

Tuberculosis
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Sacramento
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Tuberculosis (TB) is an airborne disease caused by a group of bacteria 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 of TB disease may include a prolonged productive cough, blood-tinged sputum, night sweats, fever, fatigue, and weight loss. TB most commonly affects the lungs, but can also affect other parts of the body like the brain, kidneys, or spine. TB bacteria are aerosolized into respiratory droplet nuclei when a person who has TB of the lungs or larynx coughs, sneezes, laughs, or sings. Subsequently, 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. LTBI is evidenced by a positive tuberculin skin test (TST) or a positive blood test using T-cell Interferon-Gamma Release Assay (TIGRA) testing and without evidence of disease after evaluation. Approximately 10% of infected individuals will progress to active disease at some point in their lives. During 2014, there were 71 new cases of TB reported to the County of Sacramento, Division of Public Health. Globally, anti-TB Treatment has made a significant impact on lowering the rate of active TB and deaths due to TB. However, many challenges still remain, including the increase in multi-drug resistant TB.

Purpose

The purpose of this report is to provide the community with an overview and enhanced understanding of TB in Sacramento County including trends, the distribution of TB cases, racial disparities, multi-drug resistance, TB among vulnerable populations, and TB therapy outcomes.

Acknowledgments

The Division of Public Health acknowledges Chest Clinic staff for their efforts in tuberculosis (TB) control and patient management. We also acknowledge staff at the California Department of Public Health (CDPH) Tuberculosis Control Branch (TBCB) for their assistance and guidance in outbreak management.

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Tuberculosis in Sacramento County

In 2014, there were 71 cases of tuberculosis reported in the County of Sacramento, one of whom was dead at time of diagnosis. The incidence rate was 4.9 per 100,000 population compared to 5.6 per 100,000 in the State for the same year. The TB incidence rate decreased 53.3% from 10.5 in 2005 to 4.9 in 2014 for the County.

In 2014, the City of Sacramento had 45 (63.4%) TB cases and an incidence rate of 9.5 per 100,000 population. During the ten-year period from 2005-2014, the City of Sacramento had the majority of the TB cases (71.7%) compared to all other cities in the County, and had an average TB incidence rate of 14.2 per 100,000 population. This rate was more than double the average rate of 6.4 for the listed ten-year period in Sacramento County.

In 2014, 57 out of 71 (80.3%) cases were diagnosed with pulmonary TB. Fifty-nine were laboratory-confirmed TB cases and 12 were clinic-confirmed TB cases. Of the 914 TB cases diagnosed from 2005 to 2014, 724 (79.2%) were diagnosed with pulmonary TB. 74.5% were laboratory-confirmed TB and 25.5% were clinic-confirmed TB.

Of the 914 TB cases diagnosed from 2005-2014, 23.2% of TB cases were concentrated in zip codes 95823, 95828 and 95824. Over 50% of TB cases were distributed in the following zip codes: 95823, 95828, 95824, 95758, 95822, 95624, 95814, 95838, 95820 and 95757.

Demographics

TB incidence affected all age groups. In the past ten years, 31.6% of TB cases were ages 45-64 years, 27.5% were ages 25-44, 25.9% were ages 65 and older and 10.8% were ages 15-24. Only 4.2% of TB cases in the past ten years were among children less than 15 years of age. The three-year average incidence rate decreased more than 35% from 2003-2005 to 2012-2014 for all age groups, especially for age less than 15, which dropped more than 70%.

In 2014, there were 37 female TB cases and 34 male TB cases with an incidence rate of 5.0 and 4.7 per 100,000 population, respectively. From 2005 to 2014, the incidence rate decreased 59.8% for males and 44.6% for females.

Asian/Pacific Islanders had the highest TB incidence rate among all race/ethnicity groups across all listed year in the County. In 2014, the TB rate among Asian/Pacific Islanders was 20.3, 17.1, and 8.4 times higher than the rates among Caucasians, African American, and Hispanic, respectively. Asian/Pacific Islanders accounted for 73.2% of total cases in 2014. Over the ten-year period from 2005-2014, Asian/Pacific Islanders accounted for 60.3% of 914 total cases, with an average annual incidence rate of 27.3 per 100,000 population, which is 4.3 times higher than the overall average incidence rate for the ten years.

Origin and Country of Birth

In 2014, 73.2% of TB cases were among the foreign-born. The number of TB cases among foreign-born persons in Sacramento County was 2.7 times higher than that of U.S.-born persons. From 2005 to 2014, 69.1% of TB cases among foreign-born persons occurred in persons from five countries: Philippines (117), Vietnam (116), Mexico (76), Laos (71), and India (68).

Tuberculosis Drug Resistance

In 2014, six TB cases were resistance to the first-line TB treatment drug isoniazid. From 2005-2014, for those TB cases who had susceptibility testing done, 9.5% were resistant to isoniazid, 2.2% resistant to rifampin, 3.4% resistant to pyrazinamide and 3.2% to ethambutol.

Multi-drug resistant TB (MDR TB) is caused when a TB organism is resistant to at least isoniazid and rifampin. In 2014, multi-drug resistance (MDR) susceptibility testing was performed for 54 TB cases, with zero cases of multi-drug resistance. During the ten-year period from 2005-2014, 12 TB cases were multi-drug resistant. All MDR cases were among foreign-born persons.

Tuberculosis Risk Factors

In 2014, 21.1% of TB cases also had a diabetes mellitus diagnosis.

In 2014, there were zero homeless TB cases in the County. There were 68 homeless TB cases from 2005-2014; 75% of them were male and 25% were female. The majority of homeless TB cases in Sacramento County occurred among Whites (50.0%) and Blacks or African Americans (29.4%).

Tuberculosis Surveillance

Sacramento County healthcare providers and laboratories are required by law to report cases of active tuberculosis (TB) to the Sacramento County Public Health Department by electronic transmission, telephone, or mail within one working day of identification. The Sacramento County Public Health Department TB Control Program investigates and reports TB cases to the California Department of Public Health (CDPH) Tuberculosis Branch Control Branch (TBCB) using a standard case report form, Report of Verified Case of Tuberculosis (RVCT). In 1993, the Centers for Disease Control and Prevention (CDC), in conjunction with state and local health departments, began using the Report of Verified Case of Tuberculosis (RVCT) form to collect information on each case of TB. In 2009, the RVCT was modified and expanded to include 11 additional variables. Modifications to the RVCT accommodate the changing epidemiology of TB in terms of risk factors, new drug treatments, and enhanced laboratory capacity for diagnostic tests. TB cases are reported and counted according to the Centers for Disease Control and Prevention's (CDC) Recommendations for Reporting and Counting Tuberculosis Cases.

