# Public Health - Seattle & King County
# Annual Report on Tuberculosis
# 2009

*A report prepared by the Tuberculosis (TB) Control Program, Public Health - Seattle & King County*

Public Health
Seattle & King County

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*Online supplement available: www.kingcounty.gov/healthservices/health/communicable/TB*

# EXECUTIVE SUMMARY

As members of a global community, residents of King County are vulnerable to tuberculosis (TB), a disease that 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 also evaluated and treated if appropriate, to prevent further spread of TB to others.

Key findings in the epidemiology of TB in King County in 2009 include:

- The case rate of TB is notably higher in King County than in Washington state or the U.S., reflecting that as an international community, King County is more vulnerable to global diseases like tuberculosis. In 2009, King County reported 130 cases of active TB. For every 100,000 residents of King County, 6.8 developed active TB disease in 2009. The Washington state case rate is 3.8 per 100,000 people, as is the U.S. case rate.

- People of color continue to have disproportionately high rates of TB, with the highest case rates among individuals who identify their race as Native Hawaiian or Pacific Islander (32.9 cases per 100,000) or black (32.3 per 100,000). Black people born outside the U.S. made up 81% of the black cases in King County in 2009.

- The vast majority of King County TB cases were born outside the U.S. TB is endemic in many parts of the world, and individuals diagnosed in King County were born in 27 different countries. Of the 109 foreign-born people (83%) diagnosed with TB, 67 (68%) came from five countries: the Philippines, Somalia, Ethiopia, Vietnam and India.

- Eighteen people treated for TB were resistant to at least one TB medication. No cases of multi-drug resistant TB were diagnosed in King County, although one person moved into the county after diagnosis. The treatment of multi-drug resistant TB typically requires the use of second-line medications, which have higher incidence of side effects, for 18 to 24 months, and it is estimates that the cost is approximately $250,000 to cure.

The TB Program remains committed to controlling the spread of TB in King County, but narrowed its focus in 2009 to managing the highest-priority cases of public health significance in response to funding cuts due to budget deficits. In addition to redesigning its case-management model, the TB Control Program also began work to shift the care and management of less-severe TB cases to local community partners.

# PREFACE



The purpose of this report is to describe the trend of Tuberculosis (TB) cases and epidemiology as well as to summarize the TB Control Program's activities in 2009. It is similar to previous publications, and additional epidemiological and programmatic data can be found in the online supplement.

# THE TB CONTROL PROGRAM MISSION AND FUNCTION

## *Tuberculosis Control Program Mission Statement*

The mission of the Public Health - Seattle & King County TB Control Program is to prevent the transmission of TB in King County.

**Background:** Tuberculosis is an infectious disease that spreads by airborne transmission. One unique aspect of TB is that the latency period (i.e., time between acquisition of TB infection and the development of active TB disease) is highly variable. If active TB disease is untreated, the five-year survival rate is approximately 50%, but with effective antibiotic treatment, the cure rate exceeds 90%. As one-third of the world's population has latent TB infection and globally two million people die each year of TB disease, TB remains a serious public health threat worldwide.

The Seattle & King County TB Control Program views local TB control as a community effort, emphasizing public-private partnerships, as part of the collaboration among local, state and national organizations.

**Priorities:** Following national and international guidelines, the TB Control Program prioritizes its functions in the following order:

1. Ensure persons with active TB are identified, isolated if appropriate, and fully treated until cured.

2. Ensure contacts of persons with infectious active TB are evaluated and offered appropriate preventive therapy.

3. Partner with health care professionals and agencies in King County to identify and treat persons who are at high risk for TB infection and reactivation of TB disease.

4. Monitor TB trends in Seattle and King County.

**Challenges for 2009 and beyond:** The bleak economic picture has forced the TB Control Program to reassess its service delivery system for the control of TB in King County. In response to budget deficits for 2009 and beyond, the TB Control Program focused its resources on the management of the highest-priority cases of public health significance:

| Priority 1 | Priority 2 | Priority 3 |
|---|---|---|
| • Highly infectious pulmonary TB cases (i.e. sputum AFB smear positive and cavitation on chest x-ray)<br>• Multi-drug resistant TB cases<br>• HIV co-infected TB cases | • Less infectious pulmonary cases (i.e. sputum AFB smear negative and no cavitation on chest x-ray) | • Extra-pulmonary TB<br>• Recently exposed contacts to infectious TB cases. |

2009 was a transition year for the TB Control Program to begin to identify, develop and implement public-private partnerships for the control of TB in King County. The success of these partnerships into 2010 and beyond will require the TB Control Program to increase TB expertise in the community through consultation, coordination and education, and ensure compliance with standards of care and state and federal reporting requirements.

