

# INDIANA TUBERCULOSIS ANNUAL SUMMARY 2007

**Cases** = 129

**Crude Incidence Rate** per 100,000 population = 2.0 (U.S. 2006 = 4.6)

**Race and Ethnicity-specific Incidence Rates** per 100,000 population <sup>1</sup>

White = 1.5

Black or African-American = 5.0

Asian = 18.1

Hawaiian Native or other Pacific Islander = N/A

American Indian or Alaska Native = N/A

Hispanic or Latino, all races = 11.3

**Gender-specific Incidence Rates** per 100,000 population

Male = 2.6

Female = 1.5

## Executive Summary

During 2007, there were 129 new cases of tuberculosis (TB) reported to the Indiana State Department of Health. Figures 1a and 1b show long-term and 6-year trends, respectively. TB was reported by 33 of the 92 counties. According to the estimated 2006 census, the three most populous counties (Marion, Lake, and Allen counties) accounted for 56% of all new cases. Marion County's reported cases decreased in 2007 to 42 cases from 47 cases in 2006. Lake and Allen Counties both reported increases in cases during 2007. Allen County increased from 10 cases in 2006 to 15 cases in 2007. Lake County increased from 10 cases in 2006, to 16 in 2007. Kosciusko County is still on a decline in cases since the 2005 outbreak. The Northwest region (Figure 18) increased to 22 cases in 2007 from 12 cases in 2006. The Southern region had 11 cases in 2006 and in 2007 has 22 cases. Sixteen new Indiana genotype clusters (two or more molecular matched isolates), were identified in 2007. Seven of these clusters are located exclusively in Marion County.

High risk populations include: HIV infection, children, and drug and alcohol abuse. Reporting for HIV increased in all age groups, 87% of HIV status was known for the 25 to 44 age group, compared to 66% in 2006 (Table 1). Pediatric cases decreased in 2007 to 6% from 13% of the total cases in 2006 (Figure 9). Excess alcohol use and non-injection drug use also increased from 18% in 2006 to 26% in 2007 and 4% to 9% respectively (Table 2). The percentage of cases started on appropriate therapy increased from 82% in 2006 to 88% in 2007 (Figure 2). There was one multi-drug resistant case in 2007 and eight cases resistant to Isoniazid only (Figure 13).

U.S. born cases continue to make up the majority of TB cases diagnosed in Indiana (Figure 5). Of those non-U.S. born cases, the majority come from Central/South America (Figure 6). National trends show most non-U.S. born cases are diagnosed within the first three years after entry into the U.S. In Indiana, the

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<sup>1</sup> Incidence rates based on population estimates 2006 census

largest number of non-U.S. born individuals diagnosed with TB, have lived in the U.S. for longer than five years.

Tuberculosis (TB) is an airborne disease caused by a group of bacteria that is collectively referred to as the *Mycobacterium tuberculosis* (MTB) complex. The five species in this complex are *M. tuberculosis*, *M. bovis*, *M. africanum*, *M. canettii*, and *M. microti*. General symptoms may include a prolonged productive cough, blood-tinged sputum, night sweats, fever, fatigue, and weight loss. TB usually affects the lungs, but can also affect other parts of the body like the brain, kidneys, or spine. TB bacteria are aerosolized when a person who has TB of the lungs or larynx coughs, sneezes, laughs, or sings. Another person inhales the droplet nuclei that are formed. Individuals who become infected but do not become ill are considered to have latent TB infection (LTBI) and cannot transmit the infection to others. Approximately 10% of infected individuals who are not immuno-compromised will progress to active disease during their life time.

The introduction of anti-TB chemotherapy has led to a long-term decline in the number of deaths as well as the number of new cases. However, deaths still occur from the disease. The number of TB-related deaths is shown in Figure 2, with a total of seven cases. Patients who died after sputum culture conversion to negative and those who demonstrated significant clinical improvement but died from other causes were excluded (one excluded case for 2007). Of the seven TB related deaths, five deaths were in persons  $\leq 50$  years of age; three were between the ages of 21 to 30, and two were between 41 to 50 years of age. The average age of the three pulmonary/pleural cases who died was 71 years old; the average age of the two miliary cases was 24 years old; and the average age of the two meningeal cases was 40 years old.

Figure 1a.

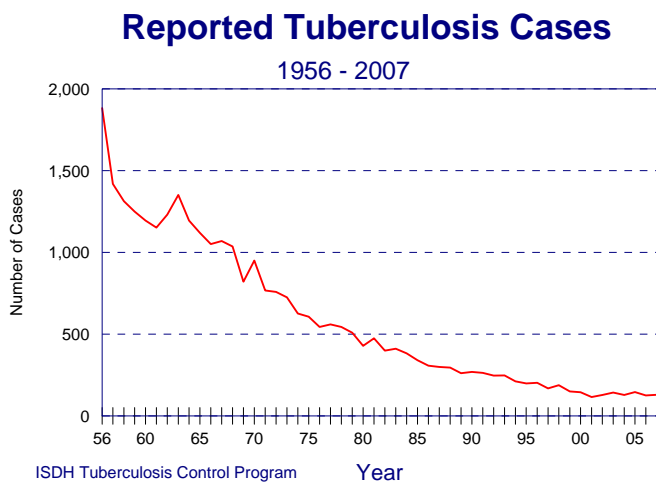


Figure 1b.

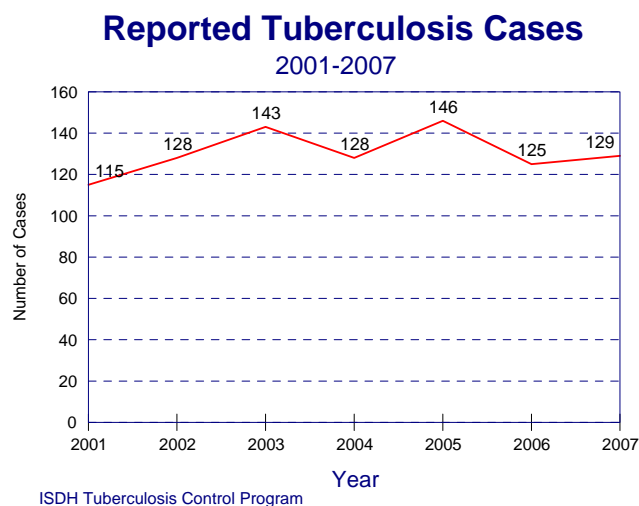
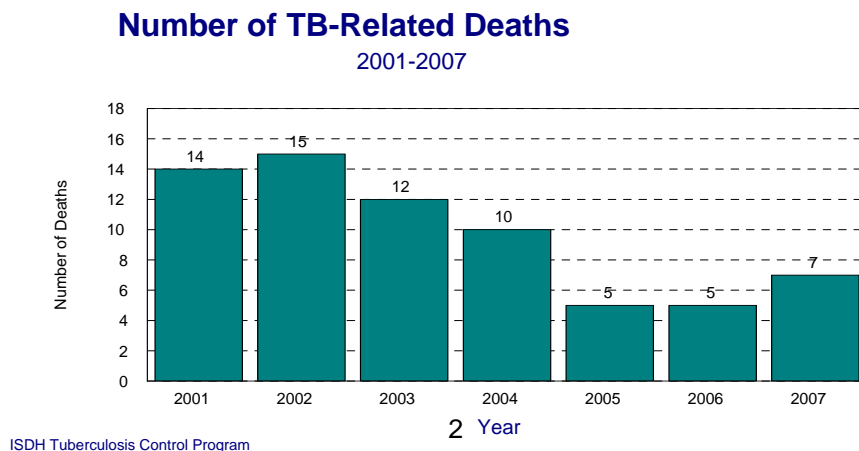


