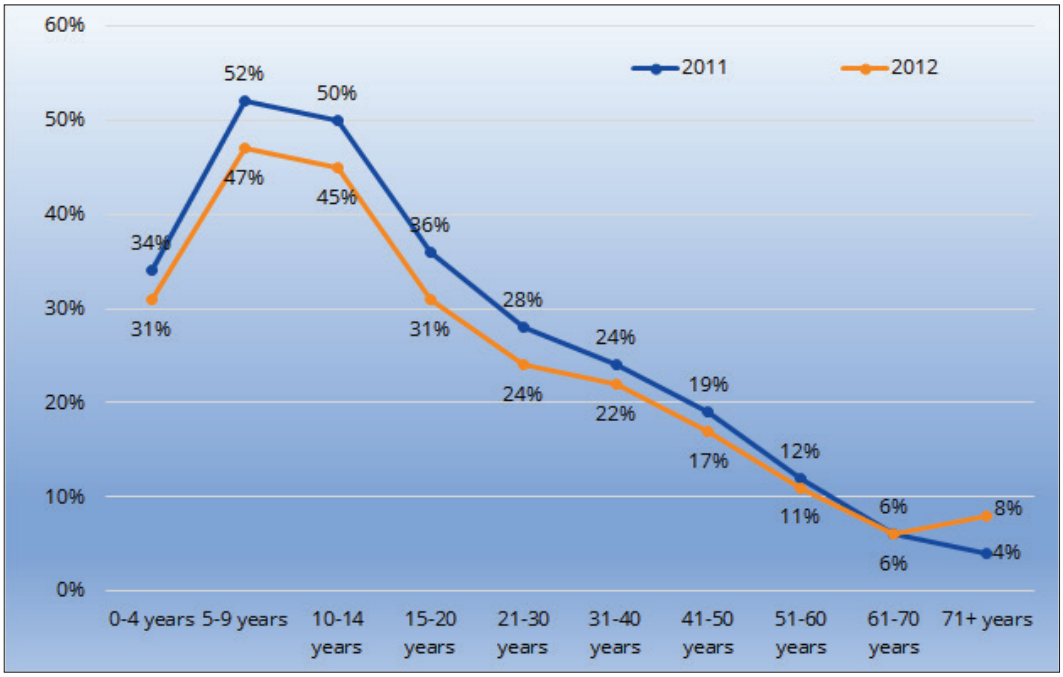
Figure 79. Utilization of oral health services among Medicaid/KCHIP enrollees by year and age in Central Triangle Region of Kentucky, Appalachian Rural Dental Education Partnership, 2011 to 2012



Data Source: Appalachian Rural Dental Education Partnership (ARDEP).

Utilization patterns in the West and West Central Region in 2011 and 2012 showed higher drops in utilization, an approximate decrease of 5%, among school aged children, ages 5 to 20, than in the Central Region where the drop was approximately 2% (Figure 80).

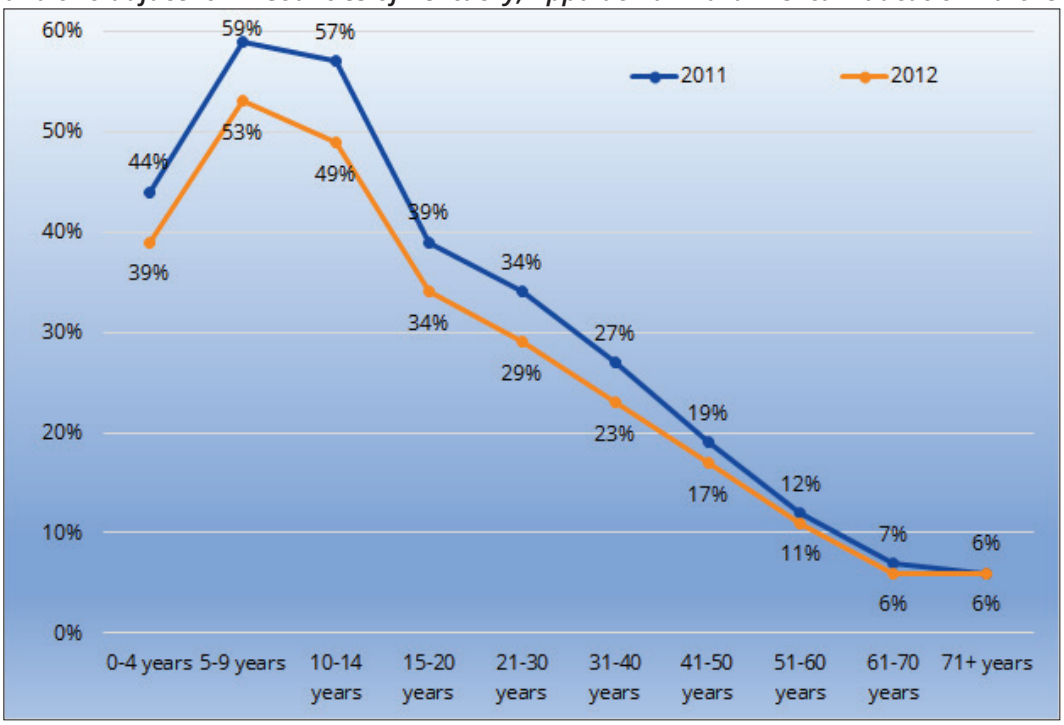
Figure 80. Utilization of oral health services among Medicaid/KCHIP enrollees by year and age in West-West Central Region of Kentucky, Appalachian Rural Dental Education Partnership, 2011 to 2012



Data Source: Appalachian Rural Dental Education Partnership (ARDEP).

There were notable differences in utilization among children and younger adults, ages 0 to 40, in the Appalachian Region between 2011 and 2012 (Figure 81). Eight percent fewer Medicaid/KCHIP enrolled children ages 10 to 14 received dental services in 2012 than in 2011.

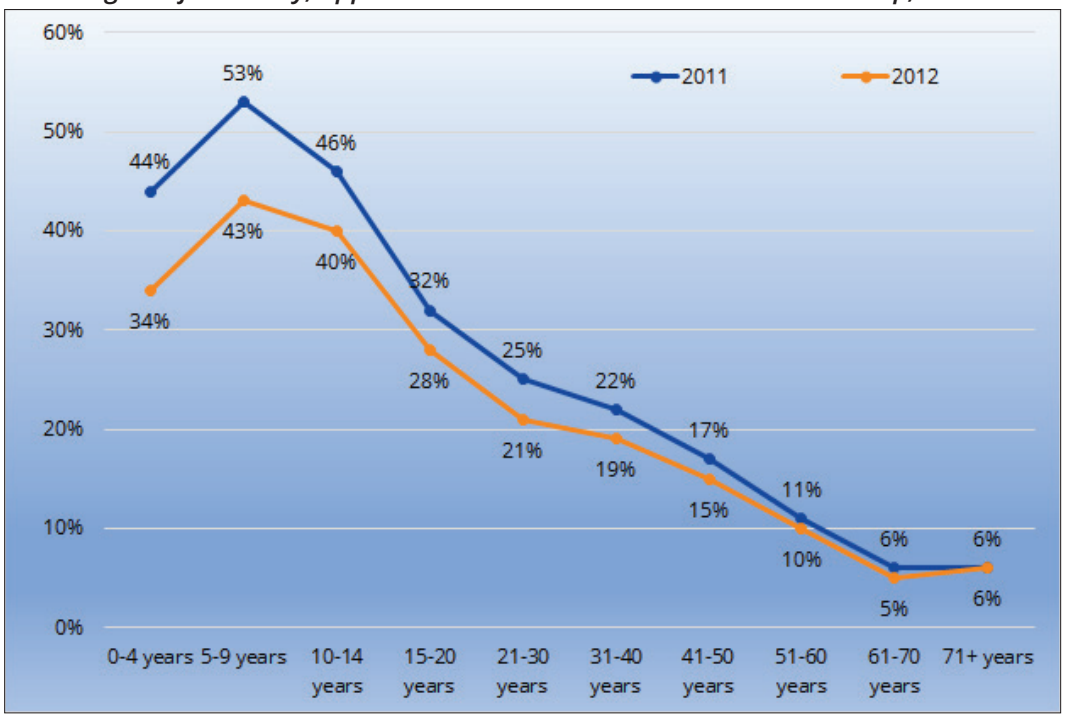
Figure 81. Utilization of oral health services among Medicaid/KCHIP enrollees by year and age in ARC Region and two adjacent NE Counties of Kentucky, Appalachian Rural Dental Education Partnership, 2011 to 2012



Data Source: Appalachian Rural Dental Education Partnership (ARDEP).

Utilization of oral health services in the Mississippi Delta Region decreased between 2011 and 2012 (Figure 82). Ten percent fewer Medicaid enrolled children ages 5 to 9 received a dental service in 2012 than in 2011.

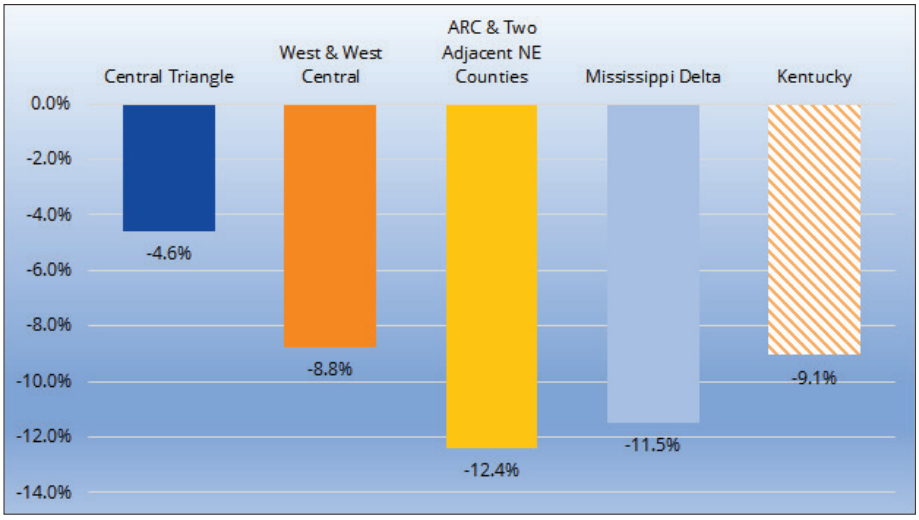
Figure 82. Utilization of oral health services among Medicaid/KCHIP enrollees by year and age in Mississippi Delta Region of Kentucky, Appalachian Rural Dental Education Partnership, 2011 to 2012



Data Source: Appalachian Rural Dental Education Partnership (ARDEP).

The Central Triangle Region experienced the smallest drop (-4.6%) in utilization of oral health services between 2011 and 2012, while the Appalachian Region (-12.4%) and the Mississippi Delta Region (-11.5%) experienced the highest drops in utilization (Figure 83).

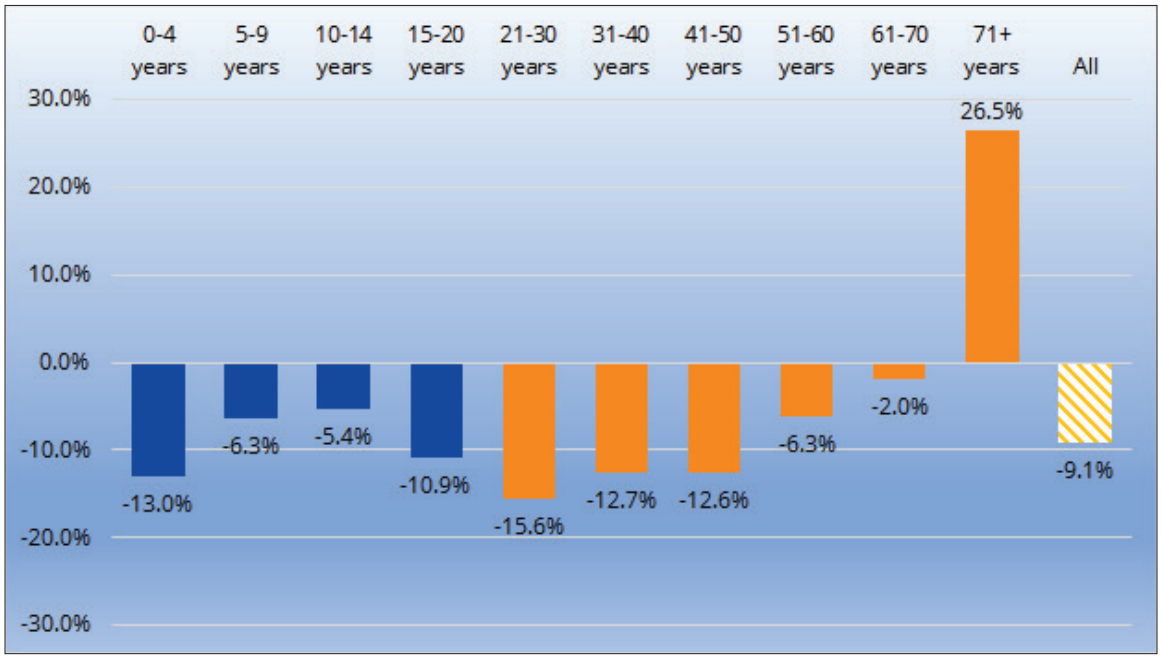
Figure 83. Percent difference 2011 to 2012 in utilization of oral health services among Medicaid/KCHIP enrollees by region in Kentucky, Appalachian Rural Dental Education Partnership



Data Source: Appalachian Rural Dental Education Partnership (ARDEP).

Utilization dropped in almost every age group, but notably for ages 0 to 4 (-13.0%) and ages 21 to 30 (-15.6%) (Figure 84). Utilization among older adults increased appreciably from 2011 to 2012 (+26.5%).

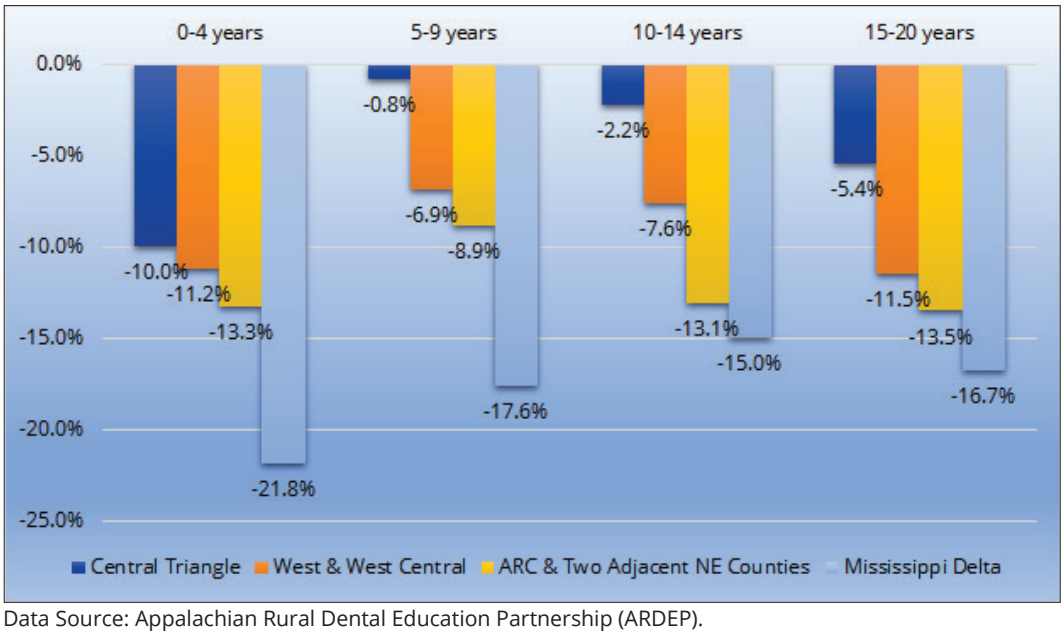
Figure 84. Percent difference 2011 to 2012 in utilization of oral health services among Medicaid/KCHIP enrollees by age in Kentucky, Appalachian Rural Dental Education Partnership



Data Source: Appalachian Rural Dental Education Partnership (ARDEP).

Changing utilization patterns among children were most apparent in the Mississippi Delta Region and the Appalachian Region (Figure 85).

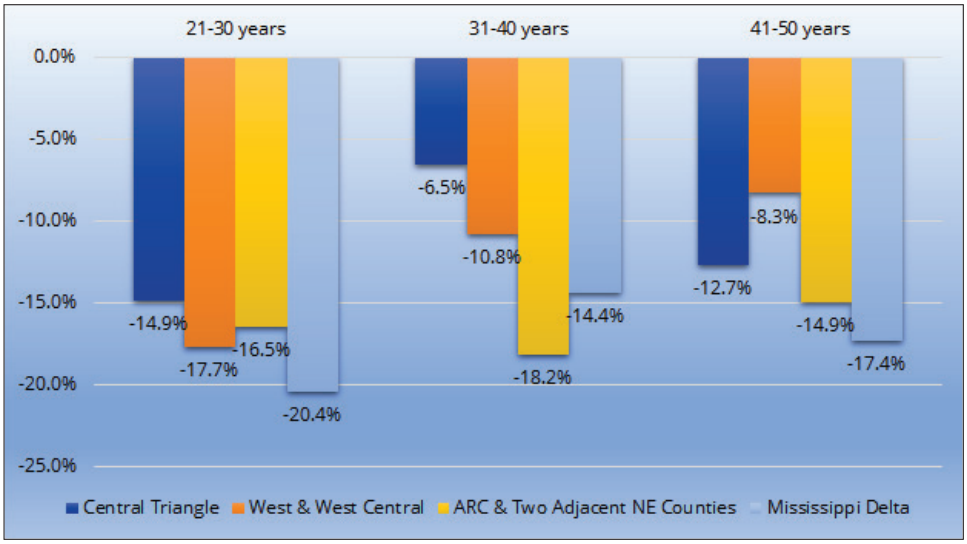
Figure 85. Percent difference 2011 to 2012 in utilization of oral health services among Medicaid/KCHIP enrollees ages 0 to 20, by region in Kentucky, Appalachian Rural Dental Education Partnership



Data Source: Appalachian Rural Dental Education Partnership (ARDEP).

Dropping utilization was especially apparent among adults ages 21 to 30 in all regions (Figure 86). Declining utilization of oral health services among adults between 2011 and 2012 was especially apparent in the Mississippi Delta and the Appalachian Region.

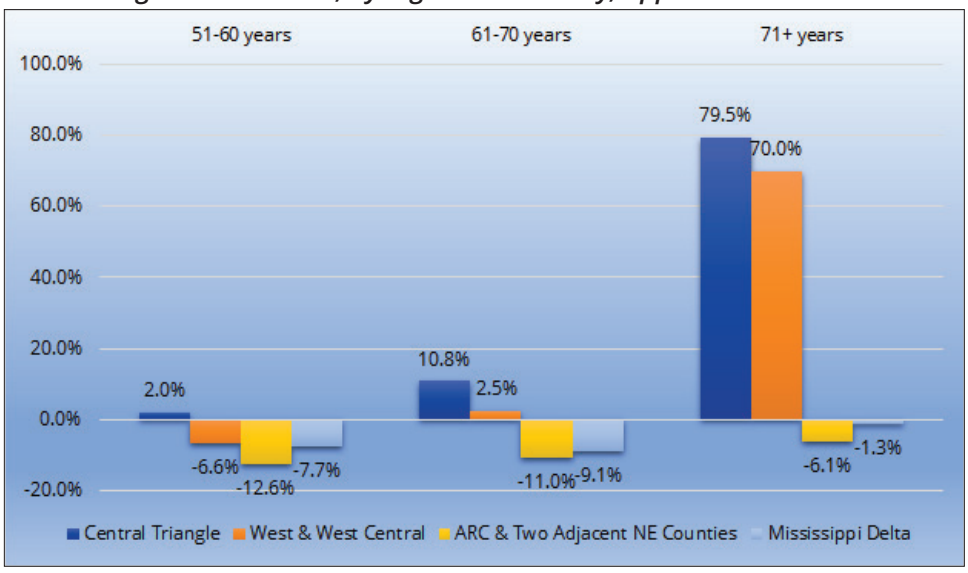
Figure 86. Percent difference 2011 to 2012 in utilization of oral health services among Medicaid/KCHIP enrollees, ages 21-50 years, by region in Kentucky, Appalachian Rural Dental Education Partnership



Data Source: Appalachian Rural Dental Education Partnership (ARDEP).

Increased utilization of oral health services among adults ages 71 and older was notably higher in the Central Triangle and in the West and West Central Region between 2011 and 2012 than in other regions of Kentucky where utilization in the cohort decreased (Figure 87). Adults ages 51 and older residing in the Central Triangle showed increased utilization between 2011 and 2012.

Figure 87. Percent difference 2011 to 2012 in utilization of oral health services among Medicaid/KCHIP enrollees ages 51 and older, by region in Kentucky, Appalachian Rural Dental Education Partnership



Data Source: Appalachian Rural Dental Education Partnership (ARDEP).

Variation in the percentage of Medicaid or KCHIP enrollees utilizing dental services was not only noticeable at the regional level, but also sub-regionally and by county (Table 17). Low utilization was especially notable in both 2011 and 2012 in many of the counties in the Mississippi Delta Region, where less than a quarter of the Medicaid insured received any dental service in either 2011 or 2012. The lowest utilization of dental services among Medicaid insured people in Kentucky in 2012 was among those residing in Hancock County (18%) in the West and West Central Region.

Table 17. Utilization of oral health services among Medicaid/KCHIP enrollees by region, sub-region and county in Kentucky, Appalachian Rural Dental Education Partnership, 2011 to 2012

Regions, Sub-Regions and Counties	2011		2012	
	Enrollment	Utilization Rate	Enrollment	Utilization Rate
ARC Region				
Big Sandy Sub-Region	57,882	33%	57,489	30%
036 - Floyd	16,718	38%	16,553	34%
058 - Johnson	8,758	33%	8,804	29%
077 - Magoffin	6,085	36%	6,026	34%
080 - Martin	5,342	28%	5,195	29%
098 - Pike	20,979	31%	20,911	26%
KY River Sub-Region	48,501	33%	48,316	29%
013 - Breathitt	6,763	35%	6,760	28%
060 - Knott	6,299	36%	6,269	35%
065 - Lee	3,440	31%	3,460	27%
066 - Leslie	4,604	32%	4,579	29%
067 - Letcher	8,946	30%	8,940	27%
095 - Owsley	2,763	31%	2,683	28%
097 - Perry	11,717	33%	11,767	29%
119 - Wolfe	3,969	31%	3,858	27%
NE ARC Sub-Region	95,843	34%	94,893	31%
006 - Bath	4,411	37%	4,478	31%
010 - Boyd	12,847	33%	12,920	30%
022 - Carter	8,965	34%	8,835	29%
025 - Clark	8,787	36%	8,660	33%
032 - Elliott	2,452	37%	2,389	32%
033 - Estill	5,754	34%	5,690	30%
035 - Fleming	4,052	38%	4,044	32%
045 - Greenup	8,676	32%	8,400	30%
064 - Lawrence	6,126	31%	5,955	28%
068 - Lewis	5,071	33%	4,995	29%
083 - Menifee	2,511	37%	2,397	30%
087 - Montgomery	7,472	36%	7,554	32%
088 - Morgan	4,594	36%	4,363	29%
091 - Nicholas	2,322	33%	2,293	32%
099 - Powell	5,070	32%	5,164	33%
101 - Robertson	776	28%	755	**25%**
103 - Rowan	5,957	36%	6,001	32%
I 75 South Sub-Region	132,723	35%	132,675	30%
007 - Bell	12,878	35%	12,822	31%
026 - Clay	10,679	33%	10,474	30%
040 - Garrard	4,198	32%	4,295	27%
048 - Harlan	11,915	32%	12,077	29%
055 - Jackson	5,249	33%	5,187	27%
061 - Knox	14,545	39%	14,412	34%
063 - Laurel	18,746	34%	18,802	30%
069 - Lincoln	7,976	33%	8,003	28%
074 - McCreary	7,960	36%	7,894	32%
076 - Madison	17,197	35%	17,359	31%
102 - Rockcastle	5,731	34%	5,692	31%
118 - Whitley	15,649	37%	15,658	30%

Table 17. Utilization of oral health services among Medicaid/KCHIP enrollees by region, sub-region and county in Kentucky, Appalachian Rural Dental Education Partnership, 2011 to 2012 (Cont.)

Regions, Sub-Regions and Counties	2011		2012	
	Enrollment	Utilization Rate	Enrollment	Utilization Rate
Lake Cumberland Sub-Region	70,059	36%	69,840	31%
001 - Adair	5,377	37%	5,393	31%
023 - Casey	5,451	36%	5,524	28%
027 - Clinton	3,897	37%	3,844	33%
029 - Cumberland	2,456	42%	2,457	36%
031 - Edmonson	3,272	31%	3,190	28%
044 - Green	3,358	35%	3,302	30%
050 - Hart	5,751	33%	5,811	28%
085 - Metcalfe	3,393	37%	3,390	33%
086 - Monroe	3,796	34%	3,807	31%
100 - Pulaski	19,861	36%	19,668	33%
104 - Russell	6,022	37%	6,070	31%
116 - Wayne	7,425	35%	7,384	32%
NE Non-ARC Region				
012 - Bracken	2,383	35%	2,411	29%
081 - Mason	5,298	32%	5,277	28%
Central Triangle Region				
003 - Anderson	3,663	45%	3,611	33%
008 - Boone	15,098	39%	15,260	27%
009 - Bourbon	4,779	49%	4,814	38%
015 - Bullitt	11,621	42%	11,871	35%
019 - Campbell	13,452	38%	13,623	29%
021 - Carroll	3,188	35%	3,255	28%
034 - Fayette	46,735	46%	47,841	34%
037 - Franklin	9,640	44%	9,821	32%
039 - Gallatin	2,410	38%	2,422	**24%**
041 - Grant	6,855	45%	6,737	31%
049 - Harrison	4,463	44%	4,412	37%
052 - Henry	3,314	39%	3,316	31%
056 - Jefferson	149,648	42%	152,142	35%
057 - Jessamine	9,921	47%	10,000	34%
059 - Kenton	28,521	35%	28,442	26%
093 - Oldham	4,719	45%	4,758	37%
094 - Owen	2,543	40%	2,491	29%
096 - Pendleton	3,252	35%	3,336	28%
105 - Scott	8,339	45%	8,516	32%
106 - Shelby	6,977	51%	7,113	41%
108 - Spencer	2,504	45%	2,492	39%
112 - Trimble	2,033	35%	1,989	**23%**
120 - Woodford	3,570	48%	3,587	36%

Table 17. Utilization of oral health services among Medicaid/KCHIP enrollees by region, sub-region and county in Kentucky, Appalachian Rural Dental Education Partnership, 2011 to 2012 (Cont.)

Regions, Sub-Regions and Counties	2011		2012	
	Enrollment	Utilization Rate	Enrollment	Utilization Rate
West-West Central Region				
002 - Allen	4,951	31%	5,040	27%
005 - Barren	11,314	33%	11,510	30%
011 - Boyle	6,632	33%	6,675	30%
014 - Breckinridge	5,154	31%	5,169	32%
016 - Butler	3,603	33%	3,644	29%
030 - Daviess	22,386	30%	22,373	**24%**
043 - Grayson	7,623	30%	7,659	27%
046 - Hancock	1,817	32%	1,719	**18%**
047 - Hardin	19,368	29%	19,559	31%
062 - Larue	3,510	34%	3,513	32%
071 - Logan	6,243	37%	6,257	29%
078 - Marion	4,931	32%	4,869	29%
082 - Meade	4,810	39%	4,842	39%
084 - Mercer	4,900	35%	4,785	33%
090 - Nelson	9,365	32%	9,401	29%
092 - Ohio	6,722	33%	6,589	28%
107 - Simpson	4,071	32%	3,961	32%
109 - Taylor	7,097	36%	7,155	32%
114 - Warren	24,184	33%	24,580	30%
115 - Washington	2,598	36%	2,625	38%
Mississippi Delta Region				
004 - Ballard	1,933	**24%**	1,799	**25%**
017 - Caldwell	3,572	29%	3,274	29%
018 - Calloway	6,430	33%	6,167	31%
020 - Carlisle	1,331	32%	1,333	32%
024 - Christian	16,144	**22%**	15,482	**23%**
028 - Crittenden	1,991	27%	1,863	**24%**
038 - Fulton	2,570	**25%**	2,553	**22%**
042 - Graves	9,490	30%	9,312	**25%**
051 - Henderson	11,178	27%	10,908	**25%**
053 - Hickman	997	30%	986	**23%**
054 - Hopkins	11,523	37%	11,410	33%
070 - Livingston	2,122	31%	2,064	29%
072 - Lyon	1,250	33%	1,356	26%
073 - McCracken	13,503	32%	13,963	27%
075 - McLean	2,411	33%	2,329	29%
079 - Marshall	5,282	32%	5,674	**25%**
089 - Muhlenberg	7,776	29%	7,930	**24%**
110 - Todd	3,013	36%	3,087	32%
111 - Trigg	2,526	38%	2,687	26%
113 - Union	3,075	33%	3,178	31%
117 - Webster	2,775	36%	3,040	28%

Data Source: Appalachian Rural Dental Education Partnership (ARDEP).

V. Dental Health Professional Shortage Areas and Safety Net Providers

Dental Health Professional Shortage Areas

Financial barriers to access to dental services may be compounded by the lack of available oral health providers especially in rural areas and in inner cities where the supply of oral health workers may be limited or not well distributed. The uneven distribution of a competent professional workforce impedes access in certain geographies and for particular population groups in Kentucky and across the US.

A HPSA is a geographic area, population group, or facility determined by the US Department of Health and Human Services, HRSA, Office of Shortage Designation to have a shortage of health professionals. A HPSA may be designated for a shortage of primary care physicians, dentists, or mental health providers. These designations are defined in the following ways:

- Geographic - This designation covers 1 or more counties or a sub-county area with a shortage of providers. In a geographic HPSA, the entire residential civilian population is considered underserved.

- Special Population - This designation covers a special population residing in a geographic area with limited access to providers. Special populations include Medicaid-eligible populations, low-income people, migrant and seasonal farm workers, homeless populations, American Indians, Alaska Natives, and others who may be isolated by linguistic and/or cultural barriers.

- Facility - This designation covers a residential facility with 250 or more residents or public and nonprofit dental facilities with insufficient capacity to meet the needs of the area or population group it serves. Facilities include federal and state correctional institutions, youth detention facilities, public or nonprofit outpatient facilities, and state or county mental health hospitals. A number of different types of facilities receive automatic designation, including FQHCs, FQHC look-alikes, rural health clinics, and outpatient health programs or facilities run by tribal organizations or urban American Indian organizations.[67]

The standard to qualify for designation as a DHPSA is a threshold ratio of full-time equivalent (FTE) dentists-to-population. The ratio varies by type of designation.

- Geographic DHPSA designations require a population-to-FTE dental ratio of at least 5,000 people: 1 dentist.

- A special population DHPSA or geographic high-need designation requires a ratio of at least 4,000:1.

[67] Health Resources and Services Administration, US Department of Health and Human Services. Shortage Designation: Health Professional Shortage Areas & Medically Underserved Areas/Populations. http://www.hrsa.gov/shortage/.

- Public or nonprofit outpatient DHPSA facility designations must document insufficient capacity (5,000 outpatient dental visits per 1 FTE dental or a wait time of at least 6 weeks for routine services) for the population or area designated as a DHPSA. Correctional facilities or youth detention facilities must have at least 250 residents and an inmate-to-FTE dental ratio of 1,500:1 in order to qualify for designation. [68]

HRSA has established formulas for counting FTE dental professionals that account for the contributions of dental auxiliaries and for differences in productivity due to differences in the ages of dental professionals. HPSA/DHPSA designation is used by a variety of federal and state health professional recruitment and retention programs, including the National Health Service Corp and programs that grant a waiver of the 2-year home return requirement for physicians with an expiring exchange visitor visa.

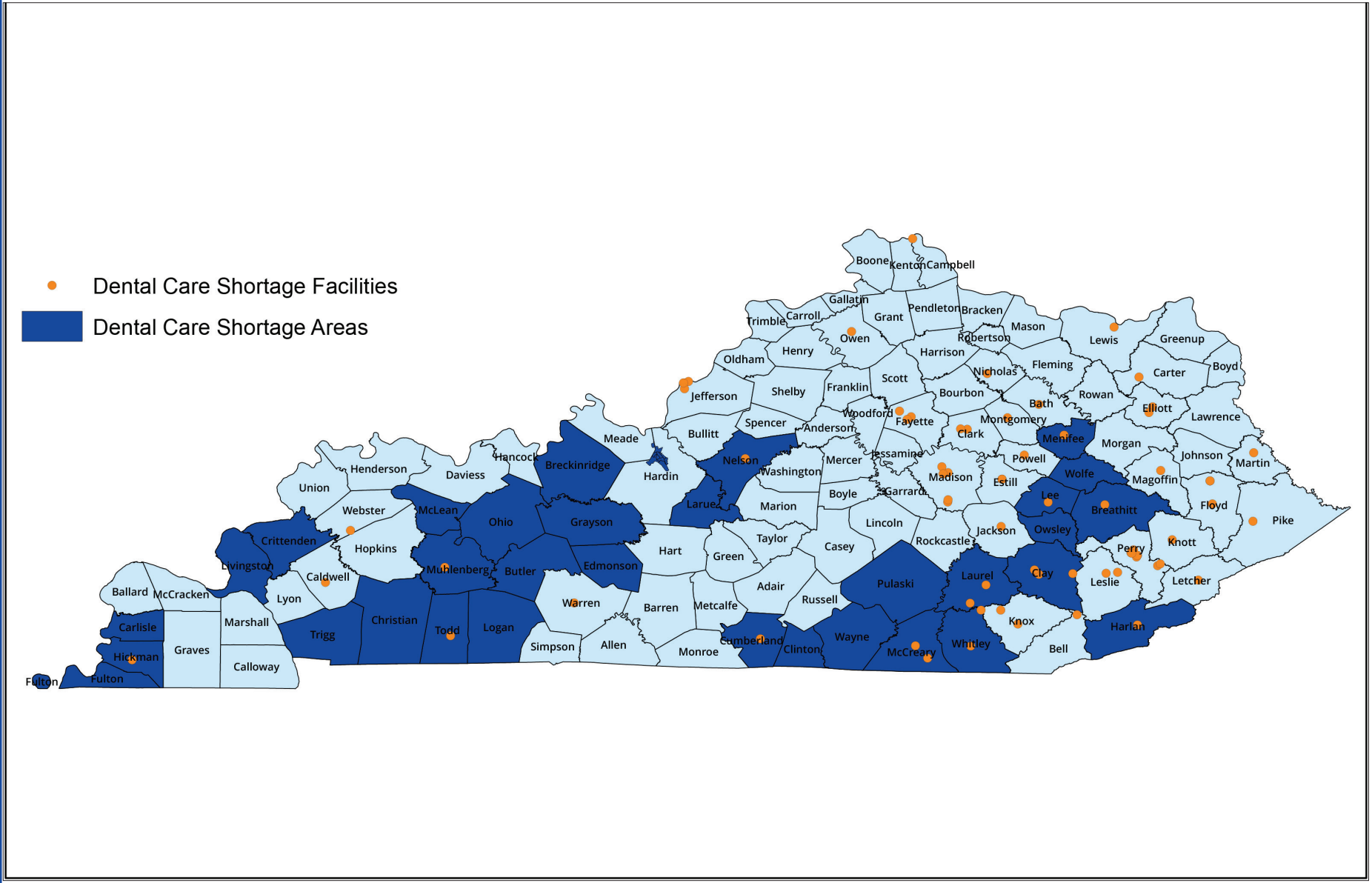
In September 2014, there were 4,968 DHPSAs in the US with a total population of 47,595,261 people.[69] HRSA estimates that it would require 7,300 additional oral health professionals to meet the needs of the currently underserved in designated geographic areas, facilities, or special populations and that only about 41% of the need for dental care is met by current capacity in DHPSAs. While many of these designations are in non-metropolitan areas (55%), a significant percentage (45%) are in metropolitan areas, suggesting that there are numerous special populations in urban settings who are underserved.

The following map shows the designated DHPSAs and facilities in Kentucky in 2015 (Figure 88). Several counties are designated as whole county DHPSAs including Breathitt, Breckinridge, Carlisle, Clinton, Fulton, Livingston, Muhlenberg, Ohio and others. There are facility designations in about a third of the counties in the state.

[68] Health Resources and Services Administration, US Department of Health and Human Services. Dental HPSA Designation Criteria. http://bhpr.hrsa.gov/shortage/hpsas/designationcriteria/dentalhpsacriteria.html.

[69] Health Resources and Services Administration Data Warehouse, US Department of Health and Human Services: Designated Health Professional Shortage Areas Statistics. Fourth Quarter of Fiscal Year 2014. Designated HPSA Quarterly Summary. November 10, 2014. http://datawarehouse.hrsa.gov/HGDWReports/RT_App.aspx?rpt=HH.

Figure 88. Designated dental health professional shortage areas and facilities in Kentucky, 2015



Data Source: Health Resources and Services Administration (HRSA), Office of Shortage Designation.

Safety Net Providers

The Institute of Medicine defines safety-net providers as providers who by mission or mandate organize and deliver substantial health and health-related services to the uninsured, the Medicaid population, or others who are considered vulnerable.[70]

The safety net for oral health services encompasses a broad range of both individual oral health professionals and organizational providers. Safety-net providers offer no-cost or reduced-cost services to populations with limited access to dental services or to those without dental homes with limited ability to pay for care. Private practice dentists provide a large portion of the free or low-cost services offered to patients. Their contributions, through their individual practices or organized volunteer opportunities, free dental clinics, or dental services-for-a-day events, are included in the safety net even though they are hard to quantify.

Private Practice Dentists

Most dental services in the US are provided in the offices of private practice dentists. Some of these provide services to underserved populations through their participation in Medicaid programs or through volunteer or donated dental service programs. The contributions of private practice dentists to care in the safety net are very difficult to quantify because it is generally embedded with other work.

As previously discussed, the uneven distribution of dental providers in many states limits access to oral health services especially for rural populations since private dental practices are commonly located in metropolitan areas, especially in the suburbs of urban areas.[71] Another factor restricting access to oral health services, is the limited number of private practice dentists who participate in state Medicaid programs.

A report from ARDEP, University of Kentucky Center for Oral Health Research in 2015 described the participation of dentists with Medicaid in Kentucky between 2010 and 2014 (Table 18). In 2014, 790 general dentists in Kentucky (approximately 40% of general dentists in the state) provided at least one oral health service to a Medicaid beneficiary. Specialty dentists also contributed to care for Medicaid insured people.

[70] Center for Healthcare Research & Transformation. Federally Qualified Health Centers: An Overview. July 2013. http://www.chrt.org/publication/federally-qualified-health-centers-overview/.

[71] Wall T, Brown L. The urban and rural distribution of dentists, 2000. JADA. 2007; 138(7):1003-1011. http://jada.ada.org/article/S0002-8177(14)62428-4/pdf.

Table 18. Number of oral health providers receiving payment from Medicaid/KCHIP programs for dental services

Billing Provider Specialty	2010	2011	2012	2013	2014
General Dentists	829	890	807	798	790
Oral Surgeons	60	60	56	60	59
Orthodontists	67	71	64	65	63
Pediatric Dentists	75	77	81	87	92
Other Dentists	15	12	12	10	14
Total	1,046	1,110	1,020	1,020	1,018

Data Source: Mullins, M. R., et al Kentucky Medicaid Outcomes: Dentist participation, 2010-2014. Appalachian Rural Dental Education Partnership (ARDEP), UK Center for Oral Health Research, College of Dentistry, University of Kentucky, Lexington KY, November 2015.

About 58% of the general dentists who participated with the Kentucky Medicaid program demonstrated substantial participation though reimbursement for services provided to Medicaid insured patients exceeding $50,000 in a year (Table 19). However, as a percentage of the total number of general dentists in Kentucky, the number of general dentists participating with Medicaid at this level is small.

Table 19. Number of oral health providers receiving >$50,000 payment from Medicaid/KCHIP programs for dental services

Billing Provider Specialty	2010	2011	2012	2013	2014
General Dentists	400	385	335	377	462
Oral Surgeons	40	41	33	36	44
Orthodontists	38	37	38	41	36
Pediatric Dentists	60	62	61	67	73
Other Dentists	1	1	1	1	1
Total	539	526	468	522	616

Data Source: Mullins, M. R., et al Kentucky Medicaid Outcomes: Dentist participation, 2010-2014. Appalachian Rural Dental Education Partnership (ARDEP), UK Center for Oral Health Research, College of Dentistry, University of Kentucky, Lexington KY, November 2015.

Federally Qualified Health Centers and Other Safety Net Clinics Providing Dental Services

The network of safety net provider organizations in Kentucky includes FQHCs, community dental clinics, clinics of professional education programs, mobile van and portable dental programs including school based and school linked oral health programs, and an array of private practice dentists whose caseloads include safety net patients.

FQHCs operate as Section 330 grantees and receive federal grant funding to provide comprehensive health, oral health, and mental health services for patients. FQHCs are mandated by the federal government to provide preventive oral health services for patients as part of their organizational responsibilities. Not all FQHCs are able to provide direct dental services or to offer a full complement

of dental services. Clinics may contract with dental providers in the community to accept referrals for patients in need of dental services. Some FQHCs provide vouchers to patients to pay for care in the community. The number of annual patient visits to FQHCs in the US for dental services tripled between 2000 and 2010 to 9.2 million stretching the ability of FQHCs to meet demand for oral health care due to limited capacity and limited availability of oral health workforce.

In 2014, there were 22 FQHCs in Kentucky that reported to the Uniform Data System at HRSA. Nationally, 1,278 FQHCs completed and submitted required data about services to patients during the year and about the characteristics of patient served; approximately 77% of these clinics provided onsite dental services. A higher percentage of FQHC patients in Kentucky received medical services than patients in the US but a lower percentage of patients received dental services than nationally (Table 20).

Table 20. Services provided to patients in FQHCs in Kentucky and the US and characteristics of patients in FQHCs, 2014

Total number of patients served	Kentucky 340,614		US 22,873,243	
Medical services	304,258	89.3%	19,495,235	85.2%
Dental services	56,965	16.7%	4,776,465	20.9%
Target Populations				
% Pediatric <12 years old		21.1%		22.0%
% Geriatric (age 65 and over)		8.7%		7.6%
% Women's health (age 15-44)		27.7%		26.4%
Other Patient Characteristics				
Racial and/or Ethnic Minority		21.3%		62.2%
% Best served in another language		5.0%		23.2%
% <= 200% Poverty (% of Known)		84.5%		92.4%
% Uninsured		18.4%		27.9%
% with Medicaid coverage		48.2%		46.7%
Data Source: US Department of Health and Human Services, Health Resources and Services Administration (HRSA)				

Only about half (52%) of the FQHCs in Kentucky provided onsite or portable dental services to patients (Table 21). In some, including the University of Kentucky sponsored clinics, Big Sandy Health Care, Health Help, and Park DuValle Community Health more than a third of patients received a dental service in 2014. In others, however, onsite or portable dental services were not available.

Table 21. Percent of patients in FQHCs in Kentucky receiving dental services

Health Center Name	City	State	Total Patients	Percent receiving dental services in 2014
Big Sandy Health Care, Inc.	Prestonsburg	KY	17,091	35.0%
Community Health Centers of Western Kentucky	Greenville	KY	8,850	0.2%
Cumberland Family Medical Center	Burkesville	KY	47,516	10.1%
Eastern Kentucky University	Richmond	KY	6,155	0.2%
Fairview Community Health Center	Bowling Green	KY	11,141	0.0%
Family Health Center, Inc.	Louisville	KY	37,451	10.8%
Grace Community Health Center, Inc.	Gray	KY	10,312	12.0%
Health Help, Inc.	McKee	KY	30,144	35.1%
Healthpoint Family Care	Covington	KY	31,770	29.4%
Juniper Health, Inc.	Beattyville	KY	7,303	0.0%
Kentucky Mountain Health Alliance, Inc	Hazard	KY	1,786	3.9%
Kentucky River Foothills Development Council, Inc.	Richmond	KY	2,196	0.5%
Lewis County Primary Care Center	Vanceburg	KY	39,450	11.3%
Lexington-Fayette County Health Department	Lexington	KY	16,597	21.2%
Mountain Comprehensive Care Center, Inc.	Prestonsburg	KY	585	13.5%
Mountain Comprehensive Health Corp.	Whitesburg	KY	27,082	6.1%
Park DuValle Community Health Center, Inc.	Louisville	KY	22,091	34.0%
Pennyroyal Healthcare Service Inc.	Hopkinsville	KY	1,638	0.0%
Regional Health Care Affiliates, Inc	Providence	KY	6,500	N/A
Sterling Health Solutions, Inc	Mount Sterling	KY	4,090	N/A
Triad Health Systems, Inc.	Warsaw	KY	2,188	0.0%
University of Kentucky Research Foundation	Lexington	KY	8,678	42.7%

Data Source: US Department of Health and Human Services, Health Resources and Services Administration (HRSA).

Appendix B contains detailed charts about the characteristics of patients and services in each of Kentucky's FQHCs between 2012 and 2014.

The following table was provided by researchers at the University of Kentucky (Table 22). It provides a summary of the array of providers offering oral health services in the safety net by county, including some private practitioners known to provide substantial number of services to safety net populations.

Table 22. Providers offering oral health services in the safety net by county

KY COUNTY	KDA SOC.	CLINIC or PROGRAM	SERVICE TYPE (Pediatric, Adult, Geriatric , ER)	SLIDING FEE, SCALE, LIMITATIONS	INSURANCE	MEDICAID
ALLEN	7	Barren River District Health Dept.	Young Children, Teens, LTC Adults, and Refugee CTR	Free; Mobile Dental Clinic	No	No
ANDERSON	1	Anderson County Health Dept.	Adult	Anderson County Only	No	No
BARREN	7	Barren River District Health Dept.	Young Children, Teens, LTC Adults, and Refugee CTR	Free, Mobile Dental Clinic	No	No
BELL	10	Red Bird Clinic	Non-profit	Yes - Sliding Scale	Yes	Yes
BOONE	5	Barth Family Dentistry	Family: Pediatric, Adult, and Geriatric	Fee for Service, Coventry Health, Wellcare	Yes	Yes
BOONE	5	Dentistry Plus	Family: Children, Teen, Adult and Geriatric	Fee for Service	Yes	Yes
BOONE	5	Smiles Plus Dental Care	Family: Children, Teen, Adult and Geriatric	Fee for Service	Yes	Yes
BOONE	5	Pediatric Dental Center	Family: Pediatric, Adult, and Geriatric	Fee for Service	Yes	Yes
BOONE	5	Dr. Kenneth F. Wallace	Not Specified	Fee for Service, Coventry Health, Wellcare of KY	Yes	Yes
BOONE	5	Moore Dental Services	Not Specified	Fee for Service, Coventry Health, Kentucky Spirit, Wellcare of KY	Yes	Yes
BOONE	5	Family Dental Care Associates PSC	Family: Children, Teen, Adult and Geriatric	Fee for Service, Coventry Health, Kentucky Spirit	Yes	Yes
BOONE	5	Mortenson Family Dental	Family: Children, Teen, Adult and Geriatric	Fee for Service, Coventry Health, Kentucky Spirit, Wellcare of KY	Yes	Yes
BOONE	5	Commonwealth Dental PSC	Not Specified	Fee for Service	Yes	No
BOONE	5	Dr. Albert Bathiany IV	Not Specified	Fee for Service, Coventry Health, Wellcare of KY	Yes	Yes
BOONE	5	Emergency. Dental Care	Emergency	Fee for Service, Coventry Health	Yes	Yes
BOONE	5	Urgent Dental Care LLC	Not Specified	Fee for Service, Coventry Health, Wellcare of KY	Yes	Yes
BOONE	5	Precision Dental Care	Not Specified	Fee for Service, Coventry Health, Wellcare	Yes	Yes
BOONE	5	Tri-State Oral and Maxillofacial Surgery	Oral Surgery	Fee for Service, Wellcare of KY, Coventry Health	Yes	Yes
BOONE	5	The Pediatric Dental Center	Pediatric	Feel for Service, Coventry Health, Wellness	Yes	Yes
BOONE	5	Immediadent Florence	Not Specified	Fee for Service, Coventry Health, Wellcare	Yes	Yes
BRACKEN	5	McCord and Jefferson	Family: Children, Teen, Adult and Geriatric	Fee for Service	Yes	Yes
BUTLER	7	Barren River District Health Dept., Director: Dr. James Coomer	Young Children, Teens, LTC Adults, and Refugee CTR	Free, Mobile Dental Clinic	No	No
CALLOWAY	8	Purchase Area Dental Clinic	Pediatric	Free: operates one Friday/month Sept. through April.	No	No
CALLOWAY	8	Angels Clinic	Adults	Free: Dental treatment for adults (for members only).	No	No
CAMPBELL	5	Winton Hills Medical Ctr.	Pediatric, Adults, and Geriatric	Sliding scale and free for qualifying patients.	No	Yes
CAMPBELL	5	Cincy Smiles (Donated Dental Services) Cincinnati	Pediatric, Adults (Primarily Dentures)	Free for low income - no insurance but patients must apply for services.	No	No
CAMPBELL	5	Healthpoint Family Care-Bellevue Health Center	Pediatric, Adult.	Sliding Scale, Fee for Service, Coventry Health	No	Yes
CAMPBELL	5	Healthpoint Mobile Dental Office	Pediatric, Adult	Sliding Scale, fee for service	No	Yes
CAMPBELL	5	Dayton Family Dentistry	Not Specified	Fee for Service, KY Spirit Health Plan	Yes	Yes
CAMPBELL	5	Dr. Laura Bowman	Not Specified	Fee for Service, Coventry Health, Wellcare of KY	Yes	Yes
CAMPBELL	5	Dr. Bert Bathiany IV	Pediatric	Fee for Service, Coventry Health; Wellcare of KY	Yes	Yes
CAMPBELL	5	Pfeiffer Family Dentistry	Family: Pediatric, Adult, and Geriatric	Fee for Service, Coventry Health; Wellcare of KY	Yes	Yes
CAMPBELL	5	Dr. Douglas Stephens	Not Specified	Fee for Service, Passport	Yes	Yes
CAMPBELL	5	Rider & Cheung	Not Specified	Fee for Service, Kentucky Spirit, Wellcare of KY	Yes	Yes
CAMPBELL	5	Smiles on York	Not Specified	Fee for Service, Coventry Health, Kentucky Spirit, Wellcare of KY.	Yes	Yes
CAMPBELL	5	Dayton Bellevue Family Dentistry	Family: Pediatric, Adult, Geriatric	Fee for Service, Wellcare	Yes	Yes
CAMPBELL	5	Pediatric Dentistry for Children	Family: Pediatric, Adult, Geriatric	Fee for Service, Wellcare	Yes	Yes
CAMPBELL	5	Newport Family Dentistry	Family: Pediatric, Adult, Geriatric	Fee for Service, Wellcare	Yes	Yes
DAVIESS	6	Christian Dental Mission	Pediatric , Teens (H.S.), Adults, Refugee Center, and LTC Adults (Nursing Home)	Free - limited to Davis, Henderson, Ohio, McLean, and Muhlenberg.	No	No
DAVIESS	6	Daviess County Regional Dental Clinic (formerly Owensboro Community)	Pediatric, Adult	Medicaid only: limited to 7 counties - Daviess, Hancock, Henderson, McLean, Muhlenberg, Ohio, and Webster.	No	Yes
EDMONSON	7	Barren River District Health Dept., Director: Dr. James Coomer	Young Children, Teens, LTC Adults, Refugee Ctr.	Free; Mobile Dental Clinic	No	No
ESTILL	1	White House Clinic- Irvine	Pediatric, Adult	Statewide Sliding scale, no denture care provided	Yes	Yes
FAYETTE	1	Univ. of KY Pediatric Dentistry	Pediatric	Not Free	Yes	Yes
FAYETTE	1	UK Dental School: Twilight and Saturday Morning	Pediatric	Free; Saturday clinic is once a mon the; Twilight clinic is every other Tuesday	No	No
FAYETTE	1	UK Dental School	Adult	Not free.	Yes	No
FAYETTE	1	Nathaniel Mission	For Fayette Co Residents with no insurance. Very reasonable or no fees.	Fayette	No	No
FAYETTE	1	Mission Lexington	Adult (over 18)	Free, only pay for dentures/partials; limited to those in Fayette Co. and under the poverty line	No	No

Table 22. Providers offering oral health services in the safety net by county (Cont.)