## *Efforts in 2009*

In the 2009 proposed budget, the TB Control Program stood to lose $741,521 in flexible funding and 15% of its staff to large budget shortfalls caused by the economic downturn. However, in the 2009 adopted budget, the County Council directed $250,000 in additional funding to accomplish the following tasks:

- Focus on the management of the highest-priority cases of public health significance.
- Develop and implement a staffing model that redefines case management.
- Establish alliances with community partners to provide care and management of extra-pulmonary cases.

Prior to 2009, the TB Control Program provided case management and directly observed therapy to all active cases of TB disease, even those medically managed by private health care providers. In 2009, the program narrowed its focus as follows:

- The Harborview Medical Center Infectious Disease Clinic now manages extra-pulmonary TB cases referred to the TB Control Program.
- The TB Control Program discontinued the assignment of a nurse case manager to the majority of extra-pulmonary TB cases and some sputum smear negative pulmonary TB cases. This enabled the program to focus its resources on cases of the highest public health significance. Approximately 20% of cases were managed by private providers in 2009, with almost all of these individuals receiving self-administered therapy rather than directly observed therapy.
- King County was divided into four regional service delivery areas, and each region was assigned a case management team. The team consists of a public health nurse case manager, an outreach worker and a disease intervention specialist. Cases are assigned by region of residence and the case manager coordinates team activities.
- Case management is now clinic-based instead of field-based.
- Directly observed therapy is limited to pulmonary cases. Other options for directly observed therapy are under consideration.
- The disease intervention specialist conducts all contact investigations. Prior to 2009, case managers conducted household contact investigations.
- With the elimination of the dedicated homeless team in 2009, all case management teams now manage homeless cases and their close contacts.

# DATA SUMMARY

In 2009, King County reported 130 cases of active tuberculosis (TB). For every 100,000 residents of King County, 6.8 developed active TB disease in 2009.[1] The King County TB case rate is notably higher than the U.S. case rate of 3.8 cases per 100,000 population.[2]

## *Age, race, and ethnicity*

The median age of TB cases in 2009 was 36 years.

Five children aged 0-14 years, four of whom were under the age of five, were diagnosed. Three of four aged under five were diagnosed through contact investigations (i.e., family members or caretakers had active TB). One case under five years old was diagnosed within one year after immigrating to the United States.

Non-white races continue to have disproportionately high rates of TB. The highest case rate was 32.9 cases per 100,000 among individuals who identify their race as Native Hawaiian or other Pacific Islander, followed closely by blacks at 32.3. Thirty of 37 (81%) black cases in King County were born outside the U.S. Rates for U.S.-born and foreign-born blacks in King County are 6.8/100,000 and 110.4/100,000, respectively.[3]

The TB case rate in people who identify as Asian and Hispanic was 24.8 and 9.4 per 100,000 people, respectively. Rates among Native Americans returned to previous levels at 16.7 per 100,000 people in 2009 after a decrease to 11.1 in 2008.

## *Country of birth*

In 2009, 109 (84%) of King County TB cases were born outside the United States, 69 of whom (63% of foreign-born) came from five countries: the Philippines, Somalia, Ethiopia, Vietnam and India.

