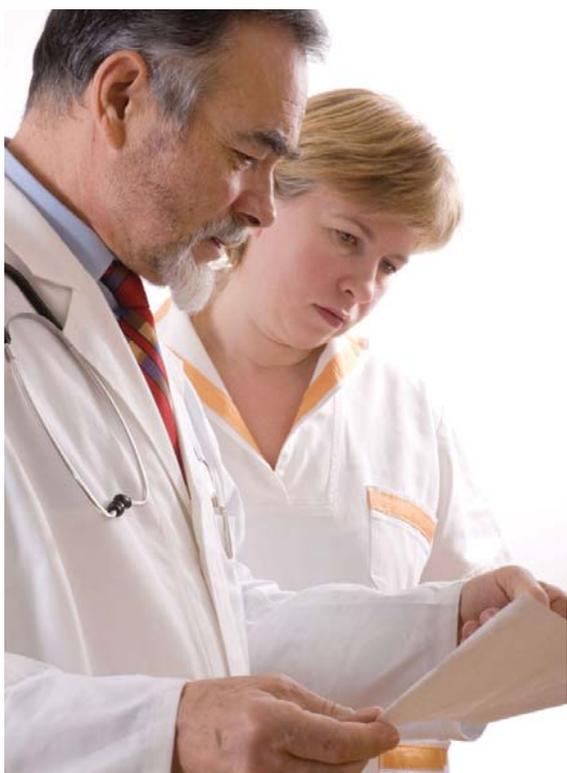


Critical Shortage of Physicians and Nurses Projected for Indiana



As policymakers and analysts work to structure improvements for the healthcare system in Indiana, a shadow looms over the future—a growing shortage of physicians and nurses threatens to limit the availability of basic medical care. These shortages are most serious in primary care, and will affect certain populations most severely—including residents of underserved areas, the poor, racial and ethnic minorities, the elderly, and those living in rural areas.

If two goals of healthcare reform are to improve health and reduce healthcare costs, then an appropriate ratio of primary care and specialty care providers is needed to ensure adequate access to basic and preventive services, including immunizations, treatment of minor infections before they become more severe, well child care, screening to identify potential health issues early when they are more responsive to treatment, management of chronic

health conditions, and basic information to help individuals manage their own health. Providers of these kinds of primary care include primary care physicians, nurse practitioners, public health nurses, and physician assistants, as well as mental health providers and dentists. Of course, many other health professionals are needed to support these primary care providers.

Most healthcare professionals in Indiana are well aware that the state already suffers from a shortage of physicians and nurses, especially primary care providers. Over half (54%) of Indiana counties are now designated *medically underserved areas* in whole or in part. And in the first quarter of 2007, there were 6,000 unfilled nurse positions in our hospitals alone.

Consider these statistics:

- we currently need 5,000 more physicians statewide to appropriately care for our population (1,000 of these need to be primary care physicians);
- if current trends continue, by 2020, we will need almost 2,000 additional primary care physicians and we will be short 20,000 registered nurses (RNs) in Indiana;
- 81% of urban counties and 98 percent of rural counties in Indiana fail to meet the U.S. benchmark for an adequate ratio of primary care specialists per 100,000 population;
- 65% of urban counties and 87% of rural counties in Indiana fail to meet the U.S. benchmark for an adequate ratio of RNs per 100,000 population;
- 38% of Indiana counties (representing 17.5% of the state's population) are designated *mental health professional shortage areas*;
- 30% of Indiana counties (representing 13.4% of the population) are designated *primary care health professional shortage areas*;
- 14% of Indiana counties (8.1% of the state's population) are designated *dental health professional shortage areas*.¹

Many trends indicate that Indiana's shortages will continue to worsen. First, the population continues to grow and it is aging. From 1980 to 2005, the state's population grew 14 percent. And

people over age 65, who make twice as many physician visits as younger people, will double between 2000 and 2030. Second, adverse lifestyle factors are impairing the health of our population and this will likely increase demand for services. For example, obesity and diabetes rates are rising very fast. And third, while federal, state, and local programs exist to recruit and retain health professionals in our state, these programs have had minimal impact on the underlying factors that contribute to the problem.²

In addition, many physicians and nurses are part of an aging workforce and often are dissatisfied with the healthcare system. Consequently, there has been an increase in the number retiring or working fewer hours. The aging health professions workforce is an environmental factor that contributes to short-

ages and has been cited in many national reports.³⁻⁵ According to one recent study in Indiana, among “critical aging occupations” are nurses with associate’s degrees and teachers in nursing education at this level.⁶

