Indiana Strategic Oral Health Initiative (SOHI)

Needs Assessment Report

2009

Indiana State Department of Health

CENTER FOR HEALTH POLICY

SCHOOL OF DENTISTRY

INDIANA UNIVERSITY

IUPUI

Oral Health Needs Assessment

Oral health is an essential and integral component of health throughout life. No one can be truly healthy unless he or she is free from the burden of oral and craniofacial diseases and conditions (U.S. Department of Health and Human Services, 2000b). Promotion of oral health requires self-care and professional care as well as population-based initiatives. Studies have shown that oral health status and access to services vary significantly by race/ethnicity, family income, and level of education (Edelstein, 2002). Furthermore, adults and children residing in rural areas are more likely to be uninsured for dental care, report more unmet dental needs, are less likely to have visited a dentist in the past year, and are less likely to be regular users of dental care, compared to their urban counterparts (Vargas, Ronzio, and Hayes, 2003; Vargas, Dye, and Hayes, 2002).

Without a doubt, community water fluoridation constitutes one of the top achievements of public health in the last century. As a result of water fluoridation, the U.S. population experienced a one-half to two-thirds decrease in the prevalence of dental caries (Horowitz, 1996). However, water fluoridation has not been enough to prevent dental caries, and there is some evidence that its prevalence may be increasing, especially in certain population subgroups. Even though there are effective measures and approaches to prevent and treat dental caries and periodontal disease, they continue to affect millions of people. The majority (85%) of the population over the age of 18 has had at least one dental cavity or filling. Periodontal disease affects larger proportions of adults as they age. Over 50% of adults age 55 and over suffer from severe periodontal disease, and about half of Americans have gingivitis. As knowledge about etiology, prevention and treatment of dental diseases has progressed, there has also been a recognition that more need to be done. A “silent epidemic” of dental and oral diseases is affecting some population groups. This burden of disease restricts activities in school, work, and home, and often significantly diminishes the quality of life (U.S. Department of Health and Human Services, 2000b). There is an ever-present need to improve and maintain Americans’ oral health.

In spite of improvements in overall oral health status, striking disparities exist within population groups; especially among the poor of all ages, racial and ethnic minorities, and rural populations. These underserved populations constitute a considerable portion of Indiana residents. A substantial obstacle to progress is the fact that there are no adequate and comprehensive data on oral health and care for the U.S. population and its diverse subgroups (U.S. Department of Health and Human Services, 2000b). It has been recognized that the infrastructure for oral health care delivery is limited, but the development of better measures of disease and health, the design of new approaches to eliminate health disparities, and the evaluation of existing programs has been hindered by the lack or rarity of data on state and local populations. The U.S. Department of Health and Human Services’ prevention initiative *Healthy People 2010* recognizes the public health impact of oral health conditions and set the goal to

prevent and control oral and craniofacial diseases, conditions, and injuries and improve access to related services (U.S. Department of Health and Human Services, 2000a).

The purpose of this report is to provide a baseline measure of Indiana's oral health status, and to identify critical needs and prevention priorities in the underserved. Information on various oral health indicators for which data were available, was collected. The results are presented in the following categories:

- Indiana's demographic profile and vulnerable populations
- Oral disease prevalence
- Access to and utilization of oral health care services
- Oral health infrastructure (existing oral health programs, services, and resources)
- Oral health workforce

Indiana's Demographic Profile and Vulnerable Populations

In 2007, Indiana had an estimated population of 6,345,289, of which about 3,125,322 were male (49%) and 3,219,967 were female (51%). The median age of the population was 36.5 years. A total of 441,614 of the population was under 5 years old (7%); 1,586,310 of the population was under the age of 18 (25%); and 793,156 of the population was over 65 years old (12.5%). The majority of Hoosiers (6,238,487 or 98%) reported to be of one race only. Among those, 5,291,210 reported to be White (83.4%), 545,111 reported to be Black (8.6%), 312,863 reported to be Hispanic of any race (5%), and the rest (196,105) reported to belong to other races (U.S. Census Bureau, n.d.).

Indiana ranked as the 24th poorest state in the country. An estimated 757,813 of Hoosiers were classified poor (12%)[i]; and 267,610 of them were under the age of 18 (17%). The percentages of the poor according to race or ethnicity were as follows: 520,749 (10%) were White (with 10% under the age of 18); 133,366 (26%) were Black (with 36% under the age of 18); 67,850 (22%) were Hispanic or Latino (with 29% under the age of 18); 12,588 (16%) were Asian (with 15% under the age of 18); and 34,329 (23%) reported "some other race" (with 31% under the age of 18) (U.S. Census Bureau, n.d.).

[i] The Census Bureau uses a set of money income thresholds that vary by family size and composition to determine who is in poverty. If a family's total income is less than the family's threshold, then that family and every individual in it is considered in poverty. The official poverty thresholds do not vary geographically, but they are updated for inflation using Consumer Price Index (CPI-U). The official poverty definition uses money income before taxes and does not include capital gains or noncash benefits (such as public housing, Medicaid, and food stamps).

On average, for the 2008 school year, 328,401 Hoosier children received free school lunches, and 88,295 children received reduced-price lunches. This constituted more than one-third (36.1%) of the student population (Indiana Department of Education, 2007).

Among the population five years and older, 898,900 reported a disability (15%). The likelihood of having a disability increased with age, from 7% of people 5-15 years old (66,521), to 13% of people 16-64 years old (529,621), and 42% of people 65 years old and older (302,758) (U.S. Census Bureau, n.d.).

Children's Health Insurance Program (CHIP)

The State Children's Health Insurance Program (SCHIP) was designed to improve access to care for low-income children. It is funded in part by the federal government and by each state. The program is intended for children in families with income above the threshold for Medicaid eligibility. The Children's Health Insurance Program is Indiana's SCHIP program.

Based on information from December 2007, there were 51,957 children enrolled in Indiana's CHIP A and 18,698 children enrolled in CHIP C programs, for a total of 70,655 children, representing a 2% reduction from the previous year. The reduction was in CHIP A, while the enrollment for CHIP C at the end of 2007 was the highest so far (Burns & Associates, Inc., 2008).[ii]

The total CHIP A population was made up of 67% Caucasians, 17% African-Americans, 14% of Hispanics and 2% other races. The total CHIP C population was made up of 74% Caucasians, 11% African-Americans, 12% Hispanics, and 3% other races (Burns & Associates, Inc., 2008).

Children aged 1 to 5 had less preventive dental appointments (8,874 or 16%) compared to other age groups. Preventive dental visits were highest in children aged 6 to 12 (26,821 or 50%). The number of dental visits in adolescents aged 13 to 18 did not differ by gender, with 9,250 visits (17%) for females and 9,146 visits (17%) for males (Burns & Associates, Inc., 2008)..

Utilization of preventive dental services was similar by race and ethnicity. However, Indiana's CHIP members had lower dental services utilization across all races or ethnicities compared to national reports (Burns & Associates, Inc., 2008).

[ii] CHIP A and CHIP C designations differentiate between the no-premium and premium share components of CHIP, which is based on family income. The Medicaid expansion portion -CHIP A, covers children in families with incomes up to 150% of the FPL ($25,755 per year for a family of three in 2007) who are not already eligible for Medicaid. The State-designed portion -CHIP C, covers children in families with incomes above 150% up to 250% of the FPL ($42,925 per year for a family of three in 2007). CHIP C requires premiums based on a sliding scale of income.