KY COUNTY	KDA SOC.	CLINIC or PROGRAM	SERVICE TYPE (Pediatric, Adult, Geriatric , ER)	SLIDING FEE, SCALE, LIMITATIONS	INSURANCE	MEDICAID
FAYETTE	1	Fayette County Refugee Med. Clinic	Adult	Fayette and Jessamine Co.	No	No
FAYETTE	1	Univ. of KY Clinic for Adult & Pediatric Pts	Pediatric, Adult	Financial arrangements through the College of Dentistry	Yes	Yes
FAYETTE	1	Univ. of KY Clinic South Dental Program	Adult	Fayette County	Yes	Yes
FAYETTE	1	Health First Bluegrass Dental Clinic	Sliding Scale	Fayette County	No	Yes
FAYETTE	1	Dept. of Veteran Affairs Dental Svc.	Eligible veterans only (with eligibility set by Congress).	Serves mostly veterans from Eastern and Southern KY.	No	No
FAYETTE	1	Lexington-Fayette County Health Dept.	Emergency patients of all ages.	Sliding Scale	Yes	Yes
FAYETTE	1	Bluegrass Community and Technical College (BCTC)	Adult	Dental hygiene only (students provide care). Very reasonable fees for dental hygiene services.	Yes	Yes
FLEMING	1	Fleming County Free Treatment Day (held 1-2 times/yr.)	Adult	Free	No	No
FLOYD	3	Big Sandy Health Dept., Mud Head Clinic	Adult	Sliding Scale	Yes	Yes
FLOYD	3	Big Sandy Community and Tech College Dental Hygiene Program (main satellite program)	Adult	Dental hygiene only (students provide care). Very reasonable fees for dental hygiene services.		
FRANKLIN	1	The Mission Frankfort Clinic	Pediatric, Adult, Geriatric	Free for those in need. Must apply at Franklin County Health Dept. (only Franklin County).	No	No
GALLATIN	5	TRIAD Health Systems, Inc.	Not Specified			
GRANT	5	Lenihan Dental	Not Specified	Fee for Service, Wellcare of KY	Yes	Yes
GRANT	5	Dr. Thad Thomas	Not Specified	Fee for Service, Coventry Health and Life Insurance, Wellcare of KY	Yes	Yes
GRANT	5	Precision Dental Care	Pediatric, Adult. s, Geriatric	Fee for Service, Coventry Health, Wellcare of KY	Yes	Yes
GRANT	5	Comfort Dentistry	Not Specified	Fee for Service, Coventry Health, Kentucky Spirit, Wellcare of KY	Yes	Yes
GRANT	5	Ouchless Dental	Not Specified	Fee for Service, Coventry Health, Kentucky Spirit, Wellcare of KY	Yes	Yes
HARDIN	4	Community Health Dental Clinic	Adult	Free, Uninsured and income eligibility. Serves the counties of Hardin, Larue, Meade, Grayson, and Breckinridge.	No	No
HARDIN	4	Richard Miller Clinic	Adult	Sliding Scale	Yes	Yes
HARLAN	9	Cloverfork Outpatient Medical Project	Pediatric, Adult, Geriatric	Restricted to Harlan County	Yes	Yes
HENDERSON	6	West AHEC Henderson Community College	Pediatric (5-17)	Free: Offered four times/yr., with 14 counties surrounding Henderson.		
HOPKINS	11	West AHEC: 14 Counties covered by West AHEC	Children: comprehensive dental care.	Free - care provided by dental students with supervision.	No	No
HOPKINS	11	UK Dan A. Martin Dental Clinic	Pediatric, Adult, Geriatric, Emergency	All insurances, statewide, open to any county.	Yes	Yes
JACKSON	1	White House Clinic	Pediatric, Adult, Geriatric	5 Community Health Centers	No	Yes
JEFFERSON	4	C & Y Clinic	Pediatric	Sliding Scale	Yes	Yes
JEFFERSON	4	Family Health Center, Inc., Portland	Pediatric, Adult	Free. Must be Homeless. Any county in Kentucky.	No	Yes
JEFFERSON	4	Home of the Innocents-Open Arms Clinic	Pediatric, Emergency, Adult	Jefferson County only.	Yes	Yes
JEFFERSON	4	Park Duvalle Community Health Center –City View	Pediatric, Adult, Geriatric, Emergency	Statewide	Yes	Yes
JEFFERSON	4	Park Duvalle Community Health Center –City View	Pediatric, Adult, Geriatric, Emergency	Sliding scale - Jefferson County only.	Yes	Yes
JEFFERSON	4	Park Duvalle Community Health Center-Newberg	Pediatric, Adult, Geriatric, Emergency	Sliding scale - Jefferson County only.	Yes	Yes
JEFFERSON	4	Special Care Dental Care of KY PLLC.	Pediatric, Adult, Geriatric	Fee for Service	Yes	Yes
JEFFERSON	4	Family Health Centers-Phoenix	Pediatric, Adult	Sliding scale but free for the homeless.	No	Yes
JEFFERSON	4	Univ. of Louisville School of Dentistry Comprehensive Care Clinic	Adult, Geriatric, Emergency	Dental care provided by dental students.	Yes	Yes
JEFFERSON	4	Univ. of Louisville PCC (Oral Surgery and Grad Clinic)	Adult, Geriatric	Dental care provided by dentists in specialty programs.	Yes	Yes
JEFFERSON	4	UL School of Dentistry – Urgent Care Center	Adult, Geriatric	None	Yes	Yes
JEFFERSON	4	UL School of Dentistry-Post doc Pediatric (ages 6-17) Special Needs (All ages), Student Clinic	Pediatric, Special Needs, Emergency	None	Yes	Yes
JEFFERSON	4	Dept. of Veteran Affairs Dental Svc.	Eligible veterans only (with eligibility set by Congress).	Serves mostly veterans from Western and Northern KY.	No	No
JEFFERSON	4	Underwood and Lee Clinic	Pediatric, Adult Special Needs, Emergency	Sliding scale - Jefferson County only.	Yes	Yes
JEFFERSON	4	G.O. Ministries, INC.				
KENTON	5	Onhealthcare Dental	Not Specified	Fee for Service	Yes	No
KENTON	5	District Health Department	Not Specified	Fee for Service	No	Yes
KENTON	5	Healthpoint Family Health Centers	Pediatric, Adult	Sliding scale	No	Yes
KENTON	5	Healthpoint Family Care Latona Dental	Family: Pediatric, Adult, Geriatric	Fee for service and sliding scale.	Yes	Yes
KENTON	5	Dr. Tracey Ross	Family: Pediatric, Adult, Geriatric	Fee for Service	Yes	Yes
KENTON	5	Dr. Charles Wuerth	Family: Pediatric, Adult, Geriatric	Fee for Service	Yes	Yes
KENTON	5	Dr. Jeffrey Kaiser	Family: Pediatric, Adult, Geriatric	Fee for Service	Yes	Yes
KENTON	5	Covington Family Dental Inc.	Family: Pediatric, Adult, Geriatric	Fee for Service	Yes	Yes
KENTON	5	Dr. Steven Neely	Family: Pediatric, Adult, Geriatric	Fee for Service	Yes	Yes

Table 22. Providers offering oral health services in the safety net by county (Cont.)

KY COUNTY	KDA SOC.	CLINIC or PROGRAM	SERVICE TYPE (Pediatric, Adult, Geriatric , ER)	SLIDING FEE, SCALE, LIMITATIONS	INSURANCE	MEDICAID
KENTON	5	Drs. Haas and Wehrman	Family: Pediatric, Adult, Geriatric	Fee for Service	Yes	Yes
KENTON	5	Pediatric Dental Garden Center	Pediatric	Fee for Service	Yes	Yes
KENTON	5	Glockner Family Dentistry	Family: Pediatric, Adult, and Geriatric	Fee for Service, Coventry Health, Wellcare of KY	Yes	Yes
KENTON	5	Dr. John M. Schulte	Not Specified	Fee for Service, Coventry Health, Kentucky Spirit, Wellcare of KY	Yes	Yes
KENTON	5	Dr. Stephen R. Kees	Not Specified	Fee for Service, Coventry Health Kentucky Spirit Wellcare of KY	Yes	Yes
KENTON	5	Dr. Mamari Maher	Not Specified	Fee for Service, Coventry Health, Wellcare of KY	Yes	Yes
KENTON	5	Struckhoff Orthodontics	Orthodontics	Fee for Service, Wellcare of KY	Yes	Yes
KENTON	5	Dr. Michelle Beck	Not Specified	Fee for Service, Wellcare of KY	Yes	Yes
KNOTT	3	East Kentucky Health Services, (Dental Services)	Not Specified	Eastern Kentucky Counties	Yes	Yes
LEE	1	Mission Dental Clinic (held twice per year)	Adults	Statewide sliding scale.	Yes	Yes
LETCHER****	3	Mountain Comprehensive Health Corporation	Not Specified			
LEWIS	2	Primary Plus (formerly Lewis County Dental)	Pediatric, Adult, Geriatric	Statewide; Dentist provides care once a week	Yes	Yes
LOGAN	7	Barren River District Health Dept., Director: Dr. James Coomer	Young Children, Teens, LTC Adults, Refugee Ctr.	Free, Mobile Dental Clinic	No	No
MADISON	1	White House Clinic- Richmond	Pediatric, Adult	Statewide, sliding scale, no denture care provided	Yes	Yes
MADISON	1	Red Bird Clinic	Pediatric, Adult, Geriatric	Sliding scale; patients limited to a 20 mile radius and includes Bell, Clay, & Leslie Counties	Yes	Yes
MARSHALL	8	Marshall County Health Dept.	2nd-7th graders, dental varnish program.	Free - Marshall County only.	No	No
MCCRACKEN	8	AHEC Free Children Clinic	Pediatric	Free and sliding scale; McCracken County only.	No	No
MCCRACKEN	8	McCracken County Family Service Society	Not Specified			
MCLEAN	6	Christian Dental Mission	Teens (H.S.), Refuge Ctr.,, LTC Adults (Nursing Hm)	Free, limited to Davis, Ohio, McClean Ctys	NO	NO
MENIFEE	1	St Claire Regional Family Dental Clinic	Pediatric, Adult, Geriatric	Sliding scale	Yes	Yes
METCALFE	9	Barren River District Health Dept., Director: Dr. James Coomer	Young Children, Teens, LTC Adults, Refugee Ctr.	Free; Mobile Dental Clinic	No	No
MUHLENBERG	11	Community Health Centers of Western KY Hygiene Program (Main satellite site)	Adults	Sliding scale - restricted to Muhlenberg County.	Yes	Yes
OHIO	6	Christian Dental Mission	Teens (H.S.), Refuge Ctr., LTC Adults (Nursing Hm)	Free, limited to Davis, Ohio, & McClean Counties	No	No
PENDLETON	5	Dr. William Verax III.	Not Specified	Fee for Service, Coventry, Wellcare	Yes	Yes
PERRY	3	UK Northfork Valley Community Health Center	Pediatric, Adult, Geriatric	Statewide, sliding scale based on household size and income.	Yes	Yes
PERRY*	3	Leatherwood/ Blackey Medical Clinic				
PIKE	3	Shelby Valley Dental (formerly Big Sandy, Pike Co Health)	Pediatric, Adult, Geriatric	Statewide; Sliding Scale	Yes	Yes
ROWAN	2	St. Claire Regional Family Medicine (Dental clinic)	Pediatric, Adult, Geriatric	Sliding scale, part of St. Claire Regional Medical Clinic.	Yes	Yes
SHELBY	4	Mercy Medical of Shelbyville	Adult	Free. Must meet poverty guidelines.	No	No
SIMPSON	7	Barren River District Health Dept., Dr. James Coomer	Young Children, Teens, LTC Adults, Refugee Ctr.	Free; Mobile Dental Clinic	No	No
SPENCER	4	Park Duvalle Community Health Center-Spencer County	Pediatric, Adult, Geriatric, Emergency.	Sliding scale - only Spencer County Residents are eligible.	Yes	Yes
WARREN	7	Barren River District Health Dept., Director: Dr. James Coomer	Young Children, Teens, LTC Adults, Refugee Ctr.	Free; Mobile Dental Clinic	No	No
WARREN	7	Commonwealth Free Health Dental Clinic	Pediatric, Adult, Geriatric	Sliding scale and Medicaid Only; 10 Counties: Allen, Barren, Butler, Edmonson, Hart, Logan, Metcalfe, Monroe, Simpson, and Warren.	No	Yes
STATEWIDE PROGRAMS		Passport Health Plans for Clients	Pediatric, Adult	No Sliding Scale; Free for Plan Members	No	No

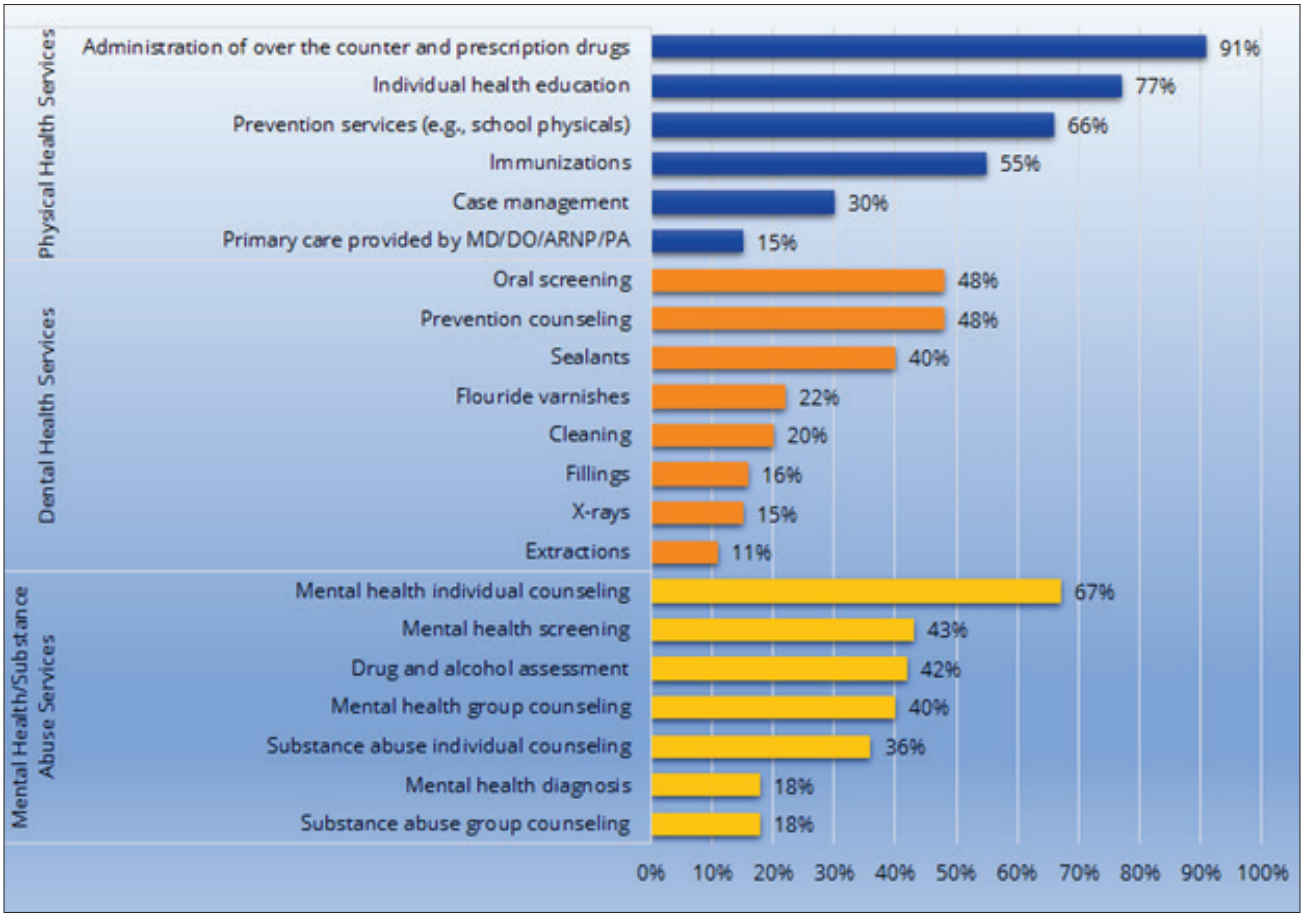
Data Source: Courtesy of the ACCESS Committee of the Kentucky Dental Association (KDA), October 10, 2014.

Table Key	Designation
Bluegrass	1
Eastern	2
Kentucky Mountain	3
Louisville	4
Northern Kentucky	5
Green Rover	6
Pennyrile	7
Southeastern	8
Purchase	9
West Central	10
South Central	11
Kentucky Student Dental Society (not a geographic Region	12

A report[31] issued in March of 2011 described findings from a statewide study of health services offered by Kentucky school districts during the 2008 to 2011 school years. Approximately 137 of the 174 school districts (79%) responded to the survey. Areas of interest included dental health, physical health, mental health, and substance abuse services for students.

Most school districts reported spending less than 1% of their annual budgets on school health services which amounted to an average of $53.11 per student. Local boards of education and local health departments were the most common funders of school health services. Eighty two percent of respondents reported that the school district allocated some funds for health services and 41% reported some funding through local health departments. Dental health, mental health, and substance abuse services were not always provided in school districts but 72% of respondents indicated that some dental services were provided in district. Most of those districts provided oral health assessment services.

Figure 89. Percent of districts offering services by type



Data Source: Kentucky Youth Advocates and the University of Louisville.

School based and school linked oral health programs are increasingly common across the US. These programs sometimes operate in fixed clinics within school buildings, in mobile dental vans that provide preventive and/or treatment services, and as mobile programs using portable equipment that permits the dentists or dental hygienist to move from school to school. In many states, school linked or school based oral health programs began providing only fluoride varnish and oral health assessment and education services but many have now progressed to providing a broader range of preventive and treatment services for children without established dental homes or for those lacking access to routine oral health services. School based or school linked programs are operated by several of the FQHCs in Kentucky and also by several Departments of Health in the state. Mobile dental services are also available from both non-profit and for profit companies.

Dental hygienists in Kentucky are permitted to work under public health supervision status if employed by a local health department. For many years, the Northern Kentucky Health Department has been providing oral health services in some of the 28 elementary schools in their catchment area where more than 45% of the student body is eligible for the free and reduced lunch program. In the past, volunteer dentists provided initial screening and assessment services for children and the dental hygienists in the program followed the treatment plans developed by those dentists. However, since the practice of public health dental hygiene is now allowed, qualified dental hygienists can provide both the screening and preventive services without a prior dental visit and in some case in a single visit. This has resulted in increased capacity in the program. Data for four schools served by public health dental hygienists, one in each of four counties served by the health department show that dentists and dental hygienists working under public health supervision have increased the number of services provided to children since the requirement for a prior dental visit was eliminated in the last three years (Table 23). These data were shared as preliminary but they provide important evidence of the impact of public health supervision on school based oral health services.

Table 23. Services to children provided in four schools in four counties in northern Kentucky 2004 to 2015

Academic Year	Enrolled	Yes Forms	No Forms	Referrals	Teeth Sealed	Screened	Medicaid	No Insurance	Private Insurance
2004-05	228	124	22	86	240	135	55	36	13
2005-06	165	72	14	31	151	78	23	21	16
2006-07	250	143	29	91	347	153	59	41	32
2007-08	245	96	11	44	222	88	50	22	16
2008-09	160	65	17	26	151	61	38	14	10
2009-10	241	100	33	39	238	92	54	20	24
2010-11	248	102	46	49	249	101	71	15	14
2011-12	250	104	35	44	260	97	60	32	6
2012-13	274	85	20	41	247	82	62	17	2
2013-14	494	168	54	91	277	155	115	38	2
2014-15	851	327	40	121	323	294	188	86	16

Data Source: Northern Kentucky Health Department.

Volunteer Dental Clinics

Free clinics staffed with volunteer dental professionals are another strategy used in local areas to address unmet need for oral health services in a population. The impact of donated dental services is difficult to quantify since free services are provided in a range of settings including private dental practices and volunteer dental days. Several of the school based initiatives discussed earlier in this report rely on volunteer dentists for screening, diagnosis and treatment planning and for restorative and therapeutic services for children in the safety net.

One example of volunteer efforts to address unmet need in a local area is Remote Area Medical (RAM) which provides free dental, vision, and medical care to underserved communities through episodic volunteer clinics. For several years, RAM has sponsored clinics in various locations in Pike County, Kentucky. Patients receive needed medical, ophthalmic, and/or dental services from volunteer clinical providers. Students and faculty from the University of Louisville School of Dentistry including dental and dental hygiene students along with local private practice general and specialty dentists have made substantial contributions through RAM clinics. The following table which presents only dental service data from the RAM clinics in Pike County describe the substantial contributions of oral health services by program volunteers (Table 24).

Table 24. Population receiving care in volunteer clinics in Kentucky, Remote Area Medical, 2004 to 2015

Year	2008	2009	2010	2011	2012	2013	Percentage change 2008-2013
Individuals served	1,344	1,429	990	1,563	1,878	1,584	17.86%
Dentistry	757	899	606	883	1,028	853	12.68%
Remote Area Medical Clinics	2 clinics: Pike and Knott	2 clinics: Pike and Letcher	1 clinic: Pike	2 clinics: Pike and Somerset	2 clinics: Pike and Somerset	Harlan and Greenup Counties	

Data Source: Remote Area Medical, Expedition Statistics, Pike County, Kentucky.

VI. Oral Health Workforce

Supply of Oral Health Professionals in Kentucky

In 2015 the Kentucky Board of Dentistry listed 2,574 licensed dentists with practice addresses and 2,250 licensed dental hygienists with practice or residence addresses in the state. These numbers may include professionals who maintain a license but are not professionally active.

Of the 2,097 general dentists licensed to practice in Kentucky in 2015, a total of 201 (9.6%) indicated more than one practice location. Most listed only a second additional location beyond their primary practice site, while a small proportion had 3 or more practice locations. The majority (60.7%) of the general dentists who had more than one practice location were working in more than one county.

Of the 477 dental specialists licensed to practice in Kentucky in 2015, a total of 151 (31.7%) practiced in more than one location. Most indicated only a second additional location beyond their primary practice site, while a smaller proportion, mainly orthodontists and oral surgeons, had 3 or more practice locations. The majority (78.1%) of the dental specialists who had more than one practice location were working in more than one county.

Dentists practiced in various dental specialties including:

- 2,097 were general dentists
- 137 were orthodontists
- 114 were oral surgeons
- 107 were pediatric dentists
- 56 were periodontists
- 40 were endodontists
- 14 were prosthodontists
- 8 were oral pathologists
- 1 was an oral radiologist

Between 1998 and 2015, the number of dentists in Kentucky has increased. The distribution of specialties among dentists in Kentucky remained constant as reflected by the percentages of general dentists (84% in 1998, 83% in 2006, and 81% in 2015) and specialists (16% in 1998, 17% in 2006, and 19% in 2015) in the state (Table 25).

Table 25. Number of licensed oral health professionals with addresses in Kentucky by primary specialty and year, Kentucky Licensure Lists, 1998 to 2015

Oral Health Professionals	1998		2006		2015	
	n	%	n	%	n	%
General Dentist	1,794	84%	1,950	83%	2,097	81%
Orthodontist	116	5%	130	6%	137	5%
Oral Surgeon	81	4%	101	4%	114	4%
Pediatric Dentist	59	3%	74	3%	107	4%
Periodontist	45	2%	46	2%	56	2%
Endodontist	22	1%	28	1%	40	2%
Prosthodontist	10	0%	16	1%	14	1%
Oral Pathologist	2	<1%	4	<1%	8	<1%
Oral Radiologist			2	<1%	1	<1%
Total	**2,129**	**100%**	**2,351**	**100%**	**2,574**	**100%**

Data Source: Kentucky Licensure Lists, 2015; Kentucky Dental Provider Workforce Analysis, 1998-2006.

More than 28% of licensed dentists in Kentucky indicated a practice address in Jefferson County; Louisville is the largest city in the county (Table 26). Nearly 14% of dentists were located in Fayette County where Lexington is located. Nineteen percent of licensed dental hygienists were located in Jefferson County and 11% were in Fayette County.

Table 26. Number of licensed oral health professionals with addresses in Kentucky by county, Kentucky Licensure Lists, 2015

County	General Dentists	Ortho-dontists	Oral Surgeons	Pediatric Dentists	Other Dental Specialists	Total Dentists	Dental Hygienists	Ratio of Total Dentists per 10,000 population	Ratio of Dental Hygienists per 10,000 population	Ratio of Dental Hygienists to General Dentists
Adair	4	0	0	0	0	4	5	2.1	2.7	1.3
Allen	6	0	0	0	0	6	11	3.0	5.5	1.8
Anderson	8	0	0	0	0	8	17	3.7	7.9	2.1
Ballard	2	0	0	0	0	2	3	2.4	3.6	1.5
Barren	17	0	0	0	0	17	36	4.0	8.5	2.1
Bath	1	0	0	0	0	1	3	0.9	2.6	3.0
Bell	11	1	1	0	0	13	2	4.6	0.7	0.2
Boone	73	5	6	8	7	99	67	8.2	5.5	0.9
Bourbon	10	0	0	0	0	10	13	5.0	6.5	1.3
Boyd	31	2	3	2	1	39	21	7.9	4.3	0.7
Boyle	15	2	2	4	0	23	10	8.0	3.5	0.7
Bracken	2	0	0	0	0	2	0	2.4	0.0	0.0
Breathitt	3	0	0	0	0	3	1	2.2	0.7	0.3
Breckinridge	3	0	0	0	0	3	8	1.5	4.0	2.7
Bullitt	20	1	0	3	0	24	39	3.2	5.2	2.0
Butler	2	0	0	0	0	2	6	1.6	4.7	3.0
Caldwell	3	0	0	0	0	3	1	2.3	0.8	0.3
Calloway	15	0	1	0	0	16	13	4.3	3.5	0.9
Campbell	34	4	1	3	1	43	53	4.7	5.8	1.6
Carlisle	1	0	0	0	0	1	0	2.0	0.0	0.0
Carroll	4	0	0	0	0	4	3	3.7	2.8	0.8
Carter	6	0	0	0	0	6	4	2.2	1.5	0.7
Casey	2	0	0	0	0	2	4	1.2	2.5	2.0
Christian	26	3	1	1	0	31	15	4.2	2.0	0.6
Clark	20	1	1	2	0	24	22	6.7	6.2	1.1
Clay	4	0	0	0	0	4	4	1.8	1.8	1.0
Clinton	4	0	0	0	0	4	2	3.9	2.0	0.5
Crittenden	1	0	0	0	0	1	3	1.1	3.2	3.0
Cumberland	3	0	0	0	0	3	3	4.4	4.4	1.0
Daviess	46	4	4	2	3	59	63	6.1	6.5	1.4
Edmonson	0	0	0	0	0	0	3	0.0	2.5	~
Elliott	3	0	0	0	0	3	0	3.9	0.0	0.0
Estill	6	0	0	0	0	6	4	4.1	2.7	0.7
Fayette	291	20	20	17	30	378	248	12.6	8.2	0.9
Fleming	4	0	0	0	0	4	9	2.8	6.2	2.3
Floyd	23	0	0	2	0	25	20	6.3	5.1	0.9
Franklin	26	1	1	1	0	29	21	5.9	4.3	0.8
Fulton	0	0	0	0	0	0	1	0.0	1.5	~
Gallatin	2	0	0	0	0	2	0	2.3	0.0	0.0
Garrard	1	0	0	0	0	1	11	0.6	6.5	11.0
Grant	7	0	0	0	0	7	9	2.8	3.6	1.3
Graves	10	1	0	0	0	11	19	2.9	5.1	1.9
Grayson	8	0	0	0	0	8	17	3.1	6.6	2.1
Green	4	0	0	0	0	4	2	3.6	1.8	0.5
Greenup	13	0	0	2	0	15	20	4.1	5.4	1.5
Hancock	5	0	0	0	0	5	3	5.8	3.5	0.6
Hardin	54	6	4	2	5	71	59	6.7	5.6	1.1
Harlan	7	0	0	0	0	7	8	2.4	2.8	1.1
Harrison	8	1	0	0	0	9	8	4.8	4.3	1.0
Hart	5	0	0	0	0	5	6	2.7	3.3	1.2
Henderson	16	1	1	2	0	20	32	4.3	6.9	2.0
Henry	4	0	0	0	0	4	7	2.6	4.5	1.8
Hickman	1	0	0	0	0	1	0	2.1	0.0	0.0
Hopkins	20	2	0	3	0	25	33	5.3	7.0	1.7
Jackson	3	0	0	0	0	3	4	2.2	3.0	1.3
Jefferson	593	45	35	23	53	749	433	10.0	5.8	0.7
Jessamine	19	0	0	1	0	20	39	4.1	7.9	2.1

Table 26. Number of licensed oral health professionals with addresses in Kentucky by county, Kentucky Licensure Lists, 2015 (Cont.)

County	General Dentists	Ortho-dontists	Oral Surgeons	Pediatric Dentists	Other Dental Specialists	Total Dentists	Dental Hygienists	Ratio of Total Dentists per 10,000 population	Ratio of Dental Hygienists per 10,000 population	Ratio of Dental Hygienists to General Dentists
Johnson	6	0	0	0	0	6	6	2.6	2.6	1.0
Kenton	61	3	4	4	2	74	50	4.6	3.1	0.8
Knott	3	0	0	0	0	3	4	1.8	2.5	1.3
Knox	11	0	0	0	0	11	7	3.5	2.2	0.6
Larue	3	0	0	0	0	3	4	2.1	2.8	1.3
Laurel	20	2	1	1	0	24	34	4.1	5.7	1.7
Lawrence	3	0	0	0	0	3	14	1.9	8.8	4.7
Lee	1	0	0	0	0	1	2	1.3	2.6	2.0
Leslie	3	0	0	0	0	3	10	2.7	8.9	3.3
Letcher	4	0	0	0	0	4	9	1.7	3.7	2.3
Lewis	4	0	0	0	0	4	9	2.9	6.5	2.3
Lincoln	2	0	0	0	0	2	6	0.8	2.4	3.0
Livingston	1	0	0	0	0	1	2	1.1	2.1	2.0
Logan	6	0	0	0	0	6	16	2.2	6.0	2.7
Lyon	2	0	0	0	0	2	2	2.4	2.4	1.0
Madison	31	3	0	3	1	38	34	4.5	4.0	1.1
Magoffin	5	0	0	0	0	5	2	3.8	1.5	0.4
Marion	7	0	0	0	0	7	12	3.5	6.0	1.7
Marshall	10	0	0	0	0	10	22	3.2	7.0	2.2
Martin	2	0	0	0	0	2	4	1.6	3.1	2.0
Mason	10	1	1	0	0	12	4	6.9	2.3	0.4
McCracken	40	6	5	3	4	58	39	8.8	5.9	1.0
McCreary	2	0	0	0	0	2	1	1.1	0.6	0.5
McLean	1	0	0	0	0	1	0	1.0	0.0	0.0
Meade	3	0	0	0	0	3	8	1.0	2.8	2.7
Menifee	1	0	0	0	0	1	1	1.6	1.6	1.0
Mercer	7	0	0	0	0	7	13	3.3	6.1	1.9
Metcalfe	2	0	0	0	0	2	5	2.0	5.0	2.5
Monroe	7	0	0	0	0	7	5	6.4	4.6	0.7
Montgomery	12	0	0	0	0	12	10	4.5	3.7	0.8
Morgan	4	0	0	0	0	4	1	2.9	0.7	0.3
Muhlenberg	9	0	0	0	0	9	12	2.9	3.8	1.3
Nelson	13	1	1	0	0	15	48	3.4	10.9	3.7
Nicholas	1	0	0	0	0	1	3	1.4	4.2	3.0
Ohio	6	0	0	0	0	6	12	2.5	5.0	2.0
Oldham	22	3	1	1	1	28	43	4.6	7.1	2.0
Owen	4	0	0	0	0	4	2	3.7	1.9	0.5
Owsley	1	0	0	0	0	1	0	2.1	0.0	0.0
Pendleton	2	0	0	0	0	2	4	1.4	2.7	2.0
Perry	16	1	1	1	0	19	9	6.7	3.2	0.6
Pike	30	3	2	2	1	38	24	5.9	3.7	0.8
Powell	3	0	0	0	0	3	2	2.4	1.6	0.7
Pulaski	28	5	3	1	4	41	44	6.5	6.9	1.6
Robertson	0	0	0	0	0	0	0	0.0	0.0	~
Rockcastle	3	0	0	0	0	3	5	1.8	2.9	1.7
Rowan	10	1	0	1	0	12	4	5.1	1.7	0.4
Russell	5	0	0	0	0	5	4	2.8	2.3	0.8
Scott	16	0	2	1	1	20	32	4.2	6.6	2.0
Shelby	18	1	1	2	0	22	18	5.1	4.2	1.0
Simpson	7	0	0	0	0	7	10	4.0	5.7	1.4
Spencer	4	0	0	0	0	4	5	2.3	2.9	1.3
Taylor	4	0	1	2	0	7	8	2.8	3.3	2.0
Todd	1	0	0	0	0	1	6	0.8	4.8	6.0
Trigg	3	0	0	0	0	3	4	2.1	2.8	1.3
Trimble	0	0	0	0	0	0	2	0.0	2.3	~
Union	6	0	0	0	0	6	11	4.0	7.3	1.8
Warren	63	4	10	5	5	87	91	7.5	7.9	1.4
Washington	4	0	0	0	0	4	12	3.4	10.2	3.0
Wayne	5	0	0	0	0	5	6	2.4	2.9	1.2
Webster	2	0	0	0	0	2	13	1.5	9.6	6.5
Whitley	15	1	0	2	0	18	17	5.0	4.8	1.1
Wolfe	1	0	0	0	0	1	2	1.4	2.7	2.0
Woodford	11	2	0	0	0	13	13	5.2	5.2	1.2
Statewide	**2,097**	**137**	**114**	**107**	**119**	**2,574**	**2,250**	**6.0**	**5.2**	**1.1**

Data Source: Kentucky Licensure Lists, 2015.

The distribution of oral health professionals is a concern because dentists often locate in more populated areas where the potential to build a successful practice is supported by a sufficient population with adequate resources to pay for care. Access to oral health services for populations living in rural areas and densely populated inner cities is compromised by the general preference of dentists for practice sites in metropolitan areas.

One factor that is widely held to affect the choice of practice location after graduation from dental school is the high level of student indebtedness among new graduates currently. According to the American Dental Education Association, the average debt among students who graduated from dental school in 2014 was $247,277.[72] More than 30% of new graduates in 2014 reported debt in excess of $300,000.[72] Student indebtedness is thought to be driving many new graduates to select practice based on economic factors including employment in corporate practices or in private practices in populated areas where demand for services would provide higher net incomes than in less populated geographic areas.

Nationally, there are approximately 6.2 dentists working in dentistry per 10,000 population (62.04 per 100,000 population).[73] However, the ratio of dentists actually providing clinical care is smaller than this number since some dentists work in research, teaching, and other non-clinical activities in the US. In 2015, the ratio of dentists to 10,000 people in Kentucky was 6.0 (Table 26). This ratio is based on Kentucky's licensure list and includes only dentists with a practice address in Kentucky. However, the licensure list may contain dentists who are retired or inactive in practice, which would decrease the ratio relative to the population. Still there appears to be a sufficient supply of dentists compared to nationally.

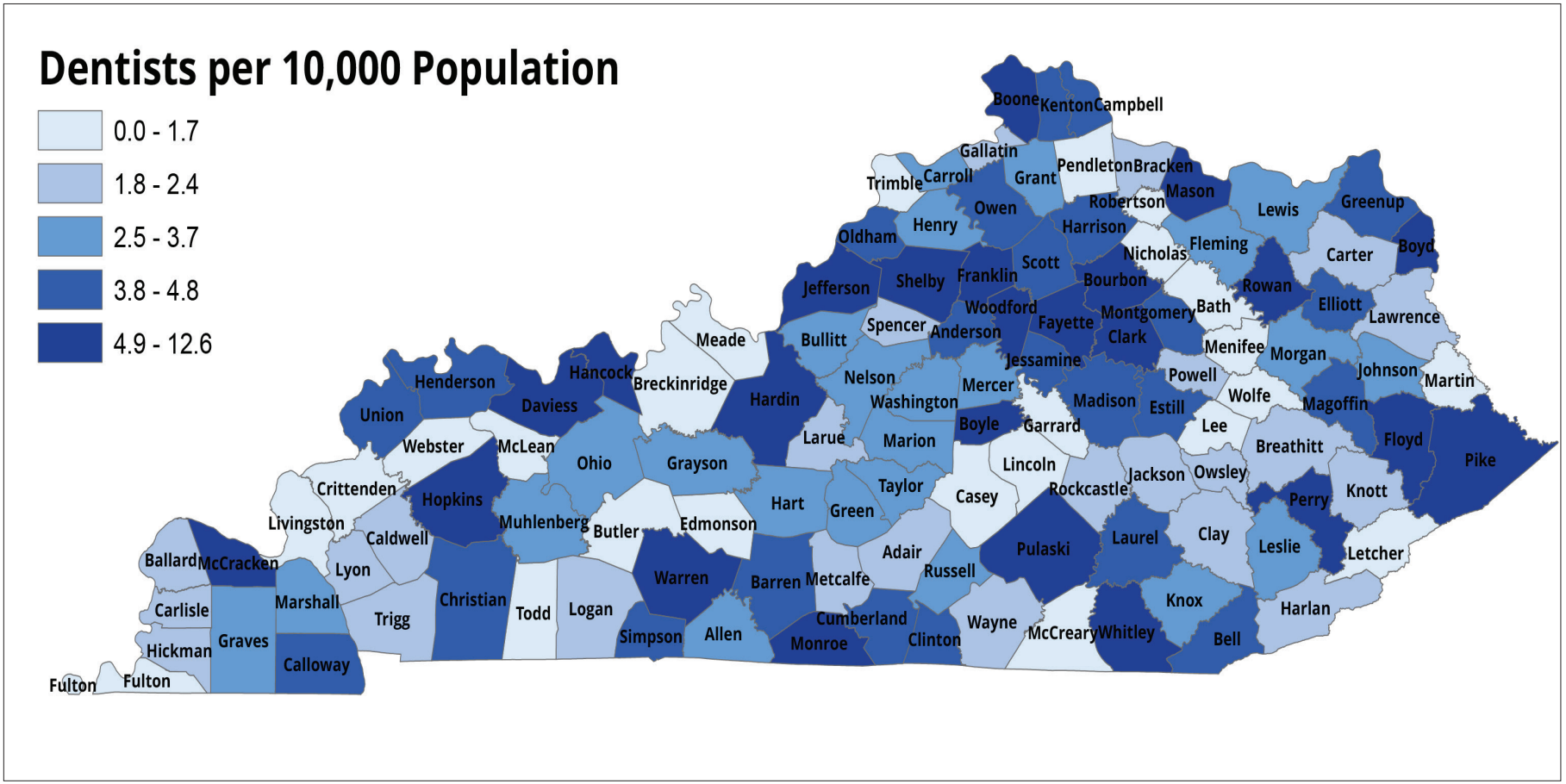
The following map shows the distribution of dentists in Kentucky by county based on the ratio of dentists to the county population (Figure 90). In 24 of the 120 counties (mainly in eastern and western Kentucky) there were fewer than 1.7 dentists per 10,000 population. In some counties, the absolute number of dentists was quite small. For example, there was:

- No dentist in 4 counties (Edmonson, Fulton, Robertson, Trimble),
- Only 1 dentist in 13 counties (Carlisle, Crittenden, Garrard, Hickman, Lee, Livingston, McLean, Menifee, Nicholas, Owsley, Todd, Wolfe), and
- Only 2 dentists in 12 counties (Ballard, Bracken, Butler, Casey, Gallatin, Lincoln, Lyon, Martin, McCreary, Metcalfe, Pendleton, Webster).

[72] American Dental Education Association. Educational Debt. http://www.adea.org/GoDental/Money_Matters/Educational_Debt.aspx

[73] American Dental Association. Dentist Supply in the US: 1993-2011. Table 5: Dentists per 100,000 Population (by State) -Dentists Working in Dentistry. 2011. http://www.ada.org/en/science-research/health-policy-institute/data-center/supply-of-dentists.

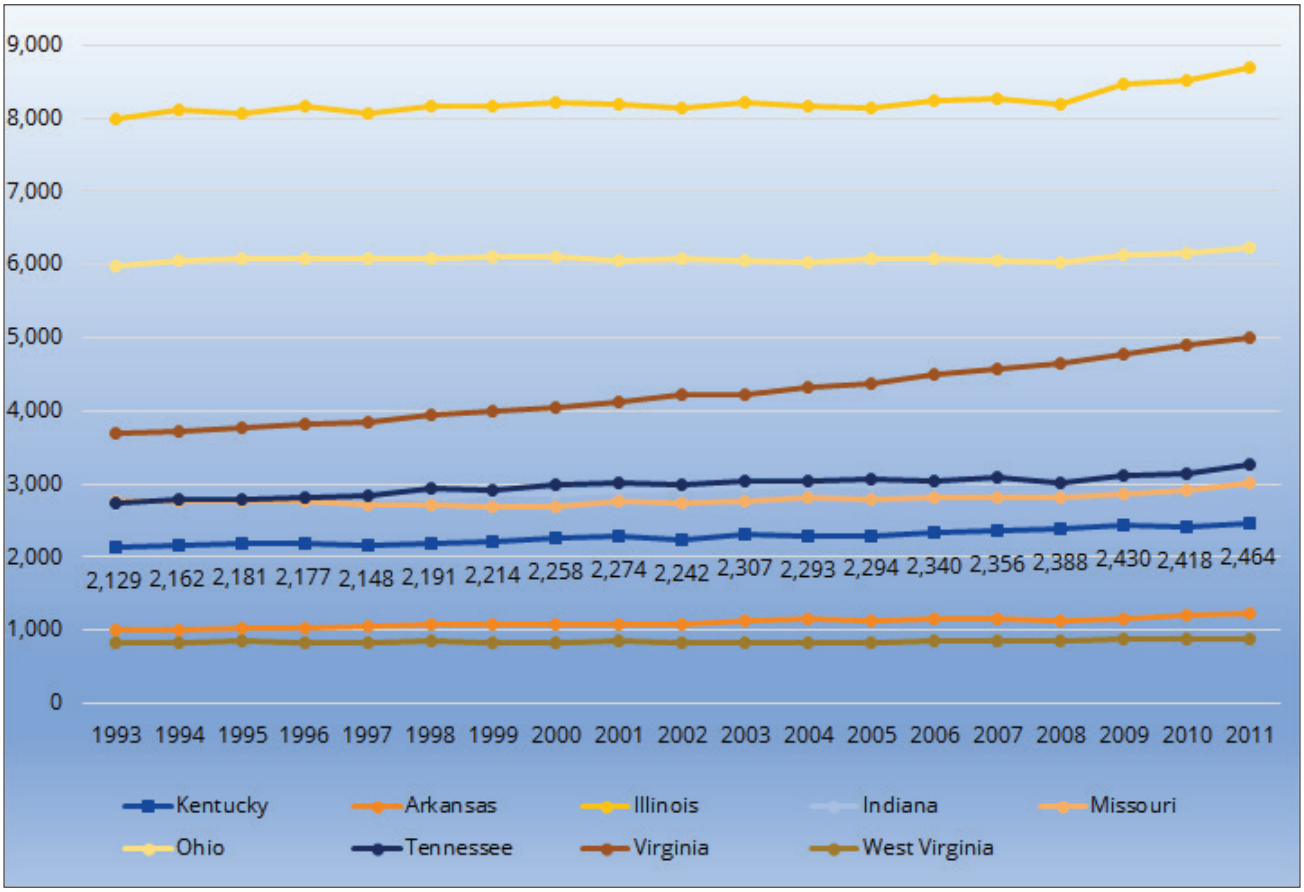
Figure 90. Ratio of dentists per 10,000 population by county in Kentucky (quintile distribution), Kentucky Licensure Lists, 2015



Data Source: Kentucky Licensure Lists, 2015.

According to data from the ADA, the supply of dentists working in dentistry in Kentucky increased slightly between 1993 and 2011 from 2,129 to 2,464 (Figure 91). During the same time period, the supply of dentists working in dentistry nationally increased from 155,087 to 193,300. A review of dental supply in neighboring states showed that Virginia and Illinois had noticeable increases in supply of dentists in recent years.

Figure 91. Supply of dentists working in dentistry in Kentucky and surrounding states, 1993 to 2011

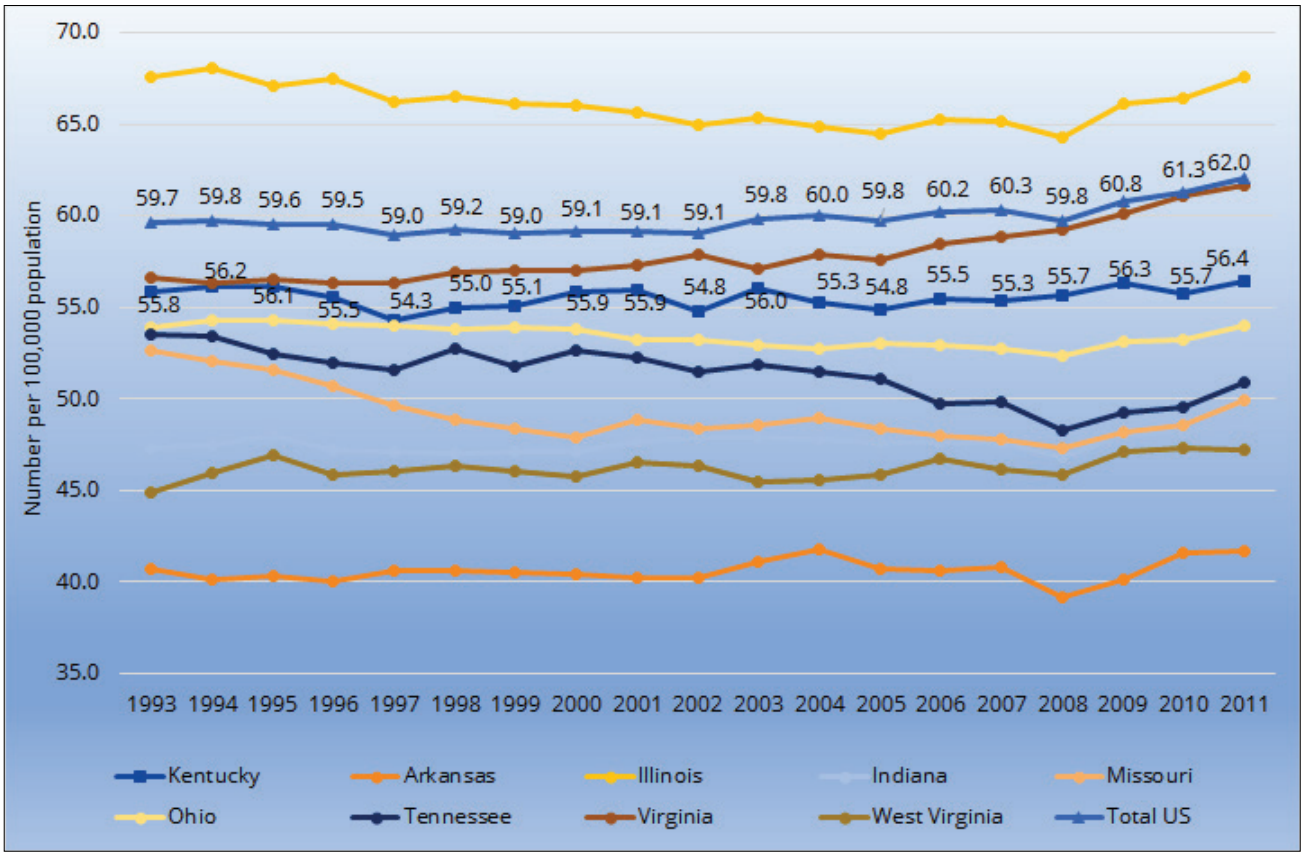


Data Source: American Dental Association (ADA).

The ratio of dentists working in dentistry (including all settings such as education, research, military, government, hospitals, clinical care, etc.) to 100,000 population has remained relatively stable over time in the US (Figure 92). In 2011, there were 62.0 dentists working in dentistry per 100,000 population in the US up from 59.8 per 100,000 population in 1993. The ratio of dentists working in dentistry to 100,000 rose in Kentucky between 1993 (55.8) and 2011 (56.4). The Kentucky ratio experienced decline beginning in 1996 with a rebound beginning in 2000. Otherwise the ratio of dentists working in dentistry to population in the state has remained relatively stable.

Neighboring states experienced increases in the ratio of dentists to population, especially West Virginia where the supply of dentists per 100,000 population increased from 44.9 per 100,000 to 47.3. Two states experienced declines in dentist to population ratio over the period. Missouri's ratio fell from 52.6 in 1993 to 49.9 in 2011 and Tennessee's ratio changed from 53.5 to 50.9.

