

Public Health — Seattle & King County
Tuberculosis Control Program

Annual Report on Tuberculosis 2012

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Executive Summary

As members of a global community, residents of King County are vulnerable to tuberculosis (TB), a disease that's been a scourge of humanity throughout history – and currently infects one-third of the world's population and kills nearly two million people every year. Public Health – Seattle & King County's TB Control Program ensures that people with active TB disease are diagnosed and treated, and that people who are exposed to TB are evaluated and treated, if appropriate, to prevent further spread of TB.

This report details key findings and accomplishments regarding the control of TB in King County in 2012.

- In King County, 108 cases of TB were reported in 2012. The rate of TB (5.5 cases per 100,000) was unchanged from 2011 -- the lowest rate over the past 30 years in Seattle and King County. The number of TB cases in the homeless community was also unchanged from 2011 and at an all-time low.
- While the rate of TB was unchanged, there are an estimated 100,000 people with latent (or dormant) TB infection (LTBI) in King County. LTBI remains a concern because the majority of newly active TB cases come from this pool of people. Thanks to a ten-year grant from the Centers for Disease Control and Prevention (CDC), as well as new technologies and interventions, the TB Control Program has a renewed focus on improving diagnosis and treatment of LTBI. This will help decrease the number of individuals progressing to active TB disease.
- Within Washington state, 58% of the total TB cases resided in King County, and the county's rate is double the state's TB case rate. (The statewide and nationwide rates each also reached a new all-time low in 2012.)
- Two King County individuals were diagnosed and treated for multidrug-resistant TB (MDR TB) in 2012. There were zero cases locally of extensively drug-resistant TB cases (XDR TB).

The Tuberculosis (TB) Control Program

The Public Health - Seattle & King County TB Control Program works to stop the transmission of TB in King County.

We view TB control as a community effort, emphasizing public-private partnerships as part of the collaboration among local, state and national organizations.

Our services

Following national and international guidelines, priorities for the TB Control Program include:

- ensuring persons with active TB disease, especially infectious cases, are identified in a timely manner, isolated if appropriate, and fully treated until cured
- ensuring contacts of persons with infectious TB are evaluated and offered appropriate preventive therapy
- partnering with health care professionals and agencies in King County to identify and treat persons who are at high risk for latent TB infection and for progression to TB disease
- monitoring TB trends in Seattle and King County.

Services for people who have—or are suspected of having —infectious TB disease

The TB Control Program ensures that cases of active infectious TB disease are diagnosed promptly and that their treatment is initiated in a timely manner and completed. We work with health care providers in King County to establish a treatment plan for *all active TB cases*.

Through specialized case management, we ensure that patients with active TB receive health care services associated with their TB management. Directly observed therapy (DOT) for infectious and other TB cases of public health significance is part of the standard of care in King County. A trained public health worker observes patients taking their prescribed TB medications to ensure adherence and completion of TB treatment in order to protect the public.

The TB Control Program also provides social services to address any psychosocial barriers that may interfere with a patient's adherence to TB treatment, ensuring appropriate referrals and counseling for our patients.

Patient care

The TB Control program has implemented a case management model using a team-based, regionalized approach. It consists of public health nurses, disease intervention specialists, and outreach workers, who provide individualized, direct patient care. Directly observed therapy (DOT) is used for priority TB cases as the standard of care to ensure adherence and completion of TB treatment and to protect the public.

Contact Investigations

After someone is diagnosed with infectious TB disease, our program conducts and guides contact investigations to ensure that people who were exposed to TB are evaluated and treated, if appropriate. This is an effective approach to interrupting TB transmission in the community. Through evaluation of close contacts, we identify people who have developed active TB disease in a timely manner, as well as those who could benefit from treatment for latent TB infection. Congregate setting investigations take place at workplaces, schools, vocational settings, and other settings such as religious organizations and homeless shelters.

Follow-up TB Evaluation for Immigrants & Refugees

The TB Control Program evaluates new immigrants and refugees who had an abnormal chest X-ray prior to emigration. If they are diagnosed with latent TB infection, we either offer treatment or work with community partners to ensure these patients are treated as appropriate.

Treatment

New treatment options for treating latent TB infection (LTBI) are emerging that make it easier for patients to complete their medication regimens. Isoniazid has been used for treatment of LTBI for many years, but daily administration for nine months can be challenging for many patients. In 2012, we began routinely using a new three-month regimen for LTBI consisting of isoniazid and rifapentine (3-HP), thanks in part to supplemental funding from the Centers for Disease Control and Prevention (CDC). A total of 42 individuals began 3-HP treatment for LTBI in 2012.