TB Case Definition

A TB case is defined as active disease, not old infections or Latent Tuberculosis Infection (LTBI). In 2009, the TB case definition was modified. TB cases are verified according to the following specified laboratory and clinical criteria.

Laboratory Criteria for Diagnosis

A case may be verified by the laboratory case definition with at least one of the following criteria: 1) isolation of *M. tuberculosis* complex from a clinical specimen, OR 2) demonstration of *M. tuberculosis* complex from a clinical specimen by nucleic acid amplification test (NAAT), OR 3) demonstration of acid-fast bacilli (AFB) in a clinical specimen when a culture has not been or cannot be obtained or is falsely negative or contaminated.

Clinical Case Criteria

A case may be verified by the clinical case definition in the presence of ALL of the following clinical criteria: 1) a positive tuberculin skin test (TST) result or positive interferon gamma release assay (IGRA) result for *M. tuberculosis*, AND 2) other signs and symptoms compatible with TB (e.g., abnormal chest radiograph, abnormal chest computerized tomography scan or other chest imaging study, or clinical evidence of current disease, AND 3) treatment with two or more anti-TB drugs, AND 4) a completed diagnostic evaluation.

Provider Diagnosis

When cases of TB are diagnosed but do not meet either the clinical or laboratory case definition, reporting areas have the option of verifying TB cases based on provider diagnosis.

Rates

Rates are expressed as the number of cases reported each calendar year per 100,000 persons. Population denominators used in calculating TB rates were based on the State of California, Department of Finance (DOF) State of California, Department of Finance, Race/Ethnic Population with Age and Sex Detail, 2000–2050. Sacramento, CA, July 2007 and Race/Ethnic Population with Age and Sex Detail, 2010–2060. Sacramento, CA, January 2013.

Race/Ethnicity Categorization

Persons of Hispanic/Latino ethnicity are categorized as Hispanic regardless of race. Persons of non-Hispanic/non-Latino ethnicity are categorized according to race (American Indian or Alaskan Native; Asian, Native Hawaiian or Other Pacific Islander; Black or African American, and White). Multiple race indicates a person of non-Hispanic/non-Latino origin with two or more races reported.

Tuberculosis Therapy Outcomes

Data collected by RVCT Follow-Up Report 2 on date and reason therapy stopped were used to determine therapy outcomes.

TB Trends by Year

For the 20-year period from 1995 to 2014, the incidence of TB has decreased 88.7%, from 134 cases to 71 cases (Figure 1). In the past ten years the TB cases have decreased by half from 142 in 2005 to 71 in 2014.

Figure 2 shows TB trends in Sacramento County compared to the state of California for the past ten years. Statewide incidence rates have steadily declined, while rates for the County have fluctuated due to sporadic local outbreaks and changes in immigration patterns.

The incidence rate for Sacramento County has dropped 53.3% from 10.5 per 100,000 in 2005 to 4.9 per 100,000 in 2014.

Figure 1. Number of TB Cases, Sacramento County, 1995-2014

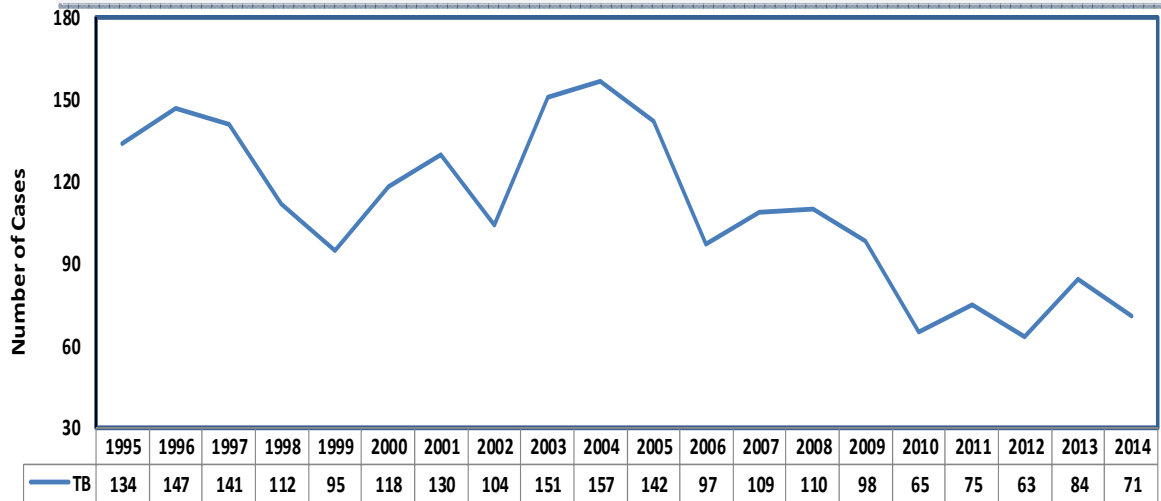
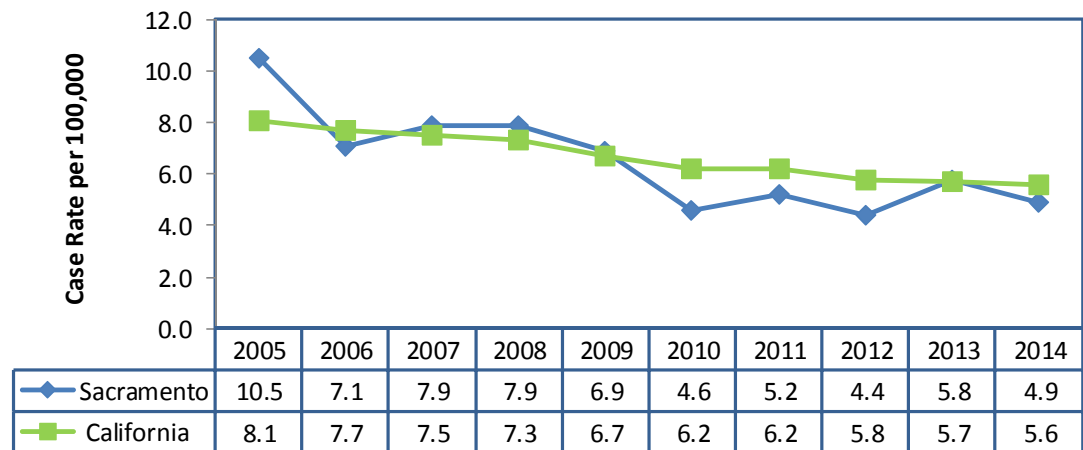


Figure 2. TB Incidence Rates, Sacramento County, 2005-2014



TB by City of Residence

Figure 3 shows TB incidence rates by select cities and for Sacramento County. The city of Sacramento had a TB incidence rate consistently higher than the overall County rate. However, the TB incidence rate for the city of Sacramento decreased from 27.3 per 100,000 in 2005 to 9.5 per 100,000 in 2014.