## *TB-HIV co-infection*

In order to provide concomitant medical care and minimize morbidity and mortality, it is important to know the HIV status of every person who has active TB. In 2009, HIV test results were obtained for 85% of people with active TB in King County. Among this group, three people were co-infected with HIV, representing 2% of TB cases. Nationwide, 72% of TB cases in 2008 had HIV test results obtained, and 6% of those with known HIV status were HIV co-infected.[4]

[1] *2009 population data from* 2009 Data Book. *State of Washington Office of Financial Management, January 2010.*

[2] Morbidity and Mortality Weekly Report. *Centers for Disease Control and Prevention. March 19, 2010. 59(10): 289-294.*

[3] *Population data from 2008 American Community Survey.*

[4] *The state of California does not report HIV status to the Centers for Disease Control and Prevention.*

## *Drug resistant TB*

In 2009, 18 people (14%) treated for TB were resistant to at least one TB medication. TB strains that are resistant to at least isoniazid and rifampin, the two key TB drugs, are called multi-drug resistant TB (MDR TB). MDR TB is exceedingly costly and difficult to treat. No MDR TB cases were diagnosed in King County in 2009.

## *Homelessness*

In 2009, seven people were diagnosed with TB who identified as currently homeless or homeless in the year prior to diagnosis. One was co-infected with HIV. The number of homeless people with TB has decreased since its peak during an outbreak among the homeless in King County (65 cases over two years [2002-2003]). The TB strain that caused the TB outbreak among the homeless in 2002-2003 was still found in eight cases with active TB diagnosed in King County in 2009.

## *Contact investigations*

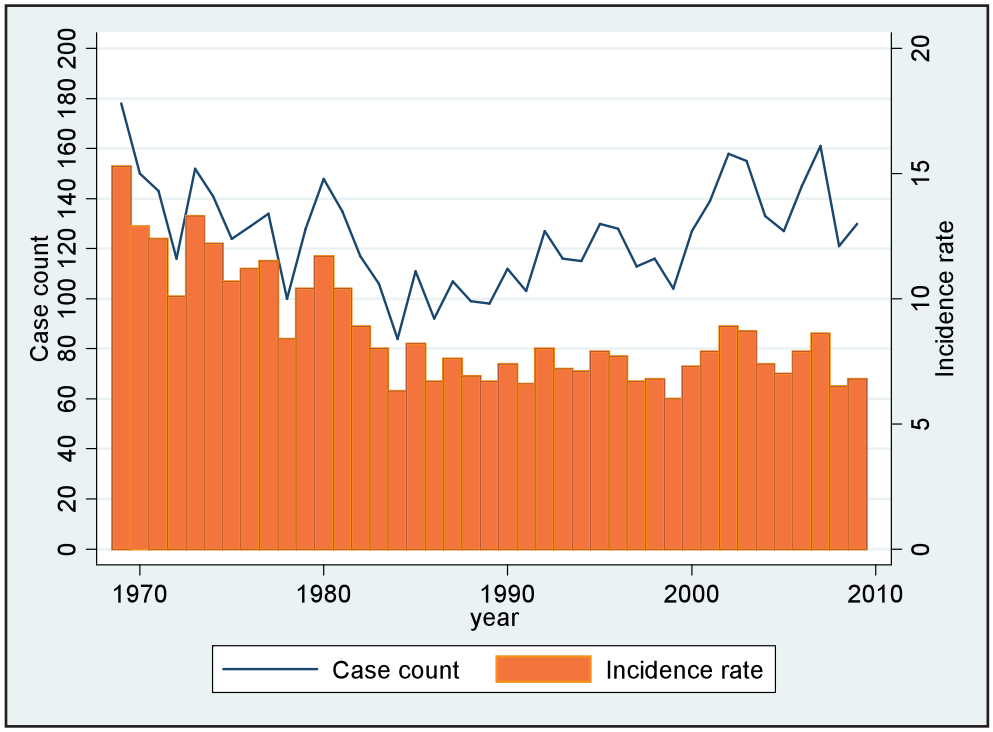
In King County contact investigations are conducted for all individuals considered infectious. In 2009, 899 close contacts, such as household contacts, were evaluated. In addition, 16 investigations were completed at congregate settings (e.g. work site, school, or nursing/medical facility) or shelters/homeless shelters.

## *Tuberculosis in King County*

### TB morbidity in 2009

The incidence rate of active TB disease in Seattle and King County was 6.8 cases per 100,000 people in 2009, compared to 6.5 cases per 100,000 people in 2008. The number of reported TB cases increased from 121 cases in 2008 to 130 cases in 2009. Figure 1 shows the TB case count and incidence rate per 100,000 people in King County from 1969 to 2009.

