

2013 Tuberculosis Statistics For North Carolina

State of North Carolina
Department of Health and Human Services
Division of Public Health
Communicable Disease Branch
Tuberculosis Control Program

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Department of Health and Human Services • Aldona Z. Wos, M.D., Secretary
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HIGHLIGHTS

While tuberculosis in the United States decreased from 3.8 to 3.0 per 100,000 between 2009 and 2013, the North Carolina rate went from 2.7 to 2.2. However, the 2013 North Carolina rate per 100,000 was a 2 percent increase over 2012.

Demographics:

- North Carolina ranked as the 25th highest state for TB case rates in the United States in 2013. This can be viewed as significant progress; in 1980, North Carolina was ranked as the 3rd highest state for case rate.
- The number of TB cases in 2013 was 216. Since 1980, TB cases in North Carolina have decreased by approximately 4 percent per year. As a result, the total number of cases in 2013 was 20 percent of the total number of cases for 1980 (216 cases compared to 1066 cases).
- In 2013, half of all cases were located in five counties: Mecklenburg (41), Wake (26), Guilford (19), Robeson (14) and Cumberland (7). The case rate was higher than the state rate in all of these counties except Cumberland County. There were 50 counties with no TB cases in 2013.
- The number of Asians with TB increased by 69 percent between 2009 and 2013; the case rate for Asians increased from 16.1 to 20.1 per 100,000 population.
- The number of African-Americans with TB decreased by 22 percent from 2009 to 2013. The case rate for African-Americans decreased from 5.3 to 3.9 per 100,000 population.
- The number of Hispanics with TB decreased from 54 cases in a year to 39 between 2009 and 2013; the rate during this same time period decreased from 7.8 to 4.6 per 100,000 population. Of the 232 total Hispanic cases between 2009 and 2013, 147 (49%) were located in six counties: Mecklenburg (35), Wake (30), Forsyth (16), Durham (12), Duplin (11), and Guilford (9).
- The number of cases from 2009 to 2013 decreased for age groups 5 to 14, 15 to 24, 45 to 64, and 65 and over. The number of cases remained the same for age group 0 to 4 and increased slightly for age group 25 to 44.

Risk Factors:

- About two-thirds of all 2013 TB cases in North Carolina have at least one of the following risk factors: being born in a country with a higher TB incidence than the United States (“foreign born”); homeless within past year; resident of a long-term care or correctional facility; HIV co-infected; excessive alcohol user; non-injecting or injecting drug user; or health care worker. Fifteen percent have two or more of these risk factors.
- The percent of cases that are foreign born increased from 37 percent to 47 percent between 2009 and 2013. Fifty percent of all foreign-born cases of TB in 2013 came from four countries: Mexico (15%), India (14%), Vietnam (13%); and Philippines (9%). For the five-year period from 2009 to 2013, there were a total of 521 foreign-born cases. Of these, 265 cases came from the same four countries: Mexico (123), Vietnam (60), India (48), and the Philippines (34). Of the total cases, 267 cases (5%) resided in three counties: Mecklenburg (107), Wake (85), and Guilford (75).

- For 2013 pediatric cases (0 to 14 years old), 36 percent were foreign-born and another 36 percent had one or both parents who were foreign born.
- TB cases with excessive alcohol use reported decreased from 17 percent in 2009 to 10.2 percent in 2013. Most of the people (82%) who reported excessive alcohol use are non-Hispanic U.S. born.
- Homeless cases remained fairly constant between 2009 (6.4%) and 2013 (5.6%).
- Reporting of HIV status for TB cases has increased significantly from 2000 to 2013. Since November 2007, the standard of care has been to offer HIV testing as part of routine screening. Patients are informed that HIV testing is part of the screening and may decide to “opt-out” of that test. Before this standard of care was official, state TB nurse consultants trained local health department staff to encourage HIV testing for TB suspects/cases. Consequently, the number of cases where HIV status is unknown has decreased greatly. In 2000, there were 133 persons for whom HIV testing was not offered, not known, done but no result, or refused by the patient. **In 2013, all persons alive at diagnosis received an HIV test.**

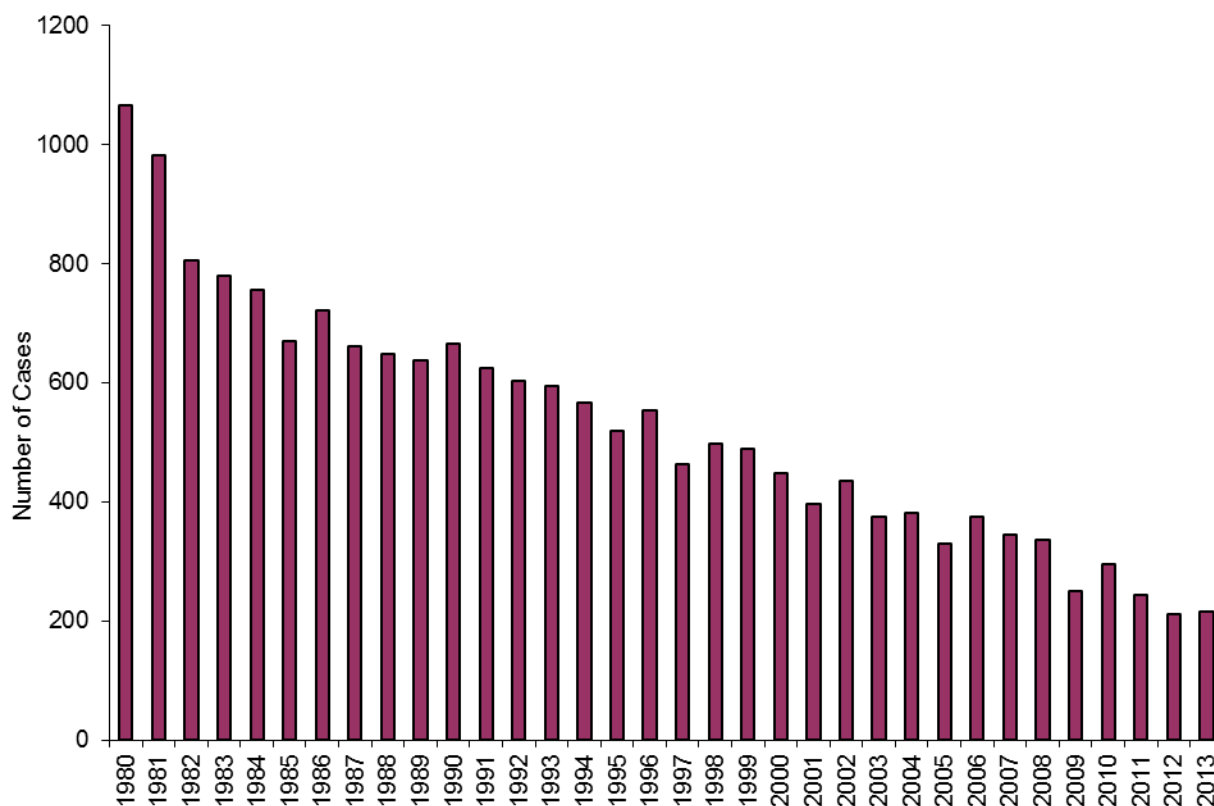
Clinical data:

- Mortality of tuberculosis cases during treatment greatly decreased from 2002 to 2012. The number of cases where death occurred during treatment was 44 in 2002 and 12 by 2012. Additionally, there were 15 people dead at diagnosis in 2002 and four in 2012.
- Previous diagnosis of tuberculosis decreased from 24 cases in 2003 to eight cases in 2012.
- The single major site of disease for TB cases in 2013 was predominately pulmonary (143), followed by pleural (14) and lymphatic: cervical (12).
- The number of cases resistant to INH in North Carolina was 12 in 2009 and eight in 2013; the percentage of cases decreased from 6 percent to 5 percent. Between 2009 and 2012, the number of MDR cases has ranged from one to two cases per year. However, this number went up significantly in 2013 – **there were five MDR cases.**
- In 2012, all cases that were begun on treatment were on totally directly-observed therapy (DOT). The percentage of 2012 cases that completed therapy in one year (when expected to complete therapy in one year) was 98 percent with another 2 percent completing after one year.

DEMOGRAPHICS

DEMOGRAPHIC CHARACTERISTICS

Figure 1. Reported TB Cases in N.C.: 1980 - 2013



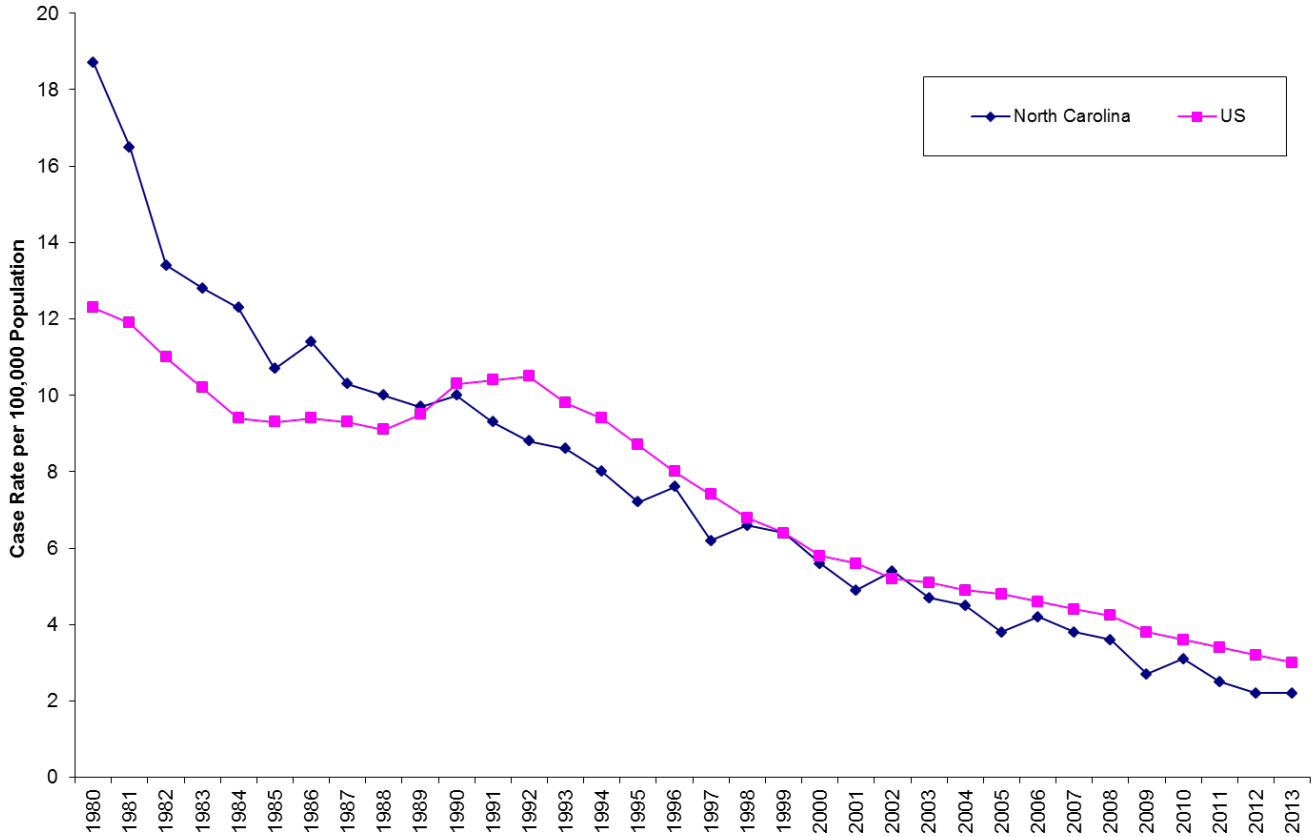
DATA SOURCE: NC Electronic Data Surveillance System (NC EDSS) and Tuberculosis Information Management System (TIMS)

As can be seen from Figure 1, the total number of cases in North Carolina for 2013 is less than 20 percent of the total number of cases in 1980 (216 cases compared to 1066). On average, the numbers have declined about 4 percent per year. TB incidence in North Carolina decreased 14 percent between 2009 and 2013, down from 250 cases to 216 cases. The number of cases reported in North Carolina increased from 211 to 216 between the reporting years 2012 and 2013 – the total number of cases in 2013 was 2 percent higher than the total number of cases in 2012.

Both national and state TB case rates have dropped significantly since 1980. [Figure 2] With the exception of two years (1999 and 2002), the TB case rate has been lower in North Carolina than in the United States since 1990.