In 2014, the city of Sacramento had the majority of TB cases (45) in the County, but the percentage of TB cases in the city of Sacramento decreased from 85.2% in 2005 to 63.4% in 2014 (Table 2).

The ten-year average incidence rate for the city of Sacramento is more than double the average incidence rate for the entire county. The city of Elk Grove also had a higher ten-year average incidence rate compared to the county (Table 2).

Figure 3. TB Incidence Rates by Select City and County, Sacramento County, 2005-2014

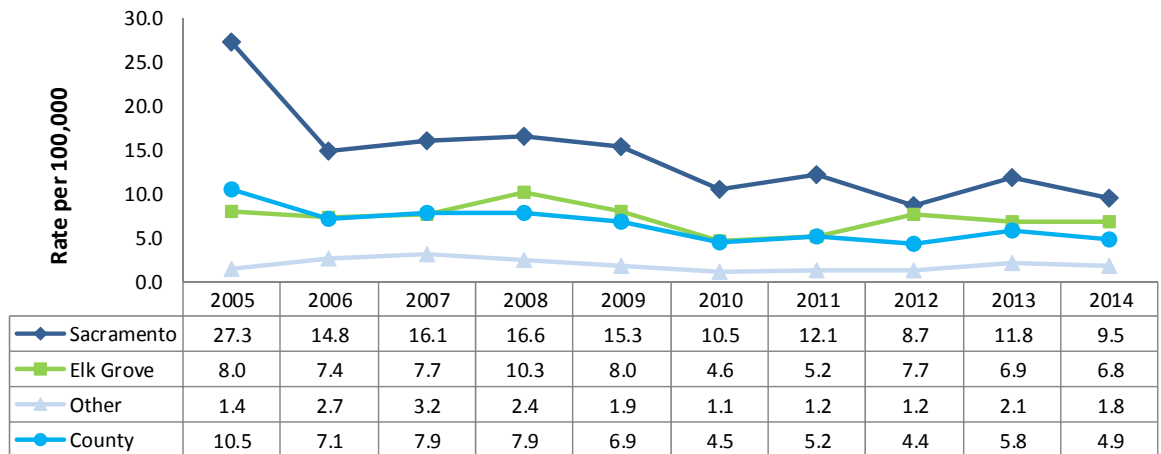


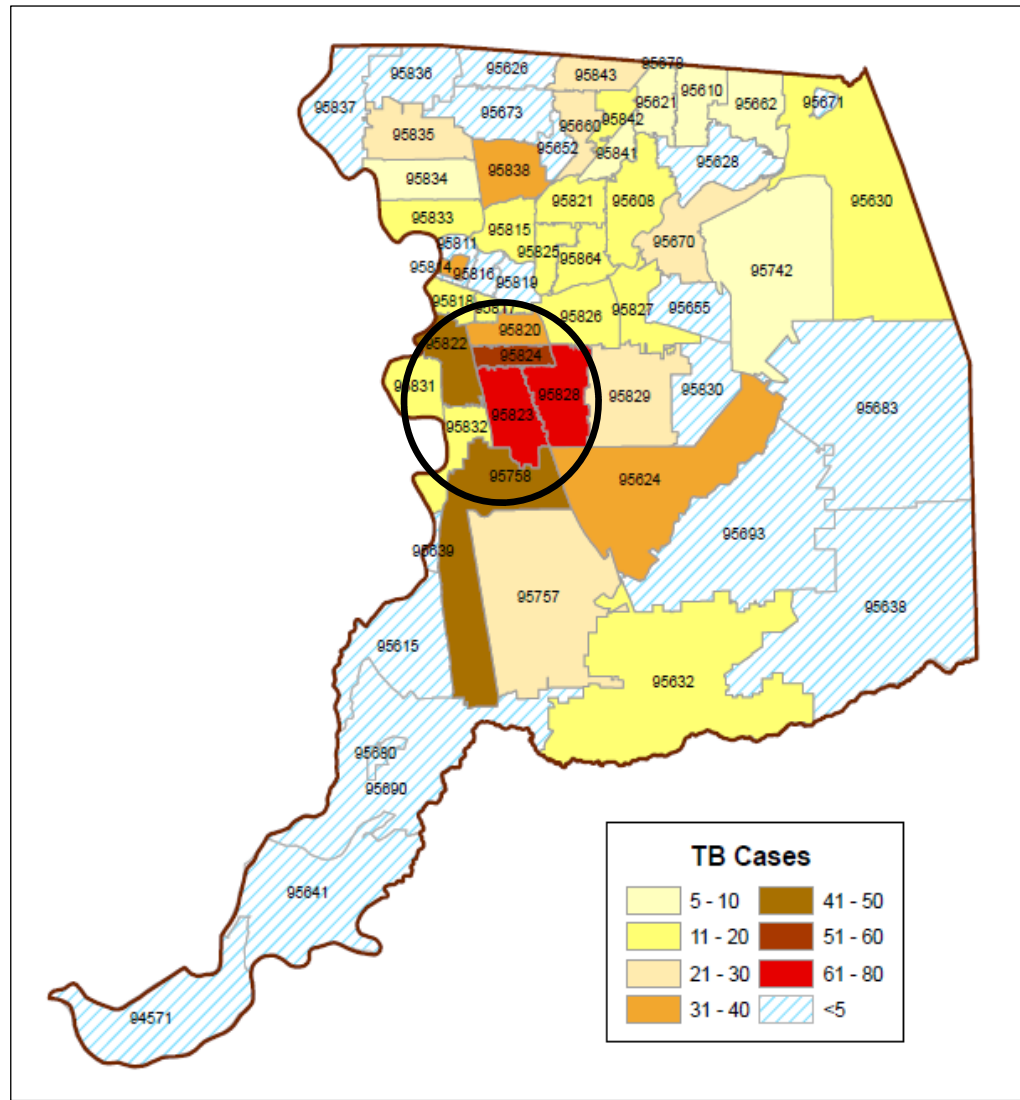
Table 2. TB Incidence Rates by City, Sacramento County, 2005-2014

City	2014 TB Cases		2005-2014 TB Cases		
	Cases	Percent	Case	Percent	Rate
Sacramento	45	63.4	655	71.7	14.2
Elk Grove	11	15.5	107	11.7	7.2
Balance Of County	5	7.0	78	8.5	1.4
Rancho Cordova	3	4.3	32	3.5	5.1
Folsom	3	4.3	19	2.1	2.7
Citrus Heights	3	4.3	11	1.2	1.3
Galt	1	1.4	12	1.3	5.1
Total	71	100.0	914	100.0	6.5

TB by Zip Code of Residence

There were a total of 914 cumulative Tuberculosis (TB) cases reported in Sacramento County from 2005 to 2014 (Map 1). Nearly 50% of all TB cases were concentrated within the geographic area denoted by the black circle. 23.2% of TB cases were within zip codes 95823, 95828 and 95824. The areas with the highest number of cases tend to be more populous urban areas in the western portion of the County.