Figure 2.



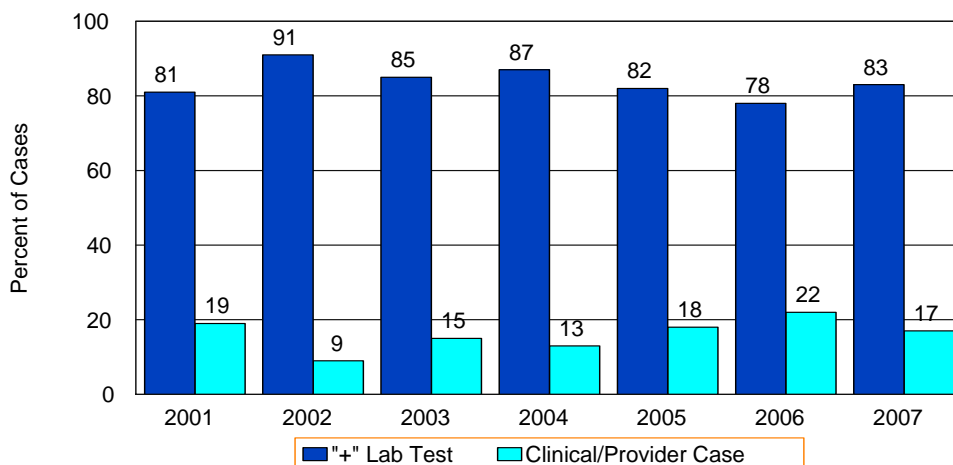
A diagnosis of TB is verified using the Centers for Disease Control and Prevention’s “Case Definitions for Infectious Conditions under Public Health Surveillance.” TB cases must meet the case definition for a laboratory, a clinical, or a provider diagnosis. A laboratory diagnosis is confirmed when *M. tuberculosis* complex has been: (1) isolated from a culture or has been demonstrated in a clinical specimen by a nucleic acid amplification (NAA) test approved by the FDA (must be accompanied by a culture for identification), or (2) acid fast bacilli (AFB) are seen when a culture has not or cannot be obtained (used primarily to aid in a post-mortem diagnosis).

A clinical diagnosis is confirmed when **all** of the following criteria are met after a completed medical evaluation: (1) a positive tuberculin skin test, (2) signs and symptoms compatible with current TB disease (e.g., an abnormal, unstable chest x-ray) or clinical evidence of current disease (e.g., cough, night sweats, weight loss, hemoptysis), and (3) current treatment with two or more anti-TB drugs. This category includes culture-negative pulmonary TB, extra-pulmonary TB where cultures would not grow or were not obtained, and children in whom obtaining specimens is difficult and invasive procedures are not warranted. Figure 3 shows the percentage of TB cases by case definition.

**Figure 3.**

### TB Classification by Case Definition

2001-2007



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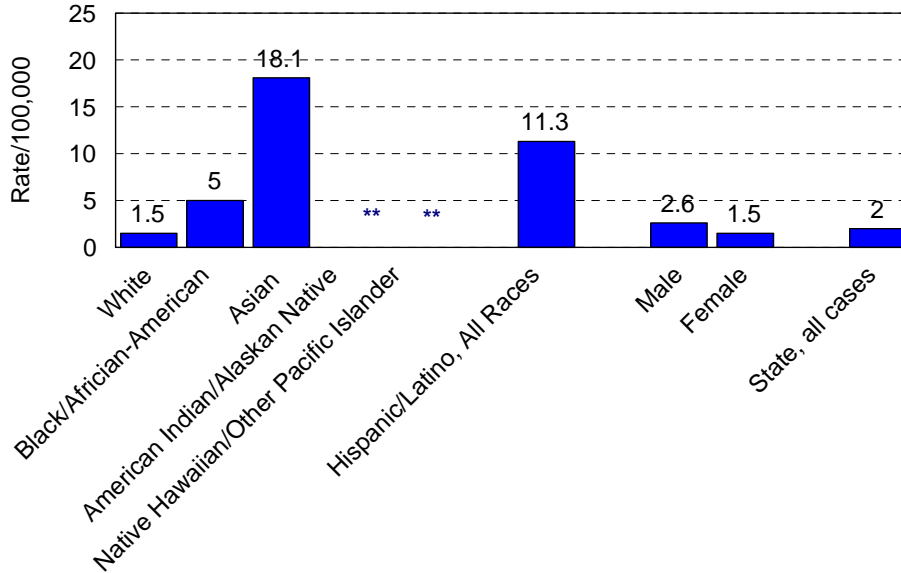
The percentages of new cases by sex, ethnicity, and race are as follows:

<b>Category:</b>	<b>Percentage of all new cases:</b>
<b>Sex:</b>	
Male	63
Female	37
<b>Ethnicity:</b>	
Hispanic or Latino	26
<b>Race:</b>	
White	64
Black or African-American	22
Asian	14
American Indian or Alaska Native	N/A
Hawaiian Native or other pacific islander	N/A

Figure 4 shows case rates per 100,000 population by race, ethnicity, and sex.