The number of cases has declined sharply in North Carolina in the past five years and the state is ranked as 25th highest for case rates in 2012. [Table 1] North Carolina has the eighth largest number of cases among the 50 states.

Figure 2. TB Rates for N.C. and the U.S.: 1980 - 2013



DATA SOURCE: Annual surveillance reports published by CDC.

Table 1: N.C. and U.S. Case Rate and N.C. Ranking in U.S. by Case Rate 2009-2013

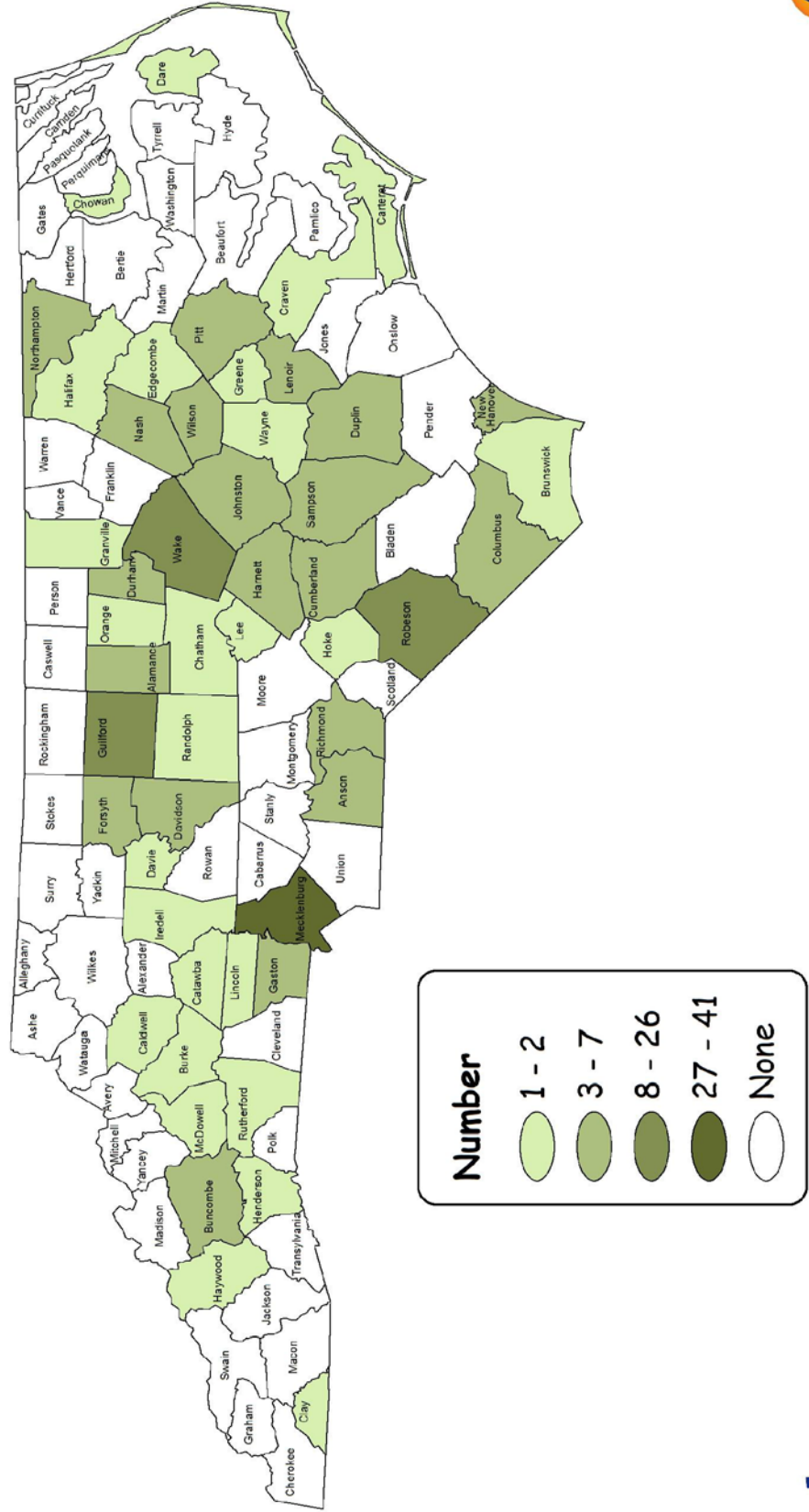
Year	Case Rate and Rank by Case Rate 2009-2013		
	Rates		Rank
	USA	North Carolina	
2009	3.8	2.7	26
2010	3.6	3.1	19
2011	3.4	2.5	24
2012	3.2	2.2	29
2013	3.0	2.2	25

DATA SOURCE: Annual surveillance reports published by CDC.

Table 1 provides a statistical overview and Table 2 provides a demographic overview of reported cases and case rates in North Carolina from 2009 through 2013. Table 10 (Page 25) provides TB cases and rates by county. Figures 4, 5, and 6 provide information about the percent of cases by gender, age, and race/ ethnicity.

Figure 3 on the following page is a map of 2013 cases in North Carolina by county of residence.

Figure 3. North Carolina 2013 Tuberculosis Cases by County



TB cases in North Carolina decreased between 2009 and 2013 from 250 to 216 – a 14 percent decrease. There were 2 percent more cases in 2013 than in 2012. In 2013, the percentage of cases for all racial groups remained fairly consistent with the percentages for 2012 with the exception of blacks (decrease from 38 percent to 32 percent) and Asians (increase from 17 percent to 23 percent). Numbers for all races decreased over the five years with the exception of persons who were Asian (49 in 2013 and 29 in 2009), American Indian (10 in 2013 and 6 in 2009), and multi-racial (9 in 2013 and 5 in 2009). The number of cases decreased or remained the same for every age group with the exception of the age group 25 to 44, increasing from 78 to 82.

North Carolina rates per 100,000 population decreased by 19 percent from 2009 to 2013 (from 2.7 to 2.2 per 100,000). The case rate for Black/African-Americans decreased from 5.3 in 2009 to 3.9 by 2013; a 26 percent decrease. While rates for Asians have fluctuated over the five years, rates for Asians increased from 16.1 in 2009 to 20.1 in 2013. Annual case rates among Hispanics decreased from 7.8 in 2009 to 4.6 in 2013. The rates for males decreased from 3.4 to 2.9.

