

INDIANA TUBERCULOSIS CONTROL PROGRAM 2012 ANNUAL REPORT



Mycobacterium tuberculosis
<http://www.lookfordiagnosis.com>

Glossary

Case fatality rate: the ratio of the number of deaths caused by a specified disease to the number of diagnosed cases of that disease.

Clinical case confirmation: A clinical diagnosis is confirmed when **all** of the following criteria are met upon medical evaluation: (1) a positive tuberculin skin test (TST) or interferon-gamma release assay (IGRA), (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.

Cluster: a group of patients with LTBI or TB that is linked by epidemiologic, location or genotyping data. A genotyping cluster is two or more cases with isolates that have an identical genotyping pattern.

Comorbid: the coexistence of two or more disease processes.

Culture: Growth of microorganisms in the laboratory performed for detection and identification in sputum or other body fluids and tissues.

Culture conversion: wherein sputum culture-positive results convert to sputum culture-negative.

Directly observed therapy (DOT): adherence-enhancing strategy in which a health care worker or other trained person watches as a patient swallows each dose of medication. DOT is the standard care for all patients with TB disease and is a preferred option for patients treated for LTBI.

Endemic: present in a community at all times typically in relatively low frequency.

Extrapulmonary TB: TB disease in any part of the body other than the lungs. The presence of extrapulmonary disease does not exclude pulmonary TB disease.

Genotype: the DNA pattern of *Mycobacterium tuberculosis* used to discriminate different strains.

Hemoptysis: the coughing up of blood or bloody sputum from the lungs or airway.

Immunocompetent: Capable of developing an immune response; possessing a normal immune system.

Incidence: the extent or rate of occurrence, especially the number of new cases of a disease in a population over a period of time.

Isolate: a population of microorganisms that has been obtained in pure culture.

Laboratory case confirmation: laboratory diagnosis is confirmed when: (1) *M. tuberculosis* complex has been 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).

Latent tuberculosis infection (LTBI): infection with *M. tuberculosis* in which symptoms or signs of disease have not manifested.

Lost to follow-up: patients who at one point in time were actively participating in treatment but have become lost (either by error in a computer tracking system or by being unreachable) at the point of follow-up. These patients can become lost for many reasons: without properly informing the healthcare provider, they may have opted to withdraw from treatment; they may have moved away from the healthcare provider, or become ill and unable to communicate or are deceased.

Miliary TB: a serious form of TB disease sometimes referred to as disseminated TB. A dangerous and difficult form to diagnose of rapidly progressing TB disease that extends throughout the body. Uniformly fatal if untreated, and in certain instances it is diagnosed too late to save a life.

Mycobacterium bovis: see *Mycobacterium tuberculosis*.

Mycobacterium tuberculosis: the namesake member organism of the *M. tuberculosis* complex and the most common causative agent of TB disease in humans. In certain instances, the species name refers to the entire *M. tuberculosis* complex, which includes *M. bovis* and *M. africanus*, *M. microti*, *M. canettii*, *M. caprae*, and *M. pinnipedii*.

Multi-drug resistance: strains of *M. tuberculosis* that are resistant to at least isoniazid and rifampin.

Outbreak: unusually high occurrence of a disease or illness in a population or area. Three or more cases are required for an occurrence of tuberculosis to be classified as an outbreak.

Pulmonary TB: TB disease that occurs in the lungs.

Provider diagnosis case confirmation: in which a case does not meet criteria for laboratory nor clinical confirmation but the TB Program counts as a TB case based upon physician assessment and as determined by TB Medical Consultant and TB Controller.

Resistance: the ability of certain strains of mycobacteria, including *M. tuberculosis*, to grow and multiply in the presence of drugs that ordinarily kill or suppress them. Such strains are referred to as drug-resistant strains and cause drug resistant-TB disease.

Sputum: mucus containing secretions coughed up from inside the lungs. Sputum is different from saliva or nasal secretions, which are unsatisfactory for detecting TB disease.



http://www.sharinginhealth.ca/pathogens/bacteria/mycobacterium_tuberculosis.html

EXECUTIVE SUMMARY

The mission of the Indiana State Department of Health's Tuberculosis and Refugee Health Division is to decrease tuberculosis incidence and prevalence within the state of Indiana and to progress towards its elimination by providing technical assistance and support, education, policy development and surveillance in collaboration with local health departments, medical providers and the Centers for Disease Control and Prevention (CDC) in the care of those infected and affected by tuberculosis.

Our vision is that by 2015 the incidence rate of tuberculosis among U.S.-born residents of Indiana will not exceed 0.5 per 100,000 as the result of the initiative and collaboration of all local health departments, health care providers and the CDC. The incidence rate for 2012 was 1.6 per 100,000 so we still have much to do to further decrease TB in Indiana.

During 2012, there were 102 new cases of tuberculosis (TB) reported to the Indiana State Department of Health – this represents a 2% increase from the previous year. However, TB cases have declined from 1,883 reported in 1956 to an all-time low of 90 cases reported in 2010 (see Figures 1a and 1b). In 2012, TB cases were reported in greater than one third of Indiana's 92 counties (n=31). Indiana's three most populous counties (Marion, Lake, and Allen) accounted for over half (n=60, 58.8%) of all new cases. At 4.2 per 100,000, Marion County's incidence rate was nearly three times higher than the overall statewide rate (1.6 per 100,000); Marion County reported 38 cases in 2012 vs. 30 cases in 2011; Lake County reported seven TB cases in 2012 vs. 11 in 2011; Allen County's caseload increased fivefold – 15 cases in 2012 vs. three in 2011.

High risk populations for TB infection include children and persons with HIV comorbidity. Pediatric cases numbered seven in 2011 and 2012; six cases in 2011 and 2012 reported HIV as a comorbid condition.

Since TB is endemic in other parts of the world, being born outside the US is a risk factor for acquiring TB infection. In fact, 60% of all TB cases in the US in 2010 occurred among people born in other countries¹ but in Indiana individuals born in the United States continue to make up a higher percentage of TB cases (n=59, 57.8% US born vs. n=43, 42.1% foreign-born). Of those non-U.S. born cases, over half (n=24, 55.8%) were born in Burma, India or Mexico. The highest incidence (25.4 per 100,000) of tuberculosis cases occurred among Indiana's population of Asian descent; the lowest incidence occurred among those who identified as White (0.8 per 100,000).

Overall, resistance to TB drugs decreased in 2012, with the exception of isoniazid resistance: 7.8% (n=8) of cases were resistant to isoniazid (6.0% in 2011), 3.9% (n=4) of cases were resistant to drugs other than isoniazid or rifampin (9.0% in 2011) and there were no multi-drug resistant cases in 2012 compared with two multi-drug resistant in 2011.

Eight new genotype clusters of more than one case were confirmed in 2012. Indiana had only one TB outbreak in 2012 along with the ongoing outbreak among the homeless population (genotype cluster IN_0074). This cluster includes 29 cases, including eight added in 2012. The two main epidemiological risk factors related to IN_0074 are chronic homelessness and residence in Marion County, Indiana.

Summary statistics listed in Table 1 illustrate 2012 data for Indiana in comparison to nationwide TB data (the most recent national data is from 2011 unless otherwise noted).

SUMMARY STATISTICS

Table 1

	Indiana (2012)	United States (2011)
Number of tuberculosis cases	102	10,528
Tuberculosis deaths (per 100,000)	.06	0.2 (2009)
Laboratory case confirmation	76%	76%
Site of disease: pulmonary	80%	79%
Incidence rate (per 100,000)	1.6	3.4
US-born	1.0	1.5
Foreign-born	15.1	17.2
White	0.8	0.8
Black	5.1	6.3
Asian	25.4	20.9
Hispanic/Latino (all races)	2.6	5.8
Male	1.9	4.6
Female	1.3	2.9
Correctional facility resident *	2.9%	4.7%
Long-term care facility resident *	3.9%	2.6%
Excess alcohol use **	16.6%	12.5%
Injecting drug use **	1.9%	1.6%
Non-injecting drug use **	6.8%	7.0%
Homeless **	8.8%	5.6%
Known HIV test results 25-44 y/o	93.0%	90.0%
HIV positive – all ages	6.0%	6.0%
Isoniazid resistance with previous TB	0.0%	17.1%
Isoniazid resistance without previous TB	8.1%	9.2%
Multi-drug resistance with previous TB	0.0%	7.8%
Multi-drug resistance without previous TB	0.0%	1.3%
Initial drug regimen I, R, Z, E ***	90.9%	85.6%
Directly observed therapy	85.0% (2011)	59.5% (2009)
Therapy completed	86.0% (2011)	87.7% (2009)
Therapy completed ≤ 1 year	99.0% (2011)	87.7% (2009)
Therapy stopped: adverse event	1.0% (2011)	0.2% (2009)
Therapy stopped: moved	0.0% (2011)	0.9% (2008)
Therapy stopped: lost	3.0% (2011)	1.7% (2008)
Therapy stopped: refused	1.0% (2011)	0.7% (2008)
Therapy stopped: died	6.1% (2011)	6.7% (2008)

* at time of diagnosis

** within the past year

*** I = isoniazid, R = rifampin, Z = pyrazinamide, E = ethambutol

Population data derived from 2010 US census data, except where noted²

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Tuberculosis is an airborne disease caused by a group of bacteria that is collectively referred to as the *Mycobacterium tuberculosis* (MTB) complex. General symptoms may include a prolonged productive cough, blood-tinged sputum, night sweats, fever, fatigue and weight loss. TB usually affects the lungs (pulmonary TB) but can also affect other parts of the body such as the brain, kidneys, or spine (extrapulmonary TB). TB bacteria are aerosolized when a person who has pulmonary TB or TB affecting the larynx coughs, sneezes, laughs, or sings; another person may become infected if he 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. Latent infection may progress to a case of active tuberculosis disease; approximately 10% of immunocompetent individuals with latent infection will progress to active disease during their lifetime. Indiana requires reporting of all suspected cases and confirmed cases of TB; LTBI infection is not a reportable disease in Indiana at this time.

The introduction of anti-TB chemotherapy has led to a long-term decline in the number of new cases (see Figures 1a and 1b) as well as a reduction in the TB case fatality rate. Indiana's case fatality rate since 2008 is shown in Figure 2.