Figure 92. Dentists working in dentistry per 100,000 Population in Kentucky, surrounding states and the US, 1993 to 2011

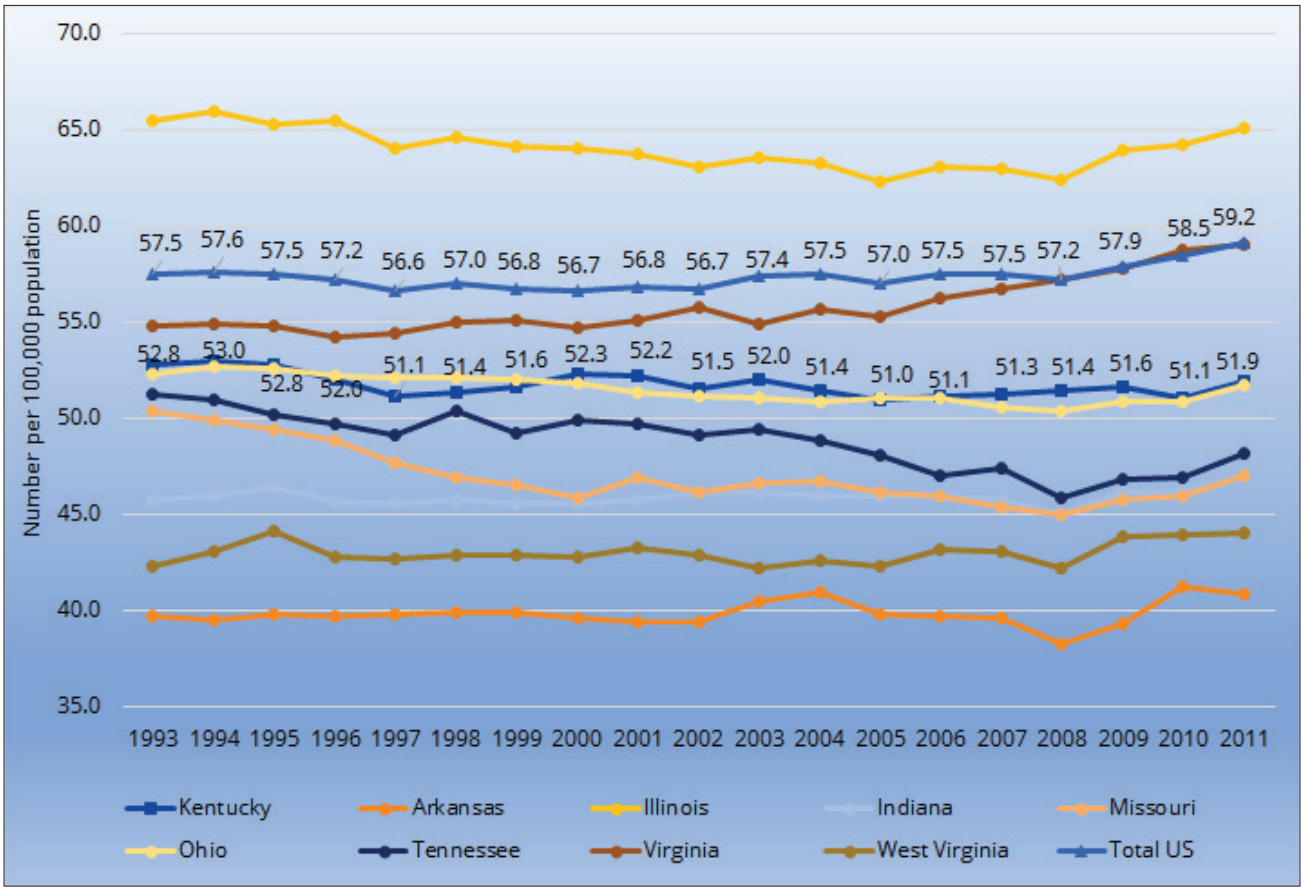


Data Source: American Dental Association (ADA).

The ratio of dentists in clinical practice to population increased in the US from 57.5 in 1993 to 59.2 in 2011 (Figure 93).[74] These ratios included dentists providing clinical services in private practices, government agencies, hospitals, and Veterans Affairs settings, among others. While the number of dentists providing clinical care in Kentucky rose from 2,012 in 1993 to 2,268 the per population ratio actually fell over the time period from 52.8 dentists providing clinical care in 1993 to 51.9 in 2011. This is likely due to more rapid growth in the state's population than in the supply of dentists providing clinical services. In contrast the ratio of dentists providing clinical care to population increased in Virginia from 54.8 in 1993 to 59.0 in 2011. Once again, Missouri and Tennessee experienced declines in dentist to population ratios between 1993 and 2011.

[74] American Dental Association. Dentist Supply in the US: 1993-2011. Table 6 Dentists per 100,000 Population (by State) – Dentists Providing Clinical Care. 2011. http://www.ada.org/en/science-research/health-policy-institute/data-center/supply-of-dentists.

Figure 93. Dentists providing clinical care per 100,000 population in Kentucky, surrounding states, and the US, 1993 to 2011



Data Source: American Dental Association (ADA).

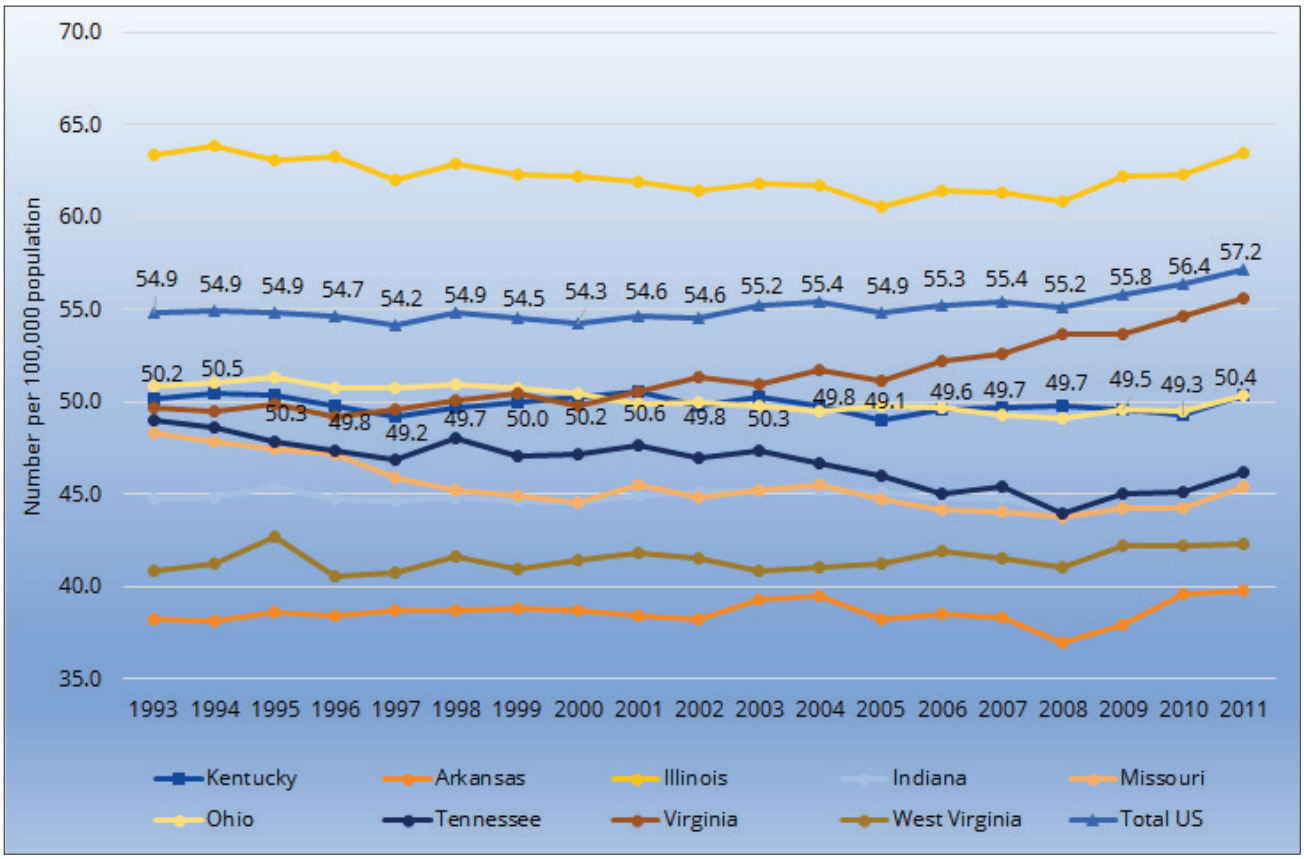
Most dental care in the US is provided in the offices of private practice dentists with about 92% of professionally active dentists working in this practice model.[75] Maintaining an adequate supply of private practice dentists per population is therefore, important to supporting access to care. The trend in private practice dentists per 100,000 population across the US from 1993-2011 included small declines in the annual ratios in the late 1990s with increases beginning in 1998. Subsequent changes in the supply of dentists resulted in an upward trend in the ratios of dentists in private practice per population. In 2011, the national ratio was 57.2 private practice dentists to 100,000 population in the US.

The ratio of dentists in private practice per population in Kentucky increased slightly between 1993 and 2011 from 50.2 per 100,000 population in 1993 to 50.4 in 2011.[76]

[75] Institute of Medicine and the National Research Council. Improving Access to Oral Health Care for Vulnerable and Underserved Populations. The National Academies Press. July 2011. https://iom.nationalacademies.org/~/media/Files/Report%20Files/2011/Improving-Access-to-Oral-Health-Care-for-Vulnerable-and-Underserved-Populations/oralhealthaccess2011reportbrief.pdf.

[76] American Dental Association. Dentist Supply in the US: 1993-2011. Table 7: Dentists per 100,000 Population – Dentists in Private Practice. 2011. http://www.ada.org/en/science-research/health-policy-institute/data-center/supply-of-dentists.

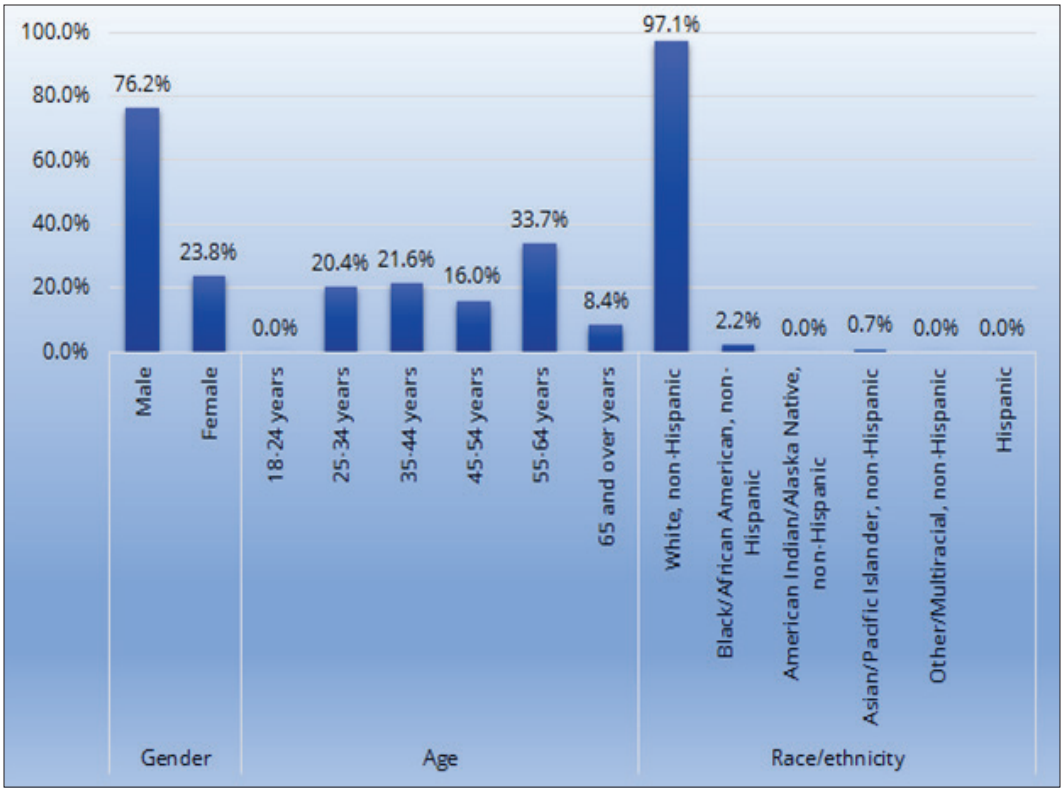
Figure 94. Dentists working in private practice per 100,000 population in Kentucky, surrounding states and the US, 1993 to 2011



Data Source: American Dental Association (ADA).

The ACS 2008-2013 of the US Census Bureau contains demographic and occupational data for the US population. The data from the ACS indicate that dentists in Kentucky are predominately male (76.2%) and White, non-Hispanic (97.1%) with age between 35 and 64 years (71.3%) (Figure 95).[77]

Figure 95. Demographic characteristics of dentists in Kentucky, American Community Survey, 2009 to 2013

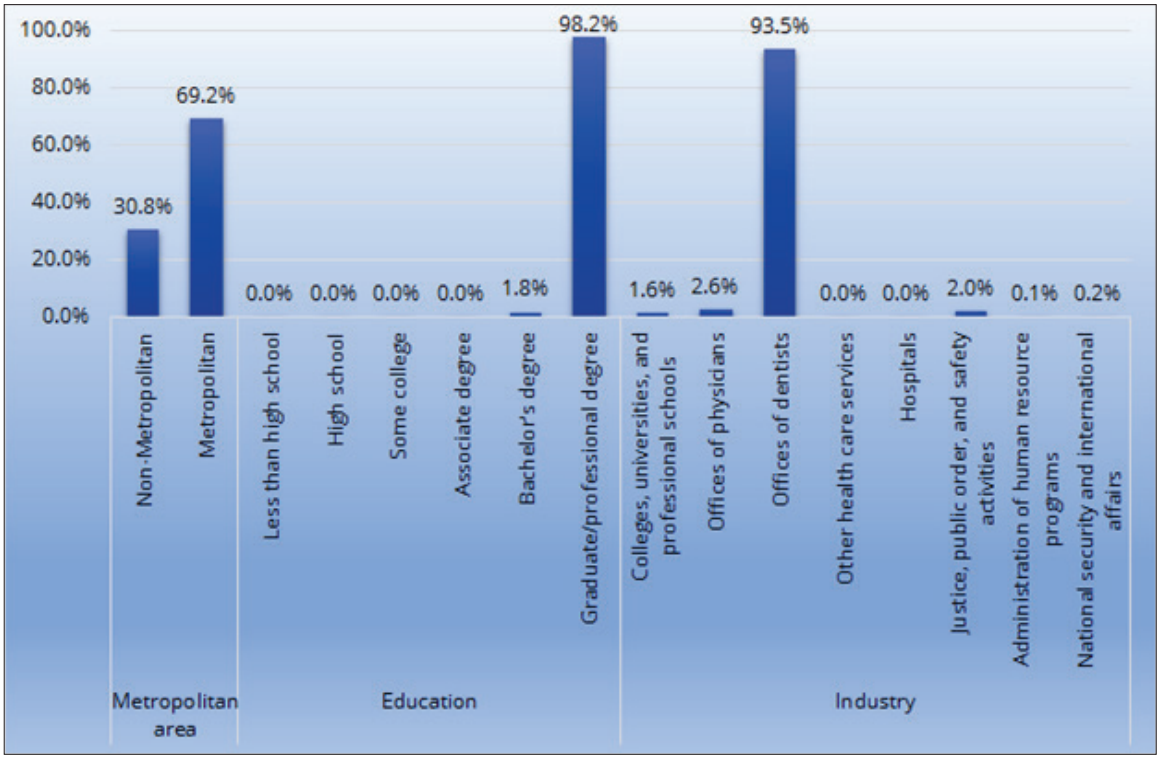


Data Sources: American Community Survey (ACS), Public Use Microdata Sample.

Dentists in Kentucky mainly practice in metropolitan areas of the state (69.2%) in offices of dentists (93.5%). These practice patterns are consistent with national data about the practice of dentists in the US (Figure 96).

[77] American Community Survey, US Census Bureau. Five-Year Estimates 2009-2013. http://www.census.gov/acs/www/ ; American Community Survey, US Census Bureau. Public Use Microdata Sample (PUMS) Documentation. http://www.census.gov/acs/www/data_documentation/public_use_microdata_sample/.

Figure 96. Metropolitan area, education and industry of practice of dentists in Kentucky, American Community Survey, 2009 to 2013



Data Sources: American Community Survey (ACS), Public Use Microdata Sample.

A Study of Supply of Dentists in Kentucky by Region

A study conducted for the ARC by researchers from the University of Kentucky and Morehead State University provided important insights to the distribution of dentists by region in Kentucky. The study used supply data from 2011 and 2012 to locate dentists in the state. The analyses were completed for all dentists and also by dental specialty.

The data suggest an oversupply of dentists proportionate to the population in the Central Triangle with notable deficits in supply in the Appalachian Region and the Mississippi Delta (Table 27). Although 27.2% of the population in Kentucky lives in Appalachia, only 19.2% of general dentists in the state practice in that region; 11.5% of the population lives in the Delta but only 8.0% of the general dentists in Kentucky practice in the area. Specialty dentists appear to be abundant in the Central Triangle but much less available in the other regions. During interviews conducted for this study, interview participants often commented on the need for dental specialists in the rural regions of the state.

Table 27. Practicing dentists in Kentucky by specialty and region, 2012

	Statewide		ARC Region		Non-ARC Northern		Central Kentucky Triangle		West/West Central		Mississippi Delta	
Total Population	4,339,367		1,184,278		25,978		1,923,776		705,228		500,107	
% of Population	100.0%		27.3%		0.6%		44.3%		16.3%		11.5%	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
General Dentists	2,063	100.0%	395	19.2%	14	0.7%	1,215	58.9%	273	13.2%	166	8.0%
Oral & Maxillofacial Surgeons	110	100.0%	19	17.3%	0	0.0%	59	53.6%	22	20.0%	10	9.1%
Orthodontists	141	100.0%	20	14.2%	1	0.7%	88	62.4%	19	13.5%	13	9.2%
Pediatric Dentists	86	100.0%	13	15.1%	0	0.0%	55	63.9%	12	14.0%	6	7.0%
Periodontists	48	100.0%	4	8.3%	0	0.0%	34	70.8%	8	16.7%	2	4.2%
Endodontists	39	100.0%	2	5.1%	0	0.0%	29	74.4%	6	15.4%	2	5.1%

Data Source: Appalachian Rural Dental Education Partnership (ARDEP).

The majority of general dentists in Kentucky were between 40 and 64 years of age (58.8%) (Table 28). However, more general dentists in the non-ARC Northern region were between 60 and 64 years of age (41.7%) compared to dentists in other regions of Kentucky. A higher proportion of general dentists in the ARC region (65.1%), the West and West Central (64.1%), and the Mississippi Delta (65.1%) were between 40 and 64 years compared to dentists statewide. One concern nationally is that an already limited supply of dentists in rural areas is aging with few younger dentists entering private practice in rural regions to replace them.

Table 28. Practicing general dentists in Kentucky by age group and region, 2012

Age Group	Statewide		ARC Region		Non-ARC Northern		Central Kentucky Triangle		West/West Central		Mississippi Delta	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
<30 years	155	7.5%	19	4.8%	1	8.3%	105	8.6%	17	6.2%	13	7.8%
30-34 years	245	11.9%	33	8.4%	0	0.0%	176	14.5%	23	8.4%	13	7.8%
35-39 years	225	10.9%	41	10.4%	1	8.3%	136	11.2%	36	13.2%	11	6.6%
40-44 years	240	11.6%	50	12.7%	2	16.7%	136	11.2%	30	11.0%	22	13.3%
45-49 years	173	8.4%	46	11.6%	1	8.3%	88	7.2%	27	9.9%	11	6.6%
50-54 years	223	10.8%	41	10.4%	1	8.3%	117	9.6%	44	16.1%	20	12.0%
55-59 years	313	15.2%	68	17.2%	0	0.0%	178	14.7%	40	14.7%	27	16.3%
60-64 years	262	12.7%	52	13.2%	5	41.7%	143	11.8%	34	12.5%	28	16.9%
65-69 years	134	6.5%	28	7.1%	1	8.3%	74	6.1%	16	5.9%	15	9.0%
70-74 years	52	2.5%	12	3.0%	0	0.0%	36	3.0%	2	0.7%	2	1.2%
>74 years	39	1.9%	5	1.3%	0	0.0%	26	2.1%	4	1.5%	4	2.4%
Total	**2,061**	**100.0%**	**395**	**100.0%**	**12**	**100.0%**	**1,215**	**100.0%**	**273**	**100.0%**	**166**	**100.0%**

Data Source: Appalachian Rural Dental Education Partnership (ARDEP).

A majority of oral and maxillofacial surgeons in Kentucky were between 40 and 59 years of age (56.4%) (Table 29). More than a quarter (26.4%) of these specialists are older than 59 years. There were no oral surgeons in the Non-ARC Northern Region. In the interviews conducted for this report, informants commented on high demand for oral surgery services from the population, especially in the non-metropolitan areas of Kentucky.

Table 29. Practicing oral and maxillofacial surgeons in Kentucky age group and region, 2012

Age Group	Statewide		ARC Region		Non-ARC Northern		Central Kentucky Triangle		West/West Central		Mississippi Delta	
	n	%	n	%	n	%	n	%	n	%	n	%
<30 years	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
30-34 years	7	6.4%	1	5.3%	0	0.0%	4	6.8%	2	9.1%	0	0.0%
35-39 years	12	10.9%	2	10.5%	0	0.0%	7	11.9%	1	4.5%	2	20.0%
40-44 years	19	17.3%	2	10.5%	0	0.0%	10	16.9%	4	18.2%	3	30.0%
45-49 years	10	9.1%	5	26.3%	0	0.0%	4	6.8%	1	4.5%	0	0.0%
50-54 years	15	13.6%	1	5.3%	0	0.0%	7	11.9%	4	18.2%	3	30.0%
55-59 years	18	16.4%	3	15.8%	0	0.0%	11	18.6%	3	13.6%	1	10.0%
60-64 years	13	11.8%	3	15.8%	0	0.0%	6	10.2%	4	18.2%	0	0.0%
65-69 years	6	5.5%	1	5.3%	0	0.0%	3	5.1%	2	9.1%	0	0.0%
70-74 years	5	4.5%	0	0.0%	0	0.0%	4	6.8%	0	0.0%	1	10.0%
>74 years	5	4.5%	1	5.3%	0	0.0%	3	5.1%	1	4.5%	0	0.0%
Total	**110**	**100.0%**	**19**	**100.0%**	**0**	**0.0%**	**59**	**100.0%**	**22**	**100.0%**	**10**	**100.0%**

Data Source: Appalachian Rural Dental Education Partnership (ARDEP).

Most orthodontists in Kentucky practiced in the Central Triangle (88 out of 144 or 62.4%) (Table 30). The majority of orthodontists in Kentucky were between 40 and 59 years old. More orthodontists in the Central Region (55.7%) and the Mississippi Delta (61.5%) were between 40 and 59 years of age than orthodontists in the rest of the state.

Table 30. Practicing orthodontists in Kentucky by age group and region, 2012

Age Group	Statewide		ARC Region		Non-ARC Northern		Central Kentucky Triangle		West/West Central		Mississippi Delta	
	n	%	n	%	n	%	n	%	n	%	n	%
<30 years	2	1.4%	0	0.0%	0	0.0%	2	2.3%	0	0.0%	0	0.0%
30-34 years	18	12.8%	2	10.0%	0	0.0%	12	13.6%	3	15.8%	1	7.7%
35-39 years	15	10.6%	3	15.0%	1	100.0%	8	9.1%	2	10.5%	1	7.7%
40-44 years	11	7.8%	0	0.0%	0	0.0%	6	6.8%	3	15.8%	2	15.4%
45-49 years	21	14.9%	3	15.0%	0	0.0%	15	17.0%	0	0.0%	3	23.1%
50-54 years	13	9.2%	1	5.0%	0	0.0%	7	8.0%	3	15.8%	2	15.4%
55-59 years	27	19.1%	3	15.0%	0	0.0%	21	23.9%	2	10.5%	1	7.7%
60-64 years	17	12.1%	5	25.0%	0	0.0%	8	9.1%	2	10.5%	2	15.4%
65-69 years	11	7.8%	2	10.0%	0	0.0%	4	4.5%	4	21.1%	1	7.7%
70-74 years	3	2.1%	0	0.0%	0	0.0%	3	3.4%	0	0.0%	0	0.0%
>74 years	3	2.1%	1	5.0%	0	0.0%	2	2.3%	0	0.0%	0	0.0%
Total	**141**	**100.0%**	**20**	**100.0%**	**1**	**100.0%**	**88**	**100.0%**	**19**	**100.0%**	**13**	**100.0%**

Data Source: Appalachian Rural Dental Education Partnership (ARDEP).

Half (50%) of the pedodontists in Kentucky were between 35 and 54 years old (Table 31). Although there was a limited supply of pediatric dentists in the ARC region (13 of the 86 in the state or 15.1%), the pedodontist in that region were younger than 54 years of age. The limited supply of pediatric dentists in the Mississippi Delta Region (6 of 86 or 7.0%) is a concern because 83.3% of the pedodontists in that region were 55 years of age or older.

Table 31. Practicing pediatric dentists in Kentucky by age group and region, 2012

Age Group	Statewide		ARC Region		Non-ARC Northern		Central Kentucky Triangle		West/West Central		Mississippi Delta	
	n	%	n	%	n	%	n	%	n	%	n	%
<30 years	2	1.4%	0	0.0%	0	0.0%	2	2.3%	0	0.0%	0	0.0%
30-34 years	18	12.8%	2	10.0%	0	0.0%	12	13.6%	3	15.8%	1	7.7%
35-39 years	15	10.6%	3	15.0%	1	100.0%	8	9.1%	2	10.5%	1	7.7%
40-44 years	11	7.8%	0	0.0%	0	0.0%	6	6.8%	3	15.8%	2	15.4%
45-49 years	21	14.9%	3	15.0%	0	0.0%	15	17.0%	0	0.0%	3	23.1%
50-54 years	13	9.2%	1	5.0%	0	0.0%	7	8.0%	3	15.8%	2	15.4%
55-59 years	27	19.1%	3	15.0%	0	0.0%	21	23.9%	2	10.5%	1	7.7%
60-64 years	17	12.1%	5	25.0%	0	0.0%	8	9.1%	2	10.5%	2	15.4%
65-69 years	11	7.8%	2	10.0%	0	0.0%	4	4.5%	4	21.1%	1	7.7%
70-74 years	3	2.1%	0	0.0%	0	0.0%	3	3.4%	0	0.0%	0	0.0%
>74 years	3	2.1%	1	5.0%	0	0.0%	2	2.3%	0	0.0%	0	0.0%
Total	**141**	**100.0%**	**20**	**100.0%**	**1**	**100.0%**	**88**	**100.0%**	**19**	**100.0%**	**13**	**100.0%**

Data Source: Appalachian Rural Dental Education Partnership (ARDEP).

The majority (52.1%) of periodontists in Kentucky were between 45 and 59 years old (Table 32). There were very few periodontists in the ARC Region, the West and West Central Region, or the Mississippi Delta Region and no periodontists in the Non-ARC Northern Region. This was concerning in light of the high rate of chronic disease including diabetes in the population in several regions of the state.

Table 32. Practicing periodontists in Kentucky by age group and region, 2012

Age Group	Statewide		ARC Region		Non-ARC Northern		Central Kentucky Triangle		West/West Central		Mississippi Delta	
	n	%	n	%	n	%	n	%	n	%	n	%
<30 years	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
30-34 years	3	6.3%	0	0.0%	0	0.0%	3	8.8%	0	0.0%	0	0.0%
35-39 years	4	8.3%	0	0.0%	0	0.0%	2	5.9%	2	25.0%	0	0.0%
40-44 years	3	6.3%	0	0.0%	0	0.0%	2	5.9%	0	0.0%	1	50.0%
45-49 years	11	22.9%	3	75.0%	0	0.0%	6	17.6%	2	25.0%	0	0.0%
50-54 years	8	16.7%	0	0.0%	0	0.0%	7	20.6%	1	12.5%	0	0.0%
55-59 years	6	12.5%	0	0.0%	0	0.0%	5	14.7%	1	12.5%	0	0.0%
60-64 years	5	10.4%	0	0.0%	0	0.0%	3	8.8%	2	25.0%	0	0.0%
65-69 years	5	10.4%	1	25.0%	0	0.0%	4	11.8%	0	0.0%	0	0.0%
70-74 years	3	6.3%	0	0.0%	0	0.0%	2	5.9%	0	0.0%	1	50.0%
>74 years	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Total	**48**	**100.0%**	**4**	**100.0%**	**0**	**0.0%**	**34**	**100.0%**	**8**	**100.0%**	**2**	**100.0%**

Data Source: Appalachian Rural Dental Education Partnership (ARDEP).

The majority of endodontists in Kentucky were between 40 and 54 years old (Table 33). Nearly three quarters (74.4%) of endodontists in Kentucky were located in the Central Triangle and the remainder were mainly located in the West and West Central Region.

Table 33. Practicing endodontists in Kentucky, by age group and region, 2012

Age Group	Statewide		ARC Region		Non-ARC Northern		Central Kentucky		West/West Central		Mississippi Delta	
	n	%	n	%	n	%	n	%	n	%	n	%
<30 years	1	2.6%	0	0.0%	0	0.0%	1	3.4%	0	0.0%	0	0.0%
30-34 years	2	5.1%	1	50.0%	0	0.0%	0	0.0%	1	16.7%	0	0.0%
35-39 years	3	7.7%	0	0.0%	0	0.0%	3	10.3%	0	0.0%	0	0.0%
40-44 years	11	28.2%	0	0.0%	0	0.0%	9	31.0%	1	16.7%	1	50.0%
45-49 years	6	15.4%	0	0.0%	0	0.0%	3	10.3%	2	33.3%	1	50.0%
50-54 years	4	10.3%	0	0.0%	0	0.0%	3	10.3%	1	16.7%	0	0.0%
55-59 years	4	10.3%	0	0.0%	0	0.0%	4	13.8%	0	0.0%	0	0.0%
60-64 years	3	7.7%	0	0.0%	0	0.0%	2	6.9%	1	16.7%	0	0.0%
65-69 years	4	10.3%	1	50.0%	0	0.0%	3	10.3%	0	0.0%	0	0.0%
70-74 years	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
>74 years	1	2.6%	0	0.0%	0	0.0%	1	3.4%	0	0.0%	0	0.0%
Total	**39**	**100.0%**	**2**	**100.0%**	**0**	**0.0%**	**29**	**100.0%**	**6**	**100.0%**	**2**	**100.0%**

Data Source: Appalachian Rural Dental Education Partnership (ARDEP).

The dental needs assessment project for the ARC included an analysis of dentist supply by ARC sub-region, grouping the two northern non-ARC counties with the ARC region. The analysis of ARC sub-regions revealed that there was an uneven distribution of dentists within the ARC region (Table 34). The supply of dentists in Big Sandy, Lake Cumberland, and the North East sub-regions was proportionate to the population. However, the I-75 region had fewer general dentists on a per population basis than other sub-regions and a relatively small supply of dental specialists. The Kentucky River area which was the most sparsely populated sub-region of the ARC was also lacking in supply of dentists proportionate to the population.

Table 34. Practicing dentists in ARC, by specialty and sub-region, 2012

	ARC Region		Big Sandy		Kentucky River		North East		1-75 South		Lake Cumberland	
Total Population	1,184,278		154,093		114,762		320,069		379,494		215,860	
% of Population	100.0%		13.0%		9.7%		27.0%		32.1%		18.2%	
	n	%	n	%	n	%	n	%	n	%	n	%
General Dentists	395	100.0%	65	16.5%	31	7.9%	123	31.1%	113	28.6%	63	15.9%
Oral & Maxillofacial Surgeons	19	100.0%	2	10.5%	1	5.3%	8	42.1%	3	15.8%	5	26.3%
Orthodontists	20	100.0%	4	20.0%	1	5.0%	7	35.0%	7	35.0%	1	5.0%
Pediatric Dentists	13	100.0%	3	23.1%	0	0.0%	5	63.9%	4	30.8%	1	7.7%
Periodontists	4	100.0%	1	25.0%	0	0.0%	1	25.0%	2	50.0%	0	0.0%
Endodontists	2	100.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	2	100.0%

Data Source: Appalachian Rural Dental Education Partnership (ARDEP).

Research finds that physicians and dentists select clinical practice locations based not only on professional opportunity and salary level but with consideration to personal preferences and places of origin.[78, 79, 80] Some states leverage these preferences with lower in-state tuition at public dental schools for students from the state who qualify for admission. Experience suggests that training in-state increases the likelihood of in-state practice upon graduation.

Kentucky is fortunate to have 2 of the 65 dental schools accredited by the Commission on Dental Accreditation (CODA) in the US. Dental professional education is available at the University of Kentucky College of Dentistry in Lexington and at the University of Louisville School of Dentistry in Louisville. Both schools enjoy public sponsorship allowing them to offer lower tuition to in-state students than to students from out of state.

In the 2014-15 academic year, 90 first year dental students with a primary residence in Kentucky enrolled in a dental education program. Of these, 41 enrolled at the University of Kentucky College Of Dentistry, 45 enrolled at the University of Louisville School of Dentistry, 1 enrolled at Indiana University School of Dentistry, 1 enrolled at Ohio State University College of Dentistry, and 1 enrolled at Virginia Commonwealth University School of Dentistry.[81]

While not all students enrolled in or graduating from dental schools in Kentucky are from the state, a portion of each year's graduating class are in-state residents, increasing the likelihood of a supply of new dentists for the state on an annual basis.

Demand for dentists across the US has led to the opening of several new dental schools during the decade as well as expansions in existing dental education programs. Both dental schools in Kentucky show increased first year enrollments in recent years. It is not possible to ascertain what proportion of the increased enrollments are Kentucky residents but some increase in in-state student enrollment is likely.

First year enrollment at the Kentucky dental schools increased over the period between 2004 and 2014 (Figure 97). The University Of Louisville School Of Dentistry increased first year enrollment by

[78] New England Journal of Medicine Career Center. 2011 Survey of Final-Year Medical Residents. Recruiting Physicians Today. November/December 2011;19(6).

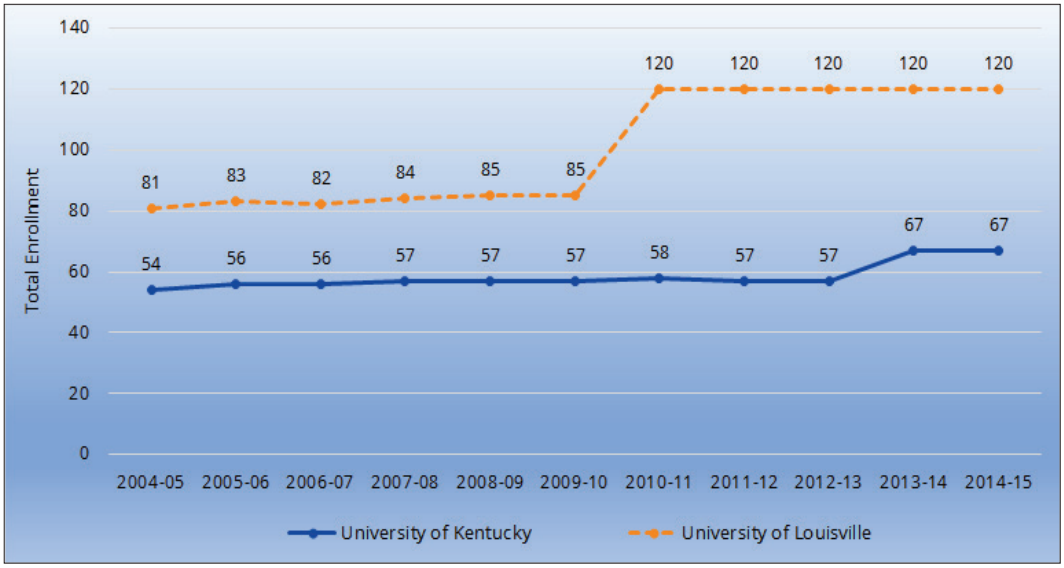
[79] Center for Workforce Studies of the Association of American Medical Colleges. Young physicians and their initial preferences: A summary of findings from focus groups conducted at US residency programs. Journal of the ASPR. 2009; 16(2): 30-31. http://c.ymcdn.com/sites/www.aspr.org/resource/resmgr/imported/young-physicians-and-their-initial-practice-preferences.pdf.

[80] Graham J. Factors influencing the choice of practice location for recent dental graduates. JADA. 1977; 94(5):821-5.

[81] American Dental Association. Survey of Advanced Dental Education for 2014-15. Table 12. General Practice Residency – Applications per Program, Enrollment, and Graduates, 2004-5 to 2014-15. July 2015. Date last modified October 2015. www.ada.org/~/.../SADV_2014-15_final.ashx.

approximately 35 students beginning in the 2010 to 2011 academic year. The University of Kentucky College of Dentistry also increased first year enrollment by 10 beginning in the 2013 to 2014 academic year.[82]

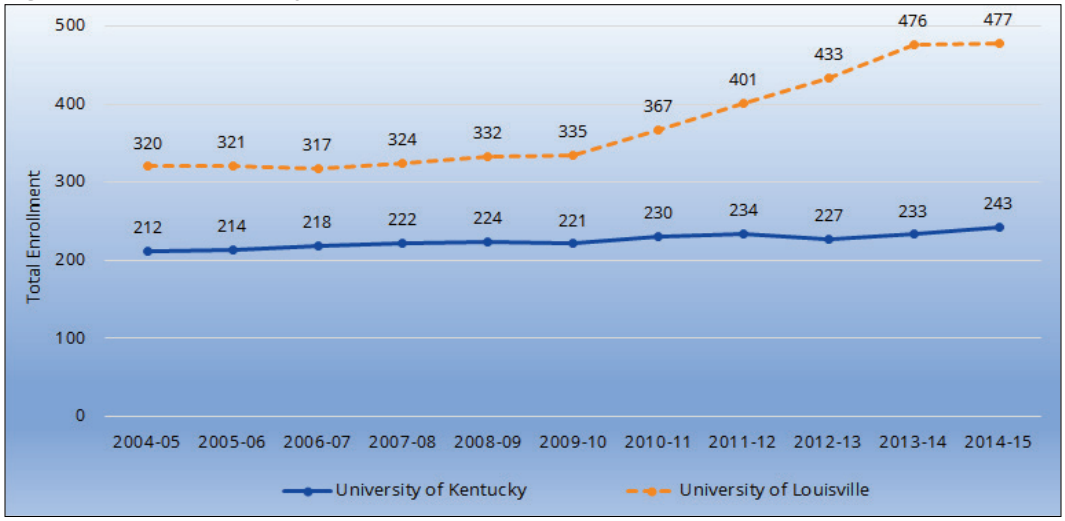
Figure 97. First-Year Kentucky dental school enrollment, 2004-05 to 2014-15



Data Source: American Dental Association (ADA), Commission on Dental Accreditation (CODA).

As a result of increasing enrollment in recent years, particularly at the University of Louisville School of Dentistry total enrollment in dental education programs in Kentucky increased substantially in the last five years, totaling 720 dental students in the 2014 to 2015 academic year (Figure 98).[83]

Figure 98. Total Kentucky dental school enrollment, 2004-05 to 2014-15

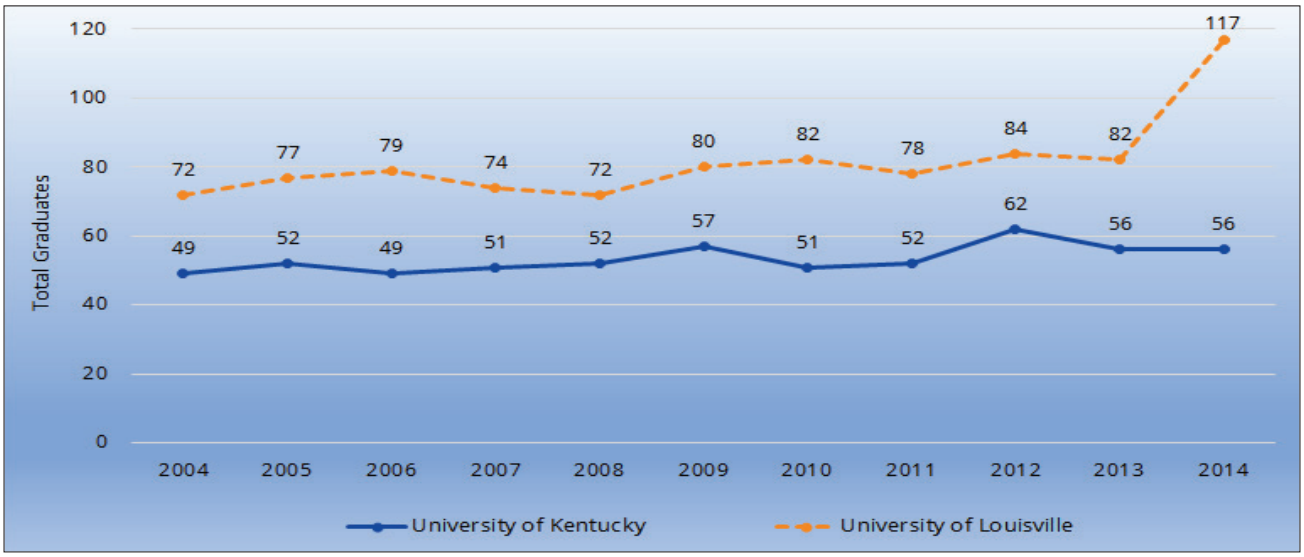


Data Source: American Dental Association (ADA), Commission on Dental Accreditation (CODA).

[83] American Dental Association. Survey of Advanced Dental Education for 2014-15. Table 10: Periodontics – Applications per Program, Enrollment, and Graduates, 2004-5 to 2014-15. July 2015. Date last modified October 2015. www.ada.org/~/.../SADV_2014-15_final.ashx.

The number of graduates from the University of Louisville noticeably increased in 2014 reflecting the increase in first year enrollment four years earlier (Figure 99).

Figure 99. Total Kentucky dental school graduates, 2004 to 2014



Data Source: American Dental Association (ADA), Commission on Dental Accreditation (CODA).

Gender and Racial/Ethnic Diversification among Dental Students in Kentucky

The high percentage of female dental students across the US suggests increasing gender diversification within the active dental workforce. Gender diversification is indicated by the high percentage of female dental students currently, a trend which has accelerated in recent years.[84] The implications of the feminization of dentistry on patterns of practice and the impact on service delivery to patients are not yet well understood,[85] although there is literature that suggests that geographic distribution of the professional workforce may be affected. Women dentists show preferences for practice in more populated areas, which may impact the availability of dental services in less populated areas over the long term.[71, 86] This preference may have implications for Kentucky over the long term since so much of the state is classified as rural.

Most licensed dentists in Kentucky are male (Table 33). However, the number of female dental students in the two professional education programs in Kentucky suggest a changing gender mix of dentists in the state. In the 2014-2015 academic year, 47.7% of first year dental student enrollees in US dental schools

[84] McKay J, Quinonez C. The feminization of dentistry: implications for the profession. J Can Dent Assoc. 2012; 78:c1. http://www.jcda.ca/article/c1.

[85] Riley J, Gordan V, Rouisse K, et al. Differences in male and female dentists' practice patterns regarding diagnosis and treatment of dental caries. JADA. 2011 Apr; 142(4):429-40.

[86] Wanchek T, Rephann T. Filling the Gaps: Dentist Disparities along the Rural Urban Continuum. March 24, 2011. http://www.cooper-center.org/sites/default/files/publications/dentist_final.pdf.

were female. In that year, 55.2% of first year students at the University of Kentucky College of Dentistry and 35% of first year students at the University of Louisville School of Dentistry were female.

The University of Louisville increased enrollment substantially beginning in the 2010 to 2011 academic year with admission of many more male students than female students (Table 35). Enrollment increased from 85 to 120 first year students, 76 of whom were male and 44 of whom were female. In the prior year, 44 of the admitted students were female and 41 were male.

Table 35. First-Year enrollment and repeating students at Kentucky dental schools and in the US by gender, 2004-05 to 2014-15

School Name	2004-05		2005-06		2006-07		2007-08		2008-09		2009-10		2010-11		2011-12		2012-13		2013-14		2014-15	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
University of Kentucky Male	33	61.1	25	44.6	31	55.4	36	63.2	32	56.1	25	43.9	25	43.1	37	64.9	29	50.9	34	50.7	30	44.8
University of Kentucky Female	21	38.9	31	55.4	25	44.6	21	36.8	25	43.9	32	56.1	33	56.9	20	35.1	28	49.1	33	49.3	37	55.2
University of Louisville Male	47	58.0	52	62.7	40	48.8	53	63.1	35	41.2	41	48.2	76	63.3	72	60.0	72	60.0	65	54.2	78	65.0
University of Louisville Female	34	42.0	31	37.3	42	51.2	31	36.9	50	58.8	44	51.8	44	36.7	48	40.0	48	40.0	55	45.8	42	35.0
U.S. Dental Schools Male	2,641	57.3	2,610	55.7	2,686	56.8	2,692	56.4	2,744	55.8	2,762	54.3	2,793	54.0	2,976	54.2	3,009	52.8	3,149	53.3	3,120	52.3
U.S. Dental Schools Female	1,971	42.7	2,078	44.3	2,047	43.2	2,078	43.6	2,174	44.2	2,327	45.7	2,377	46.0	2,517	45.8	2,688	47.2	2,755	46.7	2,847	47.7

Data Source: American Dental Association (ADA), Commission on Dental Accreditation (CODA).

The percentage of female graduates from the University of Kentucky College of Dentistry increased substantially over the last decade (Table 36). In 2014, 58.9% of graduates were female. The percentage of female graduates from the University of Louisville School of Dentistry was higher in 2013 (53.7% of graduates were female) than in 2014 (35.9% of graduates were female). This reflected the enrollment four years earlier of many more male the female students. The gender among graduates of US dental schools was relatively stable over recent years approximating 53% male and 47% female.

Table 36. Total graduates at Kentucky dental schools and in the US by gender, 2004-2014

School Name	2004		2005		2006		2007		2008		2009		2010		2011		2012		2013		2014	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
University of Kentucky Male	33	67.3	27	51.9	26	53.1	28	54.9	32	61.5	26	45.6	28	54.9	35	67.3	34	54.8	24	42.9	23	41.1
University of Kentucky Female	16	32.7	25	48.1	23	46.9	23	45.1	20	38.5	31	54.4	23	45.1	17	32.7	28	45.2	32	57.1	33	58.9
University of Louisville Male	50	69.4	48	62.3	51	64.6	45	60.8	42	58.3	54	67.5	41	50	51	65.4	39	46.4	38	46.3	75	64.1
University of Louisville Female	22	30.6	29	37.7	28	35.4	29	39.2	30	41.7	26	32.5	41	50	27	34.6	45	53.6	44	53.7	42	35.9
U.S. Dental Schools Male	2,536	58.3	2,516	56.2	2,489	55.1	2,615	55.5	2,661	55.5	2,622	53.8	2,735	54.7	2,758	54.7	2,801	53.9	2,808	52.8	2,870	52.6
U.S. Dental Schools Female	1,814	41.7	1,962	43.8	2,026	44.9	2,099	44.5	2,135	44.5	2,251	46.2	2,261	45.3	2,284	45.3	2,398	46.1	2,511	47.2	2,584	47.4

Data Source: American Dental Association (ADA), Commission on Dental Accreditation (CODA).

In 2014, more than 75% of students enrolled in the first year of dental school as well as graduates of the 2 Kentucky dental schools were White compared to approximately 55% nationally (Table 37). Female first

year students were more likely to be an underrepresented minority than males in the first year cohort. Female graduates were more diverse than their male counterparts in 2014. However, most graduates identified as White or Asian.

Table 37. First-year enrollment and graduates at Kentucky dental schools by race/ethnicity and gender, 2013-2014

Race/Ethnicity	Gender	First-Year Dental School Enrollment (2013-2014)						2013-2014 Dental School Graduates (2013-2014)					
		University Of Kentucky		University Of Louisville		United States		University Of Kentucky		University Of Louisville		United States	
		n	%	n	%	n	%	n	%	n	%	n	%
White	Male	95	40.8%	229	48.1%	7,334	32.2%	21	37.5%	32	39.0%	1,750	32.9%
	Female	83	35.6%	130	27.3%	5,163	22.7%	26	46.4%	31	37.8%	1,220	22.9%
Black Or African-American	Male	4	1.7%	11	2.3%	483	2.1%	1	1.8%	3	3.7%	123	2.3%
	Female	9	3.9%	18	3.8%	690	3.0%	1	1.8%	4	4.9%	152	2.9%
Hispanic Or Latino	Male	9	3.9%	7	1.5%	791	3.5%	-	-	2	2.4%	135	2.5%
	Female	6	2.6%	4	0.8%	929	4.1%	1	1.8%	-	-	202	3.8%
American Indian Or Alaska Native	Male	1	0.4%	1	0.2%	79	0.3%	-	-	-	-	12	0.2%
	Female	3	1.3%	-	-	71	0.3%	-	-	1	1.2%	11	0.2%
Asian	Male	9	3.9%	25	5.3%	2,438	10.7%	2	3.6%	1	1.2%	557	10.5%
	Female	7	3.0%	30	6.3%	2,904	12.8%	3	5.4%	8	9.8%	716	13.5%
Native Hawaiian Or Other Pacific Islander	Male	-	-	-	-	23	0.1%	-	-	-	-	2	0.0%
	Female	-	-	-	-	37	0.2%	-	-	-	-	5	0.1%
Two Or More Races	Male	2	0.9%	4	0.8%	212	0.9%	-	-	-	-	10	0.2%
	Female	1	0.4%	6	1.3%	196	0.9%	-	-	-	-	9	0.2%
Non-Resident Alien	Male	1	0.4%	3	0.6%	342	1.5%	-	-	-	-	71	1.3%
	Female	2	0.9%	5	1.1%	430	1.9%	1	1.8%	-	-	61	1.1%
Not Specified	Male	1	0.4%	2	0.4%	336	1.5%	-	-	-	-	148	2.8%
	Female	-	-	1	0.2%	318	1.4%	-	-	-	-	135	2.5%
Total	**All**	**233**	**100.0%**	**476**	**100.0%**	**22,776**	**100.0%**	**56**	**100.0%**	**82**	**100.0%**	**5,319**	**100.0%**

Data Source: American Dental Association (ADA), Commission on Dental Accreditation (CODA).

Dental Hygienists in Kentucky

The Kentucky Board of Dentistry lists 2,250 dental hygienists licensed and practicing in the state in 2015 (Table 26). It is unclear whether the addresses provided by dental hygienists in Kentucky are residence or practice addresses. For purposes of this research, these addresses were used to locate dental hygienists in practice.

Many dental hygienists practice in Jefferson County (19.2% of licensed dental hygienists) or in Fayette County (11.0%). The distribution patterns of dental hygienists in the state are similar to those of dentists in Kentucky. Dental hygienists are mainly employed in private dental practices (Figure 102) and are thus co-located with dentists.

According to the ADA,[87] in 2013, 77.5% of dentists in the US employ at least 1 dental hygienist. The national ratio of dental hygienist per general dentist employing dental hygienists is 1.8.[87] In 2015, the ratio of dental hygienists to general dentists in Kentucky was 1.1 (Table 26). The ratio varied by county and ranged from 0 to 11.0 dental hygienists per general dentist. Garrard county had the most dental hygienists per

[87] American Dental Association, 2013 Survey of Dental Practice. http://www.ada.org/~/media/ADA/Science%20and%20Research/HPI/Files/HPIData_SDPE_2013.ashx.