**Figure 1. TB case counts and incidence rates (per 100,000), 1969-2009, King County, Washington**




[3] *Centers for Disease Control and Prevention and the US Census Bureau define "US-born" if "he or she was born in the United States or associated jurisdictions or was born in a foreign country but at least 1 parent was a US citizen." All other individuals are classified as "foreign-born".*

## *Incidence rate in King County, Washington state, and the United States*

The incidence rate of TB in King County is 6.8 per 100,000 people, higher than the overall incidence rates in Washington and the United States. In Washington, the TB incidence rate increased from 3.5 per 100,000 in 2008 to 3.8 per 100,000 in 2009 (Table 1). Within Washington state, 50-60% of the total TB cases reside in King County.

In 2009, TB incidence rates in the 51 reporting areas in the U.S. (50 states plus the District of Columbia) ranged from 0.4 (Wyoming) to 9.1 (Hawaii) cases per 100,000 population, with a median of 2.7 cases per 100,000. Thirty-six reporting areas had lower TB rates in 2009 than in 2008, while 14 states had higher rates in 2009 than in 2008. [5]

### Age

In 2009, the mean age of TB cases in King County was 42 years (median 36 years), with a range from 8 months to 92 years. The highest incidence rate per 100,000 population was in the 25-44 age group (10.3 per 100,000) (Table 2).

In Washington state in 2009, the greatest proportion of people who had TB was also the 25-44 age group (47%) with the 45-64 age group comprising 22% and persons 65 and older making up 15% of cases.

The highest TB incidence rate in Washington in 2008 was seen in adults aged 65 and older with 5.8 cases per 100,000 people.

**Table 1. TB Incidence Rate (per 100,000 population), 2005-2009, in US, Washington State, and King County**

| | | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|
| **US** | Case Count | 14,093 | 13,767 | 13,292 | 12,898 | 11,540 |
| | Incidence rate (per 100,000) | 4.8 | 4.6 | 4.4 | 4.2 | 3.8 |
| **Washington** | Case Count | 256 | 262 | 291 | 228 | 256 |
| | Incidence rate (per 100,000) | 4.0 | 4.1 | 4.4 | 3.5 | 3.8 |
| **King County** | Case Count | 125 | 145 | 161 | 121 | 130 |
| | Incidence rate (per 100,000)[6] | 6.9 | 7.9 | 8.6 | 6.4 | 6.8 |

**Table 2. TB incidence rate (per 100,000 population) by age group, 2005-2009, King County, Washington**

| Age Group/Year | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|
| **0-4** | 0.9 | 1.9 | 6.4 | 3.6 | 3.5 |
| **5-14** | 1.4 | 0.9 | 2.8 | 2.3 | 0.5 |
| **15-24** | 7.0 | 7.2 | 11.9 | 7.5 | 6.3 |
| **25-44** | 6.2 | 9.4 | 9.7 | 7.8 | 10.3 |
| **45-64** | 8.1 | 7.8 | 8.4 | 4.5 | 5.4 |
| **65+** | 15.6 | 15.3 | 9.5 | 11.6 | 9.4 |

In 2009, 11,540 cases of TB were reported in the United States. This number represents an all-time low and the greatest single-year decrease ever recorded.

[5] Morbidity and Mortality Weekly Report. *Centers for Disease Control and Prevention. March 19, 2010. 59(10): 289-294.*

[6] *Population figures from Washington State Office of Financial Management April 1 Population Estimates.*

Nationally in 2008, the year with the latest data available, the greatest proportion of cases was seen among the 25-44 age group (33%) followed by the 45-64 age group (30%) and adults aged 65 and older (19%).