Figure 1a

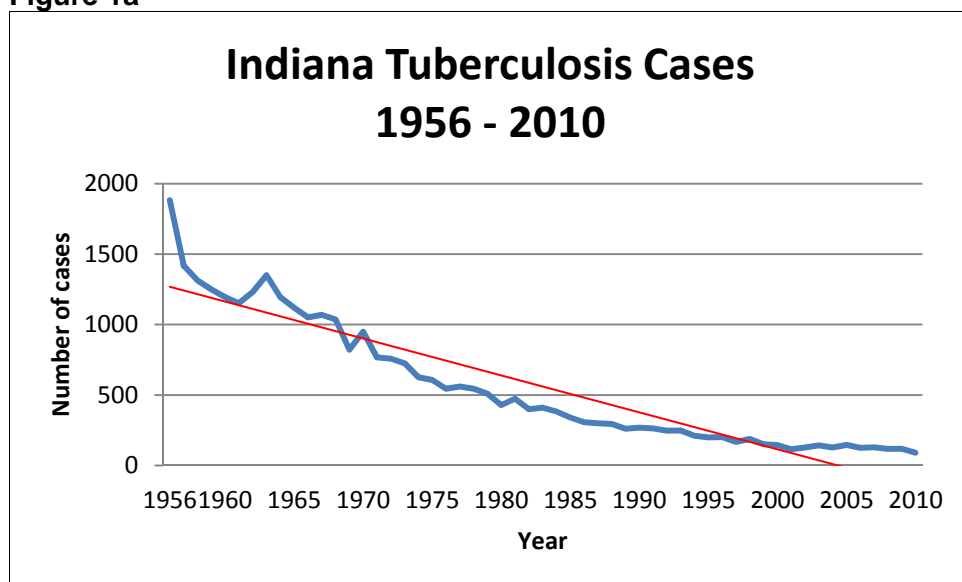


Figure 1b

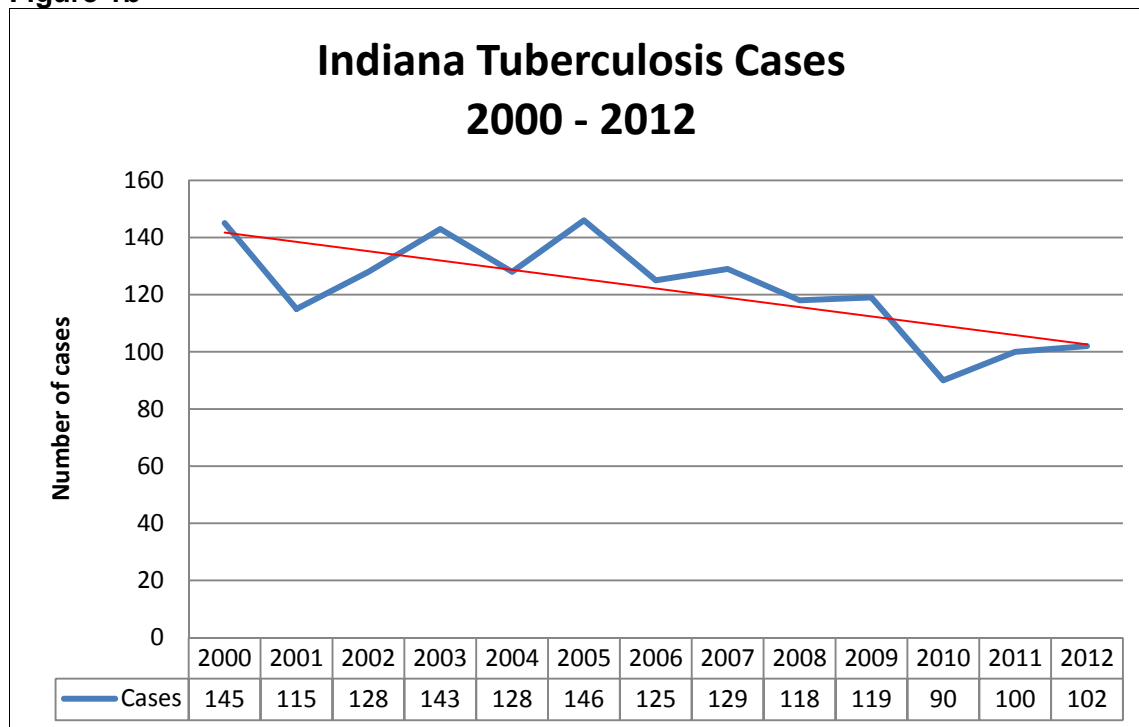
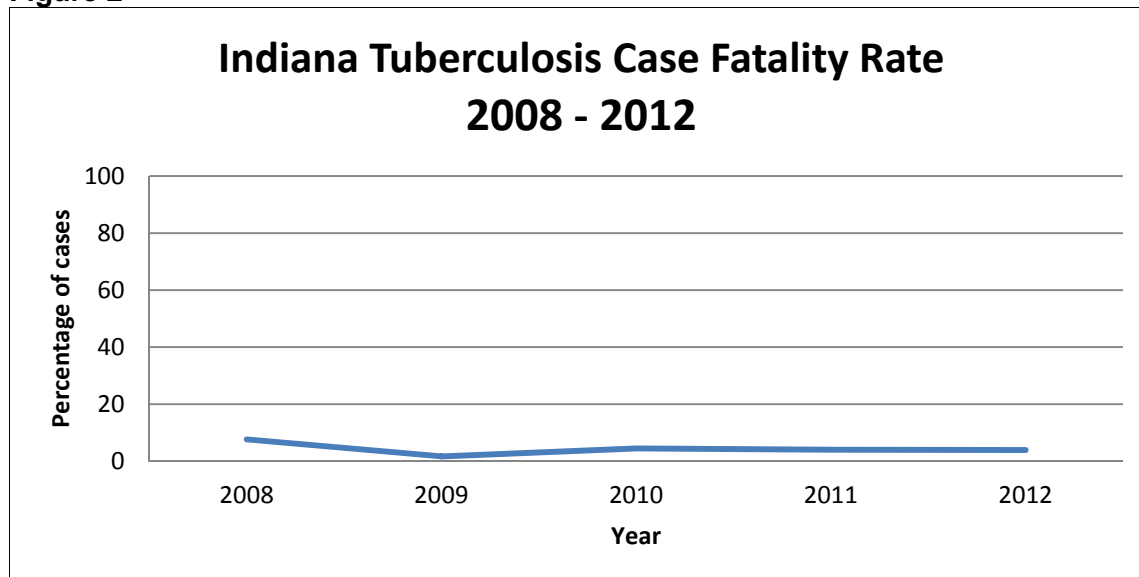


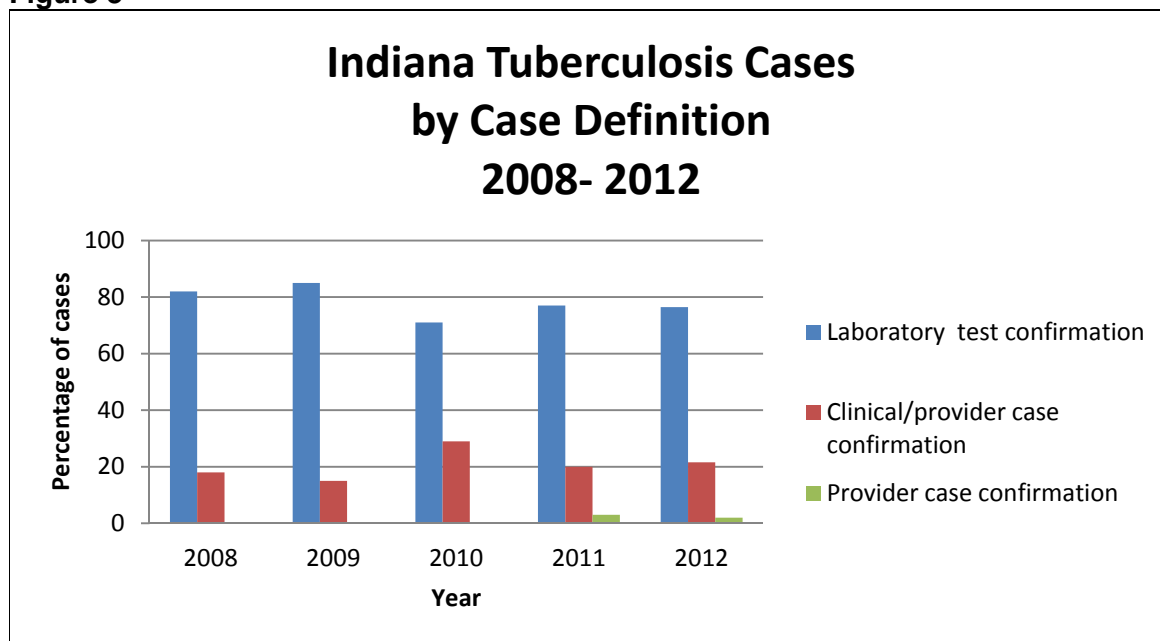
Figure 2



A diagnosis of TB is verified using the CDC's publication from 2007 entitled "Case Definitions for Infectious Conditions under Public Health Surveillance" publication¹. TB cases must meet the case definition for a laboratory, clinical, or provider diagnosis. A laboratory diagnosis is confirmed when: (1) *M. tuberculosis* complex has been 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 upon medical evaluation: (1) a positive tuberculin skin test (TST) or interferon-gamma release assay (IGRA), (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 cases of culture-negative pulmonary TB, extrapulmonary TB in which cultures did not grow or were not obtained, and in pediatric cases for whom obtaining specimens is difficult and invasive procedures are not warranted. Laboratory verification of case status has declined over the past five years yet in 2012 over three quarters (n=78, 76%) of TB cases were laboratory confirmed. Correspondingly, clinical case confirmation has risen from 18% in 2008 to 22% (n=22) in 2012. The third manner in which a TB case may be diagnosed is by provider diagnosis in which a medical provider diagnoses the case as TB based upon his clinical evaluation.

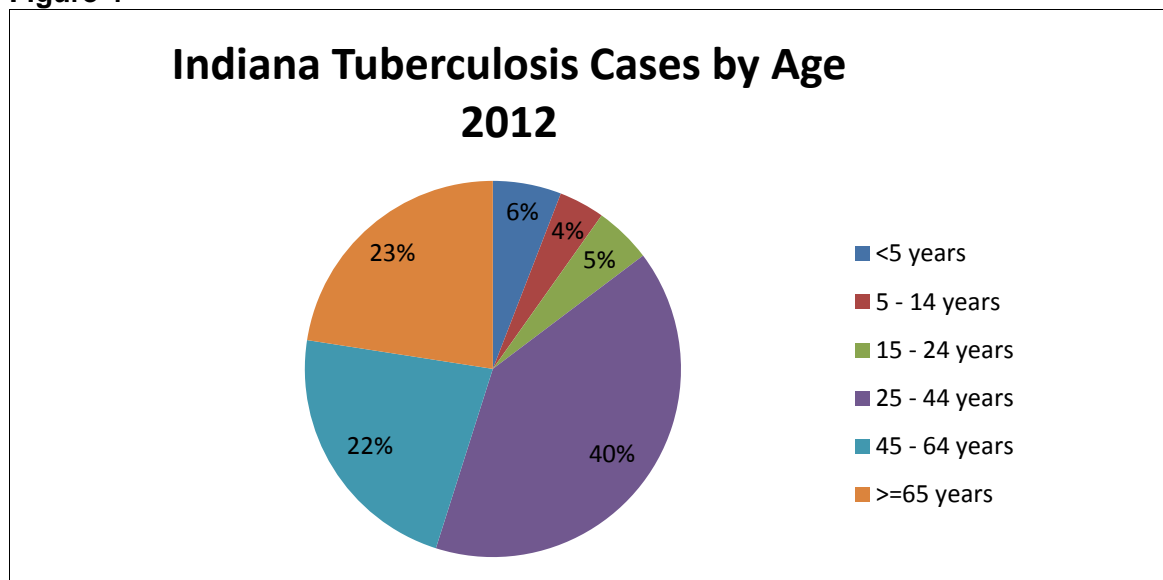
Figure 3



* Note: provider case confirmation was not calculated as separate category until 2011.

In 2012, well over seventy-five percent of diagnosed TB cases were adults aged 25 years to 65 years or greater (n=87, 85.2%) (Figure 4).

