An aerial photograph of a residential neighborhood with a white callout box in the center. The callout box contains the word 'DENSITY' in large red letters and the subtitle 'How Concentrated Is Our Population?' in smaller black text. The background shows a dense arrangement of houses and streets.

# *Indiana* **Business Review**

# DENSITY

How Concentrated  
Is Our Population?

**Summer 2006**

A publication of the Indiana Business Research Center  
at the Kelley School of Business, Indiana University

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Cover photograph of a  
neighborhood in Fishers, Indiana,  
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Orthophotography Project.

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This map shows which townships in Indiana have gained, lost, or remained stable in population from 2000 to 2005, with some discussion about the changes.

### Editor's Note

Knowing how many people live in an area is critical to all aspects of government and commerce, since all decisions are ultimately based on how many people will go to school, buy groceries, start a business, use a government service, etc. Thus, population density is a critical issue since the concentration of people is both a cause and effect. How close people live in proximity to larger urban areas but without living within an incorporated city or town is a notable trend that is escalating in certain parts of Indiana, as well as other parts of the nation.



The IBRC has tracked and analyzed changes in the population of Indiana's counties, cities, and towns for the state and its citizens for many decades through a number of official federal and state programs and offices. A multitude of business, government, and nonprofit agencies throughout the state rely on this research. This issue highlights some of that ongoing work.

*Carol O. Rogers*

# Density: How Concentrated is Our Population?

Morton J. Marcus

Director Emeritus, Indiana Business Research Center, Kelley School of Business, Indiana University

Some concepts are so simple to understand. Population density is one of them. For a particular place, we take the total number of persons and divide by the total land area. Thus, for Indiana in 2005 the population density was 6,271,973 persons distributed over 35,866 square miles or 174.9 persons per square mile (p/sm).

All of that is well and good, but why should we use only the land area and not include the total area of the state? Although few Hoosiers may live on houseboats, shouldn't we consider all surface areas in our tabulation of density? Probably only the high costs of doing so keeps many people from living on the water. If we exclude water areas, should we likewise exclude park land, industrial land, and all other places where people are not likely or permitted to live?

Land, according to the U.S. Bureau of the Census, accounts for 93.2 percent of the total area of the nation. Ten states, led by New Mexico, have less than 1 percent of their total area

under water. If you look at **Figure 1**, you will find that four states have more than one-quarter of their total areas under water. Indiana ranked thirteenth among the fifty states in water as a percent of total area and is the "driest" of its neighboring states.

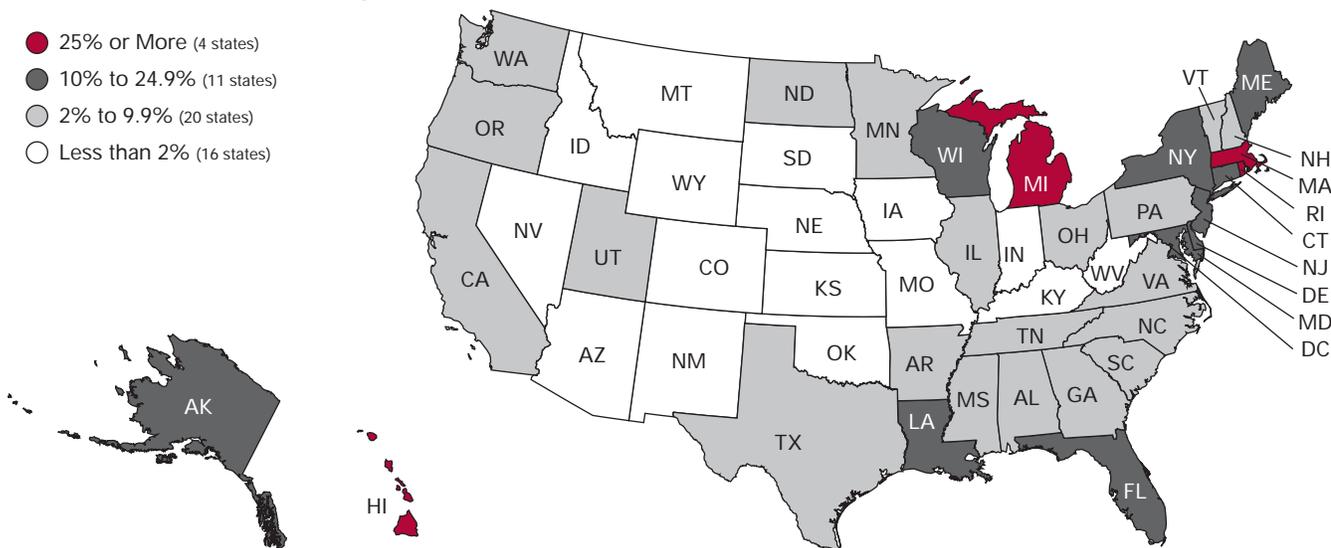
As New York, San Francisco, Singapore, and other cities on water have shown, where the price for land justifies the cost, new land can be created. The fishing ground of your grandfather becomes the garbage dump for your mother, and is now the foundation for your home.

The U.S. density of population (based on land area) in 2005 was 83.8 p/sm. This was less than half the density in Indiana (174.9 p/sm), which ranked seventeenth most dense in the nation. New Jersey had the highest density at 1,175.3 p/sm (if we ignore the 8,966.1 p/sm for the District of Columbia). The lowest density was in Alaska at 1.2 p/sm. Michigan and North Carolina were closest to us at 178 p/sm while Georgia was the nearest trailing state at 157 p/sm (see **Figure 2**).

