

Tuberculosis Surveillance Report

Arizona, 2009

Arizona Department of Health Services

Bureau of Epidemiology and Disease Control

Office of Infectious Disease Services

December, 2010

## Executive Summary

This Tuberculosis (TB) Annual Surveillance Report provides data regarding TB in Arizona for 2009. The Arizona Department of Health Services (ADHS) TB Control Program provides surveillance, data analysis, health education, dissemination of guidelines, and consultation for the local health departments. Local health departments provide the direct patient care for TB cases. The following are the highlights of the 2009 report:

1. The 2009 Arizona rate was 3.5 TB cases per 100,000 in population, which was less than the U.S. rate of 3.8 TB cases per 100,000.
  - There were 232 reported cases of TB in Arizona in 2009, representing a 2% increase in the number of cases from 2008. Arizona ranked 13<sup>th</sup> among all states for TB morbidity.
  - Maricopa, Pima, Pinal, and Yuma counties accounted for 91% (210/232) of the cases.
2. Risk factors for Arizona TB cases:
  - Foreign-born status accounted for 66% (154/232) of the reported TB cases. Mexico was the country of origin for 45% (69/154) of the foreign-born cases.
  - TB cases diagnosed in correctional facilities accounted for 17% (37/216) of the reported cases.
  - Substance abuse (including excessive alcohol use, non-injecting and injecting drug use) was reported in 14% (28/203) of the TB cases.
  - HIV co-infection was identified in 6.9% (16/232) of the TB cases and occurred solely in those 25 – 44 years of age.
3. Drug susceptibility testing was completed for 98% (178/181) of culture positive TB cases.
  - Isoniazid (INH) resistance occurred among 7.3% (13/178) of the TB cases with reported drug susceptibilities.
  - There were no multidrug resistant TB (MDR-TB) or extensively drug resistant TB cases reported.
4. The ADHS TB Control Program strives to achieve the national goal of completion of treatment with 12 months for 90% of the active cases. The latest year for which completion of treatment data is available is 2007.
  - Completion of treatment within twelve months was documented for 69% (168/245) of the 2007 TB cases. Overall completion of treatment for non-correctional cases was 87% (178/205).
  - Completion of treatment within twelve months for correctional facility inmates in 2007 was 20% (9/45). Overall completion of treatment for the correctional facility cases was 24% (11/45). The majority of correctional facility cases returned to their home country and were lost to follow-up.
  - Completion of treatment within twelve months for homeless cases was 58% (7/12) and overall completion was 85% (11/13).
  - The use of directly observed therapy promotes completion of treatment. In 2007, 88% (240/274) of cases received directly observed therapy or a combination of directly observed therapy and self-administered therapy.
5. The ADHS TB Control Program continues to encourage continuity of care for individuals being treated for TB who return to Mexico. Meet and Greets are coordinated with outside agencies and organizations and occur through the Port of Nogales. There were five successful Meet and Greets in 2009.
6. The ADHS TB Control Program continues to refer TB cases to both Cure TB and TB Net for repatriated individuals and individuals who leave the country. In 2009, fifty referrals were made to CureTB and 35 referrals were made to TBNNet.

## **I. Purpose of the Report**

This Tuberculosis (TB) Annual Surveillance Report is designed to be a source of TB data in Arizona for purposes of prevention and control of the disease through interventions, new or changes in policies, rules and statutes, allocation of funds and planning services. The target audience includes government agencies, health care organizations, healthcare providers and other interested parties.

## **II. TB Surveillance, Prevention, and Control in Arizona**

The Arizona Department of Health Services (ADHS) TB Control Program is assigned the responsibility of monitoring, controlling and preventing infection, disease, and death associated with TB statewide through surveillance, data analyses, health education, and dissemination of guidelines, consultation, and rule making. The ADHS TB Control Program assesses the burden of active disease and latent TB infection (LTBI), including the demographics, distribution and the risk factors associated with disease.

The local health departments (LHDs) in Arizona provide the direct patient care, including medical evaluation, treatment, and contact investigations. They also coordinate with private and other public providers (e.g. correctional health) who provide these services to patients with active TB disease or LTBI.

The Arizona State Public Health Laboratory provides testing services including acid-fast bacillus smear, culture, identification, and drug susceptibility testing for clinical mycobacterial samples statewide. The laboratory serves as a reference laboratory for all isolates suspected to be positive for TB and performs drug susceptibility testing on all first- time positive isolates.

Key statewide TB control activities include conducting surveillance using state and national databases; conducting case management and providing directly observed therapy to ensure completion of therapy; monitoring drug resistance patterns; and conducting contact investigations and follow-up of persons exposed to active TB cases through medical evaluation and completion of preventative therapy for contacts with LTBI.

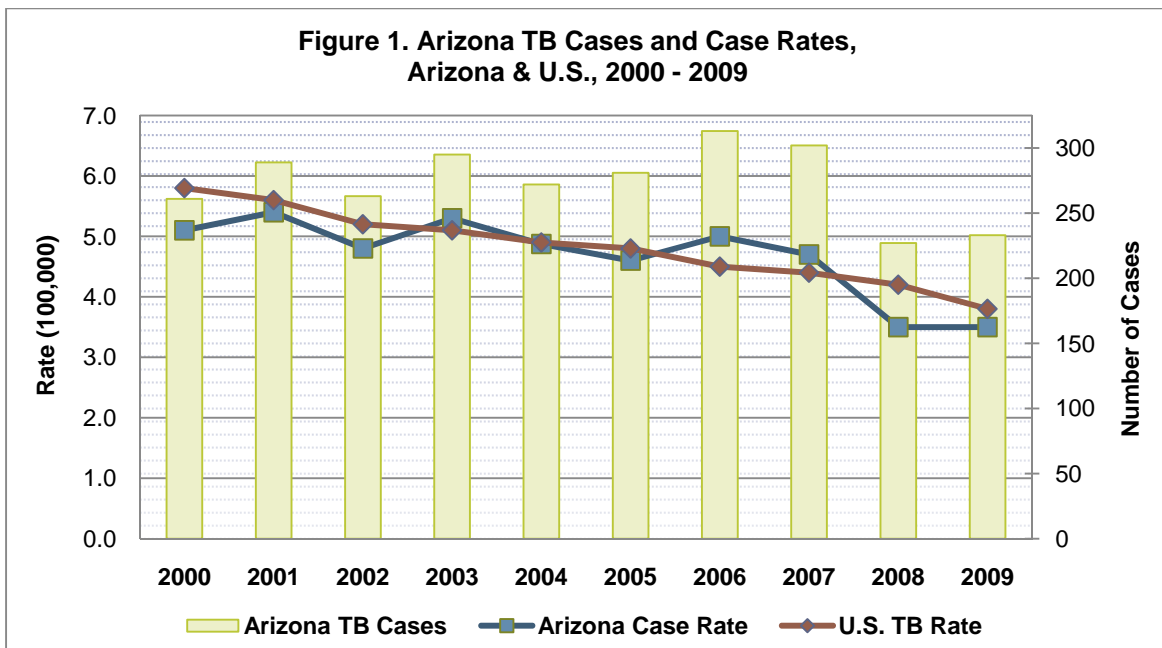
### III. Demographics

#### A. Incidence of TB

The ADHS TB Control Program received reports of 232 active TB cases in 2009. This reflects a 2% increase in the number of cases in comparison to 227 reported active TB cases in 2008. Arizona was ranked 13<sup>th</sup> among all states for TB morbidity in 2009. In the past ten years, Arizona active TB case trends were relatively stable until 2008. In 2008, an unexplained 25% decrease in the number of reported TB cases occurred. A mean of 273 active TB cases were reported over the past 10 years, with a range of 227 to 314 active TB cases. (Table 1 and Figure 1).

The 2009 case rate in Arizona was 3.5 per 100,000 population, which was less than the U.S. case rate of 3.8 per 100,000 and level with the 2008 Arizona case rate. The Arizona case rate has fluctuated for the past ten years between 3.5 and 5.4 cases per 100,000 population.

Nationally, there was a decrease of 11.4% from the rate of 4.2 per 100,000 reported for 2008 to the 3.8 reported for 2009. The 2009 rate showed the greatest single-year decrease ever recorded and was the lowest recorded rate since national TB surveillance began in 1953.