Epidemiological Surveillance

The TB Control Program conducts surveillance for all confirmed and suspected cases of TB in King County. Our program studies trends and indicators of TB cases to better understand the dynamics of the development and transmission of

TB in our community. By analyzing data, we develop strategies to improve TB control services to our community.

Research

Our research projects seek to better understand TB control, as well as to improve treatment and management of TB and latent TB infection. Highlights of current research projects include a 10-year grant from the Centers for Disease Control and Prevention's (CDC) Tuberculosis Epidemiologic Consortium Studies (TBESC) to improve the diagnosis and treatment of latent TB infection, as well as a project to assess genetic variation immunity to TB. In 2012, a total of 103 participants were enrolled in the TBESC project. Of the 103 participants, 67 had a positive screening test for LTBI and are receiving follow-up care. Thirty-three of the 67 started treatment for LTBI.

Education and Outreach

Providing education to patients and health care providers is a fundamental element of our efforts to control TB. As part of our efforts, we participate in community events to provide information for a better understanding of TB. For example, in 2011 we began a project to develop innovative education materials geared toward foreign-born communities using a generous grant from the Firland Foundation. We also provide annual "TB Intensive" courses attended by approximately 70 health care professionals.

Quality Improvement

The TB Control Program conducts both clinical and programmatic evaluation of its activities to ensure maximum effectiveness and efficiency. We conduct weekly case review and semi-annual cohort reviews to evaluate and measure our standards in the provision of care.

Consultation to Healthcare Professionals

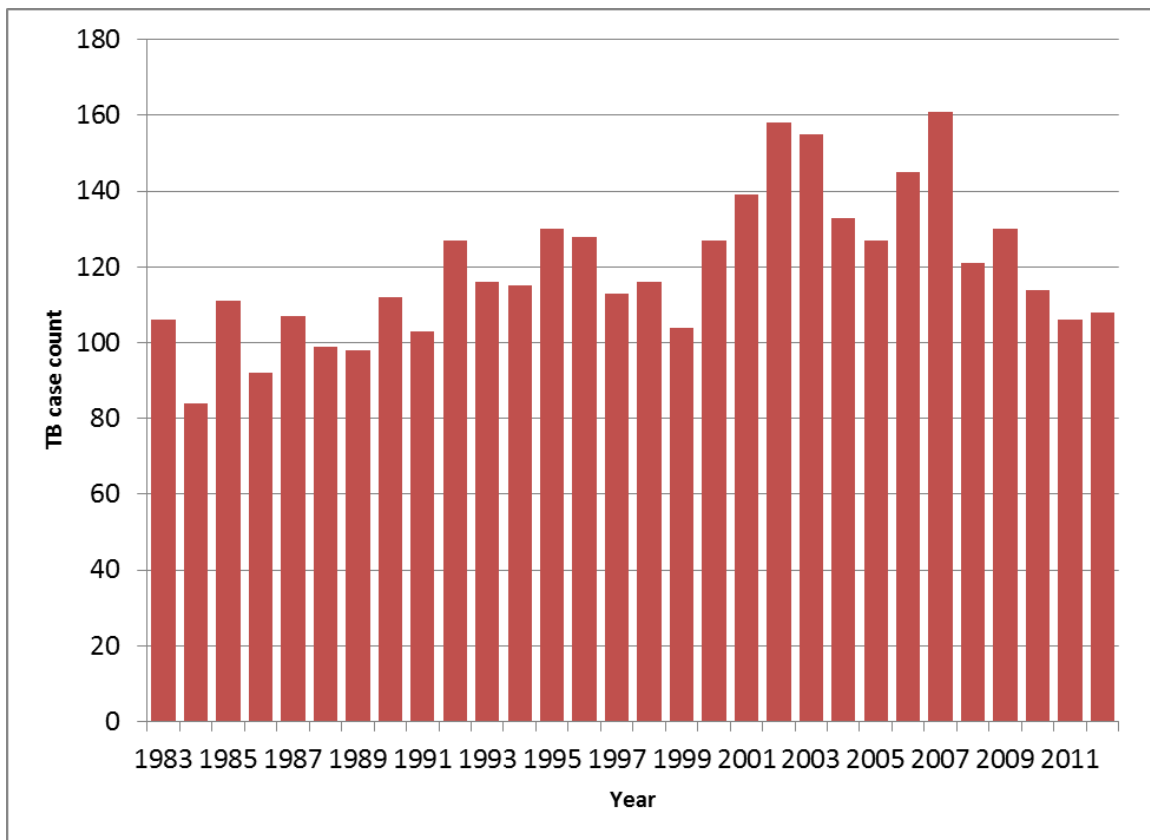
The TB Control Program provides health care professionals with consultation regarding diagnosis, treatment and policy issues on latent TB infection and active TB disease, and it participates in developing state and national TB-related guidelines.