**Figure 4.**

## Reported 2007 Tuberculosis case rate by Race, Ethnicity, and Sex



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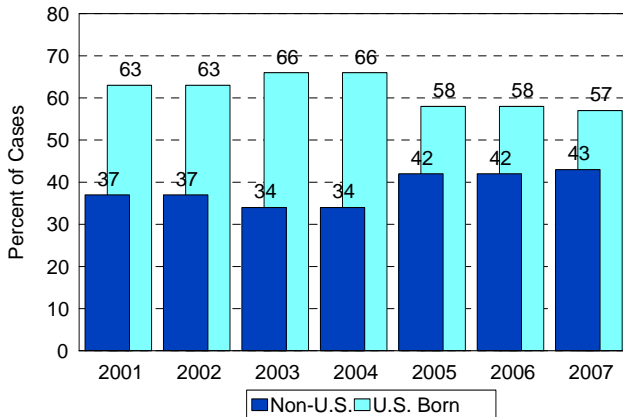
\*\* None reported or statistically insignificant

Persons born in high-prevalence countries continue to make up a large proportion of TB cases. In 2007, 55 of the 129 reported TB patients (43%) were born in countries with a high burden of TB (Figure 5). U.S. born TB cases continue to outnumber foreign born cases in Indiana. Figure 6 represents the distribution of TB cases in Indiana by world region as classified by CDC. Central/South America, Western Pacific, and Southeast Asia cases all showed increases over 2006. African and European cases decreased; Eastern Mediterranean stayed the same.

**Figure 5.**

### Reported Tuberculosis Cases

U.S. vs. non US-born  
(n=129)

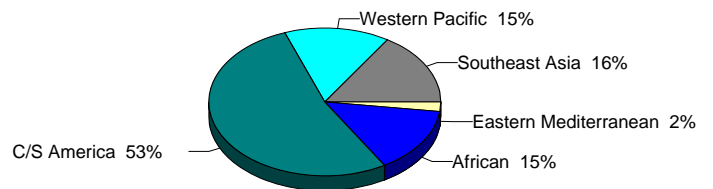


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**Figure 6.**

### Non-U.S. Born TB Cases Reported in 2007 by World Region

(n=55)



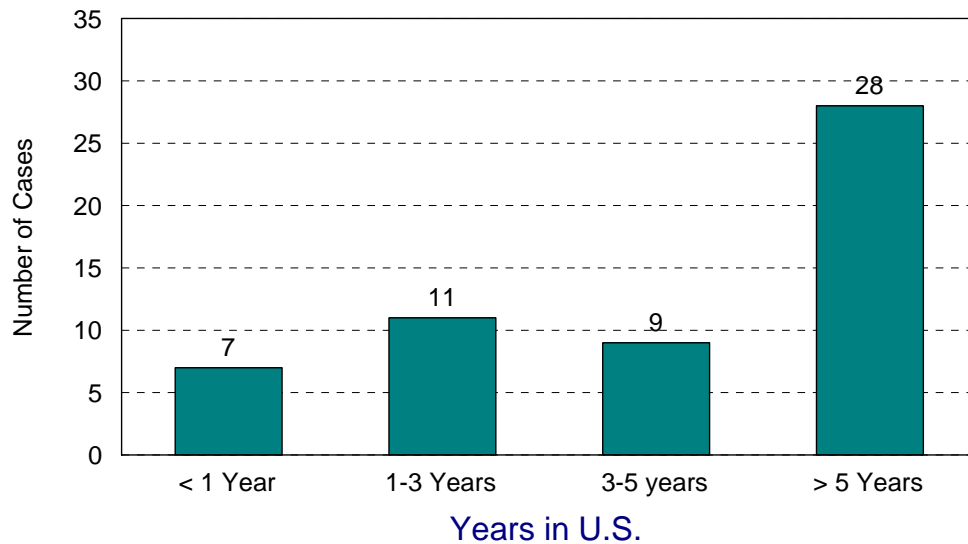
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Figure 7 represents the length of time persons were living in the US prior to TB diagnosis. Most non-U.S. born cases are diagnosed within the first three years of entry into the U.S. In Indiana, the largest number of non-U.S. born individuals diagnosed with TB have been in the U.S. for longer than five years at time of diagnosis.

**Figure 7.**

### Length of Time in the U.S. Prior to Diagnosis

2007 Reported cases (n=55)



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The number and percentages of 2007 reported cases by age group:

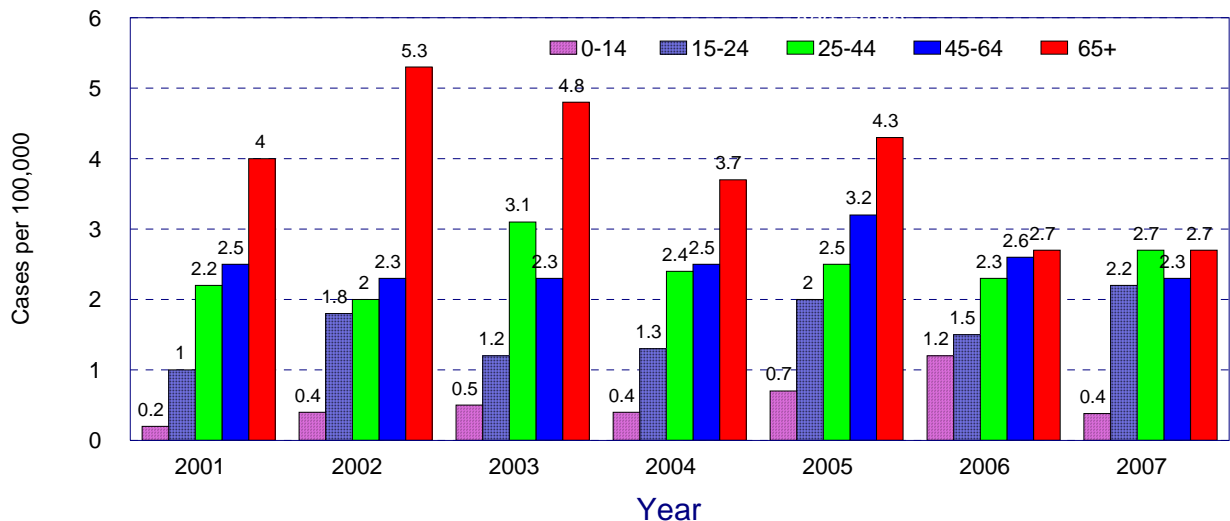
Age Group:	Numbers of new cases	Percentage of all new cases:
< 15 years	8	6
15-24 years	30	23
25-44 years	34	27
45-64 years	44	34
≥ 65 years	13	10

Case rates by age group are shown in Figure 8.

The age trend of our case rates have changed in the past two years with case rates for the older population decreasing.

Figure 8.