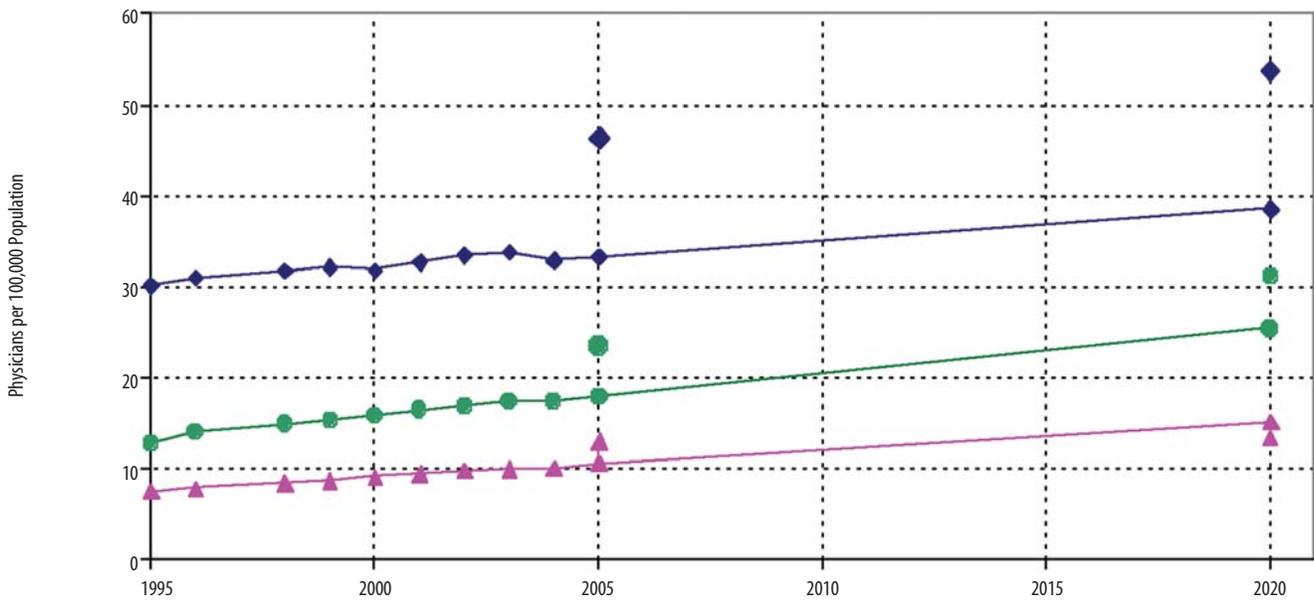
Table 1: Comparison of Indiana's Projected Physician Demand and Supply By Specialty, 2020

Specialty	Projected Total Number in State	Indiana Physician Supply (per 100,000 Indiana Citizens)	Lifton 2020 Physician Demand (per 100,000 Indiana Citizens)*	Difference Between Indiana Physician Supply & Demand (per 100,000 Indiana Citizens)	Number of Physicians Needed
Family Medicine	2,560	38.6	53.9	15.3	1,030
General Internal Medicine	1,691	25.5	31.2	5.7	383
General Pediatrics	1,011	15.3	13.5	-1.8	-118
General Obstetrics & Gynecology	769	11.6	14.3	2.7	182
General Surgery	355	5.4	11.6	6.2	421
TOTAL	6,386				1,898

Sources: U.S. Department of Health and Human Services Health Resources and Services Administration. Area Resource File. Available at <http://www.arfsys.com/>.
 U.S. Census Bureau. April 21, 2005 Table A1. *Interim State Population Projections of the Total Population for the United States and States: April 1, 2000 to July 1, 2030*: U.S. Census Bureau Population Division.
 Lifton J. *Current Perspectives on Physician Supply and Demand*. Park Ridge, IL: Lifton Associates, LLC; 2007 May.

*All specialties adjusted for differences between Indiana and U.S. service delivery models.

Figure 1: Primary Care Physician Supply in Indiana Showing Physician Demand Estimates for 2005 and 2020*
 (Demand Estimates Shown as Points Off the Lines of Supply)