*“The U.S. density of population (based on land area) in 2005 was 83.8 persons per square mile. This was less than half the density in Indiana (174.9 persons per square mile), which ranked seventeenth most dense in the nation.”*

**Figure 1**  
Percent of Land Area Covered by Water

- 25% or More (4 states)
- 10% to 24.9% (11 states)
- 2% to 9.9% (20 states)
- Less than 2% (16 states)



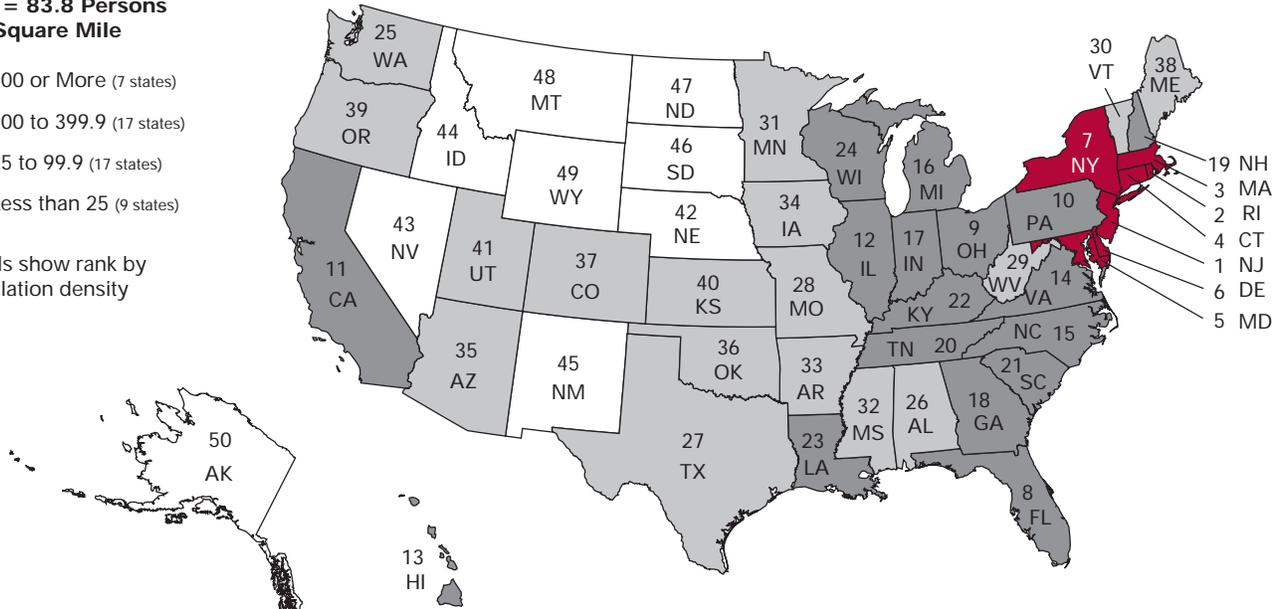
Source: IBRC, using U.S. Census Bureau data

**Figure 2**  
**Density of Population Based on Land Area, 2005**

**U.S. = 83.8 Persons per Square Mile**

- 400 or More (7 states)
- 100 to 399.9 (17 states)
- 25 to 99.9 (17 states)
- Less than 25 (9 states)

Labels show rank by population density



Source: IBRC, using U.S. Census Bureau data

What is the purpose and consequence of having a density figure? Presumably density correlates with something. Is it the case that low density offers us high costs? Or does high density mean lower costs from economies of scale and greater variety as consumers? Is it high or low density that gives us a sense of security? Is there more joy from living in New Jersey than from residing in Alaska?

### The Concentration Index

Over time, the density of America's population has been rising as the population has risen (the land area has remained constant except for areas flooded by dams). But density tells only part of the story. The distribution of our population among the states has become slightly more even over the years. One easy way to measure the differences in the distribution of population and land is see how much of the nation's population would have to be shifted among the states to give each state the same population density. This measure is known by

many names, but here we will call it the concentration index (CI) where

$$CI = \frac{\sum_{i=1}^n (\text{abs} (\%POPI - \%AREAI))}{2}$$

- %POP<sub>i</sub> = the population of state i as a percent of the U.S. population
- %AREA<sub>i</sub> = the land area of state i as a percent of the U.S. land area
- The sum of the absolute values of these differences, divided by two, equals the concentration index.

The higher the index, the more the population is concentrated. At an index of zero, the population

would be evenly distributed all across a nation, state, county, or city. An index value of 100 would have all population concentrated within one subdivision of the larger entity. Along with issues of density we need to consider the distribution of population.

The concentration index quantifies the distribution of the population at a point in time. As seen in **Figure 3**, the concentration index is declining, which indicates that the U.S. population is becoming somewhat more evenly distributed among the states. In 1900, more than half (53.4 percent) of the nation's population

*“Contrary to the U.S. experience, the population in Indiana is becoming more concentrated and less evenly distributed, with growing disparities in density.”*

would have had to be redistributed to achieve equal densities. The index declined to 44.6 percent by 2005.

