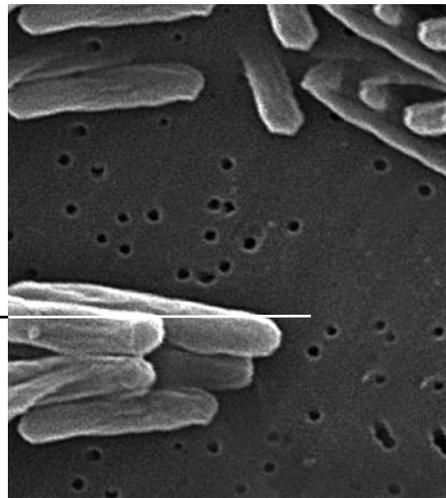


Seattle & King County
Annual
Tuberculosis
Report

2006



Public Health 
Seattle & King County

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Acknowledgement

We acknowledge the staff of Public Health - Seattle & King County's Tuberculosis Control Program for their collective hard work and dedication to provide the best patient care possible and to prevent further transmission of TB in King County. Additional gratitude is extended 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 have supported our case management and contact investigation efforts.

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2006 Report Highlights

In 2006, King County reported 145 cases of active tuberculosis (TB) disease, representing an 18% increase from the 2005 count. King County had a TB rate of 7.9 cases per every 100,000 individuals; this rate remains higher than the national rate (4.6 per 100,000). Eighty percent of the 145 cases reported (116 cases) were born outside the United States (U.S.), an increase from 95 foreign-born cases (75% of all cases) in 2005.

Age, Race, Ethnicity and Nativity

TB case rates vary by factors such as age, race, ethnicity and country of origin. The 25-44 year old age group continues to represent the largest proportion (39%) of cases seen in King County. The TB case rate among children 0-14 years of age continued to be low, at 1.3 per 100,000. Blacks (30.9 per 100,000) and Asians (38.3 per 100,000) continue to have disproportionately higher rates of TB. TB case rates among Hispanics continued to be higher than for non-Hispanics. Of the 116 cases born outside the U.S., the highest case numbers came from the Philippines, Vietnam, Ethiopia, India, and Mexico.

TB-Human Immunodeficiency Virus (HIV) Co-infection

HIV is a significant risk factor for TB. In 2006, ten TB cases among HIV infected persons were reported in King County, representing 6.9% of all TB cases. This represents an increase from 2004-2005, but is consistent with proportions from 2001-2003. The proportion of cases offered HIV testing in King County has improved from 85% to over 94% over the past five years. The program prioritizes continual trainings and places a focus on obtaining HIV tests for every active TB case.

Drug Resistant TB

In 2006, 16% (20) of TB cases in King County were drug-resistant to at least one TB medication.

Importantly, 9% of all TB cases exhibited primary resistance to isoniazid (INH) in 2006, compared to 10% the year before. Multi-drug resistant (MDR) TB is exceedingly costly and difficult to treat. King County reported three cases of MDR-TB (2% of all cases) in 2006.

TB Treatment

The proportion of TB patients initially placed on a standard four-drug regimen remains above 90 percent. The proportion of patients who were treated with directly observed therapy has increased from 61% in 2001 to 99% in 2004, the latest year with complete treatment outcome data.

Summary

The program continues to face many ongoing challenges. These challenges include a high proportion of TB patients who live under poverty thresholds, patients from diverse backgrounds, and the transient and migratory nature of many individuals at high risk for TB. Due to the large pool of individuals with latent TB infection – an estimated 100,000 people in King County, and one third of the world's population – and the lack of convenient preventive medications or an effective TB vaccine, it is unlikely that TB will be eliminated in the near future. To manage this disease with the tools currently available, the King County TB Control Program focuses on three fundamental principals: (1) case management of patients with active TB disease in order to assure the cure of all TB cases, stop further transmission of TB and prevent development of multi-drug resistant TB; (2) timely and thorough contact investigations around active TB cases to identify, evaluate and treat those who were exposed and/or recently infected; and (3) collaborative efforts with a number of public health and community partners, particularly to enhance targeted TB testing and treatment of latent TB infection.

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Tuberculosis Control Program Mission Statement

The mission of Public Health - Seattle & King County Tuberculosis Control Program is to protect the people of Seattle and King County from tuberculosis transmission.

Background: Tuberculosis (TB) is an infectious disease which spreads by airborne transmission. TB has a highly variable latency period, or the time between infection and the development of active disease. Without treatment, TB is fatal for approximately 50% of people, but with effective antibiotic treatment it is preventable and curable. Given that one-third of the world's population has latent TB infection and two million people a year die of TB globally, the disease remains a serious public health threat worldwide.

The Seattle & King County TB Control Program views TB control as a public-private partnership, collaborating with other local, state, and national organizations in a way that provides the people of King County with the best available prevention and treatment services.

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

1. Ensure persons with active TB are found, isolated and fully treated until cured.
2. Ensure contacts of persons with infectious TB are screened and offered appropriate preventive therapy
3. Work closely 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.

In order to respond to 30-year historic high case counts (158 TB cases) in 2002, several new TB control efforts were initiated between 2002 and 2005. These standards continued to be implemented in 2006:

- A nurse case management model was introduced with five teams which consist of public health nurses and outreach workers, providing individualized and direct patient care;
- Enhanced partnerships with public health agencies and the private sector to increase the proportion of patients receiving directly observed therapy and case management; and
- A focused yet thorough approach to contact investigations. A team of two epidemiologists and two disease intervention specialists conducts screenings, and collects, manages and analyzes data for over 1,000 contacts annually.

Core Activities

The TB Control Program is mandated by Washington state law to perform public health functions related to surveillance, case finding, epidemiologic analysis, and contact tracing. State law requires local health departments to conduct the following core TB control functions:

Assuring Completion of Treatment of Active Cases of TB

The highest priority of any TB control program is assuring the complete and appropriate treatment of persons with active TB. Treatment helps those who are suffering from the disease and stops transmission of TB. Complete and appropriate treatment reduces the risk of disease relapse and prevents the development of drug resistant TB strains.

The TB Control Program takes an individualized case management approach to treatment. Medical providers are required by law to report every suspected case of TB to the health department of the patient's county of residence. Directly observed therapy (DOT) is considered for every person with TB in King County. The TB Control Program achieves a very high treatment completion rate (over 90%) by considering each patient's individual needs and utilizing a range of incentives and enablers. Voluntary compliance with treatment is very successful, but in rare instances, the TB control officer will issue directives to comply with evaluation and treatment. Violation of the directive is referred to the Prosecuting Attorney for consideration of court orders and/or detention, as necessary.

Contact Investigations

Persons with untreated tuberculosis disease of the lungs can spread TB bacteria to others. Approximately one in three household contacts

of a person with infectious TB can be expected to acquire latent TB infection. Since people are at the highest risk of developing active TB disease in the first two years after acquiring latent TB infection, finding newly infected contacts of persons with active TB disease is a very high priority. Infected persons can be given treatment that greatly reduces their chances of developing active TB disease. Treatment of persons with latent TB infection reduces the likelihood of developing active disease by up to 92 percent.

The TB Control Program takes a concentric circle approach to contact investigations. The closest contacts of a person with infectious TB are evaluated first, usually with symptom reviews and TB skin tests. If a high rate of infection is found in that group, the next closest circle is investigated. Since the skin test can turn positive eight to ten weeks after the last exposure, contacts are re-tested as late as ten weeks after exposure to determine whether infection has occurred. Persons with TB infection are usually treated, but highly vulnerable close contacts, such as infants and persons with HIV infection, may receive treatment regardless of the skin test result.

Screening and Treatment for High Risk Populations

The TB Control Program provides direct service to complete the TB evaluation for recent immigrants whose screening chest X-rays were abnormal and suggestive of possible TB ("Class B" immigrants). Although cleared upon emigration based on negative sputum examination (AFB smear), approximately two to five percent have smear-negative, culture-positive pulmonary TB. Even with inactive TB status, these immigrants pose a high risk of developing TB in the future. In addition, the TB Control Program works closely with the King County Refugee Screening Program to evaluate all refugees.

Surveillance

The TB Control Program participates in a TB surveillance network that includes weekly reporting of active cases to the state and national control programs. The program performs epidemiological analysis to track trends in local patterns of TB incidence, drug resistance, and other parameters. A report detailing TB in Seattle-King County is published annually. Further, the case counts are published in each edition of Epi-Log, a monthly epidemiological newsletter of Public Health - Seattle & King County.

The TB Control Program uses the Tuberculosis Information Management System (TIMS) database for program and case management. TIMS was developed by the Centers for Disease Control and Prevention (CDC) for standardized TB data collection and analysis. Case reports are transmitted through a secure modem to the state, then on to the federal program for accurate epidemiological assessments. In addition, the program uses several local databases for case and contact tracking.