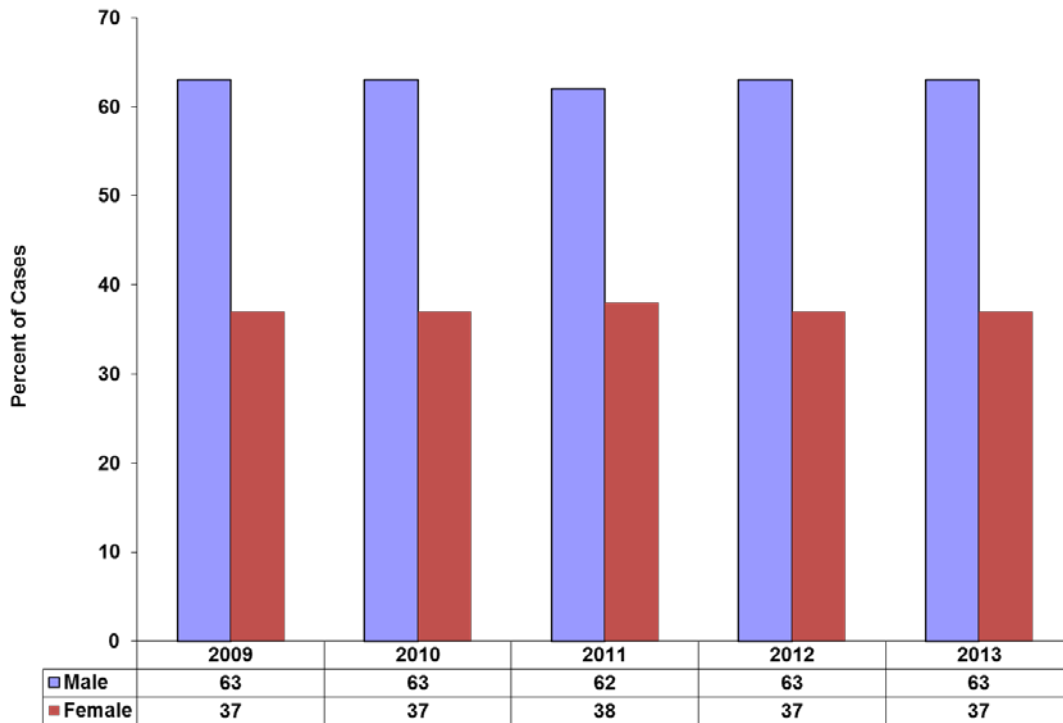
Table 2	NORTH CAROLINA TB CASE REPORTS AND CASE RATES FOR 2009-2013*									
	Year	2009		2010		2011		2012		2013
VARIABLES	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate
Cases	250	2.7	296	3.1	244	2.6	211	2.2	216	2.2
SEX										
Male	157	3.4	187	4.0	151	3.2	133	2.8	136	2.9
Female	93	1.9	109	2.2	93	1.9	78	1.6	80	1.6
RACE										
White‡	103	1.5	111	1.7	88	1.3	81	1.2	64	0.9
Black/African-American	107	5.3	113	5.5	93	4.5	67	3.2	84	3.9
Asian	29	16.1	55	26.3	42	20.1	48	22.7	49	20.1
Amer. Indian/Alaska Native	6	5.1	5	4.1	7	5.7	5	4.8	10	6.8
Hawaiian/Other Pac. Isl.	0	0	5	75.7	1	15.1	0	0	0	0
Multi-Racial	5	4.4	7	3.4	13	6.3	10	4.9	9	4.6
ETHNICITY										
Hispanic	54	7.8	56	7.0	47	5.9	42	5.1	39	4.6
Non-Hispanic	196	2.2	240	2.7	197	2.2	169	1.9	177	2.0
AGE										
0-4	9	1.4	20	3.2	11	1.7	11	1.8	9	1.5
5-14	9	0.7	4	0.3	4	0.3	4	0.3	6	0.4
15-24	30	2.3	36	2.7	25	1.9	25	1.9	19	1.4
25-44	78	3.0	86	3.3	79	3.1	72	2.8	82	3.2
45-64	82	3.4	80	3.2	69	2.8	54	2.1	63	2.4
>65	42	3.6	70	5.7	56	4.5	45	3.5	37	2.7

*Data source: NC EDSS TB Surveillance - Demographic Data Report. Rates are per 100,000.

‡Includes White Hispanic and White Non-Hispanic.

†Denominators for computing rates for the state were obtained from the Annual Estimates of the Population for the United States and Puerto Rico for 2008 and 2009. For 2010 and 2011: U.S. Census Bureau, Summary File 1, Table PCT12. For 2012 and 2013: U.S. Census Bureau, 2012 American Community Survey

Figure 4. N.C. TB Cases by Gender: 2009 – 2013



DATA SOURCE: North Carolina Electronic Disease Surveillance System (NC EDSS)