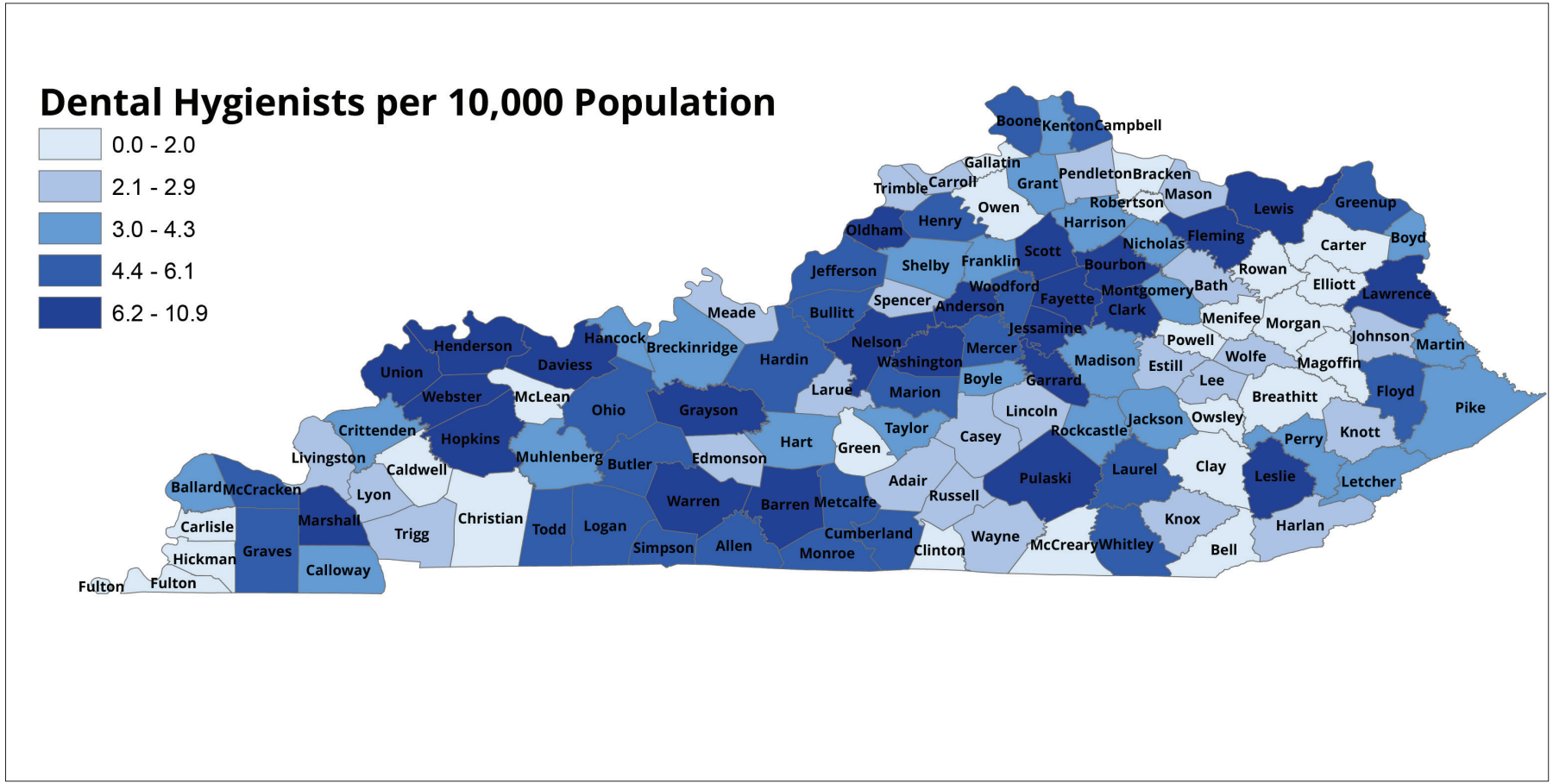
general dentists (11.0), followed by Webster (6.5), Todd (6.0), Lawrence (4.7), Nelson (3.7), and Leslie (3.3) counties. Thirty-nine of the 120 counties had ratios of dental hygienists to general dentists below 1.0. While these ratios would increase somewhat if the number of general dentists in the calculation was reduced to only those who employed dental hygienists, it is unlikely that in most of these counties, the ratios would increase to the national ratio provided by the ADA.

Reasons for a large number of dental hygienists in a county relative to the number of dentists include that dental hygienists residing in a county work outside that county or that outreach programs including school based and school linked oral health programs sponsored by local departments of health or safety net provider organizations in those counties employ dental hygienists to provide services. It is difficult to describe the reasons for these data anomalies in Kentucky with the available information. More concerning, however, is the one third of counties in Kentucky in which there are no dental hygienists or very few dental hygienists proportionate to general dentists. Many of these counties are in regions of the state that are considered underserved. A lack of or limited supply of dental hygienists would suggest barriers to accessing preventive services and limited opportunities to increase oral health outreach to public health settings.

In 2015, the statewide ratio of dental hygienists to 10,000 people was 5.2 (Table 26). Estimates of the national ratio of dental hygienists to population vary but most approximate 5.0 per 10,000 people. The distribution of dental hygienists across Kentucky was variable as illustrated by county specific ratios that ranged from no dental hygienists to 10.9 dental hygienists per 10,000 population (Figure 100). Dental hygienists provide preventive oral health services so their absence in a county suggests limited access to preventive care for populations residing in those places.

- In 8 Kentucky counties (Bracken, Carlisle, Elliott, Gallatin, Hickman, McLean, Owsley, and Robertson) there were no dental hygienists.
- In 6 counties (Breathitt, Caldwell, Fulton, McCreary, Menifee, and Morgan) there was 1 dental hygienist.
- In 10 counties (Bell, Clinton, Lee, Livingston, Lyon, Magoffin, Owen, Powell, Trimble, and Wolfe) there were 2 dental hygienists.

Figure 100. Ratio of dental hygienists per 10,000 population by county in Kentucky (quintile distribution), Kentucky Licensure Lists, 2015

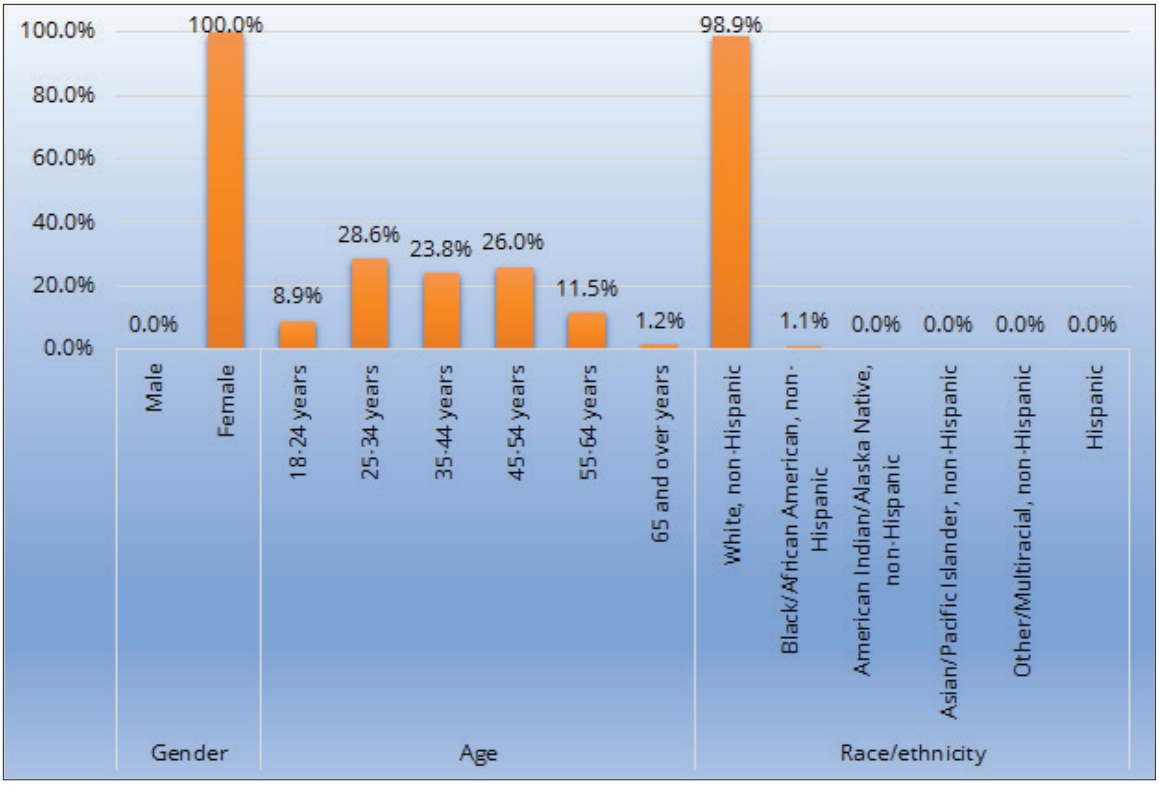


Data Source: Kentucky Licensure Lists.

Data from the ACS provides current estimates of supply of workers based on self-described employment. The following tables were compiled from the summary date in the ACS using estimates from 2009 to 2013 to describe the demographic characteristics of dental hygienists in Kentucky.

In those years, dental hygienists in Kentucky were female (100%), mostly White, non-Hispanic (98.9%) and most were between 25 and 54 years of age (78.4%) (Figure 101).

Figure 101. Demographic characteristics of dental hygienists in Kentucky, American Community Survey, 2009-2013



Data Sources: American Community Survey (ACS), Public Use Microdata Sample.

Dental hygienists in Kentucky mainly practiced in metropolitan areas of the state (58.5%) in the private offices of dentists (97.0%) (Figure 102). This is consistent with the national profile for the profession.

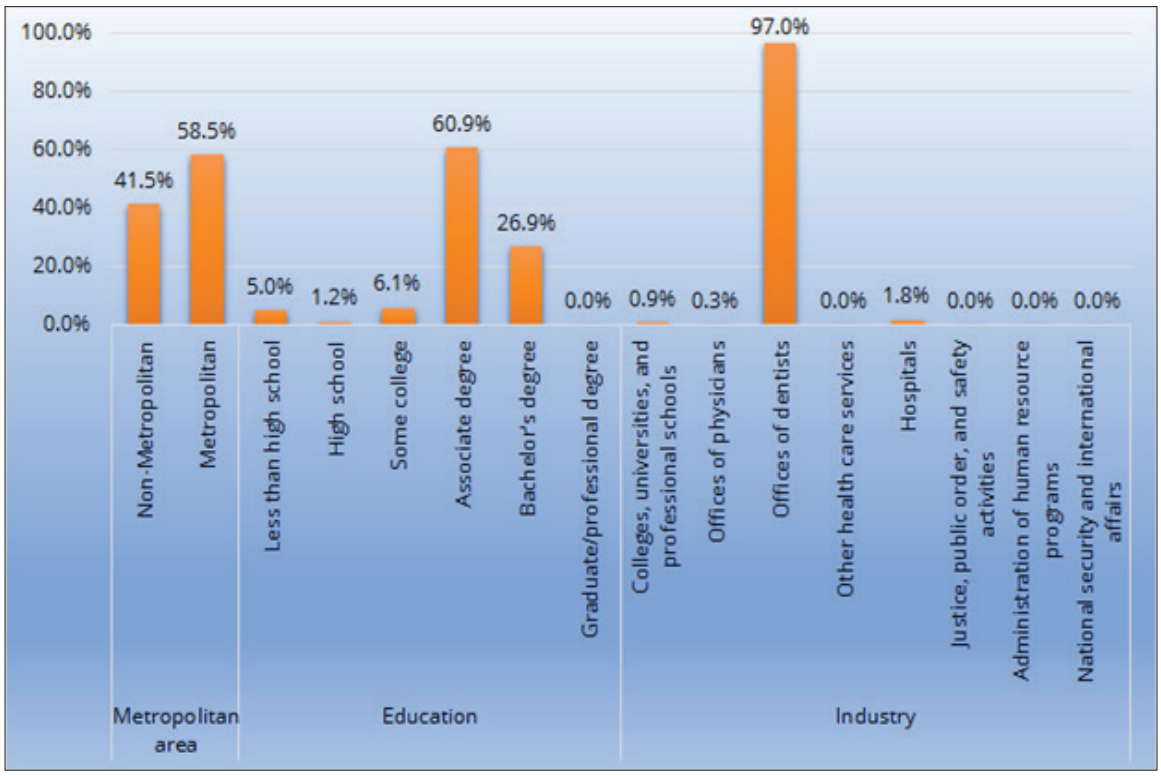
The educational profile of dental hygienists in Kentucky was generally consistent with the educational profile of dental hygienists nationally. A national sample survey of dental hygienists, conducted in 2007, showed that 60.6% of dental hygienists had an associate degree as their highest educational attainment and 3.2% indicated a certificate as their highest education. The remainder of dental hygienists had a bachelor's degree (30.7%) or a master's degree or higher (5%).[88] In the ACS data, the majority of dental

[88] Center for Health Workforce Studies, American Dental Hygienist Association. Executive Summary. The 2007 Dental Hygiene Practitioner Survey. 2008.

hygienists in Kentucky indicated an associate degree (60.9%) as their highest level of educational attainment. However, the percentage of dental hygienists in Kentucky with a bachelor's degree (26.9%) or a graduate/ professional degree (0%) was lower than nationally.

Most health professions must produce some highly educated professionals to serve as educators and researchers. In addition, some of the innovative oral health workforce models now being implemented in states (eg, advanced hygiene practice in Minnesota) require higher levels of formal educational attainment beyond that requisite for initial entry to the profession.

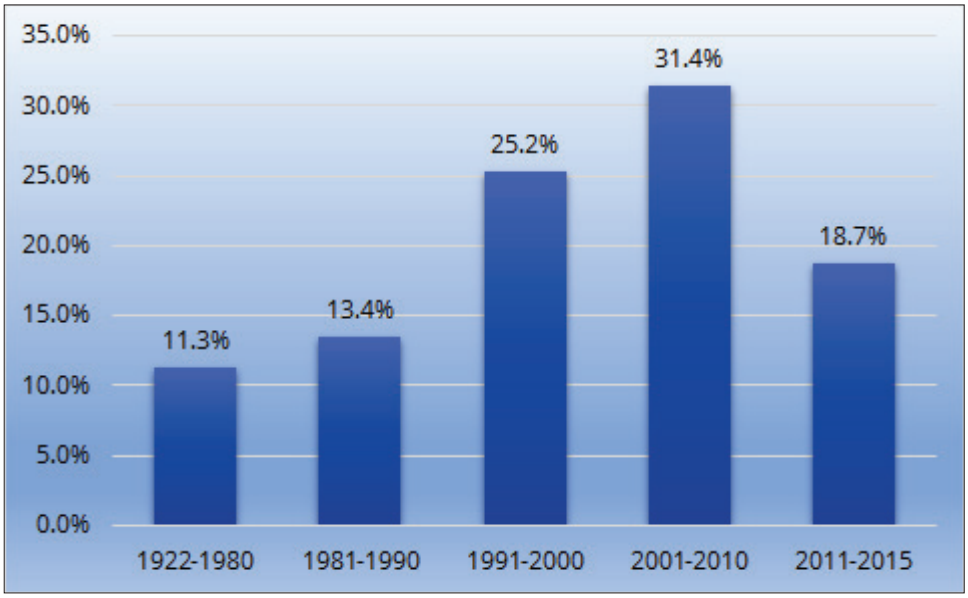
Figure 102. Metropolitan area, education and industry of practice of dental hygienists in Kentucky, American Community Survey, 2009-2013



Data Sources: American Community Survey (ACS), Public Use Microdata Sample.

The Kentucky licensure data contain information about the year in which each dental hygienist graduated from a dental hygiene education program. While using graduation year as a proxy for age of the dental hygienist is not exact, it does allow for an approximation of mean age. Most dental hygienists enter programs as first career students upon graduation from high school although in recent years the percent of second career students has increased. The majority of dental hygiene education programs award associate degrees which require between 2 and 3 years to complete. If a student entered the program at age 18, age upon graduation would be approximately 21 years. More than 50% of dental hygienists in Kentucky graduated from a dental hygiene education program after the year 2000 suggesting that the mean age of hygienists in Kentucky is below 40 years (Figure 103).

Figure 103. Graduation year of dental hygienists in Kentucky, 2015



Data Source: Kentucky Licensure Lists.

Education Programs for Dental Hygienists in Kentucky

Entry-level education for the profession is an associate degree. However, the average number of academic credits to obtain an associate degree in dental hygiene (approximately 90 credit hours)[89] far exceeds that required for most associate degrees (60 hours). Dental hygienists who graduate from associate degree programs are educated in a standardized curriculum in programs accredited by the Commission on Dental Education, which prepares them in all clinical competencies attributed to dental hygiene. Dental hygienists must pass regional boards and state licensure examinations, all of which further assure competency to practice.

Kentucky has five dental hygiene education programs accredited by CODA and administered through the community and technical college system or through the university system in the state. The University of Louisville is the only institution in the state that offers both a dental education program and a dental hygiene education program. It is also the only dental hygiene education program in Kentucky that awards a bachelor's degree (Table 38).[90]

[89] Center for Health Workforce Studies, American Dental Hygienist Association. Technical Report. Dental Hygiene Education Program Director Survey, 2006. 2007.

[90] American Dental Association. Survey of Allied Dental Education Programs, 2013-14. Table 11. Prosthodontics – Applications per Program, Enrollment, and Graduates, 2003-4 to 2013-14. March 2015. www.ada.org/~/.../SADV_2013-14_final.ashx.

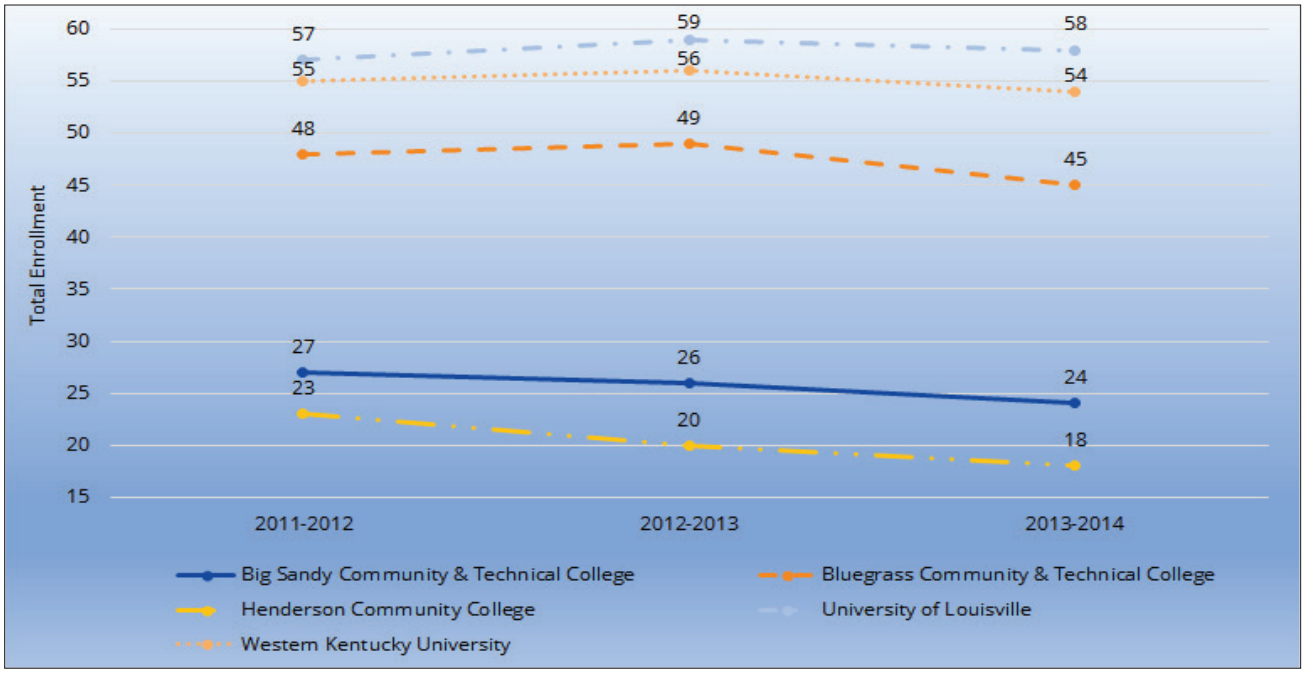
Table 38. Dental hygiene education programs in Kentucky, the American Dental Association, 2014 to 2015

Institution	Award	Length of Program			Tuition			Minimum Educational Requirement
		Instruction Term	Number of Terms	Number of Summer Sessions	In Disrtict	Out of District	Out of State	
Big Sandy Community And Technical College	Associate Degree	Semesters	4	0	$16,960	$23,680	$33,760	GED/ HS Diploma
Bluegrass Community And Technical College	Associate Degree	Semesters	4	0	$12,900	$19,900	$30,400	Less Than 1 Yr Coll
Henderson Community College	Associate Degree	Semesters	4	2	$16,067	$25,867	$40,567	Less Than 1 Yr Coll
University Of Louisville School Of Dentistry	Bachelor's Degree	Semesters	4	1	$23,010	$50,786	$50,786	2 Years College
Western Kentucky University	Associate Degree	Semesters	4	1	$19,523	$43,387	$43,387	1 Year College

Data Source: American Dental Association (ADA).

Enrollment in the university based programs was higher than in those sponsored by community and technical colleges (Figure 104). However, Bluegrass Community and Technical College enrolls almost twice as many students annually as the other programs that are located in community and technical colleges.

Figure 104. Total enrollment at Kentucky dental hygiene schools, 2011-12 to 2013-14

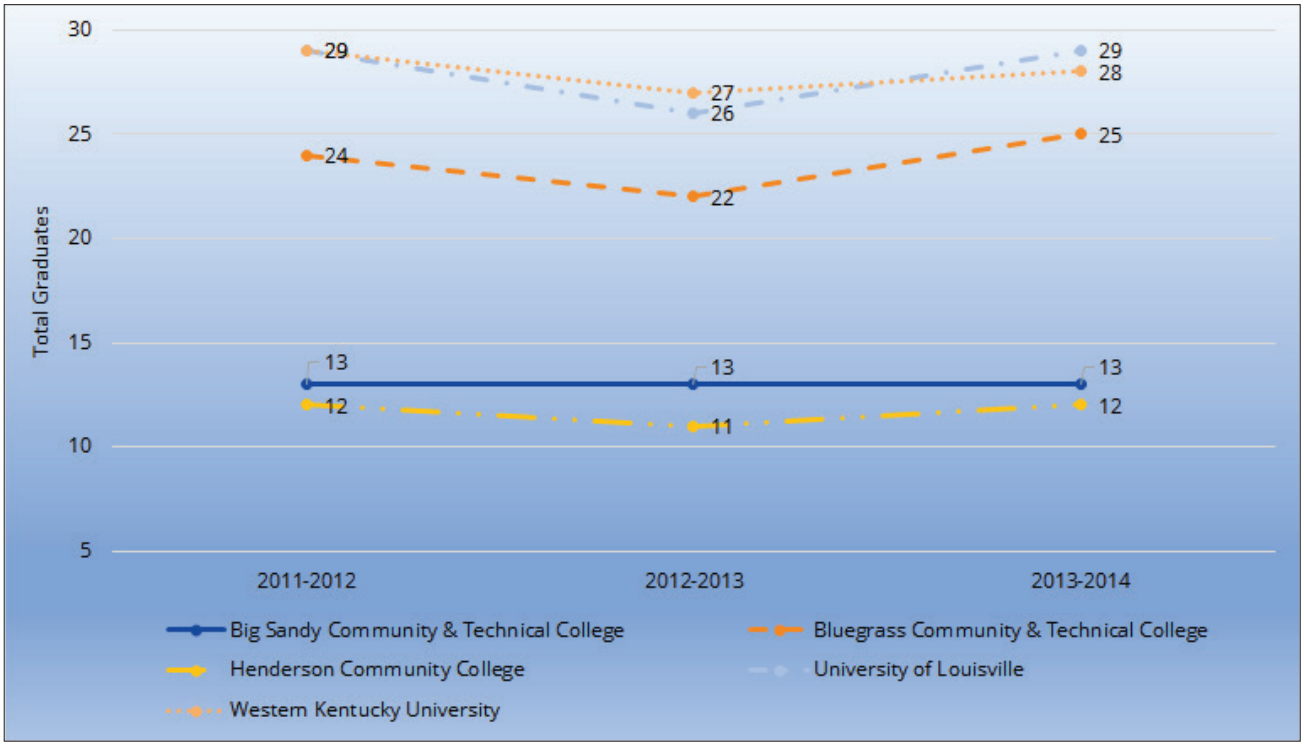


Data Source: American Dental Association (ADA), Commission on Dental Accreditation (CODA).

The number of graduates from dental hygiene education programs in Kentucky has remained relatively stable since 2012 with approximately 117 new graduates in 2014 (Figure 105).[91] Dental hygienists usually seek employment in a local, regional, or state job market so the production of new graduates each year provides an important source of professionals to fill new jobs or to replace professionals departing dental hygiene practice in the state.

[91] American Dental Association. Survey of Allied Dental Education Programs, 2013-14. March 2015. www.ada.org/~/.../SADV_2013-14_final.ashx.

Figure 105. Total graduates at Kentucky dental hygiene schools, 2011-12 to 2013-14



Data Source: American Dental Association (ADA), Commission on Dental Accreditation (CODA).

Dental Hygiene Student Clinics

Dental hygiene students are required to have clinical training experiences before graduation. Many CODA accredited dental hygiene education programs have student clinics which offer preventive services to the public at greatly reduced rates. These clinics supplement the oral health safety net in their communities. Two of the CODA accredited dental hygiene education programs in Kentucky provided data about the number and age demographics of patients served in dental hygiene student clinics between August 2015 and May 2015 (Table 39).

Table 39. Patients treated in the Dental Hygiene clinic from August 2014 to May 2015

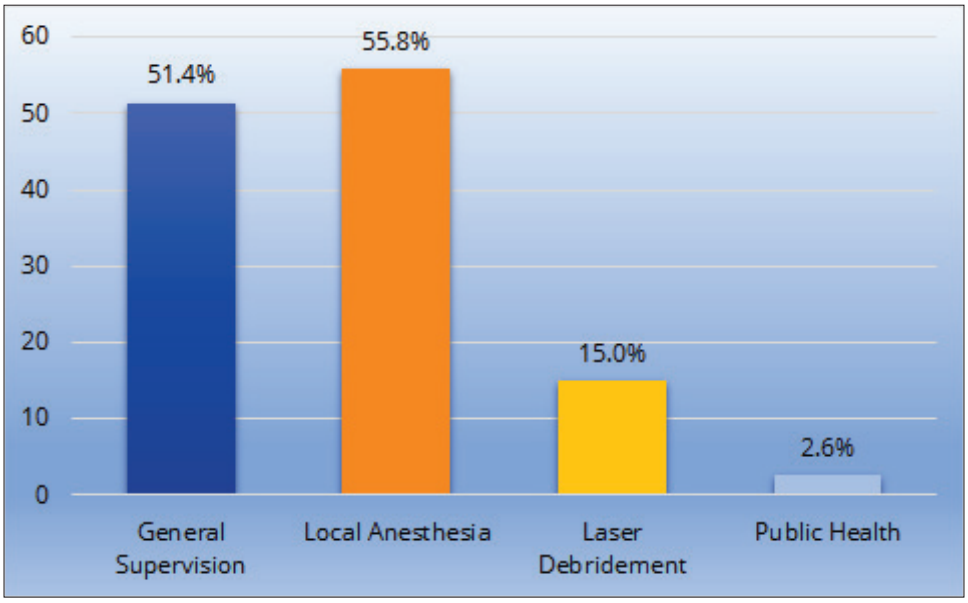
Patients Treated	Henderson Community College	West Kentucky Community and Technical College
Children (0 to 12 years)	58	72
Adolescents (13 to 17 years)	7	4
Adults (18 to 59 years)	84	63
Geriatrics (59 years and up)	32	50
Total Patients	**181**	**189**

Data Source: Dental Hygiene Programs, Henderson Community College and West Kentucky Community and Technical College.

Strategies to improve access to oral health services in many states include workforce expansions that use expanded scopes of practice for dental hygienists and dental assistants and reduced levels of required dental supervision to better enable practice in a variety of public settings. Kentucky currently allows qualified dental hygienists to practice under general supervision or as public health dental hygienists. Statutes and regulations describe the required education and experience for dental hygienists to practice in these models (See description of scope of practice for dental hygienists in Kentucky in Appendix C).

More than half of the dental hygienists licensed and practicing in Kentucky are qualified to work under general supervision or to provide local anesthesia to patients (51.4%) (Figure 106). However, very few dental hygienists are permitted to act as public health dental hygienists (2.6%). This is a relatively new designation and its use is limited to dental hygienists working for local departments of health in the state.

Figure 106. General supervision, local anesthesia, laser debridement and public health supervision among dental hygienists in Kentucky, 2015



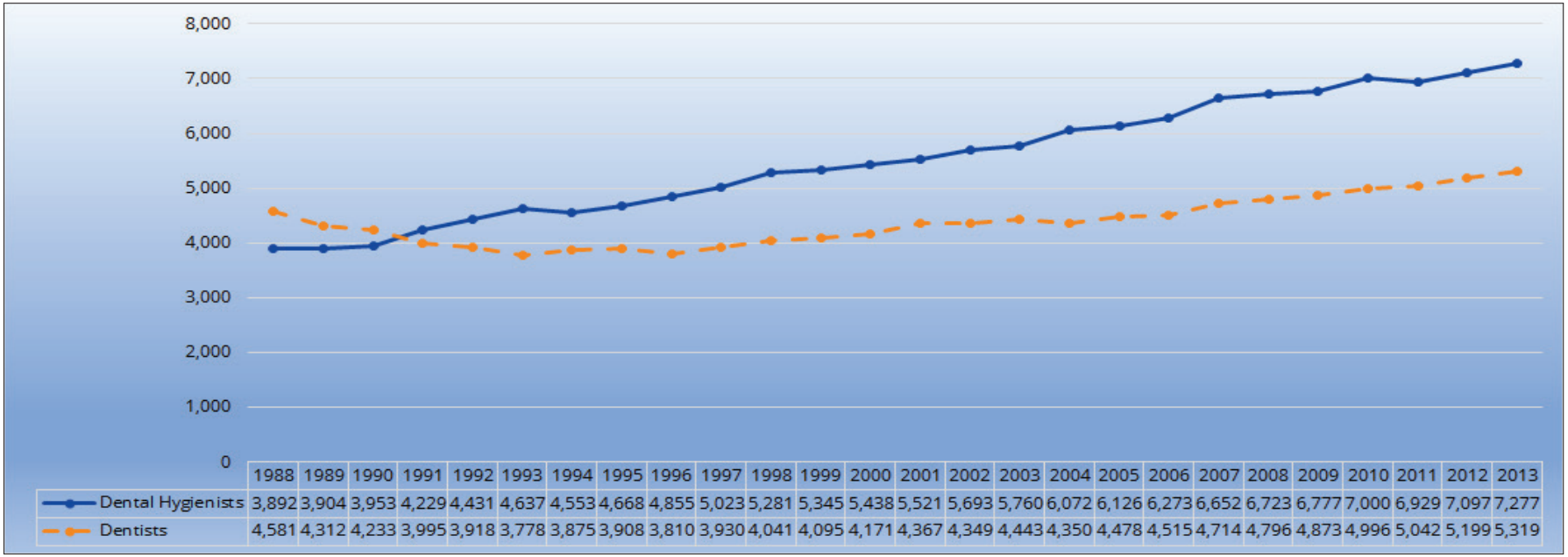
Data Source: Kentucky Licensure Lists.

A Discussion about the Sufficiency of Supply of Oral Health Professionals in the US

There is some concern nationally that education programs may be producing an oversupply of dental hygienists relative to demand for these professionals. Since dental hygienists generally work under the supervision of dentists and most work in private practice settings, job opportunities for dental hygienists are directly linked to the supply of practicing dentists. The national supply of dentists while increasing in recent years has grown at a much slower rate relative to the supply of dental hygienists. The production

of new dental hygienists in 2013 represented an 87% increase over production in 1988 while the number of new dentists in 2013 represented only a 16% increase over the number produced in 1988 (Figure 107). Concerns about the current rate of departures from the dental profession affecting employment opportunities for dental hygienists are based on the numbers of older dentists leaving the workforce. These departures are impacting the supply of dentists nationwide and may be further eroding employment opportunities for dental hygienists.

Figure 107. Number of graduates from dental and dental hygiene education programs, US, 1988 to 2013



	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Dental Hygienists	3,892	3,904	3,953	4,229	4,431	4,637	4,553	4,668	4,855	5,023	5,281	5,345	5,438	5,521	5,693	5,760	6,072	6,126	6,273	6,652	6,723	6,777	7,000	6,929	7,097	7,277
Dentists	4,581	4,312	4,233	3,995	3,918	3,778	3,875	3,908	3,810	3,930	4,041	4,095	4,171	4,367	4,349	4,443	4,350	4,478	4,515	4,714	4,796	4,873	4,996	5,042	5,199	5,319

Source: American Dental Association (ADA), Surveys of Dental Education Programs and Allied Dental Education Programs

In the past decade, about 6,000 dentists were leaving the profession annually with just over 5,000 new dental school graduates entering the active workforce; not all new entrants choose private practice. This equation would suggest that production levels of new dentists might not be adequate to maintain supply to serve the expected increased demand for dental services from a growing and aging population. However, recent data suggests that this trend may be reversing. The ADA reported that in 2013 only 3,600 dentists retired from practice while more than 5,000 new dentists entered the workforce.[92] As previously mentioned, over a 10-year period the average retirement age for dentists changed from age 64.8 in 2001 to age 69.3 in 2011.[91]

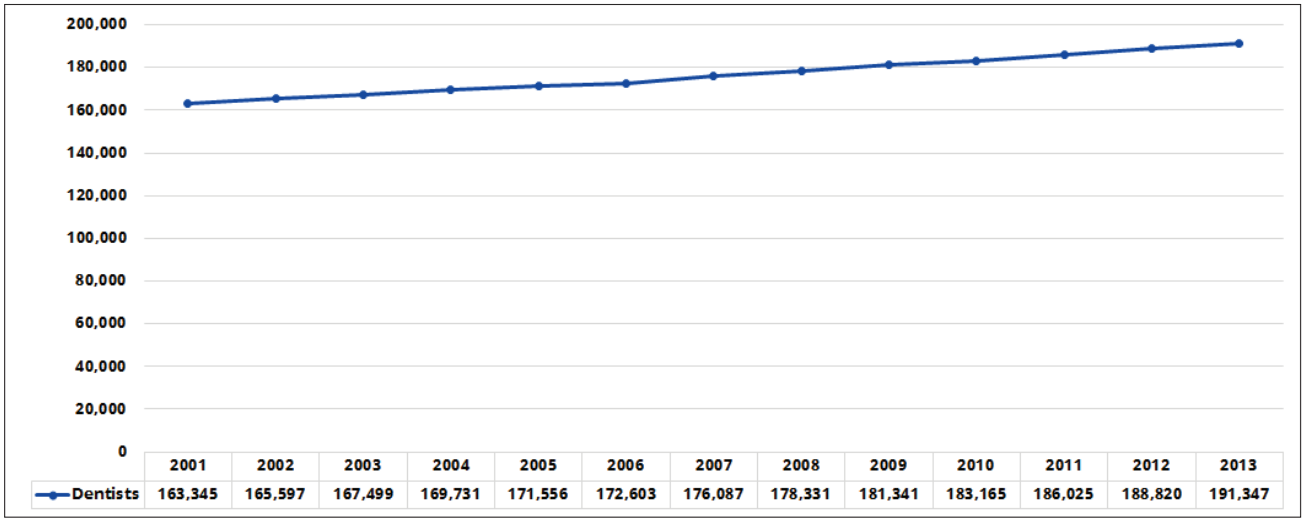
Literature also suggests that the supply/number of dentists is not the only metric that should be used in calculating the adequacy of capacity to provide services. Differences in individual dentist's contributions and efficiency in practice, improved technology, innovations in oral health service delivery, improvements in the oral health status of the population, and the efficient use of other dental personnel all effect the capacity within the current delivery system to meet demand for services.[93] While the mean number of total patient treatment hours in dentistry has declined since 1990, the number of patient visits per treatment hour (including dental hygienist appointments) has increased steadily from 2.14 visits per hour in 1981 to 1985 to 2.3 in 2014.[94] During these years there were also increases in the average number of FTE dental hygienists and chairside assistants in dental practices,[93] suggesting that supportive dental personnel are contributing to increased efficiency and productivity in oral health service delivery. The following figures provide graphical information showing trends in supply of dentists and dental hygienists nationally (Figure 108, Figure 109).

[92] Valachovic R; for American Dental Education Association. A Dentist Shortage? Maybe, Maybe Not. May 15, 2014. https://adeachartingprogress.wordpress.com/2014/05/15/a-dentist-shortage-maybe-maybe-not/.

[93] Wendling W. Private sector approaches to workforce enhancement. J Public Health Dent. June 2010; 70 Suppl 1:S24-31.

[94] American Dental Association, 2014 Survey of Dental Practice. http://www.ada.org/~/media/ADA/Science%20and%20Research/HPI/Files/HPIData_SDPC_2014.ashx.

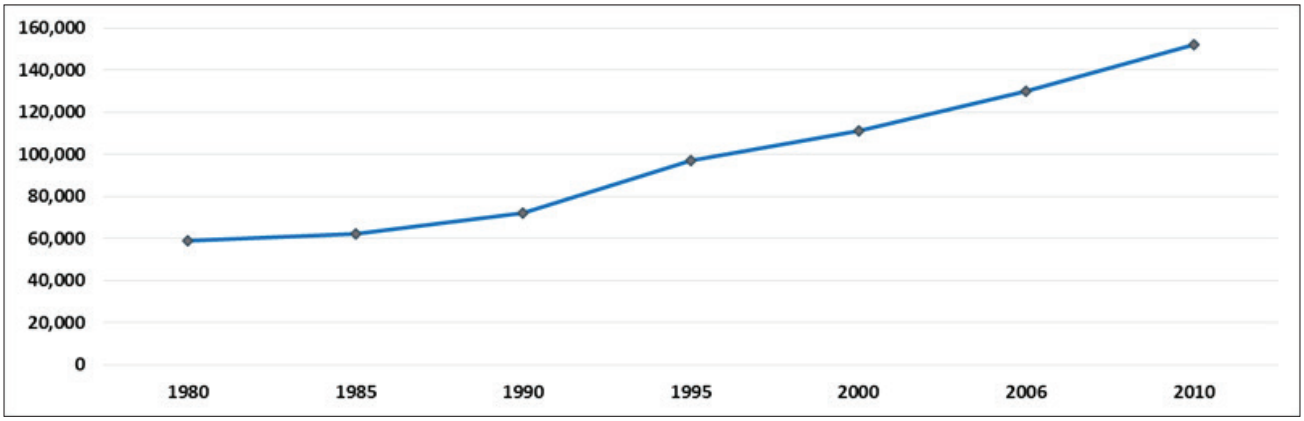
Figure 108. Estimated supply of dentists in the US, 1993 to 2013



	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Dentists	163,345	165,597	167,499	169,731	171,556	172,603	176,087	178,331	181,341	183,165	186,025	188,820	191,347

Data Source: American Dental Association (ADA).

Figure 109. Estimated supply of dental hygienists in the US, 1980 to 2010



Data Sources: Area Resource File, 1980, 1990; ADA, 1995; American Dental Hygienists Association, 2000; CHWS, 2006; ACS, 2010.

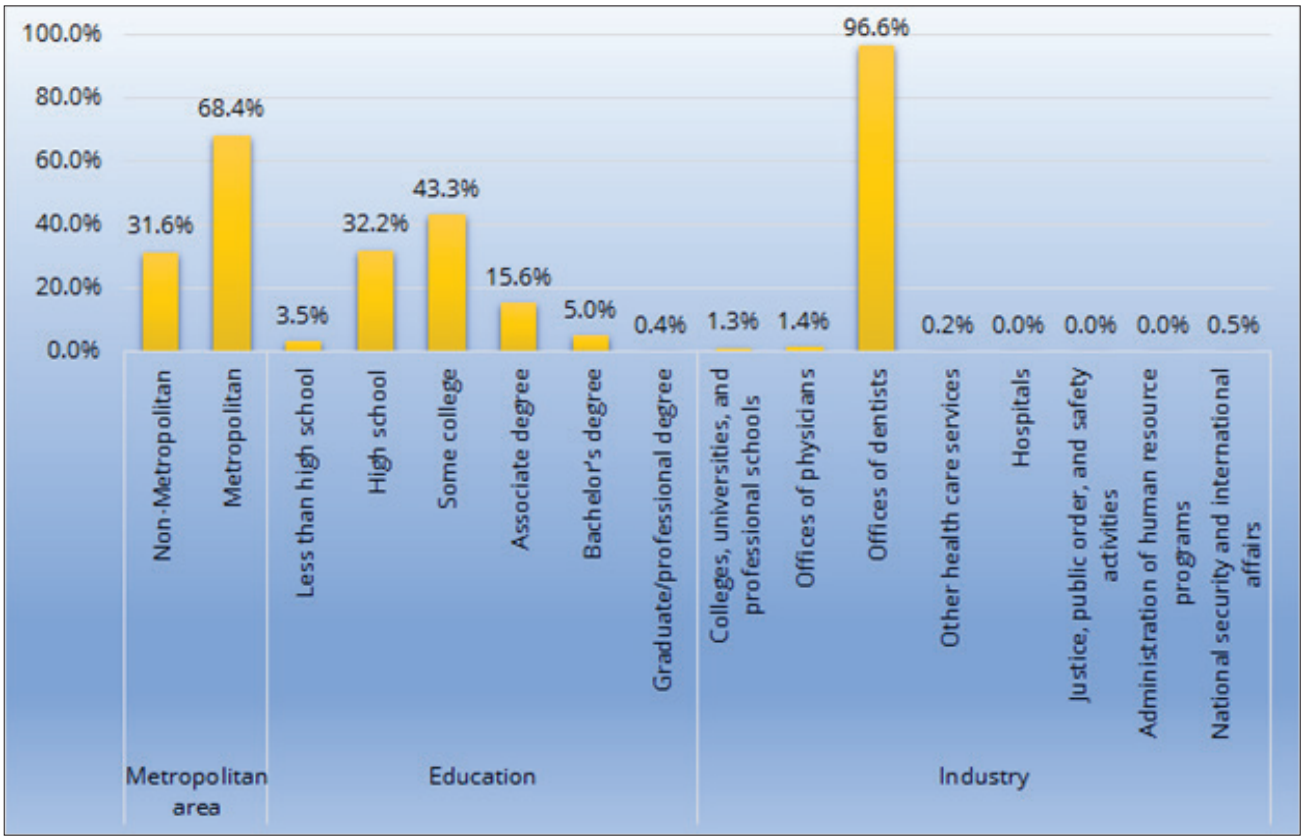
Dental Assistants in Kentucky

Enumerating the supply of dental assistants in Kentucky is problematic since they are not licensed by the state. The Bureau of Labor Statistics estimated that there were 4,400 jobs for dental assistants in Kentucky in May 2014.[95] This is not an exact proxy for supply of dental assistants since some dental assistants work only part-time and others work multiple jobs.

The ACS data provide some information about employment of dental assistants in Kentucky finding that most are employed in dentists' offices (96.6%) in metropolitan areas of the state (68.4%) (Figure 110). Forty three percent of dental assistants in Kentucky have some college education (but no degree) and 32.2% indicate high school graduation as their highest level of educational attainment.

[95] Division of Occupational Employment Statistics, US Bureau of Labor Statistics: May 2014 State Occupational Employment and Wage Estimates, Kentucky. Washington, DC: US Bureau of Labor Statistics. Date last modified March 2015. http://www.bls.gov/oes/current/oes_ky.htm#31-0000.

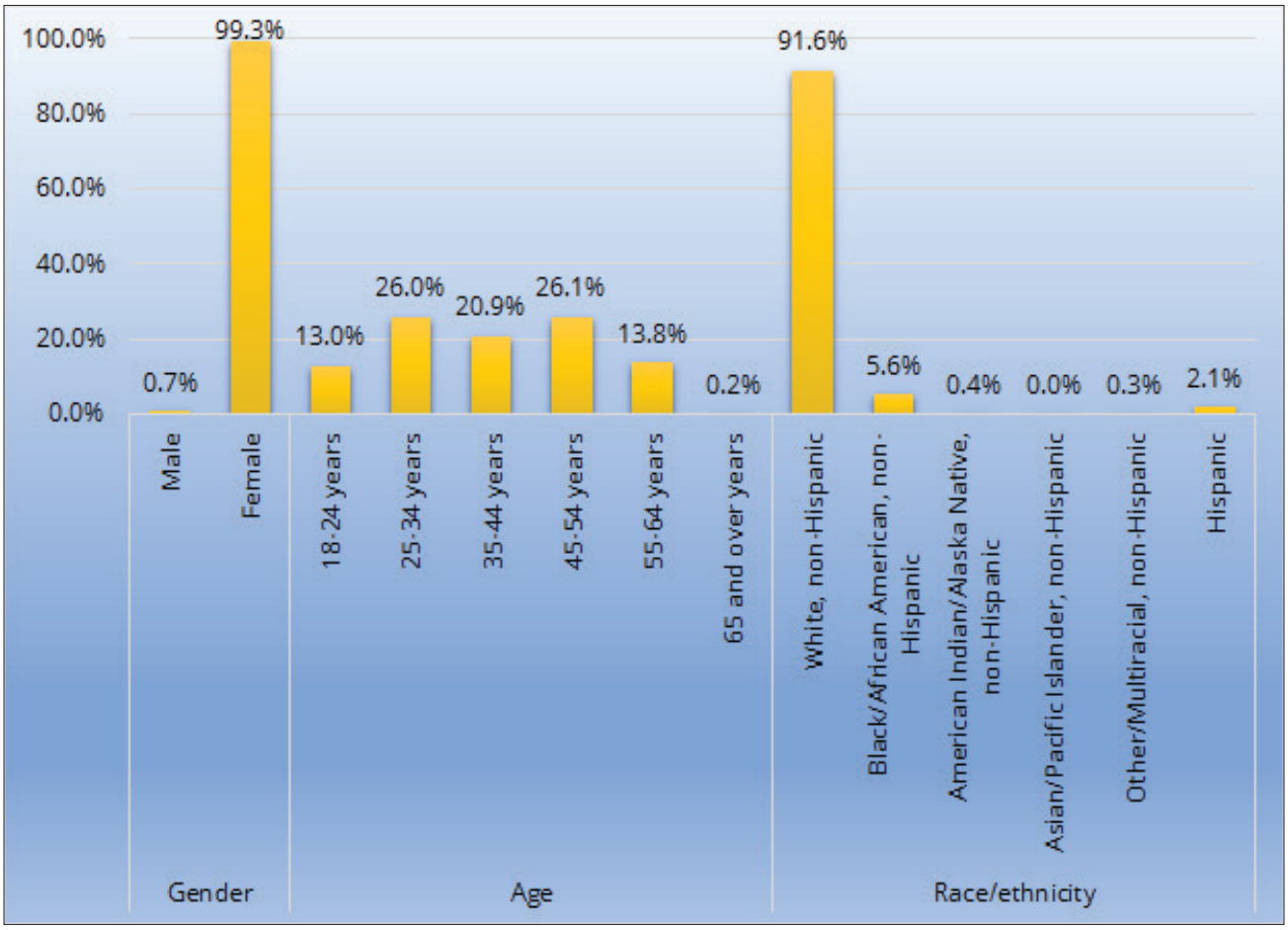
Figure 110. Metropolitan area, education and industry of practice of dental assistants in Kentucky, American Community Survey, 2009-2013



Data Sources: American Community Survey (ACS), Public Use Microdata Sample.

According to the ACS, dental assistants in Kentucky are female (99.3%), White, non-Hispanic (91.6%) and are mainly between 25 and 54 years of age (73.0%) (Figure 111).

Figure 111. Demographic characteristics of dental assistants in Kentucky, American Community Survey, 2009-2013



Data Sources: American Community Survey (ACS), Public Use Microdata Sample.

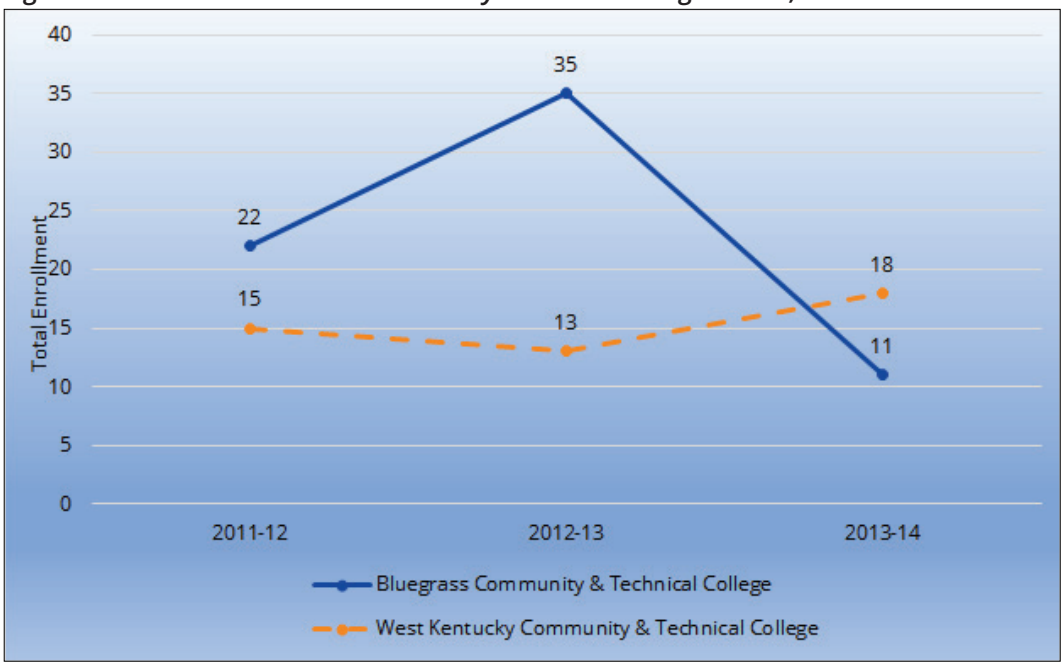
Dental Assistant Education in Kentucky

Kentucky has two CODA accredited dental assisting education programs. Formal education is not required for employment as a dental assistant in the state so demand for formal education is not as great as for other health workers. Enrollment at dental assisting programs in Kentucky is currently at less than capacity.

Bluegrass Community and Technical College has the capacity to train 60 students but enrollment in 2013-2014 was only 11 students. Capacity (20) and enrollment (18) at West Kentucky Community and Technical College were more closely aligned in the 2013 to 2014 academic year.[96]

[96] American Dental Association. Survey of Allied Dental Education Programs 2013-2014. Table 13. General Dentistry Programs – Applications per Program, Enrollment, and Graduates, 2003-4 to 2013-14. March 2015. www.ada.org/~/.../SADV_2013-14_final.ashx.