Medical Consultation and Training

Seattle & King County TB Control Program serves as a resource for health care providers seeking:

- General information on TB screening, diagnosis, and treatment;
- Specialty consultation on diagnosis and management of challenging TB cases; and
- Lectures and in-services for physicians-in-training, and community-based health care providers.

Additionally, the TB Control Program collaborates with local graduate and post-graduate educational programs on an array of TB evaluation and management projects.

1. TB IN KING COUNTY

Tuberculosis Morbidity in 2006

The incidence rate of active tuberculosis (TB) disease in Seattle & King County was 7.9 TB cases per 100,000 people in 2006, compared to the case rate of 7.0 per 100,000 in 2005. The number of TB cases increased from 125 reported in 2005 to 145 reported in 2006 (Figure 1).

This increase may be due to fluctuating immigration patterns from high TB prevalence countries (over 30% infection rate), as well as the substantial number of persons already living in King County with latent TB infection. Fifteen percent of King County residents are reported to be foreign-born. In addition, the proportion of smear positive, pulmonary TB cases (indicator of infectiousness)

increased in comparison to 2006, which may have contributed to the number of secondary cases seen in 2005 (see Section 11. Disease Characteristics).

The incidence of TB in Seattle & King County continues to be higher than the overall incidence in Washington State and the United States. In Washington State, the case rate remained stable, with an incidence of 4.1 per 100,000 in 2006 (Table 1).

In 2006, 13,767 cases of TB were reported in the United States. The five highest metropolitan statistical areas for TB incidence in 2005 were McAllen, TX (12.5 per 100,000), San Francisco, CA (12.1 per 100,000), San Jose, CA (12.0 per 100,000), New York City, NY (11.9 per 100,000) and Miami, FL (11.4 per 100,000).

FIGURE 1: TUBERCULOSIS CASES, KING COUNTY, 1969-2006

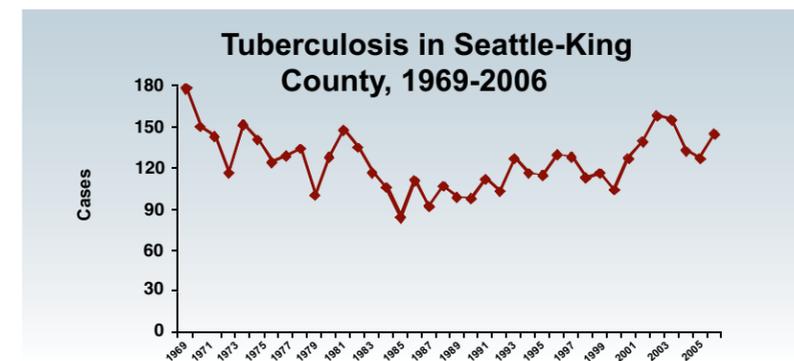


TABLE 1: TUBERCULOSIS CASES RATES, 2001-2006 FOR U.S., WASHINGTON AND SEATTLE & KING COUNTY

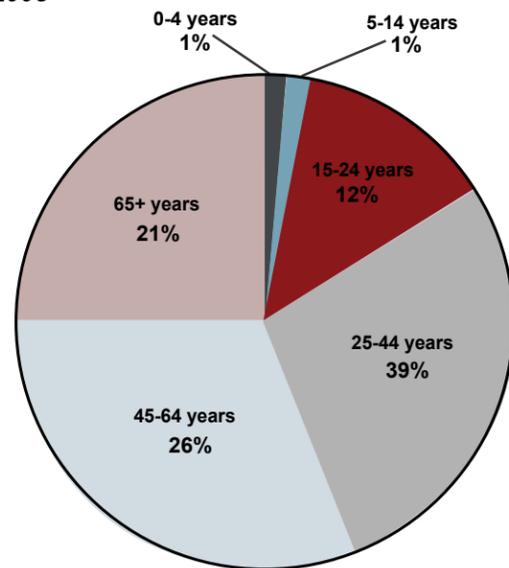
		2001	2002	2003	2004	2005	2006
U.S.A.	Count	15,945	15,057	14,852	14,517	14,093	13,767
	rate/100,000	5.6	5.2	5.1	4.9	4.8	4.6
Washington State	Count	261	252	250	245	256	262
	rate/100,000	4.3	4.1	4.0	3.9	4.0	4.1
Seattle & King County	Count	139	158	155	134	125	145
	rate/100,000	7.9	8.9	8.7	7.4	6.9	7.9

Due to delayed classification modifications there have been slight changes in counts and incidence rates for 2004 and 2005 King County cases.

Age Groups

In 2006, the mean age of TB cases was 46 years (median 43 years). Cases ranged from 1 to 94 years of age. The greatest proportion of TB cases in King County was among individuals 25-44 years of age (Figure 2). While this group has represented the largest proportion of TB cases in King County for many years, the absolute number of cases in this group has been decreasing in recent years (Figure 3). However, in 2006 both the number of TB cases and proportion of TB cases in this age group increased. The 2006 proportion of 25-44 year olds was similar to what was seen in 2003 (Figure 3). Of the 55 individuals that comprise this age category, 80% were foreign-born.

FIGURE 2. TUBERCULOSIS CASES BY AGE GROUP, 2006



Although the 25-44 year old age group represents the largest proportion (39%) of cases in King County, the incidence of cases is highest in those 65 years of age and older (16.8 per 100,000) (Table 2). Those in the 25-44 years of age group

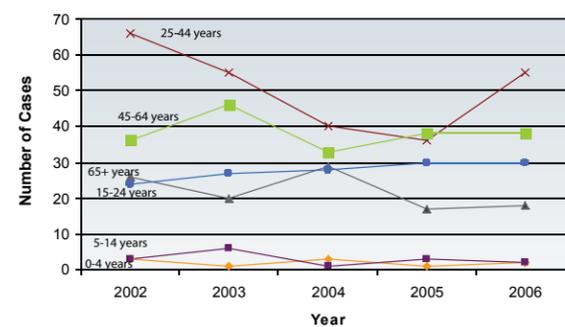
had the second highest incidence rate among the defined age groups (9.7 per 100,000). Overall, the incidence of TB in respective age groups did not vary dramatically from past years.

TABLE 2. INCIDENCE BY AGE GROUP

Age Group	2005	2006
0-4 years of age	0.9/100,000	1.9/100,000
5-14 years of age	1.4/100,000	1.0/100,000
15-24 years of age	7.0/100,000	8.4/100,000
25-44 years of age	6.2/100,000	9.7/100,000
45-64 years of age	8.3/100,000	7.9/100,000
65+ years of age	16.1/100,000	16.8/100,000

There were two cases reported in the 0-4 years of age group in 2006. Overall, there were four pediatric cases (0-14 years of age) of TB in 2006, the same as in 2004 and 2005. Figure 3 shows the relatively constant rate among pediatric cases from 2002 through 2006.

FIGURE 3. TUBERCULOSIS CASES BY AGE GROUP, 2002-2006



Statewide, in 2005, the greatest proportion of cases was seen among 45-64 year olds (32%), with cases aged 25-44 years old comprising 28% of total cases and 15-24 year olds comprising 14% of cases. Children aged 0-14 represented 4% of cases and adults aged 65 and over made up 21% of cases. Nationally, in 2005, the greatest proportions

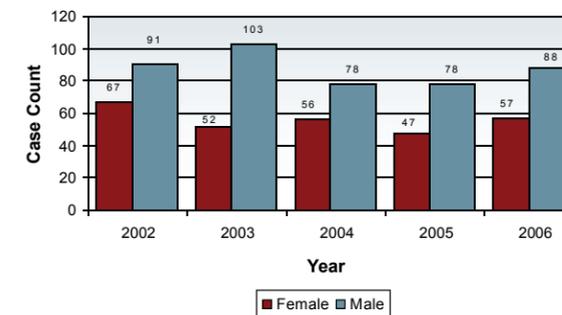
of cases was seen among 25-44 year olds (34%), followed by 45-64 year old adults (29%) and older adults (65 years of age and older, 20%).

Gender

Males represented 61% of all King County TB cases in 2006, similar to proportions seen in recent years (Figure 4). The incidence rate among males was 10.0 per 100,000; among females 6.5 per 100,000.

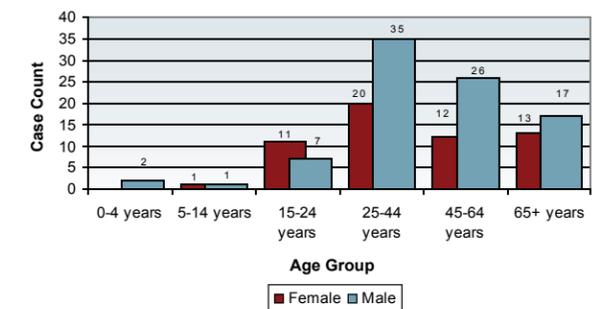
In Washington, males represented 59% of all TB cases in the state during 2005. Nationally, males represented 62% of all TB cases in the United States in 2005.