Figure 4

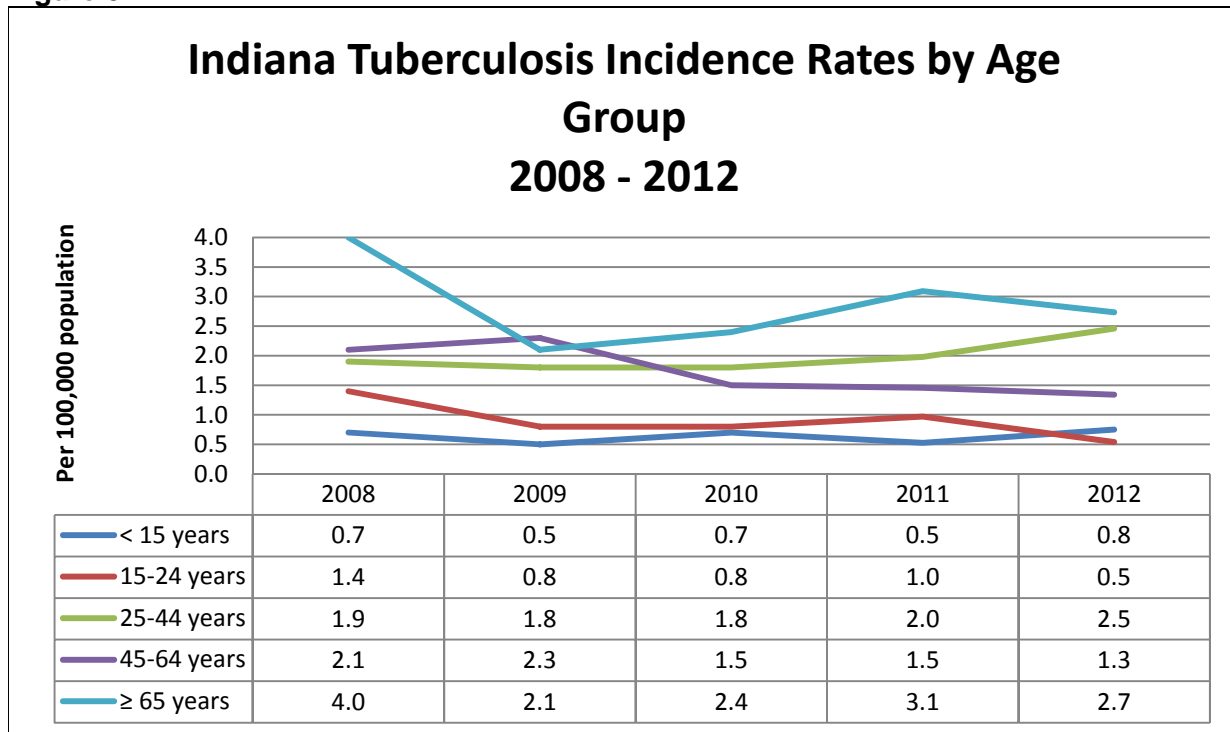


Age disparity is evident in the ≥ 65 year age group for 2012: 23% (n=23) of TB cases were reported in this age group, yet this group makes up only 13% of Indiana's total population (incidence rate = 2.7 per 100,000). In 2012, the incidence of tuberculosis increased for the <15 years age group (0.8 per 100,000), declined for the 45 – 64 years age group (1.3 per 100,000), and increased by half for the 15 – 24 years age group (0.5 per 100,000)). Figure 5 illustrates age group incidence trends for 2008 – 2012.



<http://www.harrisonburghousingtoday.com/blog/archives/2010/03/>

Figure 5

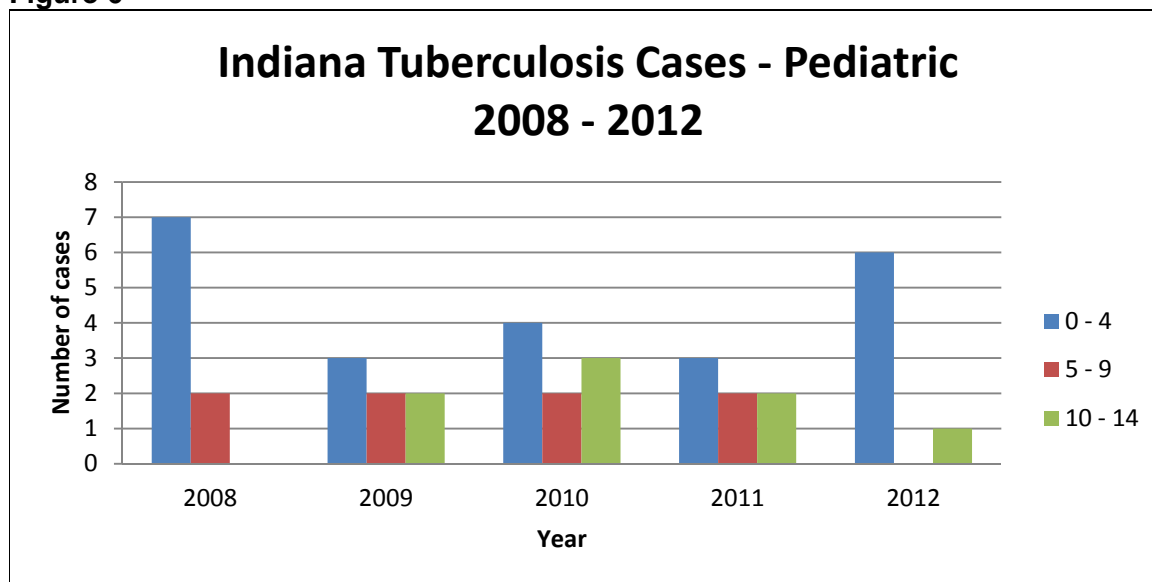


The number of pediatric tuberculosis cases in Indiana in the 0 – 4 age group doubled in 2012 (n=6); there were no cases in the 5 – 9 year age group and there was only one case in the 10 – 14 year age group (see Figure 6). The incidence rate for pediatric TB cases <5 years of age was 0.45 per 100,000 which meets Indiana’s 2012 goal of 1.3 per 100,000 cases. Pediatric cases provide important information regarding ongoing transmission in a community because TB infection in children indicates that (1) TB was transmitted relatively recently, (2) the person who transmitted TB to the child may still be infectious, (3) other people in the household or community have likely been exposed to TB and could develop TB disease.



http://www.doctorswithoutborders.org/images/2011/47354_kenya.jpg

Figure 6



The distribution of TB among White, Black, and Asian peoples of Indiana also illustrates racial disparity. Forty-five percent (n=46) of the TB disease burden in 2012 was borne by White-identified persons yet census data show that 84% of the Hoosier population is White; Indiana's Black population is 9% but Black persons accounted for 29% (n=30) of TB disease. The most serious disparity is seen among Asian peoples of Indiana who bore fully one quarter (n=26, 25%) of the TB disease burden yet account for only 2% of the overall Hoosier population (see Figure 7); 96% (n=25) the Asian cases were born outside the US. In terms of objectives established for 2012, the incidence rate for Black people was 4.9 per 100,000 which exceeds the 3.5 per 100,000 goal. (NOTE: Although American Indian/Alaska Native and Hawaiian Native/Other Pacific Islander are racial categories which are collected by the CDC and by Indiana TB Control Programs, in 2012 no TB case was classified in either of these categories.)



<http://christianmichael.org/2012/05/23/the-great-cultural-reality-of-race-income-and-our-future-in-depth-post/>

Figure 7

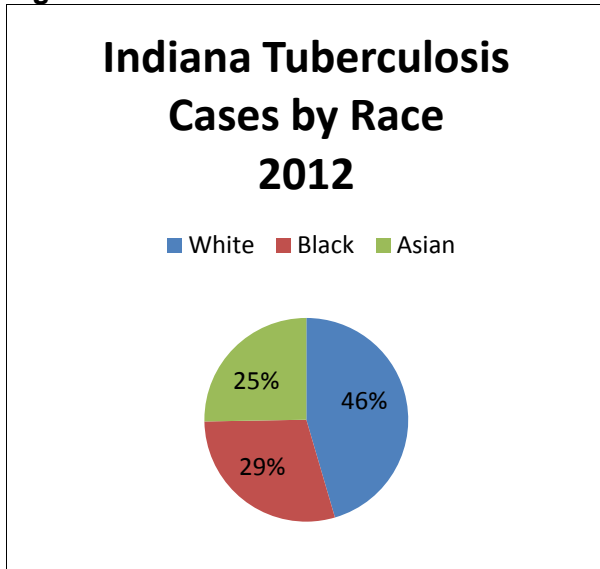
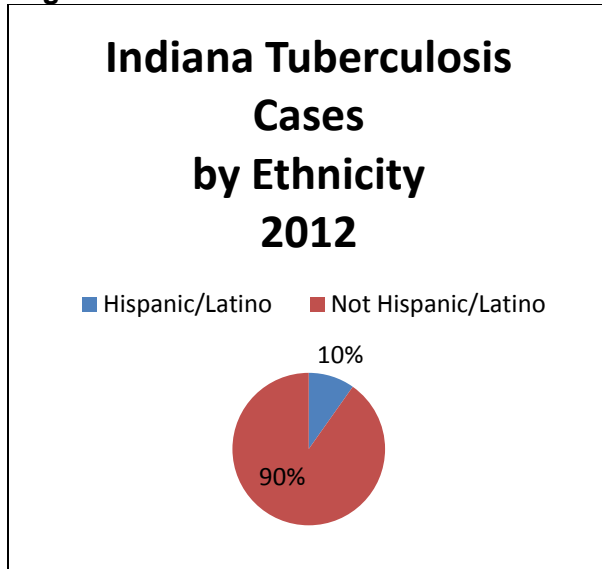


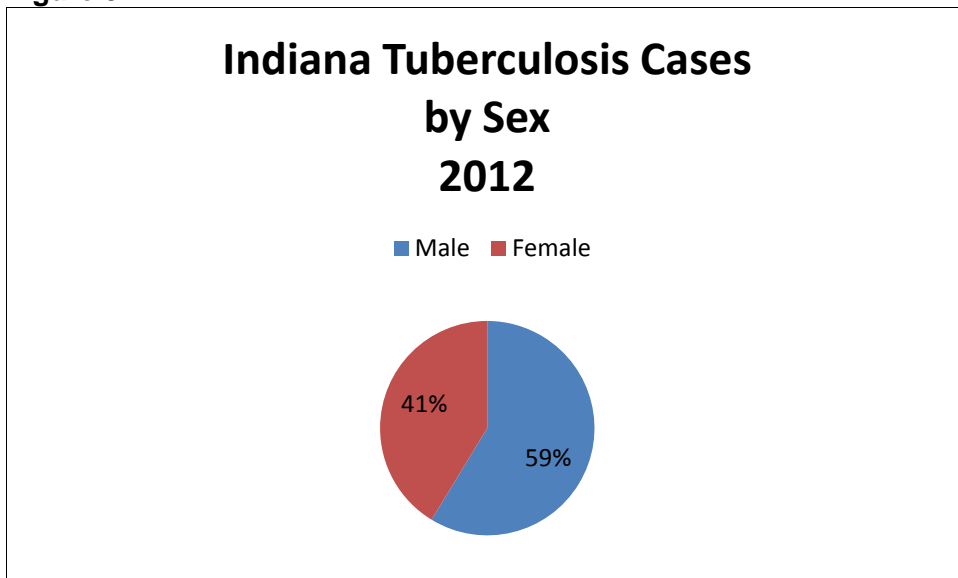
Figure 8



Disparity is also found in Indiana's Hispanic/Latino population. Although 6% of Indiana's population identifies as Hispanic/Latino, 10% (n=10) of 2012's cases were of Hispanic/Latino ethnicity (see Figure 8). Of the Hispanic/Latino individuals, 90% (n=9) were foreign born.

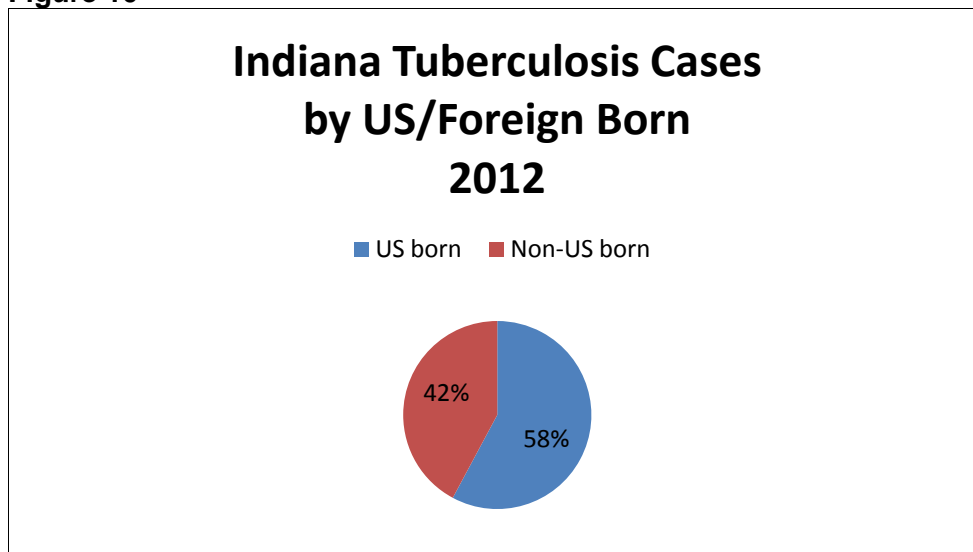
The split between male/female tuberculosis cases in Indiana in 2012 was more dramatic: males accounted for nearly 60% of TB cases (n=60, 59%) while females accounted for just over 40% (n=42, 41%) (see Figure 9).

