



# Tuberculosis in Alameda County, 2014

## Alameda County Public Health Department

Tuberculosis (TB) is a preventable and curable disease that remains one of the leading causes of death worldwide. TB is a communicable disease caused by the bacteria *Mycobacterium tuberculosis* and spreads from person-to-person when the bacteria is released into the air by a person with active TB disease. Transmission can occur when others breathe in the bacteria while in close and prolonged contact with a person with infectious TB. Although TB most often affects the lungs, it can affect any part of the body.

Once TB bacteria have been inhaled, that person may become infected with TB. In most cases, the body is able to keep the bacteria from growing, but will still show evidence of exposure or infection. In persons with latent TB infection (LTBI), the TB bacteria in the body remain alive but inactive, and cannot be spread to others. Individuals with latent TB infection have a 5-10% chance of developing TB disease over their lifetime. TB infection can progress to TB disease when the immune system cannot fight off the bacteria. TB disease can cause serious illness or death especially if treatment is delayed. Treatment regimens can take at least six to nine months, possibly longer if the strain is drug-resistant, or if the person is co-infected with other organisms that may cause treatment complications or worsen the severity of TB disease.

Tuberculosis can infect anyone who lives, works, and breathes near a person with infectious TB disease, regardless of age, sex, race, or socioeconomic status. However, it disproportionately affects the poor, homeless, and other socially marginalized groups who live in overcrowded conditions and/or lack access to healthcare. Poor nutrition, substance abuse, HIV infection, diabetes, cancer or other conditions that weaken the immune system can increase the risk of developing TB disease. Poverty can limit access to TB health services and essential support for treatment adherence, such as family assistance with taking medication or transportation to medical appointments.

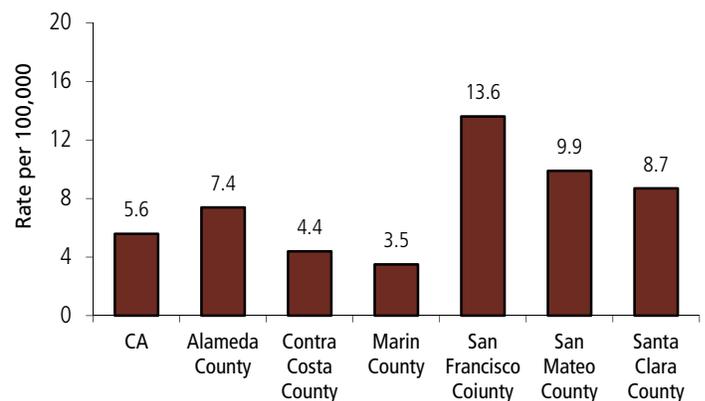
Approximately one-third of the world's population, or over 2 billion people, are infected with *Mycobacterium tuberculosis*, with an estimated 8.6 million new cases of TB and 1.3 million deaths in 2013. Over 90% of TB cases and TB deaths worldwide are concentrated in resource-poor developing nations where multiple risk factors such as war, poverty, overcrowding, malnutrition, and insufficient TB control infrastructure make TB endemic. Increased global trade, travel, and population mobility have contributed to the spread of tuberculosis. Migration from countries with high TB prevalence has led to high rising rates of TB among foreign-born populations in the United States, California, and Alameda County.

### Alameda County TB Cases and Rates

In this report, data for Alameda County excludes the City of Berkeley, which is its own health jurisdiction and reports separately. Alameda County's TB case rate (excluding the City of Berkeley) for 2014 was 7.4 per 100,000 residents, ranking fifth among all jurisdictions in the state. Compared to other Bay Area jurisdictions, the rate in Alameda County ranks lower than San Francisco, San Mateo and Santa Clara counties, but is higher than Contra Costa and Marin counties (Figure 1).

In 2014, there were 108 cases of TB in Alameda County (excluding the City of Berkeley), a 5.2% decrease from the previous year. The number of cases in Alameda County has been decreasing overall since its most recent peak of cases in 2000 (Figure 2). There were 2,145 TB cases in California in 2014, a 1.0% decrease in TB cases across the state from the previous year. Alameda, Contra Costa, Marin, and Santa Clara jurisdictions experienced decreased numbers of cases, while San Francisco and San Mateo reported increases

**Figure 1. TB Case Rates for California and San Francisco Bay Area Jurisdictions, 2014**



in TB cases in 2014. The Alameda County rate of 7.4 cases per 100,000 residents is 32.1% higher than the California rate of 5.6 per 100,000 residents, and has been consistently higher than state and national rates (Figure 3).