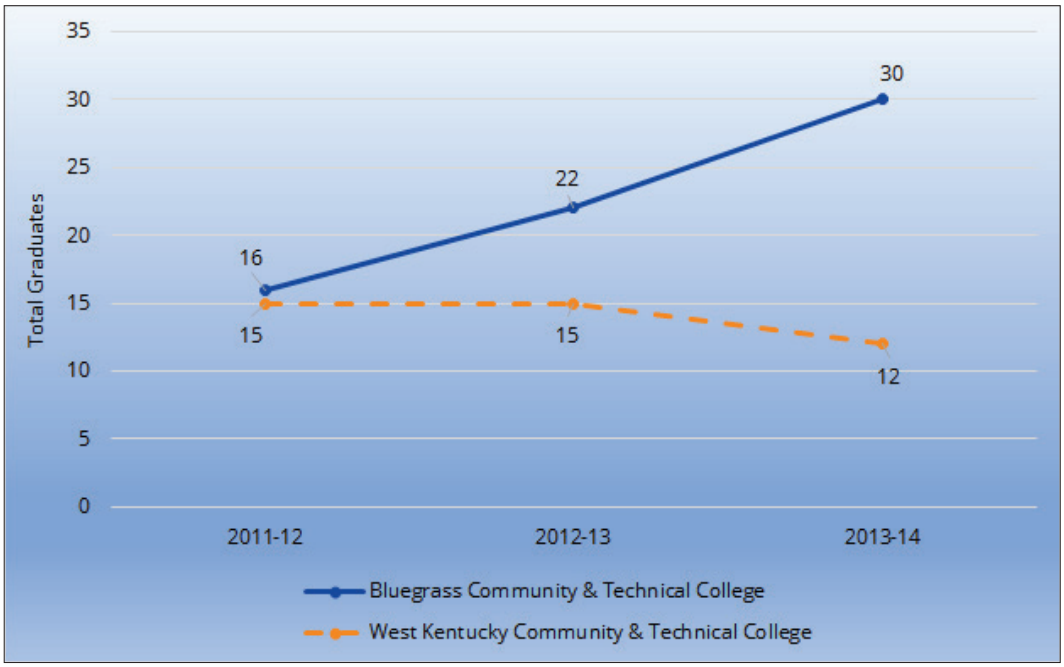
Figure 112. Total enrollment at Kentucky dental assisting schools, 2011-12 to 2013-14



Data Source: American Dental Association (ADA), Commission on Dental Accreditation (CODA).

The two dental assisting education programs graduated 42 new dental assistants in 2014 which represented an increase over the number in 2013 (37 graduates) and 2012 (31 graduates) (Figure 113). Dental assistants usually seek work in the local or regional area of their education program.

Figure 113. Total graduates at Kentucky dental assisting schools, 2011-12 to 2013-14



Data Source: American Dental Association (ADA), Commission on Dental Accreditation (CODA).

CONCLUSIONS

The research conducted for this project found that Kentucky and its stakeholders have made notable efforts to address oral health disparities in the state. Many of the oral health programs and policy initiatives in Kentucky represent the collaborative efforts of myriad partner organizations and statewide engagement with the need to improve oral health service delivery and address poor oral health outcomes.

Oral health disparities in Kentucky coincide with health disparities in the population, especially in certain regions of the state. The generally poor health and oral health outcomes among Kentucky's rural populations imply that public efforts to improve health literacy and knowledge of oral health would be beneficial. Individual patient engagement with personal health and oral health is essential to improvement in population oral health. The linkages between oral and systemic health status suggest that strategies selected to address poor outcomes should encourage integration of oral health care and primary health care service delivery and foster the building of strong referral networks between clinical disciplines.

Policy and program initiatives to improve the percentage of the population with health and dental insurance in Kentucky are laudable. Medicaid expansion and the availability of the state marketplace contributed to significant improvement in the percentage of the population in Kentucky with dental insurance. Dental insurance is a useful tool for increasing oral health service utilization and encouraging quality oral health outcomes. Legislative support for an adult dental benefit in the Medicaid program is also commendable.

Initially, administrative changes in the Medicaid program appeared to have negative impacts on utilization and availability of oral health services. The data comparing utilization in the first full year of implementation of managed care auspices with the previous year demonstrated declining rates of dental service utilization by Medicaid insured people in many areas of the state. The reasons ascribed to the decline included insufficient provider networks and provider disenchantment with administrative processes. Providers and insurers are currently engaged in efforts to address the issues attendant to the changes in program administration. The oral health delivery system, especially the safety net for oral health services, is now attempting to accommodate high demand for complex oral health services from newly insured people with serious health and oral health issues.

It was apparent that the safety net for oral health services in the state, inclusive of many private practice dentists in rural areas and inner cities, is challenged to meet growing demand for oral health services because of inadequate structural and workforce capacity. The number of safety net provider organizations offering onsite oral health services in Kentucky is limited, especially for adults with Medicaid

insurance. The safety net for oral health services was observed to be growing in Kentucky but it was still not as developed as in some other states.

People insured by Medicaid and the uninsured heavily depend on safety net providers for oral health services because many private practice dentists either do not participate with Medicaid or limit the number of patients with Medicaid on their caseloads. Approximately one quarter of the population in Kentucky is insured by Medicaid so the safety net is an important consideration when contemplating strategies to broaden access to oral health services. The federal government recently announced funding for oral health service infrastructure expansion in FQHCS. Hopefully, community health centers in Kentucky will have an opportunity to access this funding.

Although the oral health workforce in Kentucky appears to be adequate on a per population basis, it is not evenly distributed with demand for services in the state. In addition, limitations in allowable supervision in various service settings and in tasks permitted without prior dental authorization restrain the effective use of dental auxiliaries. While Kentucky has made progressive change in scope of practice for dental hygienists and dental assistants, there appear to be limitations in practice that inhibit direct access to preventive services. The use of dental hygienists in expanded roles has proven to be a positive strategy in other states to encourage utilization of preventive services and to increase the settings in which oral health services are available.

Incipient concerns about future workforce adequacy suggest the need for innovative service delivery programs and changing roles for oral health workforce. Nationally, there is increasing recognition that engaging teams of oral health professionals with a variety of skills and competencies contributes to improved access and outcomes. Those who participated in the interviews for this project discussed the utility of expanded duty dental assistants in increasing capacity and the impact of public health dental hygienists and their outreach services on case finding and referral. However, the limitations on supervision impact the extent of impact of these team members. Existing models of school based and school linked service delivery might be expanded in the regions where they offer services and replicated in others where these services are not yet available. Both program funding and capable workforce would be required to successfully duplicate these models.

Policy that is informed by data is more likely to be effective in meeting the needs of the population. One observation from this comprehensive review of oral health in Kentucky is that state specific data about the oral health of particular populations, about oral health outcomes from programmatic initiatives, and about the demographic and practice characteristics of the oral health workforce were either quite dated or generally lacking in Kentucky. Future initiatives focused on improving oral health in Kentucky would benefit from systematic data collection to inform policy and program in the state.

In conclusion, researchers observed many positive trends in oral health outcomes in Kentucky and noted increases over time in the number of providers and programs delivering oral health services. While recognizing that improvements in population oral health are not yet at desired levels, stakeholders in Kentucky should be encouraged by the noticeable progress over recent years in the number of people with access to dental insurance and to safety net oral health services.

Appendix A

DEMOGRAPHICS AND ORAL HEALTH OUTCOMES

Table 1. Demographic characteristics of the population in Kentucky by county, 2013

County	Population estimates, 2013	Age			Gender	Race/ethnicity						
		Under 5 years	Under 18 years	65 years and over	Female	White alone	Black or African American alone	American Indian and Alaska Native alone	Asian alone	Native Hawaiian and Other Pacific Islander alone	Two or More Races	Hispanic or Latino
Adair	18,696	5.5%	21.9%	10.4%	50.6%	95.4%	2.5%	0.0%	0.2%	0.0%	1.6%	1.7%
Allen	20,123	6.3%	24.2%	18.3%	51.0%	96.8%	1.3%	0.3%	0.5%	0.0%	0.6%	1.6%
Anderson	21,575	6.6%	25.3%	13.6%	51.6%	95.9%	2.6%	0.0%	0.3%	0.0%	1.0%	1.4%
Ballard	8,282	5.5%	21.9%	10.8%	50.6%	94.9%	3.5%	0.2%	0.3%	0.0%	1.0%	1.2%
Barren	42,504	6.3%	24.1%	11.2%	51.5%	93.6%	4.3%	0.3%	0.5%	0.0%	1.0%	2.7%
Bath	11,732	6.9%	25.0%	11.2%	50.5%	96.6%	1.6%	0.0%	0.0%	0.0%	1.1%	1.4%
Bell	28,409	5.9%	21.8%	14.3%	51.6%	95.4%	2.4%	0.4%	0.4%	0.0%	1.2%	0.8%
Boone	121,214	7.4%	28.0%	14.4%	50.6%	91.8%	2.8%	0.3%	2.3%	0.0%	1.6%	3.7%
Bourbon	19,999	6.2%	23.8%	17.0%	50.5%	90.1%	6.7%	0.2%	0.2%	0.0%	1.0%	6.8%
Boyd	49,314	5.7%	21.3%	12.6%	50.5%	94.7%	2.5%	0.2%	0.4%	0.0%	1.8%	1.5%
Boyle	28,701	5.5%	21.3%	14.2%	50.5%	89.2%	6.0%	0.3%	0.7%	0.0%	3.3%	3.0%
Bracken	8,472	6.6%	24.7%	14.8%	50.0%	99.8%	0.0%	0.0%	0.0%	0.0%	0.2%	1.3%
Breathitt	13,776	5.6%	21.8%	13.6%	49.5%	98.2%	0.6%	0.1%	0.3%	0.1%	0.6%	0.7%
Breckinridge	20,059	5.7%	24.0%	13.6%	50.2%	95.8%	2.4%	0.1%	0.1%	0.0%	1.3%	1.1%
Bullitt	75,250	5.8%	24.5%	21.7%	50.5%	96.5%	0.7%	0.3%	0.4%	0.0%	1.4%	1.5%
Butler	12,746	5.7%	23.3%	14.6%	49.9%	97.3%	0.8%	1.0%	0.0%	0.0%	0.5%	2.9%
Caldwell	12,946	6.1%	22.2%	16.6%	51.3%	93.3%	4.8%	0.0%	0.2%	0.2%	1.2%	1.9%
Calloway	37,383	5.2%	18.0%	9.8%	51.7%	92.1%	3.8%	0.3%	1.9%	0.0%	1.4%	2.4%
Campbell	90,606	6.3%	22.6%	18.9%	50.9%	93.9%	2.7%	0.1%	0.7%	0.0%	2.0%	1.7%
Carlisle	5,064	6.2%	22.6%	15.0%	51.9%	97.2%	1.2%	0.8%	0.0%	0.0%	0.7%	1.9%
Carroll	10,902	8.2%	25.3%	15.9%	48.8%	93.9%	1.7%	0.2%	0.8%	0.0%	1.7%	6.9%
Carter	27,493	6.4%	23.0%	15.8%	50.3%	97.8%	0.7%	0.1%	0.2%	0.0%	1.3%	1.0%
Casey	16,006	6.4%	23.5%	10.1%	50.9%	97.4%	1.0%	0.1%	0.2%	0.0%	0.8%	2.6%
Christian	74,169	9.6%	28.4%	11.5%	48.4%	72.6%	20.6%	0.5%	1.4%	0.4%	3.6%	6.6%
Clark	35,608	6.3%	23.1%	12.7%	50.9%	92.9%	5.2%	0.1%	0.5%	0.2%	0.9%	2.6%
Clay	21,633	6.7%	21.7%	16.2%	46.0%	93.1%	4.6%	0.5%	0.1%	0.0%	1.3%	1.1%
Clinton	10,210	6.2%	24.0%	16.0%	50.5%	96.1%	0.9%	0.0%	0.1%	0.0%	2.0%	2.4%
Crittenden	9,283	6.1%	23.0%	11.8%	50.0%	97.4%	0.8%	0.1%	0.0%	0.0%	1.6%	0.6%
Cumberland	6,842	5.9%	22.2%	10.0%	51.4%	95.3%	3.2%	0.0%	0.0%	0.0%	1.5%	0.5%
Daviess	97,230	6.7%	24.4%	14.9%	51.6%	91.8%	4.9%	0.1%	0.8%	0.0%	1.8%	2.6%
Edmonson	12,148	5.4%	21.3%	15.1%	50.1%	97.4%	1.7%	0.3%	0.2%	0.0%	0.4%	0.9%
Elliott	7,784	4.9%	19.5%	15.3%	43.9%	96.1%	3.2%	0.0%	0.1%	0.0%	0.4%	0.9%
Estill	14,601	5.8%	22.3%	21.3%	50.1%	98.1%	0.3%	0.4%	0.0%	0.0%	1.3%	0.0%
Fayette	300,843	6.4%	21.1%	10.7%	50.8%	76.2%	14.3%	0.3%	3.5%	0.0%	2.6%	6.8%
Fleming	14,435	6.0%	24.4%	16.4%	51.1%	96.9%	1.5%	0.1%	0.0%	0.0%	1.3%	1.1%
Floyd	39,448	6.3%	22.1%	16.7%	50.8%	97.9%	0.9%	0.1%	0.1%	0.0%	0.7%	0.6%
Franklin	49,390	5.9%	21.3%	11.6%	51.3%	83.1%	10.6%	0.3%	1.3%	0.0%	2.5%	2.8%
Fulton	6,650	6.2%	20.7%	15.6%	50.1%	73.1%	23.4%	0.1%	1.2%	0.0%	2.2%	1.1%
Gallatin	8,525	7.1%	27.4%	12.2%	50.6%	92.7%	0.7%	0.0%	0.7%	0.0%	1.7%	4.6%
Garrard	16,896	5.5%	23.0%	11.9%	50.7%	95.6%	2.8%	0.0%	0.0%	0.0%	0.5%	2.4%
Grant	24,685	7.7%	27.8%	14.9%	50.1%	96.0%	0.7%	0.0%	0.0%	0.6%	1.2%	2.4%
Graves	37,329	6.9%	24.5%	16.7%	51.4%	92.3%	4.2%	0.2%	0.3%	0.0%	2.2%	5.8%
Grayson	25,833	6.6%	23.9%	12.3%	50.4%	96.6%	1.2%	0.0%	0.2%	0.1%	1.3%	1.1%
Green	11,252	5.8%	22.2%	15.3%	51.2%	95.0%	2.5%	0.2%	0.4%	0.0%	1.7%	0.9%
Greenup	36,822	5.6%	22.3%	18.4%	51.6%	97.2%	0.7%	0.3%	0.4%	0.0%	1.3%	0.9%
Hancock	8,608	6.3%	25.3%	14.6%	48.9%	97.2%	1.1%	0.1%	0.0%	0.1%	1.0%	1.3%
Hardin	106,211	7.3%	25.8%	11.9%	50.4%	80.2%	12.1%	0.3%	2.2%	0.4%	3.8%	5.3%
Harlan	29,012	6.5%	22.8%	15.8%	51.1%	95.8%	2.5%	0.2%	0.1%	0.3%	0.7%	0.8%
Harrison	18,693	6.0%	23.7%	16.7%	51.0%	95.3%	1.7%	0.5%	0.3%	0.0%	1.3%	1.9%
Hart	18,345	6.3%	24.9%	13.1%	50.5%	93.2%	5.3%	0.2%	0.1%	0.0%	0.9%	1.5%
Henderson	46,303	6.6%	23.5%	13.8%	51.8%	89.0%	7.5%	0.3%	0.3%	0.0%	2.0%	2.0%
Henry	15,425	6.0%	24.6%	13.6%	50.2%	93.3%	3.4%	0.2%	0.0%	0.0%	1.3%	3.1%
Hickman	4,834	5.2%	20.8%	17.0%	51.3%	88.6%	8.4%	0.0%	1.2%	0.0%	1.5%	1.6%
Hopkins	46,810	6.4%	23.1%	18.0%	51.2%	90.6%	6.1%	0.2%	0.5%	0.0%	2.3%	1.7%
Jackson	13,418	5.9%	23.1%	18.3%	50.5%	99.0%	0.0%	0.0%	0.0%	0.0%	1.0%	0.7%
Jefferson	746,580	6.5%	23.0%	17.1%	51.7%	73.5%	20.6%	0.2%	2.3%	0.0%	2.6%	4.5%
Jessamine	49,112	6.8%	25.5%	17.2%	50.9%	92.8%	3.2%	0.4%	1.1%	0.1%	1.5%	2.8%

Table 1. Demographic characteristics of the population in Kentucky by county, 2013 (Cont.)

County	Population estimates, 2013	Age			Gender	Race/ethnicity						
		Under 5 years	Under 18 years	65 years and over	Female	White alone	Black or African American alone	American Indian and Alaska Native alone	Asian alone	Native Hawaiian and Other Pacific Islander alone	Two or More Races	Hispanic or Latino
Johnson	23,377	6.0%	22.4%	19.4%	50.9%	98.2%	0.4%	0.0%	0.5%	0.0%	0.7%	0.6%
Kenton	160,828	7.2%	24.8%	15.3%	50.7%	90.9%	4.5%	0.3%	1.1%	0.0%	2.0%	2.7%
Knott	16,217	5.7%	21.6%	15.9%	50.4%	97.9%	0.9%	0.0%	0.0%	0.0%	1.1%	0.7%
Knox	31,865	6.3%	24.1%	16.0%	51.5%	97.9%	1.0%	0.1%	0.0%	0.1%	0.7%	1.6%
Larue	14,149	5.2%	23.2%	13.5%	50.7%	92.7%	3.3%	0.5%	0.0%	0.0%	2.5%	2.9%
Laurel	59,178	6.5%	24.2%	15.8%	51.0%	97.1%	0.7%	0.2%	0.5%	0.0%	1.1%	1.3%
Lawrence	15,877	6.8%	23.1%	12.5%	50.5%	98.3%	0.1%	0.0%	0.5%	0.0%	1.1%	0.2%
Lee	7,554	4.3%	19.5%	15.0%	46.7%	96.7%	1.6%	0.1%	0.2%	0.0%	1.3%	0.8%
Leslie	11,220	6.1%	21.6%	15.4%	51.6%	98.4%	0.3%	0.1%	0.1%	0.0%	1.0%	0.1%
Letcher	24,202	6.2%	22.1%	16.1%	50.8%	98.6%	0.5%	0.0%	0.2%	0.0%	0.6%	0.6%
Lewis	13,859	6.1%	23.4%	14.8%	49.6%	98.4%	0.5%	0.0%	0.0%	0.0%	0.6%	0.6%
Lincoln	24,602	6.6%	24.2%	12.6%	51.8%	95.6%	2.7%	0.2%	0.3%	0.0%	0.9%	1.5%
Livingston	9,467	5.4%	20.6%	11.2%	51.2%	98.0%	0.7%	0.1%	0.3%	0.0%	0.9%	1.3%
Logan	26,822	6.4%	24.3%	11.0%	50.6%	91.1%	7.5%	0.2%	0.0%	0.0%	0.8%	2.5%
Lyon	8,394	3.6%	15.5%	16.7%	45.3%	92.1%	5.9%	0.0%	0.6%	0.0%	0.9%	0.8%
Madison	83,976	5.9%	21.4%	16.3%	51.6%	91.7%	4.3%	0.2%	1.0%	0.0%	2.0%	2.2%
Magoffin	13,179	5.7%	24.0%	13.7%	50.3%	98.7%	0.1%	0.4%	0.0%	0.0%	0.8%	0.6%
Marion	19,943	6.6%	24.4%	15.7%	48.2%	88.2%	9.8%	0.0%	0.5%	0.0%	0.6%	2.5%
Marshall	31,296	5.5%	20.6%	13.5%	50.9%	98.3%	0.3%	0.0%	0.2%	0.0%	1.1%	1.2%
Martin	12,835	5.7%	21.3%	17.5%	44.8%	93.4%	4.8%	0.2%	0.0%	0.0%	0.8%	2.1%
Mason	17,452	6.7%	24.2%	11.9%	51.5%	90.0%	7.6%	0.1%	0.3%	0.0%	2.0%	0.4%
McCracken	65,610	5.9%	22.2%	15.0%	52.1%	85.4%	10.3%	0.3%	0.8%	0.1%	3.0%	2.2%
McCreary	18,163	6.2%	22.4%	15.5%	45.6%	90.9%	6.4%	0.3%	0.0%	0.1%	1.8%	1.6%
McLean	9,524	5.7%	23.7%	16.8%	50.8%	98.0%	0.4%	0.1%	0.2%	0.0%	1.2%	1.2%
Meade	29,028	6.8%	26.6%	14.5%	49.9%	92.2%	4.3%	0.1%	0.8%	0.0%	2.1%	3.3%
Menifee	6,334	4.8%	23.2%	15.0%	49.8%	96.3%	0.7%	0.3%	0.2%	0.0%	1.8%	2.2%
Mercer	21,313	6.2%	23.3%	15.2%	51.4%	93.6%	3.7%	0.0%	0.2%	0.0%	1.8%	2.3%
Metcalfe	10,043	6.6%	23.3%	18.8%	50.3%	95.2%	2.0%	0.0%	0.3%	0.1%	0.6%	1.3%
Monroe	10,874	5.3%	22.2%	13.3%	49.9%	96.4%	2.2%	0.0%	0.1%	0.0%	1.1%	2.7%
Montgomery	26,762	6.9%	24.1%	14.2%	50.5%	94.1%	2.9%	0.3%	0.0%	0.0%	1.1%	2.6%
Morgan	13,657	5.1%	20.0%	19.1%	43.7%	95.5%	3.2%	0.0%	0.3%	0.0%	0.6%	0.7%
Muhlenberg	31,427	5.1%	21.5%	17.4%	49.4%	93.0%	4.5%	0.3%	0.1%	0.2%	1.4%	1.2%
Nelson	43,905	7.0%	25.7%	14.8%	50.4%	92.7%	5.3%	0.2%	0.3%	0.0%	1.5%	2.1%
Nicholas	7,085	6.5%	23.6%	16.2%	50.6%	98.6%	0.4%	0.0%	0.1%	0.0%	0.0%	1.6%
Ohio	23,955	6.7%	24.7%	16.8%	50.5%	95.5%	2.7%	0.0%	0.1%	0.0%	1.3%	3.5%
Oldham	60,940	5.0%	27.2%	18.6%	47.3%	90.6%	4.4%	0.3%	1.5%	0.1%	1.5%	3.5%
Owen	10,807	6.2%	24.0%	17.5%	50.2%	97.5%	1.3%	0.1%	0.1%	0.0%	0.5%	2.4%
Owsley	4,738	4.9%	20.6%	15.2%	49.8%	96.9%	0.8%	0.0%	0.6%	0.0%	1.6%	0.0%
Pendleton	14,714	5.8%	24.0%	13.2%	50.2%	98.3%	0.3%	0.2%	0.0%	0.0%	1.1%	1.0%
Perry	28,488	6.0%	21.8%	14.4%	51.3%	96.3%	1.2%	0.3%	0.5%	0.0%	1.1%	0.8%
Pike	64,473	5.9%	21.8%	15.3%	51.1%	97.7%	0.6%	0.0%	0.5%	0.0%	0.7%	0.7%
Powell	12,582	6.8%	24.7%	13.9%	50.1%	97.6%	0.7%	0.2%	0.2%	0.0%	0.8%	1.2%
Pulaski	63,369	6.0%	22.7%	13.9%	51.1%	96.6%	1.0%	0.2%	0.5%	0.1%	1.3%	2.2%
Robertson	2,254	9.6%	21.9%	15.2%	51.0%	99.6%	0.0%	0.1%	0.0%	0.0%	0.4%	0.0%
Rockcastle	16,997	5.5%	22.8%	17.8%	50.7%	98.0%	0.4%	0.8%	0.1%	0.0%	0.5%	0.2%
Rowan	23,425	5.6%	20.5%	18.7%	51.4%	95.5%	1.0%	0.0%	0.6%	0.0%	2.3%	1.4%
Russell	17,636	5.7%	22.6%	17.5%	50.8%	97.9%	0.4%	0.2%	0.2%	0.2%	1.0%	3.4%
Scott	48,149	7.1%	26.4%	15.5%	51.2%	89.4%	5.3%	0.2%	0.8%	0.0%	2.1%	4.1%
Shelby	42,911	6.7%	24.5%	15.7%	51.8%	85.6%	7.7%	0.2%	1.0%	0.0%	1.9%	9.0%
Simpson	17,443	7.1%	25.1%	14.0%	51.7%	86.5%	9.5%	0.3%	1.2%	0.0%	1.9%	1.9%
Spencer	17,303	5.9%	25.4%	14.6%	49.8%	96.0%	2.0%	0.3%	0.5%	0.0%	1.0%	1.6%
Taylor	24,585	5.8%	22.3%	14.4%	51.8%	92.5%	4.6%	0.2%	0.9%	0.0%	1.7%	1.9%
Todd	12,505	7.8%	27.3%	19.7%	49.9%	87.3%	8.6%	0.0%	0.0%	0.0%	1.1%	4.1%
Trigg	14,289	5.4%	22.7%	13.0%	50.3%	89.8%	7.8%	0.1%	0.3%	0.0%	2.0%	1.4%
Trimble	8,818	5.8%	24.6%	14.5%	49.0%	96.2%	1.9%	0.4%	0.0%	0.0%	0.9%	2.9%
Union	15,138	5.7%	22.4%	15.2%	48.8%	84.7%	12.9%	0.3%	0.2%	0.0%	1.4%	1.7%
Warren	115,438	6.3%	22.6%	14.8%	51.1%	82.8%	9.3%	0.3%	2.8%	0.0%	1.9%	4.7%

Table 1. Demographic characteristics of the population in Kentucky by county, 2013 (Cont.)

County	Population estimates, 2013	Age			Gender	Race/ethnicity						
		Under 5 years	Under 18 years	65 years and over	Female	White alone	Black or African American alone	American Indian and Alaska Native alone	Asian alone	Native Hawaiian and Other Pacific Islander alone	Two or More Races	Hispanic or Latino
Washington	11,774	5.8%	23.4%	16.0%	50.0%	90.9%	6.0%	0.5%	0.2%	0.0%	2.3%	3.5%
Wayne	20,797	5.8%	22.1%	13.7%	50.4%	95.0%	1.6%	0.1%	0.0%	0.1%	1.6%	2.9%
Webster	13,564	6.8%	23.3%	14.7%	50.1%	92.0%	5.0%	0.3%	0.1%	0.0%	0.9%	4.4%
Whitley	35,718	6.5%	24.1%	16.2%	51.3%	97.1%	0.6%	0.2%	0.3%	0.0%	1.5%	0.9%
Wolfe	7,299	6.5%	24.1%	17.9%	50.8%	99.2%	0.2%	0.2%	0.0%	0.0%	0.3%	0.2%
Woodford	24,988	5.3%	23.5%	14.2%	50.1%	88.2%	5.7%	0.1%	0.3%	0.0%	1.9%	6.6%

Data Source: US Census Bureau.

Table 2. Regional Educational Cooperatives, 2014-2015

Central Kentucky Educational Cooperative					
Anderson County	Bardstown Independent	Bourbon County	Boyle County	Burgin Independent	Clark County
Danville Independent	Frankfort Independent	Hart County	Johnson County	Martin County	Muhlenberg County
Nicholas County	Oldham County	Perry County	Silver Grove Independent	Webster County	Kentucky School for the Deaf
Green River Regional Educational Cooperative					
Adair County	Allen County	Barren County	Bowling Green Independent	Breckinridge County	Butler County
Campbellsville Independent	Caverna Independent	Clinton County	Cloverport Independent	Cumberland County	Daviess County
Edmonson County	Elizabethtown Independent	Grant County	Green County	Greenup County	Hardin County
Harlan County	Hazard Independent	Lawrence County	Lyon County	Mercer County	Monroe County
Morgan County	Owen County	Paducah Independent	Scott County	Southgate Independent	Trigg County
Trimble County	Wayne County				
Kentucky Educational Development Corporation					
Ashland Independent	Augusta Independent	Bath County	Bell County	Boyd County	Carter County
Elliott County	Fairview Independent	Fleming County	Hancock County	Kenton County	Leslie County
Livingston County	Mayfield Independent	McCracken County	Metcalfe County	Montgomery County	Murray Independent
Pendleton County	Pineville Independent	Pulaski County	Rockcastle County	Rowan County	Russell Independent
Russellville Independent	Science Hill Independent	Williamstown Independent	Wolfe County		
Kentucky Valley Educational Cooperative					
Breathitt County	Clay County	Floyd County	Harrison County	Henderson County	Jefferson County Public Schools
Jessamine County	LaRue County	Lee County	Letcher County	Lewis County	Lincoln County
Marshall County	Paintsville Independent	Pikeville Independent	Powell County	Kentucky School for the Blind	
Northern Kentucky Cooperative for Educational Services					
Beechwood Independent	Bellevue Independent	Boone County	Campbell County	Covington Independent	Dayton Independent
Erlanger-Elsmere Independent	Fort Thomas Independent	Knott County	Madison County	Ohio County	Pike County
Somerset Independent	Taylor County	Washington County	Woodford County		
Ohio Valley Educational Cooperative					
Graves County	Hickman County	Owensboro Independent	Owsley County	Simpson County	Todd County
Walton-Verona Independent	Williamsburg Independent				
Southeast/Southcentral Educational Cooperative					
Barbourville Independent	Berea Independent	Casey County	Corbin Independent	East Bernstadt Independent	Estill County
Glasgow Independent	Jackson Independent	Laurel County	Logan County	Marion County	Meade County
Middlesboro Independent	Raceland-Worthington Independent	Robertson County	Russell County	Shelby County	Spencer County
West Point Independent					
West Kentucky Educational Cooperative					
Ballard County	Caldwell County	Calloway County	Carlisle County	Christian County	Crittenden County
Dawson Springs Independent	Fulton County	Gallatin County	Grayson County	Henry County	Hopkins County
Jackson County	Ludlow Independent	Magoffin County	Mason County	McCreary County	McLean County
Menifee County	Nelson County	Newport Independent	Paris Independent	Union County	Warren County
Whitley County					
Non-affiliated Districts					
Bracken County	Fayette County	Harlan Independent	Jenkins Independent		

Data Source: Kentucky Department of Education. Student Health Services.

Table 3. Counties served by area development districts

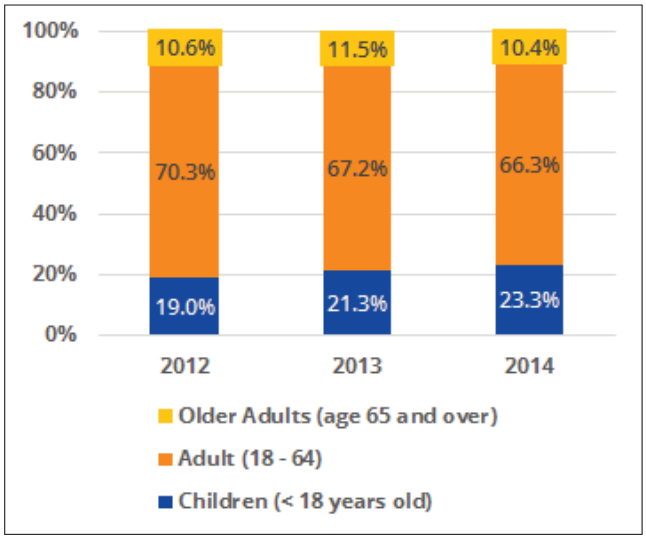
Area Development Districts (ADDs)	Counties
Barren River	Allen, Barren, Butler, Edmonson, Hart, Logan, Metcalfe, Monroe, Simpson, Warren
Big Sandy	Floyd, Johnson, Magoffin, Martin, Pike
Bluegrass	Anderson, Bourbon, Boyle, Clark, Estill, Fayette, Franklin, Garrard, Harrison, Jessamine, Lincoln, Madison, Mercer, Nicholas, Powell, Scott, Woodford
Buffalo Trace	Bracken, Fleming, Lewis, Mason, Robertson
Cumberland Valley	Bell, Clay, Harlan, Jackson, Knox, Laurel, Rockcastle, Whitley
Five County (FIVCO)	Boyd, Carter, Elliott, Greenup, Lawrence
Gateway	Bath, Menifee, Montgomery, Morgan, Rowan
Green River	Daviess, Hancock, Henderson, McLean, Ohio, Union, Webster
Kentuckiana Regional Planning & Development Agency (KIPDA)	Bullitt, Henry, Jefferson, Oldham, Shelby, Spencer, Trimble
Kentucky River	Breathitt, Knott, Lee, Leslie, Letcher, Owsley, Perry, Wolfe
Lake Cumberland	Adair, Casey, Clinton, Cumberland, Green, McCreary, Pulaski, Russell, Taylor, Wayne
Lincoln Trail	Breckinridge, Grayson, Hardin, Larue, Marion, Meade, Nelson, Washington
Northern Kentucky	Boone, Campbell, Carroll, Gallatin, Grant, Kenton, Owen, Pendleton
Pennyrile	Caldwell, Christian, Crittenden, Hopkins, Livingston, Lyon, Muhlenberg, Todd, Trigg
Purchase	Ballard, Calloway, Carlisle, Fulton, Graves, Hickman, McCracken, Marshall
Data Source: Kentucky Behavioral Risk Factor Surveillance (KyBRFS).	

Appendix B

FEDERALLY QUALIFIED HEALTH CENTERS IN KENTUCKY

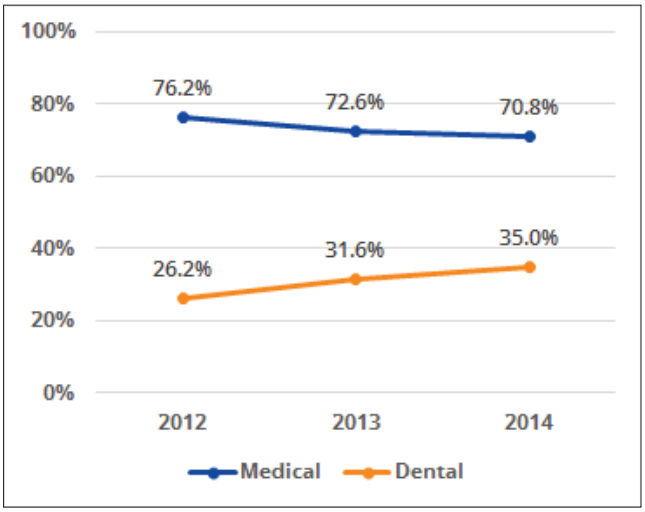
Big Sandy Health Care, Inc., FQHC in Prestonsburg, Kentucky

Age of Patient Caseload, 2012, 2013, 2014



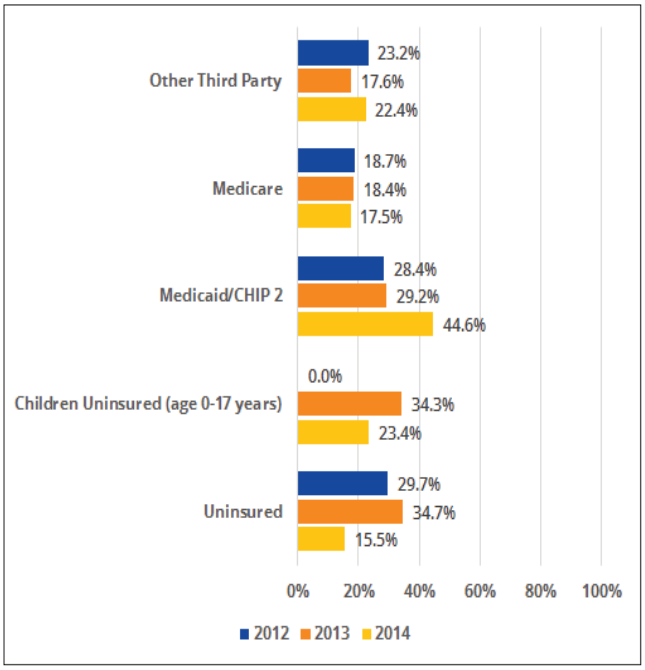
Source: UDS, 2012, 2013, 2014

Medical and Dental Patient Visits as a Percent of Total Patients, 2012, 2013, 2014



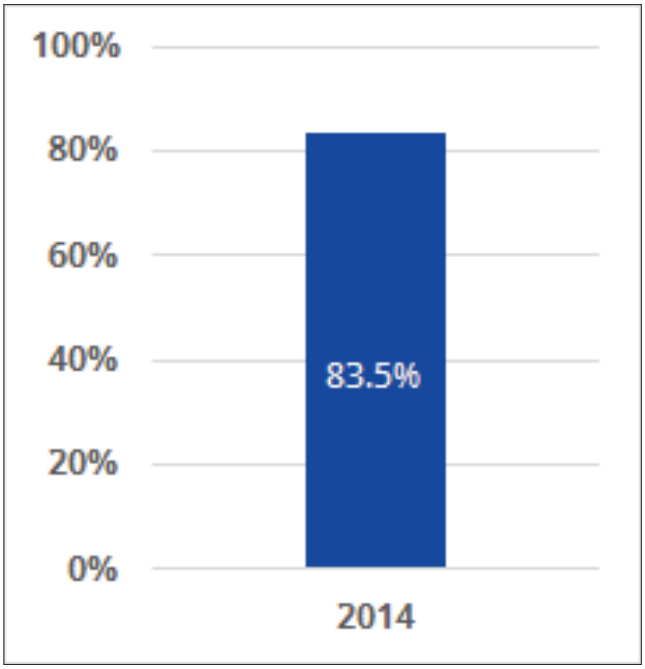
Source: UDS, 2012, 2013, 2014

Total Patient Caseload by Insurance Status, 2012, 2013, 2014



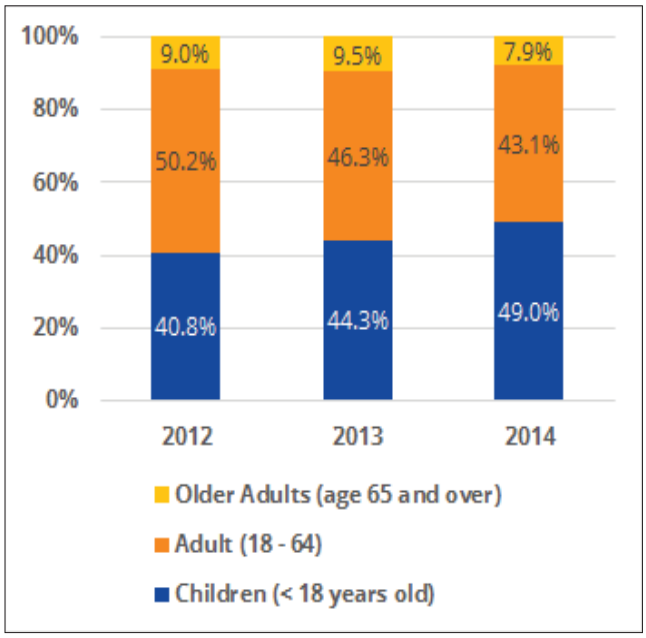
Source: UDS, 2012, 2013, 2014

Adults Screened for Tobacco Useand Receiving Cessation Intervention, 2014



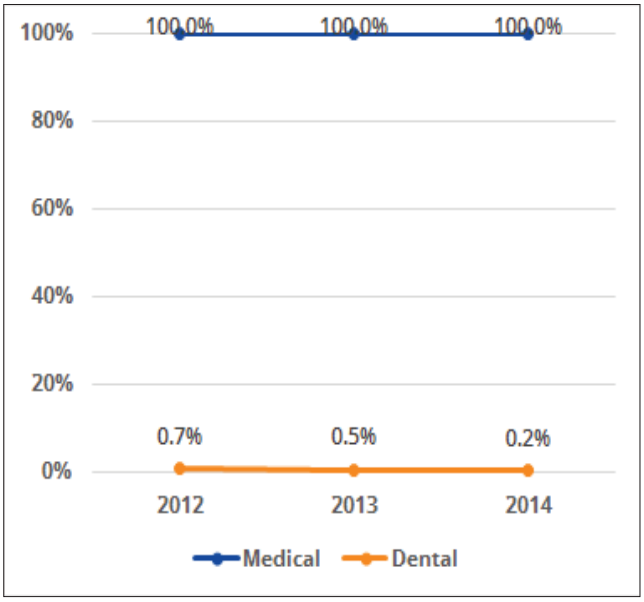
Source: UDS, 2014

Age of Patient Caseload, 2012, 2013, 2014



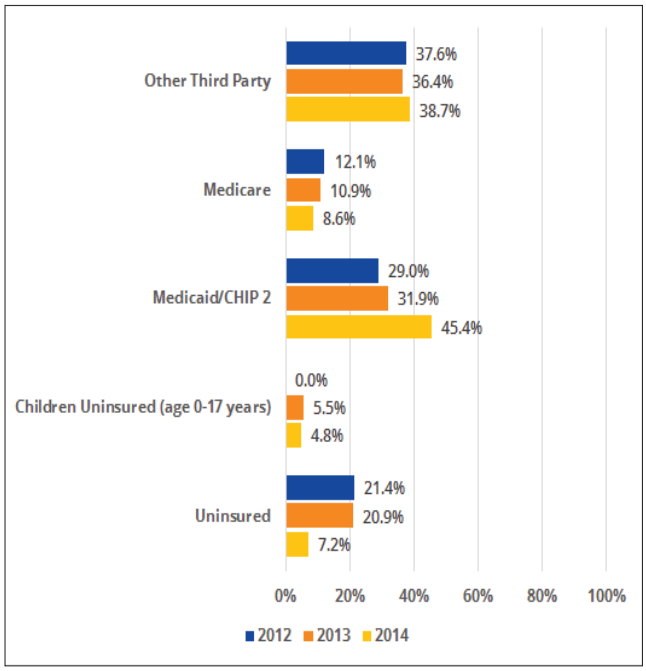
Source: UDS, 2012, 2013, 2014

Medical and Dental Patient Visits as a Percent of Total Patients, 2012, 2013, 2014



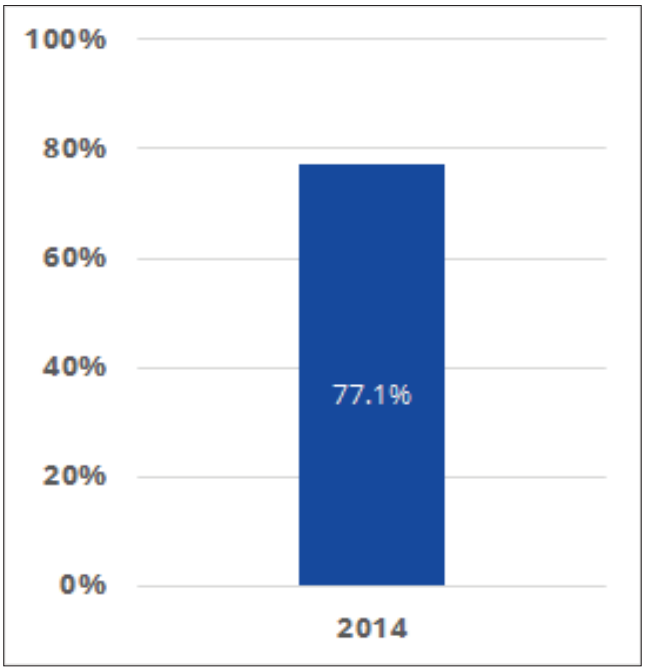
Source: UDS, 2012, 2013, 2014

Total Patient Caseload by Insurance Status, 2012, 2013, 2014



Source: UDS, 2012, 2013, 2014

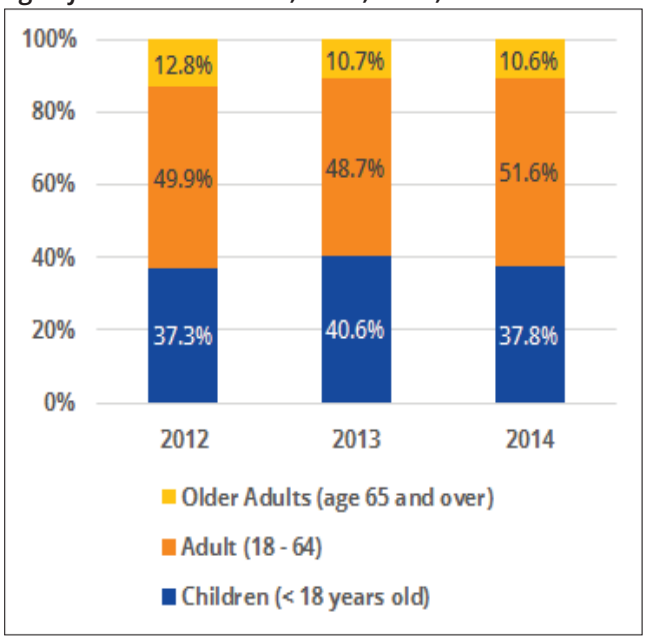
Adults Screened for Tobacco Useand Receiving Cessation Intervention, 2014



Source: UDS, 2014

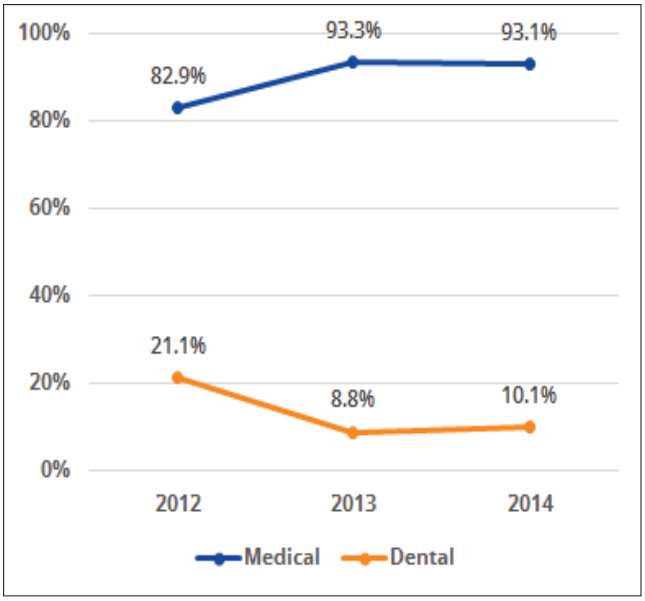
Cumberland Family Medical Center, FQHC in Burkesville, Kentucky

Age of Patient Caseload, 2012, 2013, 2014



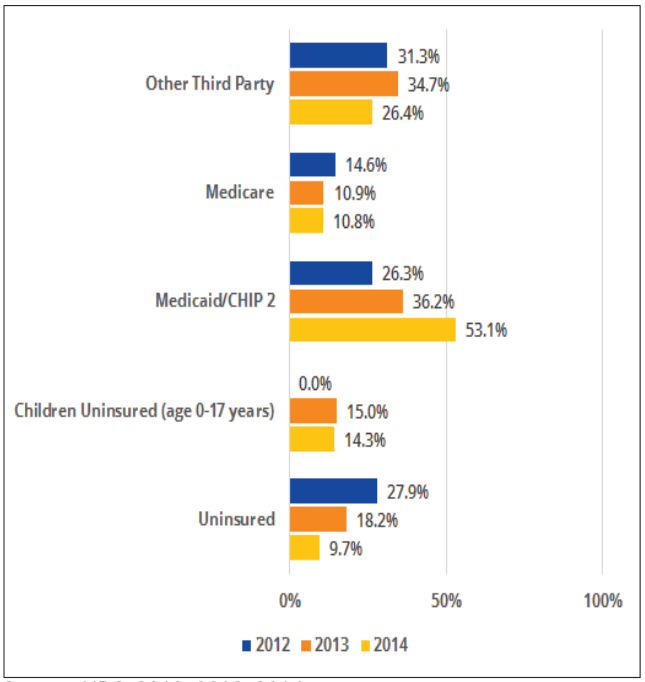
Source: UDS, 2012, 2013, 2014

Medical and Dental Visits as a Percent of Total Patients, 2012, 2013, 2014



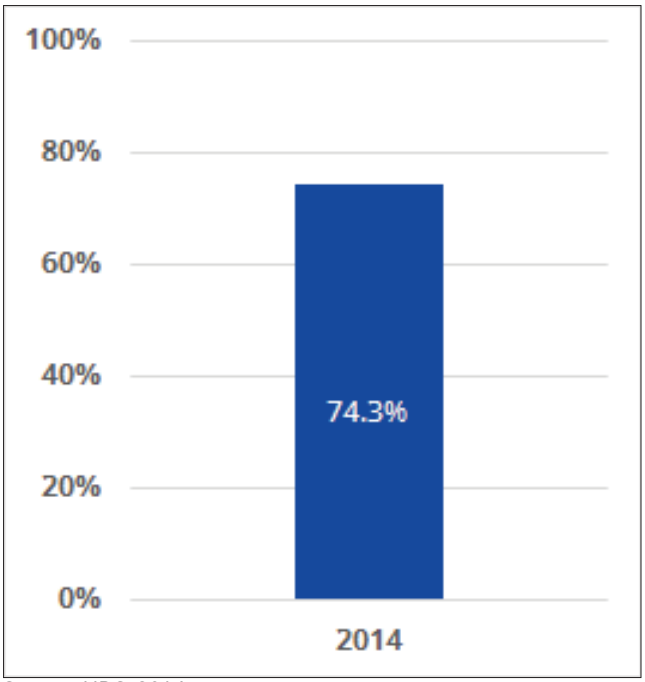
Source: UDS, 2012, 2013, 2014

Total Patient Caseload by Insurance Status, 2012, 2013, 2014



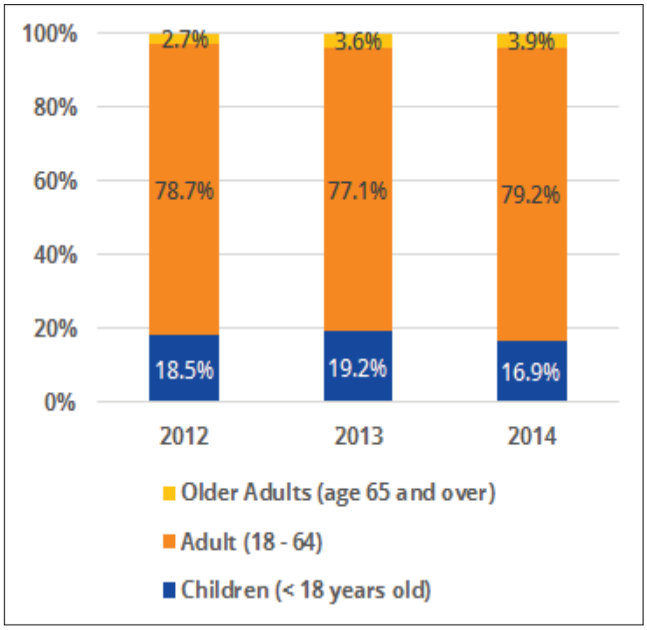
Source: UDS, 2012, 2013, 2014

Adults Screened for Tobacco Use and Receiving Cessation Intervention, 2014



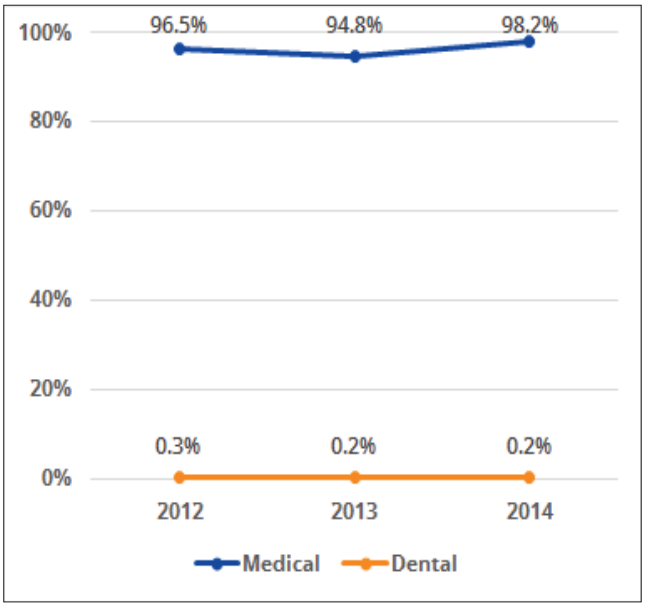
Source: UDS, 2014

Age of Patient Caseload, 2012, 2013, 2014



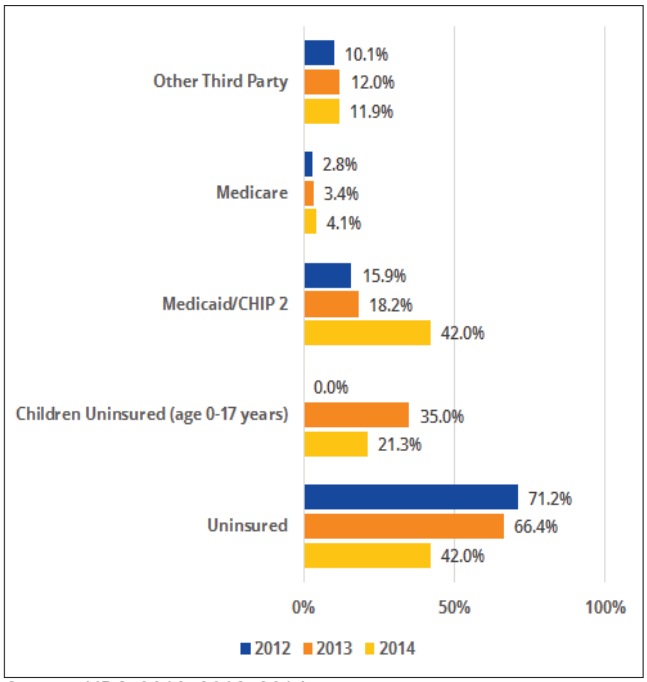
Source: UDS, 2012, 2013, 2014

Medical and Dental Visits as a Percent of Total Patients, 2012, 2013, 2014



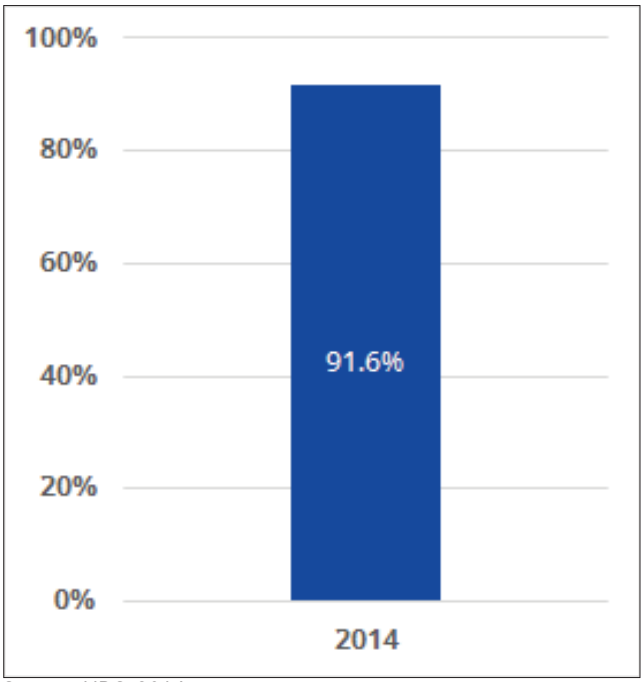
Source: UDS, 2012, 2013, 2014

Total Patient Caseload by Insurance Status, 2012, 2013, 2014



Source: UDS, 2012, 2013, 2014

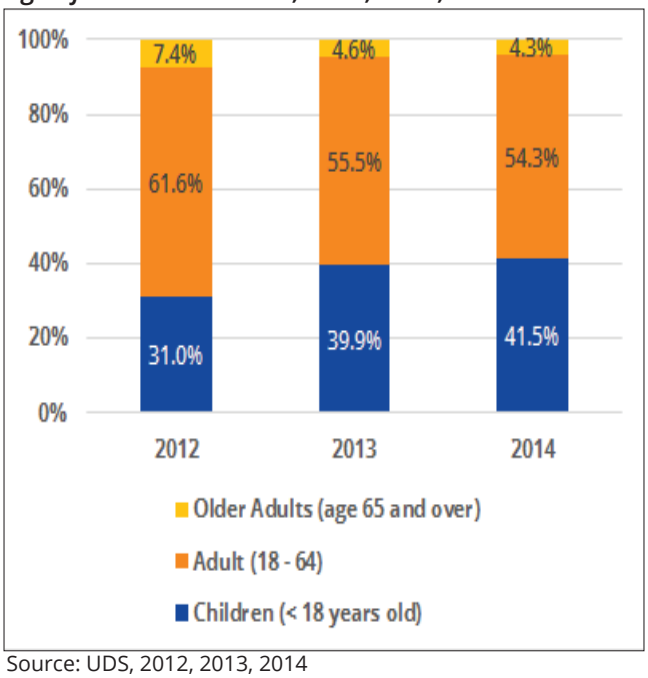
Adults Screened for Tobacco Use and Receiving Cessation Intervention, 2014