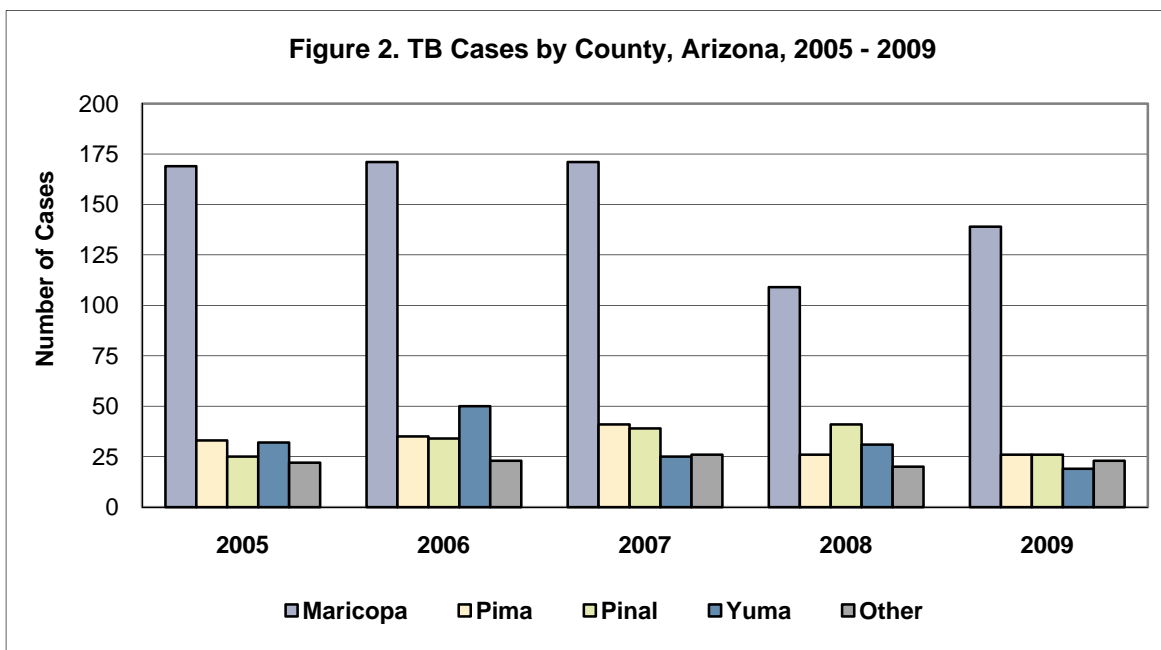


**Table 1. Tuberculosis Cases and Case Rates per 100,000 Population, Arizona and United States, 1995 - 2008**

Year	Arizona		United States	
	Cases	Rate	Cases	Rate
2000	261	5.1	16,377	5.8
2001	289	5.4	15,989	5.6
2002	263	4.8	15,078	5.2
2003	295	5.3	14,871	5.1
2004	272	4.9	14,511	4.9
2005	281	4.6	14,093	4.8
2006	313	5.0	13,767	4.6
2007	302	4.7	13,293	4.4
2008	227	3.5	12,898	4.2
2009	232	3.5	11,540	3.8

### County of Residence and County Case Rates

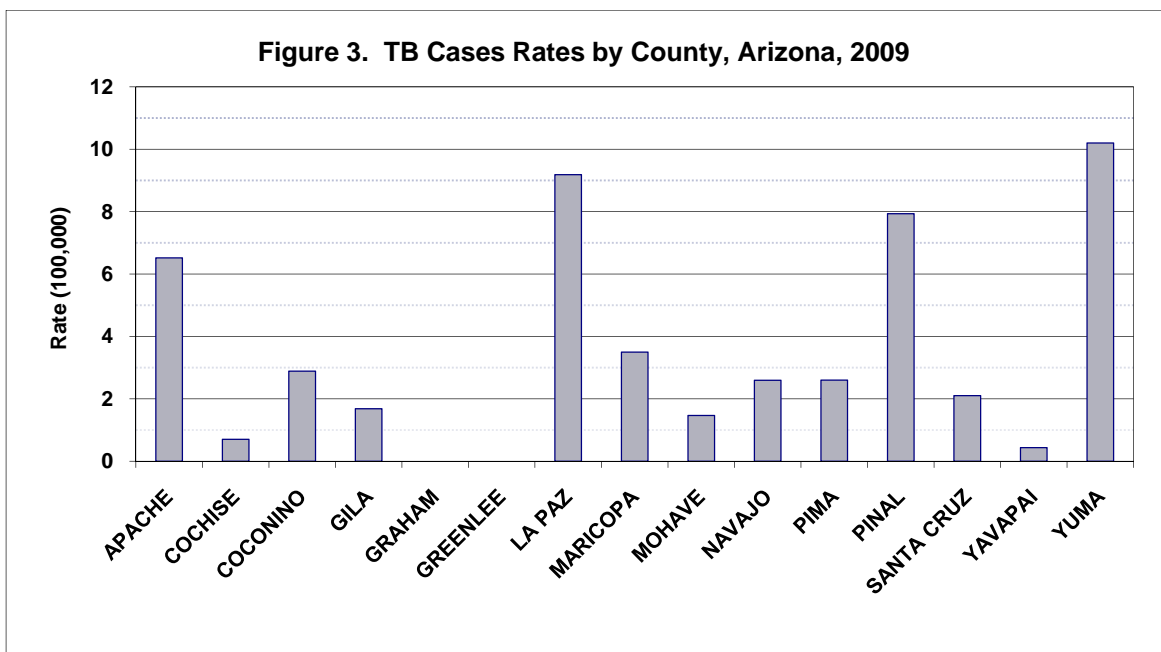
Four of Arizona's fifteen counties accounted for 91% (210/232) of the state's active TB cases. Maricopa County, representing 60% of the state population, reported 59% (138/232) of cases statewide. Pima County, the state's second largest populated county with 16% of the state's population, reported 11% of the cases (26/232). Pinal County also reported 11% of the cases (26/232) and Yuma County reported 9.1% (21/232). Nine counties plus the Navajo Nation accounted for the remaining 9.1% (21/232) of the cases. Greenlee and Graham counties did not have any reported cases in 2009. Figure 2 presents the number of cases by county.



Apache, La Paz, Pinal, and Yuma counties exceeded the statewide case rate of 3.5 per 100,000. These counties have relatively small populations and have very few cases. The small populations and low number of cases may artificially inflate the incidence rates. Figure 3 presents the case rates by county.

The case rate for Maricopa County equals the statewide rate of 3.5 per 100,000 and represents an increase of 26% from 2008 when the rate was 2.8 cases per 100,000. Pima County remained level with the 2008 rate of 2.6 per 100,000. The rate for Yuma County decreased 32% from 15.2 per 100,000 in 2008 to 10.3 per 100,000 in 2009.

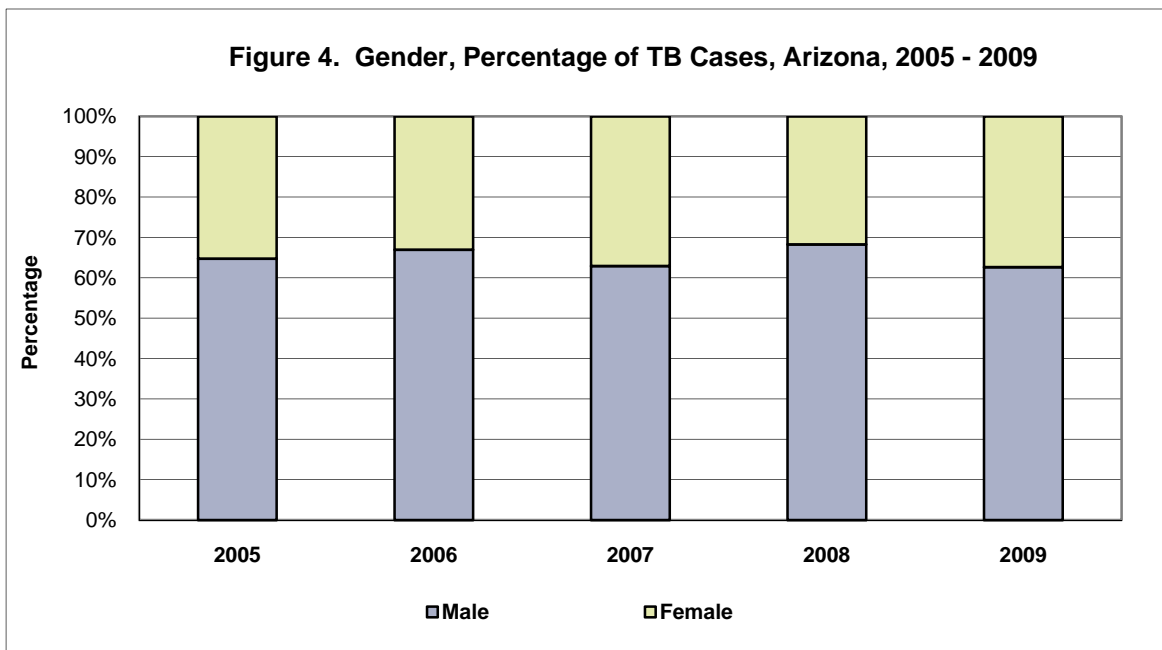
In Pinal County, 81% (21/26) of the cases were diagnosed in a correctional facility. Twenty-one correctional facilities are located in Pinal County including two of the largest state correctional facilities, private prisons, two U.S. Immigrations and Customs Enforcement Service Processing Center (ICE-SPC), and county jails.



