

County of San Diego  
 Health and Human Services Agency  
 Tuberculosis Control Program

# 1999 Annual Report



## Tuberculosis Control Program

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### Contents

Introduction	1
Case Counts	2
Case Distribution by Age	3
Case Distribution by Race / Ethnicity	3
Foreign-born Cases	4
Geographic Distribution	6
Site of Disease	7
HIV Infection	8
Other High Risk Groups	8
Drug Resistance	9
Disease Due to <i>Mycobacterium bovis</i>	9
Treatment Outcomes: 1998 Cohort	10
Evaluation of Close Contacts	12
Latent Tuberculosis Infection	12
Contacting San Diego County Tuberculosis Control	13

### Introduction

Tuberculosis (TB), an infectious disease caused by the bacterium *Mycobacterium tuberculosis*, is the leading infectious cause of death in the world today. It is estimated that one third of the world's population is infected with TB.

In the United States (US), TB was the leading cause of death in 1900. With the advent of effective treatment, the US experienced a steady decline in cases until the mid-1980s. A resurgence of TB occurred at that time, with national case rates peaking in the early 1990s. Through extensive public health interventions at the national, state, and local levels, TB is once again on the decline. Nationally, 1999 saw the lowest number of reported cases since TB statistics have been systematically recorded.

## County of San Diego Tuberculosis Control Program 1999 Annual Report

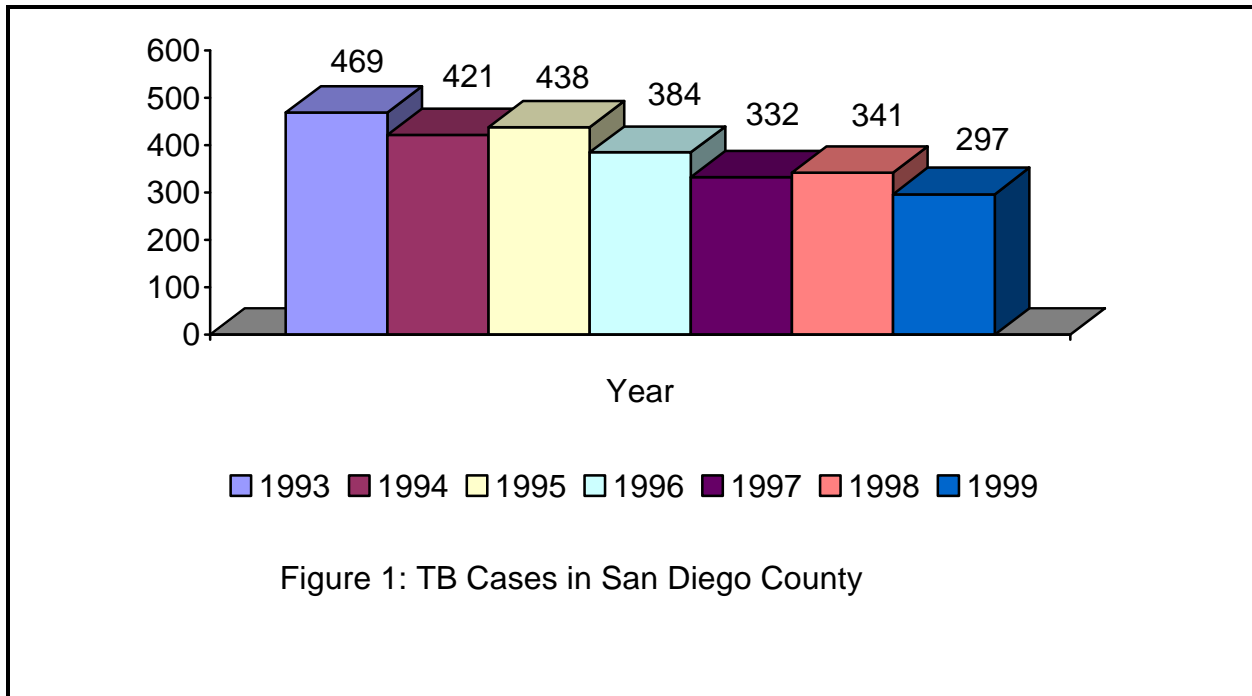


Figure 1: TB Cases in San Diego County

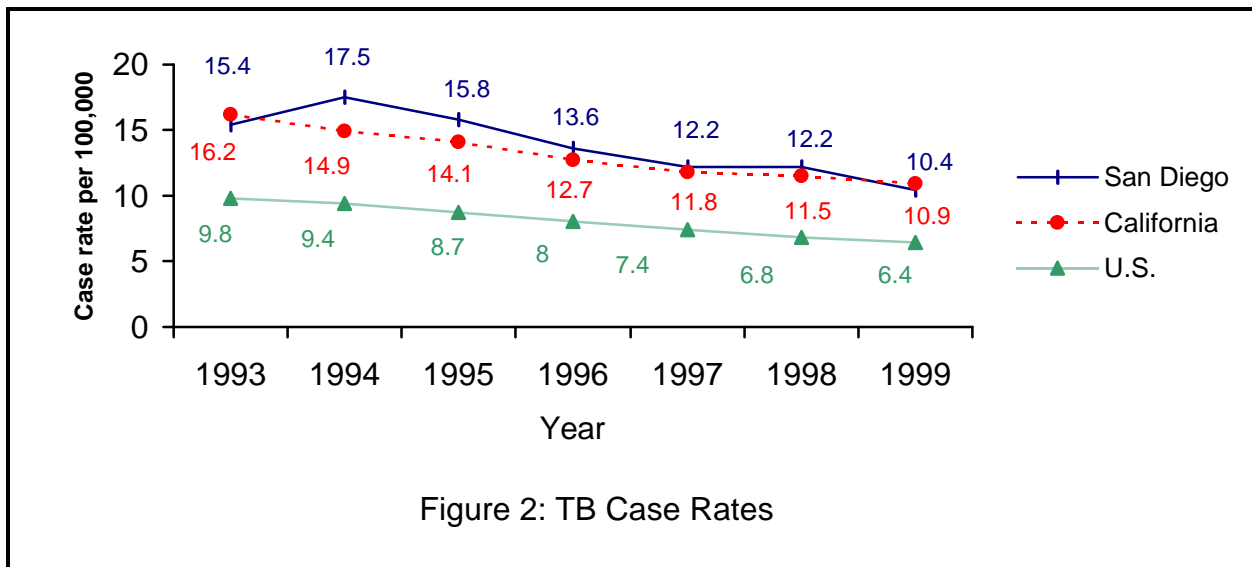


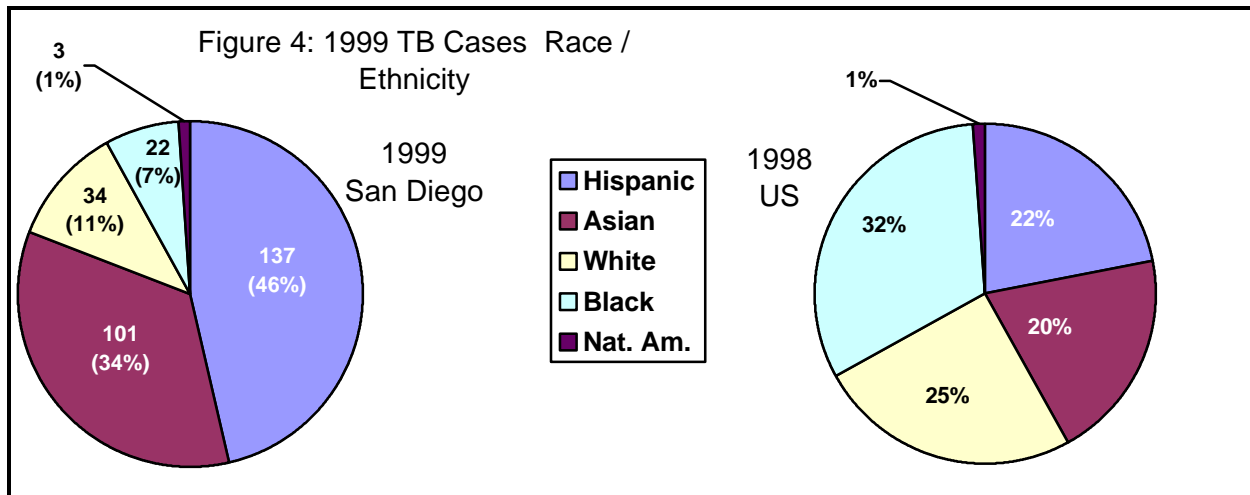
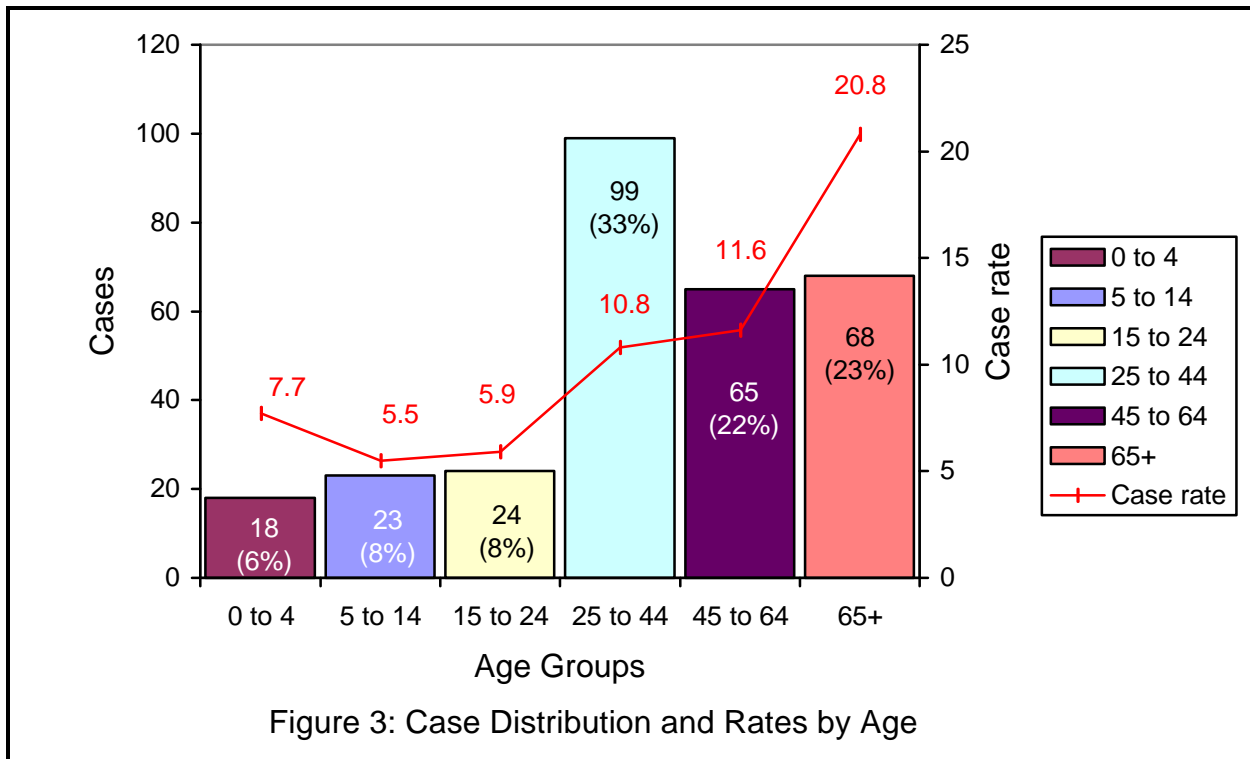
Figure 2: TB Case Rates

### Case Counts and Rates

Trends in TB case rates in San Diego County have generally paralleled those of the US, although the absolute rates have been greater. In 1999, San Diego County reported 297 TB cases with a case rate\* of 10.4 per 100,000 (Figures 1 and 2). This represents a 13% decrease in cases from 1998 and a 37% decrease from 1993, the peak year of TB resurgence in San Diego.

\* Unless otherwise specified, case rates are per 100,000.

# County of San Diego Tuberculosis Control Program 1999 Annual Report



## Age

Children, ages 0 to 4, accounted for 6% of cases in 1999 (Figure 3). There were 18 cases in this age group, a 54% decrease from 1993 (39 cases). TB cases in young children are particularly important because they are indicative of recent transmission of disease. The median age of TB cases in San Diego for 1999 was 40, and ranged from 0 to 95 years of age. Persons aged 25 to 44 made up the largest

group of TB cases, with 99 (33%). However, as a proportion of the population at risk, the 65 and older age group (68 cases) had the highest case rate (20.8).