Map 1. Number of TB Case by Zip Code, Sacramento County, 2005-2014



TB by Age Group

Table 3 shows TB cases by year and age at time of diagnosis. Persons age less than 15 represent a very low proportion of the total TB cases across all listed years.

Age group 45-64 had the highest proportion of TB cases (31.6%) in the past ten years, followed by age group 25-44 (27.5%) (Figure 4).

Three-year average incidence rates are presented in Figure 5. Age group 65 and older had the highest incidence rate across all years. From 2003-2005 to 2012-2014, the incidence rate significantly decreased for all age groups; 84.1% for age group 5-14, 63.5% for age group 0-4, 60.1% for age group 25-44, 59.7% for age group 45-64, 50.7% for age group 65 and older and 35.3% for age group 15-24.

Table 3. TB Cases by Year and Age Group, Sacramento County, 2005-2014

Year	0-4	5-14	15-24	25-44	45-64	65+	Total
2005	4	5	14	40	51	28	142
2006	0	1	15	27	33	21	97
2007	4	2	12	29	32	30	109
2008	1	3	9	35	33	29	110
2009	1	3	8	22	30	34	98
2010	1	2	5	21	19	17	65
2011	2	2	7	22	22	20	75
2012	1	1	8	23	16	14	63
2013	1	2	6	20	31	24	84
2014	2	0	15	12	22	20	71

Figure 4. Proportion of TB Cases by Age Group, Sacramento County, 2005-2014

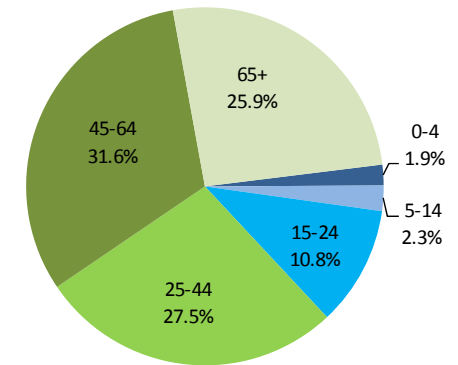
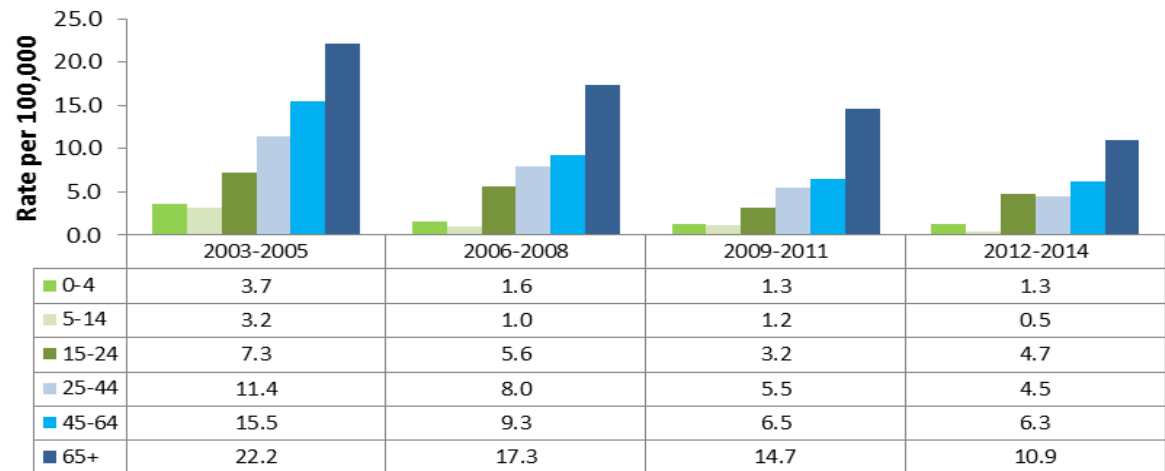


Figure 5. Three-Year Average TB Incidence Rate by Age Group, Sacramento County, 2005-2014



TB by Gender

In Sacramento County, males have historically had higher TB incidence rates than females (Figure 6). However, in 2014 females had a slightly higher number of cases and incidence rate than males in 2014.

For the past ten years, male TB incidence rates decreased 59.8% from 11.7 per 100,000 population in 2005 to 4.7 per 100,000 population in 2014. The female incidence rate decreased 44.6% in the same time period.

Figure 6. TB Cases by Gender, Sacramento County, 2005-2014

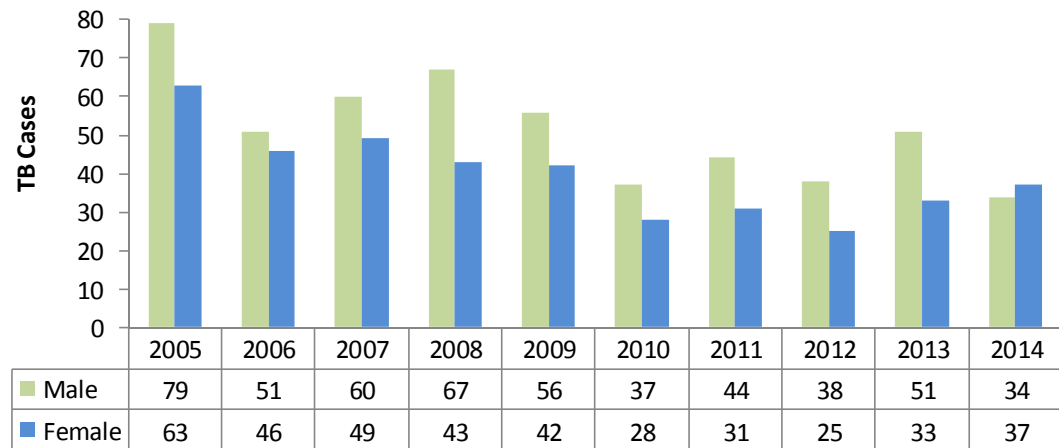
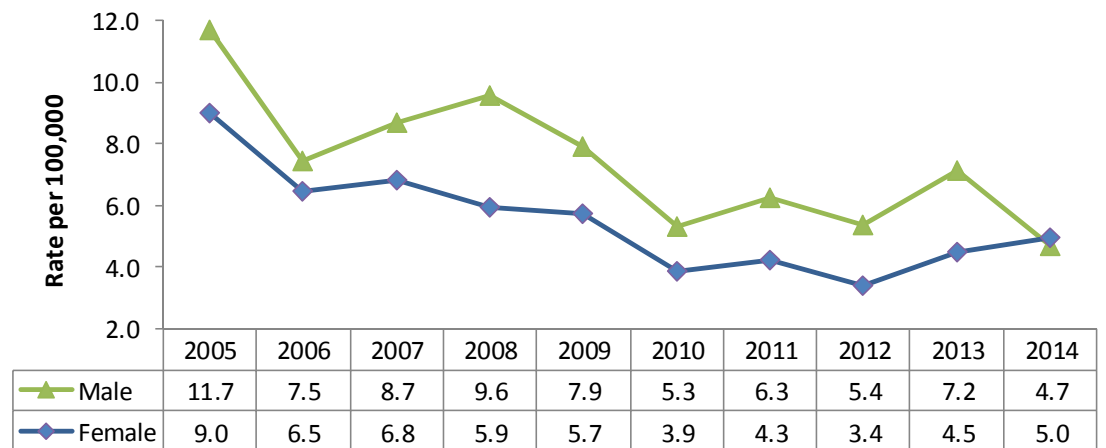