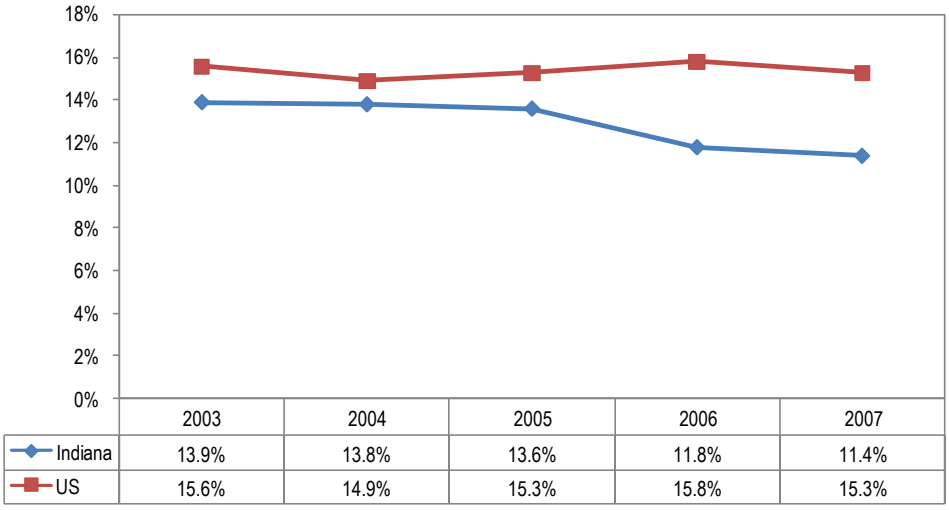
Hoosiers on Medicaid

In 2007, a total of 732,000 Hoosiers were covered by Medicaid, representing 11.69% of Indiana's population. Among the Medicaid population, 76,000 were of Hispanic origin. In regard to race, 444,000 were identified as white; 191,000 as black; 2,000 as American Indian or Alaska native; 2,000 as Asian; and 18,000 as belonging to two or more races. Medicaid coverage by age group was as follows: 466,000 children ages 0 to 17 years; 235,000 adults ages 18 to 64; and 31,000 older adults ages 65 and above (U.S. Census Bureau, n.d.).

The Uninsured

In 2007, over 0.7 million Indiana residents were not covered by health insurance. During that year, there were 706,000 people under 65 years old who had no insurance coverage at any time, and 83,000 of them were under the age of 18. The percentage of Hoosiers without insurance decreased from 13.9% in 2003 to 11.4% in 2007 (see Figure 1). Indiana's rates have been consistently lower than the national rates for the years reviewed (U.S. Census Bureau, n.d.).

Figure 1: Percentage of Indiana and U.S. Population without Health Insurance, 2003-2007



	2003	2004	2005	2006	2007
Indiana	13.9%	13.8%	13.6%	11.8%	11.4%
US	15.6%	14.9%	15.3%	15.8%	15.3%

Source: U.S. Census Bureau, n.d.

Oral Disease Prevalence

Prevalence of Tooth Extractions

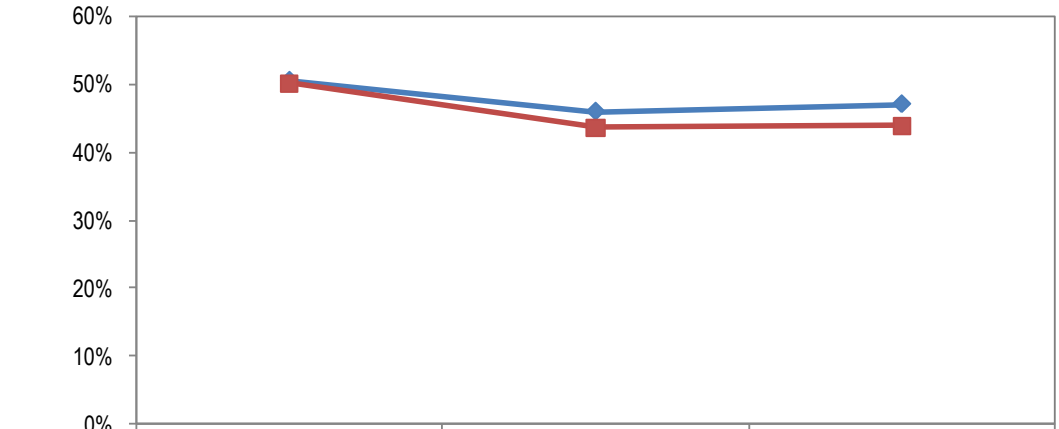
The Behavioral Risk Factor Surveillance System (BRFSS), established in 1984 by the Centers for Disease Control and Prevention (CDC), is a state-based system of health surveys that collects information on health risk behaviors, preventive health practices, and health care

access primarily related to chronic disease and injury. Oral health items were first added to the instrument in 1999 (Center for Disease Control and Prevention, 2008).

According to 2006 BRFSS results (the most recent data available), 47.1% of Indiana adults (95% CI: 45.6 – 48.6) have had any permanent teeth extracted. This percentage was significantly higher than the national median of 43.9%. Statistically, Indiana's prevalence has remained stable from 1999 to 2006 (see Figure 2). Groups that had the highest prevalence of tooth extractions included blacks; individuals with an annual household income of less than $35,000; and individuals with lower educational attainment. Also, prevalence was highly associated with age – as age increased so did the percentage of Hoosiers who reported having had any permanent teeth extracted (Centers for Disease Control and Prevention, 2008). [For 2006 prevalence rates and 95% confidence intervals by gender, race/ethnicity, age group, income level, and educational attainment, see Appendix A.]

Roughly one-fifth of Hoosiers 65 years and older (21.1%; 95% CI: 18.9 – 23.5) in 2006, have had all their natural teeth extracted. This is a significant decrease from 1999, when 37.1% of Indiana residents in that age group (95% CI: 28.9 – 45.3) reported to have had all their natural teeth extracted. The current prevalence rates for Indiana and the United States (19.3%) are statistically the same (see Figure 3). Indiana's elderly that were mostly affected included individuals with an annual household income of less than $15,000 and Hoosiers with lower educational attainment (Centers for Disease Control and Prevention, 2008). [For 2006 prevalence rates and 95% confidence intervals by gender, race/ethnicity, age group, income level, and educational attainment, see Appendix B.]

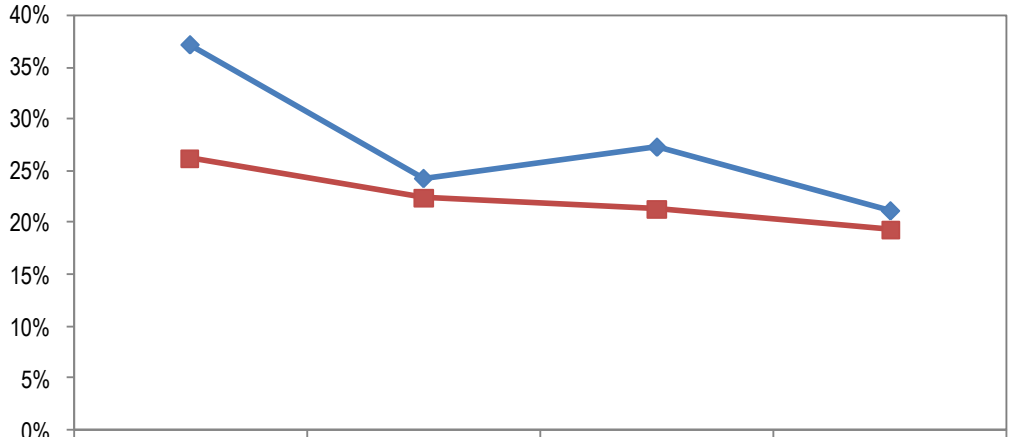
Figure 2: Prevalence Rates of Indiana and U.S. Adults That Have Had Any Permanent Teeth Extracted (Behavioral Risk Factor Surveillance System, 1999 – 2006)



	1999	2004	2006
Indiana	50.6%	46.0%	47.1%
U.S.	50.2%	43.7%	43.9%

Source: Centers for Disease Control and Prevention, 2008

Figure 3: Prevalence Rates of Indiana and U.S. Adults Ages 65 and Older That Have Had All Their Natural Teeth Extracted (Behavioral Risk Factor Surveillance System, 1999 – 2006)



	1999	2002	2004	2006
Indiana	37.1%	24.3%	27.3%	21.2%
U.S.	26.2%	22.4%	21.3%	19.3%

Source: Centers for Disease Control and Prevention, 2008

Prevalence of Cleft Lip and Palate

The National Birth Defects Prevention Network (NBDPN) is a group of individuals involved in birth defects surveillance, research, and prevention. It was created to establish and maintain a national network of state- and population-based programs for birth defects surveillance and research. ISDH collects this information in Indiana and submits the data to NBDPN.