### TB Cases by Sex

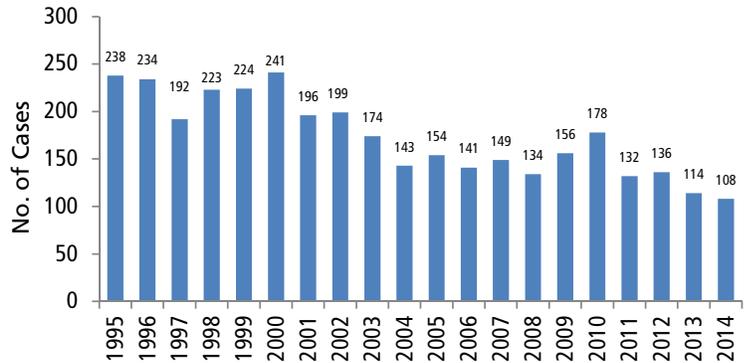
In 2014, males comprised the majority (56.5%) of TB cases (Table 1). The average annual rate among males during 2012-2014 was 9.9 per 100,000, approximately one and one half times the rate of females (6.9) (Table 2).

### TB Cases by Age Group

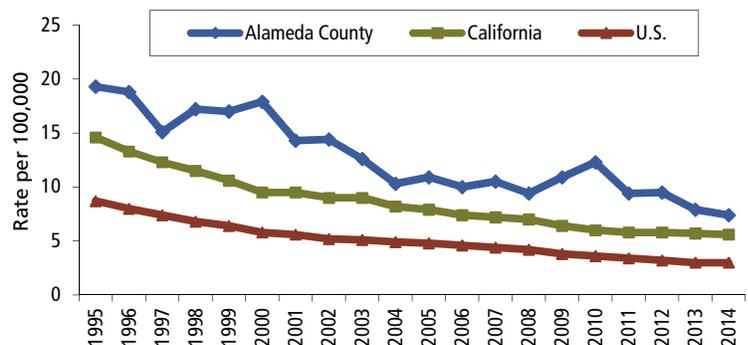
In 2014, the greatest proportion of incident tuberculosis cases occurred among adults age 65 years and older (34.3%), followed closely by adults 45-64 years old (33.3%); 87.0% of TB incident cases occurred among individuals age 25 and older. Cases among very young children indicate a recent transmission of tuberculosis and are of particular concern because such infections can potentially cause grave sequelae. Two pediatric cases of TB in children between the ages of 0-4 years old occurred in 2014 (Table 1).

Individuals ages 65 and over also have the greatest risk of having TB as they age and their immune systems weaken. These older adults had an average case rate of

**Figure 2. Annual TB Cases, 1995-2014 Alameda County**



**Figure 3. Annual TB Case Rates, 1995-2014 Alameda County, California and U.S.**



**Table 1. Incident TB Cases, Alameda County, 2014**

		Number of Cases (n=108)	Percent
Sex	Males	61	56.5%
	Females	47	43.5%
Age Group	0-4 yrs	2	1.9%
	5-14 yrs	0	0.0%
	15-24 yrs	12	11.1%
	25-44 yrs	21	19.4%
	45-64 yrs	36	33.3%
	65+ yrs	37	34.3%
Race/Ethnicity	Non-Hispanic Black*	10	9.3%
	Asian/PI	68	63.0%
	Amer Ind/Native AK	2	1.9%
	Latino	15	13.9%
	White	11	10.2%
	Other/Unknown	2	1.9%

**Table 2. TB Cases and Average Case Rates, 2012-2014, Alameda County**

		Number of Cases (n=358)	Average Case Rate per 100,000
Sex	Males	208	9.9
	Females	150	6.9
Age Group	0-4 yrs	6	n/a
	5-14 yrs	4	n/a
	15-24 yrs	31	9.7
	25-44 yrs	92	7.3
	45-64 yrs	113	18.3
	65+ yrs	111	21.6
Race/Ethnicity	Non-Hispanic Black*	38	7.1
	Asian/PI	240	20.3
	Amer Ind/Native AK	3	n/a
	Latino	48	4.6
	White	27	2.0
	Other/Unknown	2	n/a

21.6 per 100,000 in 2012-2014 (Table 2).