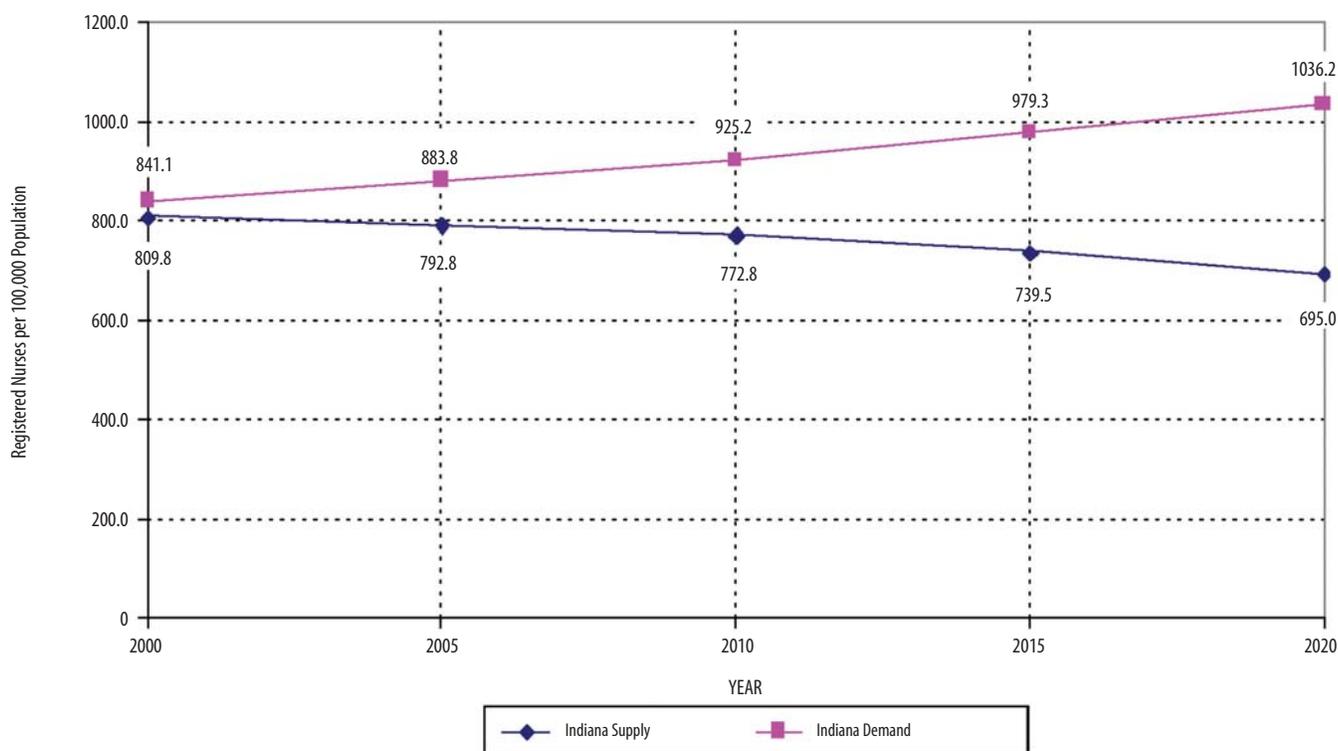


*Projections to 2020 Using 1995-2005 ARF Data (excluding 1997)



Source: U.S. Department of Health and Human Services Health Resources and Services Administration. Area Resource File (ARF). Available at <http://www.arfsys.com/>

Figure 2: Indiana Projections of Registered Nurses Per 100,000 Population For 2000 to 2020, Using HRSA Nursing Supply and Demand Models



Source: The National Center for Health Workforce Analysis (NCHWA). (2004) *What is Behind HRSA's Projected Supply, Demand, and Shortage of Registered Nurses?*

Table 1 shows the number of primary care physicians, by type, that are expected to be practicing in Indiana in 2020 based on historical trends. This projection does not include the additional medical students that were accepted into the IU Medical School for the 2007 matriculating class. The first group of 15 additional students should be ready to start practicing in the year 2015. Since about half of the medical school graduates leave Indiana to practice, and only about 40 percent choose primary care specialties, we can expect expansion of the medical school classes to add about 16 new residents in primary care specialties each year from 2019 and onward. Considering the expected population growth and the anticipated increase in demand compared to the current and expected supply, we can project that we will need approximately 1,900 more primary care physicians to meet the benchmark ratios per 100,000 population in the year 2020.

Figure 1 shows future projections for the three major primary care specialties based on Area Resource File data from 1995 to 2005. The single points above the lines in 2005 and 2020 are the benchmark ratios for each specialty needed to meet the healthcare needs of the population. The 1997 data appeared to be outliers and were not included. The projections for these

specialties are being made in the midst of major changes that are occurring in the educational matrix of primary care; thus, conclusions about the projections should be made with caution. Other factors that influence the supply of physicians in Indiana are:

- The number of family medicine (FM) residency slots in Indiana continues to drop, so we are now educating fewer FM residents than in the past.
- Nearly 60% of the residents entering FM residencies across the country and in Indiana are international medical graduates (IMGs), and we do not know what impact that will have on their eventual practice site. Changes in the U.S. immigration policies following 9/11 have reduced the number of IMGs who come to the United States for training and stay here to practice.
- Nearly 40% of the residents entering internal medicine (IM) and pediatrics residency programs are IMGs and the same issues apply.

Figure 2 shows the expected decline in the RN workforce and the increasing demand for RNs in Indiana, based on sophisticated modeling performed by the U.S. Health Resources and



Services Agency.³ The numbers on the graph are ratios of nurses per 100,000 population. Based on these numbers and the projected number of Indiana residents, over twice the number of open nursing positions reported by the Indiana Hospital and Health Association for the first quarter of 2007.⁷ With current trends, the estimated shortage of RNs in Indiana by 2020 will be 22,076.

Shortages Are More Acute in Particular Areas

The health professions workforce shortages are more acute for specific health professionals in certain geographical areas. A study commissioned by the Indiana State Office of Rural Health to examine rural recruitment and retention programs for the healthcare workforce found that federal, state, and local programs do exist to recruit and retain health professionals where they are needed; however, these programs have not had the expected impact on addressing this problem given their current implementation.¹⁰ Results could be improved by using the findings of studies about what kinds of students ultimately serve in primary care disciplines in areas of need when selecting participants for these programs.