FIGURE 4. TUBERCULOSIS BY GENDER, 2002-2006



The greater proportion of cases among males was consistent across all age groups except for 5-14 and 15-24 year-olds. The greatest difference in proportion of males to females was seen among individuals 45-64 years of age where there were more than two times as many cases among males as among females. The number of cases for both male and females was highest in the 25-44 year old age group (35 and 20 cases, respectively) (Figure 5). Eighty percent of males and 80% of females in the 25-44 year old age group were foreign-born.

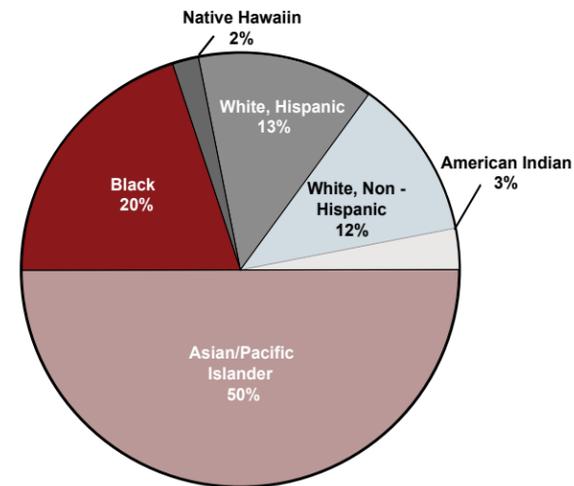
FIGURE 5. TUBERCULOSIS BY GENDER AND AGE GROUP, 2006



Race and Ethnicity

Asians continued to represent the greatest proportion of all TB cases in King County in 2006 (50%) (Figure 6). In 2005 Asians represented 44% of all cases; in 2004, 38 percent. The proportion of Hispanics continued to increase as well, representing 13% of all TB cases in 2006 (9% in 2005 and 7% in 2004).

FIGURE 6. TUBERCULOSIS BY RACE, 2006



Additionally, the incidence of TB among Hispanics increased from 2005 to 2006, 10.0* to 16.1 per 100,000, respectively (Table 3).

TABLE 3: INCIDENCE BY RACE/ETHNICITY

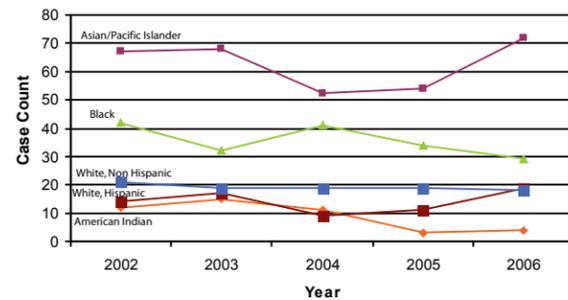
Race	2005	2006
American Indian	20.4/100,000	18.8/100,000
Asian/Pacific Islander	24.5/100,000	38.3/100,000
Black	37.0/100,000	30.9/100,000
Native Hawaiian	37.7/100,000	35.3/100,000
White	2.2*/100,000	2.7/100,000
Hispanic	10.0*/100,000	16.1/100,000

*denominator data for these rates were based on 2004 population estimates.

Nationally, the highest 2006 case rates were seen among Asian, Black, and Native Hawaiian individuals, (26, 15, and 10 per 100,000 respectively). King County case rates continue to be higher than national rates for all race categories.

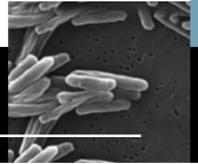
The trend in cases across racial groups has remained relatively stable with marginal to moderate increases among Asian/Pacific Islanders and White-Hispanics and decreases among Blacks and Native Americans (Figure 7).

FIGURE 7: TUBERCULOSIS BY RACE, 2002-2006



In 2006, there were four TB cases among children 0-14 years of age in King County. This comprised two percent of all King County TB cases in 2006. Nationally, this proportion was six percent in 2005.

Pediatric TB may represent a failure of TB control in the community, because children with TB are almost always recently infected by an adult infectious TB case. Thus, unrecognized active TB cases and ineffective contact investigations can result in a child with active TB disease. The TB Control Program initiates timely and thorough contact investigations for all infectious TB cases in order to prevent this from happening.



In 2006, 94% of all TB cases were offered HIV tests. Of those TB cases for whom HIV test results are available, eight percent were co-infected with HIV (Table 4). The incidence of TB/HIV co-infection has increased over the past two years, but remains lower than 2002 and 2003 rates (Table 5). The Centers for Disease Control and Prevention reported approximately one third of U.S. TB cases did not have an available HIV status in both 2005 and 2006. Of those with available HIV status, 12.4% of TB cases were co-infected with HIV in the U.S. In King County, HIV co-infection prevalence was reported at three percent (4 of 116 cases) among foreign-born cases and 21% among U.S.-born cases (6 of 29 cases) in 2006.

TABLE 4: HIV TEST RESULTS AMONG TB CASES, 2006

HIV status	Number	Percent
Negative	113	77.9%
Positive	10	6.9%
Refused	6	4.1%
Not offered	8	5.5%
Unknown	8	5.5%

TABLE 5: TREND OF HIV INFECTION AMONG TB CASES, 2002-2006

Year	Number of TB cases	Percent of all TB cases	Percent of cases offered
2002	11	7.0%	8.4%
2003	9	5.8%	6.7%
2004	3	2.2%	2.5%
2005	7	5.6%	5.6%
2006	10	6.9%	7.3%

Determining the HIV status of every TB case is an important clinical measure to ensure appropriate medical management of both diseases. Case management of TB/HIV co-infected patients typically requires more intense and frequent coordination of care between the Seattle & King County TB Control Program and HIV care providers. Furthermore, tracking HIV status of TB cases, in general, facilitates early detection of transmission in this group so appropriate disease control measures can be taken to avert or interrupt outbreaks.

Multi-Drug Resistant TB

Three individuals were diagnosed as having Multi-Drug Resistant (MDR) TB in 2006. MDR TB is defined as resistance to at least isoniazid (INH) and rifampin, the two most effective first-line TB medications. There were no extensively drug resistant (XDR) TB cases reported in King County (XDR TB is defined as resistance to INH, rifampin, and the two most effective second-line medications: fluoroquinolones and at least one of three injectable drugs [i.e., amikacin, kanamycin, or capreomycin]). In 2004 and 2005, King County had two cases of MDR-TB each year. In 2006, Washington state had two additional cases of MDR TB outside of King County for a total of five cases statewide. For individuals with MDR TB, treatment lasts from 18 to 24 months or longer, as compared to a usual course of six-to-nine months, at an estimated cost of \$250,000.

Nationally, 124 cases (or 1.2% of all cases with drug-susceptibility results reported) were diagnosed with MDR TB in 2005. This proportion of MDR cases has been stable for the last few years.

Primary Drug Resistance

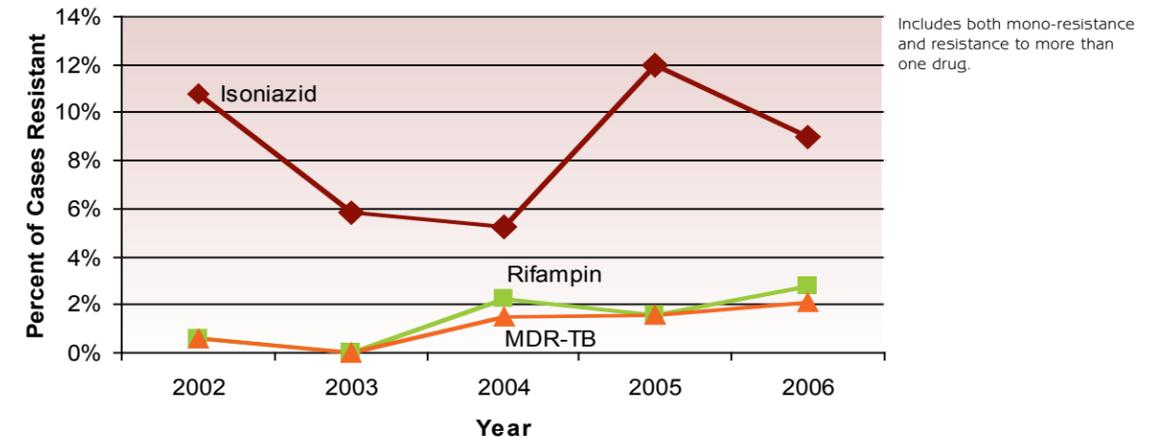
Primary drug resistance is drug resistance based on initial isolates from persons with no prior history of TB treatment. Table 6 shows King County cases whose TB strain was resistant to each of the five most common drugs used to treat TB. Figure 8 shows the trends in isoniazid resistance, rifampin resistance and MDR-TB among King County cases from 2002 through 2006. Nationally, approximately seven percent of cases showed resistance to isoniazid in 2005.