## Tuberculosis Case Rates by Age Group 2001-2007

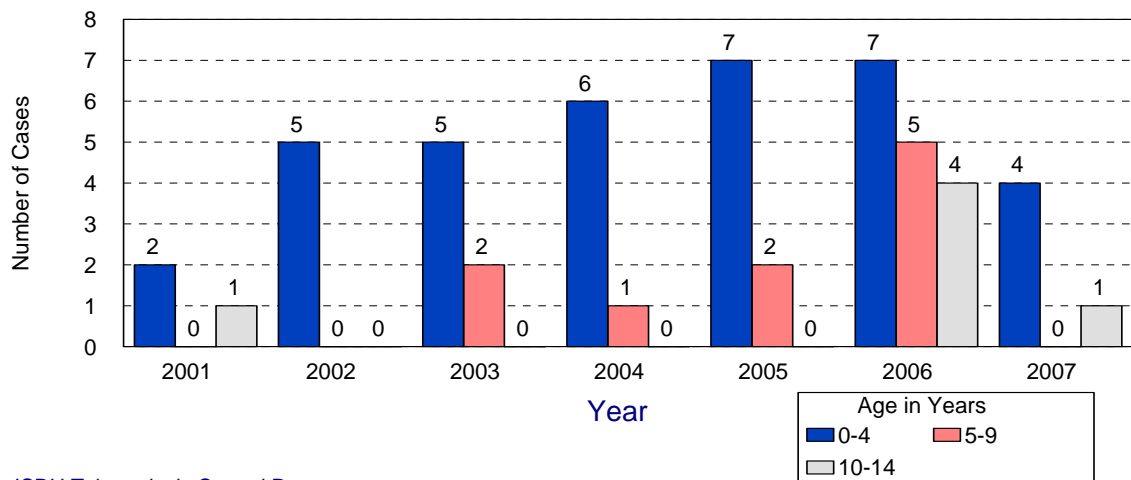


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The numbers of pediatric cases by age group are shown in Figure 9.

Figure 9.

## Pediatric TB Cases 2001-2007



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HIV disease is the most significant risk factor for progression to active disease. The percentage of patients' HIV Counseling and Testing status according to age is shown in Table 1. The reported number of adults patients who were offered HIV testing has increased from 62 (57%) in 2006 to 89 (72%) in 2007. Adult

patients who were reported to not be offered the test decreased from 39 (35%) to 28 (22%) in the past year. HIV counseling and testing is recommended for all adult patients with TB or suspected of having TB.

**Table 1.**

## HIV Counseling and Testing

Number and percent of adult patients reported in 2007  
offered counseling and testing

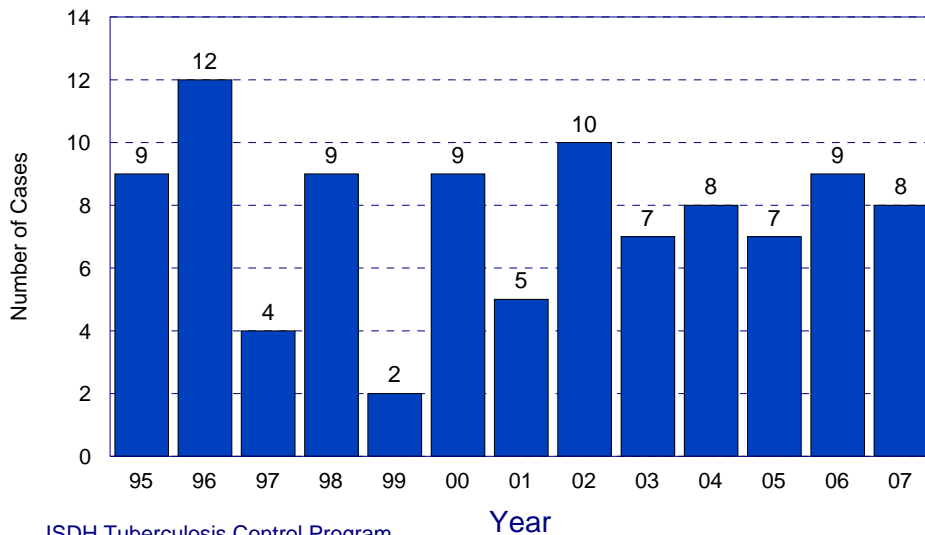
Status	Age group 25-44 (n=47)	All adult cases >=15 years of age (n=124)
Tested, results known or pending	41 (87%)	89 (72%)
Patient refused	0	7 (6%)
Test not offered	6 (13%)	28 (22%)

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The number of cases co-infected with TB and HIV is shown in Figure 10.

**Figure 10.**

## TB and HIV Co-infection 1995-2007



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Other risk factors associated with TB exposure or progression to active disease are excess alcohol use, homelessness, illicit drug use (injecting and non-injecting), and residence in a high-risk congregate setting. The numbers of persons reported with these risk factors at the time of diagnosis are shown in Table 2. A person may have multiple risk factors. There has also been an increase in the percentage of cases reporting excess alcohol use (from 18% in 2006 to 26% in 2007); injection drug use (from 2% to 5%); non-injection drug use (from 4% to 9%); and homeless (from 6% to 8%).

**Table 2.**

**Reported Tuberculosis Cases in 2007**  
with Selected Exposure and Medical Risk Factors\*  
(n=129)

Risk Factor	Number of Cases	Percent of Cases
Excess alcohol use	34	26
Injection drug use	6	5
Non-injection drug use	12	9
Homelessness	10	8
Resident of long-term care facility	4	3
Resident of correctional facility	3	2

\*at the time of diagnosis

Occupation is another variable used to detect trends. These data are shown in Table 3. The “not employed” category includes retired persons, children, and students. Of the known and reported occupations, cases with occupations have increased from 48 (38%) in 2006 to 65 (52%) in 2007.

**Table 3.**

**Reported Tuberculosis Cases in 2007**  
by Selected Occupation\*

Occupation	Number of Cases	Percent of Cases
Not Employed In Last 2 Years	61	48
Other occupations	60	48
Migrant agricultural worker	0	0
Health care worker	4	3
Correctional facility employee	1	1

2007 (n=126)

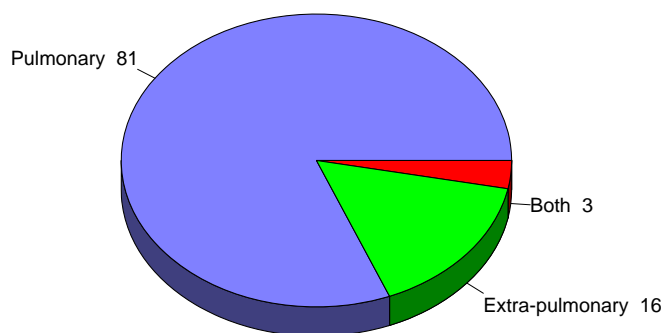
\* at the time of diagnosis



The number of TB cases classified by the site of disease is shown in Figure 11. This has not changed significantly from 2006.