According to a Price Waterhouse report,⁸ the line between nurse and physician roles is blurring in primary care. In many areas of the country, non-physician providers help deliver primary care when physicians are not available. Of hospital executives surveyed, three-fourths said they use more nonphysician primary care providers now than in the past, and over half said they will use them more in the future. However, in Indiana, there are insufficient numbers of non-physician primary care providers to fill the gap caused by the shortage of primary care physicians.

In Indiana, primary and preventive care is more likely to be provided by family medicine physicians than in the United States in general, as evidenced by the higher ratio of family medicine physicians per 100,000 population and a lower ratio of general internal medicine physicians in Indiana, compared to the United States as a whole. In addition, experts suggest that many rural areas may not have sufficient population to support both a general internal medicine physician and a pediatrician, but may be able to support a family medicine physician.

Medically Underserved Areas Suffer Most

Many Indiana communities have a shortage of health professionals in virtually all disciplines, from medical assistants to physicians. And residents of the communities with the most serious shortages often have the most poverty and the poorest health status. They suffer disproportionately from poor health status and higher healthcare costs because of their lack of access to primary and preventive care. These disparities are influenced by many factors, but they are certainly affected by the lack of healthcare insurance and insufficient numbers of providers.

Disparities are most prevalent in Indiana's urban inner cities and rural areas. Individuals in those communities tend to delay utiliz-

ing healthcare until it is urgent, and they often access healthcare in the most expensive and least effective way—through hospital emergency rooms. Emergency room charges are often covered by Medicaid, resulting in an increased tax burden, or they may remain unpaid to the hospitals, resulting in an unavoidable shifting of costs, which increases medical insurance premiums for businesses and their employees.

These medically underserved communities that suffer from health professional shortages can exist anywhere, but tend to be concentrated in rural communities and urban inner city areas with many low-income residents. Despite the poverty in these areas that may make the communities unattractive to some health professionals, there are effective strategies for

recruiting students to ultimately practice in these communities.¹⁰

Evidence shows that the strongest predictor of where a health professional will practice is where that health professional came from. This supports the theory that those who practice in medically underserved communities are most likely to have come from underserved populations. However, students from underserved backgrounds are less likely to enter higher education and health professions training programs than their wealthier counterparts unless they are equipped to overcome educational and financial barriers.^{11,12}

The supply of health professionals varies greatly based on geographic, demographic, and socioeconomic factors, resulting in a poor distribution of health professionals across the state of Indiana. Health professionals are more concentrated in affluent areas and less concentrated where the population is less

“Analyses at the county level show lower mortality rates where there are more primary care physicians, but this is not the case for specialist supply. These findings confirm those of previous studies at the state and other levels. Increasing the supply of specialists will not improve the United States’ position in population health relative to other industrialized countries, and it is likely to lead to greater disparities in health status and outcomes. Adverse effects from inappropriate or unnecessary specialist use may be responsible for the absence of relationship between specialist supply and mortality.”⁹

Table 2: Primary Care Physicians and Non-Physician Clinicians in Indiana by County

+MSA	Year 2005 Population	County	Family Medicine Physicians	General Internal Medicine Physicians	General Pediatric Physicians	Osteopathic Physicians‡	Primary Care Physician Assistants	Nurse Practitioners*	Total Primary Care Physician & Non-Physician Clinicians	Rate of Primary Care Physicians & Non-Physician Clinicians per 100,000 Population	Relative Score on 100-Point Scale
2	33719	Adams	11	2	1	0	0	3	17	50.4	17.8
1	347316	Allen	111	52	35	67	8	83	356	102.5	36.3
	74444	Bartholomew	30	17	16	3	1	14	81	108.8	38.5
	9050	Benton	3	0	0	0	0	2	5	55.2	19.5
	13603	Blackford	6	2	0	0	0	2	10	73.5	26.0
2	53526	Boone	28	34	22	13	2	8	107	199.9	70.8
	15071	Brown	5	1	0	2	0	4	12	79.6	28.2
	20526	Carroll	6	0	0	1	0	5	12	58.5	20.7
	39902	Cass	11	4	3	3	0	4	25	62.7	22.2
1	103569	Clark	24	27	9	7	3	20	90	86.9	30.8
2	27021	Clay	6	3	1	2	3	2	17	62.9	22.3
2	34217	Clinton	6	2	2	1	0	3	14	40.9	14.5
	11137	Crawford	0	0	0	0	0	2	2	18.0	6.4
	30220	Daviess	4	1	2	10	0	9	26	86.0	30.5
2	49663	De Kalb	20	9	7	4	1	3	44	88.6	31.4
2	24948	Dearborn	10	3	2	4	0	1	20	80.2	28.4
	41902	Decatur	2	3	2	1	1	3	12	28.6	10.1
1	114879	Delaware	44	54	15	10	1	29	153	133.2	47.2
	41212	Dubois	15	13	4	11	1	5	49	118.9	42.1
1	198105	Elkhart	59	20	13	31	5	32	160	80.8	28.6
	24648	Fayette	7	2	2	4	0	6	21	85.2	30.2
1	72570	Floyd	32	7	16	2	1	8	66	90.9	32.2
	17486	Fountain	3	2	1	0	0	0	6	34.3	12.1
	23373	Franklin	1	5	2	0	2	1	11	47.1	16.7
	20622	Fulton	6	1	3	3	1	4	18	87.3	30.9
	33396	Gibson	6	3	1	9	1	3	23	68.9	24.4
	69825	Grant	17	9	5	18	1	10	60	85.9	30.4
	33360	Greene	8	0	0	3	0	5	16	48.0	17.0
1	250979	Hamilton	107	139	68	41	8	36	399	159.0	56.3
2	65050	Hancock	31	5	3	5	0	12	56	86.1	30.5
2	36992	Harrison	13	1	2	1	0	4	21	56.8	20.1
2	131204	Hendricks	32	24	19	17	3	9	104	79.3	28.1
	46947	Henry	13	5	4	0	0	8	30	63.9	22.6
1	84500	Howard	28	19	10	6	2	13	78	92.3	32.7
2	38026	Huntington	13	2	4	3	0	2	24	63.1	22.3
	42404	Jackson	22	1	2	1	3	6	35	82.5	29.2
	32296	Jasper	15	2	0	1	0	4	22	68.1	24.1
	21605	Jay	7	1	0	1	0	2	11	50.9	18.0
	32668	Jefferson	17	4	3	2	1	3	30	91.8	32.5
	28473	Jennings	5	4	1	3	0	6	19	66.7	23.6
1	133316	Johnson	49	29	19	8	0	15	120	90.0	31.9
	38241	Knox	10	10	5	14	0	8	47	122.9	43.5
	76541	Kosciusko	29	3	4	13	4	7	60	78.4	27.8
	37291	La Porte	34	1	0	10	0	17	62	166.3	58.9
	494202	Lagrange	8	109	64	2	0	1	184	37.2	13.2
1	110479	Lake	121	18	8	95	0	70	312	282.4	100.0
	46413	Lawrence	10	9	3	2	0	32	56	120.7	42.7