## B. Gender/Age/Race/Ethnicity

Males accounted for 63% (146/232) of the cases and females accounted for 37% (86/232). This trend is consistent with national data. Statewide, the ratio of male to female active TB cases was 1.7 male active TB cases to one female active TB case. The rate for males was 4.4

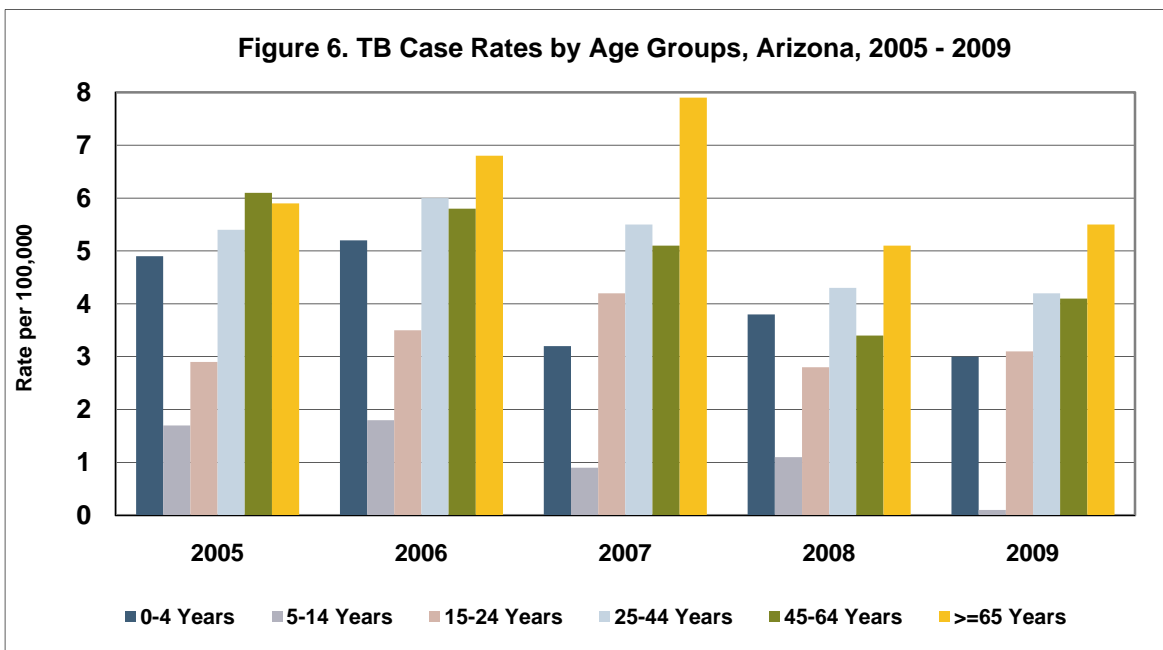
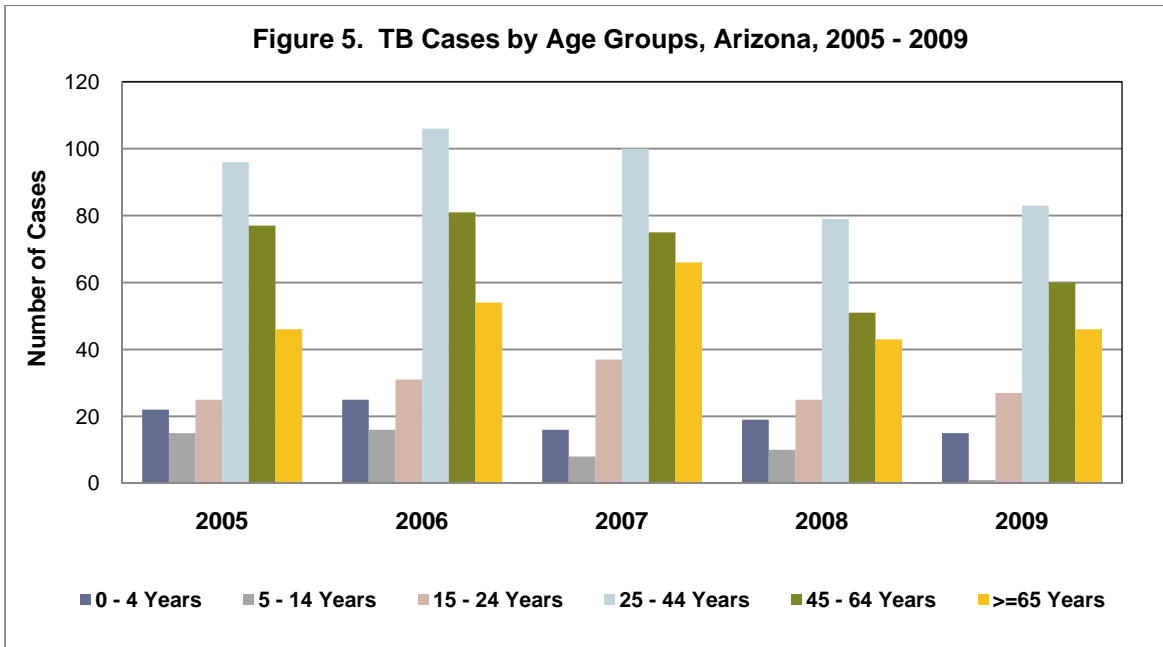
per 100,000 and the rate for females was 2.6 per 100,000. Figure 4 presents the TB cases by gender from 2005 through 2009.



## Age

The mean age for all active TB cases was 43 years of age and the median age was 42 years. For males, the mean age was 44 years and the median age was 43 years. For females, the mean age was 42 years and the median age was 40 years.

The number of cases by age group is presented in Figure 5 and the case rate by age groups is presented in Figure 6. The highest case rate (5.5 per 100,000 population) occurred among those over 65 years of age (47/232), followed by the 25-44 year old age group (83/232) at 4.4 per 100,000 population. The 25-44 year old age group accounted for 36% (83/232) of the total cases.



### TB in Children Less than Six Years of Age

Disease found in children less than six years of age indicates ongoing transmission in the community and represents missed opportunities for TB prevention.

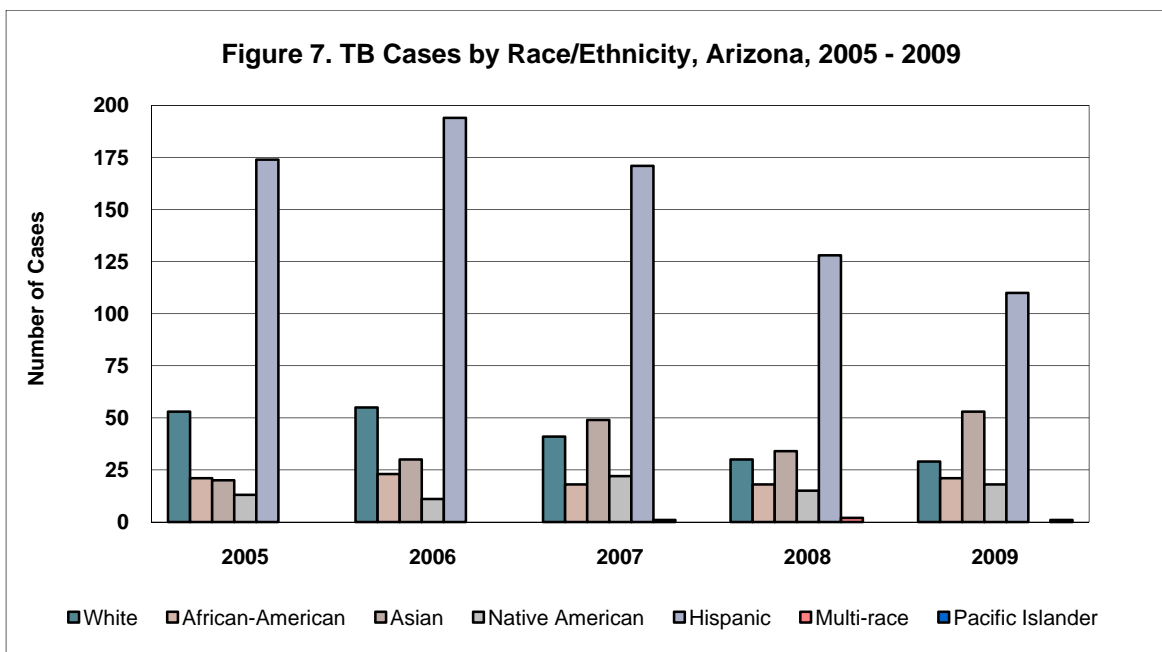
Children in this age group accounted for 6.5% (15/232) of the total cases. The rate for children less than six years of age was 3.0 per 100,000 population. In 2008, the rate for this age group was 3.8 per 100,000 population. Hispanic children accounted for 60% (9/15) of cases in this

age group, which suggests active pulmonary TB continues to occur among adults in the state. The ADHS TB Control Program's current efforts to improve TB control in adults are an important way to control TB in pediatrics.