TB in King County

Case counts and rates

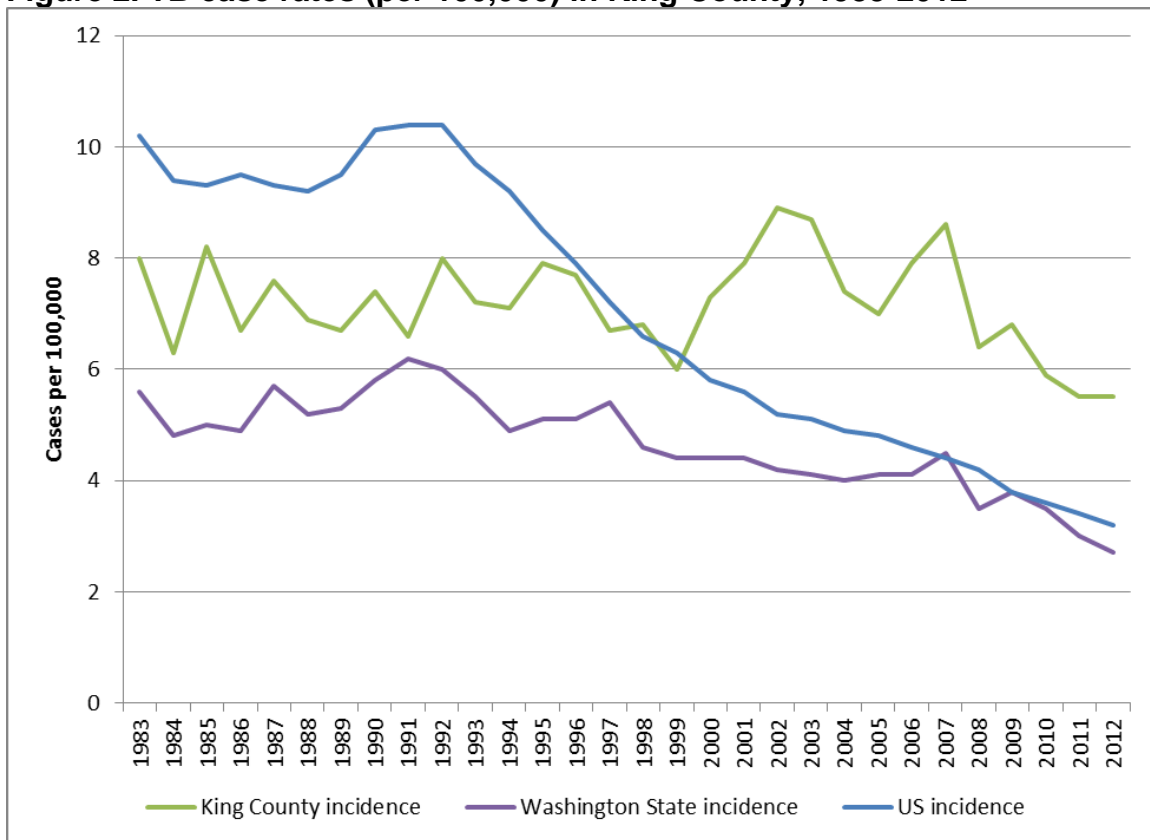
The number of reported TB cases remained stable with 108 cases in King County in 2012, compared to 106 cases in 2011(Figure 1).

Figure 1. TB case counts in King County, 1983-2012



In 2012, the active TB disease incidence rate was 5.5 cases per 100,000 people in King County, which is unchanged from 2011, and still the lowest rate in the past 30 years (Figure 2).

Figure 2. TB case rates (per 100,000) in King County, 1983-2012



While at an all-time low, the case rate of TB in King County is higher than the overall case rates in Washington and the United States. In Washington, the TB case rate decreased from 3.0 per 100,000 in 2011 to 2.7 per 100,000 in 2012, reaching a new all-time low for our state. Within Washington state, 58% of the total TB cases resided in King County.

TB incidence nationwide is also at an all-time low since national reporting began in 1953, with a continuing decline in case rates since the early 1990's. In 2012, 9,945 cases of TB were reported in the United States, with a case rate of 3.2 per 100,000 people.

Gender and Age

Historically, males comprise 55-65% of TB cases in King County. In 2012, 55% of TB cases were male. The TB case rate was 6.0 cases per 100,000 among males and 5.0 per 100,000 among females.