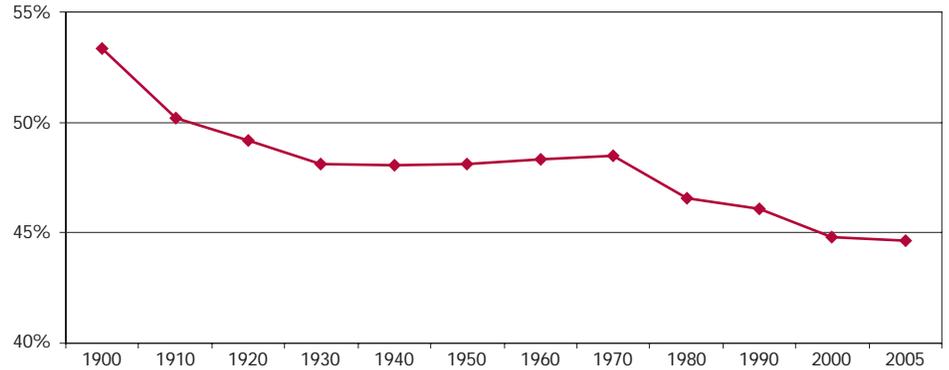
Contrary to the U.S. experience, the population in the state of Indiana is becoming more concentrated and less evenly distributed, with growing disparities in density. In 1900, the concentration index for Indiana was 19.6 percent. In 2004, the latest date for which we have data, that index stood at 41.8 percent (see **Figure 4**). Down from its peak in 1970, the CI for Indiana is rising again, indicating that an increase in the concentration of population is returning after a brief spurt of sprawl from 1970 to 1980. This finding is contrary to our common belief that population in the state is spreading out, sprawling over the countryside. Yet, as we will see, the process of redistribution is not universal among the state's 92 counties.

**Concentration and Sprawl within Indiana**

Sprawl, that ugly word signifying the evils of modern life: congestion, isolation, and long commuting times. Or we could phrase it a voluntary redistribution of population to enjoy the benefits of single-family homes, open space, privacy, and independence from public transit systems. How has the population spread out or concentrated within Indiana counties? Is the population of our counties becoming more concentrated or more spread out (sprawled)?

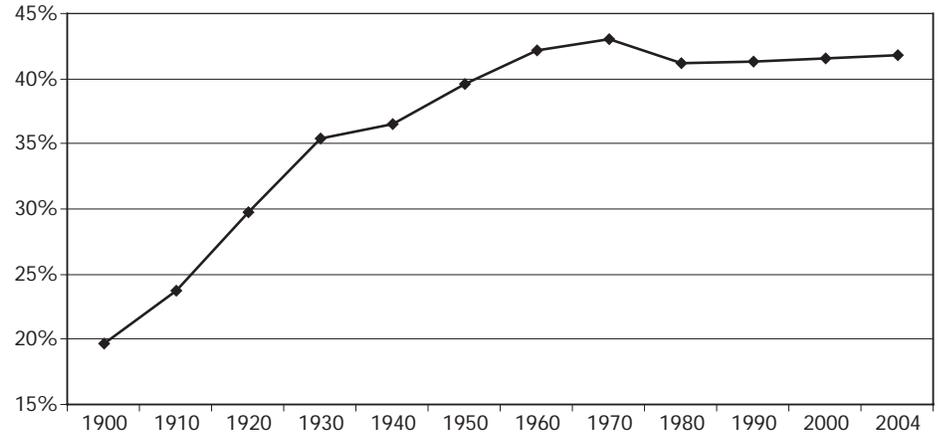
There is no question that the population density of each county has been rising, but the distribution of population among the townships is vastly different. Let's start with Cass County. In **Figure 5**, we see that the concentration of population among the townships of Cass County has been fairly unchanged over the decades. There was a peak at 56.5 percent in 1950 and a low at 46.7 percent in 1980, but the variations have been small. Contrast that with

**Figure 3**  
U.S. Concentration Index, 1900 to 2005



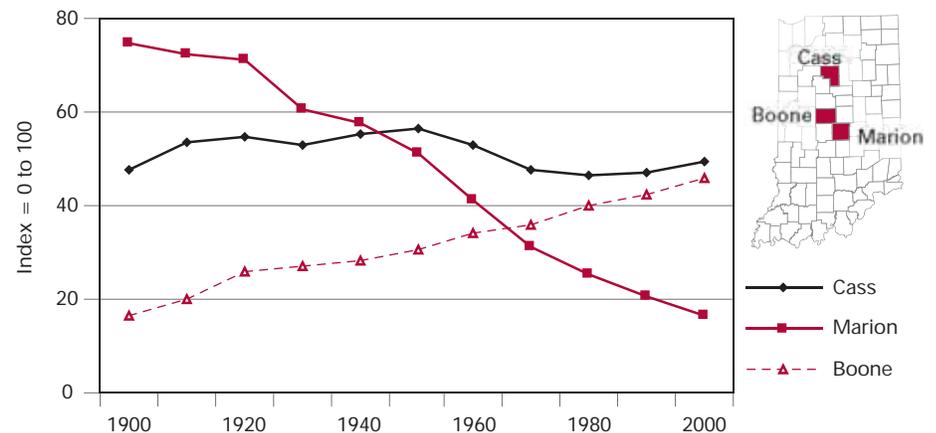
Source: IBRC, using U.S. Census Bureau data

**Figure 4**  
Indiana Concentration Index, 1900 to 2004



Source: IBRC, using U.S. Census Bureau data

**Figure 5**  
Concentration of Population for Select Indiana Counties, 1900 to 2000



Source: IBRC, using U.S. Census Bureau data

the line for Marion County. Here, the concentration index has been in steady decline from 1900 (when it measured 74.6 percent) to its low in 2000 at 16.4 percent. Where Center Township dominated the county in 1900, the population distribution of the county has recently become quite even.

For a different contrast note Boone County in **Figure 5**. It started in 1900 as a typical farm county with a fairly even distribution and little concentration of 16.5 percent. By 2000, the population had concentrated to 45.5 percent just a little below steady old Cass County. Note that Marion County's 2000 population distribution was almost identical with Boone County in 1900.