## TB Cases by Race/Ethnicity

People of color continue to make up a large proportion of TB cases, comprising 88.0% of TB cases in 2014, compared to 86.1% in 1993. These were predominantly among Asians and Pacific Islanders, who made up 63.0% of new TB cases in 2014 (Figure 4). Latinos accounted for 13.9% of cases, while Non-Hispanic Blacks\* and Non-Hispanic Whites comprised 9.3% and 10.2% of tuberculosis cases respectively (Table 1).

In the period 2012-2014, Asian/Pacific Islanders had the highest average annual case rates (20.3 per 100,000), almost three times the rate among Non-Hispanic Blacks (7.1), four-and-a-half times that of Latinos (4.6), and ten times the rate for Non-Hispanic Whites whose average annual case rate was 2.0 (Table 2).

## TB Cases by Place of Birth

Foreign-born residents account for an increasing proportion of annual TB cases in Alameda County. In the early 1990s, TB cases were almost evenly split between foreign- and U.S.-born persons. By 2014, 92 of the 108 TB cases (85.2%) occurred among foreign-born individuals, who most often came from the Philippines, India, China, Vietnam, and Mexico (Figure 5).

In 2014, the majority of the foreign-born incident cases occurred among Asians/Pacific Islanders (70.7%) and Latinos (13.0%). By comparison, Non-Hispanic Blacks made up the largest group of U.S.-born TB cases (37.5%), followed by Non-Hispanic Whites (25.0%), U.S.-born Asian/Pacific Islanders (18.8%) and Latinos (18.8%). (Figure 6)

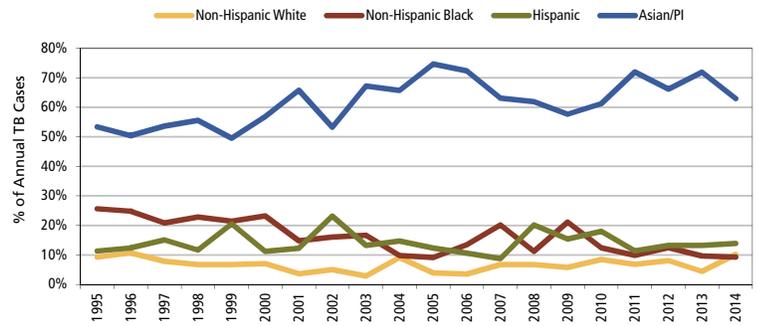
The average annual case rate in 2012-2014 for foreign-born individuals in Alameda County was 21.3 per 100,000 residents, nearly ten times the rate for individuals with TB who were born in the United States (2.3).

## TB Cases by Place of Residence

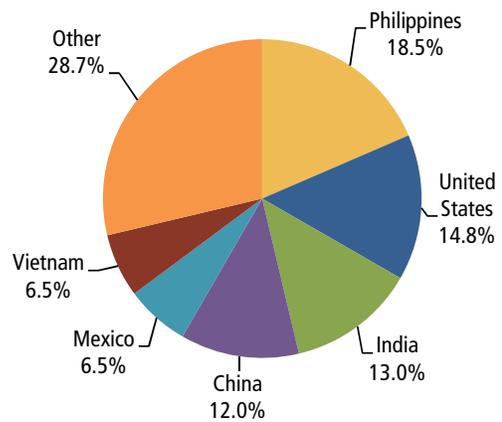
In 2014, 33.3% of TB cases were among residents of Oakland. In the south county, the cities of Fremont and San Leandro reported the greatest proportion of cases, with 20.4%, and 11.1% respectively. The east county (Dublin, Pleasanton, and Livermore) comprised 6.5% collectively. The areas in the county with the highest rates are in Oakland's Uptown, Fruitvale, and San Antonio neighborhoods, as well as the northern and

\*For purposes of this report, Non-Hispanic Black refers to both immigrant Non-Hispanic Africans and Non-Hispanic African Americans.

