Tuberculosis in Alameda County, 2013
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 case is co-infected with other diseases.

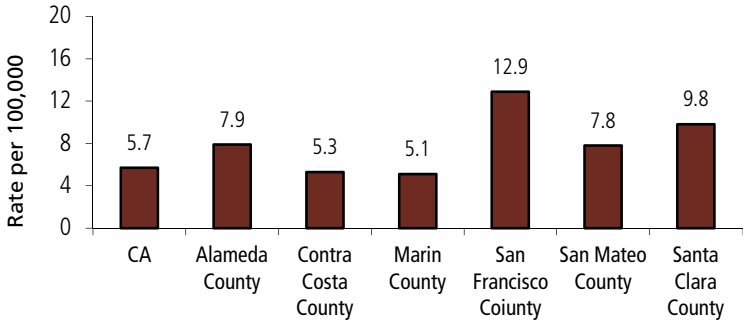
Tuberculosis can infect anyone who lives, works, and breathes in close proximity to active cases, regardless of age, sex, race, or socioeconomic status. However, it disproportionately affects the poor, homeless, and other socially marginalized groups who live in overcrowded conditions and/or lack access to healthcare. Poor nutrition, substance abuse, and co-infection with HIV, 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 supports that promote treatment adherence, like having family support in taking medication or transportation to get 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 2012. 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 rising rates of TB among foreign-born populations in the United States, California, and 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 cases separately. Alameda County's TB case rate for 2013 was 7.9 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 and Santa Clara counties, but is higher than San Mateo, Contra Costa and Marin counties (Figure 1).

Figure 1. TB Case Rates for California and San Francisco Bay Area Jurisdictions, 2013



In 2013, there were 114 cases of TB in Alameda County, a 16.2% decrease from the previous year. The number of cases in Alameda County has been decreasing overall since its most recent peak of 241 cases in 2000 (Figure 2). A lesser decrease in cases was observed in California. There were 2,170 reported TB cases in California in 2013, a 0.9% decrease from the previous year. Alameda, San Francisco, and Marin ju-

risdictions experienced decreased numbers of cases as well, while Contra Costa, San Mateo, and Santa Clara reported increases in TB cases in 2013. The rate in Alameda County is approximately 40% higher than the California rate of 5.7 per 100,000 residents and has been consistently higher than state and national rates (Figure 3).

TB Cases by Sex

In 2013, males comprised the majority (64%) of TB cases (Table 1). The average annual rate among males during 2011-2013 was 10.9 per 100,000, 1.5 times the rate of females (7.1) (Table 2).

TB Cases by Age Group

In 2013, 92.2% of TB cases occurred among individuals age 25 and over with the greatest proportion of incident tuberculosis cases among adults, age 65 years and over (32.5%). Cases among very young children often indicate recent transmission of tuberculosis, and thus are of particular concern. There were two pediatric cases of TB in children under 15 years during 2013, one of which occurred in a very young child, 0-4 years old (Table 1).

Individuals ages 65 and over also have the greatest risk of having TB as they age and their immune systems weaken. This age group had the highest average case rate of 23.9 per 100,000 during 2011-2013 (Table 2).

Figure 2. Annual TB Cases, 1993-2013
Alameda County

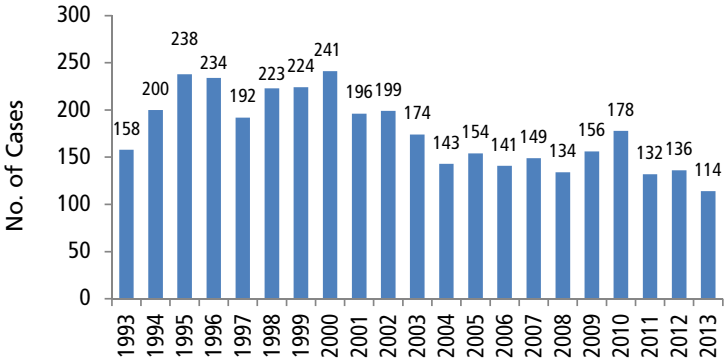


Figure 3. Annual TB Case Rates, 1993-2013
Alameda County, California and U.S.