(continued on next page)



Table 2: (continued from previous page)

+MSA	Year 2005 Population	County	Family Medicine Physicians	General Internal Medicine Physicians	General Pediatric Physicians	Osteopathic Physicians‡	Primary Care Physician Assistants	Nurse Practitioners*	Total Primary Care Physician & Non-Physician Clinicians	Rate or Primary Care Physicians & Non-Physician Clinicians per 100,000 Population	Relative Score on 100-Point Scale
1	130575	Madison	59	9	7	1	0	17	93	71.2	25.2
1	865504	Marion	277	400	241	108	20	358	1404	162.2	57.4
	47295	Marshall	25	3	1	11	0	7	47	99.4	35.2
	10340	Martin	1	2	0	2	0	1	6	58.0	20.5
	35552	Miami	6	2	3	3	0	4	18	50.6	17.9
1	122613	Monroe	47	31	11	6	4	36	135	110.1	39.0
	38173	Montgomery	13	5	5	2	0	7	32	83.8	29.7
2	70290	Morgan	10	11	6	7	1	4	39	55.5	19.7
	14293	Newton	1	1	0	1	0	3	6	42.0	14.9
	47918	Noble	15	2	1	1	0	2	21	43.8	15.5
2	5826	Ohio	0	0	0	0	0	0	0	0.0	0.0
	19659	Orange	11	0	1	2	0	3	17	86.5	30.6
	22741	Owen	3	2	0	0	1	2	8	35.2	12.5
	17021	Parke	7	0	0	0	0	1	8	47.0	16.6
	18843	Perry	8	0	1	1	0	1	11	58.4	20.7
	12855	Pike	3	0	0	0	0	2	5	38.9	13.8
2	160105	Porter	41	38	10	30	1	20	140	87.4	30.9
2	26765	Posey	5	0	0	1	0	0	6	22.4	7.9
	13861	Pulaski	6	0	0	3	0	3	12	86.6	30.7
	36978	Putnam	12	2	0	0	1	1	16	43.3	15.3
	26581	Randolph	5	2	0	3	0	6	16	60.2	21.3
	27748	Ripley	10	0	4	2	1	2	19	68.5	24.3
	17684	Rush	4	2	0	1	0	2	9	50.9	18.0
2	266678	Scott	9	48	34	0	0	6	97	36.4	12.9
2	23704	Shelby	8	1	1	1	0	2	13	54.8	19.4
	44114	Spencer	7	5	2	0	0	1	15	34.0	12.0
1	20596	St. Joseph	113	0	0	75	1	51	240	1165.3	412.6
	23069	Starke	6	0	0	3	0	3	12	52.0	18.4
	33683	Steuben	14	1	0	2	1	1	19	56.4	20.0
	21542	Sullivan	4	2	0	1	1	2	10	46.4	16.4
	9721	Switzerland	0	0	0	0	0	1	1	10.3	3.6
1	156169	Tippecanoe	46	39	21	16	0	37	159	101.8	36.0
2	16377	Tipton	7	0	2	2	0	0	11	67.2	23.8
	7291	Union	4	1	0	0	0	0	5	68.6	24.3
1	173356	Vanderburgh	103	38	23	18	2	41	225	129.8	46.0
2	16645	Vermillion	1	1	0	1	0	5	8	48.1	17.0
1	103009	Vigo	53	36	10	20	1	18	138	134.0	47.5
	33559	Wabash	13	1	0	2	0	3	19	56.6	20.0
	8701	Warren	1	0	1	2	0	1	5	57.5	20.4
2	57090	Warrick	30	22	12	7	0	12	83	145.4	51.5
	28062	Washington	8	4	1	0	0	1	14	49.9	17.7
	68846	Wayne	19	19	4	14	0	13	69	100.2	35.5
2	28199	Wells	14	3	5	4	2	5	33	117.0	41.4
	24396	White	10	0	0	0	0	1	11	45.1	16.0
2	32556	Whitley	9	1	1	5	0	2	18	55.3	19.6