According to the ISDH report, the number of children born in Indiana with a cleft lip and/or cleft palate declined from 79 in 2003 to 60 in 2005. The rate, per 10,000 live births, however, did not change significantly within these three years (see Table 1) (Indiana State Department of Health, 2008).

Table 1: Number and Rate (per 10,000 Live Births) of Indiana Children Born with Cleft Lip and/or Cleft Palate, by Birth Year, 2003-2005 (National Birth Defects Prevention Network)

	Number of Children with Cleft Lip and/or Palate	Live Births	Rate per 10,000 (95% CI)
2003	79	86,382	9.15 (7.13-11.16)
2004	93	87,125	10.68 (8.51-12.84)
2005	60	87,088	6.89 (5.15-8.63)

Note: CI = confidence interval

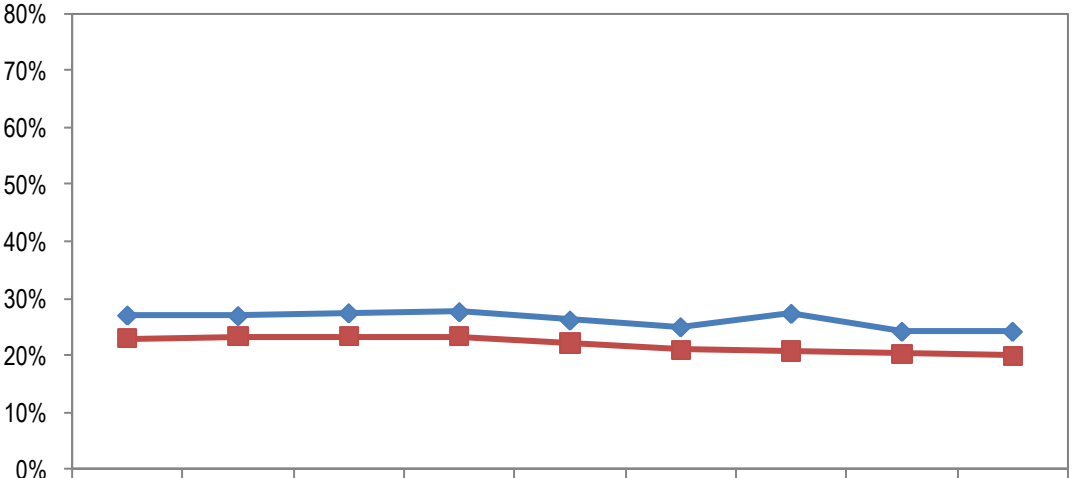
Source: Indiana State Department of Health, 2008

Prevalence of Tobacco Use

Tobacco products contain a variety of toxins that have been associated with cancers of the mouth, lip, tongue, and larynx (voice box); periodontal disease; and other oral health related conditions (Horowitz, 1996; American Dental Association, n.d.).

Adult smoking prevalence has been consistently higher in Indiana than the nation for at least the past nine years. In 1999, 27.0% of Indiana residents (95% CI: 24.0 – 30.0) had smoked in the past 30 days (U.S. median: 22.8%). The rate was similar for 2007, with 24.1% of Hoosiers (95% CI: 22.5 – 25.7) reporting past-month use (U.S. median: 19.8%). The prevalence for every-day smoking is also significantly higher in Indiana compared to the United States. Rates decreased among Hoosiers from 22.5% (95% CI: 19.7 – 25.3) in 1999 to 18.2% (95% CI: 16.8 – 19.6) in 2007 (Centers for Disease Control and Prevention, 2008). See Figures 4 and 5 for prevalence rates from 1999 through 2007.

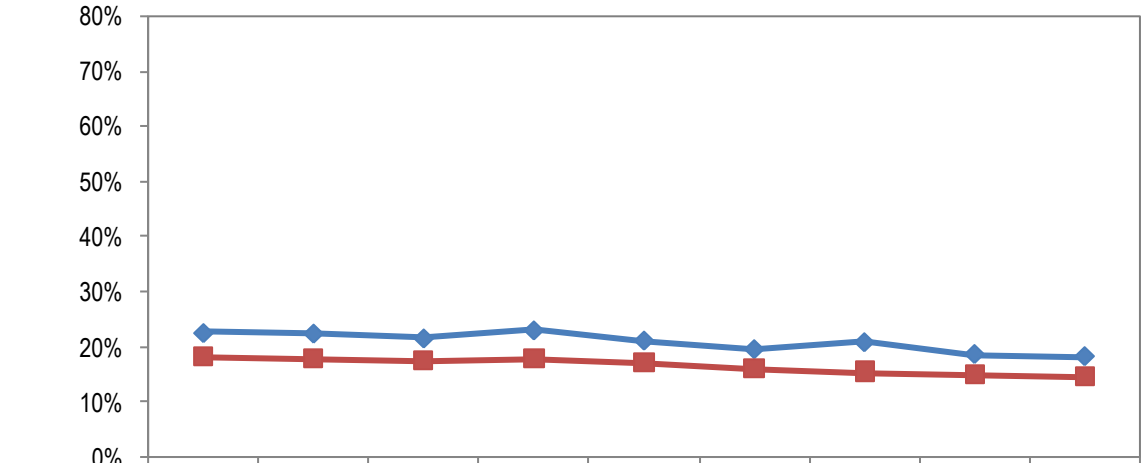
Figure 4: Percentage of Indiana and U.S. Adults who Smoked in the Past 30 Days (Behavioral Risk Factor Surveillance System, 1999 – 2007)



	1999	2000	2001	2002	2003	2004	2005	2006	2007
Indiana	27.0%	26.9%	27.4%	27.6%	26.1%	24.9%	27.3%	24.1%	24.1%
U.S.	22.8%	23.2%	23.2%	23.2%	22.0%	20.9%	20.6%	20.1%	19.8%

Source: Centers for Disease Control and Prevention, 2008

Figure 5: Percentage of Indiana and U.S. Adults who Smoke Every Day (Behavioral Risk Factor Surveillance System, 1999 – 2007)



	1999	2000	2001	2002	2003	2004	2005	2006	2007
Indiana	22.5%	22.4%	21.5%	23.0%	21.1%	19.5%	20.8%	18.6%	18.2%
U.S.	18.0%	17.7%	17.4%	17.8%	16.9%	15.8%	15.3%	14.9%	14.5%

Source: Centers for Disease Control and Prevention, 2008

Hospital Discharges with Oral Health Diagnoses

Indiana's public hospital discharge data sets include, among other variables, discharge information and principal (primary) diagnosis of the patient. Data are provided in aggregate format. The rates of hospital discharges for patients with any type of oral health diagnosis remained statistically stable from 2003 through 2006, with 15.70 (95% CI: 14.71 – 16.69) and 14.30 (95% CI: 13.36 – 15.23) respectively (Indiana State Department of Health, n.d.). See Table 2 for number of discharges due to specific oral health conditions.