**Figure 11.**

**Reported 2007 TB Cases by Site of Disease**  
**Percentage of all cases reported**  
 (n=129)

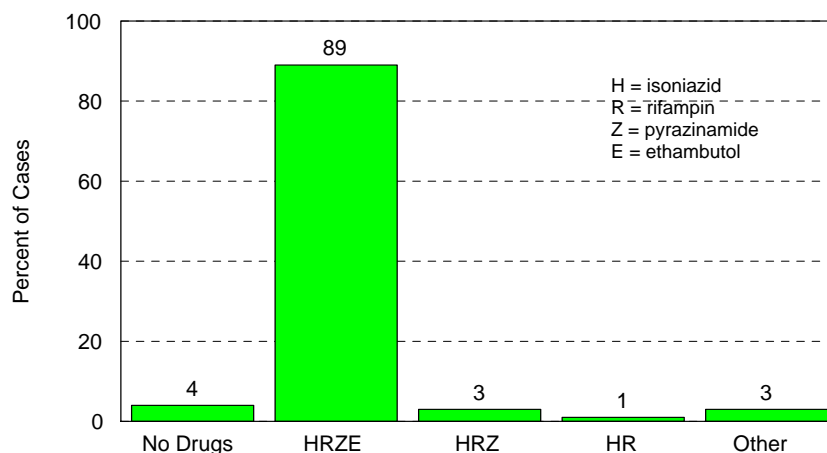


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The Indiana State Department of Health recommends the treatment guidelines set by the American Thoracic Society and the Centers for Disease Control and Prevention. Since 1991, these guidelines have recommended that four drugs be used in the initial treatment phase. Unless contraindicated, all patients should begin therapy on the preferred regimen containing Isoniazid (INH), Rifampin (RIF), Pyrazinamide (PZA), and Ethambutol (EMB). The percentage of patients who were started on the recommended four-drug regimen is shown in Figure 12.

**Figure 12.**

**Percent of Cases Reported During 2007 Started on Appropriate Therapy**



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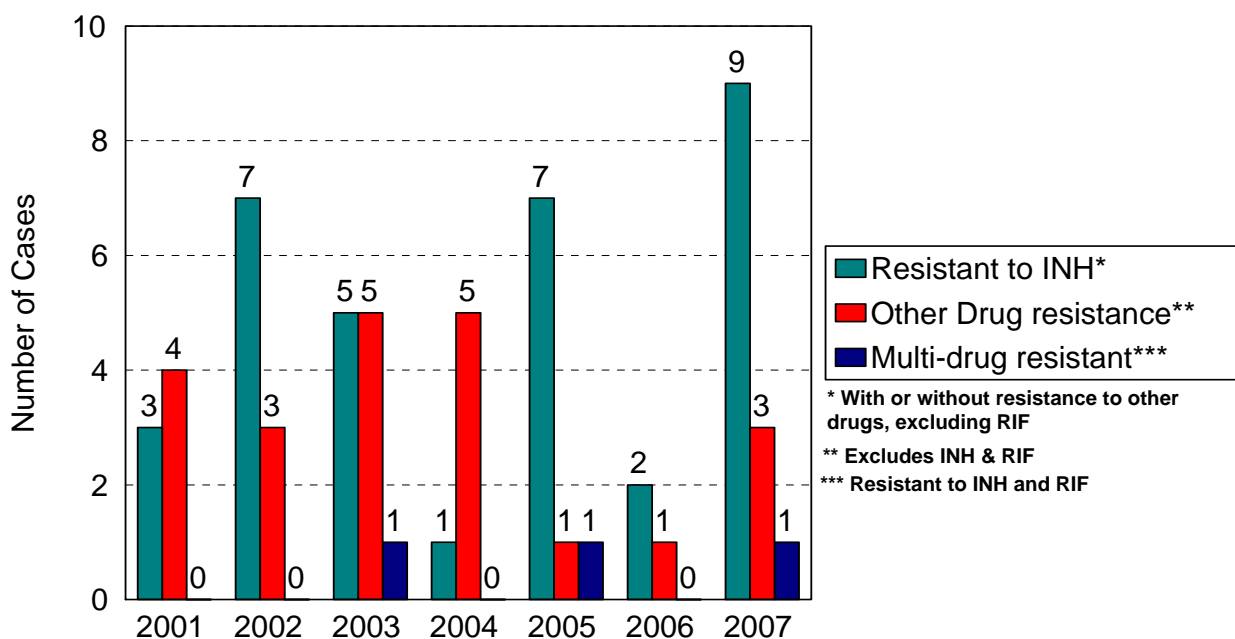
Drug susceptibility testing is routinely performed on all culture-positive isolates. On rare occasions, such as with specimen contamination, drug susceptibility testing cannot always be performed.

Of the 106 culture positive cases reported during 2007, drug susceptibility testing was performed on 106 (100%) specimens submitted. Of these, a total of 13 persons were resistant to one, or more, of the four standard first line medications. A total of nine persons were resistant to at least INH; eight of these were resistant to INH only; one person was resistant to Isoniazid and Ethambutol. Three persons were resistant to PZA.

There was one case that was Multi-drug resistant (MDR-TB). MDR TB is defined as resistance to both INH and RIF. MDR-TB is of particular public health concern since these two drugs are the most effective agents. If the organism is resistant to them, less effective and more expensive second-line drugs must be added, and the treatment period is extended from the usual 6 to 9 months to 18 to 24 months.