Figure 9



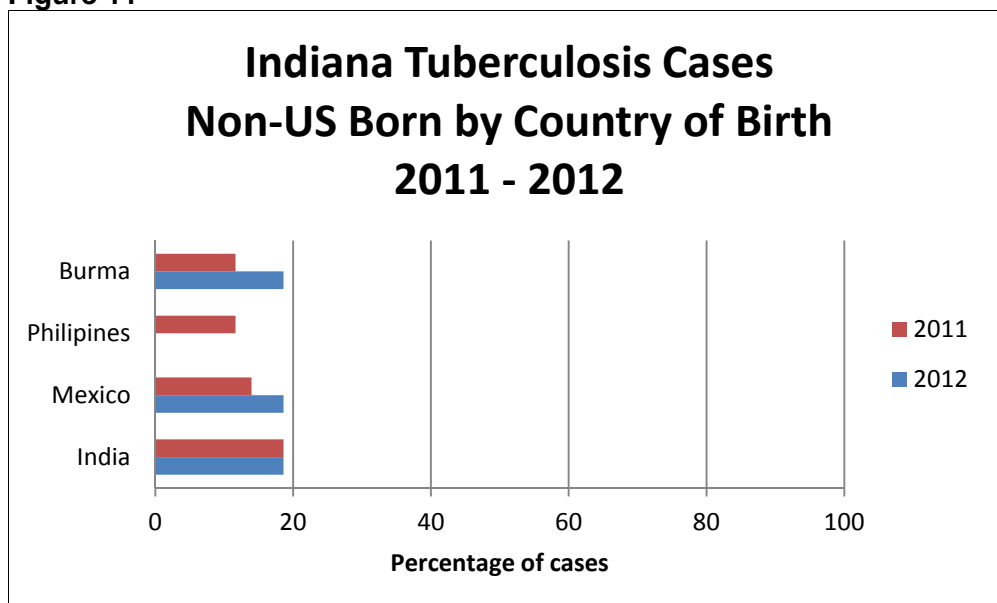
U.S. born TB cases continue to outnumber foreign born cases in Indiana yet the incidence rate for foreign born persons (15.1 per 100,000) and is 15 times higher than the rate for those born in the US (1.0 per 100,000). For 2012, Indiana's incidence rate goals for both US- born individuals (1.0 per 100,000) and foreign-born individuals (18.0 per 100,000) were met. Fifty-eight percent of 2012 TB cases were US-born (n=59); 42% (n=43) of TB cases were born outside the US (see Figure 10).

Figure 10



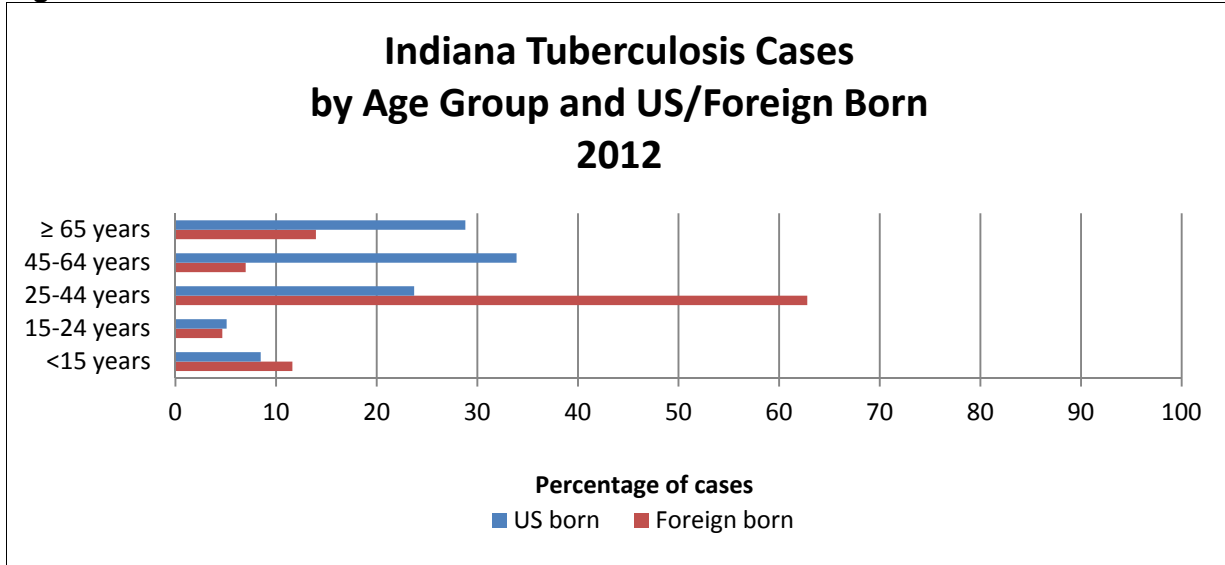
The countries with the highest percentages of 2012 TB cases are illustrated in Figure 11. Of the cases born outside the US, 18.6% (n=8) were from India (which is identical to the percentage of 2011 cases); the percentage of cases (n=6) from Mexico increased by nearly five percent; Burmese cases increased by seven percent (n= 8). (Note: only countries of origin with ≥ 5 cases are included in this analysis; 16 other countries of origin had one or two cases each.)

Figure 11



Distribution of TB cases by age group and US vs. foreign birth for 2012 is shown in Figure 12. TB disease was more common among US-born persons only in the older age groups (45-64 yrs, n=20, 34%; ≥65 years, n=17, 29%); the percentage of foreign born cases aged 25 - 44 years (n=27, 63%) was more than double the percentage of US cases (n=14, 24%).

Figure 12



Of the three countries with the highest percentages of 2012 TB cases in Indiana – Burma, India, Mexico – cases of Indian and Mexican origin were all 25 years old or greater (India: 25-44 years, n=7, 87.5%; ≥65 years, n=1, 12.5%; Mexico: 25-44 years, n=7, 87.5%; ≥65 years, n=1, 12.5%). In contrast, all of the cases of Burmese origin were aged less than 44 years (<15 years, n=3, 37.5%; 15-24 years, n=1; 12.5%; 25-44 years, n=4, 50.0%) (Figure 13).

Figure 13

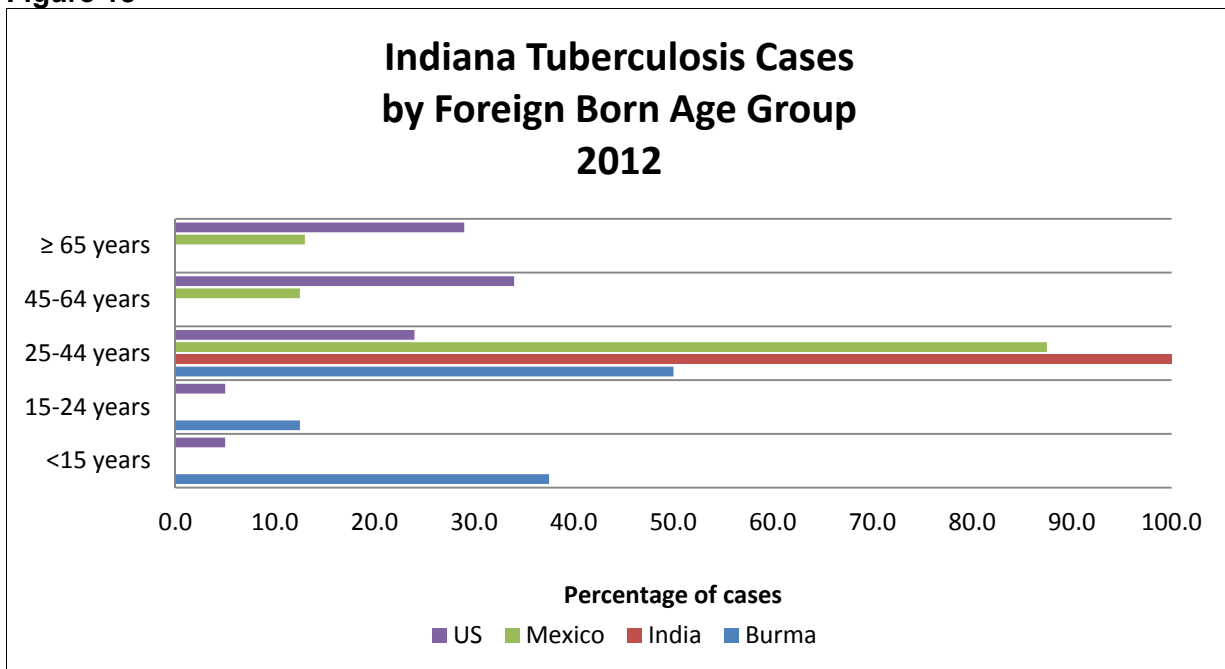


Figure 14 represents the length of time foreign-born persons were living in the U.S. prior to TB diagnosis; figure 15 illustrates the time in the U.S. prior to TB diagnosis for those cases born in countries with the highest percentage of foreign born 2012 TB cases: Burma, India and Mexico.

Figure 14

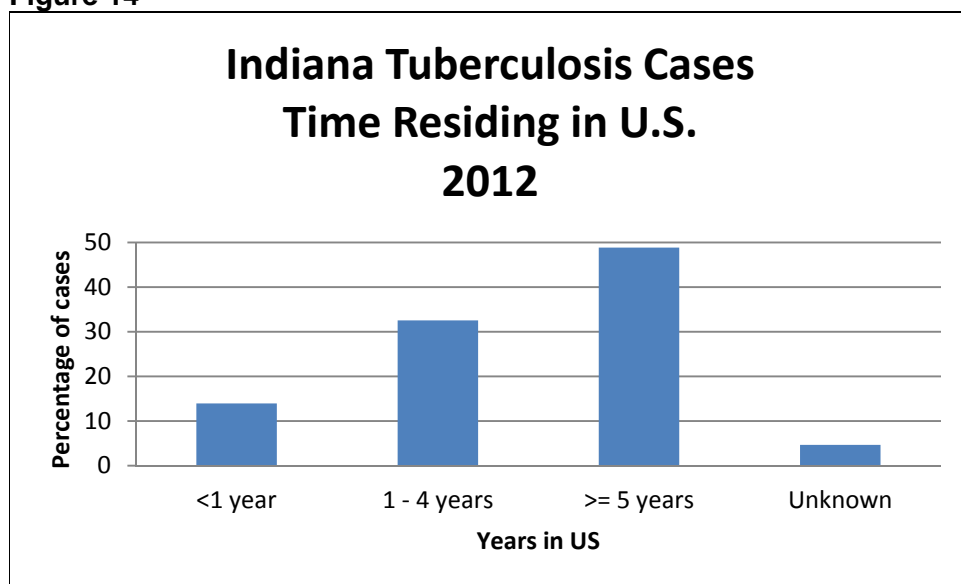
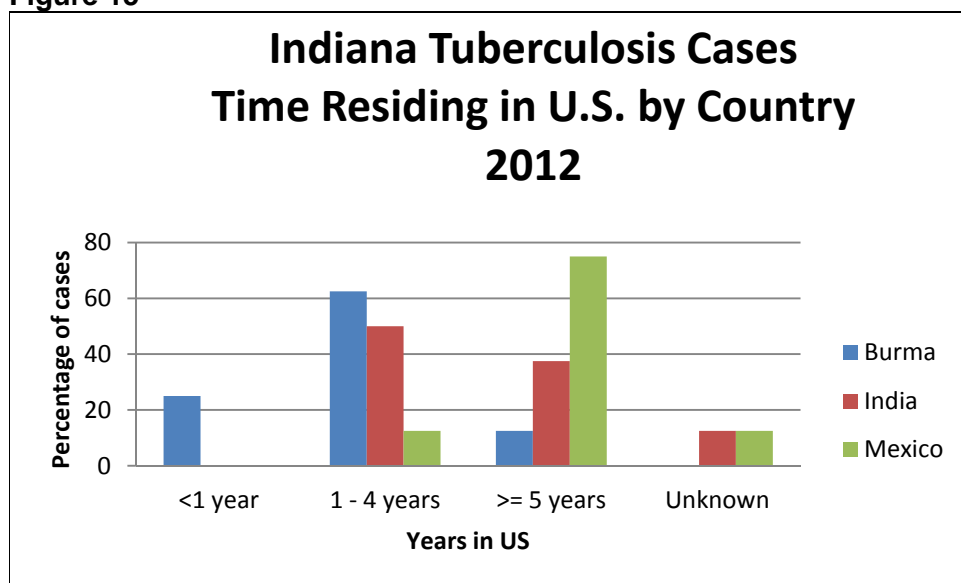