Table 1. TB case rate (per 100,000 population) by age group, 2008-2012, King County

| Age Group | 2008 | 2009 | 2010 | 2011 | 2012 |
|-----------|------|------|------|------|------|
| | Rate | Rate | Rate | Rate | Rate |
| 0-4 | 3.6* | 3.5* | 2.5* | 1.7* | 4.2* |
| 5-14 | 2.3* | 0.5* | 0.9* | 1.8* | 1.8 |
| 15-24 | 7.5 | 6.3 | 4.0 | 5.7 | 3.3 |
| 25-44 | 7.8 | 10.3 | 6.6 | 5.2 | 7.0 |
| 45-64 | 4.5 | 5.4 | 5.8 | 5.1 | 3.8 |
| 65+ | 11.6 | 9.4 | 13.8 | 12.4 | 12.3 |

* Case rates in the 0-4 and 5-14 ages may be unstable due to a small case count; therefore they should be interpreted with caution

In 2012, the median age of TB cases in King County was 40 years, with cases ranging in age from seven months to 87 years. The largest proportion of cases occurred in the 25-44 year-old age group, and the highest case rate was among persons 65 and older (Table 1).

In King County, nine children age 0-14 years, including five children under the age of five, were diagnosed with active TB disease in 2012. All five of the children under age five were diagnosed through contact investigations (associated adults had infectious TB disease).

Race and Ethnicity

All non-white races and ethnicities in King County continue to have disproportionately high rates of TB. For the past five years, Asians had the greatest proportion of TB cases in King County (51% of all TB cases in 2012). Blacks had the highest case rate in 2012 (24.2 cases per 100,000), which is 19 times the TB rate of whites (1.3 cases per 100,000) who have the lowest case rate (Table 2). The majority (79%) of black cases in King County were born outside of the United States. Case rates for U.S.-born and foreign-born blacks in King County are 6.7 and 84.6, respectively. Hispanics made up 8% of TB cases in King County in 2012.

Table 2. TB case rate per 100,000 population by race and ethnicity, 2008-2012, King County

| Race/Year | 2008 | 2009 | 2010 | 2011 | 2012 |
|-------------------------------------|------|------|------|------|------|
| American Indian or Alaska Native | 11.1 | 16.5 | 12.4 | 6.2 | 18.6 |
| Asian | 15.9 | 24.5 | 20.2 | 17.4 | 19.5 |
| Black or African American | 37.5 | 32.0 | 25.9 | 29.2 | 24.2 |
| Native Hawaiian or Pacific Islander | 49.2 | 32.5 | 48.3 | 13.8 | 20.7 |
| White | 1.7 | 1.1 | 1.1 | 1.4 | 1.3 |
| Hispanic | 15.7 | 9.3 | 3.5 | 4.1 | 5.2 |

TB Among People Born Outside the United States

In 2012, 80% of King County TB cases were foreign-born.¹ These individuals were born in 24 countries and one U.S. territory. Just over half (57%) of foreign-born cases came from five countries: the Philippines, Ethiopia, India, Somalia, and Vietnam.

The proportion of foreign-born cases in King County (Figure 3) remains considerably higher than the proportion of foreign-born cases in the U.S. (80% vs. 63% of cases, respectively). In addition, while the rate of TB in the U.S. is 11 times greater among foreign-born persons than among the U.S.-born persons, in King County the TB rate among the foreign-born is 15 times greater than that of U.S.-born persons.