In 2009, Maricopa County reported 73% (11/15) of the total cases found in children under six years of age. To address this issue, the ADHS TB Control Program conducts pediatric case reviews with Maricopa County Department of Public Health TB Control staff.

### Race/Ethnicity

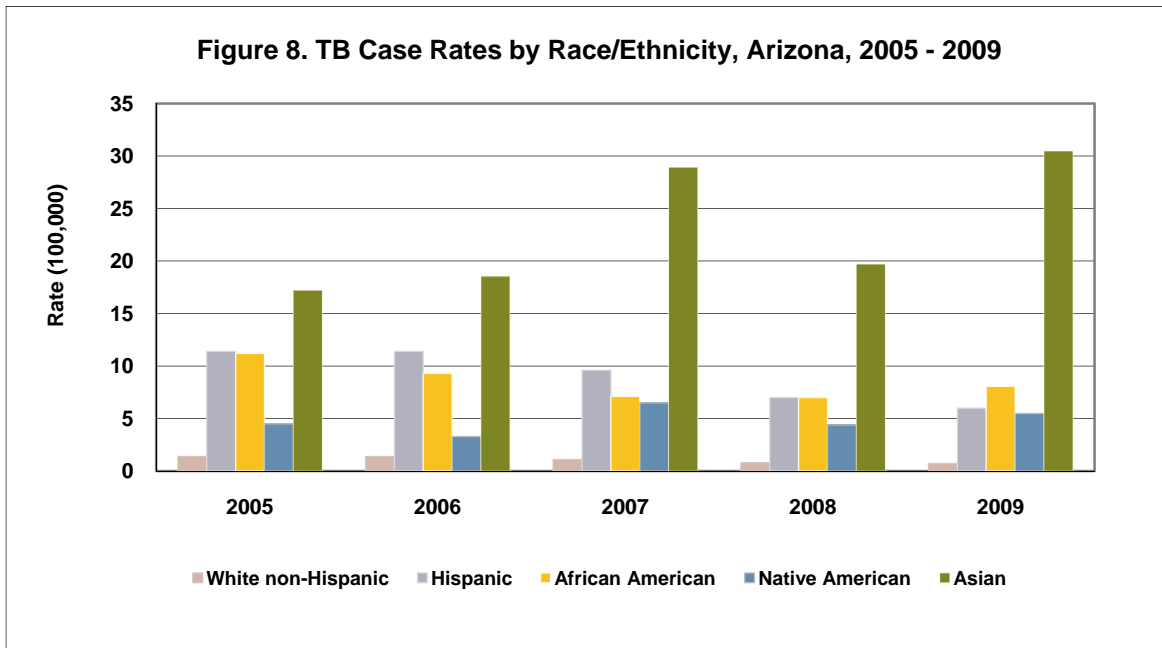
In Arizona, Hispanic ethnicity of any race accounted for 47% (109/232) of the reported cases. Asian was reported in 23% (53/232) of the cases, followed by non-Hispanic white in 13% (29/232), Native American 8.2% (19/232), African-American 9.1% (21/232), and one case was reported as Pacific Islander. There were no cases reported as multiple-race (Figure 7).



The highest case rate is 30.5 per 100,000 population for those reporting Asian race. The case rate among Asians increased by 55% from 19.7 per 100,000 population reported in 2008. The TB case rate among Hispanics decreased 14% in 2009 to 5.9 per 100,000 population from 7.0 per 100,000 population in 2008. The case rate among Hispanics had been as high as 11.4 per 100,000 population in previous years. The TB case rate among White non-Hispanics was 0.7

per 100,000 population in 2009, a slight decrease from 0.8 per 100,000 population in 2008. The TB case rates by race and ethnicity for Arizona are presented in Figure 8.

Nationally, Asians had the highest TB case rate among all racial/ethnic groups. From 2008 to 2009, TB rates decreased for all racial/ethnic minorities. The greatest annual decrease in TB rates was among Whites (15.2%), followed by African-Americans (14%) and Hispanics (13.6%). The smallest decrease in 2009 was among Asians (9.0%).



## B. Site of Infection and Vital Status at Diagnosis

Pulmonary TB with no additional site of disease accounted for 81% (189/232) of all cases in 2009. Extrapulmonary disease accounted for 12% (28/232) of the cases. Patients with both pulmonary and extrapulmonary disease accounted for 6.5% (15/232) of cases. Cases diagnosed after death accounted for 2.2% (5/232) of the 2009 cases.

### III. Risk Factors

Table 2 presents the risk factors associated with the 2009 Arizona cases.

	2005		2006		2007		2008		2009	
	Cases	%	Cases	%	Cases	%	Cases	%	Cases	%
<b>Occupation</b>										
Health Care Worker (>14 years)	1	0.4	9	2.9	10	3.3	4	3.3	3	1.4
Migrant Farm Worker (>14 years)	5	1.8	11	3.5	10	3.3	8	3.3	4	1.9
<b>Reported Behaviors</b>										
Injecting Drug Use <sup>a</sup>	11	3.9	7	2.2	10	3.3	6	3.6	3	1.5
Non-injecting Drug Use <sup>a</sup>	20	7.1	17	5.4	22	7.3	12	7.3	17	8.4
Excess Alcohol Use <sup>a</sup>	29	10.3	39	12.5	35	11.6	28	11.9	16	7.9
<b>Type of Residence</b>										
Long Term Care Facility <sup>b</sup>	7	2.5	11	3.5	9	3.0	6	3	2	0.8
Correctional Facility $\geq$ 15 years <sup>c</sup>	40	16.4	38	14.0	54	19.4	50	17.9	37	17
Homeless <sup>a</sup>	23	8.2	29	9.3	26	8.6	14	8.6	8	3.4
<b>Country of Birth</b>										
Foreign Born <sup>d</sup>	170	60.5	181	57.8	185	61.3	148	61.3	154	66
<b>Underlying Disease</b>										
HIV infection, All Ages	20	7.1	15	4.8	17	5.6	6	5.6	16	6.9
HIV infection, 25-44 Years Old	12	4.3	9	8.5	11	11.0	5	11	16	11
<b>Total Cases</b>	<b>281</b>		<b>313</b>		<b>302</b>		<b>227</b>		<b>232</b>	

<sup>a</sup>Within one year prior to diagnosis of tuberculosis.  
<sup>b</sup>Residence at time of diagnosis.  
<sup>c</sup>After 2005, the percentage of cases diagnosed in correctional facilities is based on the TB cases >15 years of age.  
<sup>d</sup>Includes persons born outside the United States and its territories.

#### A. Occupation

High-risk occupations for TB transmission include health care workers and migrant farm workers. Migrant farm workers comprised 1.9% (4/232) of the total cases in 2009. The occupation of health care worker was reported in 1.4% (3/232) of the cases. Patients reporting being retired, unemployed, or not seeking employment accounted for 58% (134/232) of the cases.

#### B. Reported Behaviors

Substance abuse (including alcohol abuse and/or illicit drug use) is defined as having a history of substance abuse during the 12 months prior to diagnosis. Substance abuse was reported in 14% (28/203) of 2009 cases.