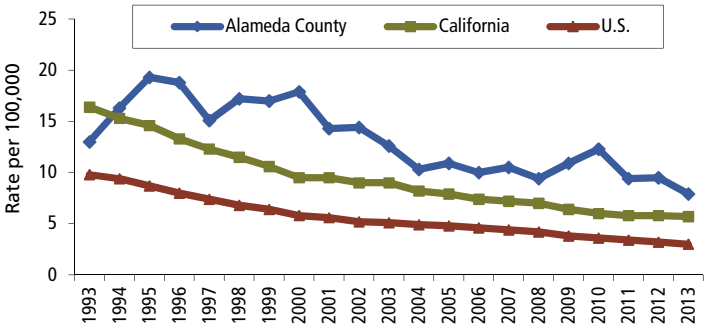


Table 1. Incident TB Cases
Alameda County, 2013

		Number of Cases (n=114)	Percent
Sex	Males	73	64.0
	Females	41	36.0
Age Group	0-4 yrs	1	0.9
	5-14 yrs	1	0.9
	15-24 yrs	7	6.1
	25-44 yrs	32	28.1
	45-64 yrs	36	31.6
	65+ yrs	37	32.5
Race/ Ethnicity	Non-Hispanic Black*	11	9.6
	Asian/PI	82	71.9
	Amer Ind/Native AK	1	0.9
	Latino	15	13.2
	White	5	4.4

Table 2. TB Cases and Average Case Rates 2011-2013, Alameda County

		Number of Cases (n=382)	Average Case Rate per 100,000
Sex	Males	228	10.9
	Females	154	7.1
Age Group	0-4 yrs	7	n/a
	5-14 yrs	10	1.9
	15-24 yrs	29	5.5
	25-44 yrs	104	8.1
	45-64 yrs	115	10.1
	65+ yrs	117	23.9
Race/ Ethnicity	Non-Hispanic Black*	41	8.1
	Asian/PI	267	22.7
	Amer Ind/Native AK	1	n/a
	Latino	48	4.7
	White	25	1.8

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TB Cases by Race/Ethnicity

People of color make up an increasing proportion of TB cases, comprising 95.6% of TB cases in 2013, compared to 86.1% in 1993. These cases were predominantly among Asians and Pacific Islanders, who made up 71.9% of new TB cases in 2013 and who consistently comprise the largest proportion of TB cases in Alameda County (Figure 4). Latinos accounted for 13.2% of cases, while Non-Hispanic Blacks* and Non-Hispanic Whites comprised 9.6% and 4.4% of tuberculosis cases respectively (Table 1).

In the period 2011-2013, Asian/Pacific Islanders had the highest average annual case rates (22.7 per 100,000), almost three times the rate among Non-Hispanic Blacks (8.1), nearly five times that of Latinos (4.7), and twelve times the rate for Non-Hispanic Whites whose average annual case rate was 1.8 (Table 2).

The distribution of TB case among racial/ethnic groups varies by place of birth. In 2013, the majority of the foreign-born incident cases occurred among Asians/Pacific Islanders (82.3%) and Latinos (13.5%). By comparison, Non-Hispanic Blacks made up the largest group of U.S.-born TB cases (44.4%), followed by Non-Hispanic Whites (22.2%), U.S.-born Asian/Pacific Islanders (16.7%) and Latinos (11.1%)(Figure 5).

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 2013, 96 of the 114 TB cases (84.2%) occurred among foreign-born. Individuals most often came from the Philippines, China, Vietnam, Mexico, and India (Figure 6).

The average annual case rate in 2011-2013 for foreign-born individuals in Alameda County was 23.3 per 100,000 residents, over ten times the rate for individuals with TB who were born in the United States (2.3).

Other Characteristics of TB Cases

TB bacteria can cause disease in the lungs (pulmonary TB) or in other parts of the body such as lymph nodes, bones and joints, and the brain or spinal cord (extra-pulmonary TB). While the majority (64.9%) of the TB cases reported in 2013 were pulmonary cases, 26.3% were extra-pulmonary, and 8.8% were both pulmonary and extra-pulmonary. Of the 84 pulmonary cases, 47 (56.0%) were smear positive and 27 (32.1%) had evidence of cavitary disease, both of which indicate a high level of infectiousness.