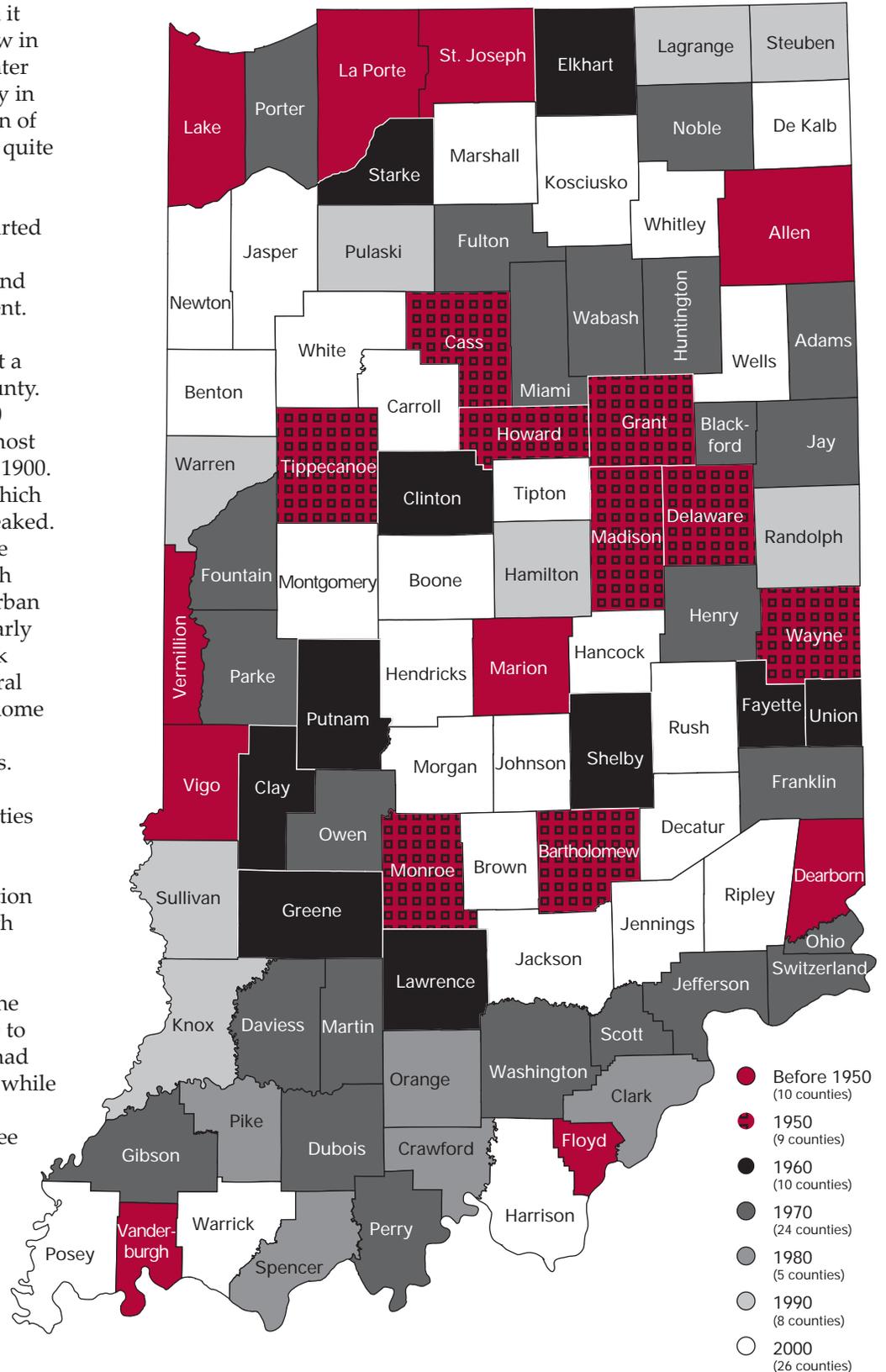
**Figure 6** shows the year in which concentration in each county peaked. For those with peaks in 2000, we may think of Boone County with an agricultural past and a suburban present. For those with peaks early in the 20th century, we can think of Marion County where a central city has spread throughout its home county and is the force behind changes in neighboring counties.

Between 1900 and 2000, the concentration index for 83 counties increased, led by Warrick and Hendricks counties. Only nine counties had decreased population concentration in that period with Marion and Floyd showing the greatest declines.

But when we focus only on the second half of the century (1950 to 2000), we find that 37 counties had declining concentration indices while the remaining 55 counties were becoming more concentrated (see **Figure 7**). By the last decade of the 20th century, 51 counties had decreased concentration measures.