**Figure 13.**

## TB Cases with Drug Resistance 2001-2007



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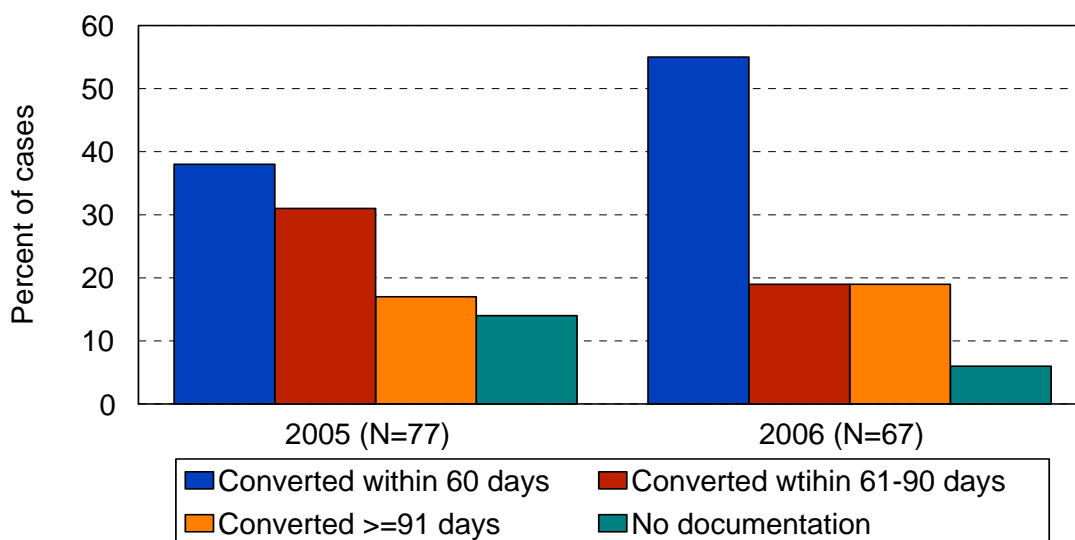
Besides drug resistance, inadequate response to therapy and failure to follow the treatment regimen are the major reasons for having to extend the treatment period. Sputum culture conversion data are collected to measure response to therapy. The absence of documentation of culture conversion is most commonly due to inadequate patient follow-up or the inability of the patient to produce a sputum specimen and is addressed with the local health departments. Patients whose sputum cultures have not become negative after two months of treatment may require a longer course of therapy. Those whose symptoms have not

improved or are still culture-positive after four months of therapy are classified as treatment failures and should be re-evaluated for drug resistance, as well as failing to adhere to the treatment regimen if they are not on directly observed therapy. The proportion of patients who convert their sputum cultures to negative in two months or less is shown in Figure 14. Cases for both 2005 and 2006 are reported.

**Figure 14.**

### Sputum Culture Conversion\*, 2005 - 2007

Elapsed time from start of therapy until the first consistently negative culture



\*sputum culture-positive, alive at the time of diagnosis, and began treatment; excludes those who died before completing 2 months of therapy and were still culture-positive

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Directly observed therapy (DOT) is the most effective way to assure that the patient is complying with the prescribed treatment regimen. DOT is a strategy proven to ensure completion of therapy, with the added benefit of preventing acquired drug resistance. DOT is the best practice and the standard of care in Indiana and should be used for all patients. Every effort must be made to initiate DOT when the patient is first started on therapy. Cohort year 2006 is the most recent period with complete DOT data and 2007 is a partial report of only those cases completed at this time (Figure 15).

The first priority of TB elimination efforts is to ensure Completion of Therapy (COT). Indiana’s goal is to have at least 90% of all patients complete treatment within one year. The completion of therapy index is based on the number of patients for whom treatment for one year or less is indicated. Exclusions from the rate calculations are those who were dead at the time of diagnosis, patients who died before completing therapy, patients who were never started on therapy, and patients with multi-drug resistant disease. Therapy is considered to be incomplete for those patients who were reported as moved, uncooperative or refused, or lost to follow-up. The current data are for those patients in cohort year 2006.

Figure 15.

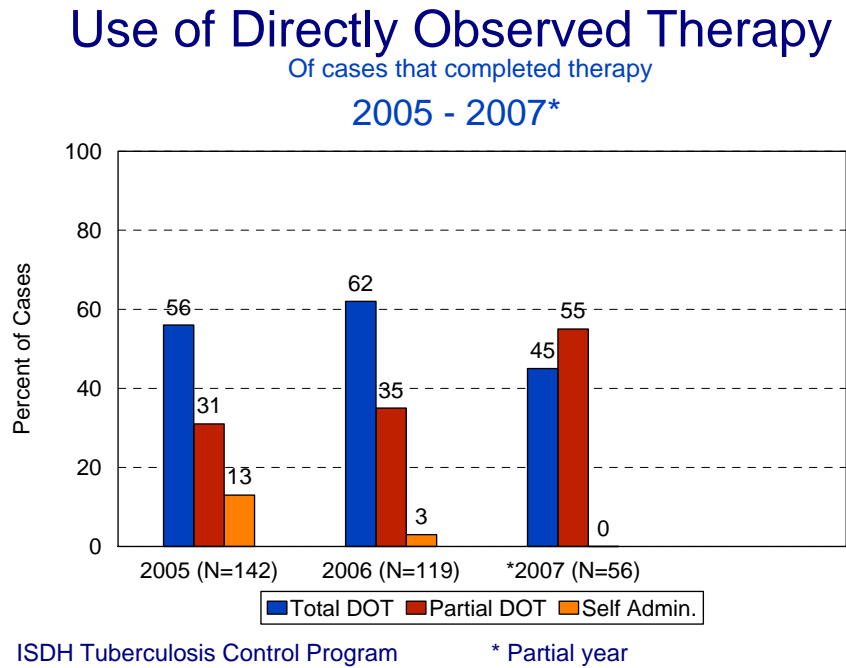


Figure 16 shows the percentage of patients who completed therapy in one year or less, and the total completion rate for all patients.

Figure 16.