## Race and Ethnicity

The distribution of TB cases in San Diego by race/ethnicity in 1999 was 46% Hispanic, 34% Asian, 11% White, 7% Black and 1% Native American (Figure 4). The highest case

rate (37.9) was found among Asians, followed by Hispanics (19.7), Blacks (12.9), and Whites (1.9).

For California (1998 data), the largest percentage of TB cases was found among Asians (40%), followed by Hispanics (36%), Whites (13%), Blacks (10%), and Native Americans (1%). For the US (1998 data), the distribution of TB by race/ethnicity was 32% Black, 25% White, 22% Hispanic, 20% Asian, and 1% native American. (Complete demographic data for 1999 TB cases for California and the US are not yet available.)

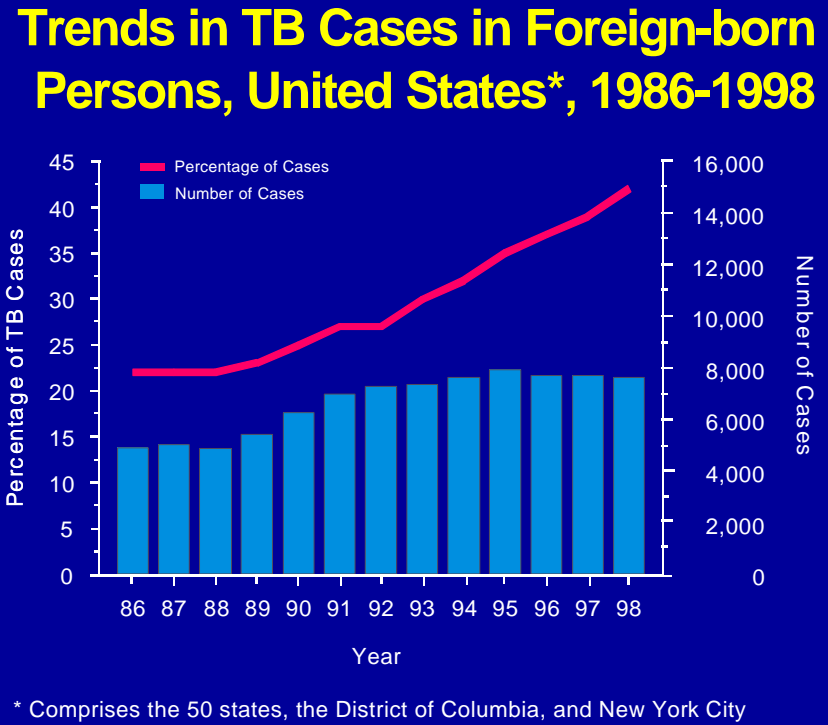


Figure 5

**Foreign Birth**

A notable trend in TB epidemiology in the US has been the increase in the proportion of cases occurring in persons of foreign birth. Between 1986 and 1992, TB cases in the foreign born increased by 47.6% (Figure 5). During the same time period, cases among US-born individuals increased by 8.5%. From 1992 to 1998, foreign-born TB cases increased 4.4% while TB in the US born decreased by 44.5%. By 1998, foreign-born TB cases accounted for 41.3% of all TB cases in the US. The most common countries of origin for persons of foreign birth with TB in the US in 1998 were Mexico (23%), the Philippines (13%), and Vietnam (10%) (Figure 6).

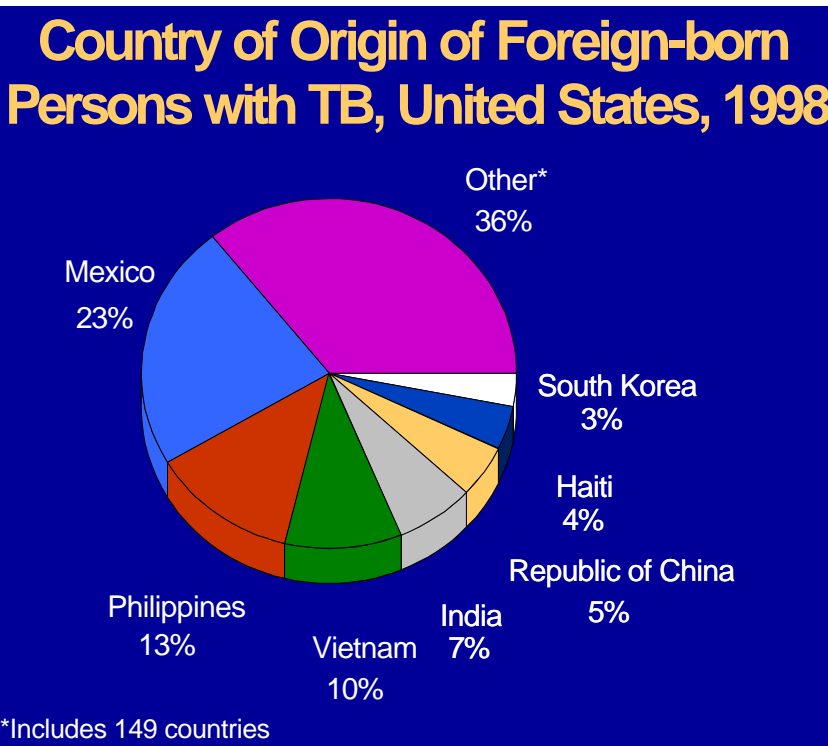


Figure 6

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Country of Origin	1994	1995	1996	1997	1998	1999
<b>THE AMERICAS</b>	<b>281</b>	<b>272</b>	<b>235</b>	<b>192</b>	<b>224</b>	<b>190</b>
United States	147	132	123	112	113	97
Mexico	120	125	105	76	106	87
Other	14	15	7	4	5	6
<b>ASIA</b>	<b>118</b>	<b>151</b>	<b>127</b>	<b>126</b>	<b>105</b>	<b>94</b>
Vietnam	25	33	26	17	14	18
Philippines	74	81	80	78	67	62
Other	19	37	21	31	24	14
<b>EUROPE</b>	<b>5</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>4</b>	<b>4</b>
<b>AFRICA</b>	<b>14</b>	<b>10</b>	<b>16</b>	<b>7</b>	<b>6</b>	<b>8</b>
<b>OTHER/UNKNOWN</b>	<b>3</b>	<b>0</b>	<b>2</b>	<b>4</b>	<b>2</b>	<b>1</b>
<b>TOTAL</b>	<b>421</b>	<b>438</b>	<b>384</b>	<b>332</b>	<b>341</b>	<b>297</b>
<b>% Foreign-born</b>	<b>65</b>	<b>70</b>	<b>67</b>	<b>66</b>	<b>67</b>	<b>67</b>