Figure 4. Annual Percent of TB Cases by Race/Ethnicity, Alameda County, 1993-2013

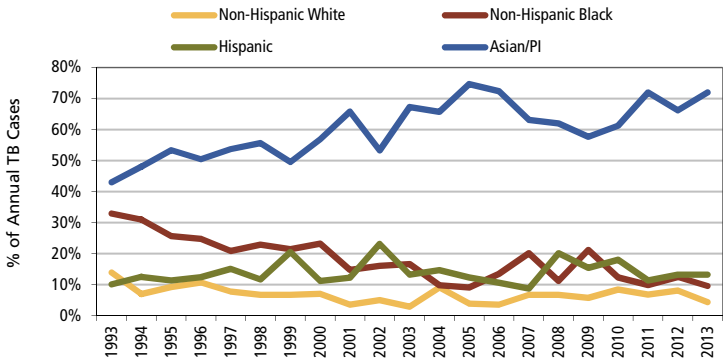


Figure 5. TB Cases by Place of Birth and Race/Ethnicity, Alameda County, 2013

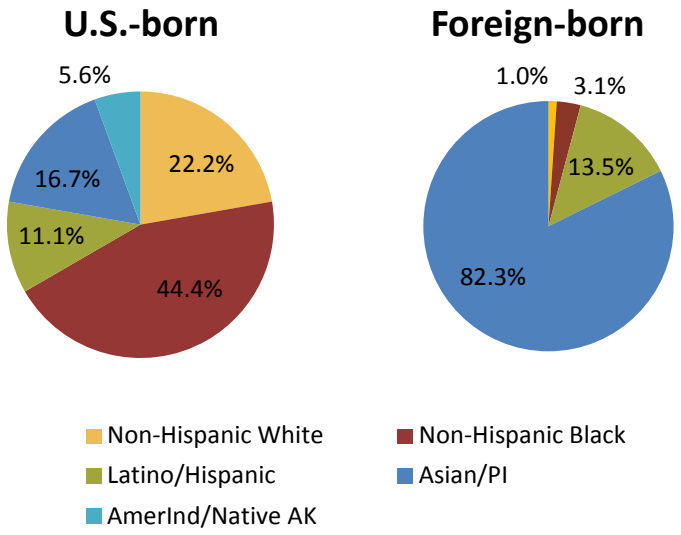
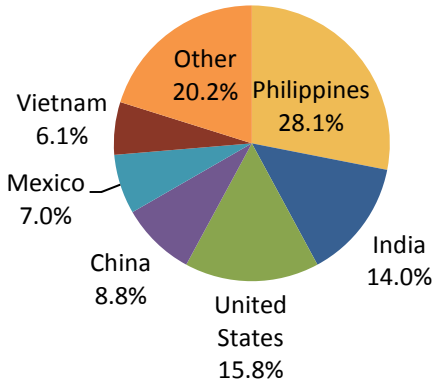
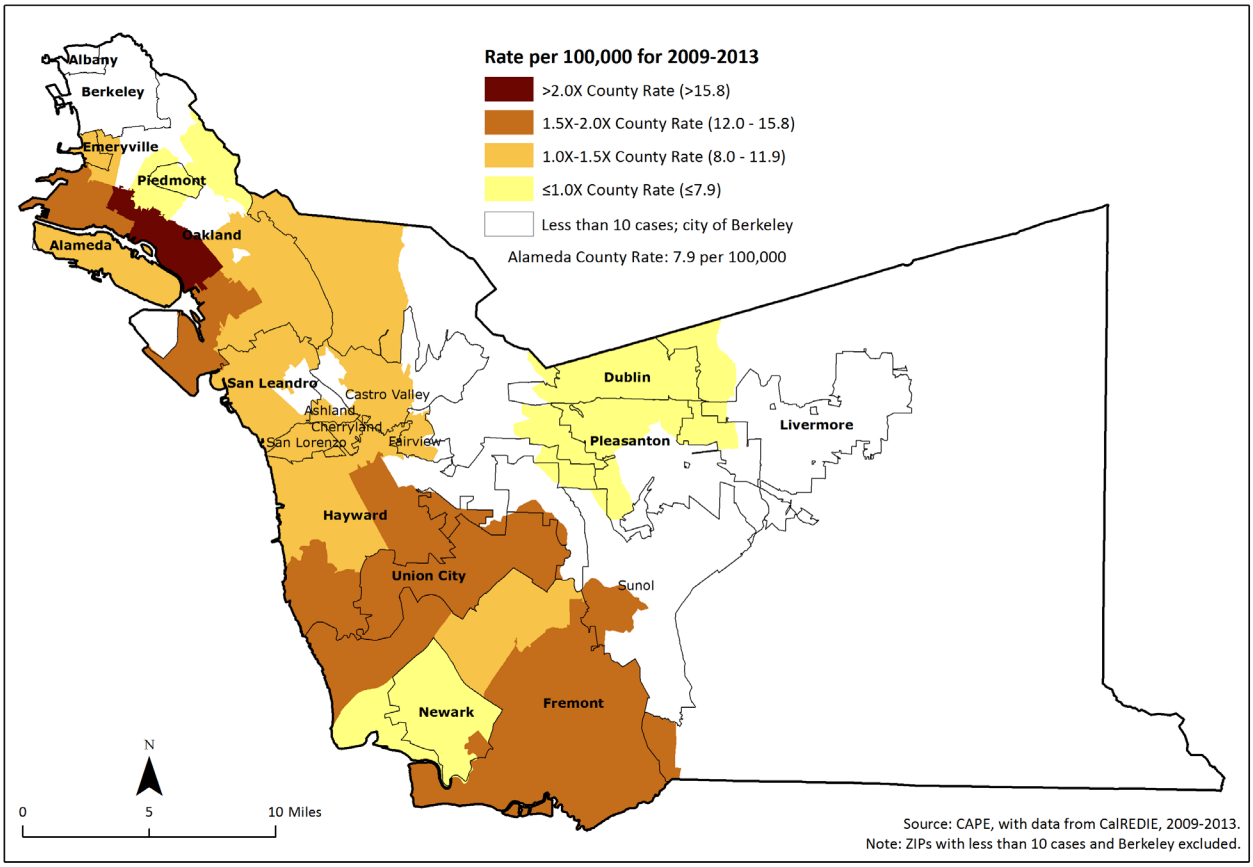