Figure 15



HIV status variables are shown in Figure 16a for the 25 – 44 years age group and in Figure 16b for all TB cases greater than 15 years of age for 2012. Indiana’s target for 2012 was 70.0% for “known HIV status”; this goal was achieved for both groups (n=37, 93% for the 25 – 44 year olds, n=75, 82% for all of those over age 15). For the 25 – 44 year age group, known HIV status increased substantially from 2011 by nearly twenty percent (2011, 76%; 2012, 93%). No patient in the 25 – 44 year age group refused testing in 2012 as contrasted with 6% in 2011; the proportion of those not offered testing rose from 0% in 2011 to 2.5% (n=1) in 2012.

The proportion of known HIV status for all cases greater than 15 years of age increased to 82% (n=75) vs. 73% in 2011; the percentage of those who refused decreased from 18% in 2011 to 8% (n=7) in 2012. At five percent, the proportion for patients not offered testing was the same for 2011 and 2012 (n=5). Five percent (n=2) of HIV testing results were unknown for 2012 in the 25 – 44 year age group – in 2011, the percentage was 0%; the proportion for the over 15 age group who refused testing was 8% (n=7) while in 2011 the proportion for this overall age group was 3%.

Figure 16a

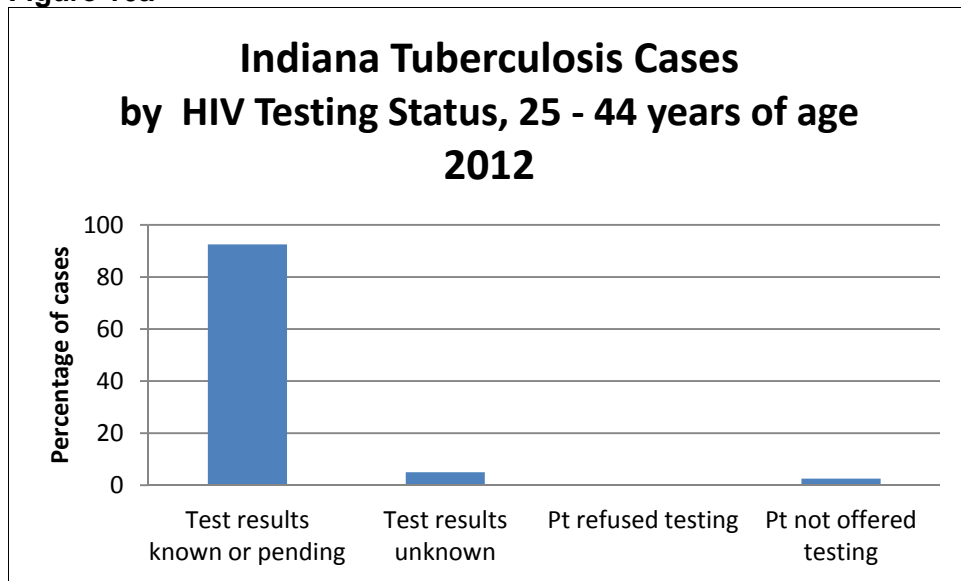
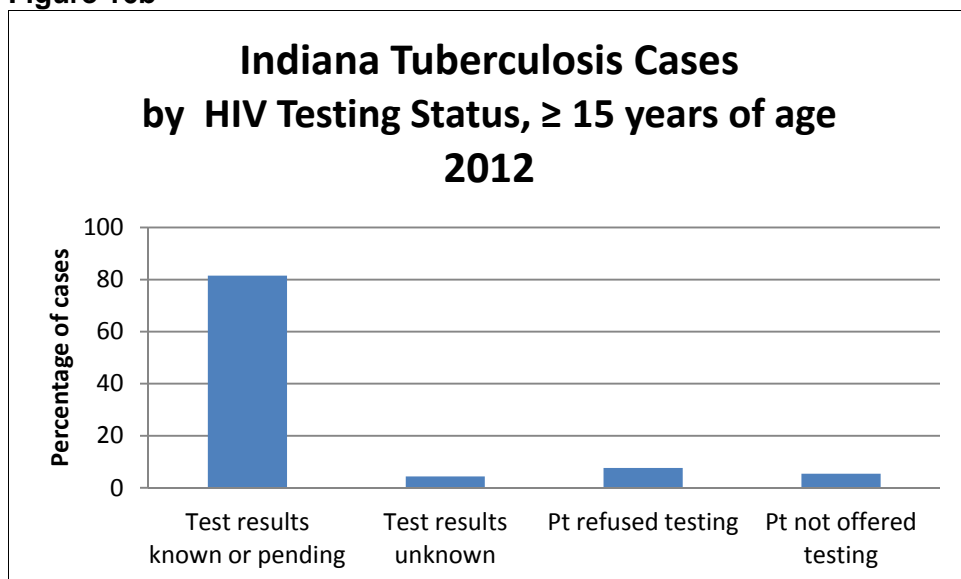
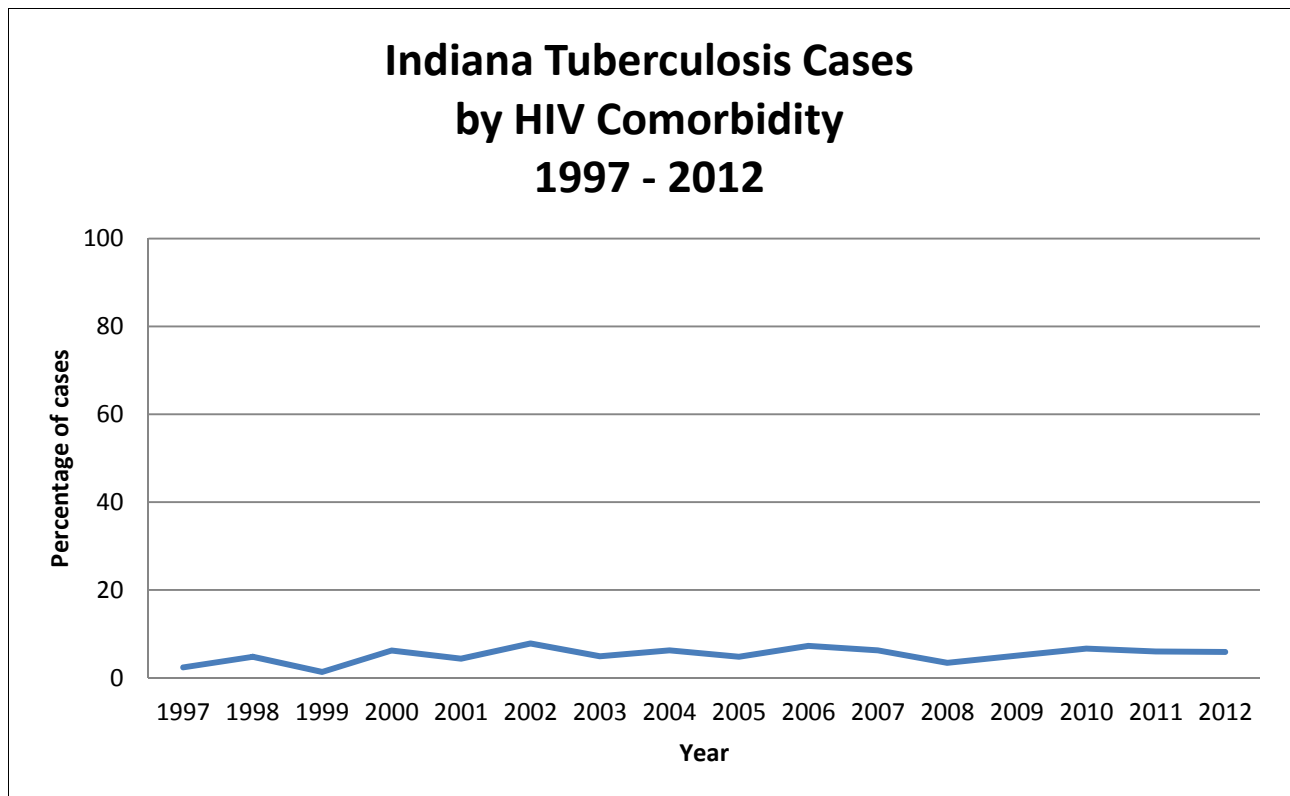


Figure 16b



The percentage of people infected simultaneously with TB and HIV has remained under 10% of TB cases from 1997 – 2012 (see Figure 15). The highest number of TB cases with comorbid HIV infection occurred in 2002 ($n=10$, 8%). Comorbid TB infection and HIV infection is an AIDS-defining condition³. Even though TB is one of the leading causes of death for those infected with HIV, TB can be effectively treated even if HIV infection is present⁴.