Population concentrations and densities are not necessarily related and they do not have the same implications for businesses or

**Figure 6**  
Year Concentration Peaked in Indiana Counties



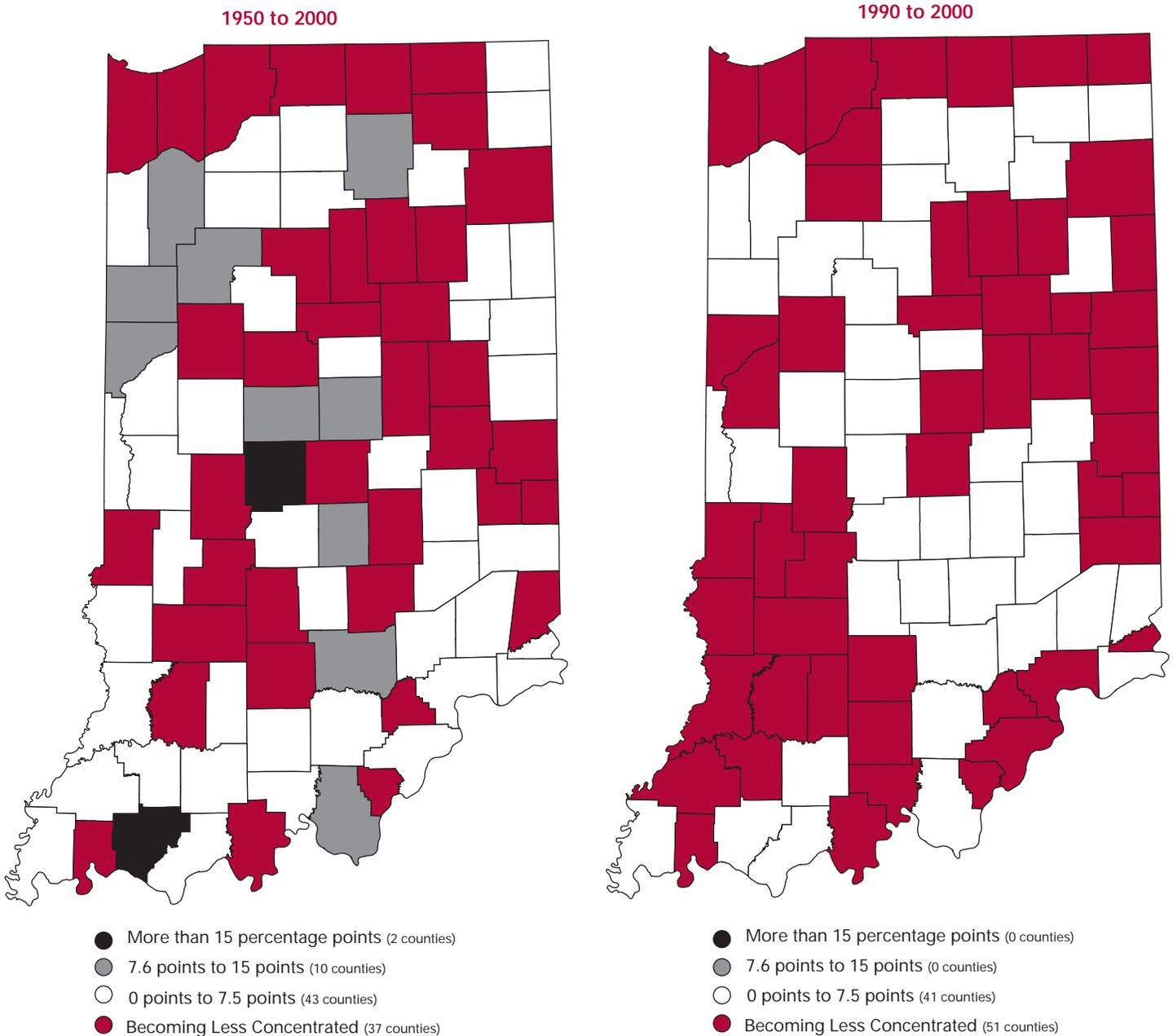
governments. Too often we consider population densities alone and do not have a proper image of the population distribution within a geographic area. Consider, for example, a fire department serving 100,000 persons in an area of 10 square miles. If those persons are evenly distributed, the concentration index is zero. If,

however, they are all within one jurisdiction because of park land and other protected areas, the nominal density remains the same, but the real density and service issues are quite different.

It might be best to adjust nominal density by the concentration index. Of course, we would want to use

something more uniform than townships, but they will do until that superior unit arrives. With GPS capabilities and appropriately organized data, we could use both density and concentration to structure our thinking about population distribution more clearly than we do at present. ■

**Figure 7**  
Percentage Point Change in Concentration Indices in Indiana



Source: IBRC, using U.S. Census Bureau data

# Proximity Matters: Close, but Not Too Close

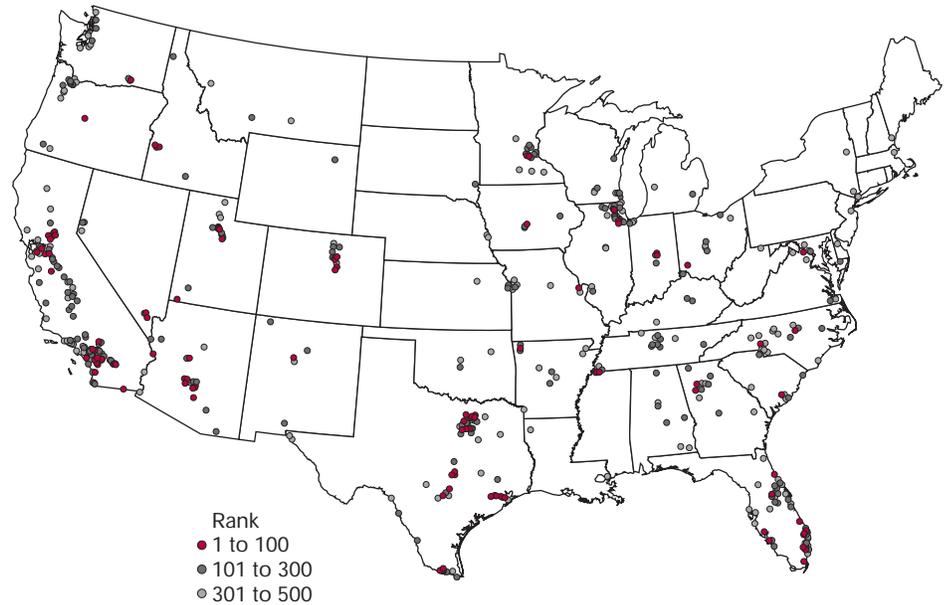
**Carol O. Rogers**

Associate Director, Indiana Business Research Center, Kelley School of Business, Indiana University