Figure 6. Incident TB Cases by Place of Birth Alameda County, 2013



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

Figure 7. Alameda County TB Rates by Zip, 2009-2013



In the 12 months prior to their TB diagnosis, seven (6.1%) of the 2013 cases had used alcohol excessively, ten(8.8%) had used non-injection drugs, and no cases reported injection drug use. Four (3.5%) had been in a long-term care facility within one year prior to diagnosis, and six (5.3%) reported having been in correctional facilities. While three (2.6%) TB cases in 2013 reported being homeless, many became displaced from their housing as a result of their TB diagnosis. The TB program assisted in providing housing for nine individuals in 2013.

Six (5.3%) of the 114 cases in 2013 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, and 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 watches 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 shown to improve TB treatment completion rates and to reduce the development of drug resistance and treatment relapse. In 2013, 70 (61.4%) cases received DOT for all or some portion of their treatment. For many other TB patients, therapy is self-administered throughout the course of treatment.

Residents of Oakland comprised 30.1% of TB cases in 2013. In the southern portion of the county, the cities of Fremont and Hayward reported the greatest proportion of cases, with 22%, and 15% respectively. Dublin, Pleasanton, and Livermore in the eastern portion of the county collectively comprised 9.6% of TB cases. The areas in the county with the highest rates are in Oakland's downtown, Fruitvale, and San Antonio neighborhoods (Figure 7).

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.

Twelve (10.5%) of the 114 TB cases in 2013 were resistant to at least one of the anti-tuberculosis medications, of which eight (7.0%) were resistant to Isoniazid (INH) (Figure 8). Multi-drug resistant (MDR) TB is a strain of TB resistant to at least Isoniazid and Rifampin, the two most potent anti-TB medications. There were no MDR cases in Alameda County in 2013, but there has been a total of 34 MDR cases since 1993. Of these MDR cases, 94% 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 pre-departure tuberculosis screening in accordance with the Centers for Disease Control and Prevention (CDC) 2007 Technical Instructions, a policy supported by the 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 his/her local health department.