TABLE 6: PRIMARY DRUG RESISTANCE, 2006

Drug	Total Cases (n=122)	U.S.-born (n=21)	Foreign-born (n=101)
Isoniazid	13 (10.7)	2 (9.5)	11 (10.9)
Rifampin	4 (3.3)	0 (0.0)	4 (4.0)
Pyrazinamide	6 (4.9)	0 (0.0)	6 (5.9)
Ethambutol	4 (3.3)	0 (0.0)	4 (4.0)
Streptomycin	6 (4.9)	0 (0.0)	6 (6.0)
Any	20 (16.4)	2 (9.5)	18 (17.8)

Includes both mono-resistance and resistance to more than one drug. Percentages are based on those with susceptibilities available for 2006.

FIGURE 8: PRIMARY ISONIAZID AND RIFAMPIN RESISTANCE AND MDR-TB IN KING COUNTY, 2002-2006



There were 16 homeless cases diagnosed with TB in 2006, comprising 11% of all TB cases in King County, lower than in 2005 (18%). Homelessness was defined as people who lacked a fixed, regular, and adequate night-time residence or whose primary night-time residence was a supervised shelter designed to provide temporary living accommodations.

Of the 16 homeless cases, 11 (69%) were born in the U.S. (Table 7). The U.S.-born homeless cases (11) represented 38% of all U.S.-born cases in 2006; 13 cases, (41%) in 2005. Four Hispanic homeless cases were seen in 2006, consistent with 2005, but an increase from the past several years (range from one to three between 2002 and 2004). In contrast, the number of American Indian homeless cases, the predominant racial group during the 2002-2003 TB outbreak among the homeless, remained low (from 17 cases in 2003 to two cases each in 2005 and 2006).

Thirteen percent of TB cases in Washington state in 2005 were homeless. Nationwide, homeless cases represented six percent of all TB cases in 2005, although rates fluctuate widely by state.

Note on TB Outbreak Among the Homeless:

In late 2002, a TB outbreak among the homeless was detected. A single strain was responsible for 17 (57%) of 30 cases among the homeless (Figure 9). In 2003, this outbreak strain was responsible for 26 cases (74%). Since 2003, the TB Control Program, community healthcare providers and various agencies have put intensive effort to control this outbreak, and the number of TB cases matching the outbreak strain dropped considerably (11 in 2004, 9 in 2005 and 10 in 2006).

Reactivation and new transmission of TB disease caused by the outbreak strain is still taking place, as indicated by genotyping results. This illustrates the difficulty of evaluating all exposed contacts as well as ensuring treatment of latent TB infection among homeless individuals.

FIGURE 9: HOMELESS TB CASES IN KING COUNTY

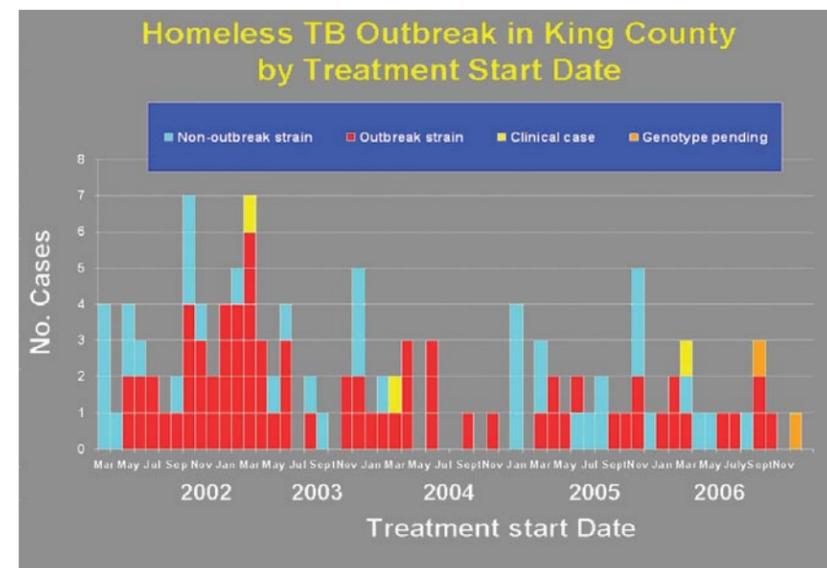


TABLE 7: WHO ARE THE HOMELESS TB CASES?

	2002 (n=30) N(%)	2003 (n=35) N(%)	2004 (n=15) N(%)	2004** (n=23) N(%)	2005 (n=23) N(%)	2006 (n=16) N(%)
Gender						
Male	26 (87)	27 (77)	12 (80)	20 (87)	21 (91)	15 (94)
Female	4 (13)	8 (23)	3 (20)	3 (13)	2 (9)	1 (6)
Age Group						
15-30	1 (3)	1 (3)	0 (0)	8 (35)	1 (4)	2 (13)
31-40	8 (27)	2 (6)	2 (13)	2 (9)	3 (13)	0 (0)
41-50	10 (33)	16 (46)	4 (26)	4 (17)	10 (43)	9 (56)
51-60	9 (30)	13 (37)	5 (33)	5 (22)	6 (26)	5 (31)
61-70	2 (7)	1 (3)	3 (20)	3 (13)	2 (9)	0 (0)
71-80	0 (0)	2 (6)	1 (7)	1 (4)	1 (4)	0 (0)
Race/Ethnicity						
White, non-Hispanic	3 (10)	7 (20)	3 (20)	3 (13)	5 (22)	7 (44)
Black, non-Hispanic	12 (40)	8 (23)	3 (20)	11 (48)	7 (30)	3 (19)
Hispanic	3 (10)	3 (9)	1 (7)	1 (4)	6 (26)	4 (25)
Asian/Pacific Islander	1 (3)	0 (0)	0 (0)	0 (0)	3 (13)	0 (0)
American Indian/Alaska Native	11 (37)	17 (49)	8 (53)	8 (35)	2 (9)	2 (13)
U.S.-born?						
Yes	25 (83)	33 (94)	13 (87)	13 (57)	13 (57)	11 (69)
No	5 (17)	2 (6)	2 (13)	10 (43)	10 (43)	5 (31)
HIV Result*						
Positive	9 (30)	1 (3)	0 (0)	0 (0)	1 (4)	3 (19)
Unknown	1 (3)	0 (0)	2 (13)	3 (13)	4 (17)	1 (6)
Genotyping						
RFLP Match	17 (57)	26 (74)	11 (73)	11 (48)	9 (39)	10 (63)
American Indian RFLP match	9	15	7	7	2	2
Other race RFLP match	8	10	4	4	7	7
Non-outbreak RFLP	13 (43)	8 (23)	2 (13)	10 (43)	14 (61)	5 (31)
Pending	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Clinical Case	0 (0)	1 (3)	2 (13)	2 (9)	0 (0)	1 (6)
No RFLP done	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

*Some patients refused HIV test.

**Includes East African Outbreak patients who were homeless (for more details on this outbreak please refer to the 2005 report).

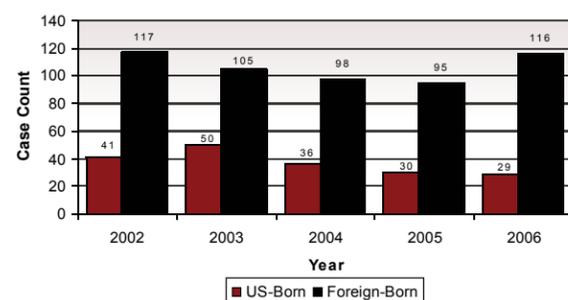
Eighty percent (116 cases) of King County TB cases were born outside the United States during 2006. While the proportion of foreign-born to U.S.-born cases over the past five years has remained relatively stable, 80% foreign-born represents more than a five-year high for King County (Figure 10).

Overall, King County sees a higher proportion of foreign-born cases than at the national level (55% foreign-born in 2005). This may be partially due to increased immigration rates to King County from countries with high TB prevalence. However, the national proportion of foreign-born cases has been steadily increasing over the last decade.

Country of Origin

In 2006, the highest case numbers came from the Philippines, Vietnam, Ethiopia, India and Mexico. Forty-seven percent of King County TB cases came from Asia (e.g., Philippines, Vietnam and China), 14% from East Africa (e.g., Ethiopia, Somalia and Kenya), and 10% from Central America (e.g., Mexico and Honduras) (Figure 11).

FIGURE 10: TUBERCULOSIS BY U.S. VS FOREIGN-BORN, 2002-2006



From 2002 through 2005, only two cases originating from Honduras were seen in King County. Five Honduran cases reported in a single year (2006) raised a concern for a potential outbreak, however genotyping results have shown that the TB strains for all five cases were unique and not related to one another.

Over the last five years, the most common countries of origin among King County's foreign-born cases were Vietnam, Ethiopia, the Philippines, Mexico and India, identical to 2006 representations (Table 8). Nationwide, in 2005, 55% of cases were among foreign-born persons; the top five countries of origin for foreign-born cases in the U.S. were Mexico, the Philippines, Vietnam, India and China.