† MSA counties are coded 1 = center county in the MSA; 2 = collar county in the MSA. Those left blank are non-MSA counties

‡ The Area Resource File does not differentiate between primary care and non-primary care doctors of osteopathy

* The director of the IU School of Nursing Nurse Practitioner program indicated that nearly all nurse practitioners in rural areas are primary care providers and about 60% of those in MSAs are primary care provider

dense and where there are higher proportions of low income and racial or ethnic minorities.¹³⁻¹⁷

Table 2 shows that Indiana counties that are not classified as metropolitan statistical areas (MSAs) have lower ratios of primary care physicians and non-physician clinicians per population than those classified as MSAs. The table also shows a great deal of variation among counties relative to the composition of the primary care clinician workforce. Family medicine physicians are by far the most common primary care clinicians in non-MSA counties. Counties with very low numbers of family medicine physicians are more likely to have nurse practitioners supporting the primary care needs of the communities. Osteopathic physicians and primary care physician assistants are not prevalent in Indiana's counties. General internal medicine physicians and general pediatric physician are less prevalent in non-MSA counties. There is a close relationship between population density and the composition of the primary care clinician workforce. The relative score shown on Table 2 is a ranking for each county on a scale from 0 to 100 to help policymakers understand where each county ranks compared to the others. The lowest ratio of primary care providers per 100,000 population was given a score of 0, and the highest ratio was given a score of 100.

Map 1 shows the ratio of primary care providers, both physicians and nonphysicians per 100,000 population for the 92 Indiana counties. A benchmark ratio for an adequate number of primary care providers per 100,000 population has not yet been established. Residents in counties with lighter shading have fewer practicing primary care providers per capita from whom they can seek health care. The map shows a wide range of ratios from 0/100,000 in Ohio County to 188.2/100,000 in Boone County.

Map 2 shows the ratio of RNs working in each county per 100,000 population. Counties with the two lightest shades have RN ratios less than the benchmark established by the federal Health Resources and Services Administration (HRSA).

According to a report for the Indiana Health Industry Forum, "the health industries will be essential parts of the state's economic success in future decades. If so, then the health industries must be able to recruit the workforce they need to sustain their growth and development. Yet, many employers report that they either currently have difficulty locating workers to fill key positions, or expect to have the problem in the near future."²⁰

A study of vulnerable populations documented the link between shortages of primary care providers and increased preventable hospitalizations. "Medicare beneficiaries in fair or poor health are more likely to experience a potentially preventable hospitalization if they live in a county designated as a Primary Care Health Professions Shortage Area. Provision of Medicare coverage alone may not be enough to prevent poor ambulatory healthcare outcomes such as preventable hospitalizations."¹⁸

Counties with the middle shade have ratios near the HRSA benchmark. Those with the two darker shades have ratios above the benchmark. Most Indiana counties fall below the HRSA benchmark.

Public Health and Economic Burden

There is a broad consensus that access to timely, primary and preventive health care results in lower healthcare costs and better health outcomes than uncoordinated, delayed care.^{9,18,19} The shortage of health professionals is a major barrier to accessing appropriate care, particularly in areas designated as Health Professions Shortage Areas (HPSAs) and Medically Underserved Areas (MUAs). When communities lack health professionals who are willing and able to provide healthcare within a reasonable travel distance of the community, residents tend to delay seeking the most cost-effective care available and often seek primary care in emergency departments, where care is expensive and inconsistent.