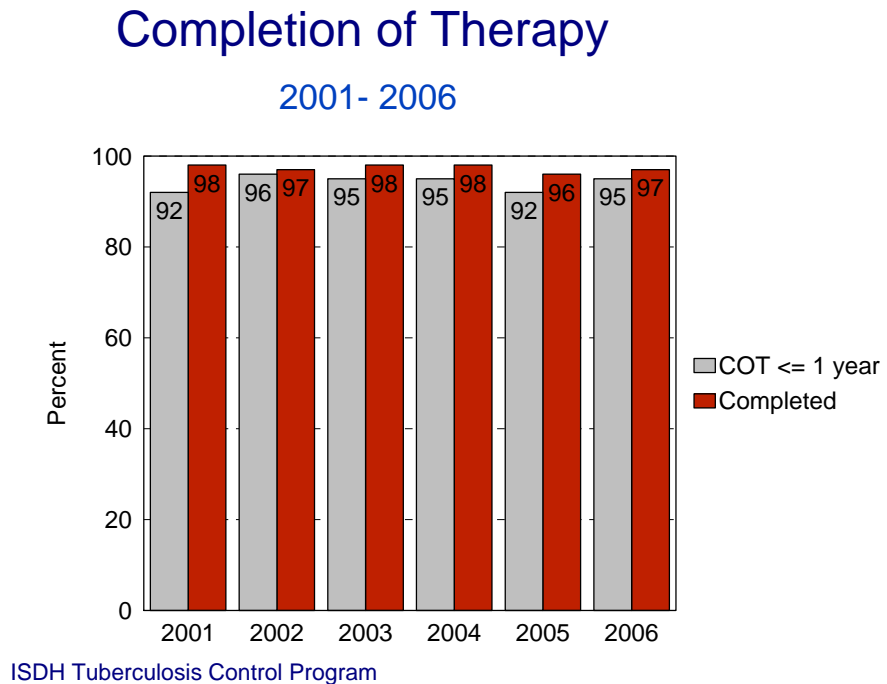


Figure 17 on the next page shows the counties that reported 5 or more cases of TB in 2007. The total number for the state is based on persons (1) whose primary residence was in Indiana at the time of diagnosis, and (2) who were verified as having TB disease in a given year. Persons counted in another state and immigrants and refugees who are diagnosed and begin treatment abroad are excluded. Foreign visitors (i.e., students, tourists, etc.) and certain other categories of non-U.S. citizens who are diagnosed in Indiana but who remain in the U.S. for less than 90 days of treatment are also excluded.

The aggregate number of cases by the four regional nurse consultant regions is shown in Figure 18 on page 15. Figure 19 on page 16 shows the number of cases per county from 2001-2007.

Figure 17.