Source: UDS, 2014

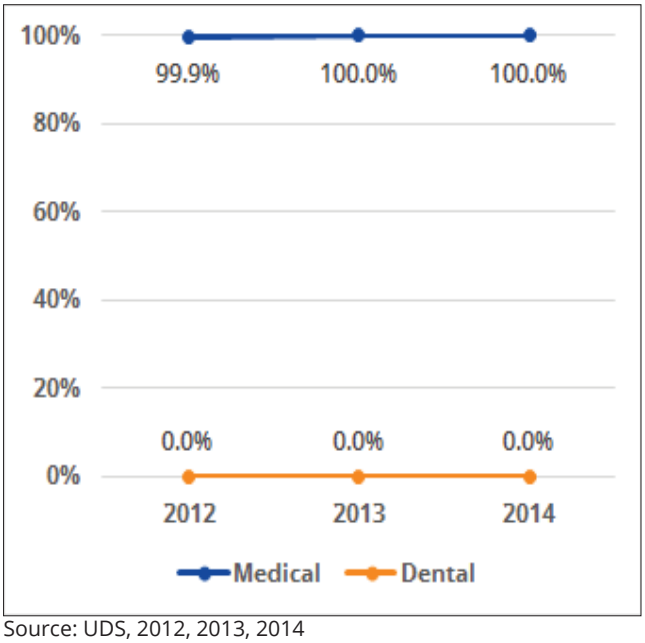
Fairview Community Health Center, FQHC in Bowling Green, Kentucky

Age of Patient Caseload, 2012, 2013, 2014



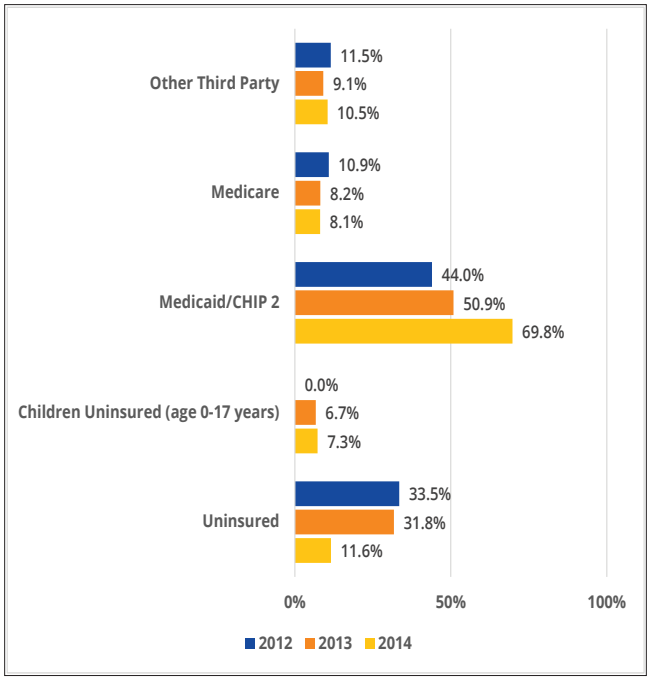
Source: UDS, 2012, 2013, 2014

Medical and Dental Visits as a Percent of Total Patients, 2012, 2013, 2014



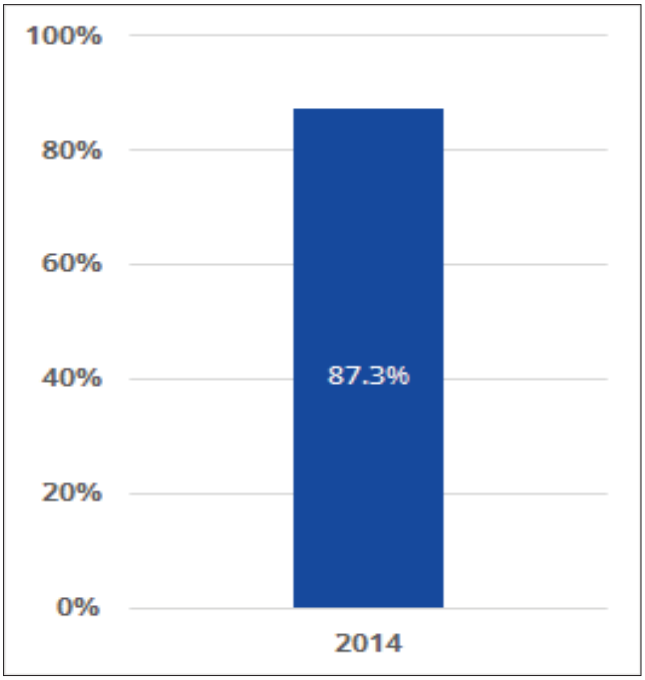
Source: UDS, 2012, 2013, 2014

Total Patient Caseload by Insurance Status, 2012, 2013, 2014



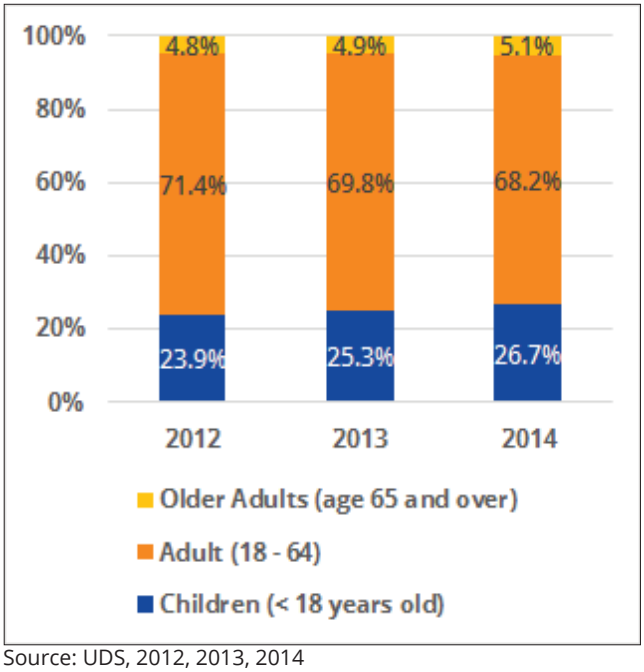
Source: UDS, 2012, 2013, 2014

Adults Screened for Tobacco Use and Receiving Cessation Intervention, 2014



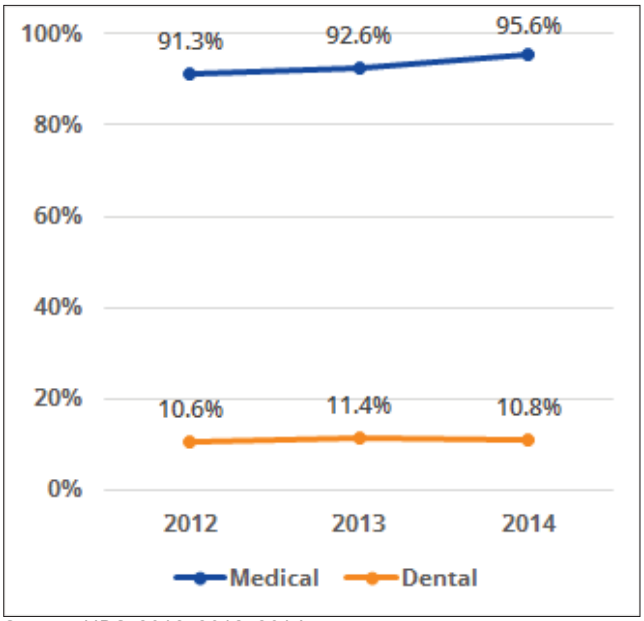
Source: UDS, 2014

Age of Patient Caseload, 2012, 2013, 2014



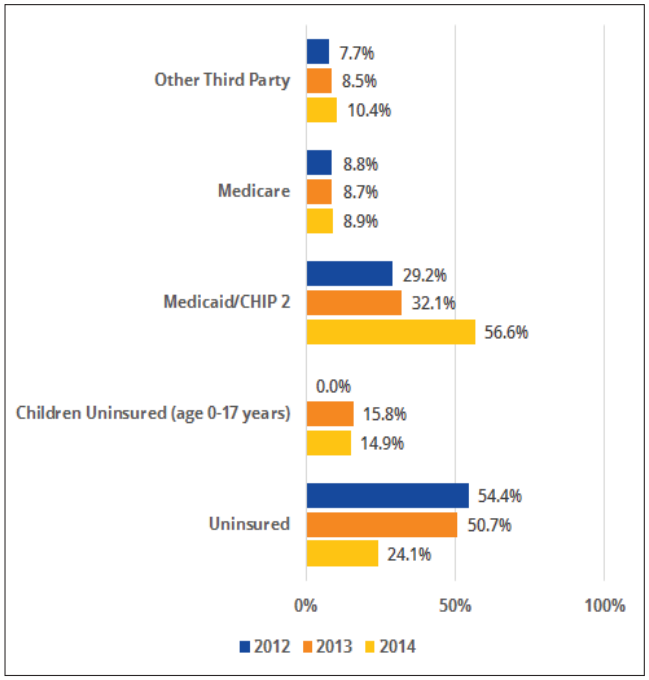
Source: UDS, 2012, 2013, 2014

Medical and Dental Visits as a Percent of Total Patients, 2012, 2013, 2014



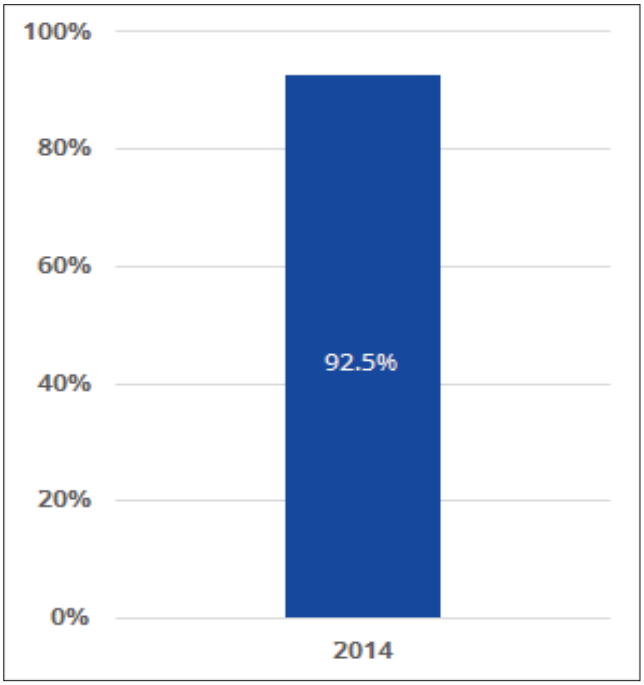
Source: UDS, 2012, 2013, 2014

Total Patient Caseload by Insurance Status, 2012, 2013, 2014



Source: UDS, 2012, 2013, 2014

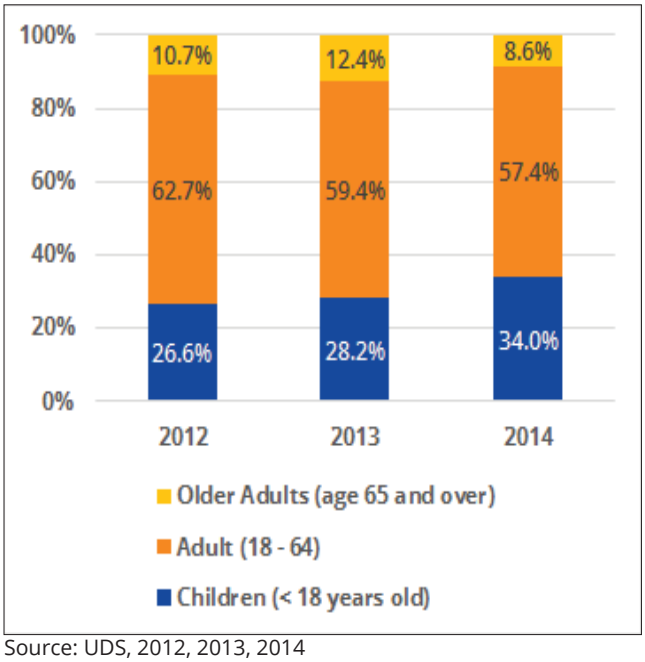
Adults Screened for Tobacco Use and Receiving Cessation Intervention, 2014



Source: UDS, 2014

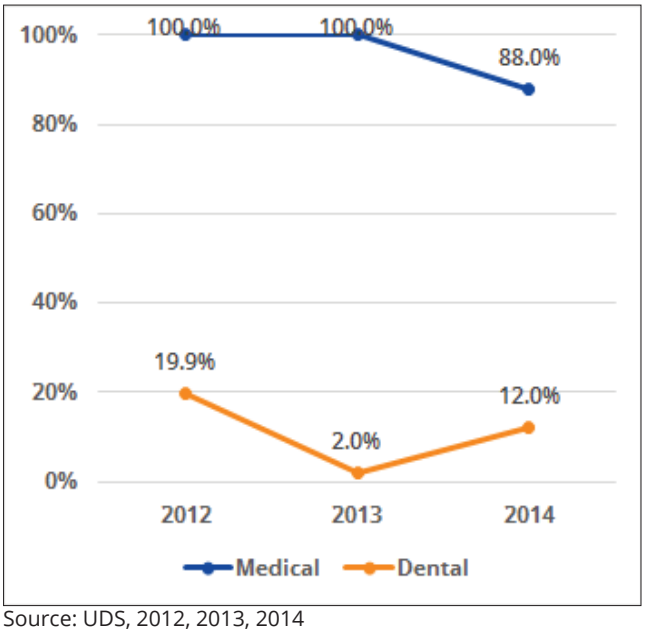
Grace Community Health Center, Inc., FQHC in Gray, Kentucky

Age of Patient Caseload, 2012, 2013, 2014



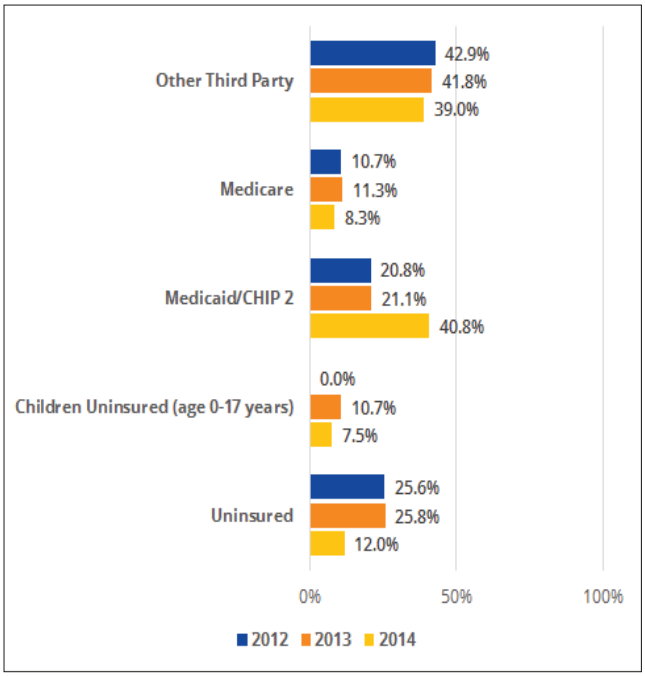
Source: UDS, 2012, 2013, 2014

Medical and Dental Visits as a Percent of Total Patients, 2012, 2013, 2014



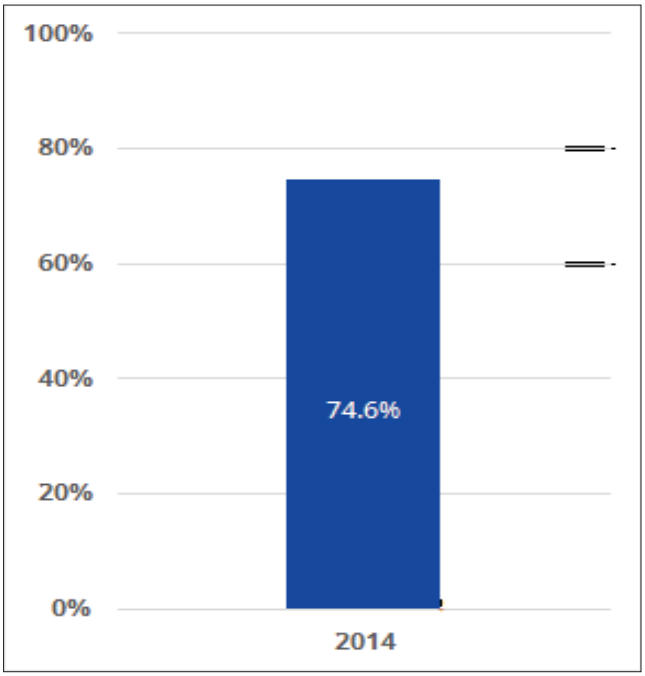
Source: UDS, 2012, 2013, 2014

Total Patient Caseload by Insurance Status, 2012, 2013, 2014



Source: UDS, 2012, 2013, 2014

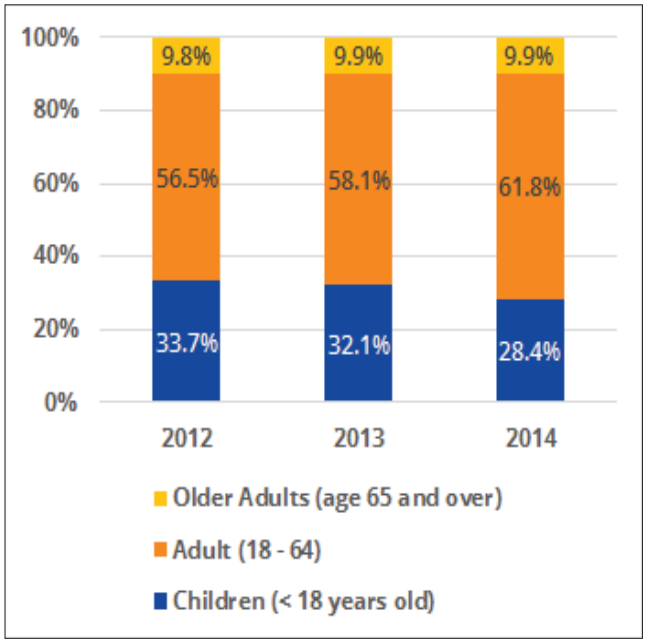
Adults Screened for Tobacco Use and Receiving Cessation Intervention, 2014



Source: UDS, 2014

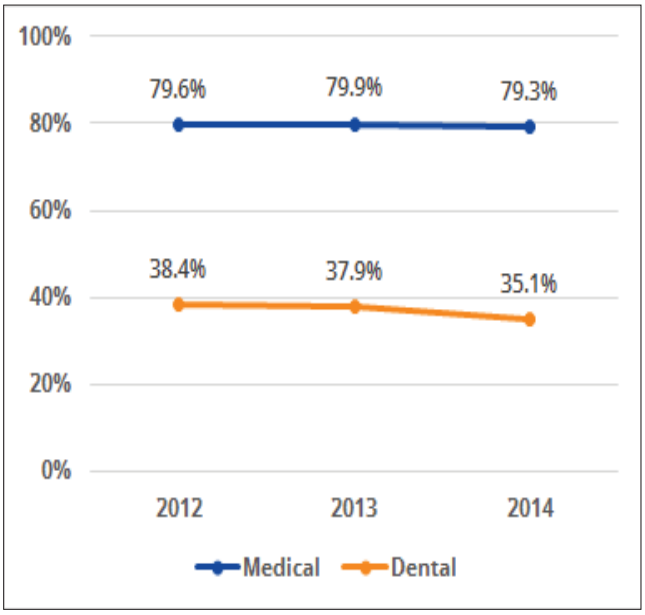
Health Help, Inc., FQHC in McKee, Kentucky

Age of Patient Caseload, 2012, 2013, 2014



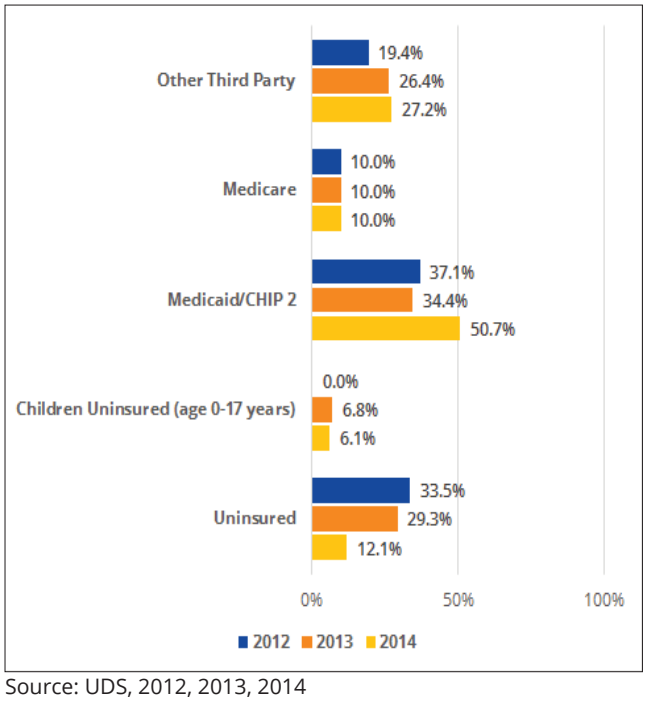
Source: UDS, 2012, 2013, 2014

Medical and Dental Visits as a Percent of Total Patients, 2012, 2013, 2014



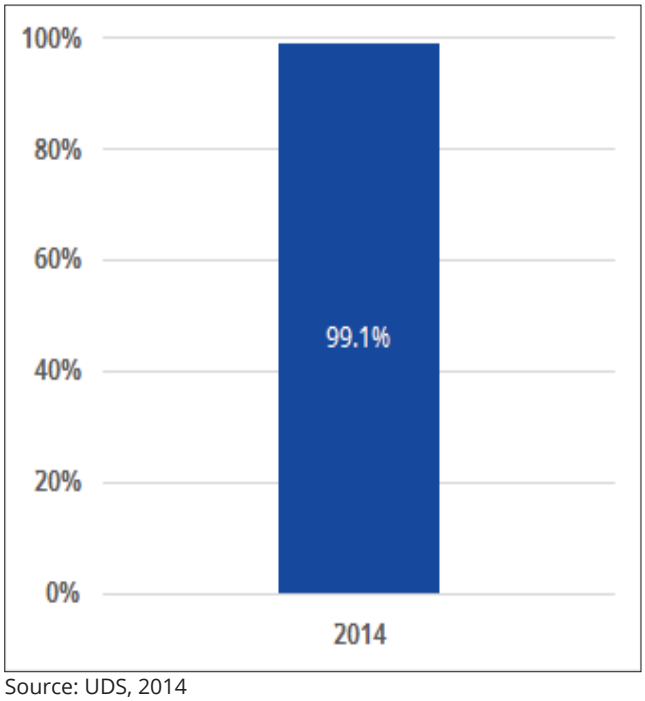
Source: UDS, 2012, 2013, 2014

Total Patient Caseload by Insurance Status, 2012, 2013, 2014



Source: UDS, 2012, 2013, 2014

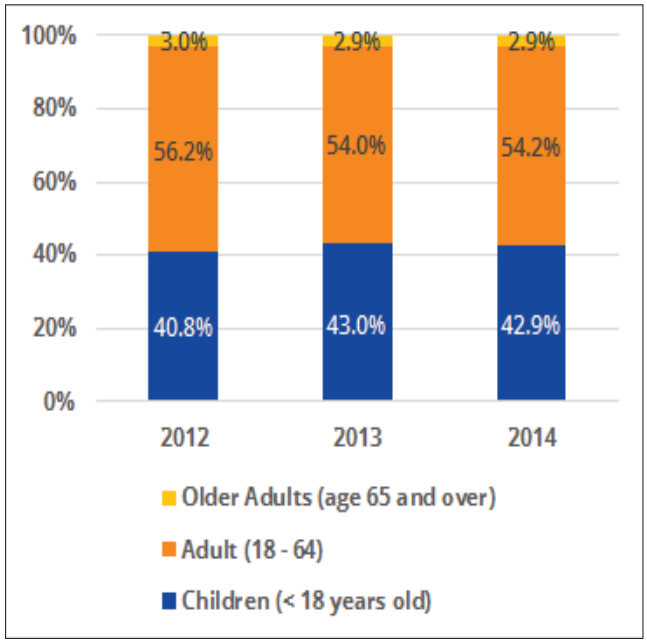
Adults Screened for Tobacco Use and Receiving Cessation Intervention, 2014



Source: UDS, 2014

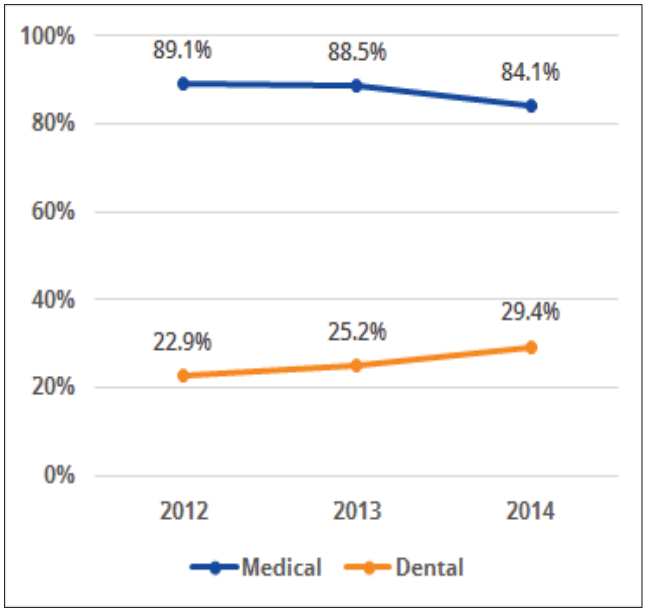
HealthPoint Family Care, FQHC in Covington, Kentucky

Age of Patient Caseload, 2012, 2013, 2014



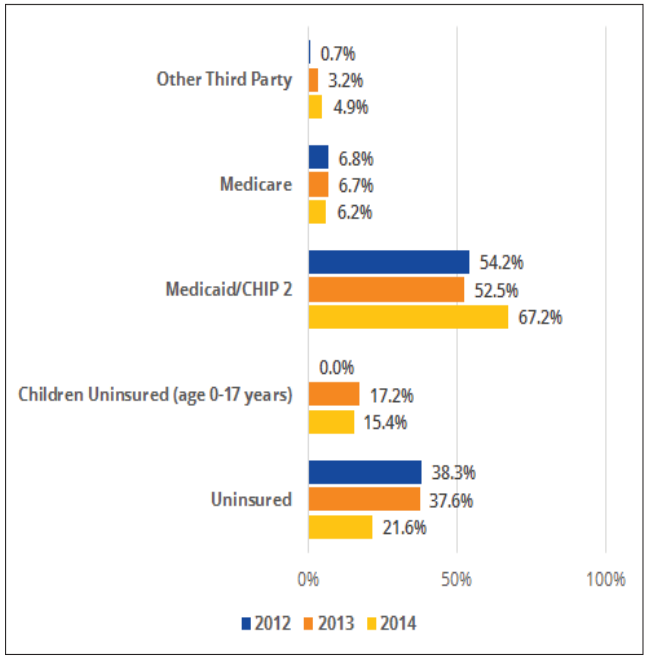
Source: UDS, 2012, 2013, 2014

Medical and Dental Visits as a Percent of Total Patients, 2012, 2013, 2014



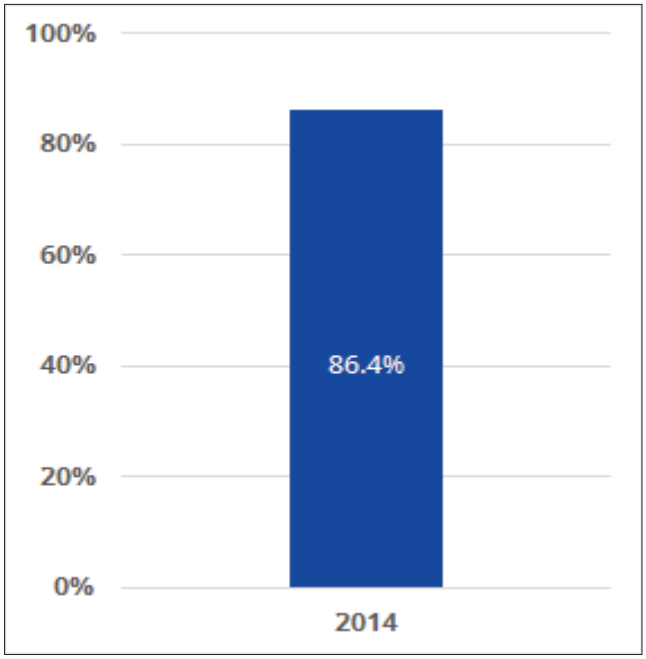
Source: UDS, 2012, 2013, 2014

Total Patient Caseload by Insurance Status, 2012, 2013, 2014



Source: UDS, 2012, 2013, 2014

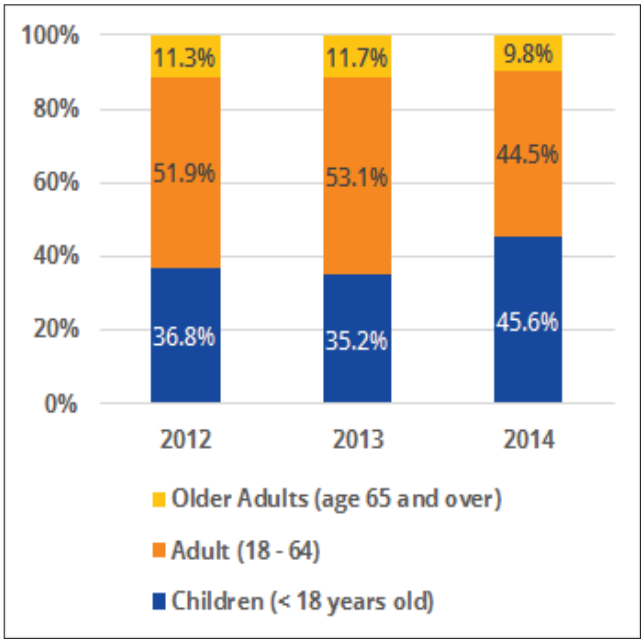
Adults Screened for Tobacco Use and Receiving Cessation Intervention, 2014



Source: UDS, 2014

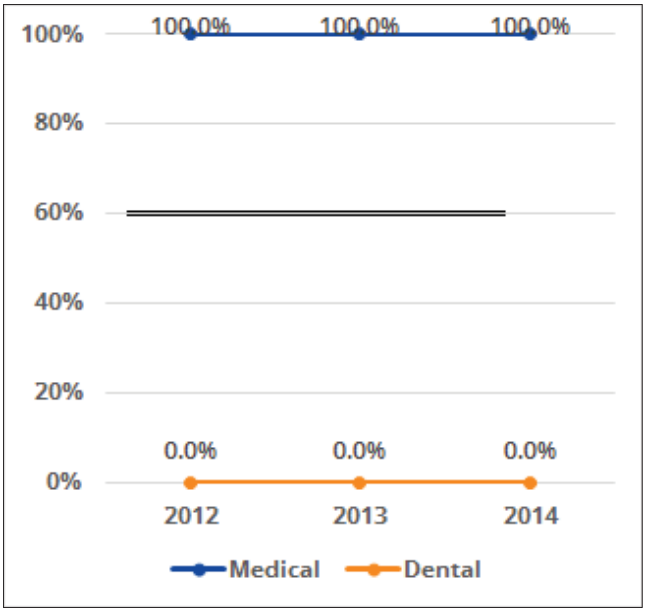
Juniper Health, Inc, FQHC in Beattyville, Kentucky

Age of Patient Caseload, 2012, 2013, 2014



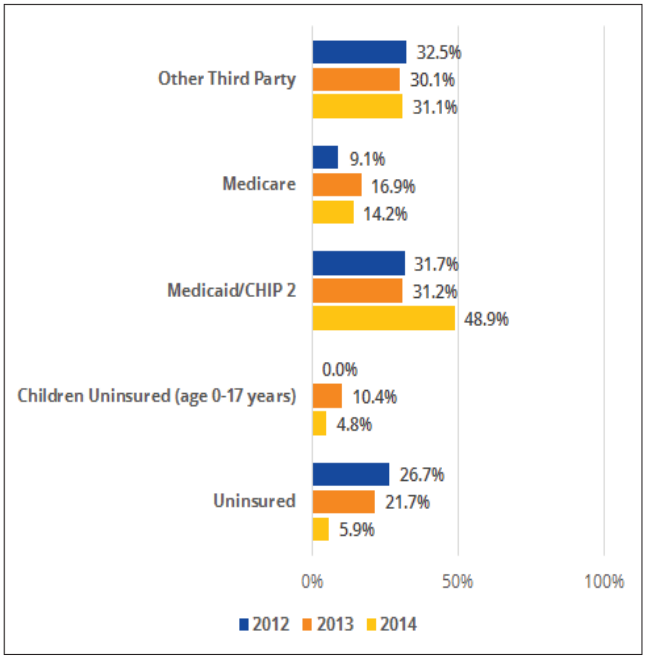
Source: UDS, 2012, 2013, 2014

Medical and Dental Visits as a Percent of Total Patients, 2012, 2013, 2014



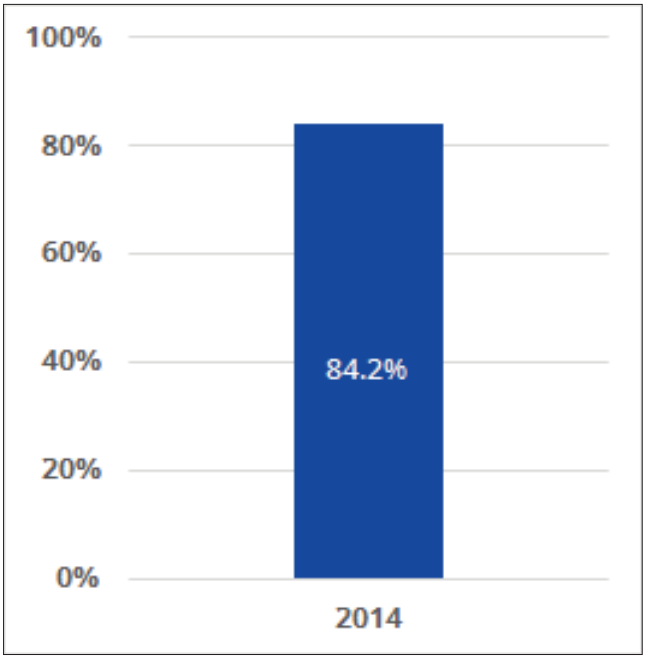
Source: UDS, 2012, 2013, 2014

Total Patient Caseload by Insurance Status, 2012, 2013, 2014



Source: UDS, 2012, 2013, 2014

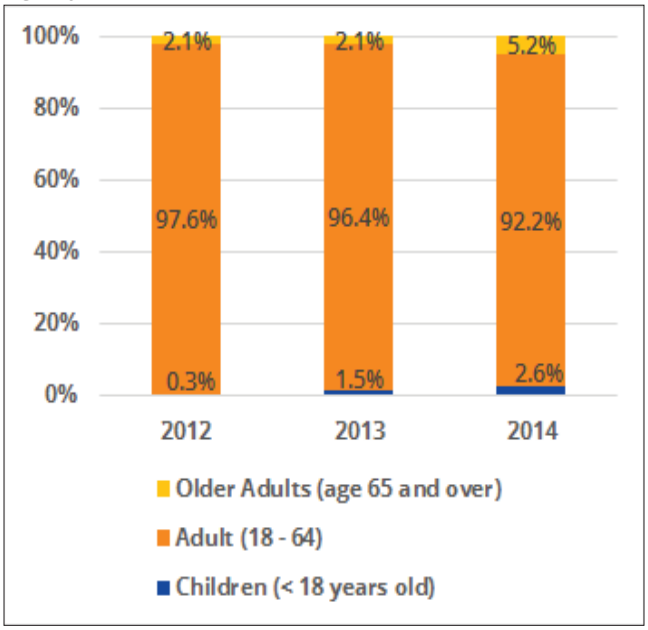
Adults Screened for Tobacco Use and Receiving Cessation Intervention, 2014



Source: UDS, 2014

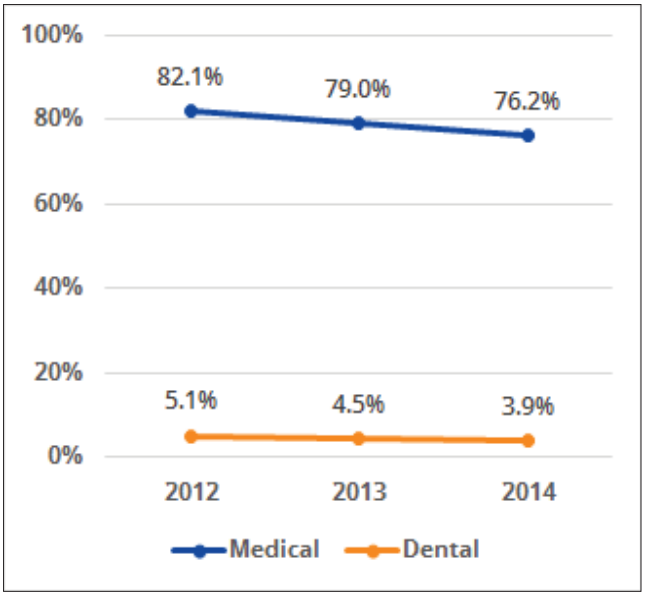
Kentucky Mountain Health Alliance, Inc., FQHC in Hazard, Kentucky

Age of Patient Caseload, 2012, 2013, 2014



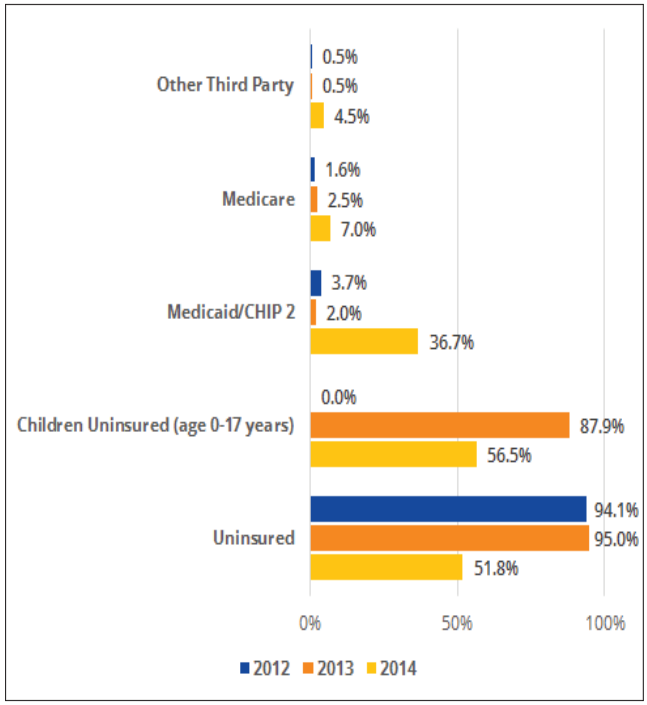
Source: UDS, 2012, 2013, 2014

Medical and Dental Visits as a Percent of Total Patients, 2012, 2013, 2014



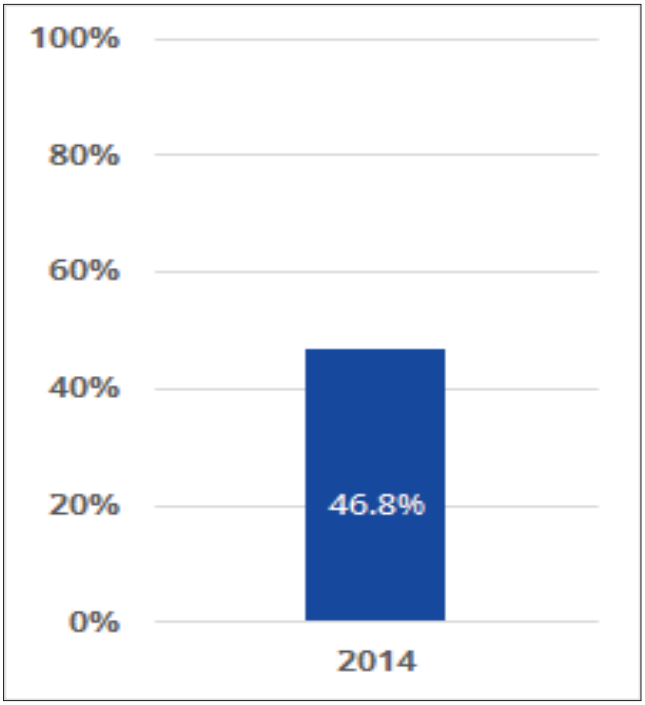
Source: UDS, 2012, 2013, 2014

Total Patient Caseload by Insurance Status, 2012, 2013, 2014



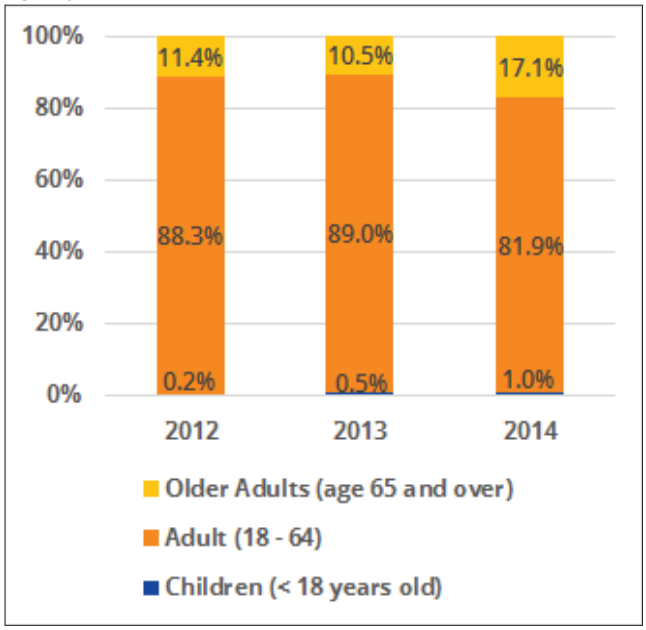
Source: UDS, 2012, 2013, 2014

Adults Screened for Tobacco Use and Receiving Cessation Intervention, 2014



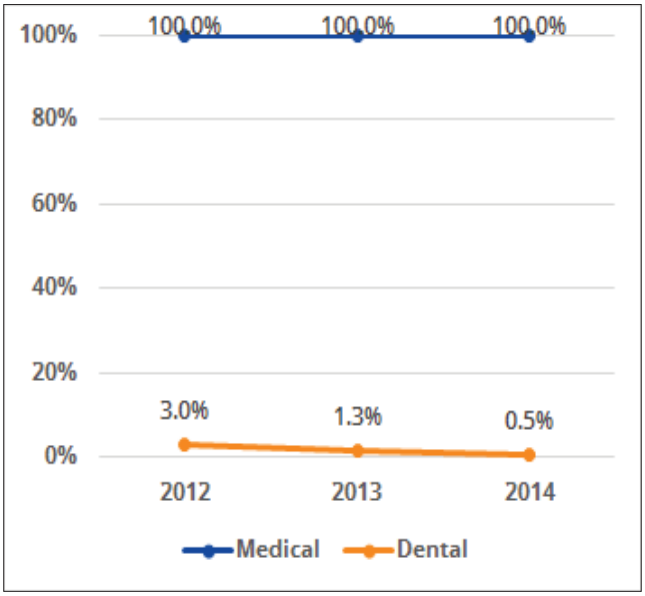
Source: UDS, 2014

Age of Patient Caseload, 2012, 2013, 2014



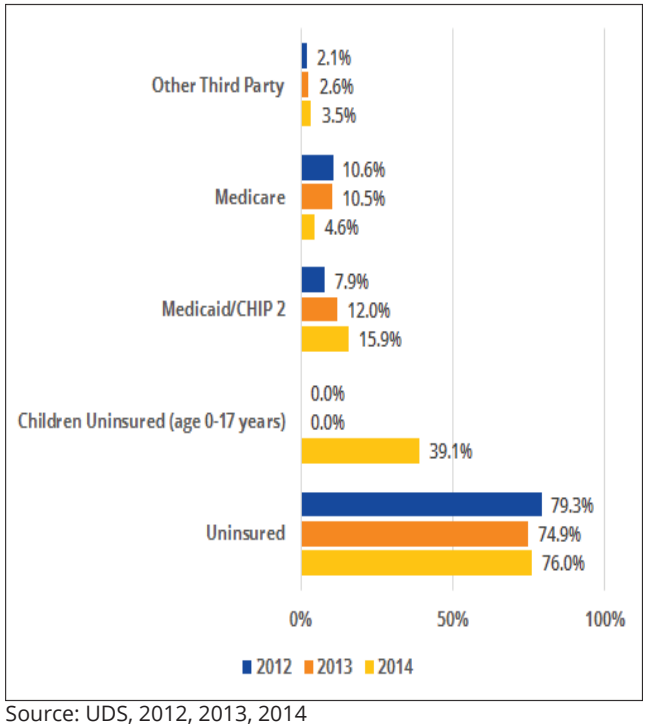
Source: UDS, 2012, 2013, 2014

Medical and Dental Visits as a Percent of Total Patients, 2012, 2013, 2014



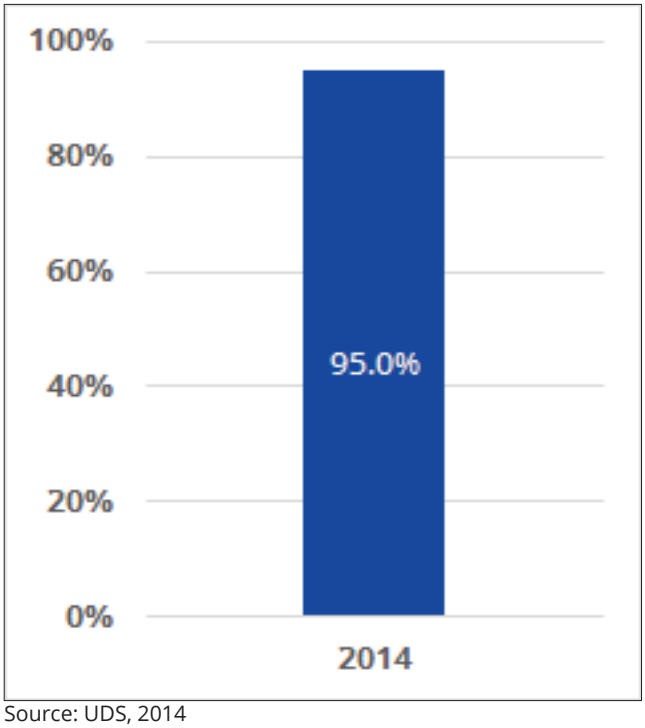
Source: UDS, 2012, 2013, 2014

Total Patient Caseload by Insurance Status, 2012, 2013, 2014



Source: UDS, 2012, 2013, 2014

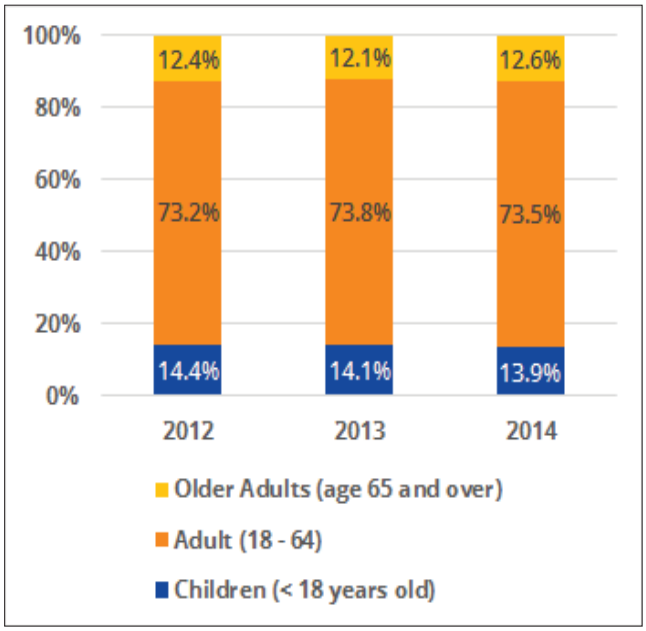
Adults Screened for Tobacco Use and Receiving Cessation Intervention, 2014