Figure 5. N.C. TB Cases by Age Group: 2009 – 2013

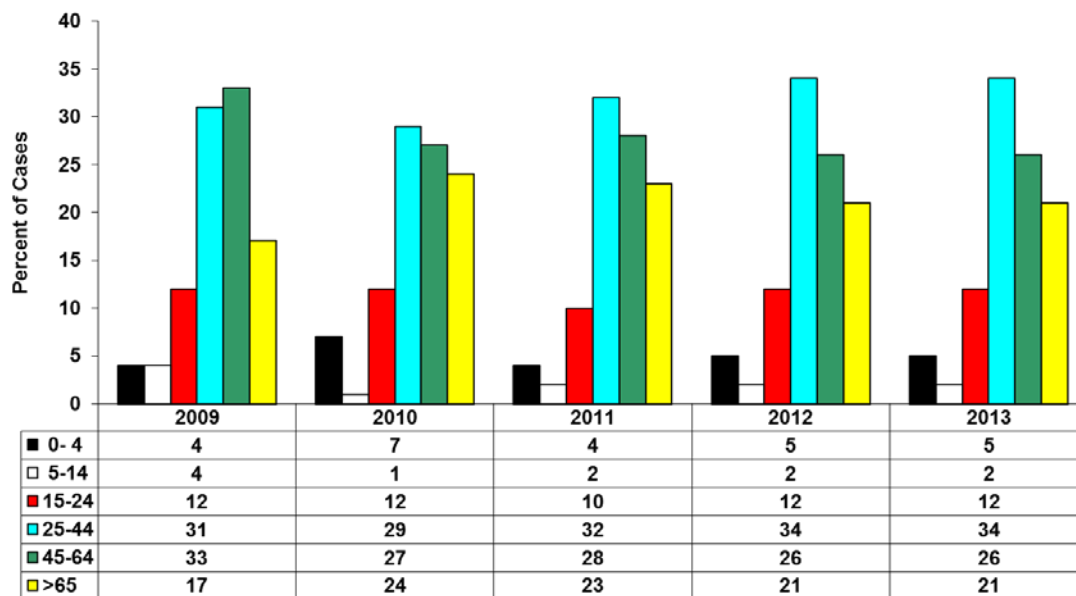
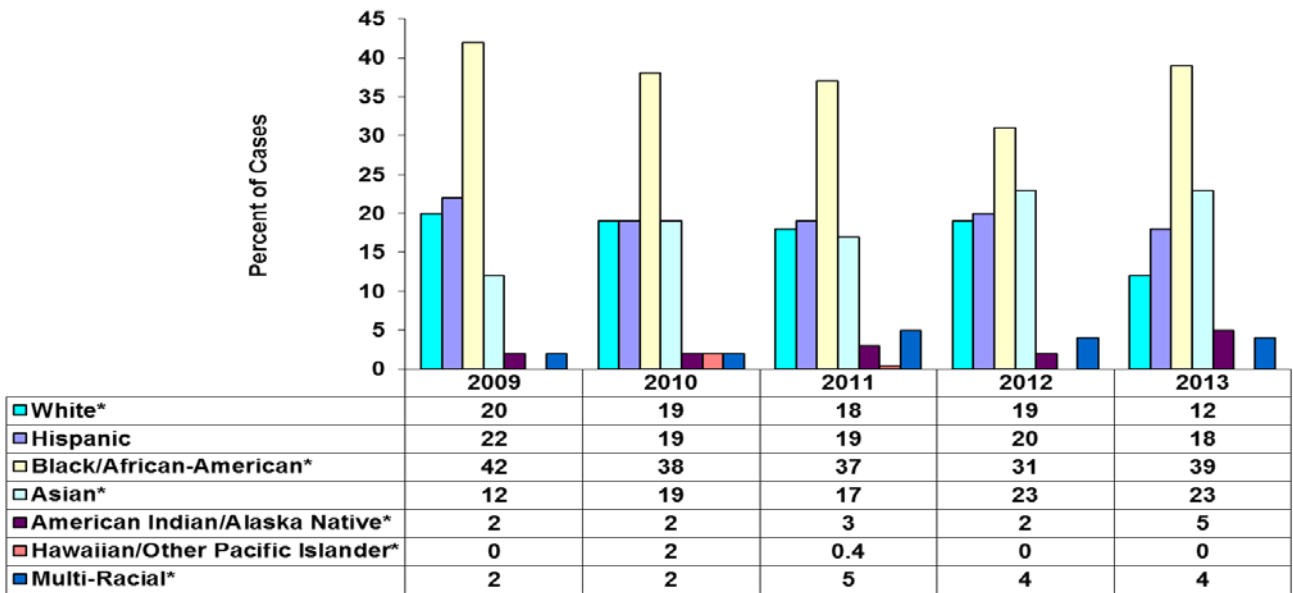


Figure 6. N.C. TB Cases by Race and Ethnicity: 2009 – 2013



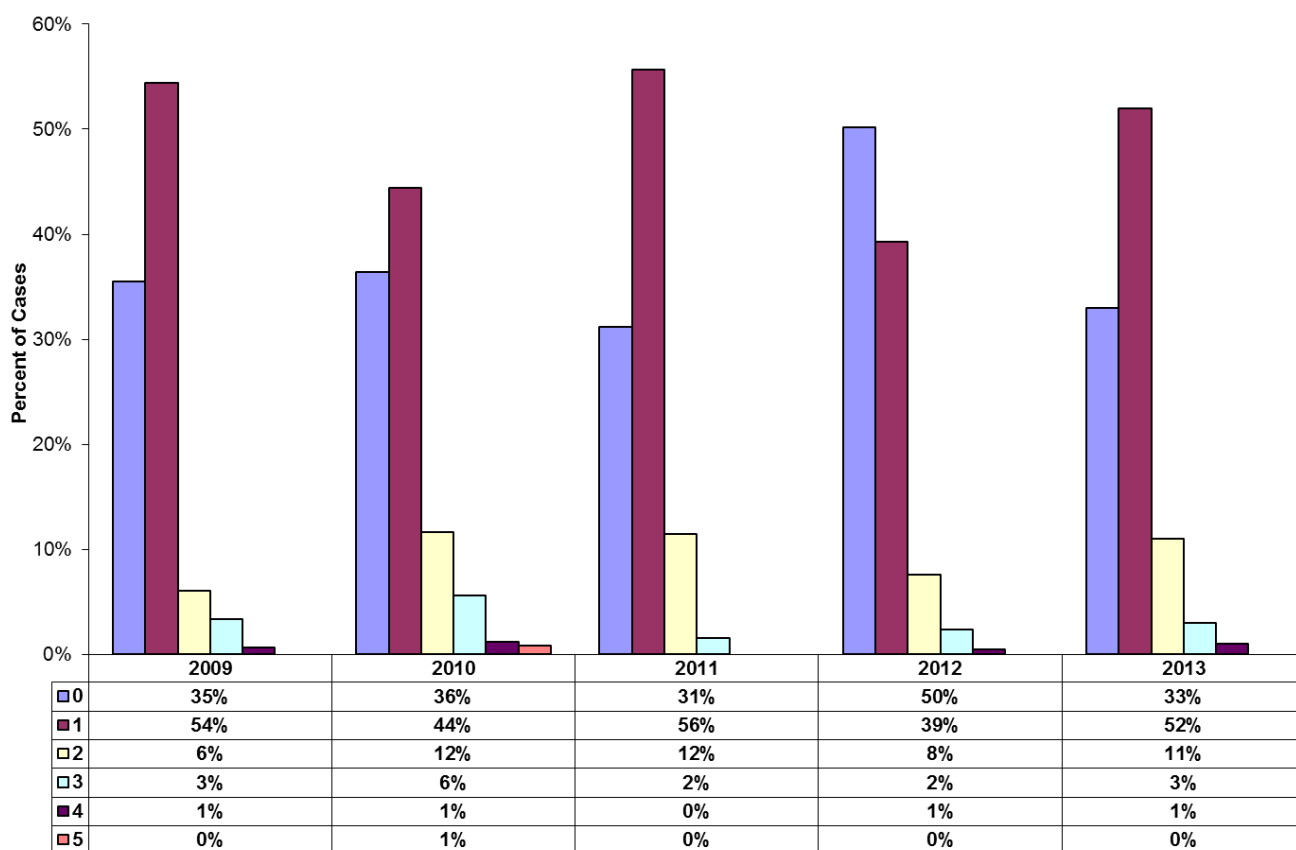
DATA SOURCE: North Carolina Electronic Disease Surveillance System (NC EDSS)