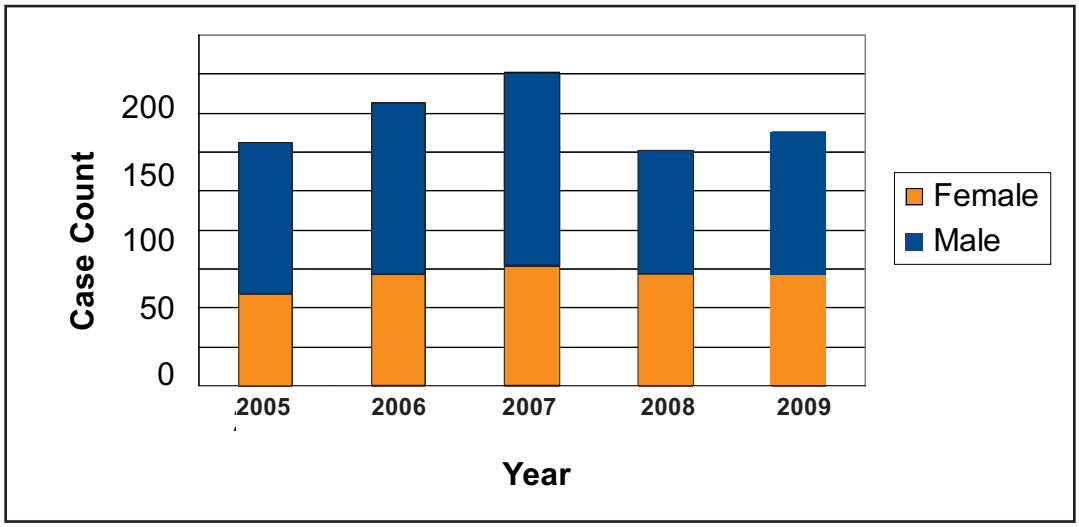
However, the highest incidence rate of TB is seen in adults aged 65 and older, 6.4 cases per 100,000 people. Individuals 25-44 years of age had the second highest case rate, with 5.1 cases per 100,000 individuals.

## *Gender*

Males comprised 56% of all King County TB cases in 2009, representing proportionately more cases than in 2008, but less than in previous years (Figure 2). The TB incidence rate among males was 7.7 cases per 100,000 and 5.9 per 100,000 among females.

In Washington, males were 61% of all TB cases. Nationally, males represented 62% of all TB cases in 2008.

**Figure 2. TB case counts by gender, 2005-2009, King County, Washington**



## *TB among people born outside the United States*

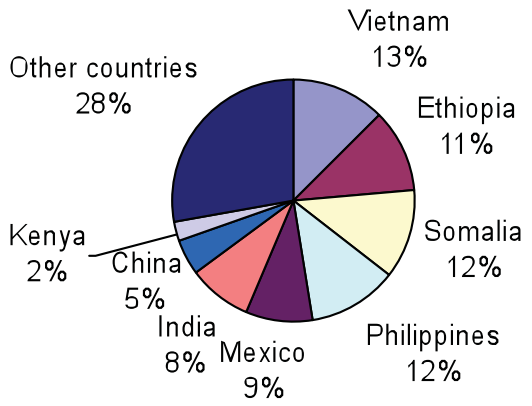
### Country of origin

In 2009, 109 people diagnosed with active TB in King County were born outside the United States (foreign-born).[7] These individuals were born in 27 countries and 68% came from five countries: the Philippines, Somalia, Ethiopia, Vietnam and India. In 2009, 23% of people with TB in King County were born in East Africa, 37% in Southeast Asia, 7% in Central America and 17% from other countries outside the United States.

The proportion of foreign-born cases (85% of all cases) in King County remains higher than that of the U.S. (60% of cases).

Figure 3 shows the country of origin among foreign-born cases from 2005 to 2009.

**Figure 3. Country of origin among foreign-born TB cases, 2005- 2009, King County, Washington**




[7] *Centers for Disease Control and Prevention and the U.S. Census Bureau define "US-born" as: if "he or she was born in the United States or associated jurisdictions or was born in a foreign country but at least 1 parent was a U.S. citizen." All other individuals are classified as "foreign-born."*

### Age and gender in foreign-born cases

The greatest number of foreign-born people diagnosed with TB in King County in 2009 were the 25-44 age group (49% of foreign-born cases). Among U.S. born cases the age group with the highest representation was the 45-64 age group (43%).