Figure 3. Trends in TB Cases among Foreign-Born persons, 2008-2012, King County

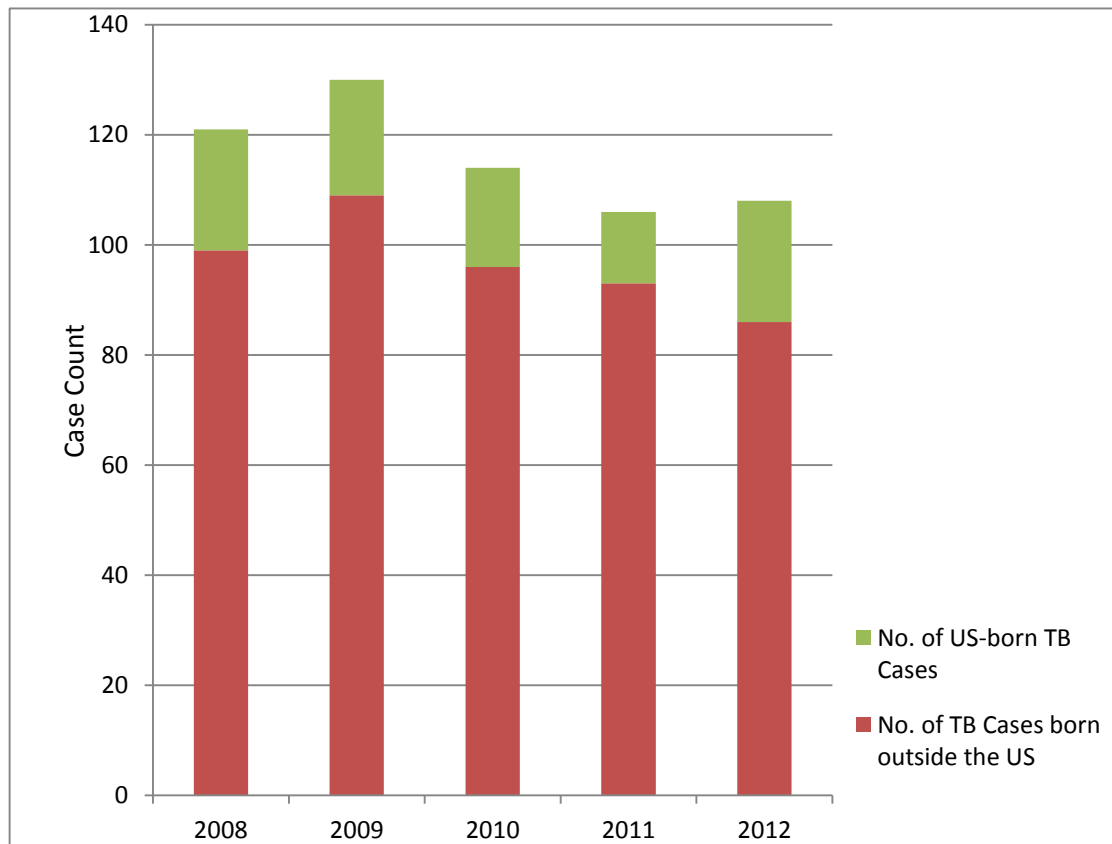
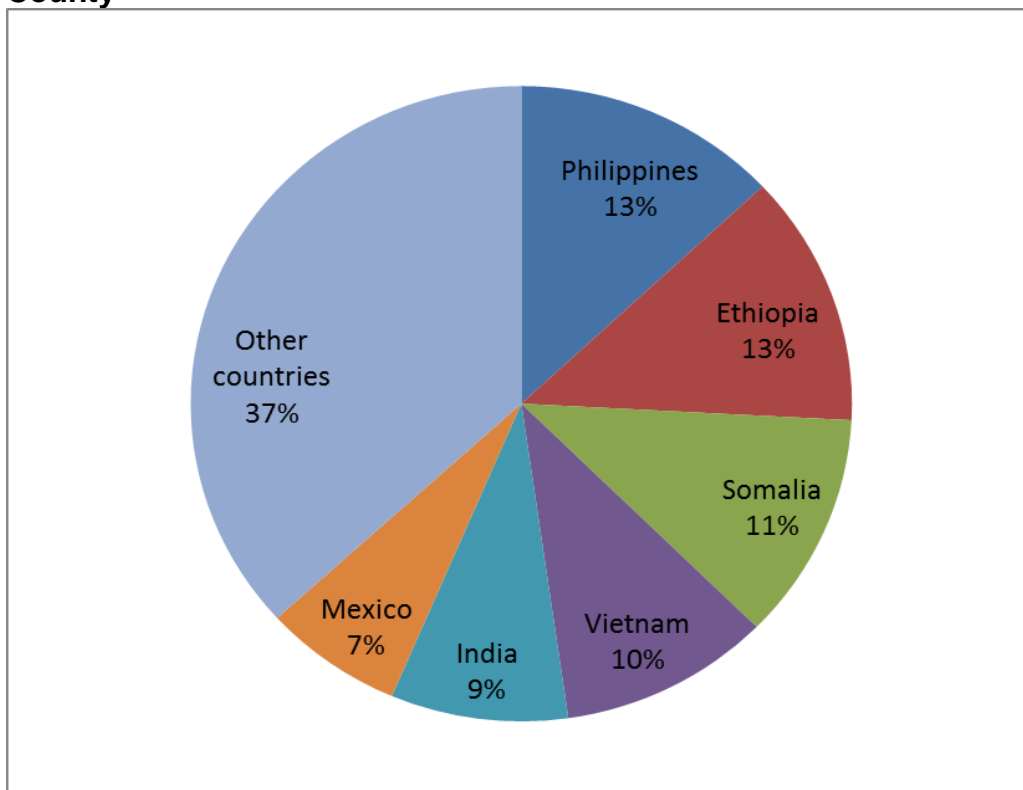


Figure 4 shows the country of origin among foreign-born cases in King County from 2008-2012.