RISK FACTORS

RISK FACTORS FOR TB

There are several risk factors commonly associated with increased incidence of TB. These include: being foreign-born; excessive alcohol use; non-injecting and/or injecting drug use; being homeless; being a resident of a long-term care facility or a correctional facility; being co-infected with HIV; and being a health-care worker. This section describes North Carolina TB cases regarding these factors. As can be seen from Figure 7, about two-thirds of the 2013 cases have one or more risk factors. In 2013, approximately 15 percent of the cases have two or more risk factors.

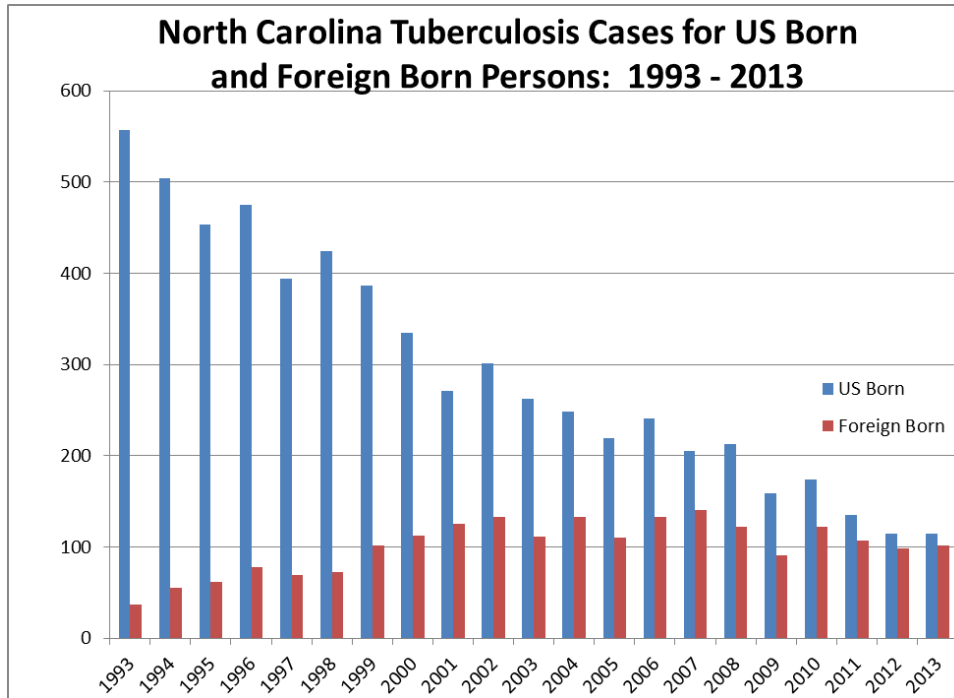
Figure 7. N.C. TB Cases by Number of Risk Factors: 2009 – 2013



DATA SOURCE: North Carolina Electronic Disease Surveillance System (NC EDSS)

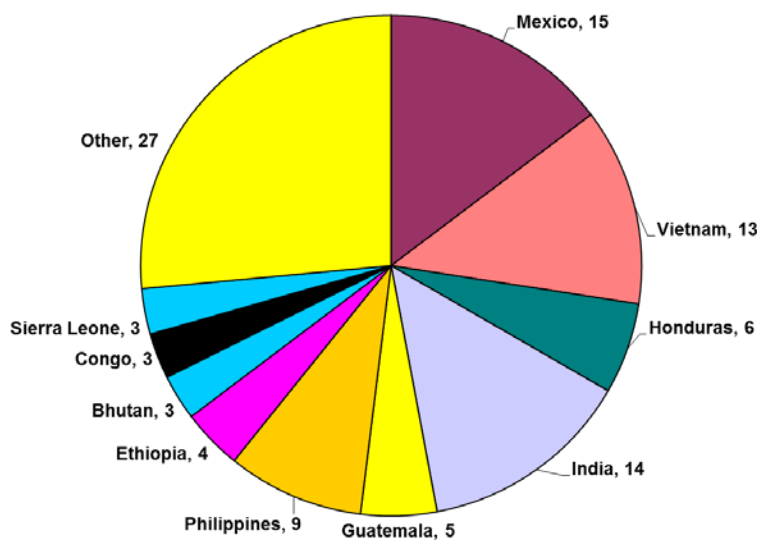
Foreign Born: The number of foreign-born cases in 2013 was 5 percent higher than the number in 2012 (102 cases in 2013 and 97 in 2012). [See Figure 8.] North Carolina has a lower percentage of foreign-born TB cases in comparison to the national average. The most common countries of origin of foreign-born cases in 2013 were Mexico (15%), India (14%), and Vietnam (13%). [See Figure 9.]

Figure 8. N.C. Tuberculosis Cases for US Born and Foreign Born Persons



DATA SOURCE: North Carolina Electronic Disease Surveillance System (NC EDSS)

Figure 9. Countries of Origin for 2013 Foreign-born TB Cases in N.C.



DATA SOURCE: North Carolina Electronic Disease Surveillance System (NC EDSS)

Pediatric Cases by Foreign-Born Status: An examination of 2013 pediatric cases by country of origin indicates that 36 percent (5 of 14) are foreign born. Of those who were born in the United States, four of those under age 5 had foreign born parents (referred to in the table below as foreign-born associated) for a total of 67 percent (6 of 9) either foreign-born or with foreign-born parents. Of those 5 to 14 years old, 80 percent (4 of 5) were foreign-born or had foreign-born parents.