**Table 1: TB Cases in San Diego by Country of Origin, 1994-1999**

In San Diego County, foreign-born persons have consistently accounted for greater than 60% of TB cases (Table 1). The estimated 1999 TB case rate for foreign-born persons in San Diego County is 34.9, compared to that of 4.3 in US-born individuals. The most common countries of origin for foreign-born TB cases in San Diego in 1999 were Mexico (44%), the Philippines (31%), and Vietnam (9%) (Figure 7).

Studies of TB epidemiology in the foreign-born have shown that the majority of cases occurred in immigrants who had been in the US for less than five years (US data 1986-1993). However, in San Diego this has not been the situation in recent years. From 1995-1999, 64% of cases in immigrants occurred in those persons who had been in the US for 6 years or more (median of 14.6 years in US for this group). This percentage did not vary significantly by country of birth.

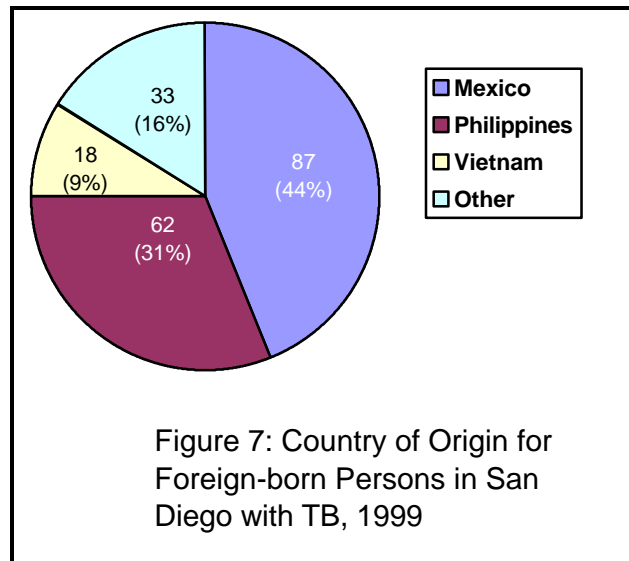


Figure 7: Country of Origin for Foreign-born Persons in San Diego with TB, 1999

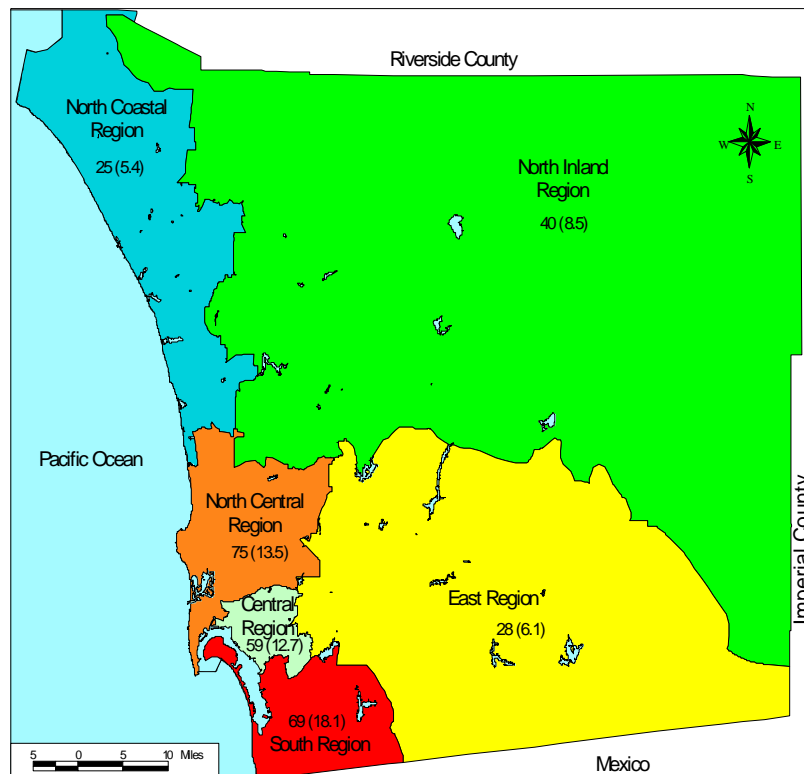


Figure 8: 1999 TB Cases by Region (case rates per 100,000 are shown in parentheses)

### Geographic Distribution

San Diego County encompasses approximately 4000 square miles. The distribution of 1999 TB cases in San Diego County by regional areas is shown in Figure 8. The largest number of cases occurred in the Central Region (75) and the South Region had the highest case rate (18.1)

The five highest case rates by region and race/ethnicity were:

- 1) South, Asian - 73.9;
- 2) North Central, Black - 58;
- 3) North Central, Hispanic - 44;
- 4) North Inland, Asian - 41.9
- 5) North Central, Asian - 35.1.

## County of San Diego Tuberculosis Control Program 1999 Annual Report

City	Cases	Rate	City	Cases	Rate
Carlsbad	4	5.2	National City	10	18.2
Chula Vista	20	12.0	Oceanside	16	10.1
Coronado	1	3.5	Poway	1	2.1
Del Mar	0	-	San Diego	163	12.9
El Cajon	10	10.5	San Marcos	4	7.7
Encinitas	2	3.3	San Ysidro	11	-
Escondido	15	11.9	Santee	1	1.7
Imperial Beach	5	17.3	Solana Beach	0	-
La Mesa	2	3.4	Vista	11	13.0
Lemon Grove	4	15.6	Other (10 cities)	17	NA