¹ Centers for Disease Control and Prevention and the U.S. Census Bureau define "U.S.-born" as "someone born in one of the 50 states or the District of Columbia, or someone born outside the United States to at least one parent who was a U.S. citizen." All other individuals are classified as "foreign-born."

Figure 4. Country of origin among foreign-born TB cases, 2008-2012, King County



Among the foreign-born people diagnosed with TB in King County in 2012, 8% lived in the U.S. less than one year before diagnosis, 26% lived in the U.S. one to four years, and 66% lived in the U.S. five years or more when diagnosed. Nationally, in 2012, 15% of foreign-born cases lived in the U.S. less than one year, 18% one to four years, and 59% five years or more at the time of TB diagnosis, with the remaining 9% unknown.

TB and Human Immunodeficiency Virus (HIV) Co-infection

In order to provide concurrent medical care for TB and HIV infection in a timely manner and to minimize morbidity and mortality, it is important to know the HIV status of every person who has active TB disease. In 2012 in King County, HIV test results were obtained for 89% of cases with active TB disease, three (3%) of whom were co-infected with HIV and TB (Table 3). All TB-HIV infected cases were foreign-born, representing 4% of foreign-born cases with HIV-test results available. Nationally, of TB cases with HIV status available for 2012 (84%), 7% were co-infected with TB and HIV.

Table 3. HIV status among TB cases, 2008-2012, King County

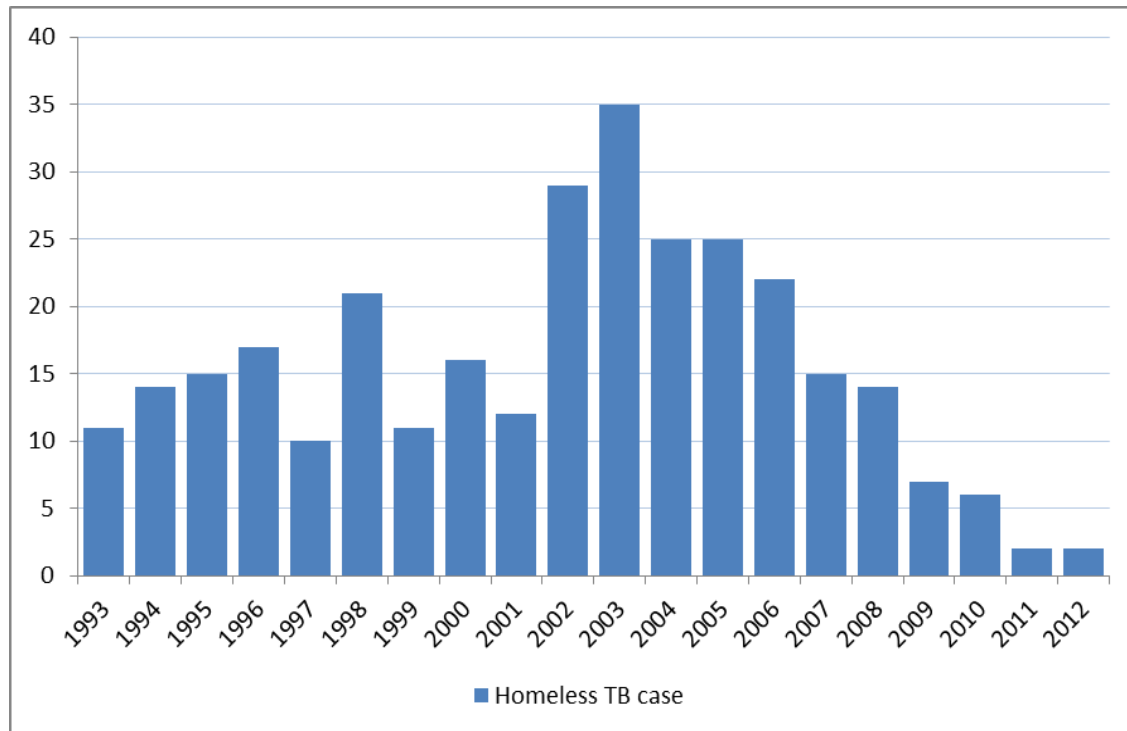
| HIV Status | 2008 | 2009 | 2010 | 2011 | 2012 |
|--------------------|---------|----------|---------|---------|---------|
| | N(%) | N(%) | N(%) | N(%) | N(%) |
| Negative | 98 (81) | 107 (82) | 89 (78) | 86 (81) | 93 (86) |
| Positive | 8 (7) | 3 (2) | 3 (3) | 4 (4) | 3 (3) |
| Refused | 4 (3) | 3 (2) | 1 (<1) | 3 (3) | 1 (1) |
| Not offered | 8 (7) | 11 (8) | 8 (7) | 10 (9) | 9 (8) |
| Unknown | 3 (2) | 6 (5) | 12 (11) | 3 (3) | 2 (2) |