**Figure 4. Annual Percent of TB Cases by Race/Ethnicity, Alameda County, 1995-2014**



**Figure 5. Incident TB Cases by Place of Birth, Alameda County, 2014**



**Figure 6. TB Cases by Place of Birth and Race/Ethnicity, 2014**

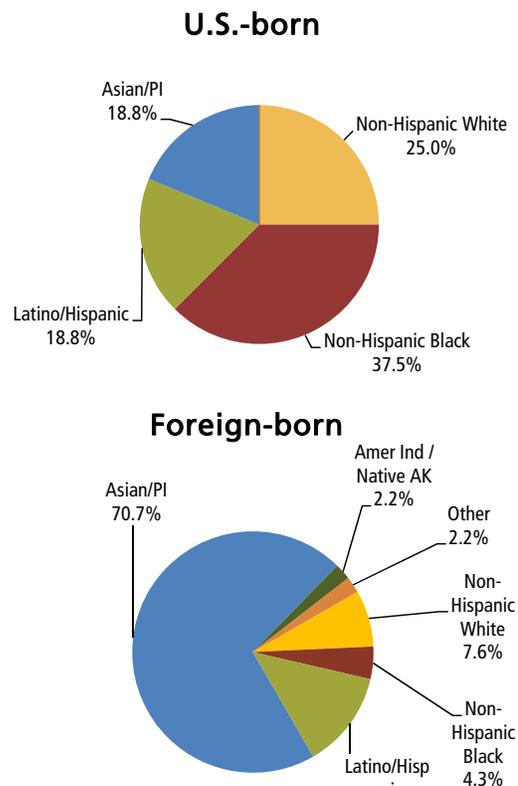
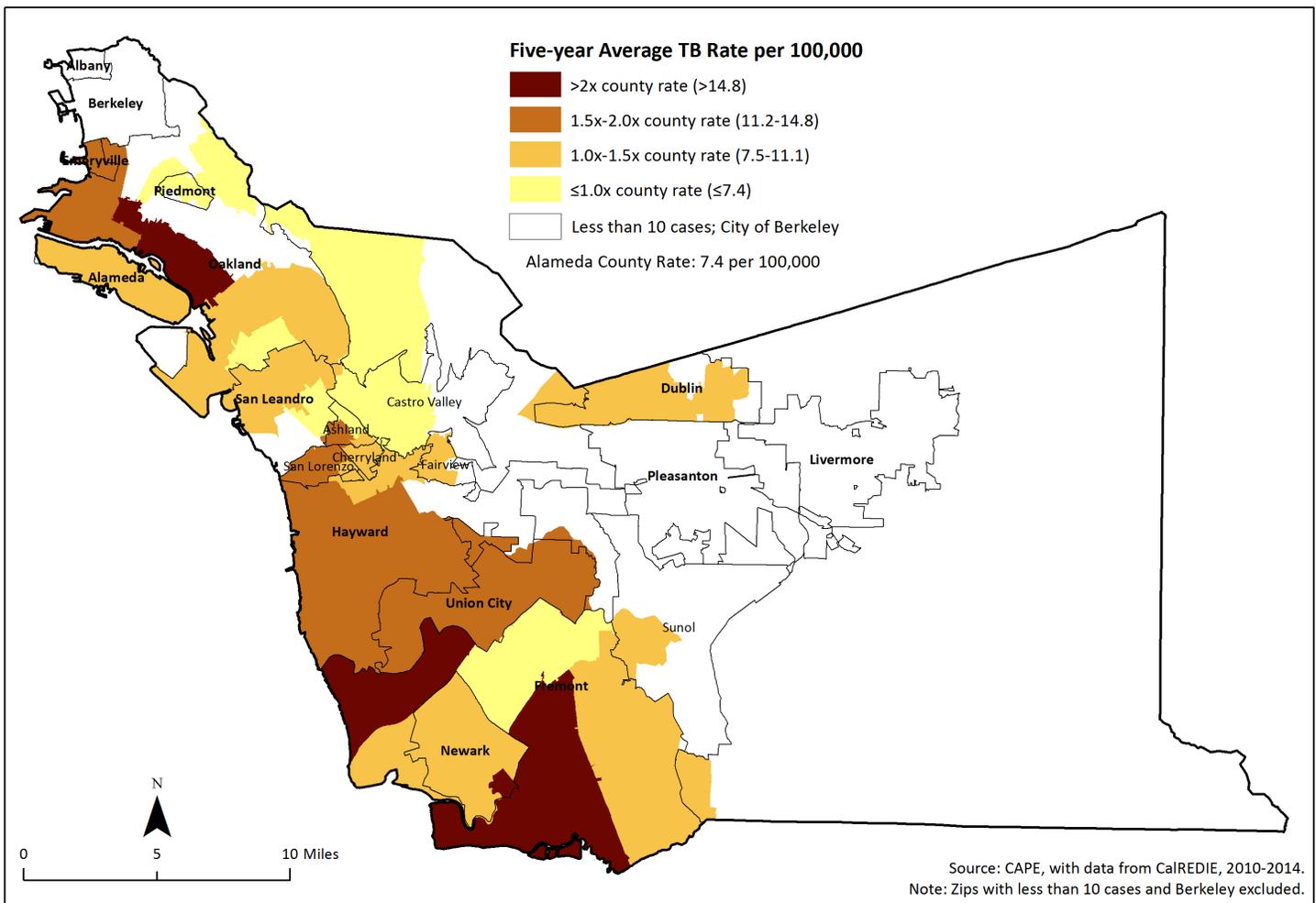