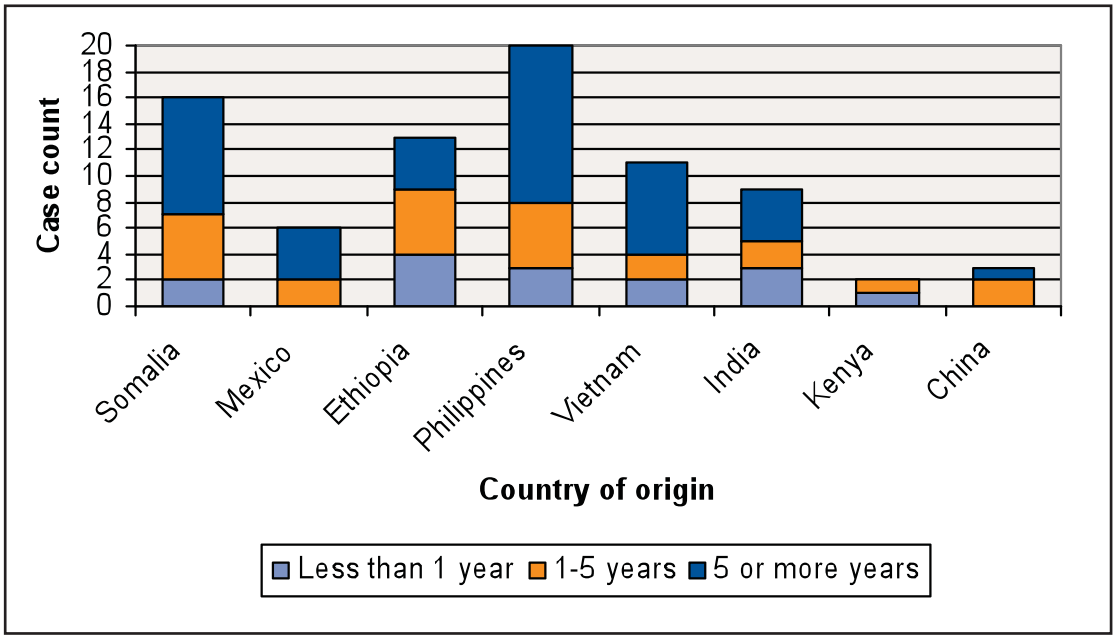
Males made up a similar proportion of cases in foreign-born (56%) and U.S.-born (57%) people.

### Duration of stay in U.S. prior to diagnosis

In 2009 in King County, the length of time since arrival in the U.S. was available for all TB cases born outside the U.S. Of this group, 19% lived in the U.S. less than one year when they were diagnosed with TB, 29% lived in the U.S. one to four years, and 60% resided in the U.S. five years or more when diagnosed. Nationally in 2009, 17% of foreign-born cases lived in the U.S. less than one year, 21% one to four years, and 51% five years or more at TB diagnosis.

Figure 4 shows the 2009 distribution of time between immigration and TB diagnosis for people born outside the U.S. for whom an arrival date is known and who are from select high-TB burden countries. Proportionally, individuals from Ethiopia and India lived in the U.S. for a shorter duration than individuals from other areas before they received a diagnosis of TB.

**Figure 4. Distribution of time between arrival in U.S. and TB diagnosis, foreign-born TB cases, 2009, King County, Washington**



## *Racial disparities and TB*

### Race and ethnicity

In 2008, (the most current data available) the highest case rates of TB nationally were among individuals identifying as Asian (25.6 cases per 100,000) and Native Hawaiian or other Pacific Islander (15.9 cases per 100,000).

All non-white race and ethnicities in King County continue to have disproportionately high rates of TB. In 2009, Asians represented the greatest proportion of all TB cases (47%) in King County, and the highest incidence rate was among people who identify as Native Hawaiian or other Pacific Islander (32.9 cases per 100,000). For the past 10 years, the greatest proportion of TB cases in a single racial group in King County occurs among people who identify as Asian. Table 3 shows TB incidence rate in King County by race and ethnicity for 2005-2009.

People who identify as Hispanic represented 9% of TB cases in 2009, a decrease from the 17% seen in 2008, 12% in 2007, and 13% in 2006. Hispanics had an incidence rate of 9.4 per 100,000 in 2009 compared to 15.7 per 100,000 in 2008.

The largest decrease in TB incidence rate from 2008 to 2009 was seen among Native Hawaiians and other Pacific Islanders (49.2/100,000 to 32.9/100,000). The largest increase was among Asians (15.9 to 24.8 per 100,000 from 2008 to 2009), but the rate remains below levels from 2005 to 2007.