TB in People who are Homeless

In 2012, two people diagnosed with active TB disease identified themselves as homeless at the time of diagnosis or in the year prior to TB diagnosis (1.9% of TB reported cases). Both were adult males, one U.S.-born and one foreign-born. Neither was co-infected with HIV. The number of homeless cases with active TB disease has decreased since its peak during an outbreak among the homeless in King County in 2002-2003 (64 active TB cases, where a single strain was responsible for 66% of homeless cases) (Figure 5). However, TB disease caused by the outbreak strain is still taking place, as indicated by genotyping results (an average of 6% of culture positive cases each year from 2007-2010). In 2011, the outbreak strain was found in one patient with active TB disease and in 2012 the strain was found in two patients with active TB with links to the homeless community. Although the persistence of the outbreak strain in the community is presumed secondary to progression from remote infection, current technology does not distinguish remote vs. recent transmission.

Nationwide in 2012, 5.7% of TB cases age 15 or older were reported as homeless, although case count and case rate varies widely among states.

Figure 5. TB case count among homeless, King County



Drug Resistance

In 2012, 23 cases (21%) treated for TB were resistant to at least one TB medication, and two individuals were diagnosed and treated for multidrug-resistant TB (MDR TB) (1.9% of all cases whose drug susceptibility results were available). Multidrug-resistant TB (MDR TB) is defined as TB that is resistant to at least isoniazid and rifampin, the two most effective first-line TB antibiotics. While treatment for a fully-susceptible (i.e., non-drug-resistant) case of TB typically lasts from six to nine months, treatment for individuals with MDR TB typically lasts from 18 to 24 months, or even longer depending on the response to treatment. Cost estimates for a typical case of MDR TB are \$250,000 or more to cure.

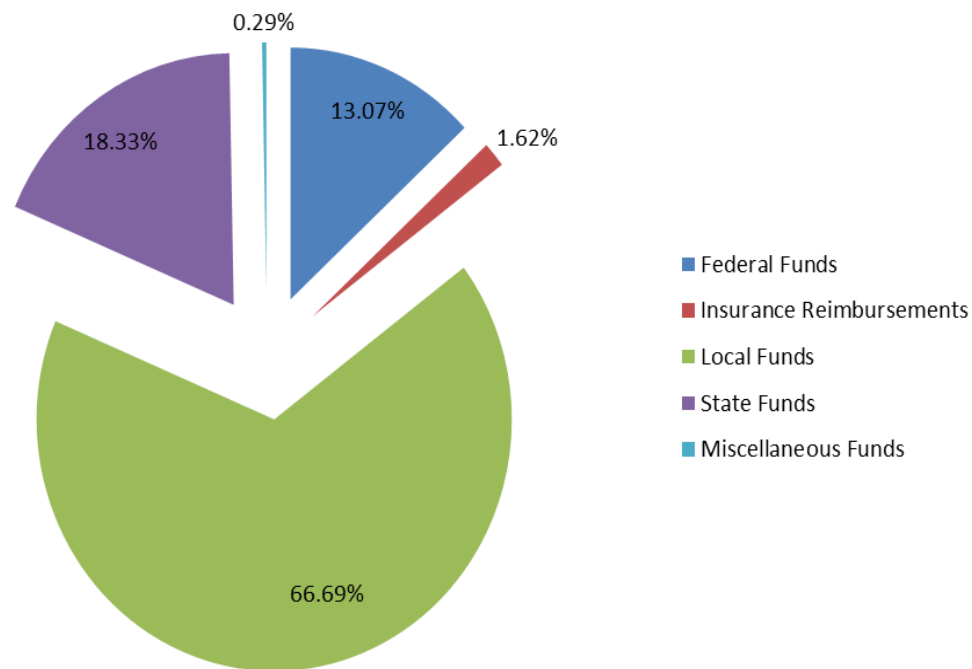
Nationally 83 cases of MDR TB were reported in 2012 (1.2% of all cases whose drug susceptibility results were available). In 2010, MDR TB continued to disproportionately affect people born outside the U.S., accounting for 87% of MDR TB cases nationwide.