Table 2: 1999 TB Cases and Case Rates (per 100,000) by City

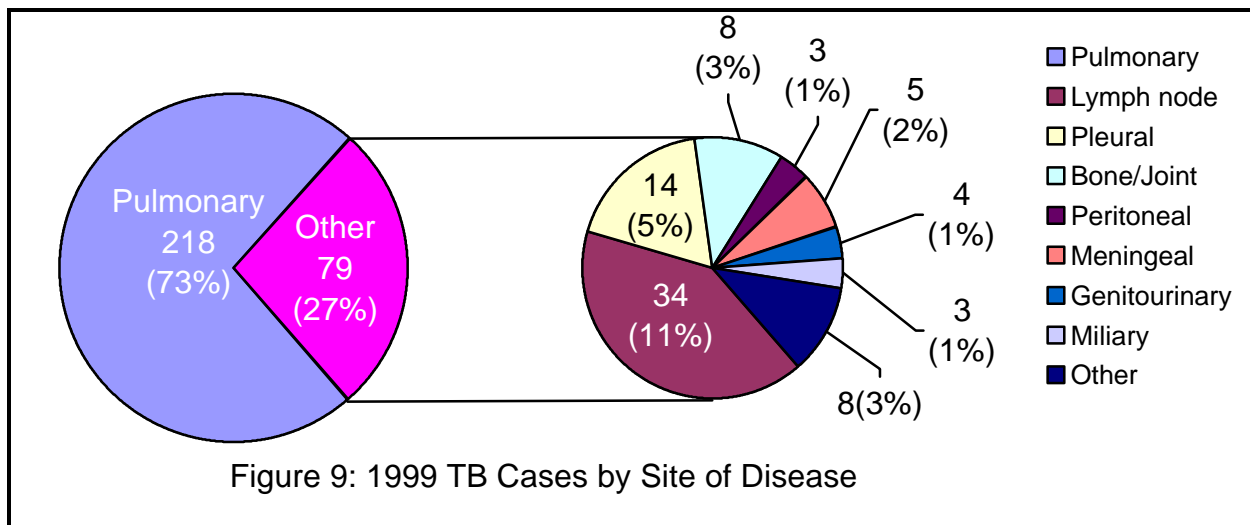


Figure 9: 1999 TB Cases by Site of Disease

Cases distributed by city are shown in Table 2. The city of San Diego had 163 cases (55%) with a case rate of 12.9. The cities with the highest case rates were National City (18.1), Imperial Beach (17.3), and Lemon Grove (15.6).

### Site of Disease

The distribution of TB cases by primary site of disease is shown in Figure 9. The majority of cases were pulmonary (73%). The percentage of cases of pulmonary TB has remained fairly constant (71-79%) since 1994. Of pa-

tients with pulmonary disease as the primary site, 10.5% also had disease at an extrapulmonary site. Forty-six percent of patients with pulmonary TB had at least one positive acid-fast bacillus (AFB) smear (indicative of a high probability of infectiousness).

TB of the lymph nodes was the second most common site of disease in 1999 (11%), a figure which has also shown little variation (9-11%) since 1994.

# County of San Diego Tuberculosis Control Program 1999 Annual Report

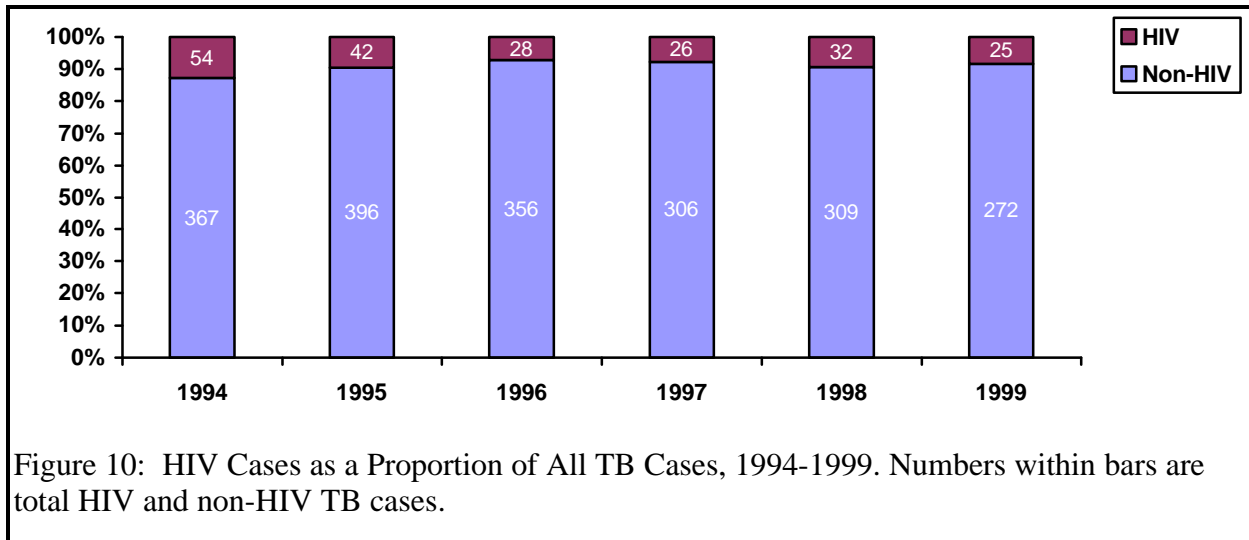


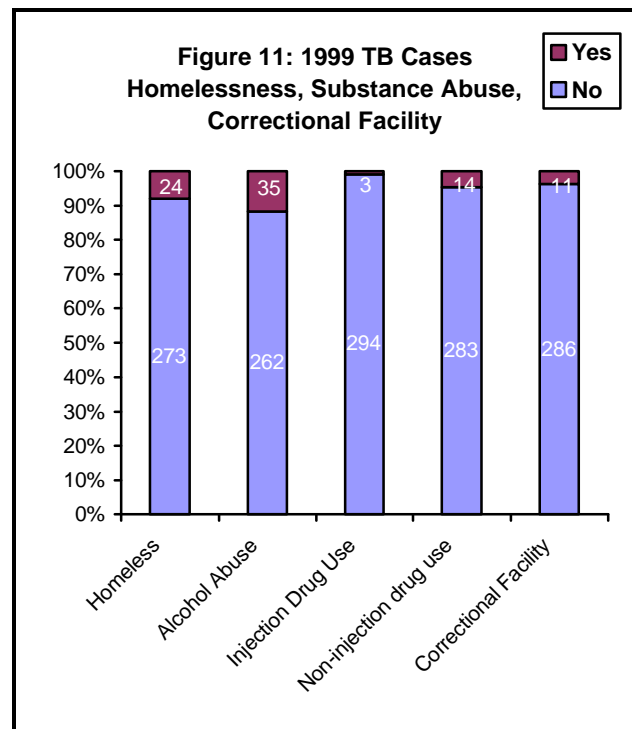
Figure 10: HIV Cases as a Proportion of All TB Cases, 1994-1999. Numbers within bars are total HIV and non-HIV TB cases.