FIGURE 11: TB CASES BY COUNTRY OF BIRTH, 2006

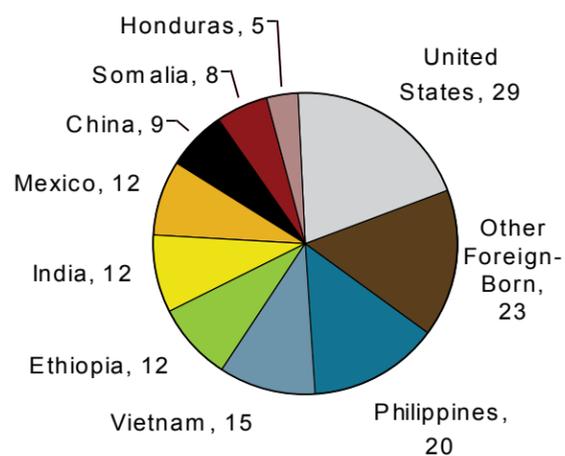


TABLE 8: TRENDS IN COUNTRY OF ORIGIN AMONG FOREIGN-BORN TB CASES 2002 – 2006

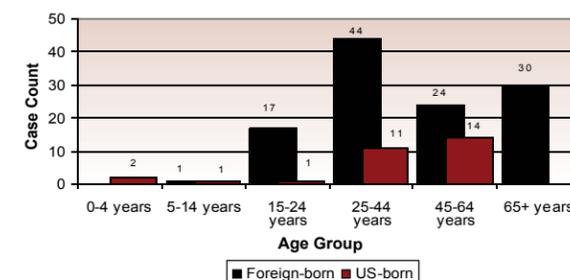
	2002	2003	2004	2005	2006
Cambodia	5 5%	5 5%	3 3%	3 3%	2 2%
China	5 4%	10 10%	4 4%	6 6%	9 8%
Ethiopia	8 7%	11 11%	13 13%	9 10%	12 10%
India	11 9%	10 10%	4 4%	8 8%	12 10%
Korea*	1 1%	8 8%	5 5%	4 4%	2 2%
Mexico	8 7%	12 11%	5 5%	9 10%	12 10
Philippines	18 15%	12 11%	11 11%	13 14%	20 17%
Somalia	15 13%	2 2%	8 8%	8 8%	8 7%
Sudan	1 1%	0 0%	6 6%	1 1%	1 1%
Vietnam	17 15%	12 11%	15 15%	12 13%	15 13%
TOTALS	116	106	97	95	116

*Democratic People's Republic of Korea and Republic of Korea.

Age of Disease in Foreign-born Cases

The greatest number of foreign-born cases were 25-44 years of age (44 cases, 38% of all foreign-born cases). United States-born cases and foreign-born cases had equal proportions (38%) of 25-44 years olds (Figure 12). King County TB cases who were 65 years of age and older were all foreign-born. The largest proportion of U.S.-born cases could be found among those individuals 45-64 year of age (48%).

FIGURE 12: TUBERCULOSIS CASES BY U.S.- OR FOREIGN-BORN AND AGE GROUP, 2002-2006



Duration of Stay in U.S. Prior to Diagnosis

The length of time since arrival in the U.S. was available for 93% of TB cases born outside of the United States in King County. Of this group, nine percent of cases had been in the U.S. less than one year; 33% of the cases had been in the U.S. between one and four years; and 57% of cases had been in the U.S. for five or more years at the time of diagnosis. Nationally, in 2005, of those with known duration, 20% of foreign-born cases had been in the U.S. less than one year, 25% had been here one to four years, and 55% had been in the U.S. for five or more years.

Figures 13 and 14 show the duration of stay in the United States at the time of diagnosis by country of origin for 2006 and the trend from 2002 through 2006, respectively. Both figures show that the majority of cases occur greater than five years after entering the United States. However, for foreign-born persons from Ethiopia, India, and Somalia, the highest proportion of cases were seen in those who had been in the U.S. from one to four years.

FIGURE 13: DISTRIBUTION OF TIME SINCE ARRIVAL IN THE U.S. FROM SELECTED COUNTRIES (AMONG CASES WITH LENGTH OF STAY DATA AVAILABLE), 2006

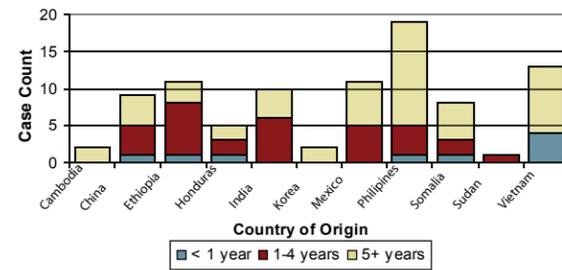
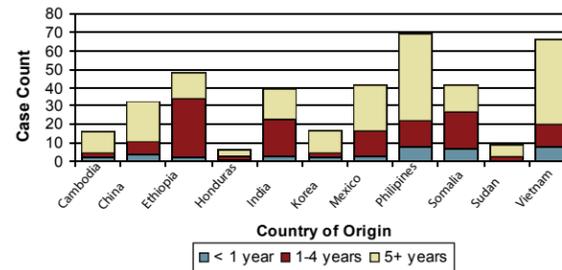
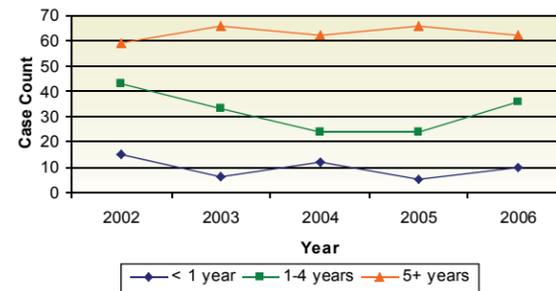


FIGURE 14: DISTRIBUTION OF TIME SINCE ARRIVAL IN THE U.S. FROM SELECTED COUNTRIES (AMONG CASES WITH LENGTH OF STAY DATA AVAILABLE), 2002-2006



The number of TB cases for each duration category has remained relatively stable over the past five years. Among those who have been in the U.S. for one to four years there is a shallow u-shape curve indicating a decrease in the number of cases in this group followed by an increase to levels seen in earlier years (Figure 15).

FIGURE 15: TIME SINCE U.S. ARRIVAL, 2002-2006



9. TREATMENT OF TB CASES

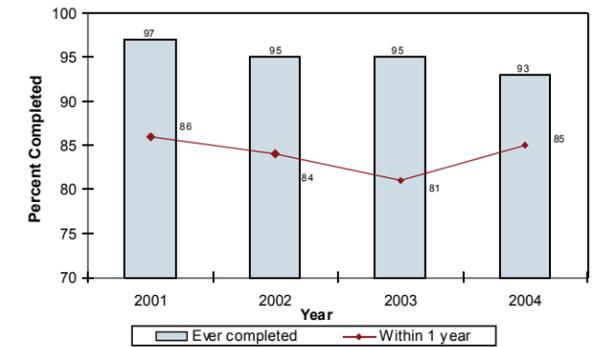
Of the cases alive at the time of diagnosis, 97% received an initial regimen consisting of four-drug therapy. Four-drug therapy is the standard recommended by the CDC, the American Thoracic Society and the Infectious Diseases Society of America. Treating TB patients with a combination of drugs prevents the occurrence of drug resistance and facilitates the cure in a timely manner.

Proportion of Cases, Completing Therapy

Overall treatment completion rates have remained at 93% or greater over the past five years (2005 data incomplete, as some TB cases require more than 12 months of treatment). The most common reasons for classification as 'not completed' were that cases moved out of King County (three percent of cases from 2002-2006, in which case efforts were made to ensure treatment continuation and completion in the jurisdiction the case moved to) or died (five percent of cases from 2002-2006). The percentage of cases ever completing treatment has remained steady (93-95%) over the past few years, and the percent completing within one year has fluctuated between 81-86% (Figure 16). Factors contributing to case non-completion within one year include drug intolerance, non-adherence with TB treatment regimen, and TB affecting bone/joint and central nervous system that requires prolonged TB treatment (see Section 11. Disease Characteristics). Furthermore, TB treatment guidelines (published by CDC/American Thoracic Society/Infectious Disease Society of America in 2003) recommend prolongation of TB treatment for those with pulmonary cavities and delayed microbiological response.

The most recent national data is from cases who initiated treatment in 2003; 83% of these cases completed treatment within one year and 92% completed therapy in total.

FIGURE 16: COMPLETION OF TB TREATMENT, 2001-2004



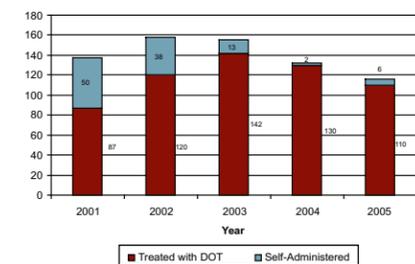
Per CDC guidelines for summarizing completion of therapy, includes persons alive at diagnosis, with initial drug regimen of one or more drugs prescribed, who did not die during therapy. Excludes persons with initial isolate resistant to rifampin and pediatric (aged <15) cases with meningeal, bone or joint, or miliary disease.