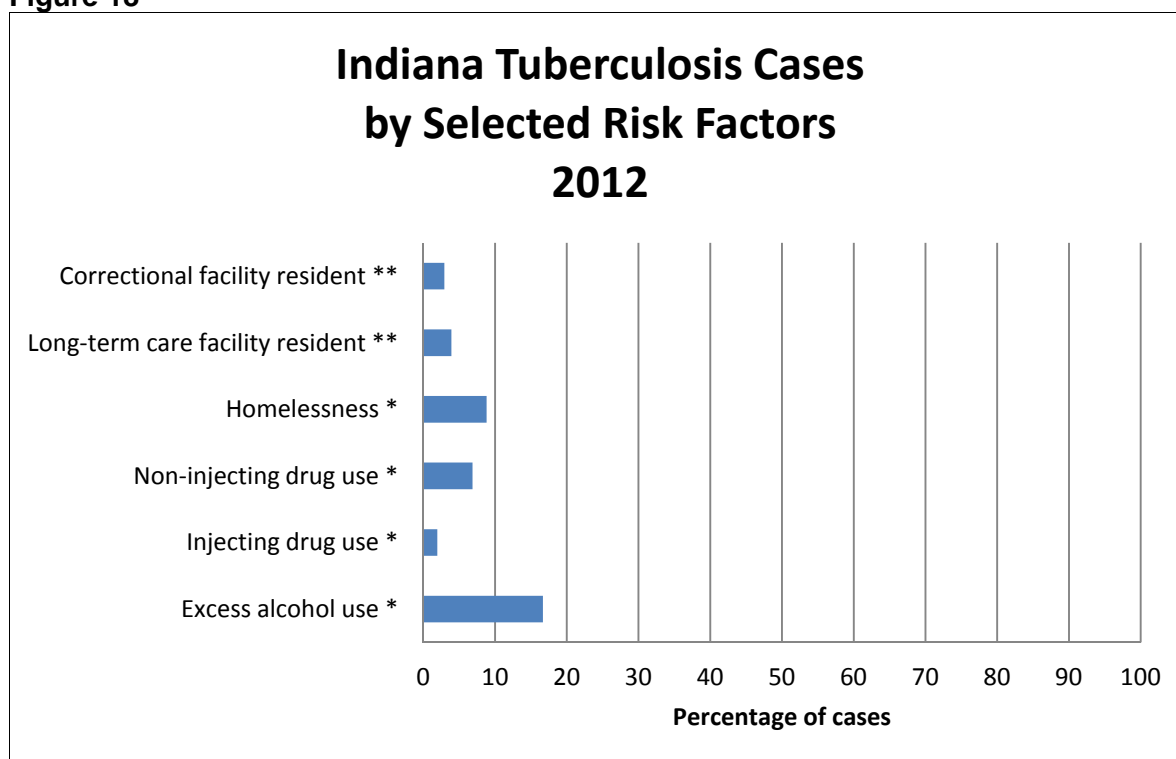
Figure 17



<http://pakmed.net/college/forum/?p=36060>

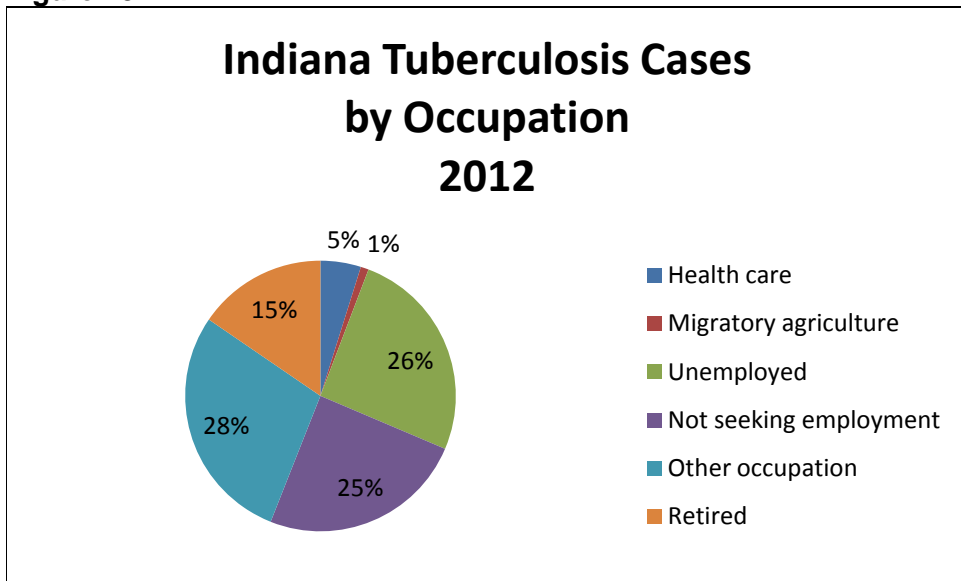
Other risk factors for progression to active disease include excessive alcohol use; illicit drug use (injection and non-injection), homelessness, and residence in a high-risk congregate setting (e.g., long-term care facilities and jails). Figure 18 illustrates the percentage of TB cases with selected risk factors for 2012. The most common risk factor present was excess alcohol use at 16% (n=17) which is identical to 2011's 16% figure. Injecting drug use decreased from 5% in 2011 to 1.9% (n=2) in 2012; non-injecting drug also declined – from 11% in 2011 to 6.8% (n=7) in 2012. The percentage of those reporting a history of homelessness within the past year remained virtually static from 9% in 2011 to 8.8% (n=9) in 2012. The percentage of long-term care facility residents remained nearly static at 3.9% (n=4) compared to 3% in 2011. Those cases who were correctional facility residents at the time of diagnosis decreased from 4% in 2011 to 2.9% (n=3) in 2012.

Figure 18



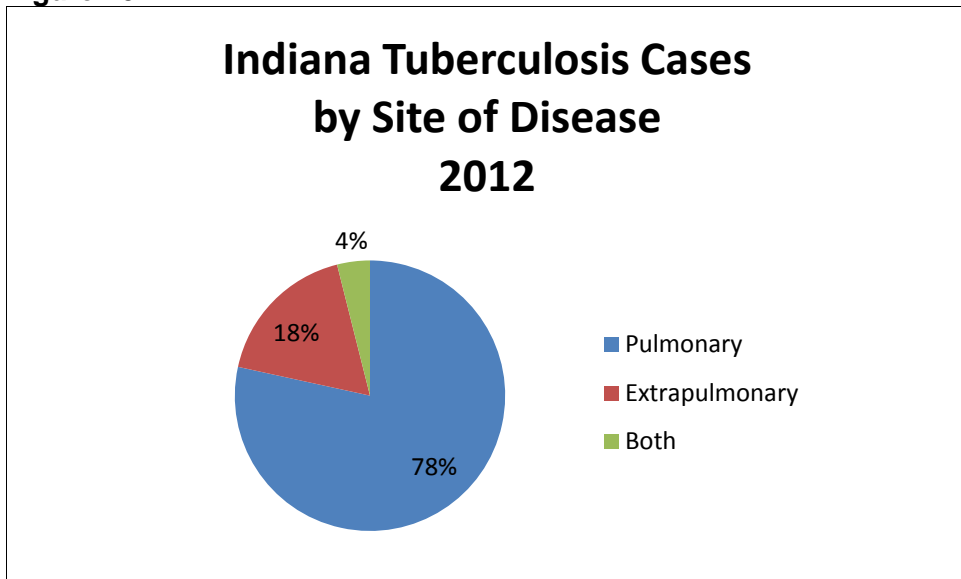
Indiana 2012 TB cases by employment category are shown in Figure 19 (n=102). Data show that the percentage of those not employed in 2012 rose by nearly ten percent (n=26, 26%) from 18% in 2011; those not seeking employment (e.g., students, homemakers, disabled persons) represented one quarter of those employed in this cohort (n=25, 25%) which is a decline from 28% in 2011. The proportion of retirees decreased from 21% in 2011 to 15% (n=16) in 2012. The percentage of those employed in various occupations rose slightly to over one third (n=35, 34%) in 2012 vs. 32% in 2011.

Figure 19



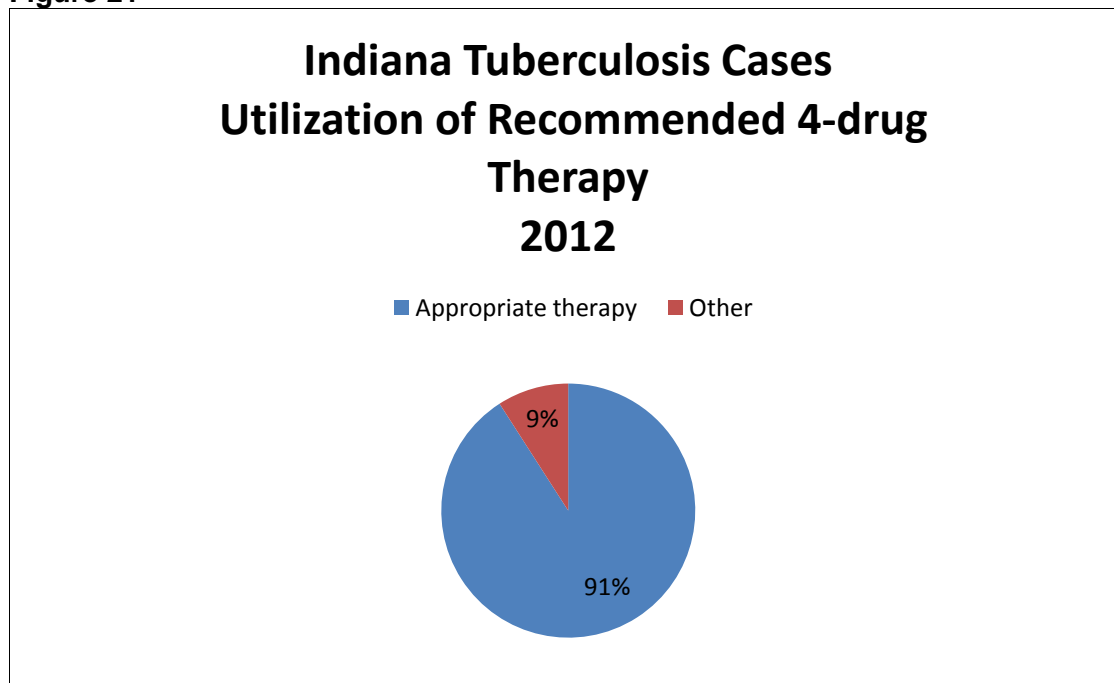
The percentage of TB cases classified by the site of disease is shown in Figure 20. Both pulmonary and extrapulmonary site cases increased by 2% in 2012 (pulmonary, n=80, 78% vs. 76% in 2011; extrapulmonary, n=18, 18% vs. 16% in 2011). Cases classified as having both pulmonary and extrapulmonary sites decreased by half in 2012 (n=4, 4% vs. 8% in 2011).

Figure 20



The Indiana State Department of Health endorses the treatment guidelines established by the American Thoracic Society and the CDC. Since 1991, these guidelines have recommended that four drugs be used in combination in the initial treatment phase. Unless contraindicated, all patients should begin therapy on the preferred regimen consisting of isoniazid (INH), rifampin (RIF), pyrazinamide (PZA), and ethambutol (EMB). In 2012, 91% (n=90) of patients began treatment on the recommended four-drug regimen; this meets the 2012 goal of 89% of patients beginning on this regimen and is a substantial increase from 84% of cases started on the recommended regimen in 2011. The percentage of patients who were started on the recommended four-drug regimen is shown in Figure 21.

Figure 21

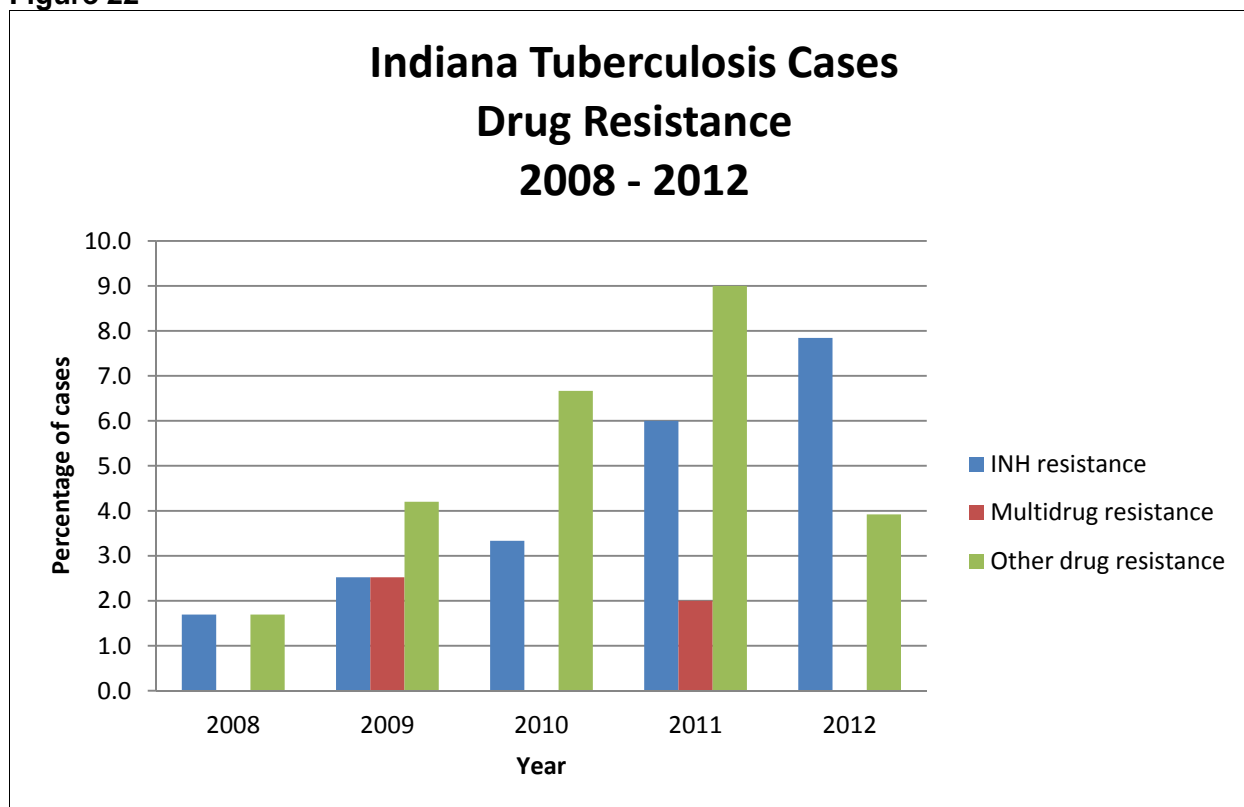


Drug susceptibility testing is routinely performed on all culture-positive isolates. Of the 78 culture-positive cases reported during 2012, drug susceptibility testing was performed on 77 (98.7%) of the specimens submitted; this proportion exceeds the 98% goal set by Indiana. In 2012, of all drug resistance metrics, drug resistance increased only in isoniazid resistance: 7.8% (n=8) resistant to INH vs. 6% in 2011; there were no new cases classified as multi-drug resistance (resistant to both INH and RIF) in 2012 vs. 2% in 2011; 3.9% (n=4) were resistant to other drugs (excluding INH and RIF) vs. 9% in 2011 (see Figure 22).