Source: UDS, 2014

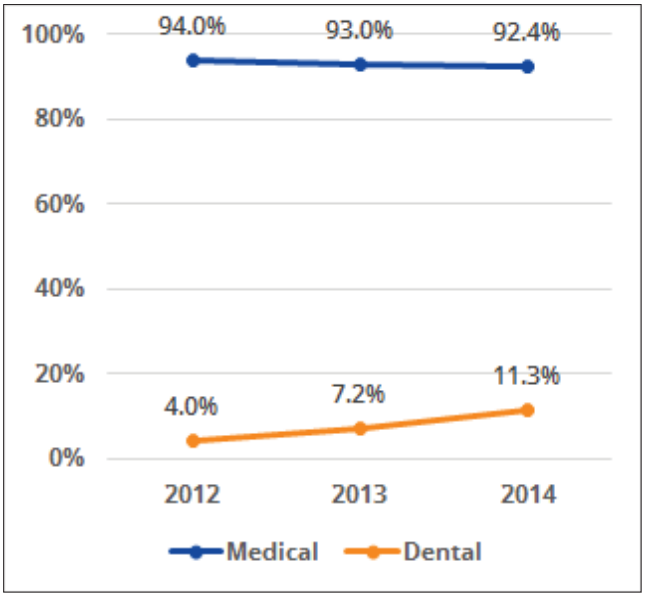
Lewis County Primary Care Center, FQHC in Vanceburg, Kentucky

Age of Patient Caseload, 2012, 2013, 2014



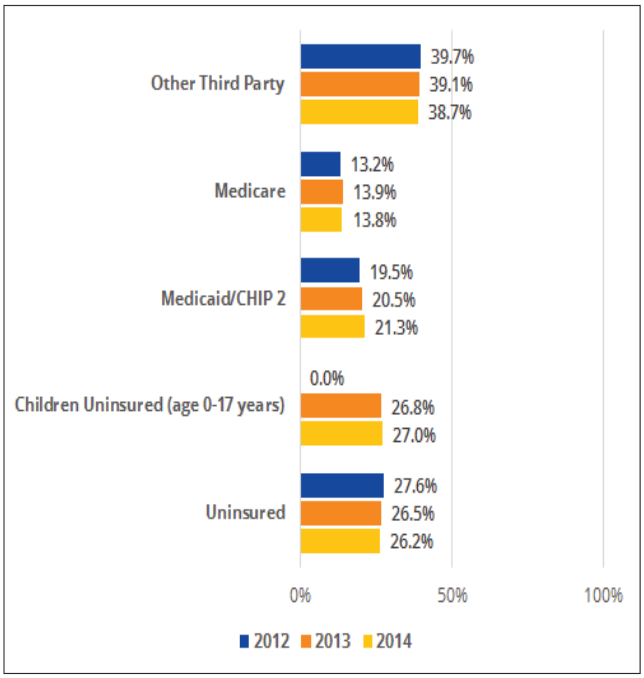
Source: UDS, 2012, 2013, 2014

Medical and Dental Visits as a Percent of Total Patients, 2012, 2013, 2014



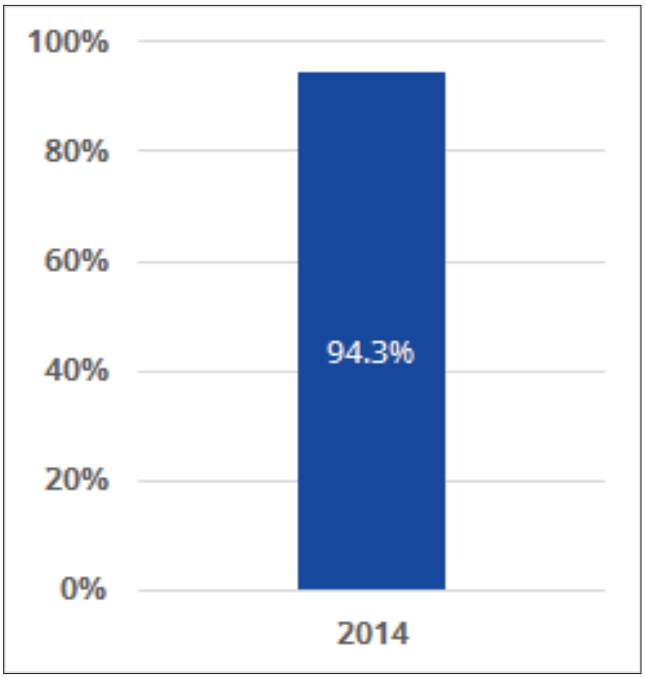
Source: UDS, 2012, 2013, 2014

Total Patient Caseload by Insurance Status, 2012, 2013, 2014



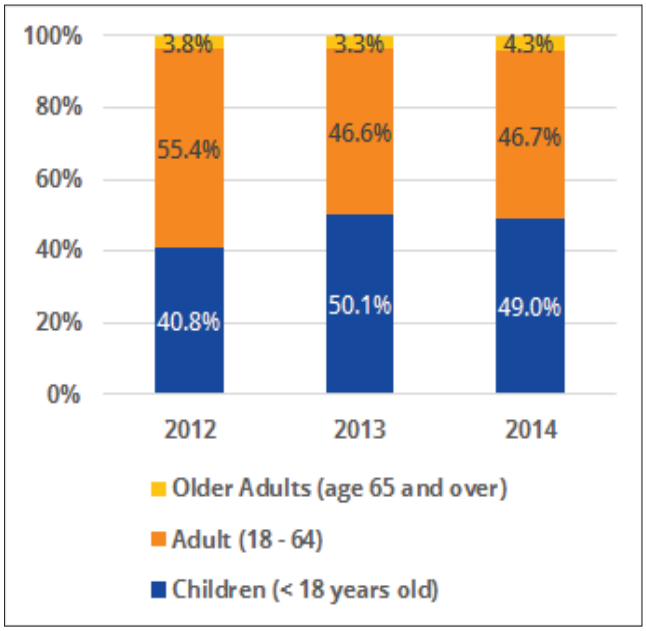
Source: UDS, 2012, 2013, 2014

Adults Screened for Tobacco Use and Receiving Cessation Intervention, 2014



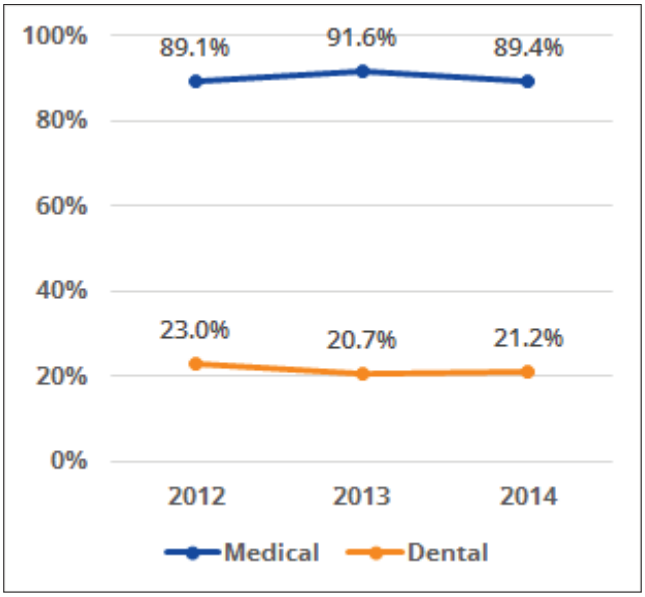
Source: UDS, 2014

Age of Patient Caseload, 2012, 2013, 2014



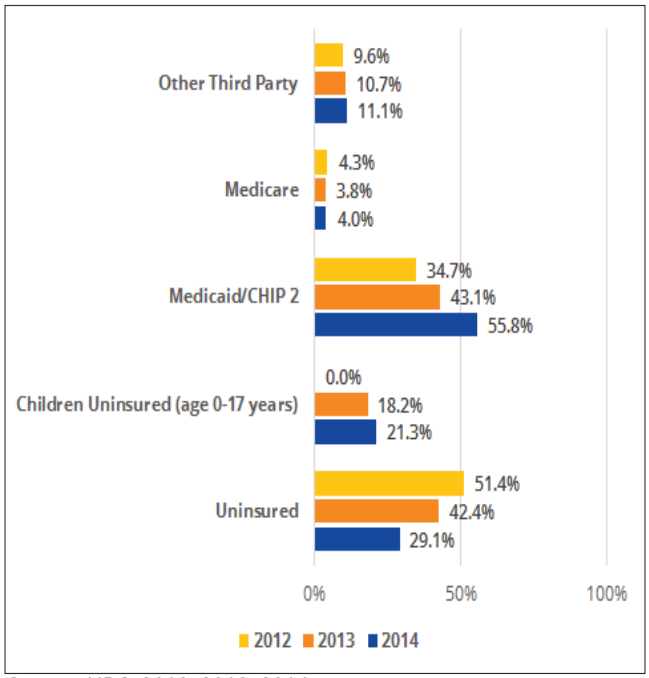
Source: UDS, 2012, 2013, 2014

Medical and Dental Visits as a Percent of Total Patients, 2012, 2013, 2014



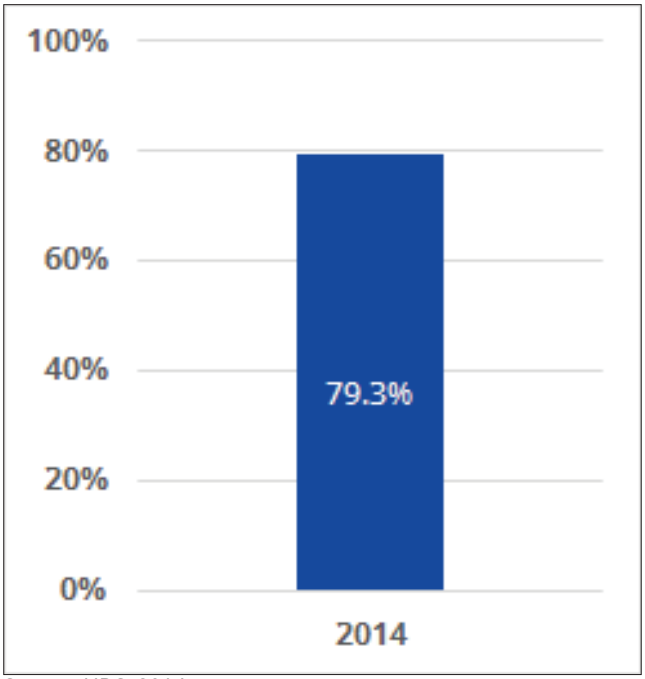
Source: UDS, 2012, 2013, 2014

Total Patient Caseload by Insurance Status, 2012, 2013, 2014



Source: UDS, 2012, 2013, 2014

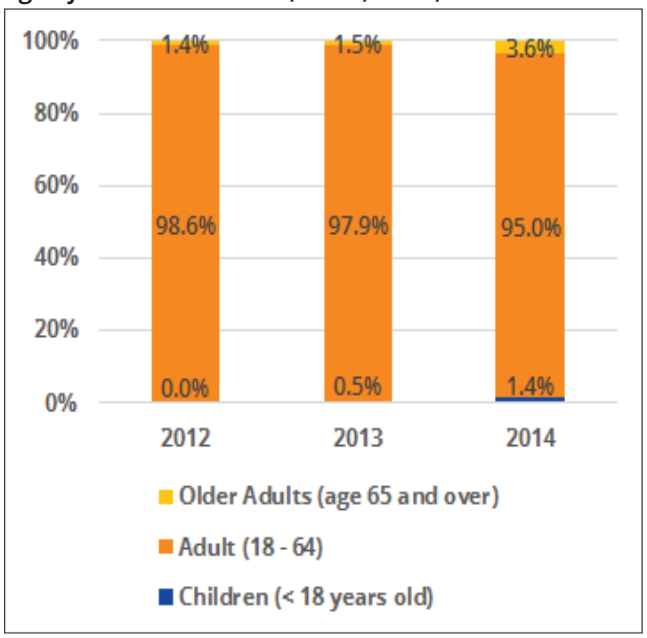
Adults Screened for Tobacco Use and Receiving Cessation Intervention, 2014



Source: UDS, 2014

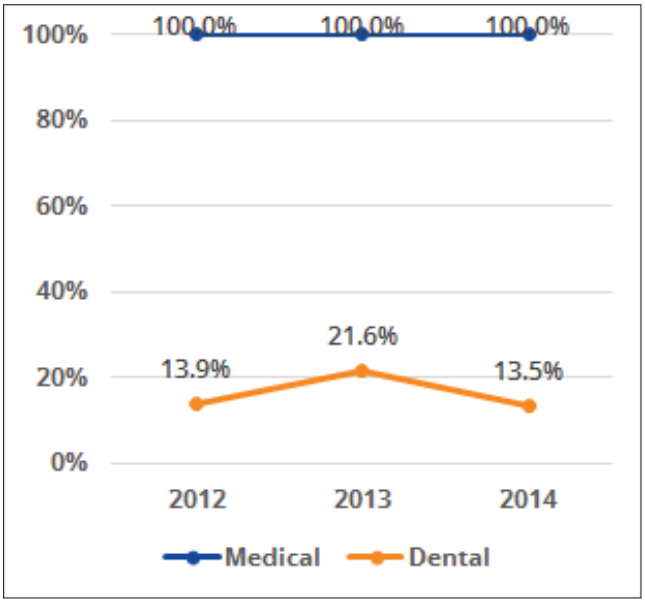
Mountain Comprehensive Care Center, Inc., FQHC in Prestonsburg, Kentucky

Age of Patient Caseload, 2012, 2013, 2014



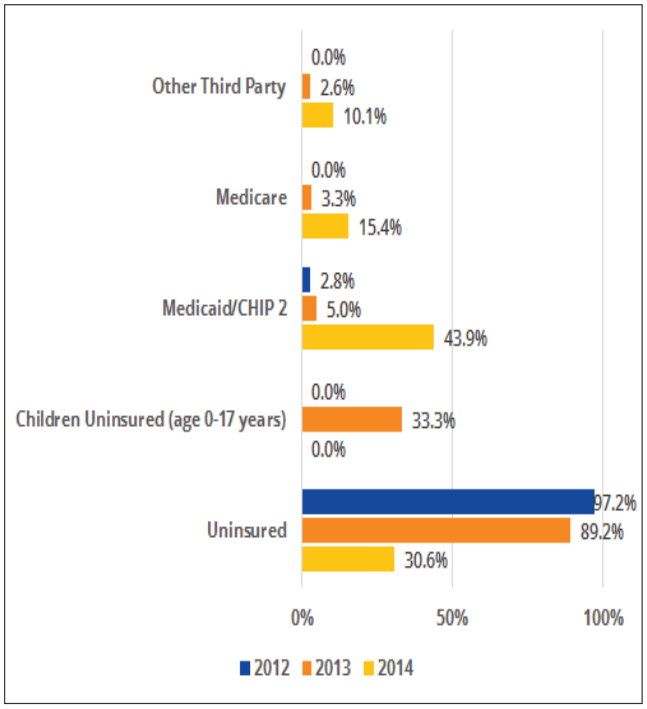
Source: UDS, 2012, 2013, 2014

Medical and Dental Visits as a Percent of Total Patients, 2012, 2013, 2014



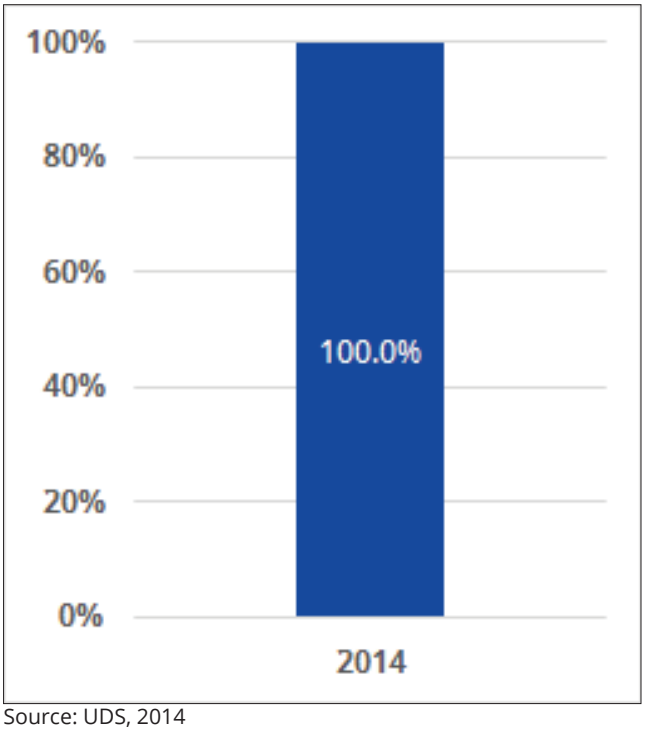
Source: UDS, 2012, 2013, 2014

Total Patient Caseload by Insurance Status, 2012, 2013, 2014



Source: UDS, 2012, 2013, 2014

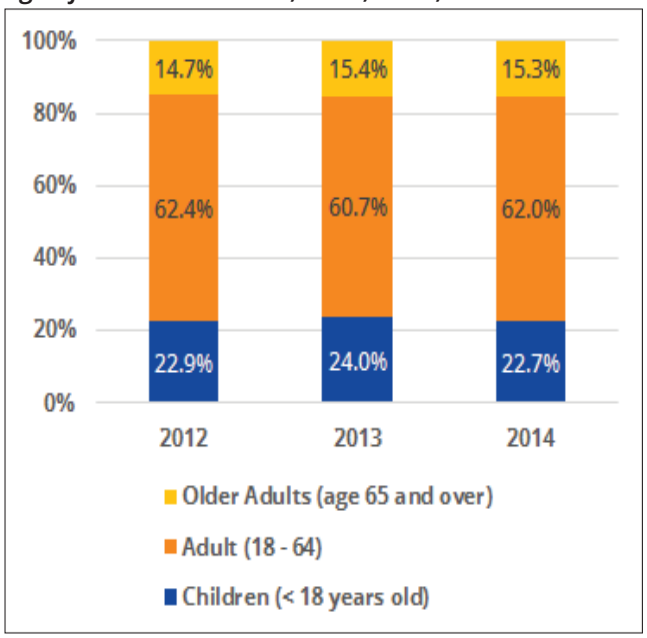
Adults Screened for Tobacco Use and Receiving Cessation Intervention, 2014



Source: UDS, 2014

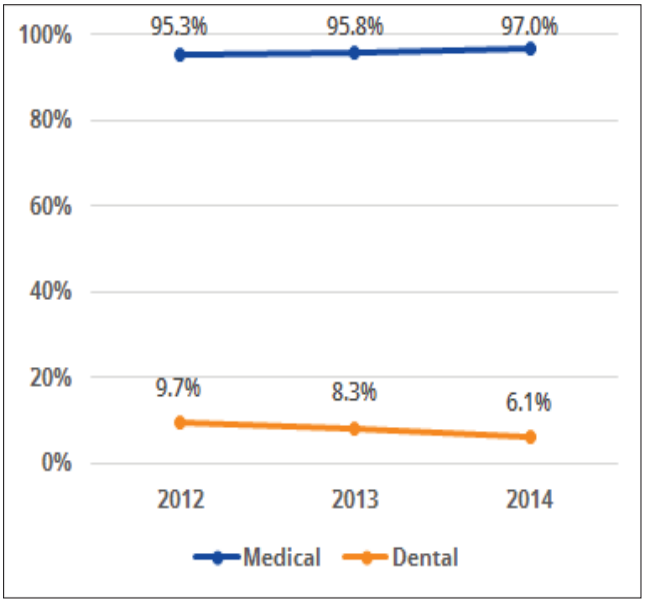
Mountain Comprehensive Health Corp., FQHC in Whitesburg, Kentucky

Age of Patient Caseload, 2012, 2013, 2014



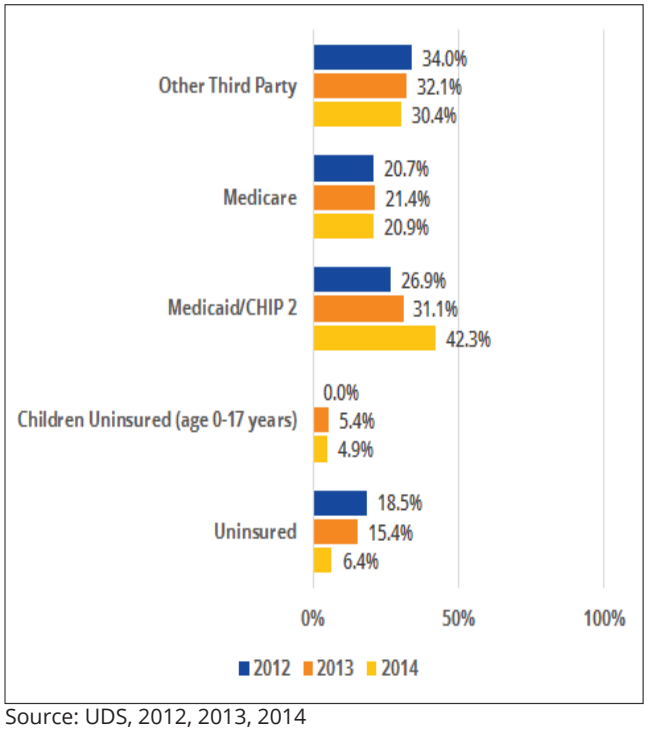
Source: UDS, 2012, 2013, 2014

Medical and Dental Visits as a Percent of Total Patients, 2012, 2013, 2014



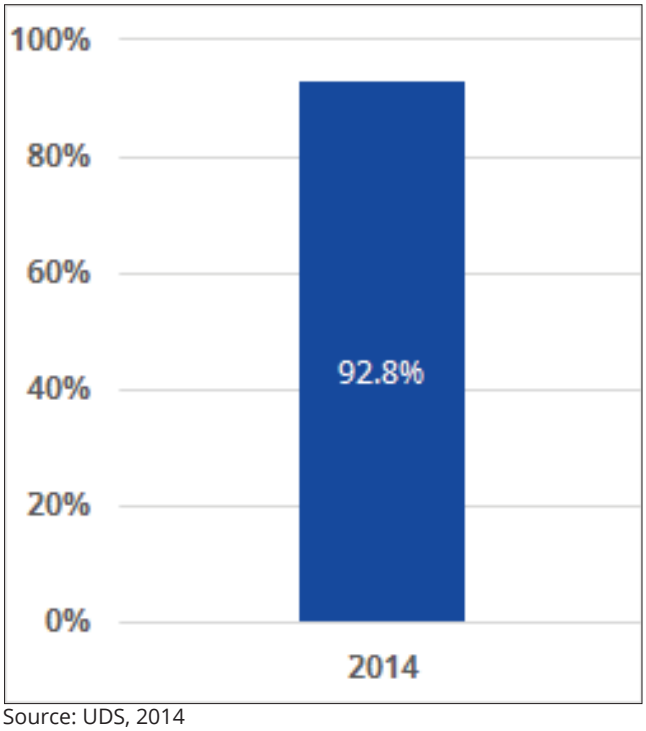
Source: UDS, 2012, 2013, 2014

Total Patient Caseload by Insurance Status, 2012, 2013, 2014



Source: UDS, 2012, 2013, 2014

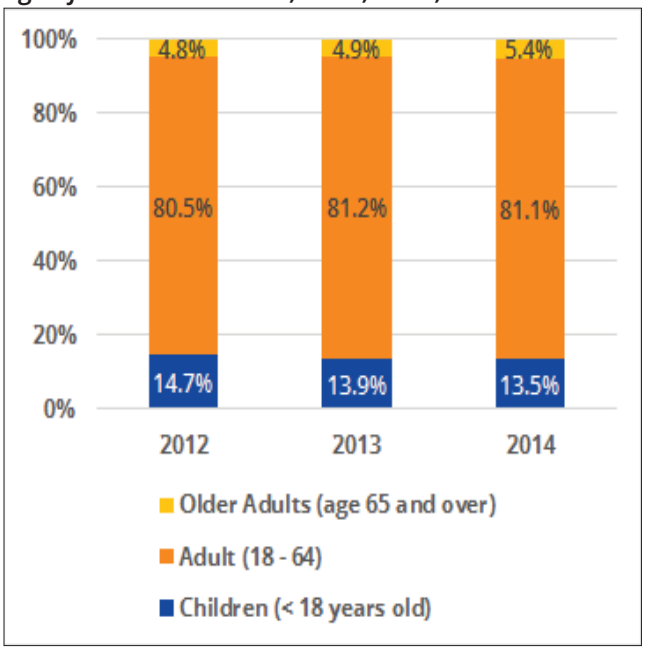
Adults Screened for Tobacco Use and Receiving Cessation Intervention, 2014



Source: UDS, 2014

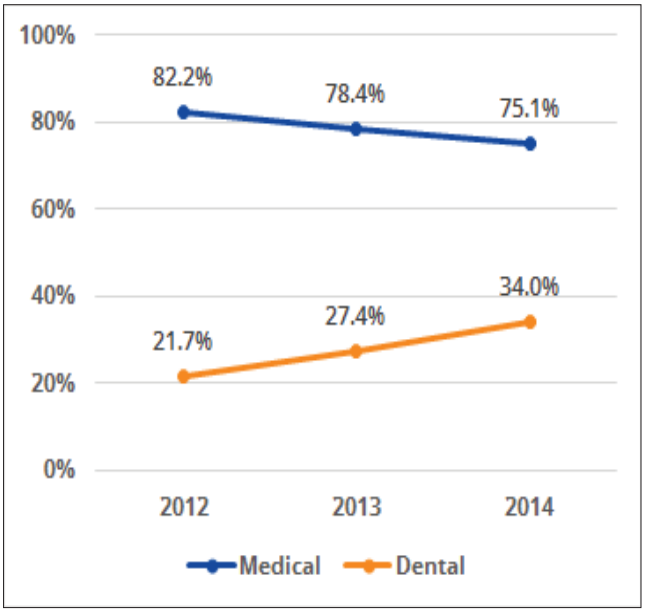
Park Duvalle Community Health Center, Inc., FQHC in Louisville, Kentucky

Age of Patient Caseload, 2012, 2013, 2014



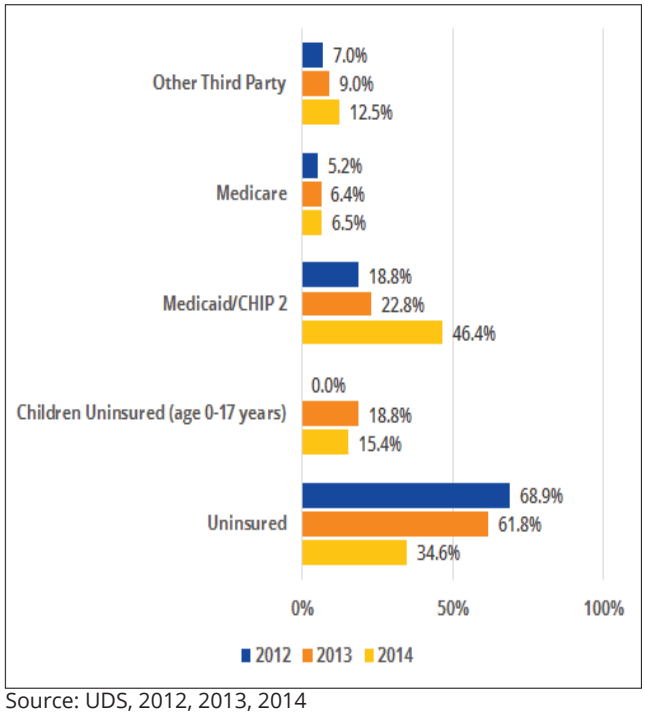
Source: UDS, 2012, 2013, 2014

Medical and Dental Visits as a Percent of Total Patients, 2012, 2013, 2014



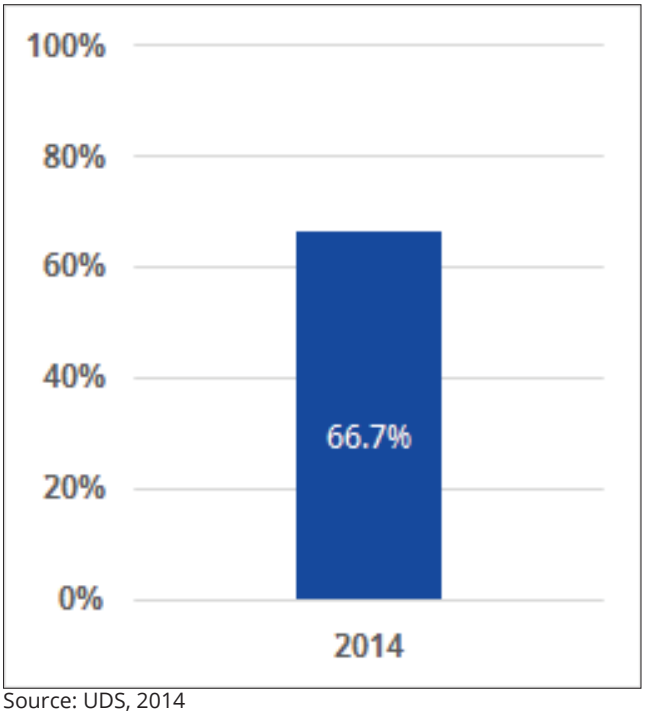
Source: UDS, 2012, 2013, 2014

Total Patient Caseload by Insurance Status, 2012, 2013, 2014



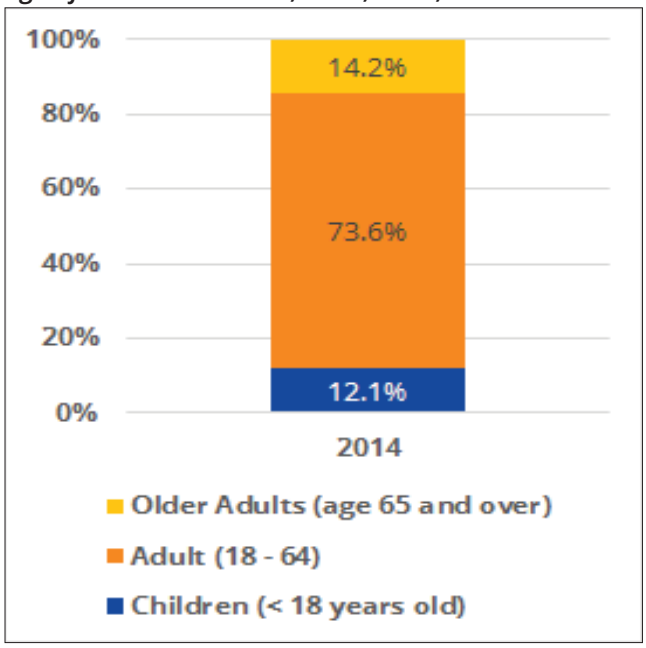
Source: UDS, 2012, 2013, 2014

Adults Screened for Tobacco Use and Receiving Cessation Intervention, 2014



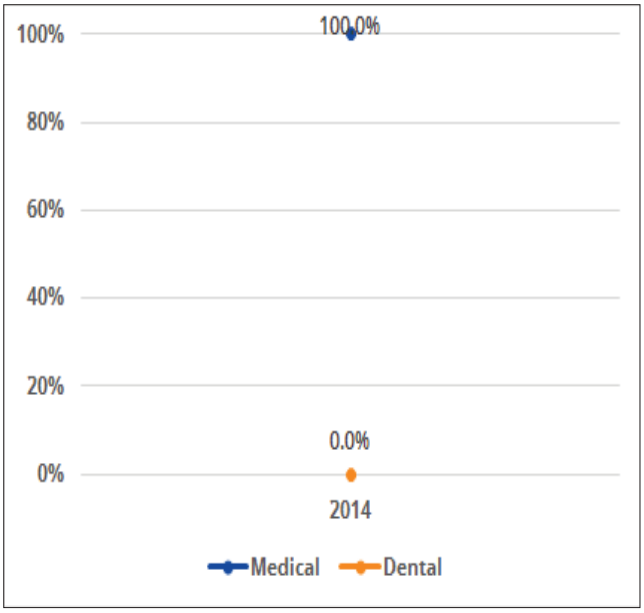
Source: UDS, 2014

Age of Patient Caseload, 2012, 2013, 2014



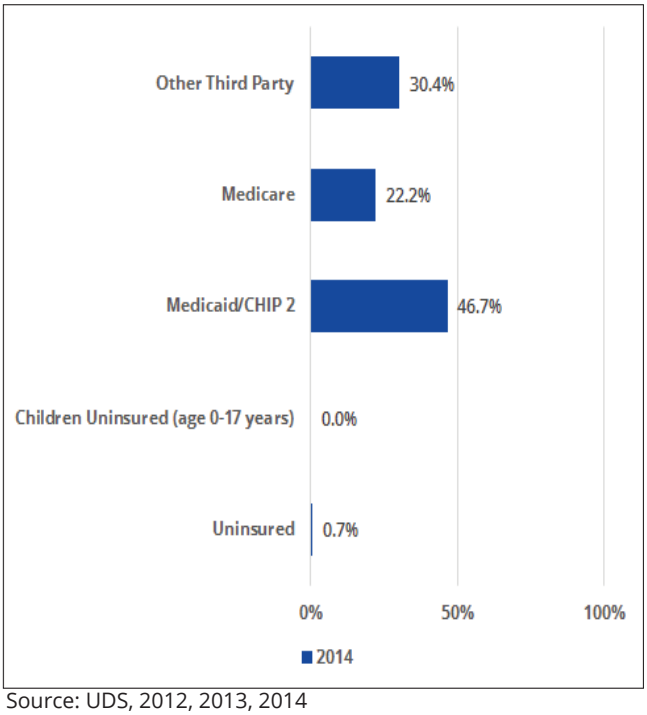
Source: UDS, 2012, 2013, 2014

Medical and Dental Visits as a Percent of Total Patients, 2012, 2013, 2014



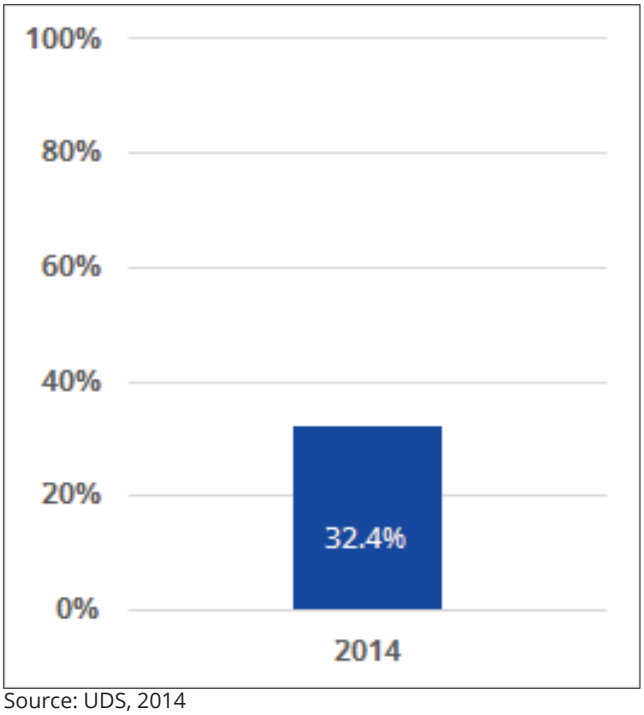
Source: UDS, 2012, 2013, 2014

Total Patient Caseload by Insurance Status, 2012, 2013, 2014



Source: UDS, 2012, 2013, 2014

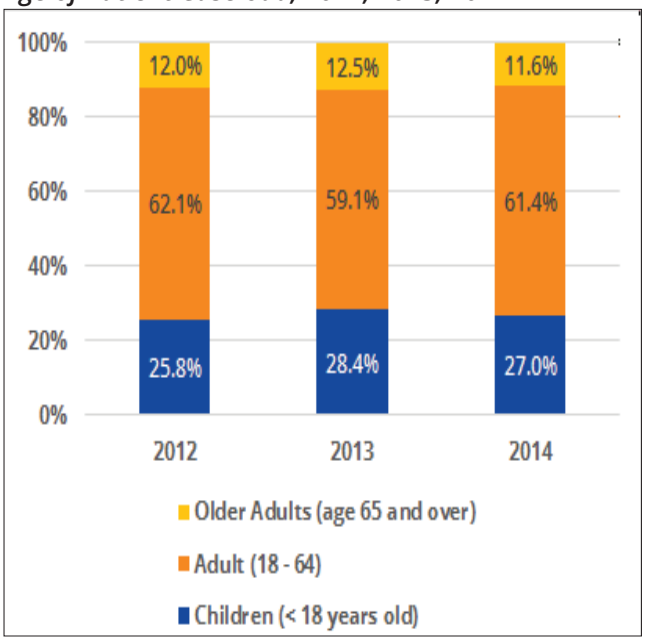
Adults Screened for Tobacco Use and Receiving Cessation Intervention, 2014



Source: UDS, 2014

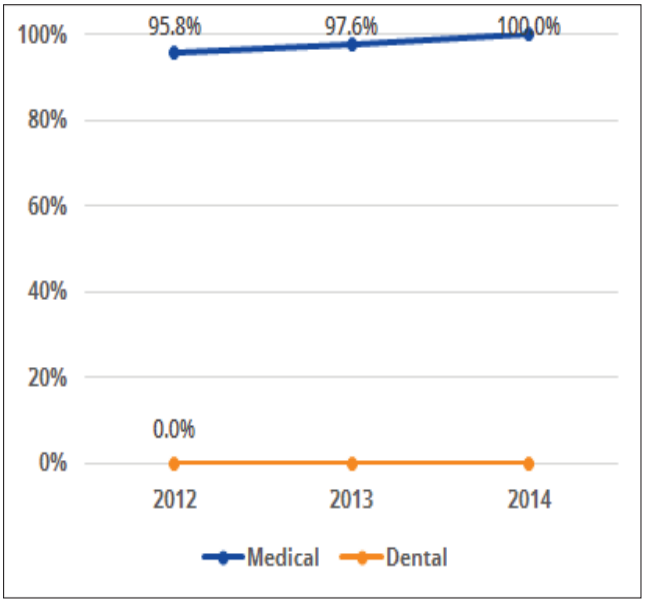
Regional Health Care Affiliates, Inc., FQHC in Providence, Kentucky

Age of Patient Caseload, 2012, 2013, 2014



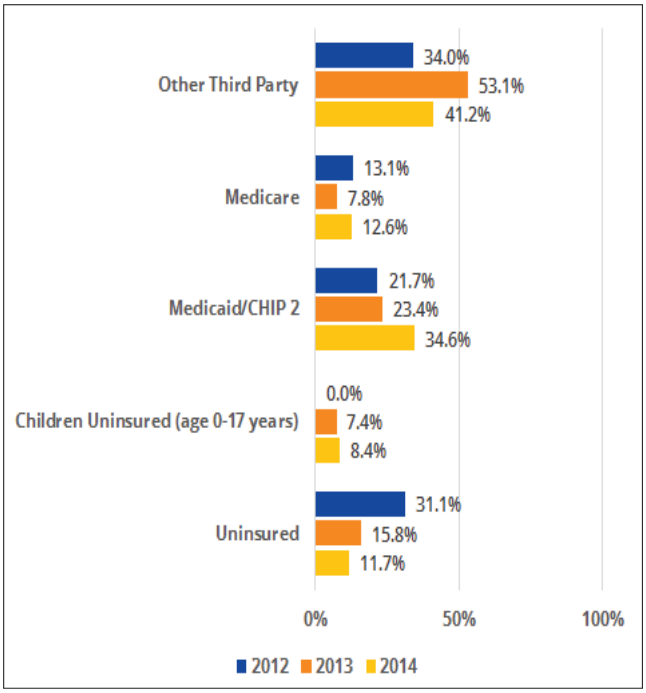
Source: UDS, 2012, 2013, 2014

Medical and Dental Visits as a Percent of Total Patients, 2012, 2013, 2014



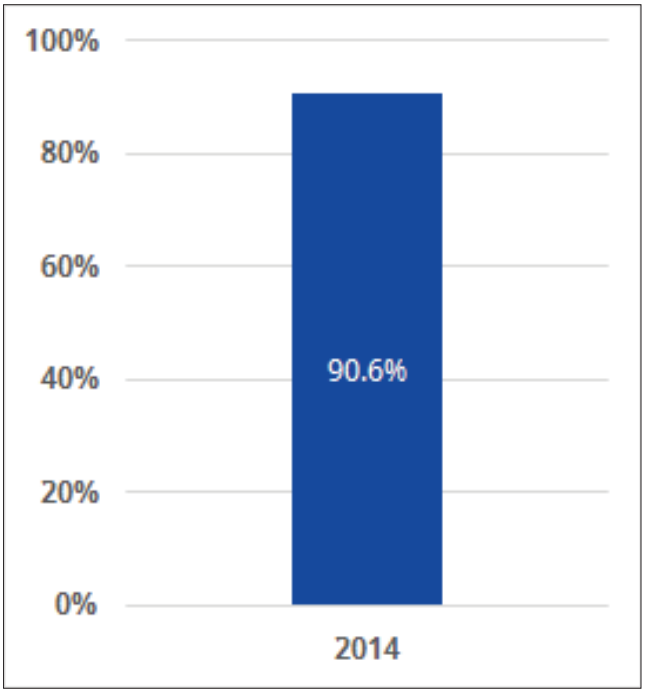
Source: UDS, 2012, 2013, 2014

Total Patient Caseload by Insurance Status, 2012, 2013, 2014



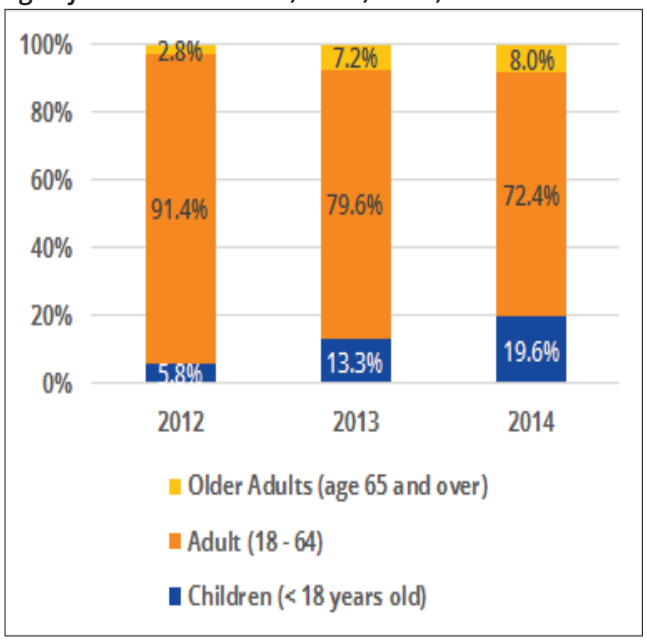
Source: UDS, 2012, 2013, 2014

Adults Screened for Tobacco Use and Receiving Cessation Intervention, 2014



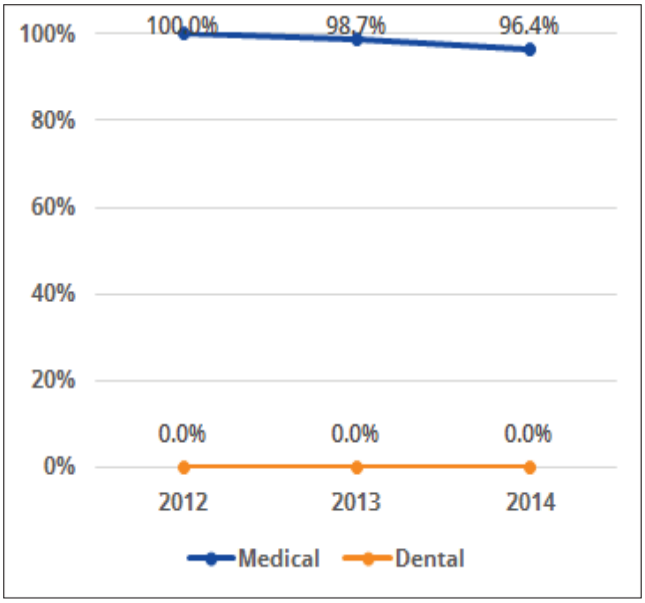
Source: UDS, 2014

Age of Patient Caseload, 2012, 2013, 2014



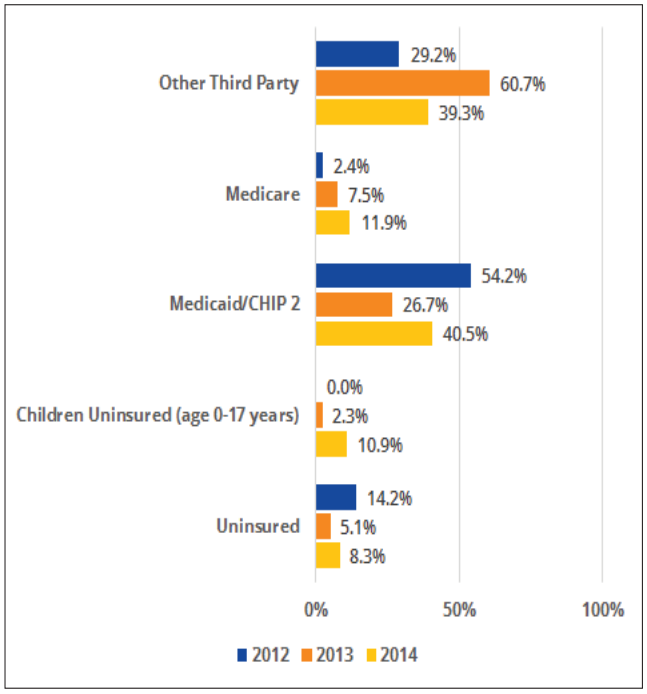
Source: UDS, 2012, 2013, 2014

Medical and Dental Visits as a Percent of Total Patients, 2012, 2013, 2014



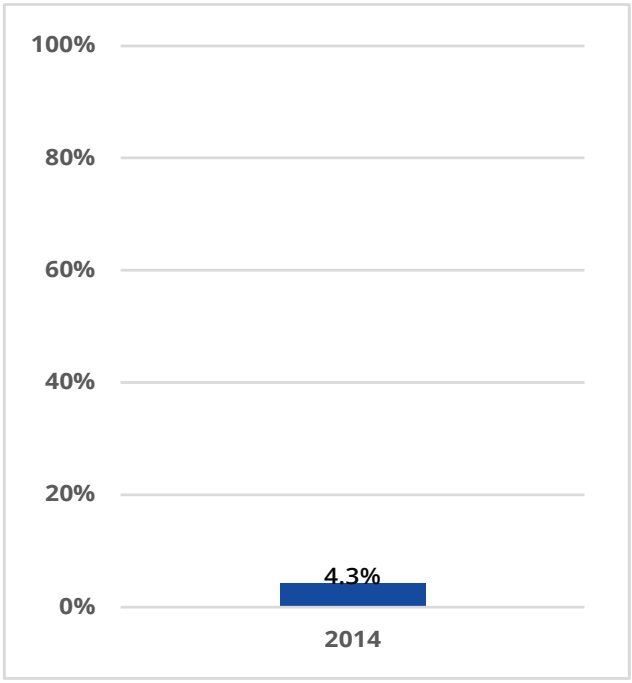
Source: UDS, 2012, 2013, 2014

Total Patient Caseload by Insurance Status, 2012, 2013, 2014



Source: UDS, 2012, 2013, 2014

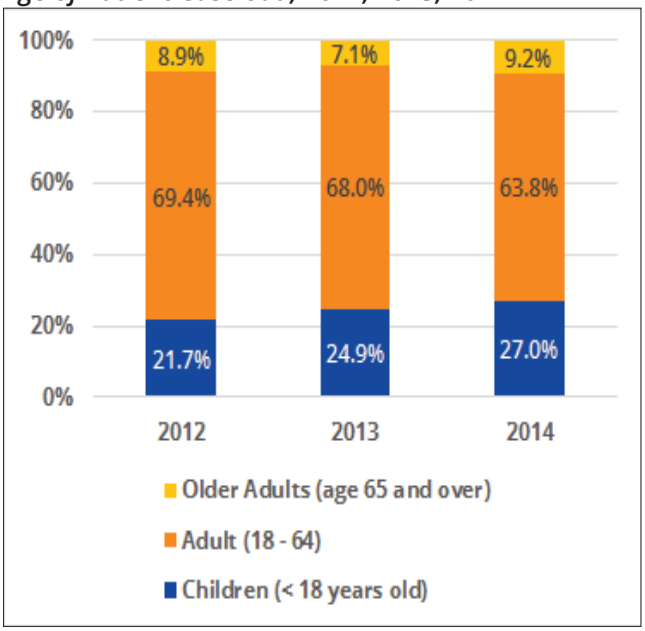
Adults Screened for Tobacco Use and Receiving Cessation Intervention, 2014