Table 2: Number of Hospital Discharges in Indiana by Oral Health Principal Diagnoses (Indiana Hospital Discharge Data Files, 2003 – 2006)

	2003	2004	2005	2006
Neoplasms of lip, oral cavity, and pharynx[iii]	329	359	349	340
Diseases of oral cavity, salivary glands, and jaws[iv]	530	518	546	465
Oral congenital anomalies (cleft lip/palate; anomalies of tongue, mouth, and pharynx)[v]	50	46	40	37
Injuries of lips, mouth, pharynx, and larynx[vi]	62	54	65	59
Total	**971**	**977**	**1,000**	**901**

Source: Indiana State Department of Health, n.d.

Oral Health Related Mortality

The number of deaths for oral health diseases is very low. In 2005, a total of 154 Hoosiers died of oral health related conditions, most of which were due to some form of cancer (see Table 3). The mortality rate for these conditions remained stable from 1999 through 2005 in Indiana, with 2.36 (95% CI: 1.97-2.75) and 2.46 (95% CI: 2.07-2.85), per 100,000 population, respectively. The U.S. mortality rate has been statistically similar for most years but was higher than Indiana's in 2001 and 2004 (Centers for Disease Control and Prevention, n.d.) (see Figure 6).

[iii] ICD-9 codes for neoplasms of lip, oral cavity, and pharynx: 140-149 Malignant neoplasm of lip, oral cavity, and pharynx; 210 Benign neoplasm of lip, oral cavity, and pharynx; 230.0 Carcinoma in situ of lip, oral cavity, and pharynx.

[iv] ICD-9 codes for diseases of oral cavity, salivary glands, and jaws: 520-529 Diseases of oral cavity, salivary glands, and jaws.

[v] ICD-9 codes for congenital anomalies: 749 Cleft palate and cleft lip; 750.0-750.2 Other congenital anomalies of upper alimentary tract (tongue, mouth, pharynx).

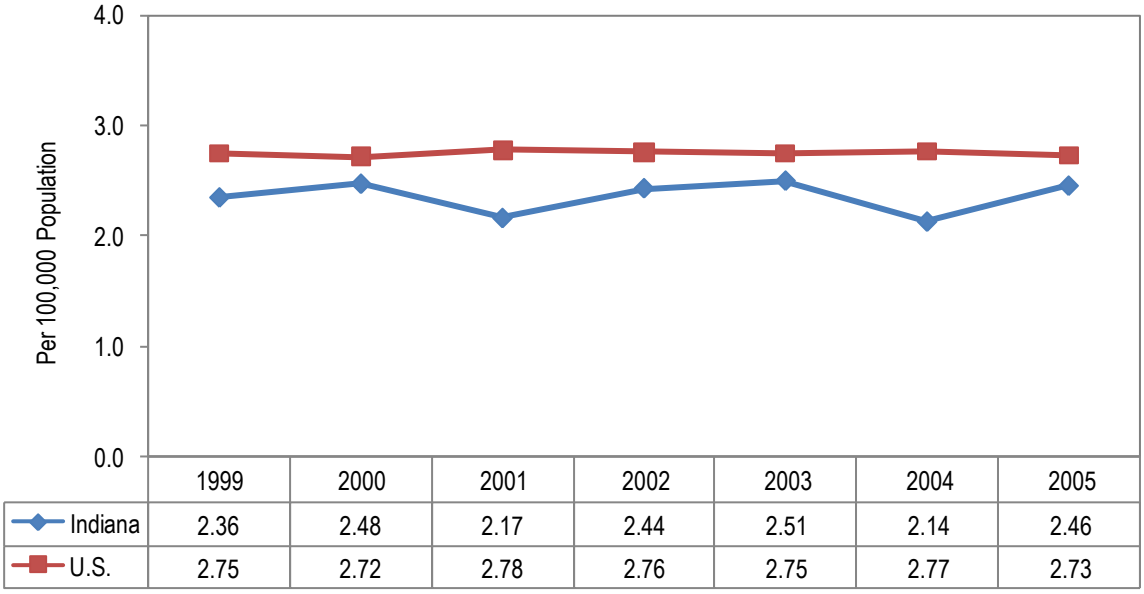
[vi] ICD-9 codes for injuries of lips, mouth, pharynx, and larynx: 933 Foreign body in pharynx and larynx; 935.0 Foreign body in mouth; 941.03/941.13/941.23/941.33/941.43/941.53 Burns of lips; 947.0 Burn of mouth and pharynx.

Table 3: Number of Deaths Attributable to Oral Health Diseases in Indiana (Mortality Data, 1999 – 2005)

	1999	2000	2001	2002	2003	2004	2005
Neoplasms of lip, oral cavity, and pharynx[vii]	136	150	130	144	151	129	151
Diseases of oral cavity, salivary glands, and jaws[viii]	4	1	3	6	4	4	2
Oral congenital malformations (cleft lip/palate and others)[ix]	N/A	N/A	N/A	N/A	N/A	N/A	1
Total	**140**	**151**	**133**	**150**	**155**	**133**	**154**

Source: Centers for Disease Control and Prevention, n.d.

Figure 6: Indiana and U.S. Mortality Rate for Oral Health Diseases, per 100,000 Population (Mortality Data, 1999 – 2005)



Source: Centers for Disease Control and Prevention, n.d.

[vii] ICD-10 codes for neoplasms of lip, oral cavity, pharynx: C00-C14 Malignant neoplasms of lip, oral cavity and pharynx; C43.0 Malignant melanoma of lip; C44.0 Basal cell carcinoma of lip; D00.0 Carcinoma in situ of lip, oral cavity and pharynx; D03.0 Melanoma in situ of lip; D04.0 Carcinoma in situ/skin of lip; D10 Benign neoplasm of mouth and pharynx; D11 Benign neoplasm of major salivary glands; D37.0 Neoplasm of uncertain or unknown behavior/Lip, oral cavity and pharynx.

[viii] ICD-10 codes for diseases of oral cavity, salivary glands, and jaws: K00-K14 Diseases of oral cavity, salivary glands and jaws.

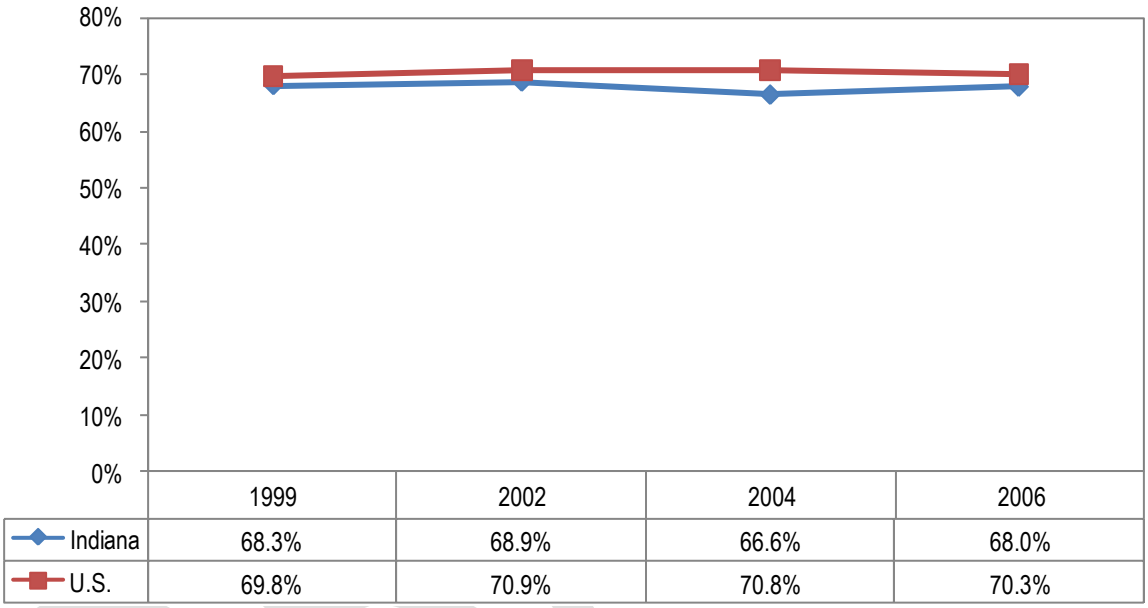
[ix] ICD-10 codes for oral congenital malformations: Q35-Q37 Cleft palate and cleft lip; Q38 Other congenital malformations of tongue, mouth and pharynx.