Figure 7. Five-year Average TB rates in Alameda County by Zip, 2010-2014



central portions of Fremont (Figure 7 - map).

### Clinical Characteristics of TB Cases

TB bacteria can cause disease in the lungs (pulmonary TB) or in other parts of the body (extra-pulmonary TB) such as lymph nodes, bones, abdominal organs, and the brain or spinal cord. While the majority (63.0%) of the TB cases reported in 2014 were pulmonary only cases, 22.2% were extra-pulmonary, and 14.8% were both pulmonary and extra-pulmonary. Of the 84 pulmonary cases, 37 (44.0%) were smear positive and 24 (28.6%) had evidence of cavitary disease, both of which indicate a high level of infectiousness.

In the 12 months prior to their TB diagnosis, nine (8.3%) of the 2014 cases had used alcohol excessively, and seven (6.5%) had used non-injection drugs, and one (0.9%) reported injection drug use. Two (1.9%) had been in a long-term care facility within one year prior to diagnosis, and 2 (1.9%) reported having been in correctional facilities. While two (1.9%) of TB cases in 2014 reported being homeless, many became displaced from their housing as a result of their TB diagnosis, and the TB program assisted in provid-

ing housing for six individuals in 2014.

Four (3.7%) of the 108 cases in 2014 were known to be co-infected with HIV/AIDS. HIV is the most important risk factor for progression from latent TB infection to TB disease; worldwide, TB is the leading cause of death among HIV-infected individuals.

Directly observed therapy (DOT) is a strategy where a trained healthcare worker or other designated individual observes the ingestion of every prescribed dose of medication. Patients who are highly infectious or at risk for drug resistance or failure to adhere to treatment are assigned an outreach worker who observes them ingest each dose of medication. DOT has been proven to increase treatment completion rates. When treatment is completed in a timely manner, patients remain infectious for a shorter period of time which decreases the chance of infecting others. Timely treatment completion has also been associated with the decrease in development of drug resistant TB strains. For 2014 cases who have completed treatment as of this report, 70.3% of cases received DOT for all or some portion of their treatment. For other TB patients, therapy is self-administered throughout the course of treatment.

## TB Drug Resistance

Drug resistance can occur when the bacteria become resistant in a person whose TB was inadequately or inappropriately treated, or can be acquired directly from someone with a drug-resistant strain of TB. Individuals with drug-resistant TB undergo longer and more complicated courses of treatment. Eighteen (16.7%) of the 108 TB cases in 2014 were resistant to at least one of the anti-tuberculosis medications, a 58.3% increase compared to 2013 (Figure 8). Fifteen of 18 TB cases resistant to at least one anti-TB medication were resistant to INH. INH-resistant cases comprised 13.9% of TB cases in 2014, compared to 7.0% in 2013. Multi-drug resistant TB (MDR-TB) is defined as resistance to at least Isoniazid and Rifampin, the two most potent anti-TB medications. There was one MDR-TB cases in Alameda County in 2014, compared to none in 2013. Of the 35 MDR-TB cases identified since 1993, 94.4% occurred among foreign-born individuals.

## New Immigrants to Alameda County

Before obtaining a visa to enter the United States, documented immigrants and refugees from countries with high rates of TB undergo a pre-departure tuberculosis screening in accordance with the Centers for Disease Control and Prevention (CDC) 2007 Technical Instructions, a policy supported by Alameda County Public Health Department. The state or local health jurisdiction is notified of the arrival of each immigrant or refugee classified overseas with a TB condition requiring follow-up TB evaluation upon arrival in the U.S., and the individual is advised to report to their local health department.