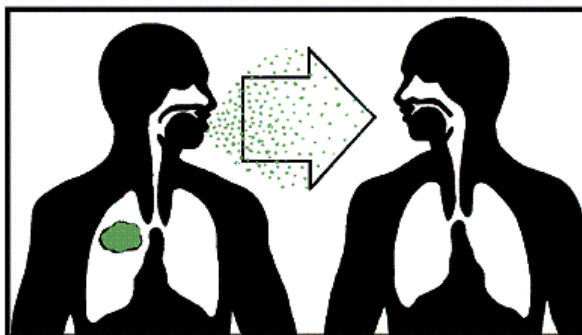
http://www.sciencephoto.com/image/432994/530wm/F0043228-Tuberculosis_resistance_to_some_drugs-SPL.jpg

Figure 22



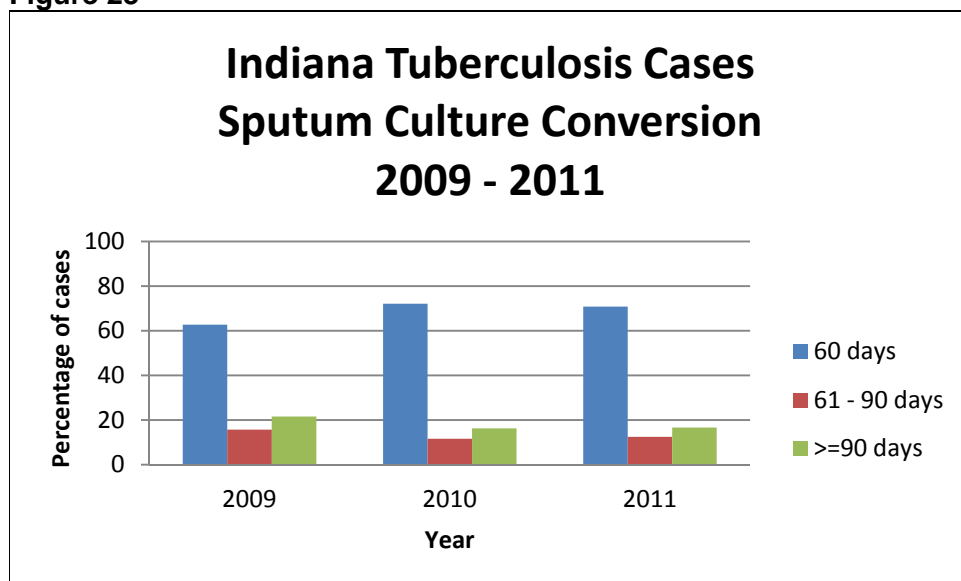
Drug resistance, inadequate response to therapy and failure to follow the treatment regimen are the most common reasons to extend the treatment period beyond 12 months.

Culture conversion data are collected to measure response to therapy and to determine length of treatment. Patients whose cultures have not converted to negative after two months of treatment may require a longer course of therapy. Those whose symptoms have not improved or who 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 for failing to adhere to the treatment regimen if not on a directly observed therapy (DOT) regimen. In 2011, culture conversion was reported for 61.5% (n=48) of Indiana TB cases which exceeded the 2011 goal of 54% of patients undergoing culture conversion. Figure 23 illustrates culture conversion data for 2009, 2010 and 2011 (2009 is the most recent year for which reliable data are available; 2012 data is incomplete and will be reported in 2013).



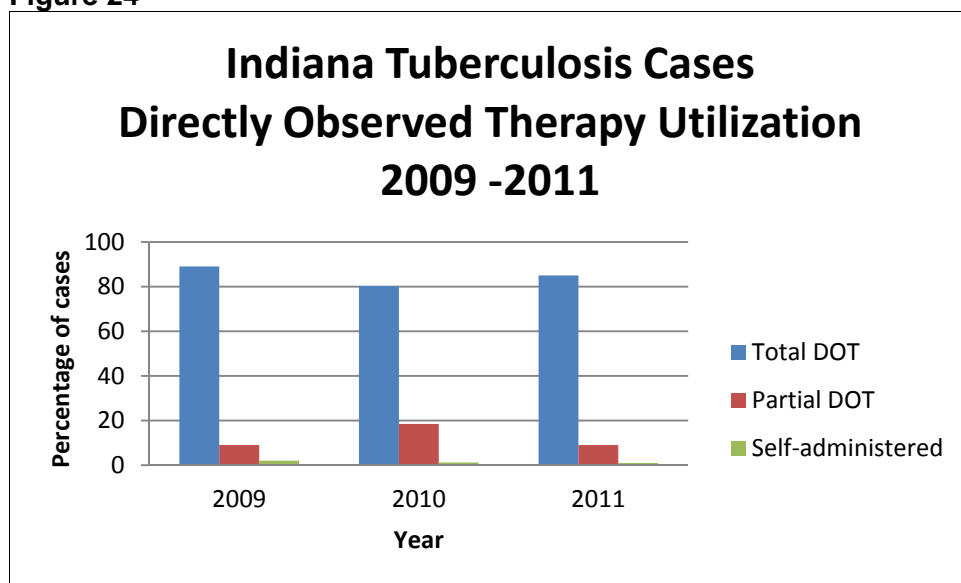
<http://www.dosomething.org/tipsandtools/11-facts-about-tuberculosis>

Figure 23



Directly observed therapy (DOT) is the most effective way to ensure that a patient is complying with the prescribed treatment regimen. Since DOT is a strategy proven to ensure completion of therapy with the added benefit of preventing acquired drug resistance, it is the standard of medical care in Indiana. Every effort must be made to incorporate DOT when therapy is initiated. DOT data for 2009 - 2011 are presented in Figure 24 (2009 is the most recent period for which complete DOT is available; 2012 data is incomplete and will be reported in 2013). For 2011, drug therapy utilizing total DOT increased to 85% from 80% in 2010 while partial DOT decreased a substantive amount from 19% in 2010 to only 9% (n=9) in 2011; self-administered DOT was at the same level – 1% in both 2010 and 2011 (n=1).

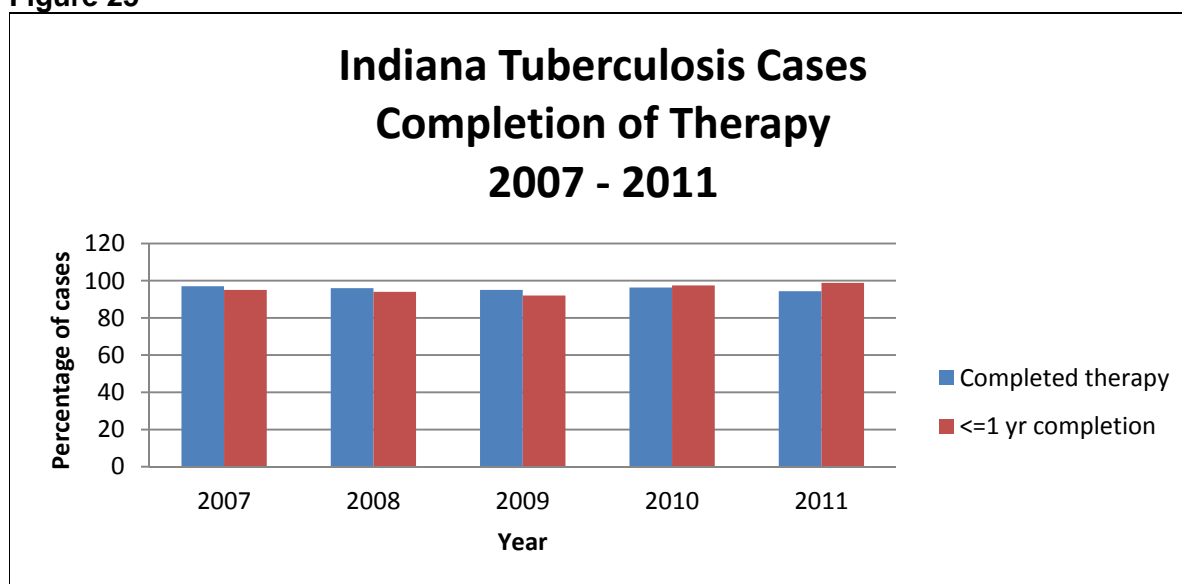
Figure 24



The first priority of TB elimination efforts is to ensure Completion of Therapy (COT). Indiana's goal of having at least 90.7% of all patients complete treatment within one year was achieved in

2012 with 99% (n=83) completing therapy within one year's time. 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 calculations are those patients who were dead at the time of diagnosis, patients who died before completing therapy, patients who were never started on therapy, patients with rifampin resistance, patients with multi-drug resistance, pediatric cases with miliary disease, pediatric cases with positive blood cultures, and all meningeal cases. Therapy is considered to be incomplete for those patients who moved out of the United States during treatment, those who are uncooperative or who refused therapy, or those who are lost to follow-up. Figure 25 shows the proportion of patients who completed therapy and those who completed therapy in one year or less.

Figure 25

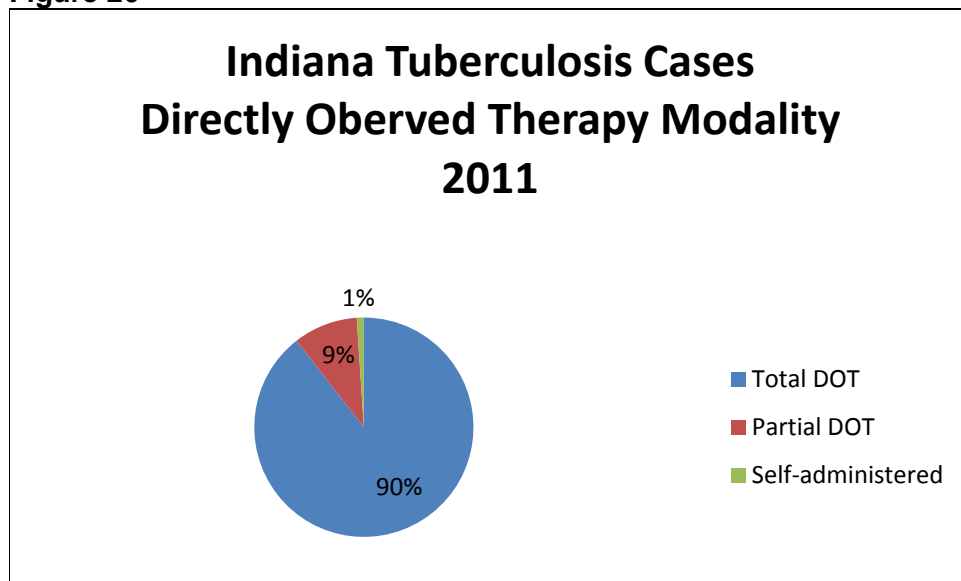


Directly observed therapy (DOT) is an intervention designed to ensure adequate treatment; figure 26 shows DOT utilization for 2011. Total DOT was utilized for 90% (n=85) of patients while 9% (n=9) were on partial DOT and only 1% (n=1) were on a self-administration regimen (figure 26).