## HIV Infection

Individuals co-infected with HIV are more susceptible to acquiring TB infection and progressing to active disease. While the lifetime risk for progression from infection to disease is under 10% for immunocompetent persons, the risk for progression in the HIV infected is approximately 8% per year. Active TB is more likely to disseminate to organs outside the lung in HIV patients and they are at increased risk for significant morbidity and mortality.

In 1999 in San Diego County, 25 patients with TB were co-infected with HIV, about 8% of total TB cases (Figure 10). Eighty percent (compared to 27% of all cases) of TB/HIV cases had disease at an extrapulmonary site with or without pulmonary TB (48% had extrapulmonary disease only). The estimated TB case rate for HIV infected persons was 214.9. This was greater than 20 times the overall case rate in San Diego.

In 1999, most TB/HIV cases occurred in males (92%). Hispanics (68%) and Blacks (16%) comprised the majority of cases by race/ethnicity. People in the 25-44 age range (76%) were the most likely to have TB and HIV compared with other age groups.



## Other High Risk Groups: Homelessness, Substance Abuse, Incarceration

A number of other conditions are associated with an increased risk for TB infection and disease. Among these are homelessness, substance abuse, and incarceration in jail or prison. Of 297 patients with TB in 1999, 24 (9%) were homeless, 35 (12%) abused alco-



hol, 3 (1%) injected drugs, 14 (5%) used non-injected drugs, and 11 (4%) were diagnosed while in a correctional facility (Figure 11).

**Drug Resistant TB**

TB may become resistant to medications if treatment is inadequate because of patient non-compliance or medical provider error. Resistant TB is more difficult to treat successfully, especially multi drug-resistant (MDR) TB, defined as TB which is resistant to both isoniazid and rifampin. MDR TB has a lower cure rate and a higher mortality rate.

In 1999, positive cultures for *M. tuberculosis* were obtained in 222 (75%) TB cases. The remaining 75 cases did not have cultures obtained or all cultures were negative. Drug resistance patterns for 1999 cases are shown in Figures 12 and 13. Of 222 culture proven TB cases, 48 (22%) were resistant to one drug, 11 (5%) were resistant to two or more drugs (not MDR) and 2 (1%) were MDR. In terms of individual medications, 26 (12%) cases were resistant to isoniazid, 0 were resistant to rifampin alone, 26 (12%) were resistant to pyrazinamide, and 2 (1%) were resistant to isoniazid and rifampin (MDR). It is because isoniazid resistance is so high (exceeds the recommended cutoff of 4%) that all TB suspects and cases in San Diego County should be started on four drug chemotherapy (usually isoniazid, rifampin, ethambutol, and pyrazinamide) while susceptibility results are pending.

**Disease Due to *Mycobacterium bovis***

Disease due to *Mycobacterium bovis*, also known as bovine tuberculosis, is usually contracted through the consumption of unpasteurized dairy products. Person-to-person transmission via inhalation of aerosolized organisms (the method through which *M. tuberculosis* is spread - see "Evaluation of Close Contacts to TB Cases") is also believed to occur.

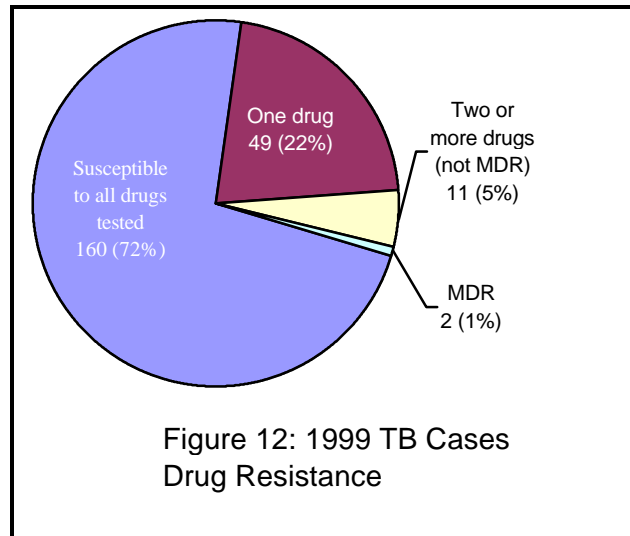


Figure 12: 1999 TB Cases Drug Resistance

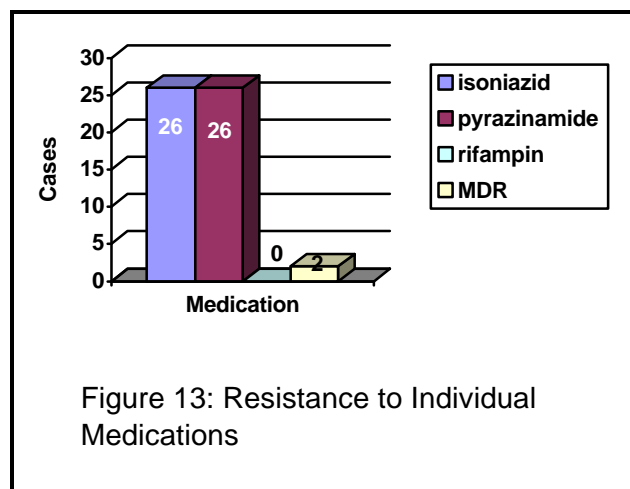


Figure 13: Resistance to Individual Medications

In 1999, 18 cases of *M. bovis* disease were reported in San Diego County. Since 1993, there have been 107 reported cases in the county. Except for 1993 (2 cases) and 1998 (26 cases), the number of cases per year has been fairly constant (11-18) over this period. Most cases occurred in Hispanics (96, 90%) who were either born in Mexico (59, 55%) or the US (45, 42%). Eighteen patients (17%) with *M. bovis* disease were HIV-infected. Fifty-six (52%) patients had disease at an extrapulmonary site. Because *M. bovis* disease is usually contracted by ingestion of contaminated dairy products, it is not surprising that peritoneal disease (9 cases, 8.4%) occurred more than 8 times as frequently as with *M. tu-*

## County of San Diego Tuberculosis Control Program 1999 Annual Report

	1994	1995	1996	1997	1998	Total
Started Treatment	405	425	367	311	333	1841
Completed (<= 12 mos.)	263	303	256	225	236	1283
Completed (>12 mos.)	58	58	60	43	32	251
Still on Treatment	0	0	0	0	14	14
Moved	48	27	22	19	22	138
Died	27	28	24	21	21	121
Lost	3	1	2	0	2	8
Refused	4	1	0	0	0	5
Other	2	7	3	3	6	21
<b>Percent Completion*</b>	<b>97%</b>	<b>98%</b>	<b>98%</b>	<b>99%</b>	<b>97%</b>	<b>98%</b>

\* Completion rates exclude patients who have died or moved.