**Table 3. TB incidence per 100,000 population by race and ethnicity, 2005-2009, King County, Washington**

| Race/Year | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|
| Am. Indian or Alaska Native | 17.1 | 17.0 | 27.9 | 11.1 | 16.7 |
| Asian | 25.7 | 31.8 | 27.9 | 15.9 | 24.8 |
| Black | 32.5 | 26.6 | 43.2 | 37.5 | 32.3 |
| Native HI./Pac. Is | 19.3 | 26.8 | 88.3 | 49.2 | 32.9 |
| White | 2.1 | 2.7 | 2.2 | 1.7 | 1.1 |
| Hispanic | 10.0 | 16.1 | 17.6 | 15.7 | 9.4 |

## *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. In 2009, HIV test results were obtained for 85% of people with active TB, three (2%) of whom were co-infected with HIV and TB (Table 4). In King County, 11% of U.S.-born and 1% of foreign-born cases with HIV-test results available were TB-HIV co-infected. In 2009, all HIV-positive people with TB knew their HIV sero-status prior to their TB diagnostic evaluation. The U.S. Centers for Disease Control and Prevention (CDC) reported that over one-third of 2008 U.S. TB cases did not have the results of a recent (within three months of TB report) HIV test available. Nationally, of those with HIV status available for 2009, about 10% are co-infected with TB and HIV. (California and Vermont do not report this statistic).

**Table 4. HIV status among TB cases, 2009, King County, Washington**

| HIV Status | 2005 N (%) | 2006 N (%) | 2007 N (%) | 2008 N (%) | 2009 N (%) |
|---|---|---|---|---|---|
| Negative | 90 (72) | 113 (78) | 141 (88) | 98 (81) | 107 (82) |
| Positive | 7 (6) | 10 (7) | 9 (6) | 8 (7) | 3 (2) |
| Refused | 17 (14) | 6 (4) | 3 (2) | 4 (3) | 3 (2) |
| Not offered | 1 (<1%) | 8 (6) | 5 (3) | 8 (7) | 11 (8) |
| Unknown | 9 (7) | 7 (5) | 3 (2) | 3 (2) | 6 (5) |

## *Drug resistance of TB*

Multi-drug resistant TB (MDR TB) is defined as TB that is resistant to at least isoniazid (INH) 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.

There were no individuals diagnosed as having MDR TB in King County in 2009, although one individual transferred in after being diagnosed elsewhere. For comparison, nationally 103 cases of MDR TB were reported in 2008 (1.1% of cases with drug susceptibility results available), the most recent year for which data are available. The proportion of MDR TB cases in the United States has been stable since 1997. In 2008, MDR TB continued to disproportionately affect people born outside the United States, accounting for 78.6% of MDR TB cases that year.

Extensively drug-resistant TB (XDR TB) is defined as resistance to INH and rifampin, as well as any of the flouroquinolones, and at least one of the three second-line injectable TB medications (amikacin, kanamycin, or capreomycin). No XDR TB cases were reported in King County in 2009. Two cases of XDR TB were reported nationally in 2007, and provisional data indicate that four XDR TB cases were reported in 2008. As of March 19, 2010 (latest available data), no cases of XDR TB had been reported for 2009[8]

## *TB in people who are homeless*

Seven homeless persons were diagnosed with active TB in 2009, comprising 5% of all TB cases in Seattle and King County. Thirteen homeless people with TB were reported in King County in 2008, representing 11% of all cases that year.

Homelessness is defined as lacking a fixed, regular, and adequate night-time residence or occupying a primary night-time residence that is a supervised shelter designed to provide temporary living accommodations. For the purpose of reporting at the national level, cases reported as homeless must be homeless within the 12 months prior to the initiation of their TB diagnostic evaluation. It should be noted that the number of individuals (15) reporting a recent homeless history beyond 12 months prior to evaluation was more than double the count under this definition.

The median age (48) of homeless people who were diagnosed with active TB in 2009 was higher than in 2008 (40).

In 2008, five of the 13 (38%) homeless cases were born in the U.S. In 2009, three of the seven homeless cases were born in the U.S. (43% of homeless cases).

One of the seven homeless cases identified as Hispanic (14%), representing a decrease from the seven Hispanic homeless cases (54% of homeless cases) reported in 2008.