Access to and Utilization of Oral Health Care Services

Dental Visits

According to 2006 BRFSS results, 68.0% of people in Indiana (95% CI: 66.6 – 69.4) visited the dentist or dental clinic within the past year for any reason. The rate is lower than the U.S. median of 70.3%. The prevalence for past-year dental visits has remained stable from 1999 through 2006 (see Figure 7) (Centers for Disease Control and Prevention, 2008).

Figure 7: Percentage of Indiana and U.S. Population that Visited the Dentist or Dental Clinic within the Past Year for Any Reason (Behavioral Risk Factor Surveillance System, 1999 – 2006)



	1999	2002	2004	2006
Indiana	68.3%	68.9%	66.6%	68.0%
U.S.	69.8%	70.9%	70.8%	70.3%

Source: Centers for Disease Control and Prevention, 2008

Health Professional Shortage Areas

Health Professional Shortage Areas (HPSAs), established under the U.S. Public Health Service Act, are federal designations of a geographic area (usually a county or a number of townships or census tracts) which meet the criteria as needing additional primary health care services. These designations are based on the availability of health professional resources within a rational service area. Primary care, dental, and mental health HPSAs also look at practitioners within a thirty-minute travel time. Designations usually are geographic areas, but may apply to population groups and facilities (Health Resources and Services Administration, 2008).

A HPSA scoring system was developed by the National Health Service Corps to determine priorities for assignment of clinicians. Scoring criteria include:

- Population and provider ratio
- Level of poverty within population
- Infant health index
- Traveling distance to the nearest provider

Scores for dental HPSAs range from 1 to 26[x]—higher scores representing greater priority or need. To be designated as a dental HPSA, the geographic area must have a population to full-time-equivalent dentist ratio of at least 5,000:1, or have a ratio between 4,000:1 and 5,000:1 and unusually high needs for dental services. Dental professionals in contiguous areas must be excessively distant or inaccessible, and overutilized. Members of federally recognized Native American tribes are automatically designated, as are federal and/or state correctional institutions and/or non-profit medical facilities (Health Resources and Services Administration, 2008). Based on the most current findings, there are 25 identified HPSAs in Indiana, affecting 12 counties (see Table 4) (Health Resources and Services Administration 2008).

Table 4: Dental Health Professional Shortage Areas (HPSAs) Currently Designated in Indiana

County	Service Area Name	Destination Type	Score
Allen	Central Fort Wayne	Low Income Population	14
	Neighborhood Health Clinics, Inc.	Comprehensive Health Center	8
Delaware	Open Door/BMH Health Center, Inc.	Comprehensive Health Center	10
	Center Township	Low Income Population	9
Lake	East Chicago Service Area	Geographical Area	15
	East Chicago Community Health Center	Comprehensive Health Center	10
Marion	Highland-Brookside (Indianapolis)	Geographical Area	19
	South Central Indianapolis	Geographical Area	15
	Near North Side (Indianapolis)	Geographical Area	10
	Indiana Health Centers	Comprehensive Health Center	9
	Health & Hospital Corp. of Marion Co.	Comprehensive Health Center	10
	Shalom Health Care Center, Inc.	Comprehensive Health Center	6
	Raphael Health Center	Comprehensive Health Center	10
	Healthnet	Comprehensive Health Center	4
Porter	North Shore Health Center	Comprehensive Health Center	8
	Valparaiso Service Area	Geographical Area	13
	Healthlinc, Inc.	Comprehensive Health Center	8
Randolph	Randolph County	Low Income Population	10
Rush	Rushville Township	Low Income Population	8
St. Joseph	Southwest South Bend	Low Income Population	15
Switzerland	Switzerland	Low Income Population	11
Tippecanoe	Lafayette City	Low Income Population	25
	Tippecanoe Community Health Center	Comprehensive Health Center	11
Vanderburgh	Echo Community Health Care	Comprehensive Health Center	10
Vigo	U.S. Penitentiary Terre Haute	Correctional Facility	21

Source: Health Resources and Services Administration, 2008

[x] HPSA scores range from 1 to 25 for primary care and mental health, and from 1 to 26 for dental professional shortages.

Oral Health Infrastructure

Indiana State Department of Health (ISDH) – Oral Health

Currently, oral health is part of the Maternal and Children's Special Health Care Services division at ISDH. Staffing for the state's oral health program consists of the oral health director (1 FTE), a dental hygienist (1 FTE; currently vacant); and an administrative assistant (0.25 FTE). The Department's fluoridation staff is part of the Environmental Public Health Division. Indiana's fluoridation program is managed and maintained by the chief of the fluoride unit and three fluoridation consultants.

ISDH received federal funding from the Maternal and Child Health Services Title V Block Grant to support the following oral health programs (K. Smith, personal communication, December 15, 2008):

- SEAL INDIANA ($90,000)
- Indiana Hemophilia and Thrombosis Center ($75,000 for the Indiana hemophilia Amish program)
- Donated Dental Services ($42,932) (An additional $52,000 was provided by the Indiana Family and Social Services Administration's Division of Aging)

Fluoridation Program

Fluoride is a naturally occurring element needed regularly throughout life to protect teeth against tooth decay. In the US, fluoridated community drinking water and fluoride toothpaste are the most common sources of fluoride. Fluoride can inhibit or reverse the initiation and progression of dental caries, by inhibiting the demineralization of sound tooth enamel and enhancing the remineralization of demineralized enamel throughout the lifetime of teeth. It also inhibits dental caries by affecting the activity of cariogenic (caries-causing) bacteria. Adults and children both benefit from its protective effect, especially those difficult to reach through other public health programs, or those with difficulties in accessing private dental care. The Public Health Service recommends the use of an optimally adjusted concentration of fluoride in the community drinking water, of 0.7 ppm to 1.2 ppm (depending on the average maximum daily air temperature of the area). This concentration can occur naturally or be attained through the controlled addition of fluoride to a public water supply (Centers for Disease Control and Prevention, 2001).

ISDH authorized support for community water fluoridation on December 22, 1950. The first Indiana communities to begin community water fluoridation were Fort Wayne, Huntingburg and Indianapolis around 1951. Currently, there are 397 Indiana Public Water Supplies that adjust fluoride in their drinking water (253 municipalities, 118 Consecutive Systems, and 26 schools), plus 91 water systems with naturally occurring optimal fluoride levels (that serve about 328,000 Hoosiers), for a total of 488 Indiana Water Systems with optimal fluoride levels. In general, every

city with a population of over 5,000, fluoridates its water, with the exception of Brazil, Rockville, the Tri-Township of Dearborne County (serving 8,370), Linton of Greene County (serving 11,748) and Jennings Water Inc. (serving 11,669). About 4.4 million residents receive optimally fluoridated water. Over 95% of Indiana residents who are served by community water systems receive optimally fluoridated water (K. Smith, personal communication, December 15, 2008). Community water fluoridation is a safe, equitable and cost-effective method of delivering fluoride to communities to aid in the prevention and control of dental caries. The Centers for Disease Control and Prevention estimate that every $1 invested in community water fluoridation yields approximately $38 savings in dental treatment costs (Centers for Disease Control and Prevention 2001).