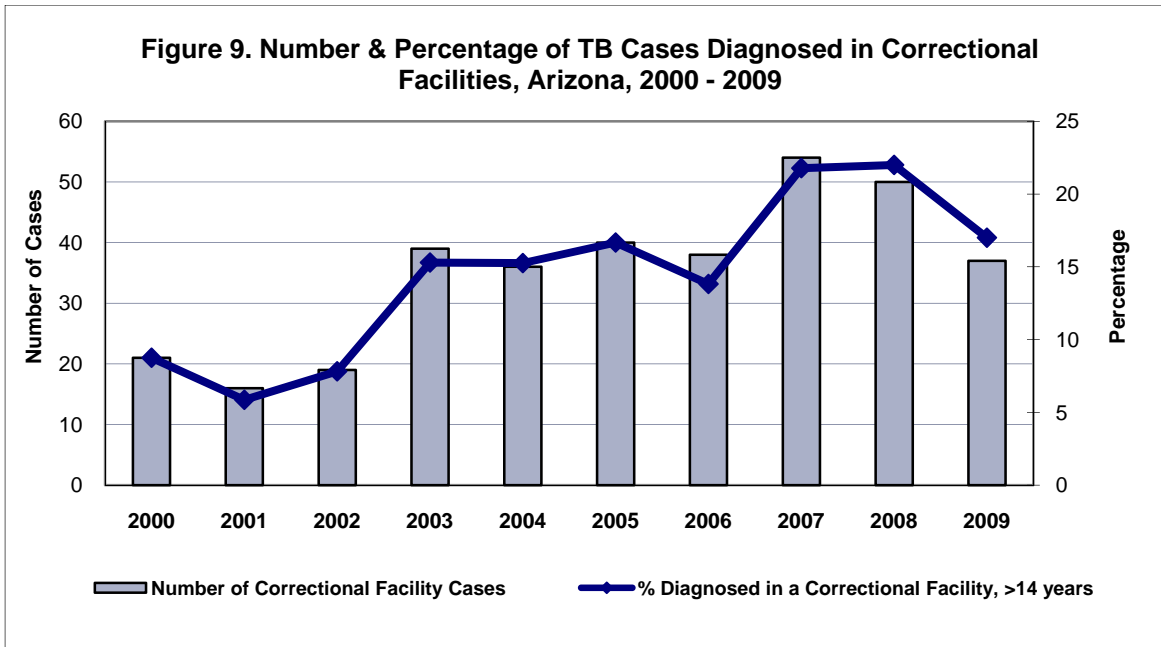
In 2009, 7.9% (16/201) reported excess alcohol use, 8.4% reported (17/203) non-injecting drug use, and 1.5% (3/203) reported injection drug use. The variables for substance abuse are underreported in Arizona as data is unknown in 12% of the cases (28/232).

### **C. Correctional Facilities**

Preventing TB transmission in congregate settings, such as correctional and detention facilities, is a significant challenge. Individuals from diverse backgrounds and communities are housed in close proximity for varying lengths of time. Routine evaluation of all inmates for TB during the intake process allows for diagnosis of both latent and active TB in this population.

Arizona has consistently ranked first in the nation for the percentage of cases greater than fifteen years of age diagnosed in correctional facilities. In 2009, correctional facilities accounted for 17% (37/216) of the state's reported cases over the age of fourteen (Figure 9). The ADHS TB Program has been working closely with correctional health staff to provide TB training and education and ensure the facilities comply with the inmate screening requirements.

The 2009 correctional cases were diagnosed in federal facilities (15/37), local jails (8/37), state correctional facilities (2/37), and private facilities (12/37). Twenty-five of the 37 correctional TB cases were diagnosed while in the custody of the U.S. Immigration and Customs Service (ICE). Of the 32 male inmates reported, the mean age was 36 years. The five reported females had a mean age of 26 years. Hispanic race was reported for 76% (28/37) of the TB cases. Mexico was reported as the country of origin in 54% (20/37) of the foreign-born correctional TB cases. Other countries reported were China, Guatemala, Ecuador, Honduras, El Salvador, and Burundi.



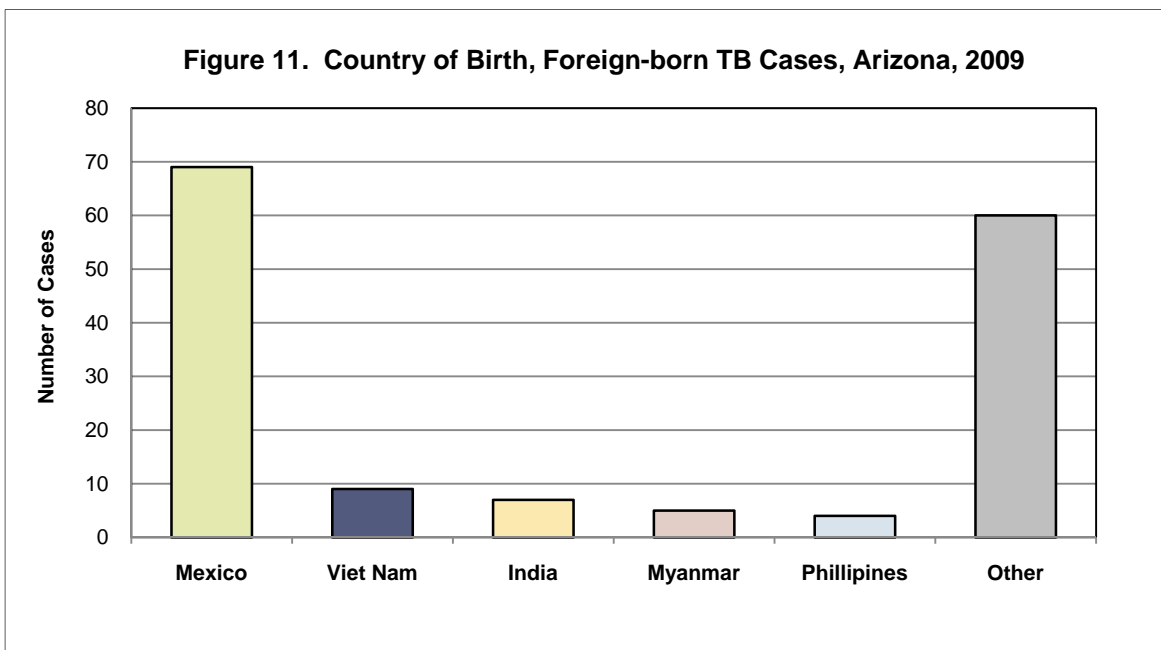
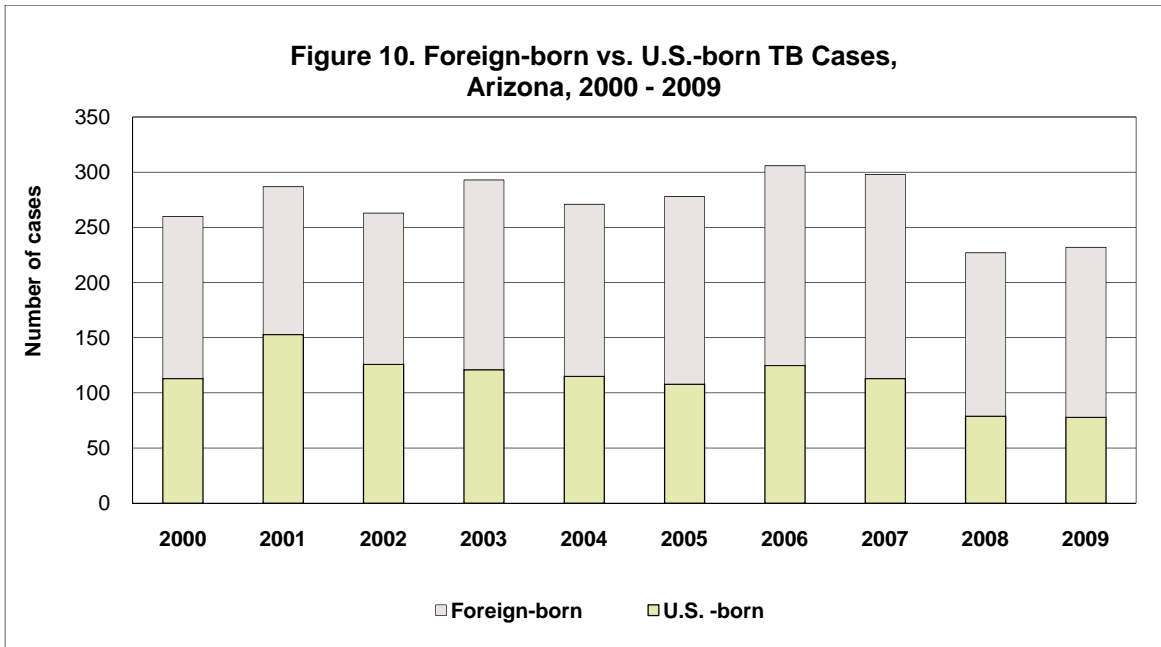
#### D. Homelessness

Homelessness is another important risk factor with 3.4% (8/232) of the 2009 cases reported as being homeless within 12 months prior to diagnosis. Maricopa County reported 63% (5/8) of the homeless cases. Coconino, Mohave, and Pima counties reported the remaining three active cases.

#### E. County of Birth

Arizona has observed an increasing proportion of cases among foreign-born individuals (Figures 10 and 11). In 2009, 66% (154/232) of Arizona cases were born outside the U.S. and its territories.

Mexico accounted for 45% (69/154) of the country of origin for foreign-born cases in 2009. Only 17% (12/69) of the foreign-born cases from Mexico reported being in the U.S. less than one year and 22% (15/69) reported U.S. residence for more than twenty years.