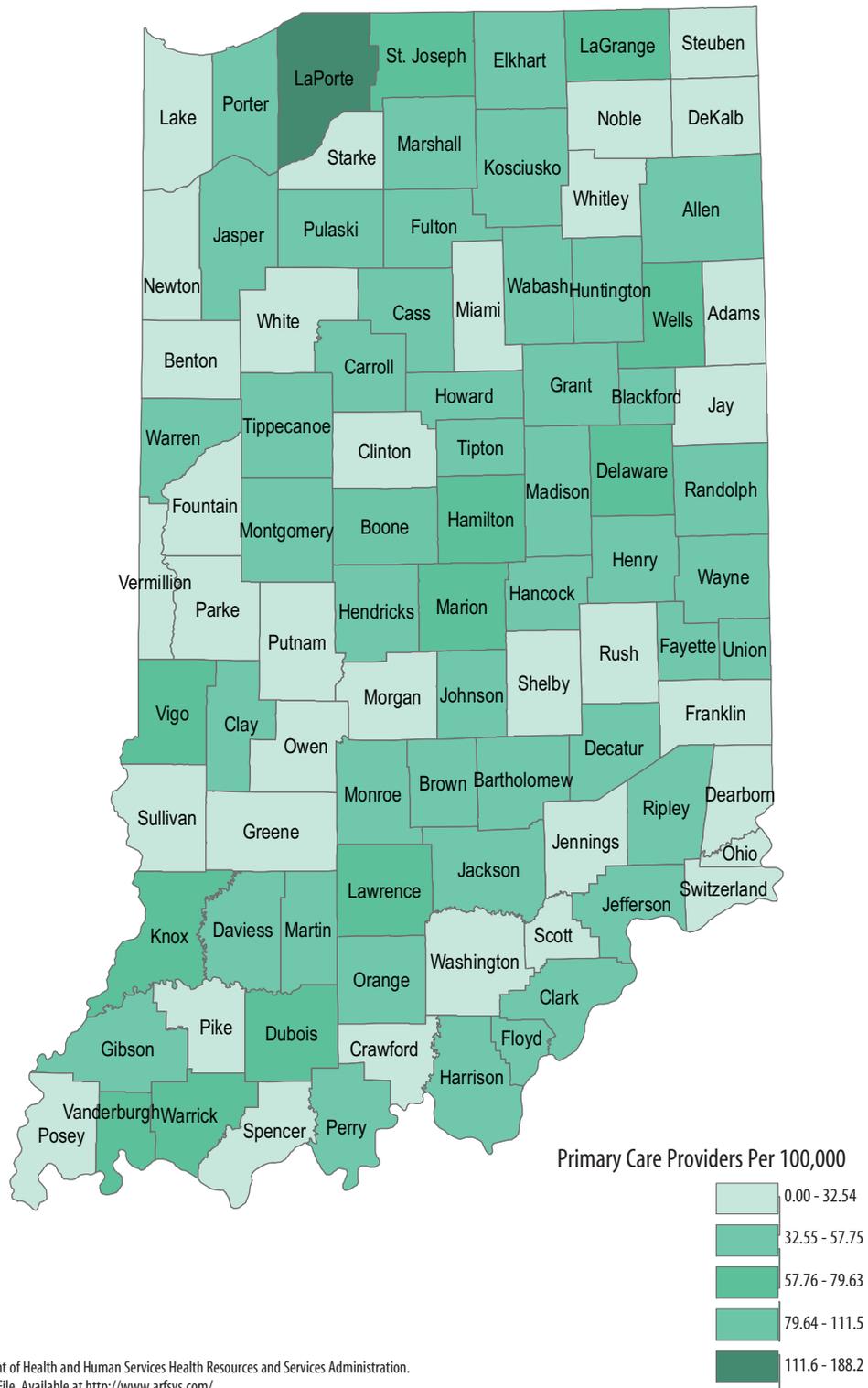
Individuals who do not receive preventive care services, who do not receive care early in their disease process, or who seek primary care in the emergency departments suffer from a lower quality of life. And there is another economic consequence to communities, citizens in poor health are less productive, and this restricts their ability to support local and state businesses.

With health professional shortages, healthcare facilities are not able to fully staff their departments, putting an excess burden on existing staff and significantly increasing the cost of care they deliver.

The increase in cost of care is reflected in the cost of health insurance premiums paid by businesses and employees, as well as higher copayments and deductibles paid by individuals. The increased cost of health care also increases the cost of products produced and services rendered by Indiana residents, which decreases our competitive business standing with other states.



Map 1: All Types of Primary Care Providers Per 100,000 Population by County, 2005



Source: U.S. Department of Health and Human Services Health Resources and Services Administration. Area Resource File. Available at <http://www.arfsys.com/>



Thoughts for Policymakers

Shortages of physicians and nurses in Indiana will be affected by many factors. Programs that can expand our capacity to train these professionals are essential, especially training for the primary care professionals who are expected to be in critically short supply, including primary care physicians—which may be family practitioners, general internists, and pediatricians—as well as non-physician primary care providers (nurse practitioners and physician assistants) and nurses.

Strategies that could be expected to make a difference include:

- programs to help retain existing physicians, nurses, and relevant faculty members;
- increases in class sizes in professional training programs;
- programs to recruit new students based on their predicted willingness to work in rural and urban inner-city primary care practices;
- increases in remote teaching technologies that can be used in higher education;
- increases in the size of teaching faculties, including part-time and adjunct teaching faculty members (to attract applicants, higher salaries for teachers in critical training programs);
- policies that help physicians and nurses from other countries enter the country and practice in medically underserved areas should be reviewed;
- rural and community health training programs designed to train primary care physicians, nurse practitioners, physician assistants, and nurses;



- requirements that healthcare students must acquire clinical training experiences in a rural or urban inner-city primary care setting in a medically underserved area; and
- targeted, best-practice financial aid incentives for healthcare students and professionals who commit to serving identified areas where there are critical shortages of healthcare services.