There were no extensively drug-resistant TB cases (XDR TB) diagnosed in King County. Extensively drug-resistant TB is defined as resistance to INH and rifampin, plus any of the fluoroquinolones, and at least one of the three second-line injectable TB medications (i.e., amikacin, kanamycin, capreomycin). Two cases of XDR TB were reported nationally in 2012.

Funding to support TB control activities

In 2012, the TB Control Program had revenue totaling \$4,142,194.55 and employed a staff of 30.1 FTE (38 people). The Program's grant projects include educational materials for cases and contacts; the contact investigations themselves; collaboration to develop a device to rapidly diagnose multidrug-resistant (MDR) TB; and collaboration as part of the TB Epidemiological Studies Consortium (federal funding).

Figure 6. TB Control Program's Revenue Sources, King County, 2012



Technical Notes

Since TB is a reportable disease, all 2012 diagnosed cases are assumed to have been included in this report. For detailed reporting requirements, see the TB Control Program Resource Guide found on our website. Case verification is determined by the Washington State Department of Health using TB case classifications defined by the Centers for Disease Control and Prevention (CDC).

All case data came from the Public Health Information Management System database (PHIMS). This database was designed to allow counties and states to report TB surveillance data to the CDC. PHIMS uses data from the Report of Verified Case of Tuberculosis (RVCT) case report form, submitted by all reporting areas. Additional information is supplemented by internal program databases.

Patient-level genotyping data came from the CDC's Genotyping Information Management System (GIMS) database. GIMS provides TB genotyping information data for TB patients nationwide.

<http://www.cdc.gov/tb/programs/genotyping/default.htm>

King County 2008-2009 and 2011-2012 total population, age and gender are from the Washington State Office of Financial Management Intercensal and Postcensal Estimates of April 1 County Population by Age and Sex: 1990-2012.

<http://www.ofm.wa.gov/pop/asr/default.asp>

King County 2010 population, age, gender, race and ethnicity and 2011-2012 race/ethnicity (replicated from the 2010 data, which is the most recent available) are from the 2010 Census (DP-1 - King County, Washington: Profile of General Population and Housing Characteristics: 2010).

http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=DEC_10_DP_DPDP1&prodType=table

2008-2009 Race/ethnicity are from the Washington State Community Health Assessment Tool (1990-2009 Population Estimates: Population Estimates for Public Health Assessment, Washington State Department of Health and Krupski Consulting, December 2009.).

Rates of U.S.-born and foreign-born blacks are derived from the American Community Survey Selected Population Profiles (1 yr estimates), 2008-2010. 2011 and 2012 ACS data are replicated from 2010 numbers, which are the most recent data available.

http://factfinder.census.gov/servlet/DatasetMainPageServlet?_program=ACS&_submenuld=&_lang=en&_ts=http://www.kingcounty.gov/healthservices/health.aspx

Washington data are courtesy of the Washington State Department of Health.
<http://www.doh.wa.gov/cfh/TB/default.htm>

National data are from the CDC's *Reported Tuberculosis in the United States, 2012* and *Trends in Tuberculosis-United States, 2011*. *MMWR Morb Mortal Wkly Rep* 2012 Mar 23; 61:181–5.
<http://www.cdc.gov/tb>

Hispanic ethnicity is of any race. Race is single race only, regardless of ethnicity. Race definitions are changed from reports prior to 2010, which used “Black alone or in combination with one or more other races” (all ethnicities) and may result in a change in rates reported in previous years.

All charts and tables are from TB Control Program, Public Health - Seattle & King County.

Data reported for previous years may have changed slightly from what was reported in the respective year's summary, as population data are updated with current statistics upon preparation of this report.

Some percentages may not sum to 100 percent due to rounding.

Acknowledgments

We acknowledge the staff of Public Health - Seattle & King County TB Control Program for their dedication to providing high-quality patient service in order to prevent transmission of tuberculosis (TB) in King County. We wish to thank the communications team in Public Health for their review and comments on this document. We also express gratitude to our community-based medical colleagues for their diagnosis, reporting, and collaboration in the management of TB cases, as well as to the various institutions and agencies which support our case management and contact investigation efforts.

This report was prepared by Christina Thibault MPH, Monica Pecha MPH, and Masa Narita MD, as well as other staff of the Tuberculosis (TB) Control Program, Public Health - Seattle & King County

www.kingcounty.gov/health/TB