Mode of TB Treatment

Among the cases from 2005 who have already completed treatment (61 cases), 97% were treated with directly observed therapy (DOT) only or a combination of DOT and self-administered therapy (80% DOT only, 17% combination). The proportion of cases treated with DOT has increased substantially over the past five years (Figure 17). Nationally, 85% of cases are on DOT or a combination of DOT and self-administered therapy.

For the 2005 cases with data available (56 at time of this report), TB patients in King County received 23 weeks of DOT on average (median of 27 weeks).

FIGURE 17: TB CASES TREATED WITH DOT, 2001-2005



2005 data incomplete. Includes both DOT only treatment and treatment with a combination of DOT and self-administered medications.

In King County in 2006, 57% of cases were exclusively pulmonary, 29% were exclusively extrapulmonary, and 14% were both pulmonary and extrapulmonary. Nationally, 70% of cases were pulmonary in 2005, 21% of cases were extrapulmonary, and nine percent of cases were both pulmonary and extrapulmonary. Reasons for the differences between local and national data may include better ascertainment of extrapulmonary cases (both improved diagnosis and reporting), more complete and specific coding of all involved disease sites and a higher proportion of cases among groups known to have increased rates of extrapulmonary TB (e.g., East African and East Asian cases).

Smear and Culture Results

Of the 97 cases with pulmonary TB as their major site of disease, 54% were smear-positive, and 85% had positive cultures. Table 10 shows a more detailed breakdown of these cases. Nationally, in 2005, 46% of pulmonary cases were smear-positive and 69% were culture-positive. However,

13% of cases nationwide had test results that were “not done” or “unknown” and this may contribute to the lower percentage of culture positive cases nationwide than in King County.

Figure 18 shows the five year trends in disease sites among King County cases. Compared to national statistics during this time period, King County consistently maintained a greater percentage of extrapulmonary cases.

FIGURE 18: PULMONARY VS. EXTRAPULMONARY SITE OF DISEASE, 2002-2006

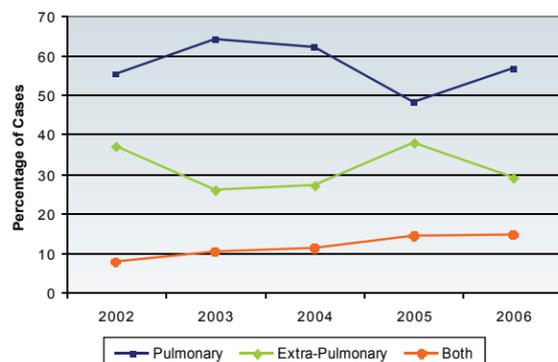


TABLE 9: PRIMARY SITE OF DISEASE, 2002-2006

	2002	2003	2004	2005	2006
Pulmonary	96 (61%)	108 (70%)	95 (71%)	79 (62%)	97 (67%)
Pleural	15 (9%)	7 (5%)	5 (4%)	9 (7%)	6 (4%)
Lymphatic: Cervical	25 (16%)	17 (11%)	14 (11%)	10 (8%)	16 (11%)
Lymphatic: Intrathoracic	2 (1%)	4 (3%)	4 (3%)	7 (6%)	4 (3%)
Lymphatic: Other	8 (5%)	4 (3%)	3 (2%)	7 (6%)	3 (2%)
Lymphatic: Unknown	0 (0%)	0 (0%)	1 (1%)	0 (0%)	0 (0%)
Bone/Joint	4 (3%)	4 (3%)	2 (2%)	4 (3%)	5 (3%)
Genitourinary	2 (1%)	2 (1%)	0 (0%)	0 (0%)	2 (1%)
Miliary	2 (1%)	2 (1%)	2 (2%)	0 (0%)	3 (2%)
Meningeal	0 (0%)	1 (1%)	2 (2%)	2 (2%)	1 (1%)
Peritoneal	2 (1%)	4 (3%)	3 (2%)	2 (2%)	5 (3%)
Other*	3 (2%)	2 (1%)	3 (2%)	7 (6%)	3 (2%)

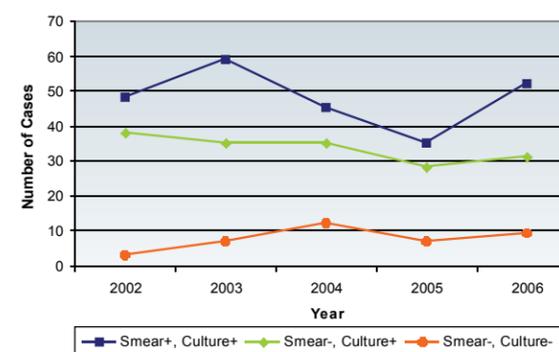
*Includes Central Nervous System.



TABLE 10: 2006 SMEAR AND CULTURE RESULTS ON PULMONARY CASES

Smear+, Culture+	Smear-, Culture+	Smear-, Culture-	Smear+, Culture-	Not done or unknown	Total
52 (53%)	31 (32%)	9 (9%)	1 (2%)	4 (4%)	97 (100%)

FIGURE 19: SMEAR AND CULTURE STATUS OF PULMONARY CASES AT DIAGNOSIS, 2002-2006



Looking at five year trends in King County, we see a peak of smear-positive, culture-positive cases in 2003; this coincides with the homeless outbreak which consisted of primarily smear-positive, culture-positive cases with matching genotypes (Figure 19).

Genotyping of specimens has taken place at a CDC or CDC-affiliated laboratory since 2000. However, until the start of Universal Genotyping (UG) in 2004, only a partial sample of culture-positive specimens were submitted for genotyping. Since UG was implemented in 2004, all culture-positive specimens have been submitted to the CDC-affiliated laboratory in Berkeley, California for genotyping. Table 11 summarizes the results of all specimens tested from King County.

TABLE 11: GENOTYPE SUMMARY

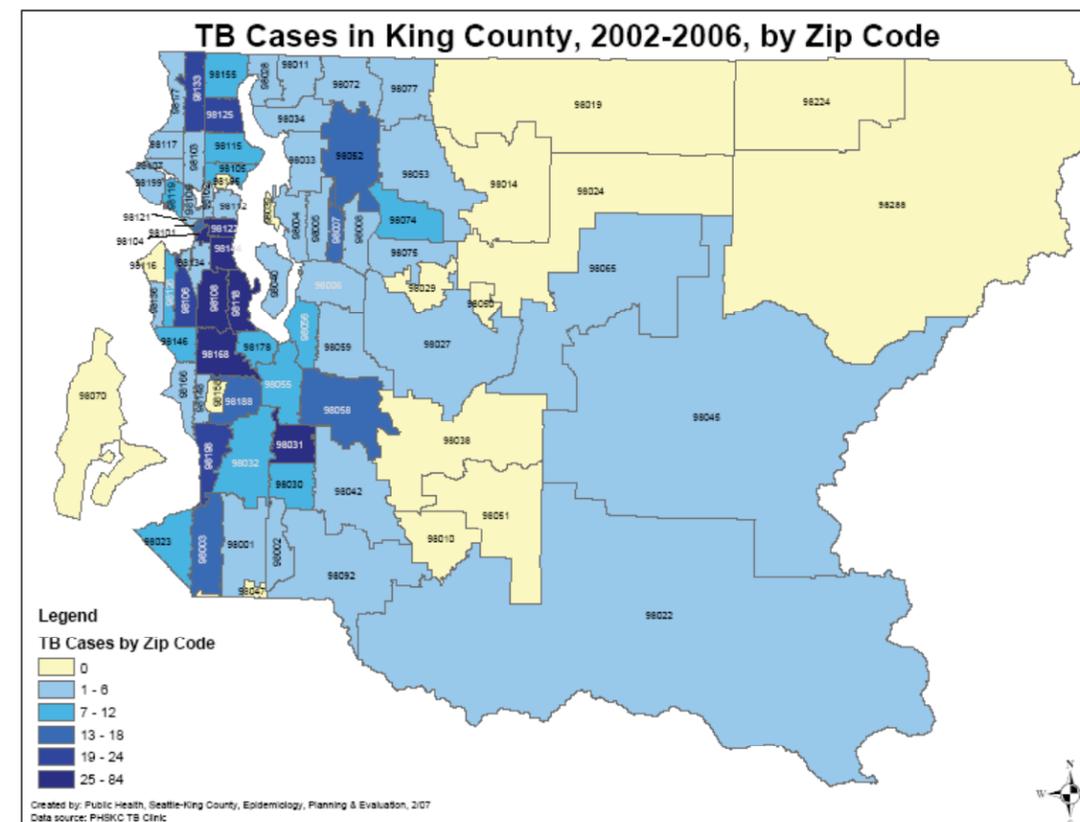
Year	No. of isolates	No. clustered	Proportion clustering	No. of clusters	Mean isolates/clusters
2000	12	8	67%	8	1.0
2001	7	3	43%	3	1.0
2002	50	45	90%	24	1.9
2003	73	63	86%	26	2.4
2004	118	58	49%	23	2.5
2005	99	50	51%	23	2.2
2006*	99	42	42%	21	2.0

*Results available on 70% of samples at the time of writing.