SEAL INDIANA Program

SEAL INDIANA is a not-for profit state-wide mobile dental sealant program of Indiana University School of Dentistry that works in cooperation with Indiana dentists and the Indiana State Department of Health. The program's goals are to:

- Locate rural and urban children from low-income families who are not receiving dental care
- Provide oral examination, with parental consent, and when indicated, apply sealants and fluoride varnish for prevention of dental caries
- Help to find local dental homes to insure restorative services and continuity of care
- Provide service-learning experiences for dental and dental hygiene students to foster greater understanding of issues related to community oral health and access to dental care
- Engage in research that will promote optimal oral health and more equitable access to care

Since establishment of the program in March 2003, more than 17,000 children received a dental examination; more than 24,000 dental sealants were applied; and more than 11,000 fluoride varnish treatments have been provided.

Oral Health Workforce

The Indiana University School of Dentistry (IUSD) is the only dental school in the state, granting a degree of Doctor of Dental Surgery (DDS). There are 6 institutions with ADA-accredited Dental Hygiene programs, and 11 with accredited Dental Assisting programs in Indiana (see Table 5).

Table 5: Accredited Dental Programs in Indiana

Institution	Doctoral Degree (DDS)	Dental Hygiene Degree	Dental Assisting Training
Indiana University School of Dentistry	X	X	X
Indiana University Purdue University Fort Wayne		X	X
Indiana University Northwest		X	X
Indiana University South Bend		X	X
University of Southern Indiana		X	X
Ivy Tech Community College South Bend		X	
C4 Columbus Area Career Connection/Ivy Tech State			X
Ivy Tech Community College Lafayette			X
Ivy Tech Community College Anderson Campus			X
Ivy Tech Community College Kokomo			X
Professional Careers Institute			X
International Business College			X

A total of 498 dentists graduated from IUSD between 1994 and 1999. It was reported that about 70% of all graduates remained in Indiana, and 78% of graduates who were Indiana residents were practicing in Indiana. About 30% of out-of-state graduates also remained to practice in Indiana (Yoder, 2007). A total of 755 dentists graduated from IUSD between 2000 and 2007 (P. Clark, personal communications, October 21, 2008, and January 14, 2009). There are no data about how many of them are practicing in Indiana. In that time period, there were 17 Hispanic/Latino graduates, 9 African-American and 1 American Indian (T. Adams-Wilson, 2008).

Dental Hygiene Programs

At IUSD, there were 225 Dental Hygiene graduates from 2003 to 2007. Of the enrolled students for those years, the majority were female (246) and 4 were male. Most of them (233) were Caucasian. There were 10 African-Americans (9 female and one male), 3 Asian females, 3 Hispanic females and 1 American-Indian female graduate (Young, 2008).

There were 137 dental hygiene graduates from Indiana University Purdue University Fort Wayne from 2003 to 2007. Most of them were female (133), and Caucasian (132), with 2 African-Americans and 3 Hispanic graduates (Valliere, 2009).

From 2003 to 2007, there have been 120 graduates from the Dental Hygiene program at Indiana University Northwest. The vast majority was female (119) and Caucasian (108), with one African-American, one Asian and 10 Hispanic graduates (Robinson, 2008).

There have been 166 Dental Hygiene graduates from Indiana University South Bend, from 2003 to 2007. All of them were female, the majority were Caucasian (160), 2 were African-American, 2 were American Indian, one was Asian and one was Hispanic (Schafer, 2009).

During the years 2003 to 2007, there were 117 Dental Hygiene graduates from the University of Southern Indiana. All graduates were Caucasian and 115 of them were female (Carl, 2008).

The first Dental Hygiene class at Ivy Tech Community College South Bend will graduate in 2010. They currently have 15 female students. One student is African-American, one is part American-Indian and one is bi-racial (African-American and White) (MacMillan, 2008).

Dental Assisting Programs

The 11 ADA-accredited institutions that offer Dental Assisting education are: C4 Columbus Area Career Connection/Ivy Tech, Indiana University Northwest, Indiana University Purdue University Fort Wayne, IUSD, Indiana University South Bend, Ivy Tech Community College, Ivy Tech Community College Anderson Campus, Ivy Tech Community College Kokomo, Professional Careers Institute, University of Southern Indiana and International Business College.

From 2003 to 2008, there have been 162 Dental Assistant graduates from IUSD. Most of them were female (161) (Ford, 2009).

There have been 105 Dental Assistant graduates from Indiana University Purdue University Fort Wayne, from 2003 to 2007. Most of them were Caucasian (94), 7 of them were African-American, and 4 were Asian or Pacific Islander. Most graduates were female (104). Over 80% of them are practicing in Indiana (Kracher, 2009).

At Indiana University Northwest, there were 84 graduates from the Dental Assisting program from 2003 to 2007. All of them were female, 10 were African-American and 7 were Hispanic (Robinson, 2008).

There have been 85 graduates from the Dental Assisting program at Indiana University South Bend, from 2003 to 2007. All of them were female. The majority were Caucasian (79), 5 were African-American and one was Hispanic (Schafer, 2009).

At the University of Southern Indiana, from 2006 to 2008, there were 53 dental assisting graduates, all female and Caucasian, with only one African-American (Bastin, 2009).

During the years 2003 to 2007, there were 83 Dental Assistants that graduated from C4 Columbus Area Career Connection/Ivy Tech. The majority was female (81) and Caucasian (82), while one graduate was an African-American female (Ross, 2009).

At Ivy Tech Community College Lafayette, there have been 114 Dental Assistant graduates from 2003 to 2007. Most graduates were female (113). The ethnicity of graduates from 2004 to 2007 was Caucasian (88), Hispanic (3) and African-American (1) (Ticen, 2009).

The first year for the Dental Assisting program at Ivy Tech Community College Anderson Campus was 2005. Since then, 64 students have graduated. The majority were female (63) and Caucasian (60). There were 3 African-Americans (2 females, one male) and one multi-racial female (Macauley, 2008).

Ivy Tech Community College Kokomo – No info yet

Professional Careers Institute –No info yet

International Business College will have their first Dental Assistant graduating class in 2009. The class is made up of 8 women and 2 men. There are one African-American and one Hispanic student (both female), while the rest are Caucasian (Brown, 2009).

Licensed dentists and registered dental hygienists

According to the Health Resources and Services Administration (HRSA), there were 3,299 licensed dentists practicing in Indiana in 2007 (IU Bowen Research Center), for a ratio dentist to population of 1: 1,923.

There were 3,661 registered dental hygienists in 2006 (Yoder, 2007), for a ratio of one dental hygienist per 1,722 people in that year.

The ratios of dentists and dental hygienists varied considerably from county to county. For example, in 2007, the county of Newton had one dentist per 14,014 people, while the county of Hamilton had one dentist per 931 people (see Appendix C). The statistics are similar for dental hygienists, where, in 2006, the numbers ranged from one dental hygienist for all 10,892 inhabitants of Crawford, to one dental hygienist per 923 people in Hamilton county (see Appendix D).