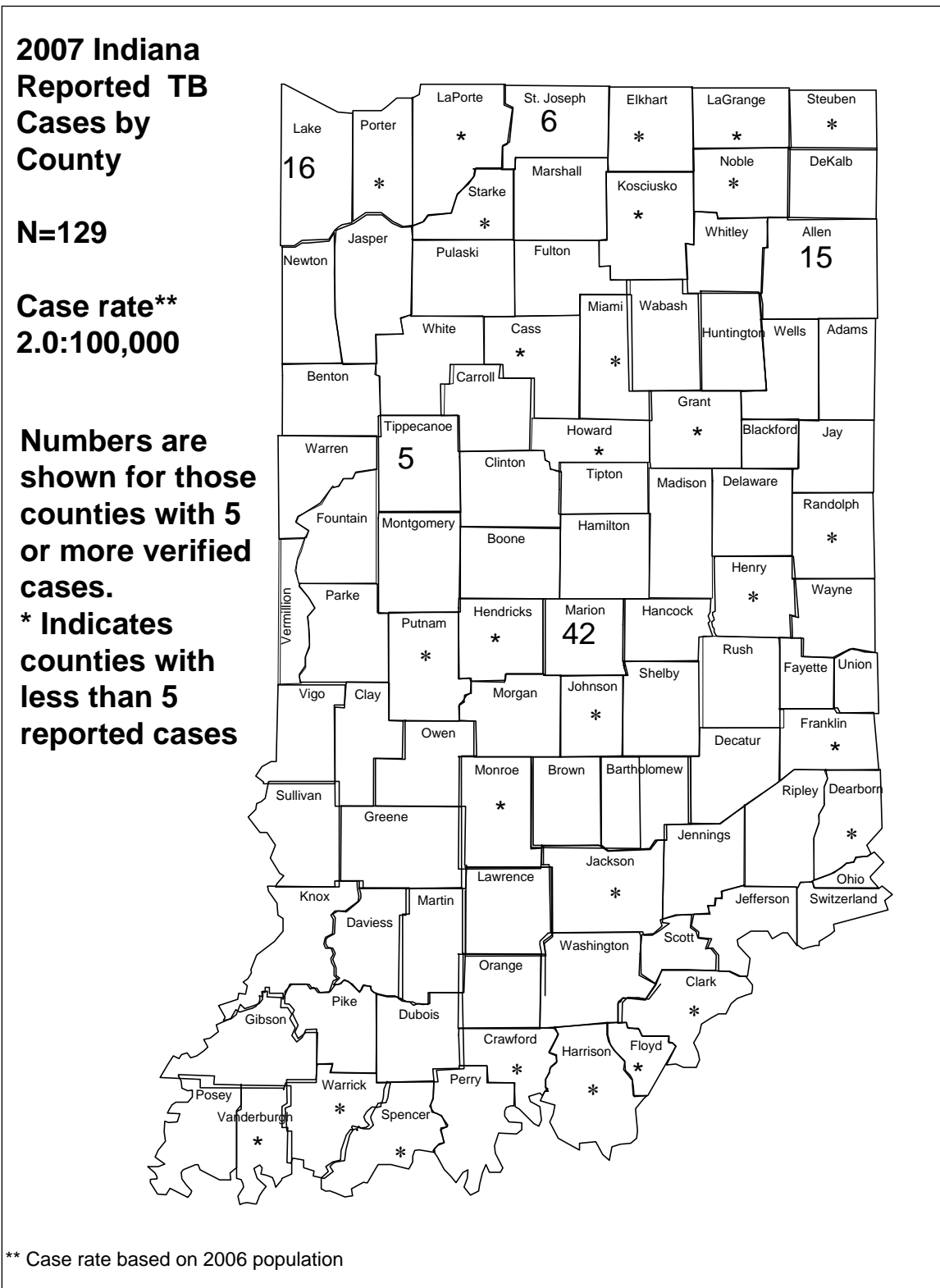
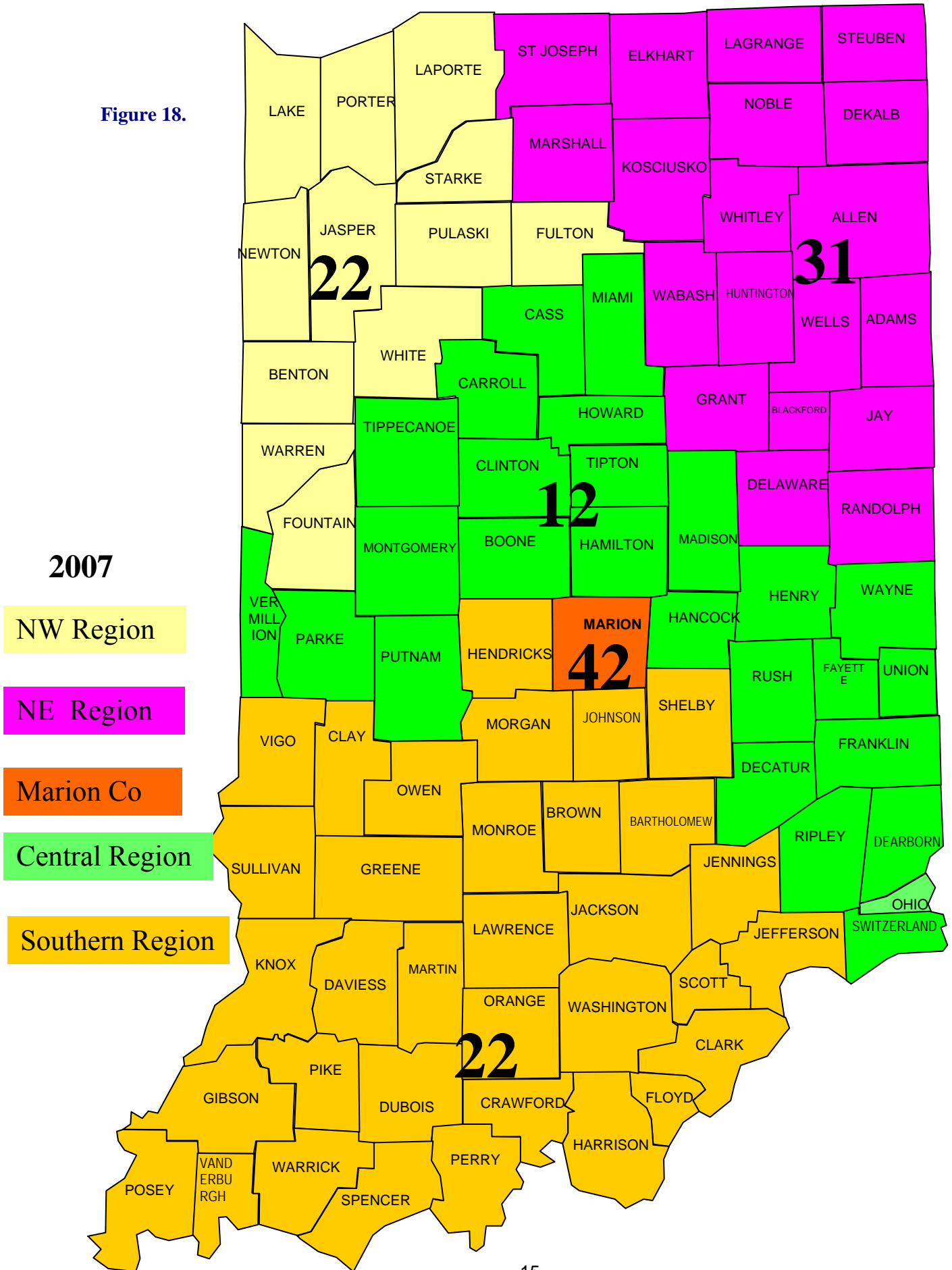
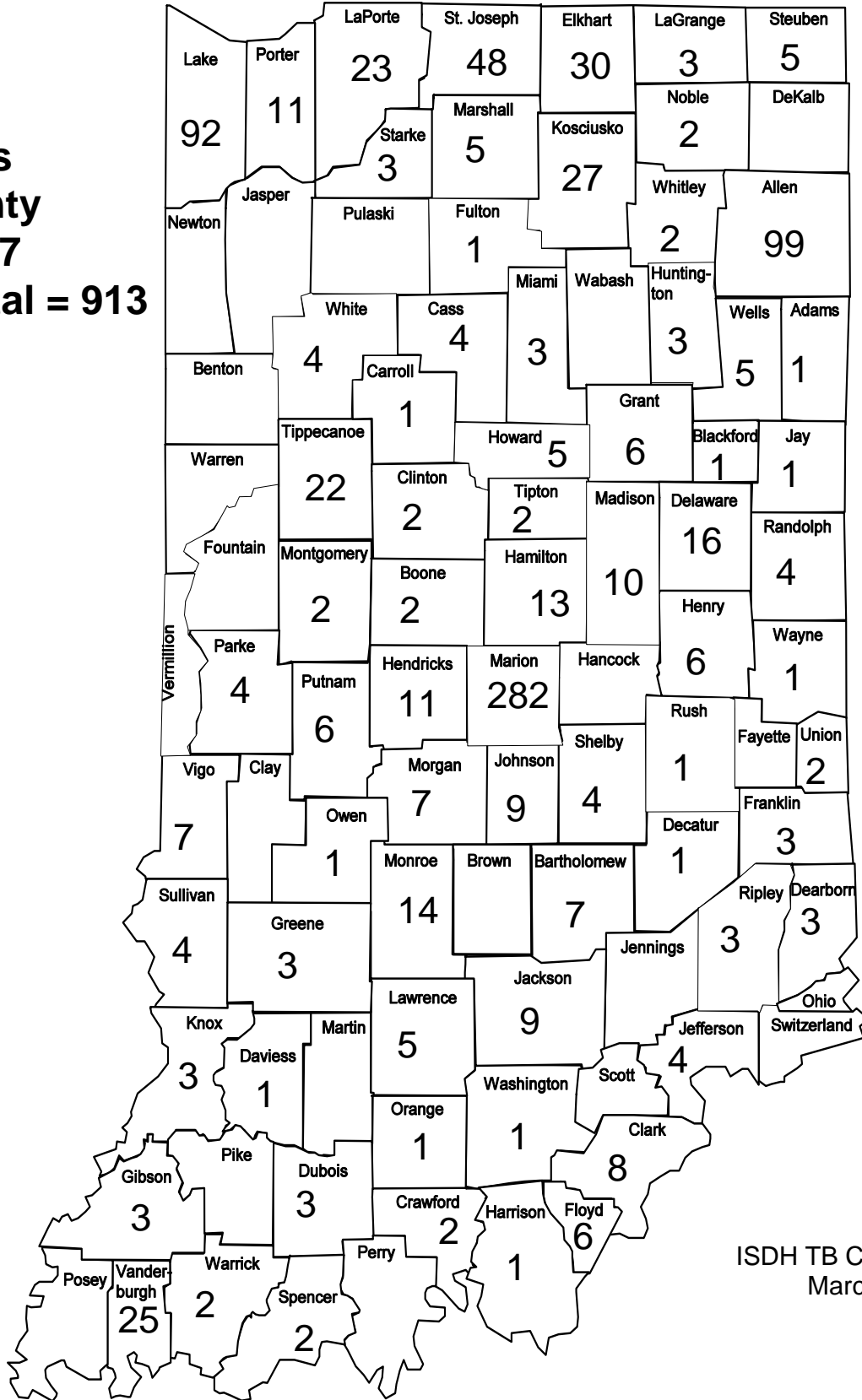


Figure 18.



**TB Cases  
per County  
2001-2007  
State Total = 913**



ISDH TB Control Program  
March 2008