In addition to programs that can increase the supply of needed physicians and nurses, programs that will lessen the demand for services will also be beneficial. Some of the most obvious are preventive medicine programs, educational programs, and programs that foster good health habits such as exercise, good nutrition, and smoking cessation.

References

1. Indiana State Department of Health. Health Professional Shortage Area & Medically Underserved Area Designations. Available at: <http://www.in.gov/isdh/publications/llo/shortages/shortage.htm>
2. Zollinger T.W., Muegge C.M., Emery E.J., Galloway CM. (2007). *Indiana State Office of Rural Health: Analysis of Programs to Recruit and Retain Primary Care Physicians in Rural Areas of Indiana*. Indianapolis: Indiana University School of Medicine.
3. Health Resources and Services Administration (HRSA) Bureau of Health Professions. (2002, July). *Projected Supply, Demand, and Shortages of Registered Nurses: 2000-2020*: U.S. Department of Health and Human Services.
4. Kimball B., O'Neil E. (2002, April). *healthcare's Human Crisis: The American Nursing Shortage*. Princeton, NJ: The Robert Wood Johnson Foundation.
5. American Medical Association. (2007, June). *Initiative to Transform Medical Education: Recommendations for Change in the System of Medical Education*.
6. Toft G.S., Jeserich N. (2006). *The Aging Matrix: A Scorecard of Economic & Social Participation in Indiana*. Indianapolis: University of Indianapolis Center for Aging & Community.
7. Indiana Hospital & Health Association. (2007). *Workforce Benchmarking: 1st Quarter 2007*.
8. Price Waterhouse Coopers Health Research Institute. (2007). *What Works: Healing the Healthcare Staffing Shortage*: Price Waterhouse Coopers.
9. Starfield B., Shi L., Grover A., Macinko J. (2005, Jan-Jun). The effects of specialist supply on populations' health: assessing the evidence. *Health Aff (Millwood)*. Suppl web exclusives:W5-97-W95-107.
10. Health Resources and Services Administration Bureau of Health Professions. (2002, November). *State Responses to Health Worker Shortages: Results of a 2002 Survey of States*: U.S. Department of Health and Human Services.
11. Haycock K. (2006, August). *Promise Abandoned: How Policy Choices and Institutional Practices Restrict College Opportunities*: The Education Trust and the Lumina Foundation for Education.
12. Gerald D., Haycock K. (2006). *Engines of Inequality: Diminishing Equity in the Nation's Premier Public Universities*: The Education Trust and the Lumina Foundation for Education.
13. Indiana University School of Medicine Physician Workforce Task Force. *Task Force Findings and Recommendations: Indiana Physician Profile, Analysis and Projection - Final Report, 2006*. Indianapolis, IN: Indiana University School of Medicine; November 2006.
14. Zollinger T.W., Przybylski M.J., Sutton B.S., Jackson L.D. (2007). *2005 Indiana Registered Nurse Survey Report*. Indianapolis: Indiana University School of Medicine.
15. Yoder K.M. (2007, Summer). Indiana's dental workforce: distribution and related issues. *JIDA*, 16-20.
16. Larson E., Johson K., Norris T., Lishner D., Rosenblatt R., Hart L. (2003, August). *State of the Health Workforce in Rural America: Profiles and Comparisons*: WWAMI Rural Health Research Center.
17. Wade M.E., Brokaw J.J., Zollinger T.W., et al. (2007). Influence of hometown on family physicians' choice to practice in rural settings. *Fam Med*, 39, 248-254.
18. Parchman M.L., Culler S.D. (1999). Preventable hospitalizations in primary care shortage areas: An analysis of vulnerable Medicare beneficiaries. *Arch Fam Med*, 8, 487-491.
19. Richman I.B., Clark S., Sullivan A.F., Camargo C.A. Jr. (2007). National study of the relation of primary care shortages to emergency department utilization. *Acad Emerg Med*, 1, 279-282.
20. Thomas P. Miller & Associates. (2003, July 15). *Indiana Health Industries Workforce Study Executive Summary*: Hudson Institute.



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About This Report

This report is part of a series on the health care system in Indiana. It was created as a result of the work of the Indiana University Health Care Reform Faculty Study Group, a group of faculty members and analysts from the following Indiana University organizations:

- IU Center for Health Policy
- IUPUI Consortium for Health Policy, Law, and Bioethics
- William S. and Christine S. Hall Center for Law and Health
- IU School of Medicine



The Indiana University Center for Health Policy is an independent, nonpartisan applied research unit within the Indiana University School of Public and Environmental Affairs at Indiana University–Purdue University Indianapolis (IUPUI). CHP researchers work on critical policy issues related to the health of Hoosiers and the quality and accessibility of health care in Indiana. The CHP is part of the Indiana University Public Policy Institute and the Consortium for Health Policy, Law, and Bioethics, a Signature Center at IUPUI. For more information, visit the CHP Web site at <http://www.healthpolicy.iupui.edu>.

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