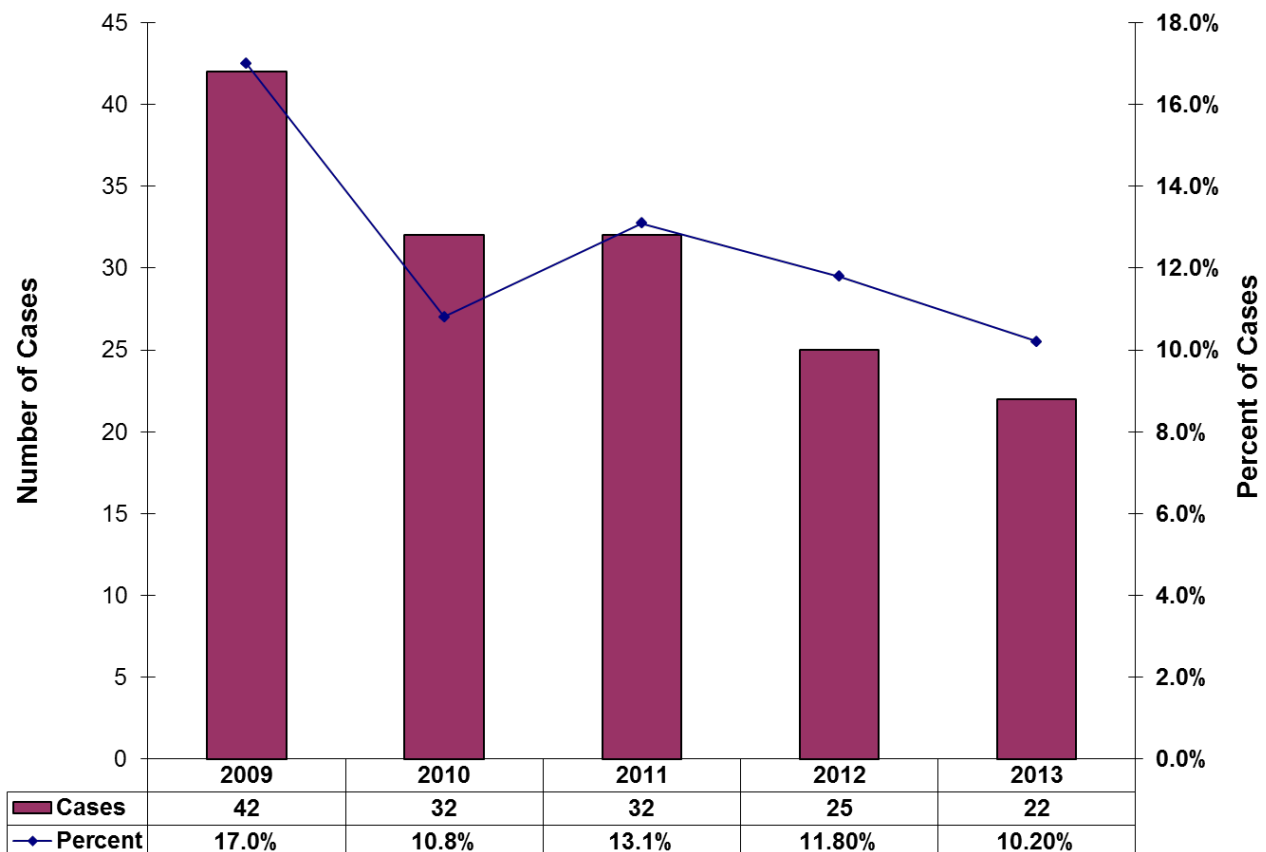
Table 3: Pediatric Cases by Foreign-Born Status

TABLE 3	2012			2013		
	U.S.	FOREIGN-BORN ASSOCIATED	FOREIGN BORN	U.S.	FOREIGN-BORN ASSOCIATED	FOREIGN BORN
0 – 4 YEARS	4	6	1	3	4	2
5 – 14 YEARS	0	2	2	1	1	3
TOTAL	4	8	3	4	5	5

DATA SOURCE: North Carolina Electronic Disease Surveillance System (NC EDSS)

Excessive Alcohol Use: The number of TB cases with reported excessive alcohol use between 2009 and 2013 decreased by 48 percent; the proportion they represent among cases reported in these years decreased about 40 percent (17% v. 10.2%). [See Figure 10.] In 2013, 82 percent of this group was U.S. born. Fourteen percent was foreign-born non-Hispanics, and 4 percent was foreign-born Hispanics. [See Table 4.]

Figure 10. N.C. TB Cases with Excess Alcohol Use: 2009 - 2013



DATA SOURCE: North Carolina Electronic Disease Surveillance System (NC EDSS)

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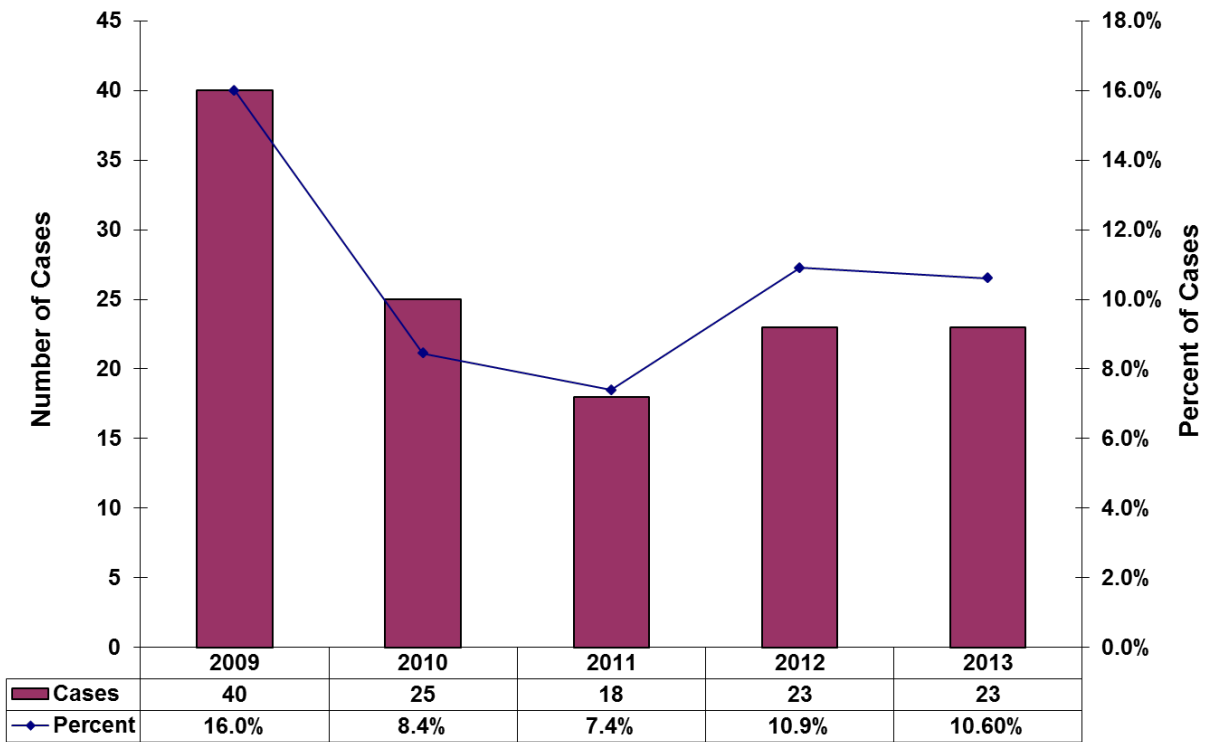
Table 4: Alcohol Use by Ethnicity and Foreign-Born Status 2009-2013