The clustering trends from this table should be interpreted with caution as the majority of samples sent in 2000-2003 were sent specifically due to linked epidemiological information and a heightened alert for outbreaks (hence specimens were, by definition, more likely to cluster).

Three large, distinct clusters (n = 13, 20, and 16) were identified and investigated further in 2006. Meetings were held to discuss each of the clustered cases, with additional social networking information used to supplement demographic and medical information obtained from the patient chart and from the Tuberculosis Information Management System database. No additional epidemiological links were ascertained for any of these clusters, thus we concluded these clusters were more likely due to reactivation of widely-distributed strains than to ongoing recent transmission. However, we continue to monitor the trend of incidence of these strains, as an increasing trend of a particular strain may represent undiscovered ongoing transmission.

FIGURE 20: DISTRIBUTION OF KING COUNTY TB CASES, 2002-2006



As seen above, cases continue to be concentrated in the urban, west side of King County. In order to provide a patient-centered approach, the TB Control Program has established a satellite clinic located in the downtown core, operating out of the Connections Program of the Downtown Emergency Service Center. The clinic is focused on providing services to homeless cases and their contacts.

Contact investigations are conducted in all congregate settings where people were exposed to infectious TB cases. These locations typically include schools, colleges, shelters, worksites, and nursing homes.

The TB Control Program uses a concentric circle approach to conduct contact investigations; contacts are prioritized based on their duration/intensity of exposure and personal medical characteristics, those at highest risk are tested first. Depending on the results from this closest circle of contacts, the investigation may be expanded to the 'second tier' contacts, and so on. Additional factors which determine the scope of contact investigations include: characteristics of the case (i.e., relative infectiousness and duration of "infectious period"), vulnerability and immunocompetence of the population exposed, and the environmental features of the setting where exposure occurred (ventilation, room size, etc.). The TB Control Program evaluates all contacts with a symptom review, a medical-risk assessment, and a skin test. If necessary, contacts are encouraged to obtain a chest x-ray

TABLE 12. 2006 CONGREGATE SETTING INVESTIGATION SUMMARY

Investigation	Contacts Identified	Prior Positive Skin Tests	Received a Skin Test	Skin Test Positive (% positive)±
Nursing/Medical facilities*	176	55	97	4 (4%)
Schools/Universities	551	24	391	48 (12%)
Worksite/Other Institution#	299	15	191	48 (25%)
Total	1026	94	679	100 (15%)

± Excluding prior positive skin tests * Excluding hospitals # Excluding homeless shelters and services

and treatment if they are found to have latent TB infection or TB disease. In addition, contacts with latent TB infection are eligible to be enrolled in the TB Trials Consortium clinical research study (see page 29).

TB Cases in Schools or Other Congregate Settings

In 2006, the TB Control Program conducted contact investigations at 25 congregate setting sites (excluding homeless shelters); 12 worksites and other places of business, six schools and seven medical/nursing facilities. In 2006, 1026 individuals were identified as close contacts to infectious TB cases at these settings. Seventy-five percent (773) of these contacts were located and screened for both active and latent TB. This is a considerable increase in both contacts identified and contacts screened once identified from 2005. In 2005, 274 contacts were identified, of which 60% were evaluated. Table 12 summarizes the congregate setting investigation activities for 2006.

TB Cases in Homeless Shelters

Ten contact investigations were conducted in homeless shelters during 2006. There were 518 individuals identified at these shelters. Individuals found were screened for both active and latent TB in collaboration with the TB satellite clinic. Table 13 summarizes the homeless shelter contact-investigation activities for 2006.

TABLE 13. 2006 HOMELESS SHELTER INVESTIGATIONS SUMMARY

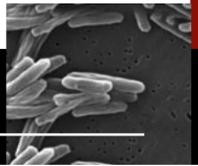
Homeless Shelter Contact Investigations	
Contacts Evaluated	180
Prior Positive Skin Tests	45
Received a Skin Test	125
Skin Test Positive (% positive)	27 (22%)

The need for a TB satellite clinic in close proximity to the homeless community was identified through focus group research. The satellite clinic began follow-up of close contacts in December 2006 with four core functions:

- Treating homeless contacts of persons with infectious TB;
- Screening homeless contacts of persons with infectious TB;
- Collaborating with public health and community partners to enhance targeted TB testing and treatment of latent TB infection in the homeless population; and
- Assisting in the treatment of homeless individuals with active TB disease who are not infectious.

Household Contacts

In addition to congregate and homeless shelter contacts, the TB Control Program screens household contacts. The TB nurse case managers are responsible for household and close social contacts. In general, household contacts are family and friends of a TB case who have prolonged, shared air space. An estimated 650 household contacts were identified in King County during 2006. Of these, 423 (65%) individuals received a TB skin test. Of the 423 screened contacts, 237 were skin test positive for a rate of 56% positive. The number screened with a skin test does not include contacts who had a prior history of a positive skin test or individuals who were identified but never located.



14. OUTBREAK AND PREVENTION SECTION

The Public Health - Seattle & King County Tuberculosis Control Program recently implemented an outbreak prevention section that is responsible for congregate setting investigations, outbreak response, and surveillance. Congregate setting investigations take place at workplaces, schools, vocational settings, and congregate care settings such as nursing homes, religious organizations and homeless shelters (see Section 13 above).

Following a large outbreak among the homeless in King County in 2002-2003, a section consisting of an outbreak coordinator, epidemiologists and disease intervention specialists was formed. The primary goals for this section are to conduct contact evaluations in congregate settings and provide assessment of the contact investigation process. This assessment is used to determine how investigations can be improved and whether to expand to the next concentric circle of contacts.

The coordinator and epidemiologists organize screenings, process and analyze exposure data and produce summary reports; disease intervention specialists interview index cases, locate contacts, and conduct skin tests for congregate setting TB screenings. Additionally, the team conducts environmental assessments to analyze possible transmission.

Prioritization of activities depends on case characteristics, cumulative exposure, exposure risk based on environmental characteristics, and available resources. This specialized section assists heavily-burdened nurse case managers who generally carry 15-25 cases at any given time. The section coordinates the development of procedures to ensure treatment for latent TB infection is successfully initiated and completed by infected contacts.

15. THE TB CONTROL PROGRAM SPECIAL PROJECTS

Community Partnerships

Community partners provide important collaborations with the TB Control Program. A community TB coalition created during the homeless TB outbreak meets on a quarterly basis. Regular meetings of this coalition and a partnership between the TB Control Program and Health Care for the Homeless Network (HCHN) have also resulted in evaluation of environmental factors that affect the spread of TB in homeless shelters. Partnership with HCHN, the REACH project, King County Jail Health, Harborview Medical Center, homeless service sites, and others have been enormously helpful in our searches for homeless TB cases and contacts.

These partnerships offer additional information and insight on behaviors and patterns that help us refine our approach.

The King County HCHN contracts with the TB Control Program to provide TB services to homeless persons in our area. These services include TB screening in shelters and directly observed therapy for homeless persons who are found to have TB infection and disease. The HCHN provides funding for a number of incentives and enablers, such as housing and food, which help persons with TB disease complete their course of treatment while preventing TB transmission to others.

Another area of partnership has been with the TB laboratories of the CDC, Washington State Department of Health, Harborview Medical Center, Public Health – Seattle & King County, and Seattle Biomedical Research Institute (SBRI). This collaboration has enhanced our ability to monitor the transmission of TB within King County and beyond.

Tuberculosis Trials Consortium

The TB Control Program is one of 28 health departments and academic centers worldwide which comprise the TB Trials Consortium (TBTC). The CDC sponsors the TBTC to conduct large scale, multi-center trials of new diagnostic tools and regimens for the treatment of TB infection and disease. Ongoing studies include: comparison of a 3-month, once-weekly regimen of two drugs to standard 9-month therapy with isoniazid for treatment of latent TB infection and a randomized, double-blind clinical trial assessing the impact on 2-month sputum conversion rate of substituting moxifloxacin for isoniazid in the standard intensive phase TB treatment regimen. Further details regarding the TBTC can be found at: www.cdc.gov/nchstp/tb/tbtc/default.htm

Tuberculosis Epidemiologic Studies Consortium

The Tuberculosis Epidemiologic Studies Consortium (TBESC) consists of 21 sites across the U.S. and Canada. These sites collaborate on multiple special studies, thereby providing access to diverse populations at highest risk for TB and assuring that findings are generalizable across the U.S. and Canada. Currently, the Seattle TBESC site participates in four projects/Task Orders (TOs):

- TO 5 (Prevalence of Latent TB among the Homeless)
- TO 8 (Multi-drug Resistant TB to better determine how MDR TB is acquired)
- TO 9 (TB among the Foreign-Born to determine how to better prevent TB disease among foreign-born persons living in the U.S.)
- TO 12 (Providers Who Care for Foreign-Born Persons)

Additional details regarding the TBESC can be found on www.cdc.gov/nchstp/tb/TBESC/TOC.htm

TB Educational Course for Healthcare Professionals

In 2006, Seattle & King County's TB Control Program worked closely with the American Lung Association of Washington, the Washington Thoracic Society, the University of Washington/Harborview Medical Center, the Washington State TB Advisory Council, the Firland Foundation, the Washington Department of Health, and the Seattle STD/HIV Prevention Training Center to hold the 4th annual, two-day TB educational course for healthcare professionals who provide health care services to high-risk TB clients. This successful collaboration led to further expansion of this project and partnering with the Francis J. Curry National TB Center in San Francisco.