Figure 7. TB Incidence Rate by Gender, Sacramento County, 2005-2014



TB by Race/Ethnicity

TB incidence rates decreased over the past ten years across all race/ethnicity groups (Figure 8). Blacks had the largest decrease (92.4%) from 17.9 per 100,000 population in 2005 to 1.4 per 100,000 in 2014. Whites decreased 63.1%, Hispanics dropped 66.5% and Asian/Pacific islanders declined only 43.7%.

Asian/Pacific Islanders made up the majority of TB cases in Sacramento County in the past ten years. Figure 9 and Figure 10 show the proportion of TB cases by race/ethnicity group in the past ten years and for 2014, respectively.

Figure 8. TB Incidence Rate by Race/Ethnicity, Sacramento County, 2005-2014, Sacramento County

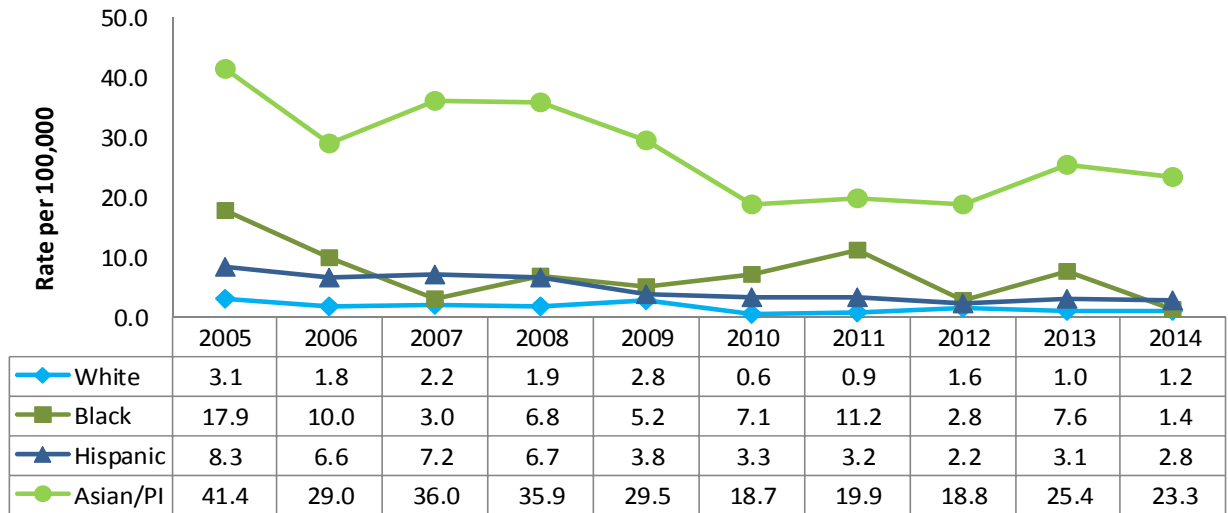


Figure 9. Proportion of TB Cases by Race/Ethnicity, Sacramento County, 2005-2014

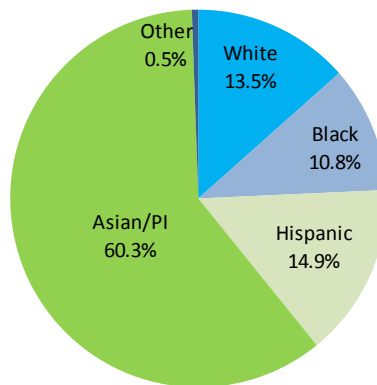
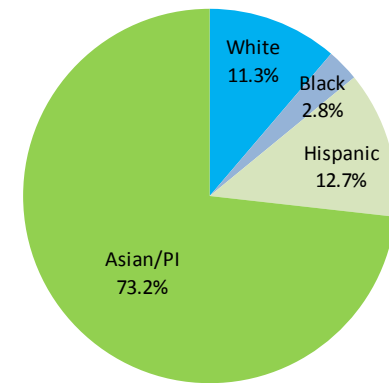


Figure 10. Proportion of TB Cases by Race/Ethnicity, Sacramento County, 2014



U.S.–Born Cases

From 2005 to 2014, there were 914 TB cases reported in Sacramento County and 251 (27.5%) were U.S.-born TB cases. Among these TB cases 34.7% were White, 30.3% were Black, 19.9% were Asian/Pacific Islander and 14.3% were Hispanic (Figure 11).

TB affected all age groups among the U.S.-born. The greatest proportion was among age group 25 to 64, which had 53.8% of all U.S.-born TB cases (Figure 12). Table 4 shows the number of U.S.-born TB cases by gender, race/ethnicity and age group.