Source: UDS, 2014

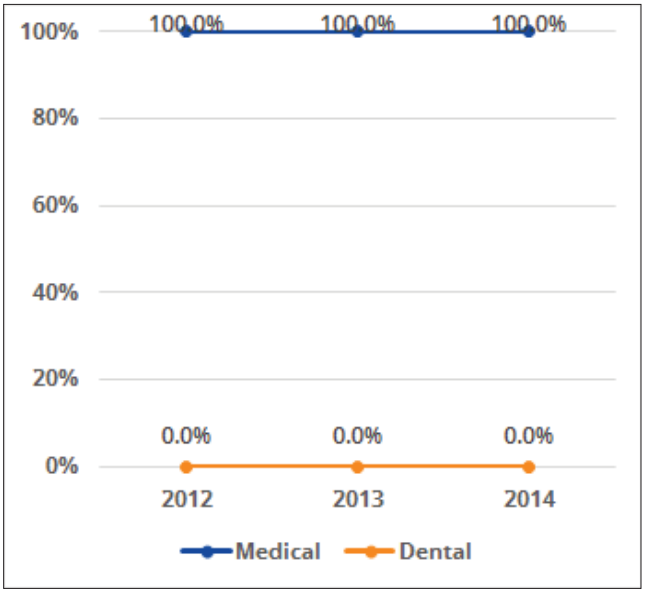
Triad Health Systems, Inc., FQHC in Warsaw, Kentucky

Age of Patient Caseload, 2012, 2013, 2014



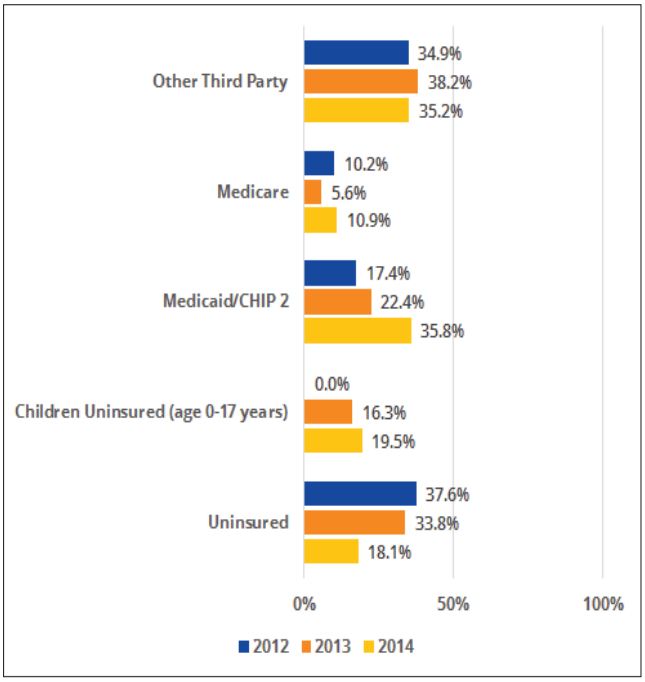
Source: UDS, 2012, 2013, 2014

Medical and Dental Visits as a Percent of Total Patients, 2012, 2013, 2014



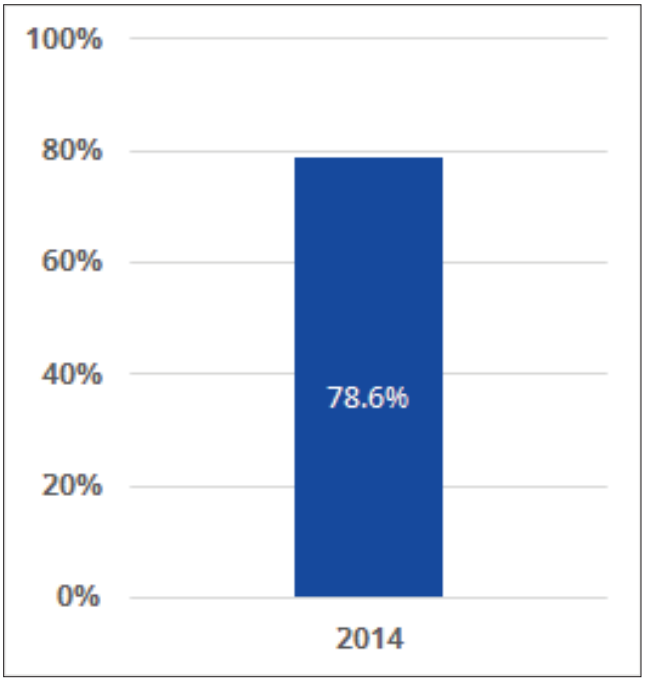
Source: UDS, 2012, 2013, 2014

Total Patient Caseload by Insurance Status, 2012, 2013, 2014



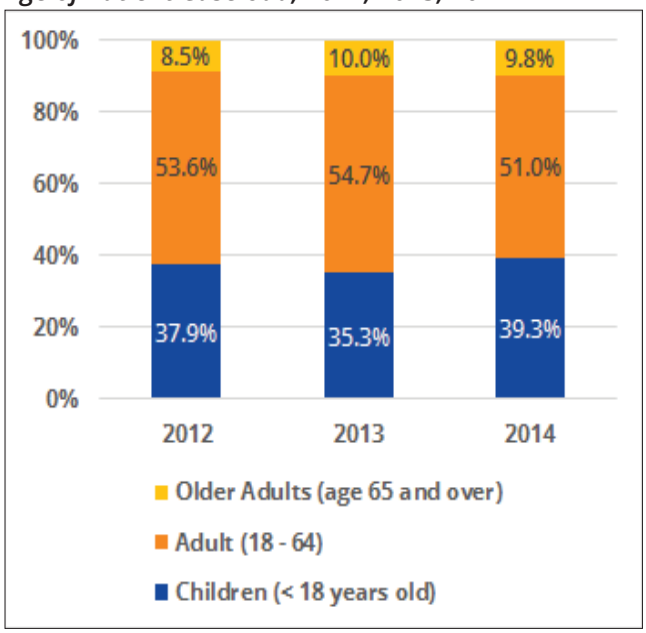
Source: UDS, 2012, 2013, 2014

Adults Screened for Tobacco Use and Receiving Cessation Intervention, 2014



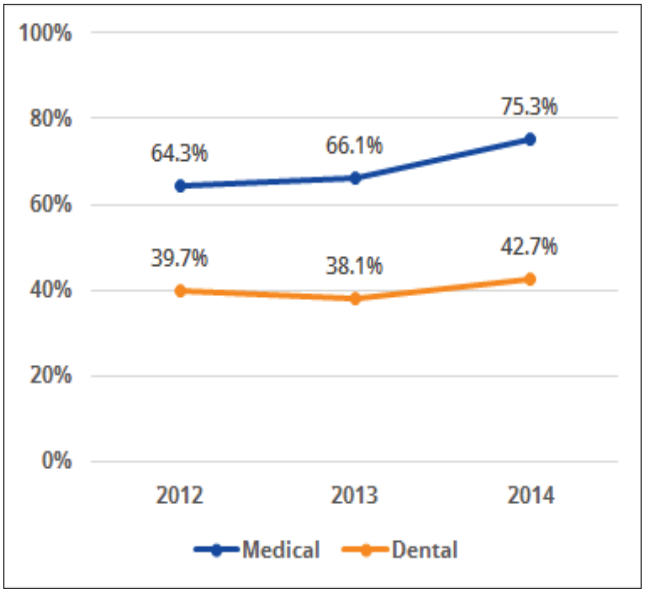
Source: UDS, 2014

Age of Patient Caseload, 2012, 2013, 2014



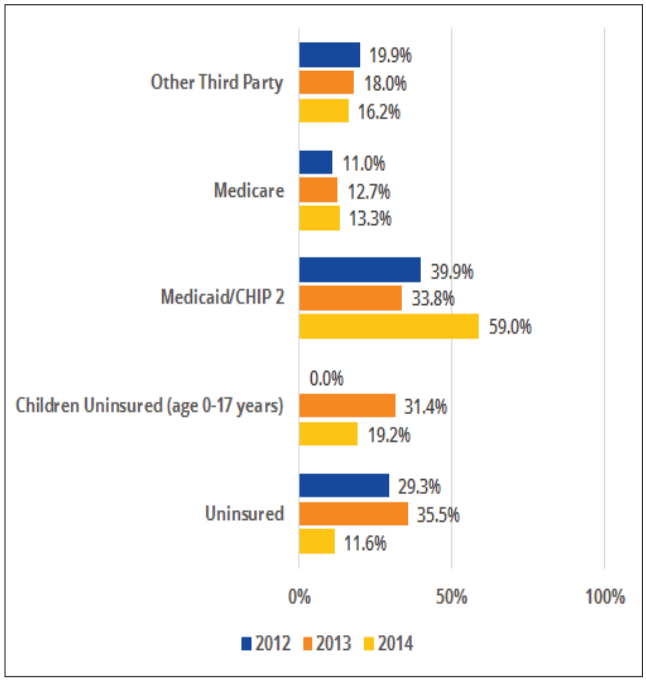
Source: UDS, 2012, 2013, 2014

Medical and Dental Visits as a Percent of Total Patients, 2012, 2013, 2014



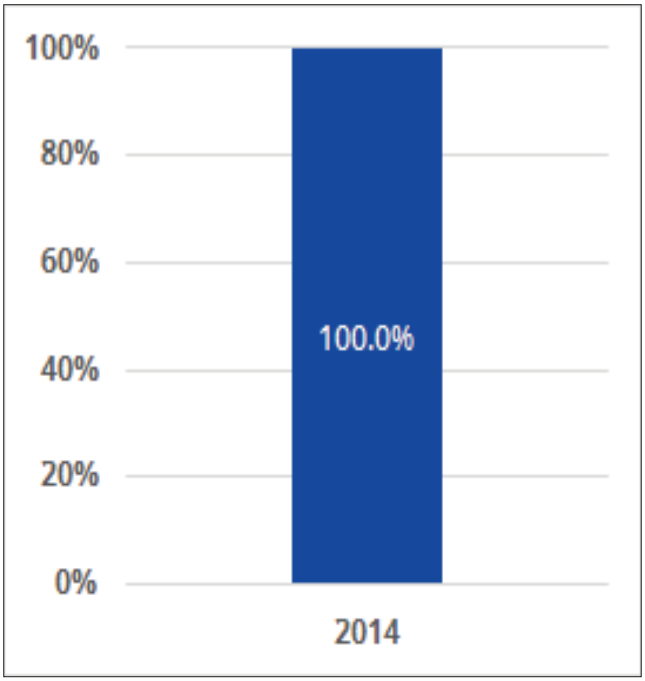
Source: UDS, 2012, 2013, 2014

Total Patient Caseload by Insurance Status, 2012, 2013, 2014



Source: UDS, 2012, 2013, 2014

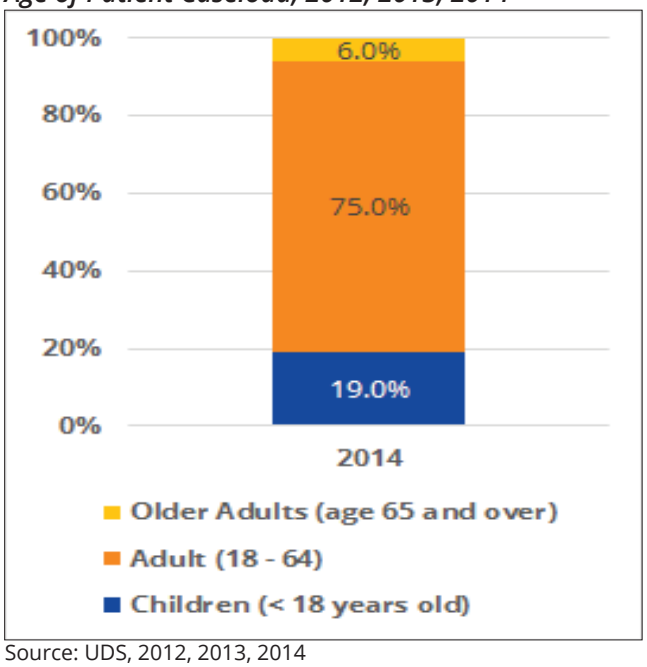
Adults Screened for Tobacco Use and Receiving Cessation Intervention, 2014



Source: UDS, 2014

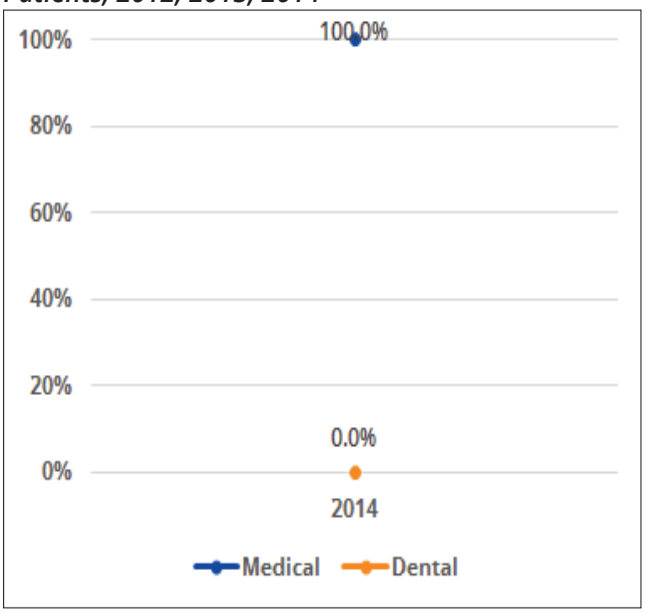
Shawnee Christian Healthcare Center, Inc., Look-Alike Health Center in Louisville, Kentucky

Age of Patient Caseload, 2012, 2013, 2014



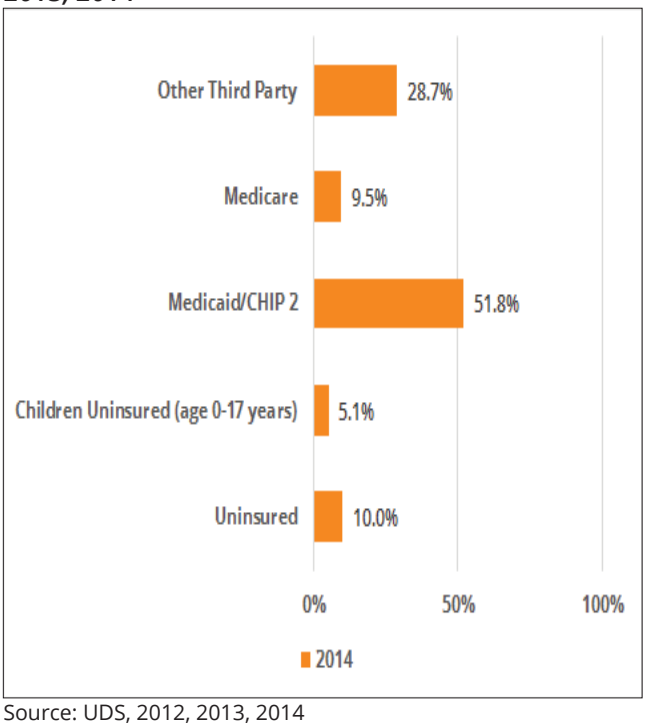
Source: UDS, 2012, 2013, 2014

Medical and Dental Visits as a Percent of Total Patients, 2012, 2013, 2014



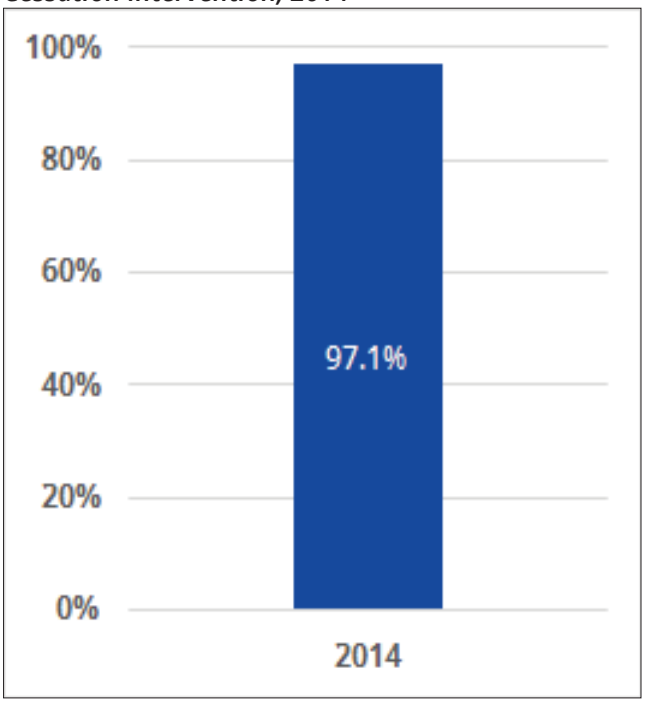
Source: UDS, 2012, 2013, 2014

Total Patient Caseload by Insurance Status, 2012, 2013, 2014



Source: UDS, 2012, 2013, 2014

Adults Screened for Tobacco Use and Receiving Cessation Intervention, 2014



Source: UDS, 2014

Appendix C

Dental Hygienists

The qualifications for licensure as a registered dental hygienist in Kentucky include the following:

Licensure by Examination:

- Graduation from a CODA accredited dental hygiene education program.
- Successful completion of the National Board Dental Hygiene examination.
- Successful passage of one of the regional clinical examinations within 5 years preceding the filing of an application for licensure: Council of Interstate Testing Agencies (CITA), Central Regional Dental Testing Services (CRDTS), Northeast Regional Board of Dental Examiners (NERB), Southern Regional Testing Agency (SRTA), or Western Regional Examining Board (WREB).
- Successful passage of the state jurisprudence examination.
- Proof of CPR certification.
- A criminal background check performed by the F.B.I. within the last 5 years.
- Verification of any license to practice dental hygiene that is currently held or was previously held in any state or jurisdiction within 3 months of the date of the application to the Kentucky dental board.

If an individual is applying for initial licensure by examination more than 2 years after fulfilling all the requirements of the CODA accredited dental hygiene program, he or she must hold a license to practice that is in good standing in another state or territory of the US or the District of Columbia. If the individual does not hold a license to practice dental hygiene in good standing, the individual must complete a board approved refresher course prior to receiving a license to practice dental hygiene in Kentucky.

If an individual was licensed in another state since graduation, he or she must provide verification of any license to practice in another state or jurisdiction within 3 months of the date the application is received at the office of the board. The board must complete an electronic query about the dental hygienist through the National Practitioner Data Bank Report and AADE Clearing House Report.

Licensure by Credential:

- Graduation from a CODA accredited dental hygiene school, college or department of a university.
- Successful completion of the National Board Dental Hygiene Examination.
- Successful passage of a state, regional, or national clinical examination used to determine clinical competency in a state or territory of the US or District of Columbia.

- Submit an affidavit stating the individual has been engaged in the legal practice of dental hygiene for five (5) of the past six (6) years in a state or territory of the US or the District of Columbia in which the qualifications for licensure were equal to or higher than those for licensure in Kentucky.
- Successful passage of the state jurisprudence examination.
- Proof of CPR certification.
- Submit a criminal background check performed by the F.B.I. for the last 5 years.
- Provide verification of any license to practice dental hygiene that is currently held or was previously held in any state or jurisdiction within 3 months of the date of the application to the Kentucky dental board.

Requirements for Charitable Limited License:

- Submission of a completed, notarized application for charitable dental hygiene licensure.
- The dental hygienist must not be subject to disciplinary action that would prevent licensure.
- The applicant must have a license in good standing to practice dental hygiene in another state.
- Provide a written explanation for any positive returns on the query to the National Practitioner Data Bank.

Individuals with a charitable limited license shall only work with charitable entities registered with the Cabinet for Health and Family Services. The dental hygienist is subject to the following requirements:

- The dental hygienist must perform duties without expectation of compensation or charge to the individual and without payment or reimbursement by any governmental agency or insurer.
- The dental hygienist must have a charitable limited license.
- The individual must notify the sponsor of the charitable clinic and its board of intent to provide services in the clinic.

Licenses to practice dental hygiene are issued by the Kentucky Board of Dentistry and expire on December 31 of odd-numbered years. Dental hygienists are required to complete 30 hours of continuing education preceding application for licensure renewal. In addition, dental hygienists must maintain no more than a 30 day lapse in CPR certification. The training must meet or exceed the guidelines set by the American Heart Association. The dental hygienist must be current with the CHFS-approved HIV/AIDS course.

Dental hygienists work under the direct supervision of a licensed dentist. Dental hygienists may work under general supervision for not more than fifteen consecutive full business days, if they meet the following requirements:

- Have two years (a minimum of 3,000 hours) of experience in the practice of dental hygiene.
- Have successfully completed a board approved medical emergency course.
- Must comply with written emergency protocols established by the supervising dentist.

The patient must have been examined by the supervising dentist within the previous seven months. The patient must sign an informed consent and must be categorized as ASA I or ASA II.

Registered dental hygienists in Kentucky may provide the following services:

- Dental hygiene assessment or screening,
- Scaling and root planning,
- Nonsurgical therapy,
- Removing calcareous deposits,
- Removing accumulated accretion from beneath the free gingival margin,
- Cavity prevention procedures,
- Periodontal procedures that require administering antimicrobial agents, and
- Other general activities outlined in the treatment care plan which are not prohibited by administrative regulation by the state board of dentistry.

Other duties may include:

- Administration of Atridox,
- Administration of local anesthetics by block and by infiltration,
- Applying bases and cavity liners,
- Adjusting bands and bonding brackets,
- Bleaching (as long as educational requirements are met),
- Removal of cement from coronal surfaces,
- Diagnadent (laser caries detection) ,
- Examine oral cavity (inspecting and information gathering only),
- Fabricating, placing, or removing temporary crowns,
- Placing fluoride
- Perform laser debridement,
- Placement and removal of Actisite,
- Placing (condensation), carving, polishing amalgam restorations,
- Placing and finishing resin restorations,
- Starting intravenous access lines,
- Topical application of anesthetics.
- Administering and monitoring nitrous oxide analgesia (if educational requirements are met),
- Exposing radiographs,
- Taking preliminary Iimpressions (only if the impression is not used for an orthodontic appliance),
- Performing pulp vitality testing,
- Placing and removing matrices,
- Placing and removing periodontal dressings,
- Placing and removing rubber dams,
- Placing and packing or removal of retraction cords,
- Probing,
- Pumicing,
- Removal of sutures,
- Sealant application, and
- Supra gingival and subgingival scaling.

Dental hygienists in Kentucky may practice public health dental hygiene if they meet the following requirements:

- Submit a completed public health registered dental hygienist application.
- Meet requirements established in KRS 313.040(8).
- Provide documentation (eg, payroll or employment records) of 2 years or 3,000 hours of experience in dental hygiene practice.
- Complete a live 3 hour board-approved course on the identification of potential medical emergencies.
- Complete at least 5 hours of continuing education in the area of public health or public dental health during each renewal cycle.

A public health registered dental hygienist may perform dental hygiene services only under the supervision of a governing board of health. Services are limited to preventive services. The public health registered dental hygienist may only treat a patient who is in the ASA (American Society of Anesthesiologists) Patient Physical Status Classification of ASA I or ASA II. Patients must have informed consent prior to receiving preventative services. The consent must include the name of the public health entity (including the name of the dentist assuming responsibility and control), an inquiry as to the current dentist, and a statement that services are provided by a dental hygienist without the direct supervision of a dentist.

Public health registered dental hygienists may practice in a government-created public health program at:

- Local health departments,
- Public or private educational institutions that provide Head Start, preschool, elementary, and secondary instruction to school-aged children under the jurisdiction of the State Board of Education, and that have an affiliation agreement with the health department of jurisdiction,
- Mobile and portable dental health programs under contract with a board of health, and
- Public or private institutions under the jurisdiction of a federal, state, or local agency.

Dental Assistants

In Kentucky, a dental assistant is a non-licensed person who performs basic supportive tasks under the direct supervision of a licensed dentist. The Kentucky Dental Practice Act does not require graduation from an education or training program to become a dental assistant. Dental assistants may receive on-the-job training by their employing (and/or supervising) dentist. All dentists must register the dental assistants in the dental practice with the Board of Dentistry.

Direct supervision of dental assistants requires the immediate presence of the supervising dentist who assigns particular tasks to the dental assistant and monitors the quality of the dental assistant's work upon its completion.

The supervising dentist must:

- Register the dental assistant on his or her Application for Renewal of Dental Licensure.
- Maintain a personnel file for the registered dental assistant that contains the following[97]:
    - A copy of proof of current CPR certification,
    - If applicable, a copy of certificates of completion of courses in Coronal Polishing, Radiation Safety, Radiation Techniques Court, Starting IV Access Lines (if the registered dental assistant completed these course), and expanded duties,
    - The dentist's statement attesting to the competency of the registered dental assistant in the procedures delegated from the Delegated Duties List.

If qualified under the rules of the Board of Dentistry, a dental assistant may perform coronal polishing or place and start intravenous (IV) access lines under the direct supervision of a licensed dentist in Kentucky. To perform coronal polishing procedures, a registered dental assistant must successfully complete an 8-hour course at a CODA-accredited institution and obtain a certificate of completion from the authorized institution. To start intravenous (IV) access lines, a registered dental assistant must successfully complete a board-approved course in starting IV lines and submit documentation of course completion to the supervising dentist to retain in the employee personnel file.

With a dentist's direct orders, a registered dental assistant may deliver nitrous oxide at the rate specified by the supervising dentist under direct supervision. A registered dental assistant may also assist in the management of emergencies when under direct supervision of minimal pediatric sedation, moderate enteral sedation, moderate parenteral sedation, moderate pediatric sedation, moderate enteral sedation, and deep sedation or general anesthesia permit holders.

[97] The Kentucky Dental Board office does not keep any documentation for registered dental assistants.

Under the direct supervision of a dentist with a sedation permit, a dental assistant may:

- Record vital sign measurements in the sedation record.
- Apply noninvasive monitors.
- Perform conscious observation of patients and noninvasive monitors appropriate to the level of sedation.
- Report monitoring parameters to the operating dentist on a periodic basis or when changes occur.
- Remove IV lines (for moderate parental sedation, moderate pediatric sedation, deep sedation, or general anesthesia permit holders only).

A dental assistant may expose radiographs under direct supervision. To legally operate dental x-rays and perform dental radiographic procedures in the state of Kentucky, a dental assistant must:

- Pass the national DANB Radiation Health and Safety (RHS) exam, or
- Successfully complete a CODA-approved course in radiation safety and technique, or
- Complete a 6-hour Kentucky Board-approved course in dental radiography safety and complete either a minimum of 4 hours of instruction in dental radiography technique while under the employment and supervision of the dentist in the office or a four hour course in radiography technique approved by the Kentucky Board of Dentistry.

Dental assistants may also administer medications into an existing IV line upon the verbal order of a permit holder under direct supervision (for moderate parenteral sedation, moderate pediatric sedation, deep sedation, or general anesthesia permit holders).

Expanded Function Dental Assistant (EFDA) is not a specifically recognized certification in the state of Kentucky. Dental assistants who receive formal training or education in expanded duties are not thus certified in Kentucky. An employing dentist must ascertain that the dental assistant is qualified and approved to perform particular expanded dental assistant duties and records of course completion must be maintained. These duties may only be performed by the dental assistant under the direct supervision of the supervising dentist.

The following expanded functions may be assigned to a dental assistant with appropriate training under direct supervision:

- Supragingival scaling procedures,
- Apply pit and fissure sealants,
- Apply desensitizing agents or topical anesthetics,
- Remove sutures,
- Take preliminary impressions,
- Take final impressions,
- Monitor nitrous oxide and monitor vital signs,

- Place and cement temporary or provisional crowns,
- Place amalgam,
- Carve amalgam,
- Place periodontal dressings,
- Re-bond brackets/removal of bonded brackets, and
- Apply bleaching agents.

Other tasks that may be assigned to a dental assistant with or without formal credential include:

- Application of topical fluoride, and
- Placing cavity liners and bases.

The following functions are not permitted at any level by a dental assistant in Kentucky:

- The making of final impressions from which casts are made to construct any dental restoration.
- Diagnosis.
- The practice of dental hygiene or the performance of tasks of a licensed dental hygienist that requires the use of any instrumentation that may elicit the removal of calcareous deposits or accretions on the crowns and roots of teeth.
- Treatment planning and prescription, including prescriptions for drugs or medicaments, or the authorization of restorative, prosthodontic, or orthodontic appliances.
- Surgical procedures on hard and soft tissues of the oral cavity, or any other intraoral procedure that contributes to or results in an irreversible alteration of the oral anatomy.
- Administration of injectable medication or anesthesia unless otherwise authorized by law.
- Cutting of hard or soft tissues.
- Any intraoral procedure which is directly used in the fabrication of an appliance, which when worn by the patient, could come into direct contact with hard or soft tissue.

Bibliography

BIBLIOGRAPHY

American College of Obstetricians and Gynecologists and the California Dental Association Foundation. Oral health during pregnancy and early childhood: evidence-based guidelines for health professionals. *J Calif Dent Assoc.* 2010; 391-403, 405-40. http://www.cdafoundation.org/Portals/0/pdfs/poh_guidelines.pdf.

American College of Obstetricians and Gynecologists. Oral health care during pregnancy and through the lifespan. Committee Opinion No. 569. *Obstet Gynecol.* 2013; 122:417-22. http://www.acog.org/-/media/Committee-Opinions/Committee-on-Health-Care-for-Underserved-Women/co569.pdf?dmc=1&ts=20151214T1111143843.

American Community Survey, US Census Bureau. Five-Year Estimates 2009-2013. http://www.census.gov/acs/www/.

American Community Survey, US Census Bureau. Public Use Microdata Sample (PUMS) Documentation. http://www.census.gov/acs/www/data_documentation/public_use_microdata_sample/.

American Dental Association, 2013 Survey of Dental Practice. http://www.ada.org/~/media/ADA/Science%20and%20Research/HPI/Files/HPIData_SDPE_2013.ashx.

American Dental Association, 2014 Survey of Dental Practice. http://www.ada.org/~/media/ADA/Science%20and%20Research/HPI/Files/HPIData_SDPC_2014.ashx.

American Dental Association. Dentist Supply in the US: 1993-2011. Table 5: Dentists per 100,000 Population (by State) -Dentists Working in Dentistry. 2011. http://www.ada.org/en/science-research/health-policy-institute/data-center/supply-of-dentists.

American Dental Association. Dentist Supply in the US: 1993-2011. Table 6 Dentists per 100,000 Population (by State) – Dentists Providing Clinical Care. 2011. http://www.ada.org/en/science-research/health-policy-institute/data-center/supply-of-dentists.

American Dental Association. Dentist Supply in the US: 1993-2011. Table 7: Dentists per 100,000 Population – Dentists in Private Practice. 2011. http://www.ada.org/en/science-research/health-policy-institute/data-center/supply-of-dentists.

American Dental Association. Survey of Advanced Dental Education for 2014-15. Table 8: Orthodontics and Dentofacial Orthopedics – Applications per Program, Enrollment, and Graduates, 2004-2005 to 2014-15. July 2015. Date last modified October 2015. www.ada.org/~/.../SADV_2014-15_final.ashx.

American Dental Association. Survey of Advanced Dental Education for 2014-15. Table 10: Periodontics – Applications per Program, Enrollment, and Graduates, 2004-5 to 2014-15. July 2015. Date last modified October 2015. www.ada.org/~/.../SADV_2014-15_final.ashx.

American Dental Association. Survey of Advanced Dental Education for 2014-15. Table 12. General Practice Residency – Applications per Program, Enrollment, and Graduates, 2004-5 to 2014-15. July 2015. Date last modified October 2015. www.ada.org/~/.../SADV_2014-15_final.ashx.

American Dental Association. Survey of Allied Dental Education Programs, 2013-14. March 2015. www.ada.org/~/.../SADV_2013-14_final.ashx.

American Dental Association. Survey of Allied Dental Education Programs, 2013-14. Table 11. Prosthodontics – Applications per Program, Enrollment, and Graduates, 2003-4 to 2013-14. March 2015. www.ada.org/~/.../SADV_2013-14_final.ashx.

American Dental Association. Survey of Allied Dental Education Programs 2013-2014. Table 13. General Dentistry Programs – Applications per Program, Enrollment, and Graduates, 2003-4 to 2013-14. March 2015. www.ada.org/~/.../SADV_2013-14_final.ashx.

American Dental Education Association. Educational Debt. http://www.adea.org/GoDental/Money_Matters/Educational_Debt.aspx.

Anderson, A, Jewell T, Jones K, et al. Kentucky Pregnancy Risk Assessment Monitoring System (PRAMS) Pilot Project 2008 Data Report. Division of Maternal and Child Health, Kentucky Cabinet for Health and Family Services. http://chfs.ky.gov/NR/rdonlyres/888F8BBC-3DF7-47A4-B34E-8BD7BABA1E09/0/PRAMS-REPORT08finalwithcovers.pdf.

Appalachian Regional Commission. The Appalachian Region. http://www.arc.gov/appalachian_region/TheAppalachianRegion.asp.

Center for Health Workforce Studies and the American Dental Hygienist Association. Executive Summary. The 2007 Dental Hygiene Practitioner Survey. 2008.

Center for Health Workforce Studies and the American Dental Hygienist Association. Technical Report. Dental Hygiene Education Program Director Survey, 2006. 2007.

Center for Healthcare Research & Transformation. Federally Qualified Health Centers: An Overview. July 2013. http://www.chrt.org/publication/federally-qualified-health-centers-overview/.

Center for Workforce Studies of the Association of American Medical Colleges. Young physicians and their initial preferences: A summary of findings from focus groups conducted at US residency programs. *Journal of the ASPR*. 2009; 16(2): 30-31. http://c.ymcdn.com/sites/www.aspr.org/resource/resmgr/imported/young-physicians-and-their-initial-practice-preferences.pdf.

Centers for Disease Control and Prevention. Youth Online: High School YRBS. Kentucky 2013 and United States 2013 Results. https://nccd.cdc.gov/youthonline/App/Results.aspx?TT=G&OUT=0&SID=HS&QID=QQ&LID=KY&YID=2013&LID2=XX&YID2=2013&COL=&ROW1=&ROW2=&HT=QQ&LCT=&FS=S1&FR=R1&FG=G1&FSL=&FRL=&FGL=&PV=&C1=KY2013&C2=XX2013&QP=G&DP=1&VA=CI&CS=N&SYID=&EYID=&SC=DEFAULT&SO=ASC&pf=1&TST=True.

Centers for Disease Control and Prevention. Youth Risk Behavior Surveillance System. http://www.cdc.gov/healthyyouth/data/yrbs/overview.htm.

Centers for Disease Control and Prevention: Behavioral Risk Factor Surveillance System. Atlanta, GA: Centers for Disease Control and Prevention. Date last modified November 13, 2015. http://www.cdc.gov/brfss/questionnaires/index.htm.

Centers for Disease Control and Prevention: Oral Health Data. Atlanta, GA: Centers for Disease Control and Prevention. Date last modified April 1, 2015. http://www.cdc.gov/oralhealthdata/.

Centers for Disease Control and Prevention: Oral Health. My Water's Fluoride. State Fluoridation Reports: Kentucky. Atlanta, GA: Centers for Disease Control and Prevention. https://nccd.cdc.gov/DOH_MWF/Reports/FlStatus_Rpt.aspx.

Centers for Disease Control and Prevention: The Pregnancy Risk Assessment Monitoring System (PRAMS). Atlanta, GA: Centers for Disease Control and Prevention. Date last modified May 14, 2015. http://www.cdc.gov/prams/index.htm.

Centers for Medicare & Medicaid Services, Medicaid.gov. Kentucky. 2016. https://www.medicaid.gov/medicaid-chip-program-information/by-state/kentucky.html.

Centers for Medicare and Medicaid. Managed Care in Kentucky. https://www.medicaid.gov/medicaid-chip-program-information/by-topics/delivery-systems/managed-care/downloads/kentucky-mcp.pdf.

Child and Adolescent Health Measurement Initiative. The National Survey of Children's Health. Data Resource for Child and Adolescent Health. 2013. http://www.childhealthdata.org/learn/NSCH.

Choi M. The impact of Medicaid insurance coverage on dental service use. *Journal of Health Economics*. 2011; 30(5):1020-1031. http://www.sciencedirect.com/science/article/pii/S016762961100110X#.

Collins S, Rasmussen W, Doty M, et al. Too High a Price: Out of Pocket Health Care Costs in the United States. *The Commonwealth Fund.* 2014; 29 (1784). http://www.commonwealthfund.org/publications/issue-briefs/2014/nov/out-of-pocket-health-care-costs.

Dawkins E, Michimi A, Ellis-Griffith G, et al. Dental caries among children visiting a mobile dental clinic in South Central Kentucky: a pooled cross-sectional study. *BMC Oral Health*. 2013; 13(1):19. http://www.biomedcentral.com/content/pdf/1472-6831-13-19.pdf.

Deloitte Consulting. The Commonwealth of Kentucky Health Care Workforce Capacity Report. May 2013. http://healthbenefitexchange.ky.gov/Documents/KY%20Healthcare%20Workforce%20Capacity%20Report%20FINAL%205_28_13.pdf.

Division of Occupational Employment Statistics, US Bureau of Labor Statistics: May 2014 State Occupational Employment and Wage Estimates, Kentucky. Washington, DC: US Bureau of Labor Statistics. Date last modified March 2015. http://www.bls.gov/oes/current/oes_ky.htm#31-0000.

Division of Oral Health, Centers for Disease Control and Prevention: Community Water Fluoridation. Fluoridation Basics. Atlanta, GA: Centers for Disease Control and Prevention. Date last modified July 28, 2015. http://www.cdc.gov/fluoridation/basics/index.htm.

Foundation for a Healthy Kentucky and Interact for Health. Kentucky Health Issues Poll (KHIP). Most Kentucky adults have had dental visit in past year. March 2014. http://www.healthy-ky.org/sites/default/files/KHIP%20Dental%20visits%20FINAL%20032114.pdf.

Foundation for a Healthy Kentucky and Interact for Health. Kentucky Health Issues Poll (KHIP). http://healthy-ky.org/presentations-reports/reports/kentucky-health-issues-poll.

Foundation for a Healthy Kentucky and the Health Foundation of Greater Cincinnati. Kentucky Health Issues Poll (KHIP). Many lack access to dental care in Kentucky. April 2013. http://www.healthy-ky.org/sites/default/files/KHIP_Oral%20Care_FINAL_041913.pdf.

Graham J. Factors influencing the choice of practice location for recent dental graduates. JADA. 1977; 94(5):821-825.

Hall M, Holland K. Systematic screening and assessment of workforce innovations in the provision of preventive oral health services. Evaluability assessment site visit summary report, UK North Fork Valley Dental Outreach Program Hazard, Kentucky. December 2012. https://ruralhealth.med.uky.edu/sites/default/files/FINAL_Summary_Report_UK_North_Fork_Valley_Dental_Outreach_Program_Formatted.pdf.

Hardison J, Cecil J, Mullins M, et al. Final Results: 2001 Kentucky Children's Oral Health Survey: State and Regional Comparisons of Key Oral Health Measures in Kentucky. Kentucky Department for Public Health and the University of Kentucky. 2003. http://chfs.ky.gov/nr/rdonlyres/a1066bc6-7bce-4f12-ba3a-1d568af3fcdb/0/kcohsregionalprofiles_01.pdf.

Hardison J, Cecil J, Mullins M, et al. The 2001 Kentucky's Children's Oral Health Survey: Findings for children ages 24 to 59 months and their caregivers. *Pediatric Dentistry*. 2003; 24(4):365-372. http://www.aapd.org/assets/1/25/Hardison4-03.pdf.

Health Care Access Branch, Oral Health Program, Kentucky Department for Public Health. Statewide Oral Health Strategic Plan, the Commonwealth of Kentucky – 2006. May 2006. http://chfs.ky.gov/NR/rdonlyres/69AA0FAC-4479-49D4-8B5F-BD350C4E7594/0/262366UofKRoundIII.pdf.

Health Resources and Services Administration Data Warehouse, US Department of Health and Human Services: Designated Health Professional Shortage Areas Statistics. Fourth Quarter of Fiscal Year 2014. Designated HPSA Quarterly Summary. November 10, 2014. http://datawarehouse.hrsa.gov/HGDWReports/RT_App.aspx?rpt=HH.

Health Resources and Services Administration, US Department of Health and Human Services. Dental HPSA Designation Criteria. http://bhpr.hrsa.gov/shortage/hpsas/designationcriteria/dentalhpsacriteria.html.

Health Resources and Services Administration, US Department of Health and Human Services. Shortage Designation: Health Professional Shortage Areas & Medically Underserved Areas/Populations. http://www.hrsa.gov/shortage/.

Healthy People 2020, Office of Disease Prevention and Health Promotion. Tobacco Use. Overview. Washington, DC: Office of Disease Prevention and Health Promotion. Date last modified January 12, 2016. https://www.healthypeople.gov/2020/topics-objectives/topic/tobacco-use.

Healthy People, Office of Disease Prevention and Health Promotion. Oral Health. Date last modified January 12, 2016. http://www.healthypeople.gov/2020/topics-objectives/topic/oral-health/objectives#4993.

Henry R, Sallee N, Durham L. The Kentucky Elder Oral Health Survey: 2005 Executive Summary. Kentucky Department for Public Health. http://chfs.ky.gov/nr/rdonlyres/712d2e9b-e6c3-46ad-b705-4f0f59bde20b/0/51106executivesummarywithpagenumbers.pdf.

Henry R. Kentucky's Dental Access Summit, May 24-25, Lexington, KY. Kentucky Dental Health Coalition. May 2001. http://www.astdd.org/docs/KentuckySummitReport.pdf.

Institute of Medicine and the National Research Council. Improving Access to Oral Health care for Vulnerable and Underserved Populations. The National Academies Press. July 2011. https://iom.nationalacademies.org/~/media/Files/Report%20Files/2011/Improving-Access-to-Oral-Health-Care-for-Vulnerable-and-Underserved-Populations/oralhealthaccess2011reportbrief.pdf.

Isman R, Isman B. Oral health America white paper: Access to oral health services in the United States 1997 and beyond. *Oral Health America*. 1997.

Kandel E, Richards J, Binkley C. Childhood caries in the state of Kentucky, USA: a cross-sectional study. *BMC Oral Health*. 2012; 12(1):38. http://www.biomedcentral.com/content/pdf/1472-6831-12-38.pdf.

Kann L, Kinchen S, Shanklin S, et al. Youth risk behavior surveillance--United States, 2013. *MMWR Surveill Summ*. 2014; 63(4):1-168. http://www.cdc.gov/mmwr/pdf/ss/ss6304.pdf.

Kanotra S. Kentucky Behavioral Risk Factor Surveillance (KyBRFSS) Data. Department for Public Health, Cabinet for Health and Family Services. 2014. http://chfs.ky.gov/NR/rdonlyres/CC7425CB-575C-4C47-8B80 E499FCBE9CC2/0/2015BRFSSProfiles.pdf.

Kentucky Cabinet for Economic Development. Kentucky Economic Development Guide 2015. http://siteselection.com/cc/kentucky/.

Kentucky Cabinet for Health and Family Services, Department for Public Health. MCH Forum Findings in Brief: Dental Health, 2009. 2010. http://chfs.ky.gov/dph/mch/maternal+and+child+health+(mch)+needs+assessment+results.htm.

Kentucky Cabinet for Health and Family Services, Department for Public Health: Oral/Dental Health. Frankfort, KY: Kentucky Cabinet for Health and Family Services. Date last modified May 29, 2014. http://chfs.ky.gov/dph/mch/cfhi/oralhealth.htm.

Kentucky Cabinet for Health and Family Services, Department for Public Health: Oral/Dental Health. Rural School Fluoridation. Frankfort, KY: Kentucky Cabinet for Health and Family Services. Date last modified May 29, 2014. http://chfs.ky.gov/dph/mch/cfhi/oralhealth.htm.

Kentucky Department of Education. 156.160. Promulgation of Administrative Regulations by Kentucky Board of Education. http://www.lrc.ky.gov/Statutes/statute.aspx?id=40139.

Kentucky Department of Education: Student Health Data. Frankfort, KY: Office of Guiding Support Services/General Counsel, Division of Communications, Kentucky Department of Education. Date last modified October 2, 2015. http://education.ky.gov/districts/SHS/Pages/Student-Health-Data.aspx.

Kentucky Department of Education: Student Health Services. About Schools and Districts. Frankfort, KY: Office of Guiding Support Services/General Counsel, Division of Communications, Kentucky Department of Education. Date last modified July 2, 2013. http://education.ky.gov/comm/schdist/Pages/default.aspx.

Kentucky Oral Health Coalition. 2014 Roadmap to Oral Health Literacy Planning Report. October 2013.
Kentucky Youth Advocates and the University of Louisville. A Picture of Health: A Report of Kentucky's School Districts' Health Services. Foundation for a Healthy Kentucky. March 2011. http://www.healthyky.org/sites/default/files/Kentucky%20Youth%20Advocates%20School%20Health%20Services%20Report-FINAL.pdf.

Kentucky Youth Advocates. Kentucky Kids Count: 2015 County Data Book. Kentucky State Data Center, University of Louisville and Kentucky Youth Advocates. 2015. http://kyyouth.org/kentucky-kids-count.

Kentucky Youth Advocates. Kentucky's Oral Health Outlook: Opportunities Abound for Needed Improvements. Kentucky KIDS COUNT Data Book. 2011.

Krause D, May W, Lane N, et al. An analysis of oral Health disparities and access to services in the Appalachian region. December 2011. http://www.arc.gov/research/researchreportdetails.asp?REPORT_ID=100.

McKay J, Quinonez C. The feminization of dentistry: implications for the profession. *J Can Dent Assoc*. 2012; 78:c1. http://www.jcda.ca/article/c1.

Medicaid. Early and Periodic Screening, Diagnostic and Treatment. http://www.medicaid.gov/medicaid-chip-program-information/by-topics/benefits/early-and-periodic-screening-diagnostic-and-treatment.html.

Meyerhoefer C, Zuvekas S, Manksi R. The demand for preventive and restorative dental services. *Health Economics*. 2014; 23 (1):24-32. http://onlinelibrary.wiley.com/doi/10.1002/hec.2899/pdf.

Mullins R. Comprehensive Needs Assessment: Appalachian Rural Education Partnership (ARDEP), ARC Planning Grant, 2011-2013. Morehead State University, University of Kentucky. September 2015.

Nasseh K, Vujicic M. Dental care utilization rate increases among children, holds steady among working-age adults and the elderly. Health Policy Institute, American Dental Association. October 2015. http://www.ada.org/~/media/ADA/Science%20and%20Research/HPI/Files/HPIBrief_1015_1.ashx.

Nasseh K, Wall T, Vujicic M. Cost barriers to dental care continue to decline, particularly among young adults and the poor. Health Policy Institute, American Dental Association. October 2015. http://www.ada.org/~/media/ADA/Science%20and%20Research/HPI/Files/HPIBrief_1015_2.ashx.

National Association of Dental Plans. Kentucky Dental Benefits Fact Sheet. 2015. http://www.nadp.org/researchpublications/reportvault.aspx.

National Association of Dental Plans. Who has dental benefits? http://www.nadp.org/Dental_Benefits_Basics/Dental_BB_1.aspx.

New England Journal of Medicine Career Center. 2011 Survey of Final-Year Medical Residents. *Recruiting Physicians Today*. 2011; 19(6).

Peterson M, Williams J, Mundt C. Kentucky Dental Provider Workforce Analysis: 1998-2006. http://chfs.ky.gov/NR/rdonlyres/7988E4FD-E33E-4BD5-B912-3739EC00374C/0/28070DentalWorkfoceBrochuresmall1.pdf.

Riley J, Gordan V, Rouisse K, et al. Differences in male and female dentists' practice patterns regarding diagnosis and treatment of dental caries. *JADA*. 2011 Apr;142(4):429-40.

Rudd R, Aleshire N, Zibbell J, et al. Increases in drug and opioid overdose deaths — United States, 2000–2014. *MMWR Morb Mortal Wkly Rep*. 2015; 64. http://www.cdc.gov/mmwr/pdf/wk/mm64e1218.pdf.

Smile Kentucky. Fact Sheet. January 2013. http://www.smilekentucky.com/Smile%20Kentucky%20Fact%20Sheet%20January%202013.pdf.

Smith B. The next crisis: elder oral health care. PowerPoint presentation for the American Dental Association. 2010. http://www.nationaloralhealthconference.com/docs/presentations/2010/Barbara%20Smith%20-%20The%20Next%20Crisis%20-%20Elder%20Oral%20Health%20Care.pdf.

SOAR Health Work Group. SOAR Health Work Group Final Report: Health. September 2014. http://www.soar-ky.org/wp-content/uploads/2014-SOAR-Wrk-Grp-IV-F-Health.pdf.

Stein P, Aalboe A, Skelton J, et al. Meeting oral health challenges in long-term care facilities. *Annals Long Term Care*. 2012; 20(9):30-34. http://www.annalsoflongtermcare.com/article/meeting-oral-health-challenges-long-term-care-facilities.

US Department of Health and Human Services. HHS and EPA announce new scientific assessments and actions on fluoride. Published January 7, 2011. Date modified May 7, 2011. http://www.rcap.org/sites/default/files/Fluoride%20and%20Chromium%206%20News.pdf.

US General Accounting Office. Factors Contributing to the Low Use of Dental Services by Low Income Populations. September 2000. GAO/HEHS-00-149. http:///www.gao.gov/assets/240/230602.pdf.

Valachovic R; for American Dental Education Association. A Dentist Shortage? Maybe, Maybe Not. May 15, 2014. https://adeachartingprogress.wordpress.com/2014/05/15/a-dentist-shortage-maybe-maybe-not/.

Wall T, Brown L. The urban and rural distribution of dentists, 2000. JADA. 2007; 138(7):1003-1011. http://jada.ada.org/article/S0002-8177(14)62428-4/pdf.

Wall T, Nasseh K, Vujicic M. US dental spending remains flat through 2012. Health Policy Resources Center, American Dental Association. January 2014. http://www.ada.org/~/media/ADA/Science%20and%20Research/Files/HPRCBrief_0114_1.ashx.

Wall T, Vujicic M. US dental spending continues to be flat. Health Policy Institute, American Dental Association. December 2015. http://www.ada.org/~/media/ADA/Science%20and%20Research/HPI/Files/HPIBrief_1215_2.ashx.

Wanchek T, Rephann T. Filling the Gaps: Dentist Disparities along the Rural Urban Continuum. March 24, 2011. http://www.coopercenter.org/sites/default/files/publications/dentist_final.pdf.

Wendling W. Private sector approaches to workforce enhancement. *J Public Health Dent*. June 2010; 70 Suppl 1:S24-31.

Wilbur Smith Associates. Kentucky water transportation corridors, public riverport development and intermodal access. February 2000. http://transportation.ky.gov/Riverports/Documents/Kentucky%20Water%20Transportation%20Corridors.PDF.

Willis D, Butters J, Cecil J, et al. Executive Summary: 2002 Kentucky Adult Oral Health Survey. 2003. http://chfs.ky.gov/nr/rdonlyres/f3509d88-532d-4e82-b04e-31da874a890c/0/2002adultoralhealthsurveyexecutivesummary.pdf.

Witters D. Arkansas, Kentucky See Most Improvement in Uninsured Rates. Gallup. http://www.gallup.com/poll/181664/arkansas-kentucky-improvement-uninsured-rates.aspx?utm_source=tagrss&utm_medium=rss&utm_campaign=syndication.

Yarborough C, Nasseh K, Vujicic M. Key differences in dental care seeking behavior between Medicaid and Non-Medicaid adults and children. Health Policy Institute, American Dental Association. September 2014. http://www.ada.org/~/media/ADA/Science%20and%20Research/HPI/Files/HPIBrief_0814_4.ashx.

CHWS
Center for Health Workforce Studies

School of Public Health | University at Albany, SUNY
1 University Place, Suite 220 | Rensselaer, NY 12144-3445

https://chws.albany.edu