<http://www.pih.org/blog/pih-russia-to-publish-books-authored-by-tuberculosis-survivors>

Figure 26



To eliminate the transmission of TB in Indiana, contact investigations must focus on those at highest risk and records of these investigations must be completed and returned to the TB program in a timely manner. Each contact with a positive TB screening test must be followed through medical evaluation, initiation of treatment and completion of treatment. In 2010 the CDC began soliciting data on newly infected contacts because recently infected contacts have a higher risk of developing active TB disease within the first two years of exposure⁵. This is one reason that completing a thorough contact investigation is crucial in the prevention of TB disease. A Contact Investigation Summary for the past four years is presented in Table 2.

Table 2

2015 National Objective	2008	2009	2010	2011
Number of cases reported	118	119	90	100
Contact investigation:				
1) Contacts will be identified in 100% of newly reported sputum AFB smear-positive TB cases	100%	100%	97%	97%
2) At least 93% of contacts to sputum AFB smear-positive TB cases will be evaluated for infection and disease	48%	54%	66%	83%
3) At least 79% of infected contacts who are started on treatment for latent TB will complete therapy.	69%	67%	70%	63%

Figure 27 (page 25) shows the incidence in counties that reported five or more cases of TB in 2012. The total number for the state is based on persons whose primary residence was in Indiana at the time of diagnosis and 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. In numeric terms, the five counties with the most cases included Marion (n=38), Allen (n=15), Lake (n=7), Tippecanoe (n=<5), Hendricks (n=<5), St. Joseph (n=<5).

Figure 28 (page 26) shows the incidence rate per county for the past 10 years in map format. During this time period, ten counties did not have a reported case of TB: Newton, Benton, Warren, Pulaski, Jasper, Brown, Hancock, Jennings, Posey, and Ohio. In fact, only nine of the 92 counties experienced a sufficient number of cases to allow calculation of stable rates (>20 cases). These data clearly illustrate the challenge of ensuring a knowledgeable public health workforce when doctors and nurses in certain areas of the state may seldom see a TB case.

In order to reduce Indiana's U.S. born incidence rate to 0.5 per 100,000 by 2015, we must continue to include TB in diagnosis differentials, treat appropriately using directly observed therapy and improve our contact investigation strategies and activities.

Figure 27

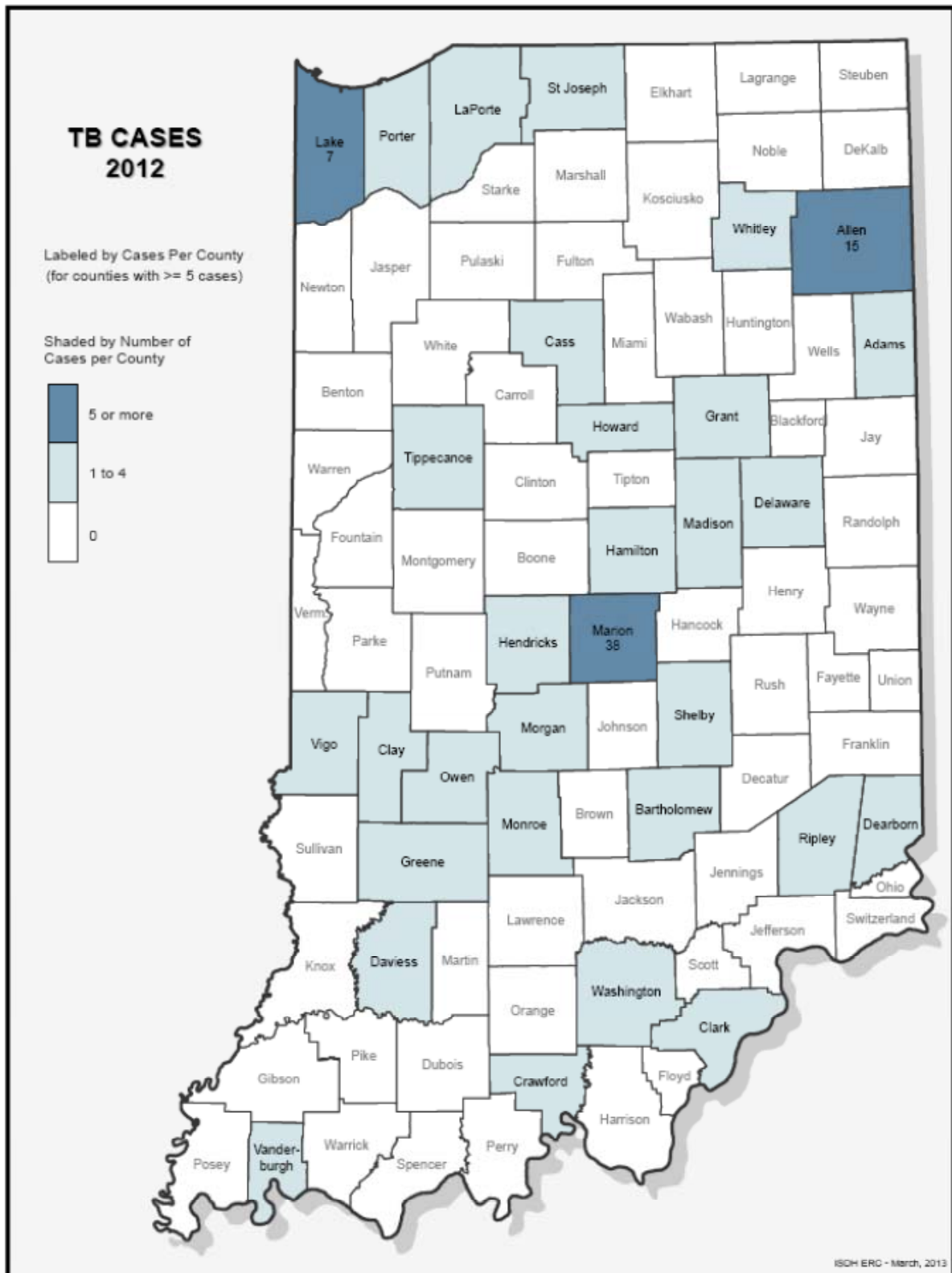
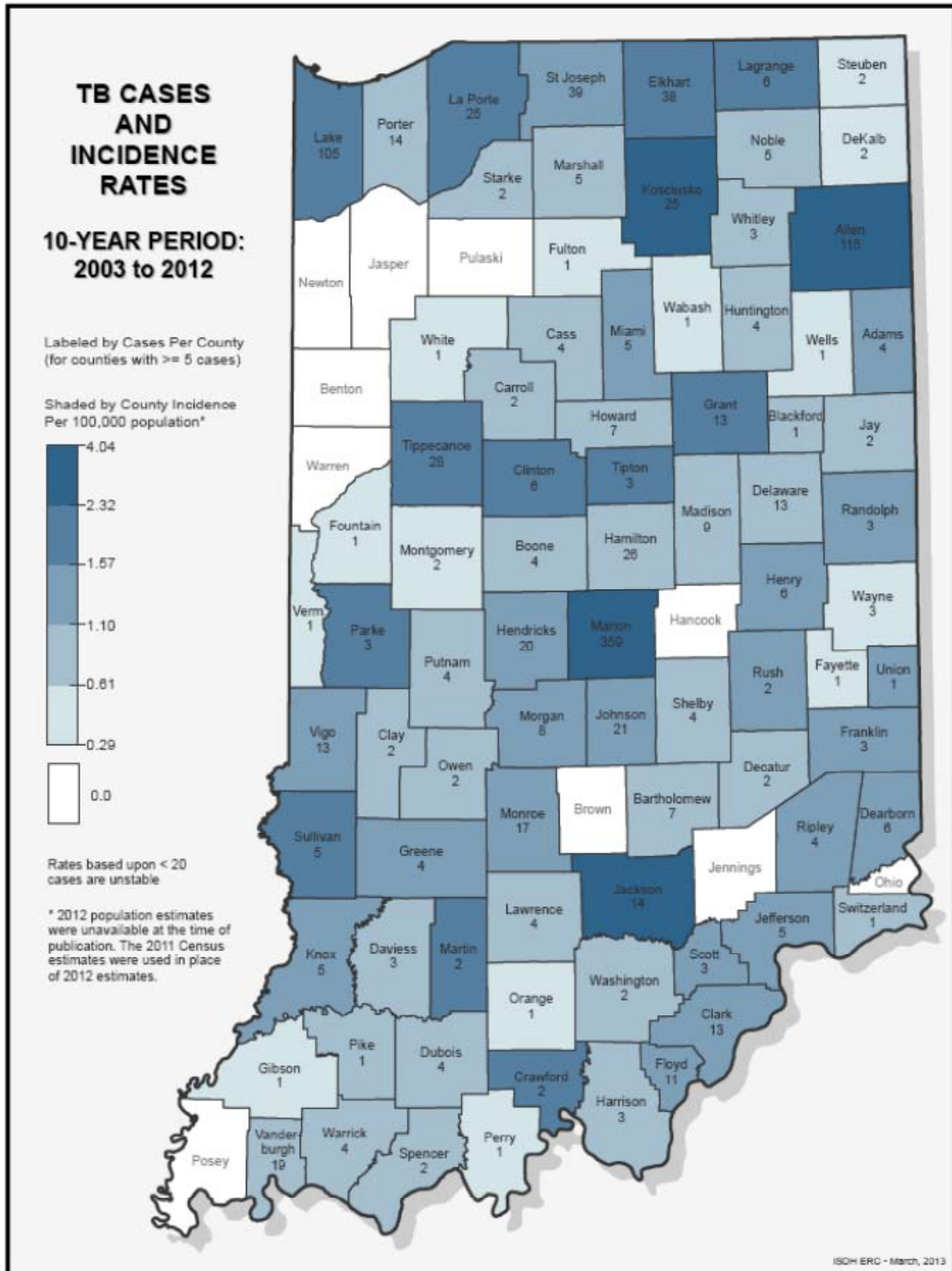


Figure 28



Notes

1 The Centers for Disease Control and Prevention, MMWR 46(RR10);1-55, May 02, 1997. Retrieved April 26, 2013 from <http://www.cdc.gov/mmwr/preview/mmwrhtml/00047449.htm>

2 The Centers for Disease Control and Prevention, Global Tuberculosis. Retrieved February 28, 2010 from <http://www.cdc.gov/tb/topic/globaltb/default.htm>

3 US Census Bureau, <http://www.census.gov/>

4 US Department of Health and Human Services. Centers for Disease Control and Prevention National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention Division of Tuberculosis Elimination. 2008. Self-study Modules on Tuberculosis: Epidemiology of Tuberculosis.

5 US Department of Health and Human Services. Centers for Disease Control and Prevention National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention Division of Tuberculosis Elimination. 2012. TB and HIV Coinfection. Retrieved February 29, 2012 from <http://www.cdc.gov/tb/topic/TBHIVcoinfection/default.htm>

6 CDC. Guidelines for the Investigation of Contacts of Persons with Infectious Tuberculosis. MMWR 2005;54(No. RR-15):11

Sources:

<http://www.medterms.com/script/main/art.asp?articlekey=11992>

<http://medical-dictionary.thefreedictionary.com/case+fatality+rate>

<http://www.medterms.com/script/main/art.asp?articlekey=3234>