Figure 11. Proportion of U.S.-Born TB Cases by Race/Ethnicity, Sacramento County, 2005-2014

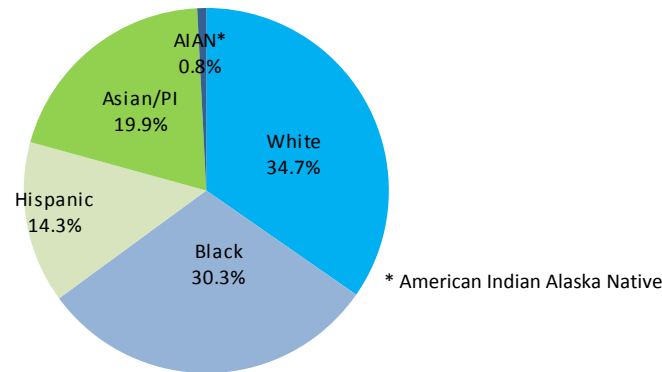


Figure 12. Proportion of U.S.-Born TB Cases by Age Group, Sacramento County, 2005-2014

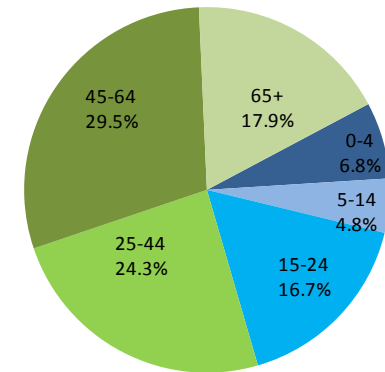


Table 4. U.S.-Born TB Cases by Gender, Race/Ethnicity and Age Group, Sacramento County, 2005-2014

TB Case	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Total	48	26	30	25	28	17	24	14	20	19
Gender										
Male	31	13	20	17	16	10	16	10	8	7
Female	17	13	10	8	12	7	8	4	12	12
Race/Ethnicity										
White	19	7	14	10	13	4	4	6	5	5
Black	21	13	4	6	4	7	11	2	7	1
Hispanic	6	3	8	4	3	3	4	1	2	2
Asian/Pacific Islander	2	3	4	5	7	2	5	5	6	11
American Indian/Alaska Native	0	0	0	0	1	1	0	0	0	0
Age Group										
0-4	4	0	4	1	1	1	2	1	1	2
5-14	3	0	2	2	1	1	1	0	2	0
15-24	3	5	2	4	6	1	5	3	4	9
25-44	10	6	9	8	4	7	6	5	2	4
45-64	24	11	7	7	5	3	5	2	7	3
65+	4	4	6	3	11	4	5	3	4	1

Foreign-Born Cases

Among the 914 reported TB cases from 2005 to 2014, 649 (71.0%) of them were foreign-born TB cases. Among these foreign-born cases, 76.0% were Asian/Pacific Islander, 14.9% were Hispanic, 5.5% were White and 3.5% were Black (Figure 13).

Compared to U.S.-born TB cases, foreign-born TB cases had a smaller proportion of people in the age groups below 25 years. The other age groups all have higher proportions than U.S.-born cases (Figure 14). Table 5 shows the number of foreign-born TB cases by gender, race/ethnicity and age.

Figure 13. TB Proportion by Race/Ethnicity for Foreign-Born, 2005-2014, Sacramento County

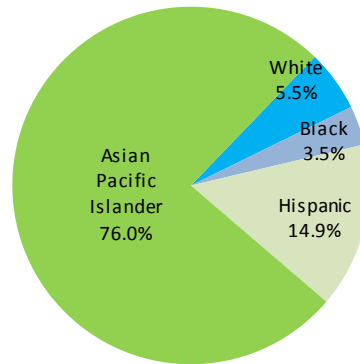


Figure 14. TB Proportion by Age Group for Foreign-Born, 2005-2014, Sacramento County

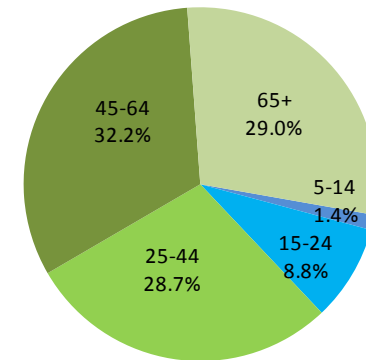


Table 5. Foreign-Born TB Cases by Gender, Race/Ethnicity and Age Group, 2005-2014, Sacramento County

TB Case	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Total	92	70	74	82	67	48	51	49	64	52
Gender										
Male	46	37	36	47	37	27	28	28	43	27
Female	46	33	38	35	30	21	23	21	21	25
Race/Ethnicity										
White	4	6	2	4	8	0	2	5	2	3
Black	2	0	0	3	3	3	5	2	4	1
Hispanic	16	14	12	14	7	7	6	6	8	7
Asian/Pacific Islander	70	50	60	61	49	38	38	36	50	41
Age Group										
0-4	0	0	0	0	0	0	0	0	0	0
5-14	2	1	0	1	2	1	1	1	0	0
15-24	11	10	10	5	2	4	2	5	2	6
25-44	29	21	18	26	18	14	16	18	18	8
45-64	27	21	23	25	23	16	17	14	24	19
65+	23	17	23	25	22	13	15	11	20	19

Countries of Birth

From 2005 to 2014, 649 (71.0%) TB cases in Sacramento County were foreign-born. The top 5 countries of birth among foreign-born cases were the Philippines (18.0%), Vietnam (17.9%), Mexico (11.7%), Laos (10.9%) and India (10.5%). These five countries of origin represent 69.0% of all foreign-born TB cases (Graph 15).

Table 6 lists all foreign-born TB cases by country of origin and number of years of in the USA. About 21% of foreign-born TB cases had stayed in USA for less than one year and over 27% had stayed for more than 20 years before becoming sick with TB disease. TB cases from Thailand, India, Ukraine, Ethiopia and the Philippines were much more likely to be recent immigrants compared to TB case from Cambodia, Vietnam, Laos or China.

Graph 15. Proportion of TB Cases by Country of Origin, Sacramento County, 2005-2014

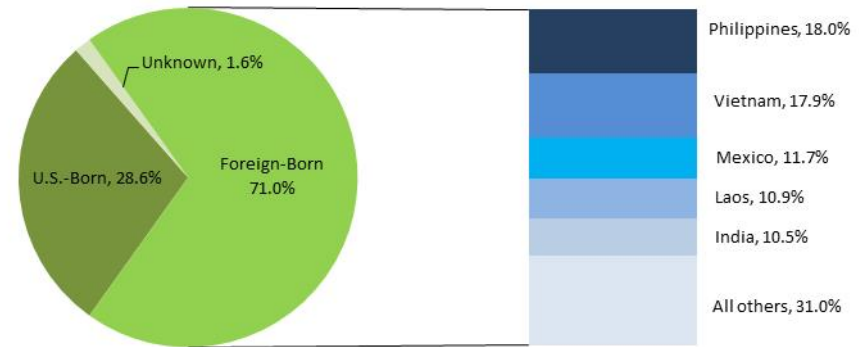


Table 6. Foreign-Born TB Cases by Number of Years in the US, Sacramento County, 2005-2014