APPENDIX A

Percentage (and 95% Confidence Interval) of Indiana Adults Who Reported in 2006 That They Have Had Any Permanent Teeth Extracted (Behavioral Risk Factor Surveillance System, 2006)

		Percentage of Adults that have had any permanent teeth extracted
Gender	Male	45.9% (43.5-48.3)
	Female	48.2% (46.3-50.1)
Race	White	46.1% (44.5-47.7)
	Black	56.4% (50.8-62.0)
	Hispanic	45.7% (37.7-53.7)
Age	18 - 24	10.9% (7.2-14.6)
	25 - 34	25.7% (22.4-29.0)
	35 - 44	40.0% (36.8-43.2)
	45 - 54	53.0% (49.9-56.1)
	55 - 64	71.0% (68.0-74.0)
	65 +	81.6% (79.4-83.8)
Income	Less than $15,000	63.0% (56.8-69.2)
	$15,000 - $24,999	59.7% (55.5-63.9)
	$25,000 - $34,999	63.3% (58.9-67.7)
	$35,000 - $44,999	44.4% (40.5-48.3)
	$50,000 +	34.3% (32.0-36.6)
Education	Less than H.S.	60.8% (55.3-66.3)
	H.S. or G.E.D.	57.7% (55.0-60.4)
	Some post-H.S.	42.2% (39.2-45.2)
	College graduate	30.6% (28.2-33.0)

Note: H.S. = High school
G.E.D. = General Educational Development certificate
Source: Centers for Disease Control and Prevention, 2008

APPENDIX B

Percentage (and 95% Confidence Interval) of Indiana Adults 65 Years and Older Who Have Had All Their Natural Teeth Extracted (Behavioral Risk Factor Surveillance System, 2006)

		Percentage of Adults aged 65+ who have had all their natural teeth extracted
Gender	Male	19.6% (15.9-23.3)
	Female	22.3% (19.5-25.1)
Race	White	20.1% (17.7-22.5)
	Black	n/a
	Hispanic	n/a
Age	65 - 74 years	20.2% (17.2-23.2)
	75 and over	22.2% (18.8-25.6)
Income	Less than $15,000	37.3% (29.9-44.7)
	$15,000 - $24,999	23.9% (19.2-28.6)
	$25,000 - $34,999	21.5% (15.2-27.8)
	$35,000 - $44,999	15.6% (9.5-21.7)
	$50,000 +	7.5% (3.6-11.4)
Education	Less than H.S.	45.4% (38.3-52.5)
	H.S. or G.E.D.	23.5% (20.0-27.0)
	Some post-H.S.	14.2% (9.9-18.5)
	College graduate	4.5% (2.2-6.8)

Note: H.S. = High school
G.E.D. = General Educational Development certificate
Source: Centers for Disease Control and Prevention, 2008

APPENDIX C

Numbers and ratios of dentists in Indiana by county in 2007

County	Population	DDS	Ratio
Adams	33,644	13	2588
Allen	349,488	176	1986
Bartholomew	74,750	42	1780
Benton	8,810	2	4405
Blackford	13,189	4	3297
Boone	54,137	42	1289
Brown	14,670	3	4890
Carroll	19,987	9	2221
Cass	39,193	9	4355
Clark	105,035	37	2839
Clay	26,648	5	5330
Clinton	33,795	9	3755
Crawford	10,782	2	5391
Daviess	30,035	6	5006
Dearborn	49,759	7	7108
Decatur	24,959	5	4992
DeKalb	41,796	20	2090
Delaware	115,419	54	2137
Dubois	41,225	22	1874
Elkhart	197,942	60	3299
Fayette	24,273	6	4046
Floyd	73,064	44	1661
Fountain	17,143	4	4286
Franklin	23,234	8	2904
Fulton	20,308	7	2901
Gibson	32,754	12	2730
Grant	68,847	30	2295
Greene	32,692	12	2724
Hamilton	261,661	281	931
Hancock	66,305	29	2286
Harrison	36,810	17	2165
Hendricks	134,558	87	1547
Henry	47,181	12	3932
Howard	83,776	48	1745
Huntington	37,743	11	3431
Jackson	42,184	16	2637

Jasper	32,275	10	3228
Jay	21,514	6	3586
Jefferson	32,704	19	1721
Jennings	28,106	4	7027
Johnson	135,951	79	1721
Knox	37,949	18	2108
Kosciusko	76,115	24	3171
LaGrange	37,032	6	6172
Lake	492,104	230	2140
LaPorte	109,787	47	2336
Lawrence	46,033	15	3069
Madison	131,312	53	2478
Marion	876,804	837	1048
Marshall	46,698	15	3113
Martin	10,058	2	5029
Miami	36,641	6	6107
Monroe	128,643	63	2042
Montgomery	37,881	14	2706
Morgan	69,874	27	2588
Newton	14,014	1	14014
Noble	47,526	12	3961
Ohio	5,772	2	2886
Orange	19,607	6	3268
Owen	22,398	4	5600
Parke	17,169	2	8585
Perry	18,916	7	2702
Pike	12,605	3	4202
Porter	160,578	83	1935
Posey	26,262	6	4377
Pulaski	13,778	5	2756
Putnam	37,014	11	3365
Randolph	25,859	6	4310
Ripley	27,350	7	3907
Rush	17,494	5	3499
St. Joseph	266,088	132	2016
Scott	23,679	6	3947
Shelby	44,063	11	4006
Spencer	20,334	4	5084
Starke	23,542	2	11771
Steuben	33,450	10	3345
Sullivan	21,366	4	5342
Switzerland	9,684	1	9684

Tippecanoe	163,364	75	2178
Tipton	16,069	7	2296
Union	7,203	2	3602
Vanderburgh	174,425	93	1876
Vermillion	16,417	4	4104
Vigo	104,915	52	2018
Wabash	32,918	13	2532
Warren	8,482	2	4241
Warrick	57,090	28	2039
Washington	27,920	7	3989
Wayne	68,260	34	2008
Wells	27,927	9	3103
White	23,819	8	2977
Whitley	32,655	9	3628
TOTAL	**6,345,289**	**3299**	**1923**

Population data source: U.S. Census Bureau, n.d.
Dentist data: IU Bowen Research Center

APPENDIX D

Numbers and ratios of registered dental hygienists in Indiana by county in 2006

County	Population	RDH	Ratio
Adams	33,623	31	1085
Allen	346,144	309	1120
Bartholomew	73,999	39	1897
Benton	8,860	3	2953
Blackford	13,281	4	3320
Boone	52,938	54	980
Brown	14,825	4	3706
Carroll	20,017	5	4003
Cass	39,459	28	1409
Clark	103,692	43	2411
Clay	26,738	10	2674
Clinton	33,795	11	3072
Crawford	10,892	1	10892
Daviess	29,899	12	2492
Dearborn	49,199	12	4100
Decatur	25,003	9	2778
DeKalb	41,540	29	1432
Delaware	115,680	36	3213
Dubois	41,050	21	1955
Elkhart	196,466	98	2005
Fayette	24,384	7	3483
Floyd	72,383	40	1810
Fountain	17,225	5	3445
Franklin	23,059	22	1048
Fulton	20,281	12	1690
Gibson	32,974	20	1649
Grant	69,501	25	2780
Greene	32,934	13	2533
Hamilton	251,980	273	923
Hancock	64,551	55	1174
Harrison	36,624	19	1928
Hendricks	130,325	107	1218
Henry	47,492	21	2262
Howard	83,874	46	1823
Huntington	37,875	25	1515
Jackson	42,052	18	2336