Table 3: Treatment Outcomes, 1994-1998

*berculosis.*

*M. bovis* is uniformly resistant to pyrazinamide and accounted for 69% of pyrazinamide resistant cases in 1999. About 3% of *M. bovis* is resistant to isoniazid and < 1% is MDR in San Diego County.

### Treatment Outcomes (1994-1998† Cohorts)

From 1994 through 1998, 1841 patients with TB were started on treatment in San Diego County. Ninety-seven percent of these patients completed therapy (Table 3).

### Treatment Outcomes for 1998 Cohort: Medical Providers

In San Diego, most TB patients are treated by community providers rather than the TB Control Clinic. The TB Control Program provides case management and other assistance for all TB cases, regardless of medical provider type. For the 1998 cohort, 183 (55%) patients re-

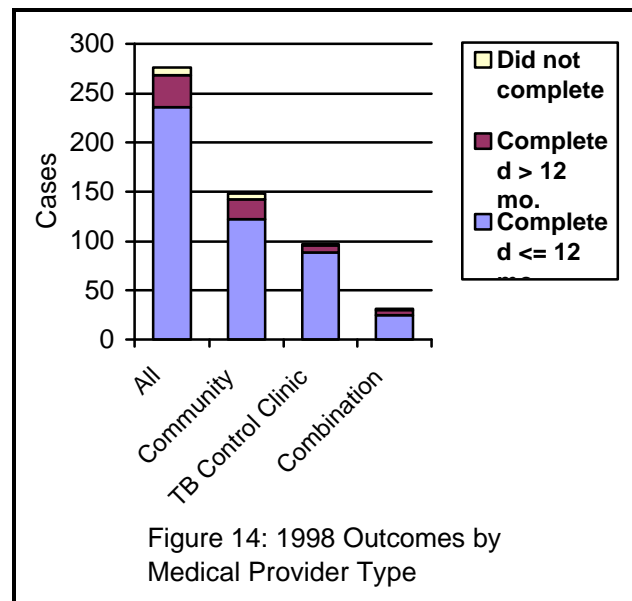


Figure 14: 1998 Outcomes by Medical Provider Type

ceived treatment from community providers, 105 (32%) patients were treated at the TB Control Clinic, and 33 (10%) received treatment from a combination of both. Treatment outcomes were similar for all groups. The completion rates were 97% for community providers and 99% for the TB Control Clinic

† Much of the outcome data for the 1999 cohort are not yet available as many patients remain on treatment.

# County of San Diego Tuberculosis Control Program 1999 Annual Report

(Figure 14) and therapy was usually completed within 12 months.

## Treatment Outcomes for 1998 Cohort: Method of Treatment

To treat active tuberculosis, multiple medications must be given for at least six months. If therapy is interrupted or taken inappropriately, drug resistance may develop. In order to overcome the problem of patient non-adherence to treatment, many health departments offer directly observed therapy (DOT). DOT entails the administration of medication under the direct observation of a nurse or outreach worker. Use of DOT has been demonstrated to increase TB cure rates and decrease acquired and primary drug resistance.

Because DOT is resource intensive, San Diego County TB Control has not instituted a policy of universal DOT. Nevertheless, San Diego County TB Control attempts to honor all physician requests for this service. Priority for DOT is given to patients with drug resistance, suspected or documented non-adherence to treatment, a history of psychiatric disorders, unstable housing, a history of substance abuse, severe immunosuppressive diseases or conditions, patients taking multiple medications for other conditions, and children.

In 1998, information on the method of treatment, DOT versus self administered (SAT), was available for 315 of 333 TB cases started on therapy. Approximately 80% of these patients received some or all of their treatment as DOT (Figure 15). Full or partial DOT was used for 94 % of patients treated by TB Control Clinic