Country of Origin	Time In United State														
	Total	<1 Year		1-2 Year		3-5 Year		6-10 Year		11-20 Year		>20 Year		Unknown	
	No.	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Philippines	117	33	28.2	4	3.4	7	6.0	11	9.4	23	19.7	27	23.1	12	10.3
Vietnam	116	22	19.0	1	0.9	9	7.8	13	11.2	18	15.5	44	37.9	9	7.8
Mexico	76	14	18.4	6	7.9	4	5.3	13	17.1	17	22.4	19	25.0	3	3.9
Laos	71	1	1.4	0	0.0	3	4.2	3	4.2	29	40.8	35	49.3	0	0.0
India	68	21	30.9	2	2.9	8	11.8	6	8.8	12	17.6	12	17.6	7	10.3
China	37	5	13.5	1	2.7	1	2.7	3	8.1	12	32.4	12	32.4	3	8.1
Thailand	23	8	34.8	1	4.3	4	17.4	1	4.3	3	13.0	6	26.1	0	0.0
Ukraine	13	4	30.8	1	7.7	0	0.0	2	15.4	4	30.8	0	0.0	2	6.5
Ethiopia	10	3	30.0	1	10.0	3	30.0	1	10.0	1	10.0	0	0.0	1	3.3
Cambodia	10	0	0.0	0	0.0	1	10.0	0	0.0	2	20.0	6	60.0	1	10.0
All Other	108	26	24.1	8	7.4	8	7.4	15	13.9	25	23.1	18	16.7	8	33.2
TOAL	649	137	21.1	25	3.9	48	7.4	68	10.5	146	22.5	179	27.6	46	7.1

TB Sites of Disease

Table 7 lists TB cases by form of disease. Pulmonary TB cases represent more than 75% of all TB cases across all listed years.

In 2014, 80.3% of TB cases had pulmonary TB only, 7.0% had extra-pulmonary TB and 12.7% had both pulmonary and extra-pulmonary TB (Table 8). The most common extra-pulmonary sites of disease were cervical and pleural.

Cases with a disseminated form of the disease, called miliary disease, are categorized as both pulmonary and extra-pulmonary. There were no miliary TB cases in the County in 2014.

Table 7. TB Cases by General Site of Disease, Sacramento County, 2005-2014

Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)
Pulmonary	115 (80)	73 (75.3)	86 (78.9)	88 (80)	79 (80.6)	50 (76.9)	63 (84)	47 (74.6)	66 (78.6)	57 (81.4)	724 (79.3)
Extrapulmonary	20 (14.1)	15 (15.5)	18 (16.5)	18 (16.4)	11 (11.2)	12 (18.5)	10 (13.3)	9 (14.3)	8 (9.5)	5 (5.7)	126 (13.7)
Both	7 (4.9)	9 (9.3)	5 (4.6)	4 (3.6)	8 (8.2)	3 (4.6)	2 (2.7)	7 (11.1)	10 (11.9)	9 (12.9)	64 (7)
Total	142 (100)	97 (100)	109 (100)	110 (100)	98 (100)	65 (100)	75 (100)	63 (100)	84 (100)	71 (100)	914 (100)

Table 8. TB Cases by Specific Anatomical Site, Sacramento County, 2014

TB Diagnosis (2014)	Number of Cases	Percent of All Cases
Total	71	100.0
Pulmonary only	57	80.3
Extrapulmonary	5	7.0
Cervical	1	1.4
Bone	1	1.4
Pleural	1	1.4
Other (Liver)	1	1.4
Both	9	12.7
Pulmonary+Axillary	1	1.4
Pulmonary+Bone	1	1.4
Pulmonary+Cervical	3	4.2
Pulmonary+Pleural	2	2.8
Pulmonary+Other (Colon)	1	1.4
Pulmonary+Other (Liver)	1	1.4

TB Case Verification

Reportable TB cases are verified either by laboratory testing (culture or smear), clinical criteria or provider diagnosis (see Technical Notes). Table 9 shows the diagnostic criteria that were used to verify reportable cases of TB in Sacramento County over the 10-year period from 2005 to 2014. The proportion of TB cases that were laboratory-confirmed increased 37.1% from 60.6% in 2005 to 83.1% in 2014. The proportion TB cases verified with clinical criteria have fluctuated with a low of 9.2% in 2009 and a high of 26.2% in 2010. The proportion of TB cases verified by provider diagnosis decreased from 20.4% in 2005 to 2.8% in 2014 (Table 9).

Table 9. Diagnostic Criteria used to Verify Cases of TB, 2005-2014, Sacramento County, 2005-2014

Year	Total	Laboartory Confirmed TB				Non-Laboratory Confirmed			
		Positive Culture		Positive Smear*		Clinical Case		Provider Diagnosis	
		No.	%	No.	%	No.	%	No.	%
2005	142	86	60.6	1	0.7	26	18.3	29	20.4
2006	97	75	77.3	1	1.0	9	9.3	12	12.4
2007	109	80	73.4	2	1.8	17	15.6	10	9.2
2008	110	69	62.7	3	2.7	25	22.7	13	11.8
2009	98	72	73.5	1	1.0	9	9.2	16	16.3
2010	65	45	69.2	0	0.0	17	26.2	3	4.6
2011	75	60	80.0	1	1.3	13	17.3	1	1.3
2012	63	53	84.1	1	1.6	8	12.7	1	1.6
2013	84	72	85.7	0	0.0	10	11.9	2	2.4
2014	71	59	83.1	0	0.0	10	14.1	2	2.8
Total	914	671	73.4	10	1.1	143	15.6	89	9.7

*Indicates the number of cases for which a positive smear (in the absence of culture-confirmation) was used to verify a case of reportable TB; counts do not reflect the total number of TB cases with a positive smear result

Note: Laboratory cultures and smears include both sputum cultures/smears and cultures/smears from other biological specimens.

TB Drug Resistance

During the ten-year period from 2005 to 2014, 650 (71.1%) TB cases had drug susceptibility testing performed. Among those TB cases that had susceptibility testing done, 9.5% were resistant to isoniazid, 2.2% were resistant to rifampin, 3.4% were resistant to pyrazinamide and 3.2% were resistant to ethambutol (Table 10).

From 2005 to 2014 there were a total of 12 multi-drug resistant (MDR) TB cases reported to the County. All reported MDR cases were among foreign-born persons (Table 11).