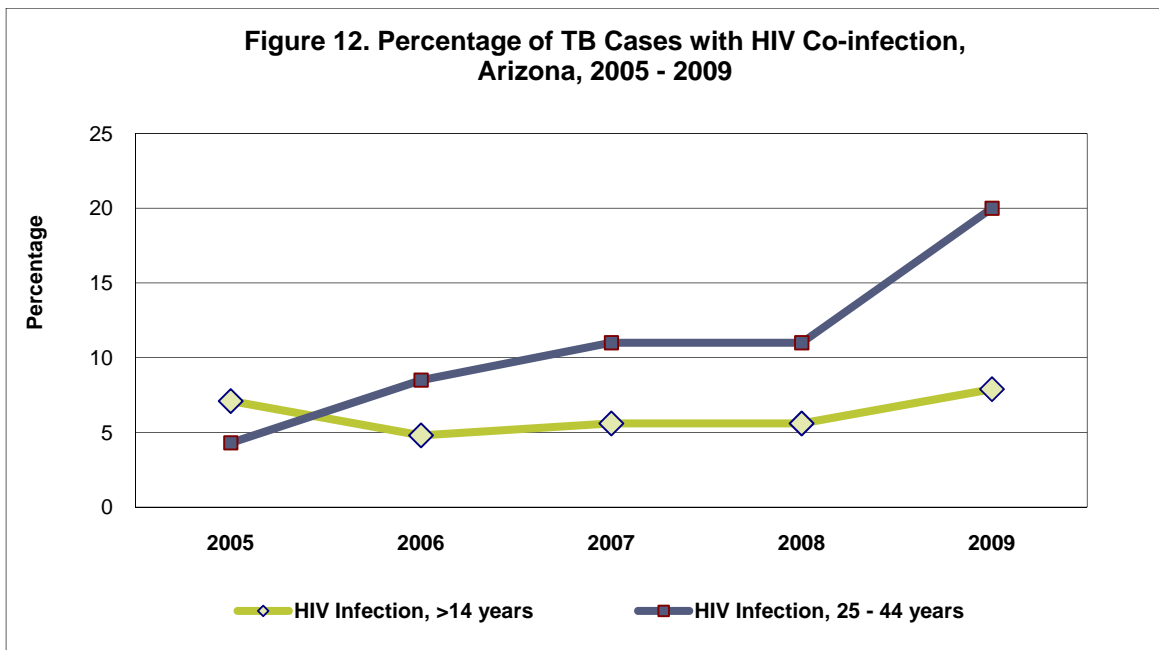
**F. TB-HIV Co-Infection**

Co-infection with HIV in individuals with TB is a major concern because immunosuppression by HIV can impact the body's ability to fight TB. Individuals with co-infection have higher mortality and are susceptible to increased drug resistance, leading to longer and more complex treatment regimens. The Department emphasizes to healthcare providers the importance of all newly diagnosed TB cases of all ages to receive HIV screening. The CDC estimates approximately

10 – 15% of the TB cases in the United States also have HIV infection. For those TB cases 25 – 44 years of age, the estimated co-infection increases to 30%. Worldwide, the 25 – 44 year old age group is the most impacted by HIV infection.

HIV testing results were reported for 76% (164/216) of the TB cases fourteen years of age and older. HIV co-infection was identified in 6.9% (16/232) of the TB cases compared to 3.0% (6/198) in 2008. (Figure 12).

HIV testing results were reported in 82% (68/83) of TB cases ages 25-44 years of age. All sixteen TB/HIV co-infected cases in 2009 occurred among this age group resulting in 19% (16/83) reported as TB/HIV co-infected.

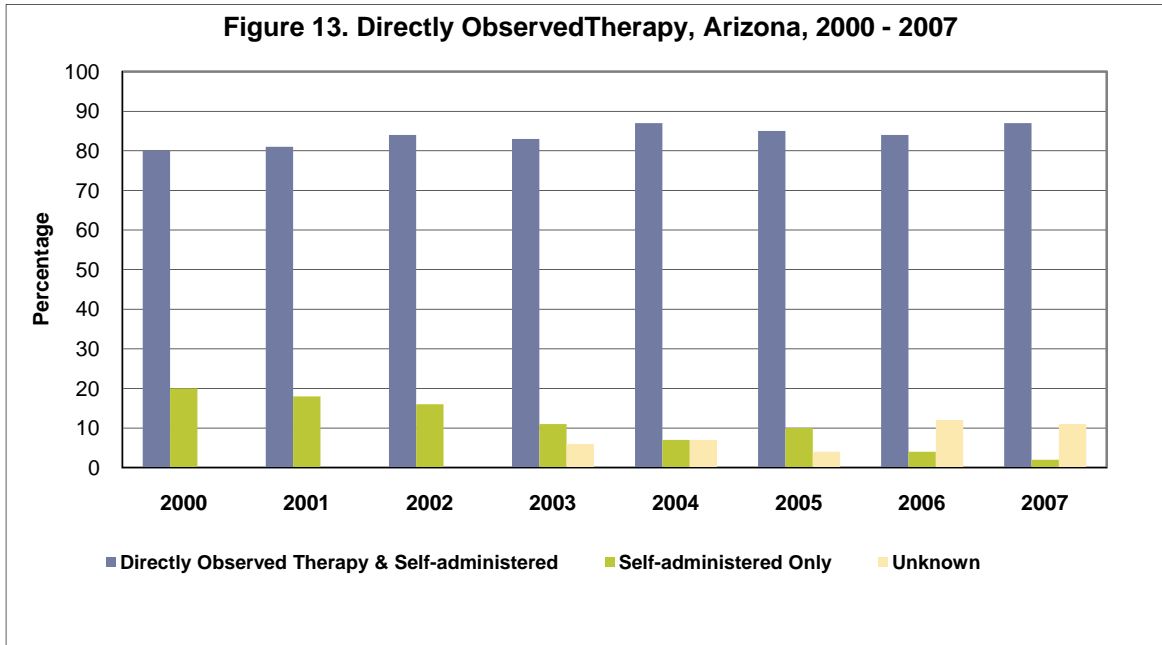


#### IV. Directly Observed Therapy

Directly observed therapy (DOT) is the standard of care for administering TB medications. In DOT, health care workers observe the patient take his/her medications to ensure compliance with the treatment regimen.

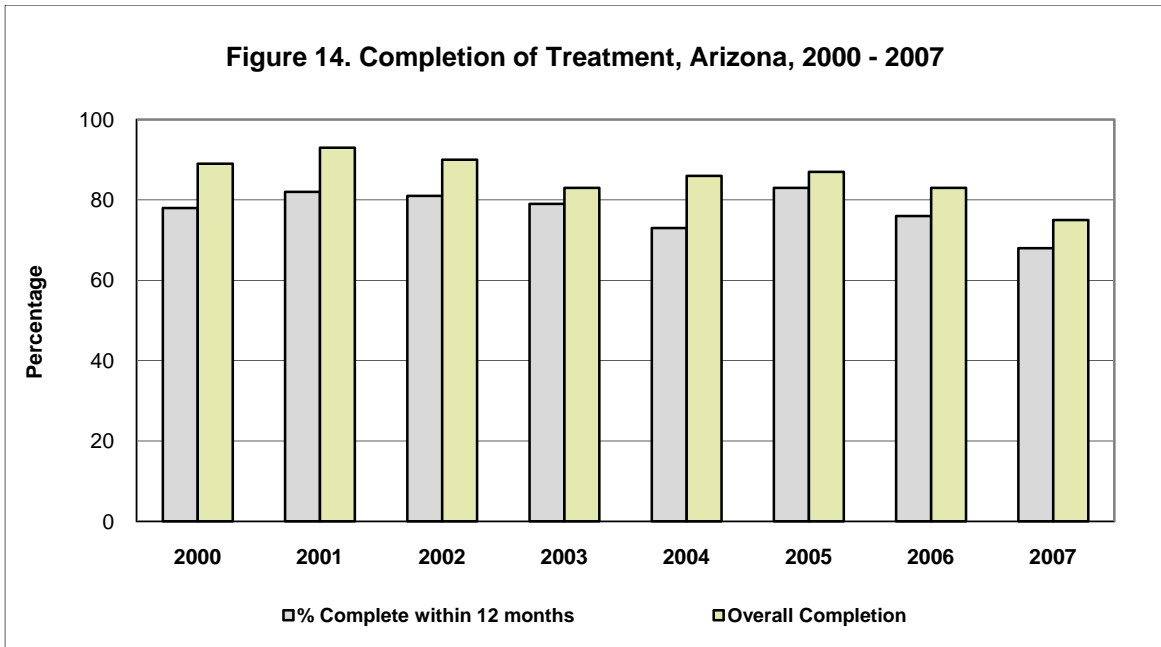
Figure 13 presents the number and percentage of cases receiving DOT. Due to the length of time to complete treatment for TB, 2007 data were the most recently finalized data available. In

2007, 88% (240/274) of TB cases who started treatment received DOT or a combination of DOT and self-administered treatment. Self-administered treatment only was reported in only 1.8% (5/274) of the cases.