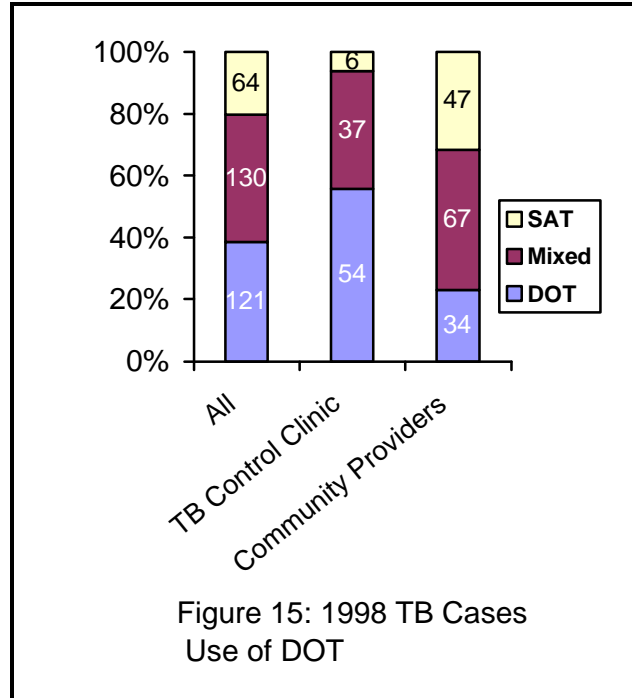


Figure 15: 1998 TB Cases Use of DOT

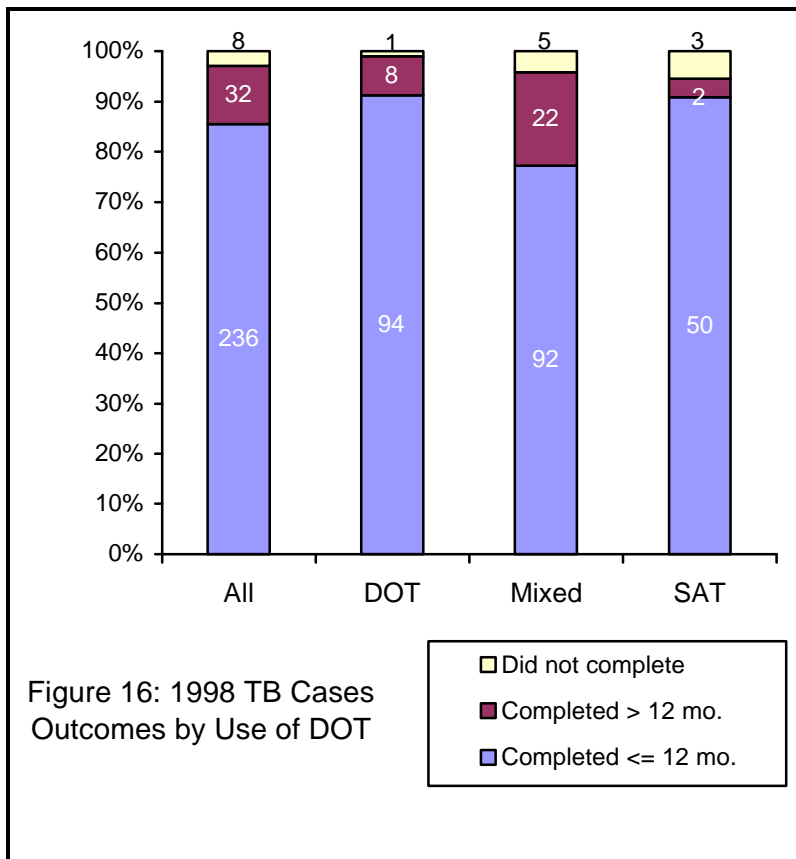


Figure 16: 1998 TB Cases Outcomes by Use of DOT

and for 68% of patients treated by community providers. This difference, at least in part, reflects that TB Control Clinic treats a higher

## County of San Diego Tuberculosis Control Program 1999 Annual Report

	1994	1995	1996	1997	1998
Contacts Identified	1681	2225	1627	1383	1145
Contacts examined	1294 (77%)	1830 (82%)	1432 (88%)	1246 (90%)	1051 (92%)
Contacts per case	6	8	7	6	5

Table 4: Contacts TB Cases Evaluated, 1994-1998

proportion of patients, such as the homeless, who are high risk for non-adherence. Outcomes for 1998 TB cases, stratified by use of DOT, are shown in figure 16.

### Evaluation of Close Contacts to TB Cases (1994-1998 Cohorts)

TB is transmitted via infectious airborne particles, produced by patients when they cough. Likelihood of transmission depends on six factors: 1) infectiousness of the TB case; 2) proximity of contact to the TB case; 3) duration of contact to the TB case; 4) host susceptibility; 5) the environment in which contact occurs (i.e. the risk increases with poor ventilation); and 6) virulence of the TB strain. When deciding whether an individual who has been in contact with a TB patient needs evaluation for TB infection, all of these factors should be considered. Priority for contact investigation is given to highly infectious cases (e.g. pulmonary disease: AFB smear positive and/or cavitary disease and/or extensive infiltrates), highly susceptible contacts (e.g. children and immunosuppressed contacts), and contacts with prolonged, close exposure to the source case (e.g. household members).

From 1994 to 1998, San Diego County TB Control identified 8071 close contacts of TB cases (Table 4). Six thousand eight hundred fifty-three (85%) of these received an evaluation for TB infection by San Diego TB Control or by a community provider.

### Treatment of Latent TB Infection (1994-1998 Cohorts)

The majority of patients who are infected with TB do not become ill with disease immediately after infection. Most individuals achieve a state of equilibrium in which TB organisms remain alive within their body, but do not multiply and cause disease. This state is known as latent infection. Persons with latent infection remain at risk for the development of disease, known as reactivation, for the rest of their lives. The overall lifetime risk for progression from latent infection to active disease is approximately 10%. About half of this risk occurs within the first two years after infection. The risk for progression to active disease is much higher for immunosuppressed persons. For example, AIDS patients who are infected with TB have an estimated risk of developing active TB of 8% per year.

The risk of progression to active disease can be greatly reduced by providing treatment for latent infection. Latent TB is usually treated with a single medication (isoniazid) for 6-12 months or with multiple medications (e.g. rifampin and pyrazinamide) for 2-4 months. Because these medications can have serious side effects (e.g. hepatitis), especially in elderly patients, treatment of latent infection is not recommended for all individuals. Guidelines for treatment of latent TB infection can be obtained from San Diego County TB Control, the Centers for Disease Control and Prevention, or the American Thoracic Society.

## County of San Diego Tuberculosis Control Program 1999 Annual Report

	1994	1995	1996	1997	1998
Patients started on treatment	1672	1861	1817	1631	1295
Completion rate (all patients)	70% (1163)	75% (1403)	78% (1426)	75% (1218)	67% (870)
Contacts <15 yrs.	57% (42)	74% (57)	86% (73)	73% (33)	81% (42)
Contacts 15 – 34 yrs.	73% (85)	67% (95)	76% (97)	69% (54)	63% (46)
Contacts >= 35 yrs.	71% (27)	70% (43)	70% (28)	65% (17)	69% (29)
Others	70% (1009)	76% (1208)	79% (1228)	75% (1114)	68% (715)

Table 5: Completion of Treatment for Latent Infection 1994-1998

San Diego County TB Control Clinic completion rates for treatment of latent infection are shown in Table 5. From 1994 to 1998, 8276 patients were started on treatment for latent infection. Of these, 6080 (73%) completed therapy.

### Contacting San Diego County TB Control

Mail:

TB Control  
P.O. Box 85222  
P511D  
San Diego, CA 92186-5222

Phone:

General information: 619-692-5565  
Medical Provider Reporting: 619-692-8610  
Epidemiology: 619-542-4019

Fax:

619-692-5650

Internet:

<http://www.co.san-diego.ca.us/cnty/cntydepts/health/services/tb/index.htm>

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