Surprise, Arizona, probably isn't surprised that it is the fastest growing city in the United States (of cities and towns with 20,000 or more population as of April 2000). This charmingly named city had a population of 30,848 in April of 2000, but by July 2005 had grown to nearly 75,000 (see **Table 1**). Perhaps some of the folks in Surprise are surprised, since it is seeing 8,800 new residents each year and experienced a 141 percent increase over the five-year period.

When considering the fastest growing (in percentage change terms) cities and towns, the vast majority of those in the top 500 are located in the southern and western areas of the United States (see **Figure 1**). But there are also some places on the fast track in the Midwest.

**Figure 1**  
Top 500 Fastest Growing Cities and Towns, 2000 to 2005\*



\*Data refers to cities and towns with a population of at least 20,000 in April 2000  
Source: IBRC, using U.S. Census Bureau data

**Table 1**  
Top 20: A Five-Year Fast Track—Cities and Towns That Began with a Population of 20,000 or More in April 2000

Rank	City or Town	State	Census 2000 (Base)	2005 Estimate	Numeric Change	Percent Change	Metropolitan Statistical Area
1	Surprise	Arizona	30,904	74,411	43,507	140.8	Phoenix
2	Frisco	Texas	33,708	70,793	37,085	110.0	Dallas–Fort Worth
3	Palm Coast	Florida	32,737	60,952	28,215	86.2	Deltona–Daytona
4	Avondale	Arizona	35,906	66,706	30,800	85.8	Phoenix
5	North Port	Florida	22,827	42,253	19,426	85.1	Sarasota
6	Cedar Park	Texas	26,075	48,139	22,064	84.6	Austin
7	Brentwood	California	24,026	43,794	19,768	82.3	San Francisco
8	McKinney	Texas	54,403	96,581	42,178	77.5	Dallas–Fort Worth
9	Castle Rock	Colorado	20,289	35,745	15,456	76.2	Denver
10	Romeoville	Illinois	21,134	36,396	15,262	72.2	Chicago
11	Parker	Colorado	23,584	38,428	14,844	62.9	Denver
12	Murrieta	California	50,866	82,778	31,912	62.7	Riverside
13	Commerce City	Colorado	21,190	34,189	12,999	61.3	Denver
14	La Quinta	California	23,700	38,232	14,532	61.3	Riverside
15	Allen	Texas	43,619	69,222	25,603	58.7	Dallas–Fort Worth
16	Gilbert	Arizona	110,061	173,989	63,928	58.1	Phoenix
17	North Las Vegas	Nevada	115,488	176,635	61,147	53.0	Las Vegas
18	Shakopee	Minnesota	20,596	31,233	10,637	51.7	Minneapolis
19	Pearland	Texas	37,472	56,790	19,318	51.6	Houston
20	Fishers	Indiana	37,946	57,220	19,274	50.8	Indianapolis

Source: IBRC, using U.S. Census Bureau data

Consider the 500 fastest growing cities and towns between 2000 and 2005. A mere 69 had populations of 100,000 at the beginning of that time period. Contrast that with the 361 cities and towns that began the five-year period with populations less than 50,000.

Such growth provides demographic evidence of the continued concentration of population within metropolitan areas, but that concentration is brought about by people moving to smaller places within those metropolitan counties. It is important to note that most of these smaller towns and cities are in close proximity to large metropolitan areas. **Table 2** shows the twenty largest cities nationwide. While many of America's large industrial-age cities, such as Detroit, Chicago, Gary and others, have seen declines in population during the five years since the last census in 2000, those same cities remain vital as the core of metropolitan areas, with significant growth sprouting up around them. The choice being made more often these days is that of living close to those large cities, just not within the city limits. ■

**Table 2**  
**Largest Cities in the United States**

Rank	City	State	Population (July 2005)	Change since 2000*
1	New York	New York	8,143,197	134,543
2	Los Angeles	California	3,844,829	150,345
3	Chicago	Illinois	2,842,518	▼ -53,503
4	Houston	Texas	2,016,582	59,564
5	Philadelphia	Pennsylvania	1,463,281	▼ -54,269
6	Phoenix	Arizona	1,461,575	139,948
7	San Antonio	Texas	1,256,509	105,062
8	San Diego	California	1,255,540	32,127
9	Dallas	Texas	1,213,825	25,202
10	San Jose	California	912,332	17,053
11	Detroit	Michigan	886,671	▼ -64,599
12	Indianapolis	Indiana	784,118	2,254
13	Jacksonville	Florida	782,623	47,017
14	San Francisco	California	739,426	▼ -37,307
15	Columbus	Ohio	730,657	18,641
16	Austin	Texas	690,252	30,423
17	Memphis	Tennessee	672,277	▼ -10,676
18	Baltimore	Maryland	635,815	▼ -15,339
19	Fort Worth	Texas	624,067	82,728
20	Charlotte	North Carolina	610,949	48,976

\*Using the April 1, 2000 estimates base  
Source: IBRC, using U.S. Census Bureau data

Elk Grove, California, had the nation's fastest growth rate among large cities (100,000 or more population) between July 1, 2004, and July 1, 2005, according to new U.S. Census Bureau population estimates.