EPI-LOG

Working closely with the Communicable Disease Control, Epidemiology & Immunization Section of Public Health – Seattle & King County, sections of "TB update" were published in Epi-Log (November and December issues), a monthly publication distributed to health care providers in King County. These updates discussed recent TB epidemiology, TB Control Program activities, and the role that health care providers play in the control of TB in King County.

Acid-Fast Bacilli (AFB) smears: Smears performed on sputum or other non-respiratory specimens to detect the presence of Mycobacterium.

Bacille Calmette-Guerin (BCG): A vaccine for TB named after the French scientists Calmette and Guérin. BCG is not widely used in the United States, but it is often given to infants and small children in other countries where TB is common.

Cavity: A hole in the lung resulting from destruction of pulmonary tissue. TB patients with cavities on chest X-rays are generally more infectious because of high bacterial load.

Clinical Case: In the absence of laboratory confirmation of *M. tuberculosis* after a diagnostic process has been completed, persons must have all of the following criteria for clinical TB case:

- Evidence of TB infection bases on a positive TB skin test *AND*
- One of the following:
 - (1) signs and symptoms compatible with current TB disease, such as an abnormal, unstable (worsening or improving) chest radiograph, or
 - (2) clinical evidence of current disease (such as fever, night sweats, cough, weight loss, hemoptysis) *AND*
- Current treatment with two-or more anti-TB medications.

Contact: An individual who has had some exposure to a source case. Contacts are often differentiated into 'close contacts,' that is, individuals who have shared the same air space with a person who has infectious TB disease for a prolonged time, or 'casual contacts,' those who did not have prolonged exposure.

Culture: Growth of bacteria in the laboratory, on either a liquid or solid medium, so that organisms can be identified based on species.

Directly Observed Therapy (DOT): A health care worker or other designated person who watches the TB patient swallow each dose of the prescribed drug.

DNA Genotyping: A laboratory approach that provides a description of the genetic makeup of a TB isolate.

Drug Susceptibility Testing: Tests done to determine which drugs will kill the bacteria that are causing the disease. Those bacteria killed by a particular drug are said to be susceptible to that drug, while those that grow in a drug's presence are said to be resistant to it.

Epidemiological (Epi) link: A known epi-link is defined as either: a) one of the patients naming the other as a contact during one of the patient's infectious period or b) the two patients being at the same place at the same time during one of the patient's infectious period.

Ethambutol (EMB): One of the four first-line oral drugs used for TB treatment.

Extrapulmonary TB: TB disease in any part of the body other than the lungs (for example, the kidney or lymph nodes).

Fingerprinting: Refers to TB genotyping using a specific type of RFLP analysis.

Foreign-born: Anyone born outside the United States; regardless of the location of their family's birth.

Genotyping: A laboratory approach used to determine if TB isolates are genetically identical.

Immunosuppression: Medical conditions that reduce the body's usual immune response and as a result predispose a person to TB. Examples include HIV infection, diabetes, malnutrition and immunosuppressive therapy (such as steroids).

Incidence: The number of new cases of TB during a specified period of time; often expressed as a rate. For example, for every 100,000 American Indians in King County we would expect to see 18.8 cases of TB.

Index case: The first case identified. Infectious: The stage of disease in which an individual transmits TB bacteria into the air.

Isoniazid (INH): One of the four first-line drugs used to treat TB, this drug is used either alone or in combination with other drugs as therapy for either TB disease or infection.

Latent TB Infection: Condition in which living TB bacteria are present in an individual, but do not produce clinically active disease. While the infected person usually has a positive tuberculin skin test, he/she does not have symptoms related to the infection, has a normal chest x-ray, and is not infectious. However, this individual remains at risk for developing TB disease.

Multi-Drug Resistant TB (MDR-TB): Drug resistance to both isoniazid (INH) and rifampin (RIF).

Mycobacterial interspersed repetitive unit (MIRU): A PCR-based genotyping assay performed on every isolate submitted for analysis.

Mycobacterium Tuberculosis (M. TB, M. tuberculosis): The mycobacterium organism that causes TB.

Polymerase Chain Reaction (PCR): A technique that allows for identification of TB strain types. Two PCR-based techniques are currently in use, spoligotyping and MIRU analysis.

Pulmonary TB: TB that occurs in the lungs.

Purified Protein Derivative (PPD): A type of purified tuberculin preparation derived in the 1930's. The standard (Mantoux) skin test uses 5 tuberculin units of this preparation. The test is thus also known as a 'PPD,' or 'TST,' which stands for Tuberculin Skin Test.

Pyrazinamide (PZA): One of the four first-line oral drugs used for TB treatment.

Regimen: The treatment plan specifying which drugs, dosages, schedule and length of therapy to use for TB.

Resistance: The ability of some strains of bacteria to grow even in the presence of certain drugs which normally kill them.

Restriction Fragment Length Polymorphism (RFLP): A lab technique used to "fingerprint" strains of TB to track patterns of transmission. The technique is based on measuring the number and length of specific DNA fragments that are cut using specific enzymes.

Rifampin (RIF): One of the four first-line oral drugs used for TB treatment.

Screening: Evaluation for TB including skin testing of individuals or groups.

Spoligotyping: A genotyping technique based on spacer sequences found in a specified region of the TB bacteria's chromosome.

Source case: An infectious individual who has transmitted TB to other people.

Susceptible: Bacteria which can be killed by drugs used against them.

Tuberculin Skin Test (TST): The test to see if someone has latent TB infection.

Tuberculosis Disease (TB): The disease that is caused by the mycobacterium *M. tuberculosis*. Diseased persons have met one of the case definition criteria, be it either a laboratory or clinical case definition (or both).

APPENDIX 2: TB EPIDEMIOLOGY RESOURCES

Public Health - Seattle & King County: www.metrokc.gov/health

Public Health - Seattle & King County TB Control Program: www.metrokc.gov/health/tb/

Washington State Department of Health: www.doh.wa.gov/cfh/tb/

CDC Division of TB Elimination: www.cdc.gov/nchstp/tb/

TB Education and Training Resources: www.findtbresources.org/scripts/index.cfm

Francis J. Curry National Tuberculosis Center: www.nationaltbcenter.edu

WHO Stop TB Partnership: www.stoptb.org/
www.who.int/tb/en/

This report primarily presents data for verified 2006 TB cases. However, where unavailable, summaries from previous years have been presented.

All case data came from the Tuberculosis Information Management System database (TIMS). This database was designed to allow counties and states to report TB surveillance data to the Centers for Disease Control and Prevention. TIMS uses data from the Report of Verified Case of Tuberculosis (RVCT) case report form that is submitted by all reporting areas.

EPI-LOG support provided by Communicable Disease Epidemiologist Laurie Stewart.

All Charts and Tables are from TB Control Program, Seattle King County Public Health.

2006 TB morbidity maps are provided courtesy of the Epidemiology, Planning and Evaluation unit (EPE), Seattle King County Public Health.

Denominator estimates are courtesy of the HIV/AIDS Epidemiology Unit, Seattle King County Public Health and VISTAPHw software, courtesy of the EPE unit.

2000 Census Data Summary Files used in preparing these population estimates can be found at:

www.census.gov/main/www/cen2000.html and www.quickfacts.census.gov/qfd/states/53/530331k.html

Estimates for overall population, age group and race were also taken from the State of Washington Office of Financial Management at: www.ofm.wa.gov/pop/april1/finalapril12005popofcities.pdf

Washington state data for 2006 are courtesy of the Washington State Department of Health Infectious Disease and Reproductive Health Assessment Unit.

National data are from the surveillance reports at CDC's Division of TB Elimination website www.cdc.gov/nchstp/tb/surv/Surv.htm (Reported Tuberculosis in the United States, 2005) and from www.cdc.gov/mmwr/PDF/wk/mm5410.pdf

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

Figure trends were generated in Microsoft Excel using ordinary least squares regression.

Since TB is a reportable disease, all 2006 cases are assumed to have been included in this report.

For more information about tuberculosis in King County, please visit the TB Control Program's website at: www.metrokc.gov/health/tb/

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