Table 10. TB Cases by Resistance to First Line Drugs, Sacramento County, 2005-2014

Year	Number Tested	Isoniazid		Rifampin		Pyrazinamide		Ethambutol	
		Cases	%	Cases	%	Cases	%	Cases	%
2005	86	8	9.3	3	3.5	3	3.5	3	3.5
2006	75	6	8.0	0	0.0	2	2.7	2	2.7
2007	79	11	13.9	1	1.3	0	0.0	0	0.0
2008	69	6	8.7	4	5.8	4	5.8	4	5.8
2009	71	10	14.1	2	2.8	2	2.8	2	2.8
2010	43	0	0.0	0	0.0	0	0.0	0	0.0
2011	54	2	3.7	0	0.0	2	3.7	2	3.7
2012	48	6	12.5	1	2.1	1	2.1	1	2.1
2013	71	7	9.9	3	4.2	7	9.9	7	9.9
2014	54	6	11.1	0	0.0	1	1.9	0	0.0
Total	650	62	9.5	14	2.2	22	3.4	21	3.2

Table 11. TB Cases by Multidrug-resistance (MDR), Sacramento County, 2005-2014

No. Of	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Culture Positive	86	75	80	69	71	43	54	48	72	59
MDR Susceptibility Testing	83	75	79	69	71	43	54	46	71	54
Mutil-drug Resistance	3	0	1	3	2	0	0	0	3	0

TB Therapy Outcome

Uncomplicated TB disease can be treated by taking several drugs for six to nine months. More complicated (e.g., drug resistant, pregnant, HIV infected) cases often require modification in TB treatment regimens. Treatment completion is determined by the number of doses ingested over a given period of time.

During the ten-year period from 2003 to 2012, the percentage of TB cases that had completed their treatment within 12 months was consistently around 70%. TB patients that had finished their treatment in greater than 12 months significantly decreased. In 2012, only 6.5% of cases finished their treatment beyond 12 months compared to 11.0% in 2003 (Table 12).

Table 12. TB Cases by Therapy Outcome, Sacramento County, 2003-2012

Year	Cases Starting Therapy	Completed Treatment <= 12 months		Completed Treatment > 12 months		Died		Other*	
		No.	%	No.	%	No.	%	No.	%
2003	146	109	74.7	16	11.0	9	6.2	12	8.2
2004	157	101	64.3	19	12.1	6	3.8	31	19.7
2005	139	99	71.2	12	8.6	4	2.9	24	17.3
2006	95	75	78.9	12	12.6	4	4.2	4	4.2
2007	106	77	72.6	14	13.2	9	8.5	6	5.7
2008	108	80	74.1	9	8.3	6	5.6	13	12.0
2009	95	69	72.6	7	7.4	11	11.6	8	8.4
2010	62	45	72.6	4	6.5	6	9.7	7	11.3
2011	73	56	76.7	5	6.8	7	9.6	5	6.8
2012	62	46	74.2	4	6.5	4	6.5	8	12.9

*Other includes TB cases that moved, were lost to follow-up, refused therapy, and those with unknown therapy outcome.

TB Risk Factors

Certain groups have higher rates of TB transmission, including substance users, those who live or work in institutions, and those with compromised immune systems. Children under age five and persons with medical conditions that weaken the immune system are at a higher risk of developing active TB disease if they become infected.

Table 12 shows the prevalence of select risk factors for TB patients in 2014. Having a diabetes diagnosis and being a contact to an infectious TB patient were the most common risk factors reported. Information reported on HIV/AIDS status for TB cases may be incomplete due to concerns about confidentiality, timing of HIV testing, or anonymous testing practices.

Table 13. TB Cases by Risk Factors, Sacramento County, 2014

Risk Factor	No. Cases	Percent
Total Cases	71	100.0
Substance Use		
Excess alcohol use within past year	2	2.8
Injection Drug Use within past year	1	1.4
Non-injection drug use within past year	1	1.4
Place of Residence		
Correctional facility	0	0
Homelessness	0	0
Long-term care institutionalization	1	1.4
Co-morbidities		
Diabetes mellitus diagnosis	15	21.1
HIV/AIDS diagnosis	1	1.4
Non-HIV Immuno-suppressive Condition	3	4.2
Post-organ Transplantation	1	1.4
Contact to infectious TB patient	12	16.9

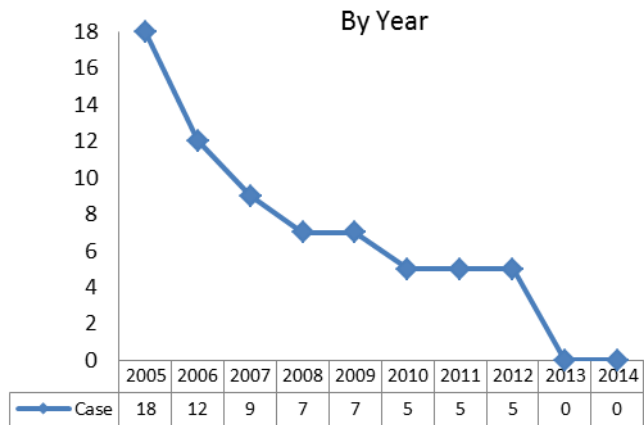
TB Among Homeless Persons

From 2005 to 2014 there were a total of 68 TB cases among homeless persons, which represents 7.5% of all TB cases during this time period. The number of homeless TB cases decreased significantly from 18 cases in 2005 to zero cases in 2014. Fifty-one (75.0%) homeless TB cases were male and 17 (25.0%) were female (Figure 16).

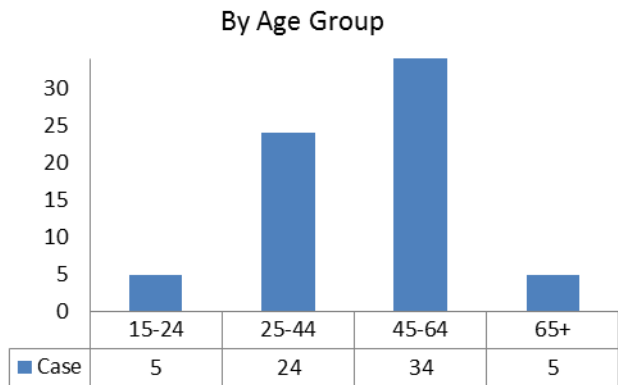
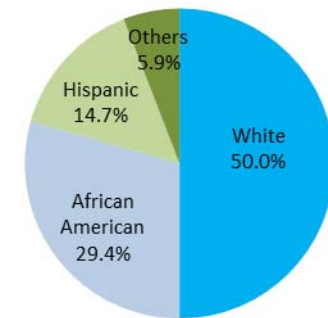
The majority of homeless TB cases in Sacramento County occurred among White (50.0%) and Black persons (29.4%).

Half of all homeless TB cases were distributed in age group 45-64, followed by age group 25-44.

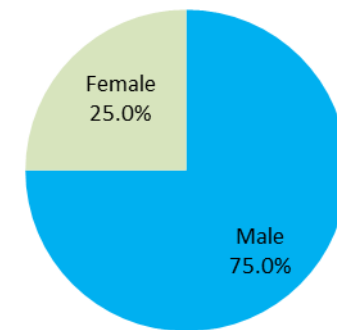
Figure 16. TB Among Homeless Persons, Sacramento County, 1995-2014



By Race/Ethnicity (N=68)



By Gender (N=68)



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