Located south of Sacramento, Elk Grove is a relatively new city, having incorporated less than six years ago. Elk Grove's population increased 12 percent during the period, to 112,338. It was joined on the list of the ten fastest-growing cities by three others in California: Moreno Valley (ranking sixth), Rancho Cucamonga (seventh) and Irvine (10th). These three cities are each located in southern California.

Florida had three cities among the fastest growing: Port St. Lucie (third), Cape Coral (fifth) and Miramar (eighth). Two cities in Arizona were in the top ten—Gilbert (fourth) and Chandler (eighth)—and, relatively nearby, North Las Vegas, Nevada, was second.

Phoenix had the largest population increase of any city between 2004 and 2005. San Antonio; Fort Worth, Tex.; North Las Vegas, Nev.; and Gilbert, Ariz., rounded out the list of the five biggest numerical gainers.

New York City continued to be the nation's most populous city, with 8.1 million residents in 2005. This was more than twice the population of Los Angeles, which ranked second at 3.8 million. The estimates show that among the 10 largest cities, one change has occurred in the rankings: San Antonio has replaced San Diego as the nation's seventh most populous city.

—Excerpt from "Elk Grove, California, Named Fastest-Growing City" by the U.S. Census Bureau, June 2006

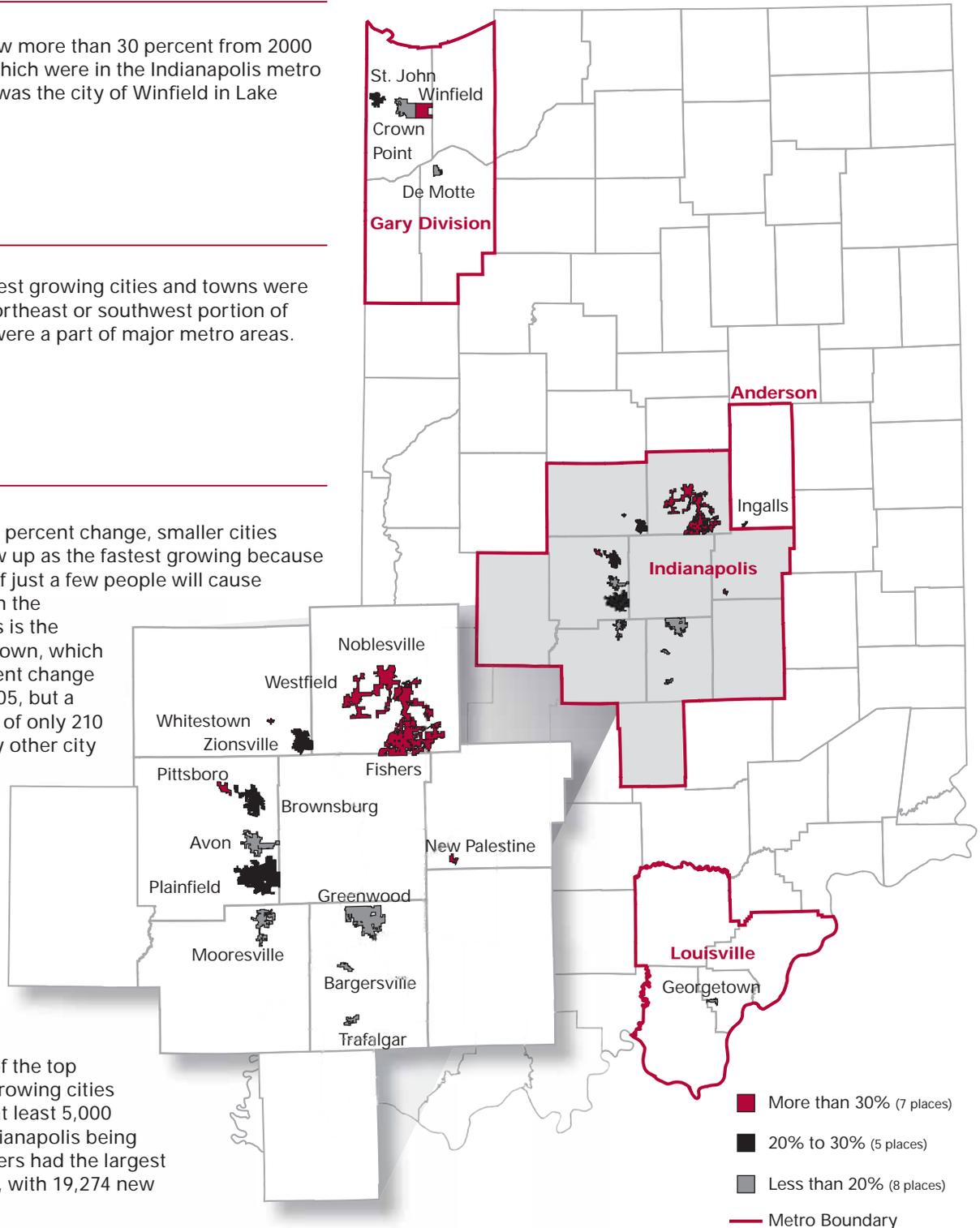
# Indiana's Twenty Fastest Growing Cities and Towns, 2000 to 2005\*

Seven cities grew more than 30 percent from 2000 to 2005, six of which were in the Indianapolis metro area. The other was the city of Winfield in Lake County.

None of the fastest growing cities and towns were located in the northeast or southwest portion of Indiana, but all were a part of major metro areas.