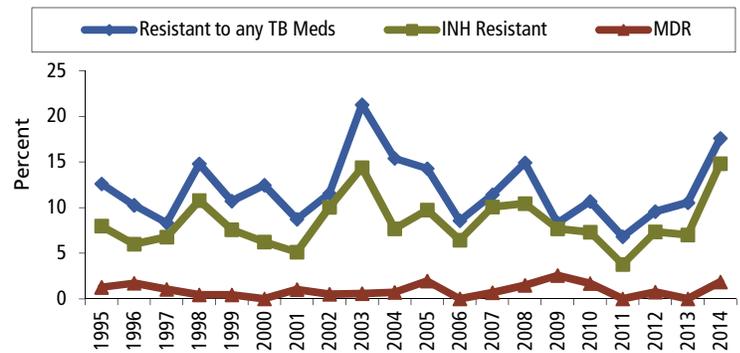
In 2014, 408 new arrivers requiring TB evaluation were reported to Alameda County by the CDC's Division of Global Migration and Quarantine (Figure 9). Alameda County comprises 4% of the state's population, but received 7.2% of California's arrivers in 2014 who required follow-up TB evaluation. Alameda County differs from the state in immigrants requiring TB evaluation; a smaller proportion arrived from Mexico and Vietnam and a larger proportion arrived from China and India (Figure 10).

## TB Control Program in Action

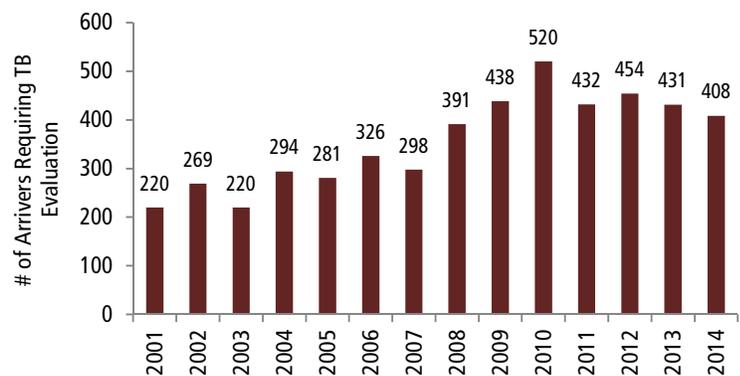
In its efforts to prevent and reduce TB transmission throughout the county, the Alameda County TB Control Program prioritizes work in three core areas:

1) Identifying persons who have active TB and ensuring treatment completion, with the provision of directly observed therapy for higher-risk subgroups such

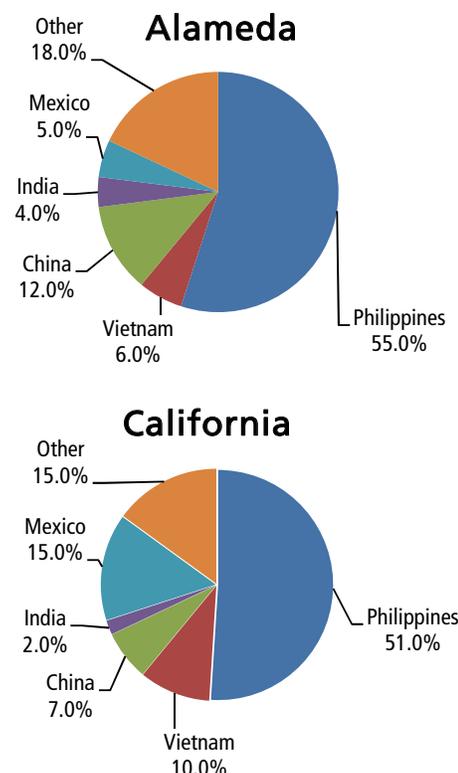
**Figure 8. Percent TB Cases Resistant to any TB Meds, INH Resistance and MDR Resistance, Alameda County, 1995-2014**



**Figure 9. New Arrivers Requiring TB Evaluation Alameda County, 2001-2014**



**Figure 10. New Arrivers Requiring TB Evaluation by Country of Origin, 2014**



as the highly infectious, multi-drug resistant, co-infected, or homeless;

2) Finding, conducting TB testing and evaluating persons who might have been exposed to active TB cases to identify secondary cases, then facilitating and linking to care those persons with confirmed latent or active TB; and

3) Conducting targeted testing among other subgroups who are especially vulnerable to TB (e.g., newly arrived immigrants from countries with high TB rates).