In 2013, 401 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% of California's new arrivers in 2013 who required follow-up TB evaluation. Alameda County differs from the state, with a smaller proportion of individuals arriving from Mexico and a larger proportion arriving from China (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 DOT for higher-risk subgroups such as the highly infectious, multi-drug resistant, HIV co-infected, or homeless;

2) Finding, 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 TB disease, 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

Figure 8. Percent TB Cases Resistant to any TB Meds, INH Resistance and MDR Resistance, Alameda County, 1993-2013

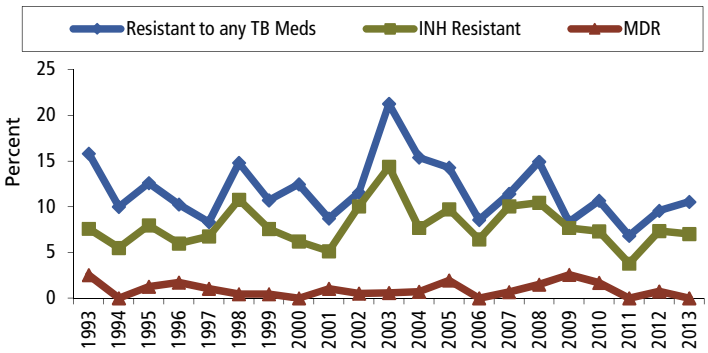


Figure 9. New Arrivers Requiring TB Evaluation Alameda County, 2001-2013

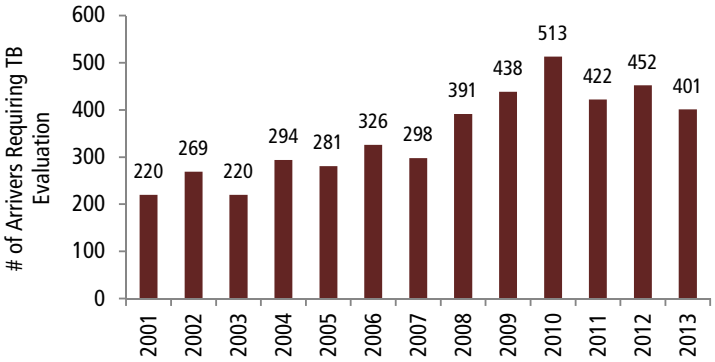
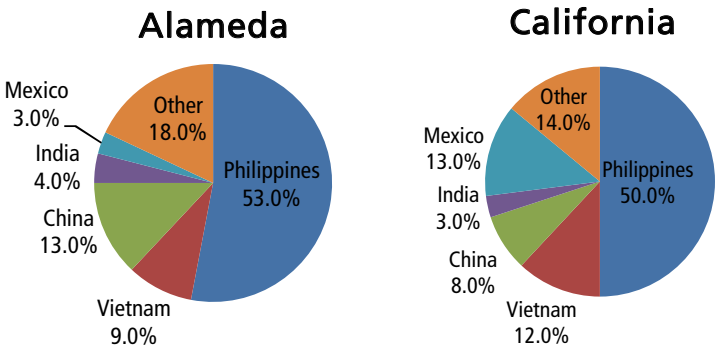


Figure 10. New Arrivers Requiring TB Evaluation by Country of Origin, 2013



transitioned into necessary ongoing support, such as a permanent medical home, housing assistance, or drug rehabilitation;
- Collaborating with HIV care providers 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, those in need of preventative services, or for patients who request assistance.

Beyond the TB Control Program, the Alameda County Public Health Department (ACPHD) is taking action to address economic and social conditions that are root causes of TB and overall health inequities. ACPHD is involved in a national Place Matters (PM) initiative, working collaboratively with multiple sectors to advance health equity through community-centered local policy focused in five key areas, including: 1) economics, 2) education, 3) housing, 4) criminal justice, and 5) land use and transportation.

Specifically supporting tuberculosis control:

- The PM Economics workgroup is working with community partners to develop a proposal for Alameda County to support the creation of an affordable small lending program to help low-income families stabilize their finances and build positive credit and financial skills. By helping to protect income and build wealth at individual and community levels, this policy would address poverty, a TB risk factor.
- The PM Housing workgroup is helping the City of Oakland to transform code enforcement services to proactively address substandard housing conditions that threaten public health and safety. Resulting improvements in housing conditions could help to reduce vulnerability to major public health problems – like TB, asthma, and lead poisoning – and support better treatment adherence among vulnerable subgroups in unstable, unhealthy housing situations.

Acknowledgments

This brief was produced by the Alameda County Public Health Department (ACPHD)

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Data Sources

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

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