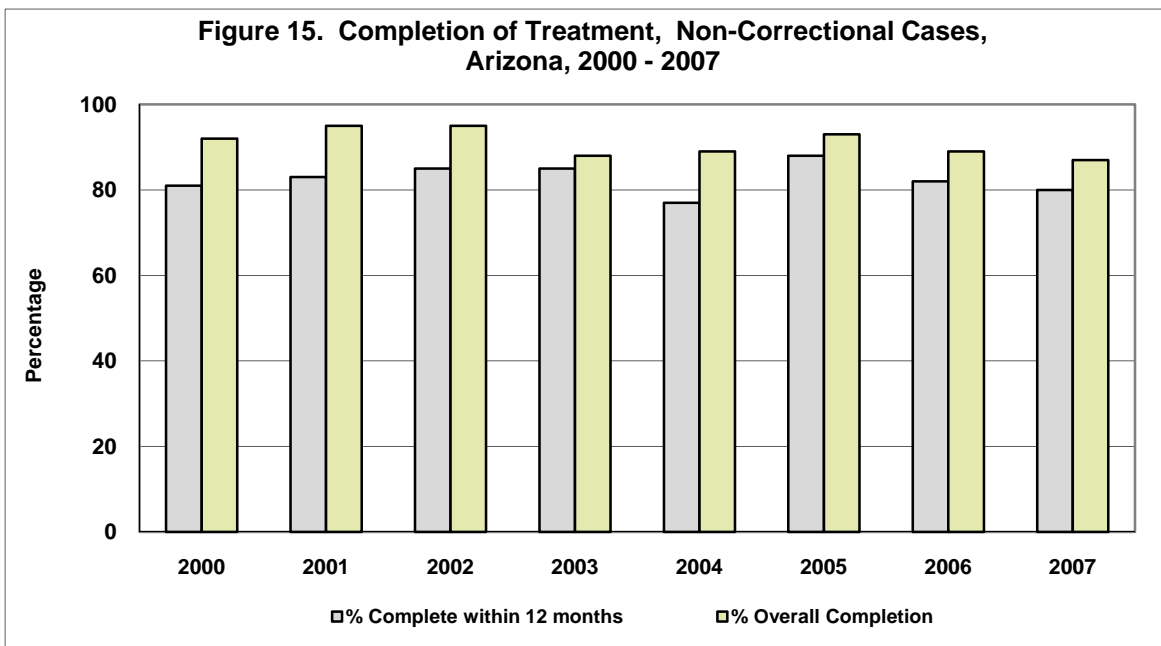


## V. Completion of Treatment

The ADHS TB Control Program strives to achieve the national goal of completion of therapy within twelve months for 90% of the active cases. In 2007, 69% (168/245) of all cases completed treatment within twelve months. Overall, 76% (189/250) of the cases completed therapy in 2007, regardless of the time frame. The low completion of treatment rates are impacted by the number of TB cases diagnosed in a correctional facility. (Figure 14)

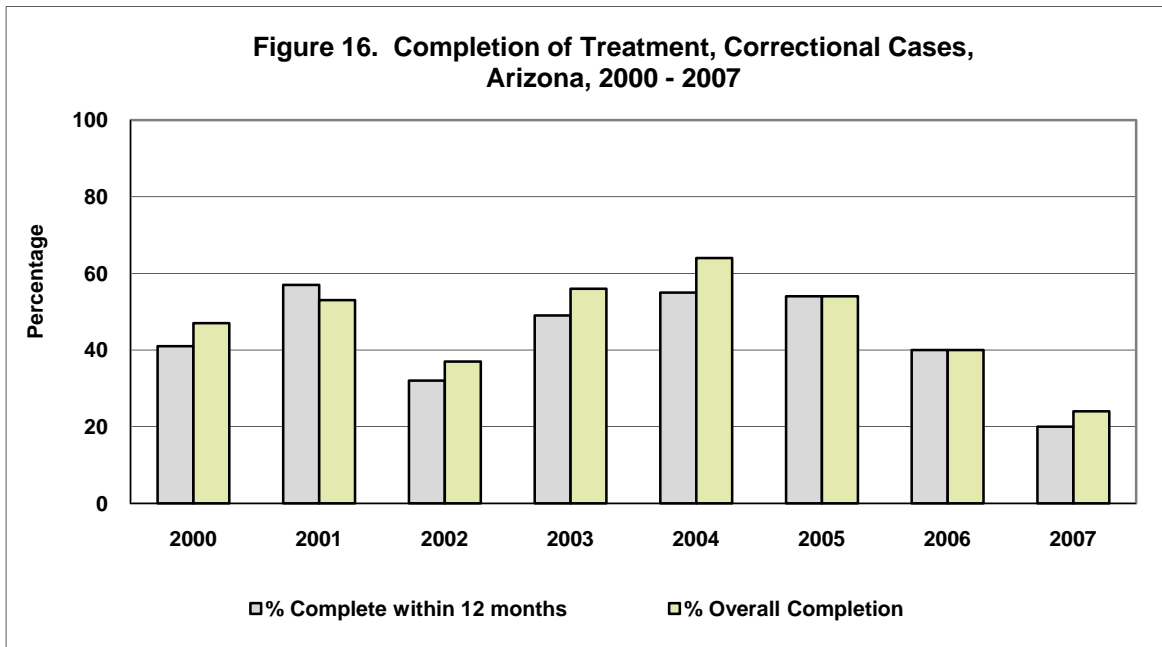


The percentage of completion of treatment within twelve months for non-correctional facility cases was 80% (159/200). The overall completion of treatment for non-correctional facility cases was 87% (178/205) (Figure 15).

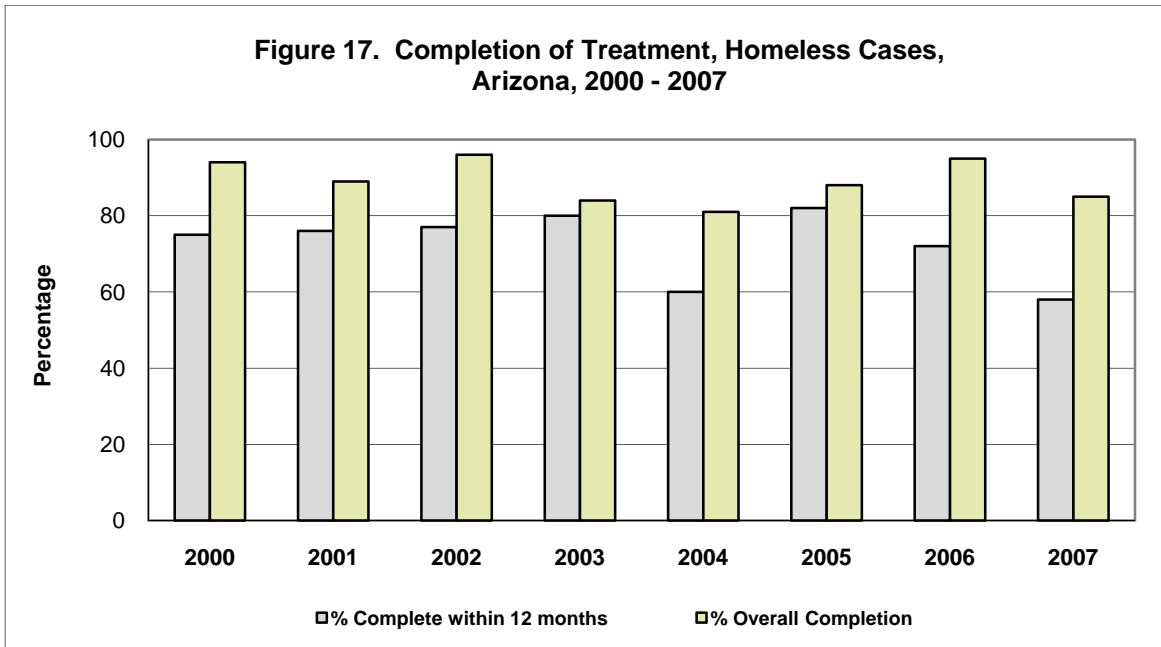


Only 20% (9/45) of correctional facility cases completed treatment within twelve months and 24% (11/45) completed treatment overall (Figure 16). Many of the correctional facility cases

were lost to follow-up after being released to the community or repatriated. Treatment outcomes are unknown for 76% (34/45) of the correctional facility cases. The percentage of TB cases diagnosed in correctional facilities increased to 22% in 2007 from 14% in 2006 and the majority of these cases were subject to repatriation. This contributed to a high percentage of unknown treatment outcomes.