In addition to these core areas, the TB Control Program is working at individual, community, and policy levels to improve outcomes in terms of tuberculosis and overall health and health equity by:

- Reaching out to healthcare providers, hospitals, schools, correctional facilities, and various local organizations to educate the community about tuberculosis;
- Working with vulnerable clients to ensure they are linked to essential resources that support treatment adherence, such as medical insurance, food, housing, and transportation;
- Forging partnerships with community service providers to make sure clients, upon treatment completion, are transitioned into necessary ongoing support, such as a permanent medical home, housing assistance, or drug rehabilitation;
- Collaborating with the Office of AIDS to appropriately manage patients co-infected with HIV by connecting them to critical services like Medi-Cal or housing assistance;
- Finding permanent medical homes for patients with co-morbidities, in need of preventative services, or for patients who request assistance.

## Inequities Affecting TB Infection, Diagnosis and Treatment

Globally and locally, TB disproportionately affects people who face economic and social inequities such as poverty, limited access to health care, homelessness and malnutrition. In 2013, at least 13% of persons with confirmed or suspected TB disease in Alameda County had no health benefits at the time of diagnosis, and the highest rates of TB disease occur in areas of the county where over 20% of persons live below the federal poverty level. Although the rates of TB disease are highest in foreign-born residents of Alameda County, US-born African American residents of Alameda County bear a disproportionate burden of TB risk factors such as poverty, homelessness, incarceration, and HIV infection and have higher rates of TB disease than US-born white residents. TB disease itself can further exacerbate poverty by causing income loss, out-of-pocket

medical costs, and loss of housing.

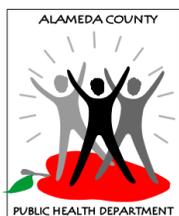
Patients who have early symptoms of TB frequently delay seeking care for a variety of reasons, including lack of insurance, paid sick leave, child care and transportation, as well as high insurance co-pays. A large proportion of Alameda County TB patients have markers of advanced TB infection at the time of their diagnosis, such as lung cavities and TB bacteria in their sputum that are visible under the microscope. Most of these patients had prolonged symptoms before they saw a healthcare provider. Delays in health care access and diagnosis may lead to longer periods of infectiousness, isolation, and exclusion from school or work; a longer treatment course and recovery time; and greater spread of TB infection to close contacts and the community.

Once diagnosed, TB patients who are infectious and/or have advanced disease may require treatment for several weeks before they are well enough to return to work. If they do not have paid leave or savings, they may lose their housing due to income loss and inability to pay rent. TB patients may also lose their housing if their household members are fearful and do not allow them to return home, despite intensive education efforts by TB control nurse case managers. Although the Alameda County TB Control Program can assist active TB patients under treatment with housing and limited food and transportation resources, this assistance cannot replace the potentially catastrophic financial losses experienced by some patients.

Patients who are diagnosed with TB may experience delays in obtaining health insurance or health benefits, such as Medi-Cal, a private Covered California insurance plan, or Health Program of Alameda County (HealthPAC). Although the safety net of HealthPAC clinics and hospitals will treat patients who do not have insurance or whose application for insurance is pending, some important TB testing and treatment services may not be easily accessed until insurance enrollment or health benefits are confirmed. Without a public health TB clinic to serve these patients, gaps in timely testing and treatment are difficult to overcome. Even patients with pre-existing health insurance may experience financial obstacles to care; some have very high co-pays for office visits, laboratory tests, or medications that are needed to treat TB. High out-of-pocket costs lead patients to delay visits to their health care provider and obtaining the tests that are needed to ensure their safety and a good response to TB medications.

Several professional health organizations recognize that health insurance alone does not guarantee true access to TB diagnosis and treatment services. In 2013, the California Medical Association and the California Conference of Local Health Officers recommended to Covered California leadership that the diagnosis and treatment of TB disease

and infection should be recognized as an essential health benefit, and that cost sharing on such services and TB medications must be prohibited. As of February 2015, Covered California has not yet responded to this request, but advocacy efforts are continuing. The World Health Organization's post-2015 Global TB Strategy also emphasizes that significant improvement in preventing TB will be impossible without universal health coverage and social protection measures that will prevent or mitigate financial hardships associated with TB.



### Acknowledgments

This brief was produced by the Alameda County  
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### Data Sources

For information on TB in California  
[http://www.cdph.ca.gov/data/statistics/Pages/  
TuberculosisDiseaseData.aspx](http://www.cdph.ca.gov/data/statistics/Pages/TuberculosisDiseaseData.aspx)