Jasper	31,844	25	1274
Jay	21,457	9	2384
Jefferson	32,720	10	3272
Jennings	27,971	22	1271
Johnson	132,597	104	1275
Knox	38,066	20	1903
Kosciusko	75,811	37	2049
LaGrange	36,693	14	2621
Lake	489,925	243	2016
LaPorte	109,278	75	1457
Lawrence	45,892	22	2086
Madison	131,195	64	2050
Marion	872,986	436	2002
Marshall	46,648	36	1296
Martin	10,153	6	1692
Miami	36,954	10	3695
Monroe	127,306	38	3350
Montgomery	37,718	19	1985
Morgan	69,605	35	1989
Newton	14,009	4	3502
Noble	47,518	25	1901
Ohio	5,836	1	5836
Orange	19,483	2	9742
Owen	22,323	8	2790
Parke	17,154	10	1715
Perry	18,824	4	4706
Pike	12,639	4	3160
Porter	158,189	154	1027
Posey	26,372	10	2637
Pulaski	13,775	6	2296
Putnam	36,813	18	2045
Randolph	26,110	9	2901
Ripley	27,431	6	4572
Rush	17,554	5	3511
St. Joseph	265,505	231	1149
Scott	23,617	5	4723
Shelby	43,712	13	3362
Spencer	20,335	12	1695
Starke	23,522	12	1960
Steuben	33,555	17	1974
Sullivan	21,367	9	2374
Switzerland	9,634	4	2409

Tippecanoe	160,458	65	2469
Tipton	16,151	9	1795
Union	7,176	2	3588
Vanderburgh	174,087	119	1463
Vermillion	16,458	9	1829
Vigo	104,899	36	2914
Wabash	33,291	21	1585
Warren	8,581	2	4291
Warrick	56,165	52	1080
Washington	27,846	7	3978
Wayne	68,559	23	2981
Wells	27,895	19	1468
White	23,980	8	2998
Whitley	32,390	28	1157
TOTAL	**6,302,646**	**3661**	**1722**

Population source: U.S. Census Bureau, n.d.
Dental Hygienists data: Yoder, 2007

REFERENCES

Adams-Wilson, T., Coordinator of Diversity Support Services, Indiana University School of Dentistry (personal communication, October 24, 2008)

American Dental Association. (n.d.). *Smoking (tobacco) cessation*. Retrieved November 14, 2008, from http://www.ada.org/public/topics/smoking_tobacco_faq.asp

Bastin, K.G.,Dental Assisting Program Director, University of Southern Indiana (personal communication, January 26, 2009)

Brown, K., International Business College Dental Assisting Program (personal communication, February 18, 2009).

Burns & Associates, Inc. (2008). *Independent evaluation of Indiana's Children's Health Insurance Program – annual report*. Retrieved November 11, 2008, from http://www.in.gov/fssa/files/2007CHIPEvaluationFinalReport0408.pdf

Carl, D., Dental Hygiene Program Director, University of Southern Indiana (personal communication, December 17, 2008)

Centers for Disease Control and Prevention. (2008). *Behavioral Risk Factor Surveillance System - prevalence data*. Retrieved November 10, 2008, from http://apps.nccd.cdc.gov/brfss/

Centers for Disease Control and Prevention. (n.d.). CDC WONDER – compressed mortality, 1999 – 2005 request. Retrieved November 2, 2008, from http://wonder.cdc.gov/cmf-icd10.html

Centers for Disease Control and Prevention. (2001). Recommendations for using fluoride to prevent and control dental caries in the United States. Retrieved December 18, 2008, from http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5014a1.htm#fig2

Clark, P.M., Assistant Director of Admissions, Indiana University School of Dentistry (personal communications, October 21, 2008 and January 14, 2009)

Curran, T.S., Coverage and Benefits Unit, Office of Medicaid Policy and Planning, Family and Social Services Agency (personal communication, November 12, 2008)

Edelstein, B.L. (2002). Disparities in oral health and access to care: Findings of national surveys. *Ambulatory Pediatrics,* 2(2):141-147.

Ford, P.T., Director of Dental Assisting - Campus Program, Indiana University School of Dentistry (personal communication, January 12, 2009)

Health Resources and Services Administration. (2008). Shortage designation: HPSAs, MUAs & MUPs. Retrieved December 1, 2008, from http://bhpr.hrsa.gov/shortage/

Horowitz, H.S. (1996). The Effectiveness of Community Water Fluoridation in the United States. *Journal of Public Health Dentistry*, 56(5):253-8.

Indiana Department of Education. (2007). *Indiana Free Lunch Percent 2007-08*. Retrieved November 2, 2008, from http://mustang.doe.state.in.us/TRENDS/flunch.cfm?year=2008&pub=1

Indiana State Department of Health. (n.d.). *Hospital guide & public data (inpatient, aggregated data)*. Retrieved November 2, 2008, from http://www.in.gov/isdh/20624.htm

Indiana State Department of Health. (2008). *National Birth Defects Prevention Network Reports, 2003 – 2005*. Provided by Dr. Kent Smith, State Oral Health Director, on December 17, 2008.

Indiana University Bowen Research Center (Dr. Deborah Allen and Dr. Komal Kochhar).

Kracher, C., Chair and Associate Professor, Department of Dental Education, Indiana University-Purdue University Fort Wayne (personal communication, February 20, 2009).

Macauley, T., Program Chair Dental Assisting, Ivy Tech Community College – Anderson Campus (personal communication, December 17, 2008)

MacMillan, B., Dental Hygiene Program Chair, Ivy Tech Community College South Bend (personal communication, December 18, 2008)

Robinson, J., Clinical Assistant Professor in Dental Education, Director Dental Education, Indiana University Northwest (personal communication, December 22, 2008)

Ross, C., Program Director, Dental Assisting Program, C4 Columbus Area Career Connection/Ivy Tech State (personal communication, January 6, 2009)

Schafer, J. M., Director, Programs in Dental Education Indiana University South Bend (personal communication, January 7, 2009)

Smith, K., State Oral Health Director, Indiana State Department of Health (personal communication, December 15, 2008).

Ticen, M.K., Dental Programs Ivy Tech Community College Lafayette (personal communication, February 2, 2009).

U.S. Census Bureau. (n.d.). *American Community Survey.* Retrieved November 11, 2008, from http://www.census.gov/

U.S. Census Bureau. (March 20, 2008). Annual Estimates of the Population for Counties of Indiana: April 1, 2000 to July 1, 2007 (CO-EST2007-01-18). Source: Population Division. Available at http://quickfacts.census.gov/qfd/states/18000lk.html
Accessed 03-13-09.

U.S. Department of Health and Human Services. (2000a). *Healthy People 2010. 2nd ed. With Understanding and Improving Health and Objectives for Improving Health*: Washington, DC: U.S. Government Printing Office.

U.S. Department of Health and Human Services. (2000b). *Oral health in America: A report of the Surgeon General.* Rockville, MD: U.S. Department of Health and Human Services, National Institute of Dental and Craniofacial Research, National Institutes of Health.

Valliere, B., Director, Dental Hygiene, Indiana University-Purdue University Fort Wayne (personal communication, January 15, 2009).

Vargas, C.M., Dye B.A., and Hayes K.L. (2002). Oral health status of rural adults in the United States. *JADA*, 133(12): 1672-1681.

Vargas, C.M., Ronzio, C.R., and Hayes, K.L. (2003). Oral health status of children and adolescents by rural residence, United States. *Journal of Rural Health,* 19(3):260-268.

Yoder, K.M. (2007). Indiana's dental workforce: Distribution and related issues. *JIDA*, Summer: 10-15.

Young, N., Associate Professor & Director of Dental Hygiene, Indiana University School of Dentistry (personal communications, November 4, 2008 and November 11, 2008)