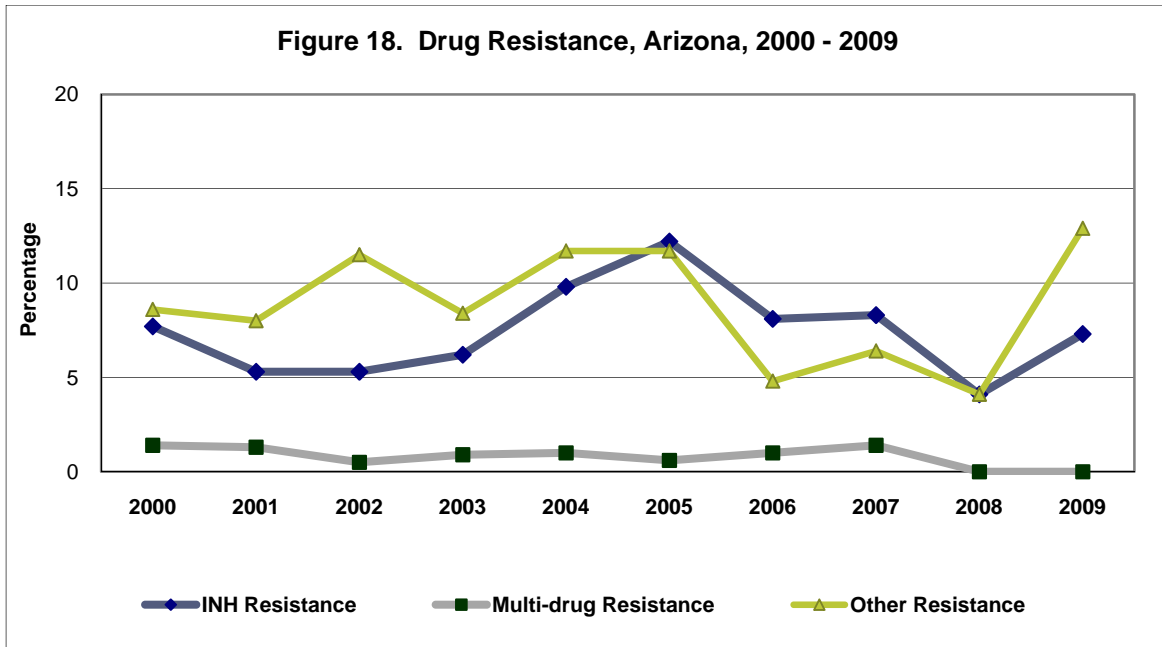
The completion of treatment within twelve months among homeless cases (Figure 17) was 58% (7/12) and overall completion was 85% (11/13). Two of the homeless cases completion of treatment information is unknown.



## VI. Drug Susceptibility

Initial drug susceptibility testing was completed on 98% (178/181) of culture positive TB cases in 2009. Isoniazid (INH) resistance occurred among 7.3% (13/178) of the TB cases who received drug susceptibility testing (Figure 18).

Multidrug resistant TB (MDR-TB) is defined as resistance to INH and Rifampin. Extensively drug resistant TB (XDR-TB) is defined as resistance to INH and Rifampin, plus resistance to any fluoroquinolone and at least one of three injectable second-line anti-TB drugs such as Amikacin, Kanamycin, or Capreomycin. There were no multi-drug resistant or extensively drug resistant TB cases identified in Arizona in 2009.



## VII. Contact Investigations

Contact investigations identify, examine, and evaluate all persons who are at risk of infection with *Mycobacterium tuberculosis* due to recent exposure to a diagnosed infectious case. It is a method for new case finding which allows for early treatment of disease and early detection and treatment of new infection. In some cases, it may prevent disease. It is an essential component of tuberculosis containment.

The local health departments are responsible for ensuring contact investigations are conducted at the local level. The local health departments either conduct the contact investigation or coordinate with responsible parties outside public health to ensure contact investigations are completed. Table 3 presents a summary of contact investigations for sputum smear positive TB cases.

In 2008, 74% (57/77) of sputum smear positive cases had contacts identified. It is often difficult to obtain contact investigation information for correctional cases, and for those who are repatriated. Given the high number of correctional cases in the state, an analysis of community contacts only and correctional contacts only was done. The percent of sputum smear positive TB cases with contacts is 83% (52/63) among community cases and 36% (5/14) among correctional cases.

Of the contacts to sputum smear positive TB cases, 66% (505/770) were evaluated. Among contacts to correctional cases, 25% (57/224) were evaluated compared to 82% (448/546) among community cases.

In 2008, 71% (62/87) of infected contacts who were started on LTBI treatment completed therapy. Among infected contacts to community cases, 75% (62/83) of those who were started on LTBI treatment completed treatment. LTBI treatment was completed by 0% (0/4) of contacts to correctional cases.

Among children less than six years of age, 93% (39/42) who began treatment for LTBI completed treatment. Six children less than six years of age were contacts to smear positive cases, of which 50% (6/8) were started on LTBI therapy. From these three contacts who began therapy, 100% (3/3) completed LTBI therapy.

**Table 3. Summary of Contact Investigations, Arizona 2005-2008**

	2005		2006		2007		2008	
	No.	%	No.	%	No.	%	No.	%
Total Sputum Smear Positive TB Cases	101		124		90		77	
Sputum Smear Positive Cases with Contacts	79	78	94	76	64	71	57	82
Infected Contacts Started on LTBI Therapy	80		152		98		87	
Infected Contacts Completing LTBI Therapy	54	68	111	73	66	67	62	71

## VIII. Activities

### A. International Referral and Case Management

The ADHS TB Control Program coordinates with international referral agencies to ensure continuity of care for individuals with TB or suspected of having TB who return to their home country. CureTB facilitates the referral process with public health officials in Mexico. TBNet facilitates the referral process for all countries including Mexico. In 2009, the ADHS TB Control Program referred 85 cases to CureTB and TB Net.

### B. Evaluation of Class B1/B2 Referrals

Immigrants and refugees traveling to the U.S. are evaluated for TB as part of the admission process, and assigned a classification according to the status of their disease. An individual found to have non-infectious active TB is classified as a Class B1. Those with a chest x-ray that suggests a history of TB disease that is not currently active are classified as Class B2. Individuals who are contacts and cleared for travel are designated as Class B3.

The Division of Global Migration and Quarantine notifies the ADHS TB Control Program of all Class B individuals entering the state. The ADHS TB Control Program forwards these referrals to the local health departments of the counties where the individual will reside. The local health departments provide medical evaluation and treatment.

In 2008, the ADHS TB Control Program received 423 notifications for immigrants and refugees designated as B1, B2, and B3, of which 84% (355/423) were evaluated. There were 223 immigrants/refugees designated as B1 and 200 designated as B2.

Four immigrants and refugees designated as B1 were evaluated as having active TB. All four patients were started on treatment with 75% (3/4) completing treatment and one patient lost to follow-up. Of the 200 B2 individuals, 58 started treatment for LTBI. Treatment completion data indicates 66% (38/58) completed treatment, 33% (19/58) were lost to follow-up, and 1.7% (1/58) discontinued treatment due to adverse affects.

### **C. Border Health Activities**

To ensure continuity of care for individuals being treated for TB who are repatriated to Mexico through Nogales, Arizona, the ADHS TB Control Program coordinates "Meet and Greets." The Meet and Greet involves transferring these individuals from Arizona and federal law enforcement authorities to Mexican law enforcement and public health authorities.

A "Meet and Greet" requires coordination between the ADHS TB Control Program, ADHS Office of Border Health, Sonora Health Department, ICE, local health departments, and the correctional facility or detention center housing the inmate. The ADHS Office of Border Health coordinates the Meet and Greet with physicians from the Hospital General of Nogales, representatives from the Mexican National Institute of Immigration, and the Mexican Consulate.

Final treatment outcome is difficult to obtain because many of these individuals are lost upon return to their home country, despite the efforts of the referral agencies.

## **IX. Conclusion**

The ADHS TB Control Program continues to partner with local health departments, federal agencies, correctional facilities, and the international community to prevent and control TB in Arizona. While the number of TB cases and case rates continue to decline from previous years, the number of TB cases reported among foreign-born, correctional facilities, and in children less than six years of age continue to be of concern. Emphasis on completion of treatment for community and correctional cases requires close collaboration with local health departments and outside partners to prevent further spread of the disease and the emergence of drug-resistant TB.