None of the seven homeless cases identified as American Indian or Alaska Native, compared to two of 13 cases in 2008 (15%). The number and proportion of American Indian cases has remained low since the 2002-2003 TB outbreak among the homeless subsided. (In 2002-2003, 43% were Native American.)

Nationwide in 2008, 5.7% of TB cases were reported as homeless, although case count and incidence rate varies widely between states.

[8] Morbidity and Mortality Weekly Report. *Centers for Disease Control and Prevention. March 19, 2010. 59(10): 289-294.*

## *TB contact investigations*

Contact investigations are conducted in household settings for all people with infectious TB. A team comprised of nurse case managers and disease intervention specialists is responsible for identifying and evaluating all household contacts and "very close social contacts." In general, household contacts are family members of an infectious TB case and "very close social contacts" including close friends, relatives, and coworkers who spend many hours together in a confined space.

An estimated 899 close contacts were identified in King County in 2009. Of these, 780 (87%) individuals received an evaluation for TB. Evaluation consisted of history, symptom check and a test for latent TB infection (TB skin test or Quantiferon Gold In-Tube [QFT]), if indicated. Of the contacts evaluated, 662 (85%) had a TB skin test or QFT administered and read. Fifty percent were skin test or QFT positive on first round (or immediately after being identified as close contact). On second round (or 8–10 weeks after the last exposure to an infectious TB case), 13% percent were skin test or QFT positive. The overall TB infection rate was 23% positive among close contacts. A TST/QFT conversion rate of approximately 3% was observed, indicating potential transmission among these close contacts. The number of those evaluated did not include close contacts whose names were obtained but were never located. One-hundred and twenty seven infected contacts (77%) began treatment for latent TB infection, of whom 36% have completed treatment, 33% are still on treatment, with the remainder either moved, lost, or treatment discontinued for other reasons.

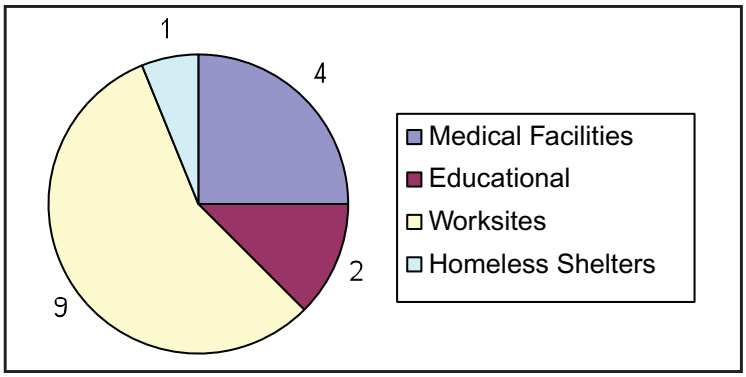
In 2009, contact investigations (primary and expanded combined) uncovered seven additional secondary TB cases. Seven of 780 (1%) contacts evaluated were thus diagnosed as active TB cases. Of all 130 cases in 2009, seven (5%) were discovered as a result of contact investigation. When an index case was highly infectious, or a household contact investigation suggested TB transmission (i.e. TB infection rate higher than expected), the contact investigation was expanded to the second tier of people who were less intensely exposed to the index case ("expanded contact investigations"). Additionally, when necessary, if the index case spent prolonged hours in congregate settings, contact investigations were expanded and people at the setting were evaluated. Congregate settings typically include schools, colleges, shelters, work sites and nursing homes.

### TB cases in schools or other congregate settings

The TB Control Program's outbreak prevention section is responsible for investigating TB exposure in congregate settings, outbreak response, and surveillance. Congregate setting investigations take place at workplaces, schools, vocational settings, and other settings such as nursing homes, religious organizations and homeless shelters.

In 2009, the TB Control Program conducted contact investigations at 16 congregate setting sites, as outlined in Figure 5 below.

**Figure 5. Non-homeless Congregate Setting Investigation Sites, 2009**



# ACKNOWLEDGEMENTS

We 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 that support our case management and contact investigation efforts. We also 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 TB in King County.

For more detailed epidemiological and programmatic data please see our online supplement: www.kingcounty.gov/healthservices/health/communicable/TB

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