When looking at percent change, smaller cities sometimes show up as the fastest growing because even a change of just a few people will cause a large change in the percentage. This is the case for Whitestown, which saw a 43.9 percent change from 2000 to 2005, but a numeric change of only 210 people. The only other city with less than 1,000 people to make the fastest growing list was Trafalgar.

More than half of the top twenty fastest growing cities and towns had at least 5,000 people, with Indianapolis being the largest. Fishers had the largest numeric growth, with 19,274 new residents.



\*Based on percent change from April 1, 2000 to July 1, 2005, using the estimate base  
Source: IBRC, using U.S. Census Bureau data

# Indiana's Township Population Change, 2000 to 2005\*

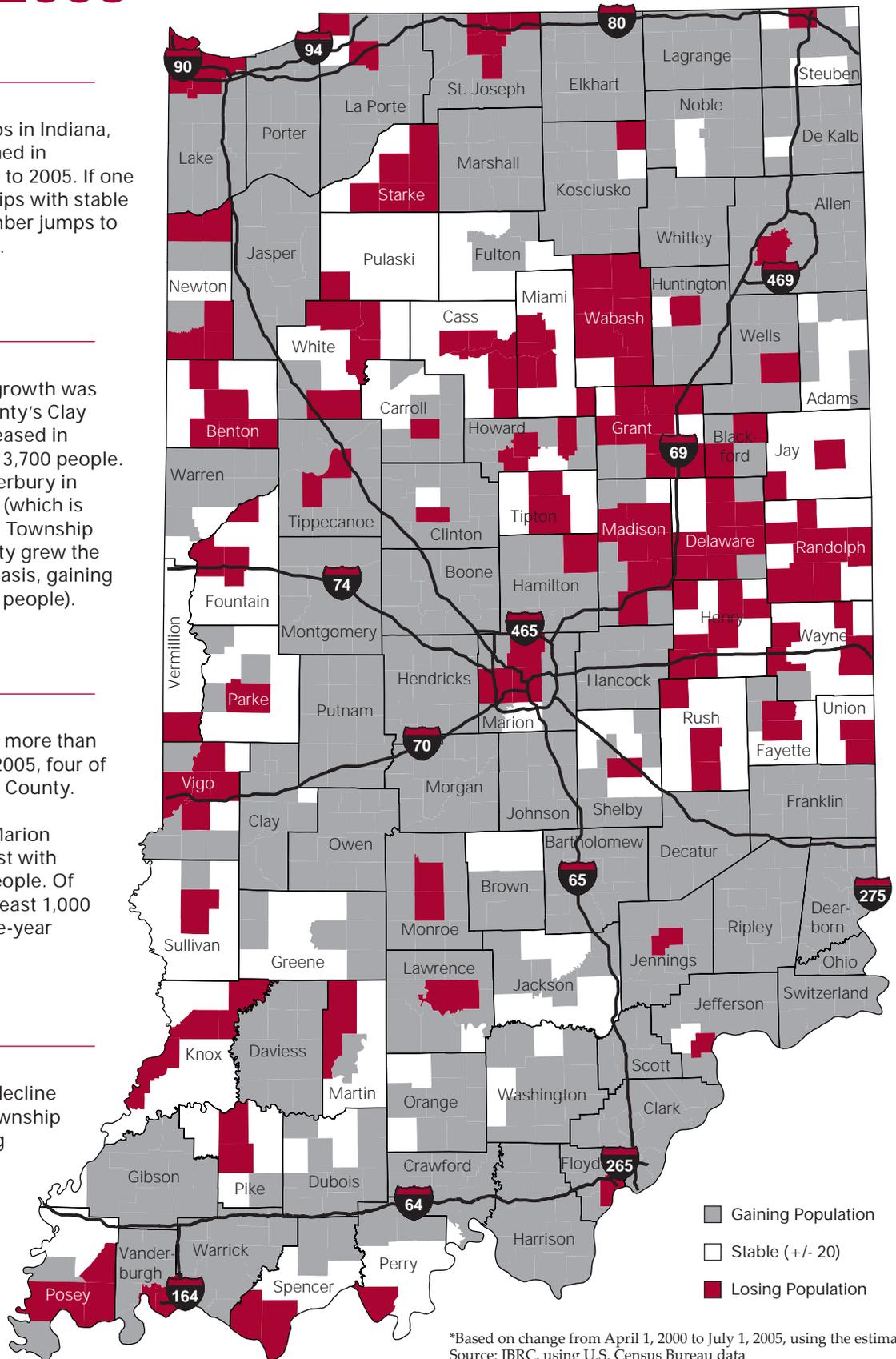
Of the 1,009 townships in Indiana, about 62 percent gained in population from 2000 to 2005. If one adds in those townships with stable populations, that number jumps to more than 85 percent.

The largest numeric growth was seen in Hamilton County's Clay township, which increased in population by about 13,700 people. Aside from Camp Atterbury in Bartholomew County (which is a special case), Union Township in Vanderburgh County grew the fastest on a percent basis, gaining by 137.9 percent (553 people).

Seven townships had more than 100,000 residents in 2005, four of which were in Marion County.

Center Township of Marion County was the largest with more than 163,500 people. Of the seven, six lost at least 1,000 residents over the five-year span.

The largest numeric decline was seen in North Township of Lake County, losing 5,081 people. Benton County's Center Township and Vigo County's Harrison Township tied for the largest percent decline, with losses of 152 and 2,759, respectively.



\*Based on change from April 1, 2000 to July 1, 2005, using the estimate base Source: IBRC, using U.S. Census Bureau data

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