Year	2009		2010		2011		2012		2013	
	Foreign Born	US Born	Foreign Born	US Born	Foreign Born	US Born	Foreign Born	US Born	Foreign Born	US Born
Hispanic	3	1	4	0	0	6	4	1	1	0
Not Hispanic	5	33	1	27	2	24	1	20	3	18
TOTAL	42		32		32		26		22	

DATA SOURCE: North Carolina Electronic Disease Surveillance System (NC EDSS)

Non-Injecting Drug Use: Non-injecting drug use has been reported for approximately 7 percent to 16 percent of state TB patients for several years. [See Figure 11.]

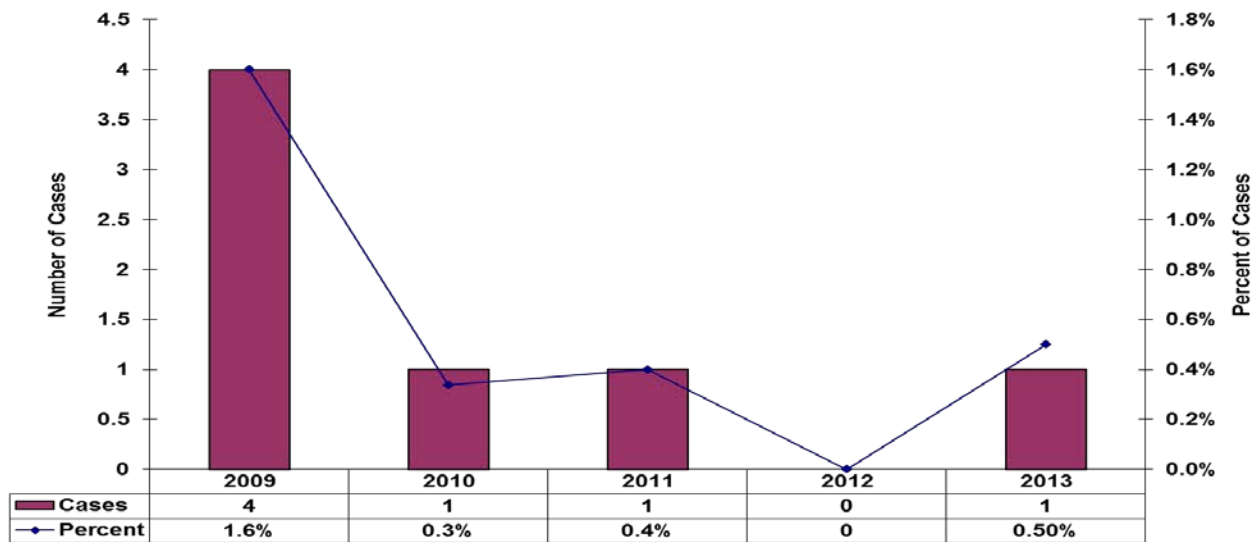
Figure 11. N.C. TB Cases with Known Non-Injecting Drug Use: 2009 – 2013



DATA SOURCE: North Carolina Electronic Disease Surveillance System (NC EDSS)

Injecting Drug Use (IDU): IDU is not a significant problem for TB cases in North Carolina. It has been reported in only 0 percent to 2 percent of TB cases in the years 2009-2013. One case was reported in 2013. [See Figure 12.]

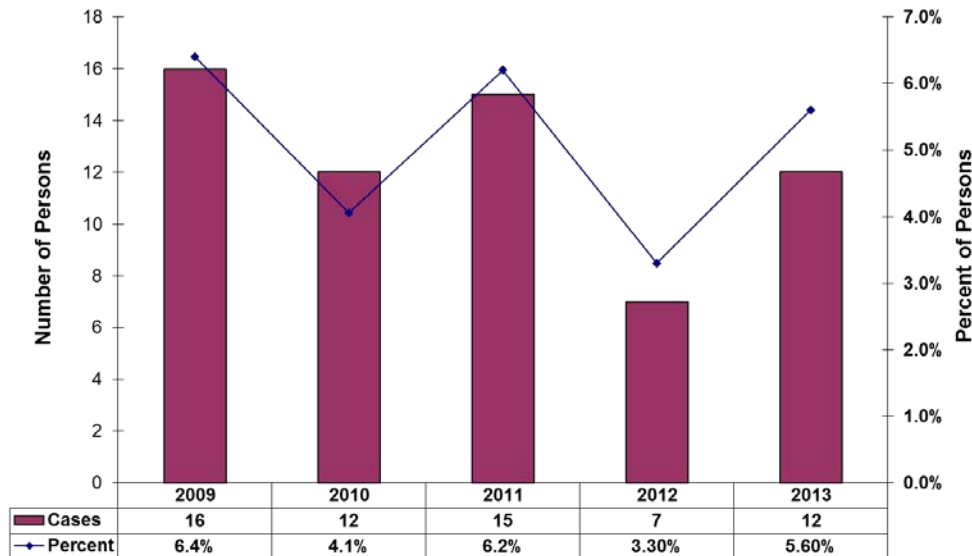
Figure 12. N.C. TB Cases with Known Injecting Drug Use: 2009 – 2013



DATA SOURCE: North Carolina Electronic Disease Surveillance System (NC EDSS)

Homeless: The number of reported homeless TB cases increased from 2012 to 2013. The percentage is generally between 4 percent and 6 percent. [See Figure 13.]

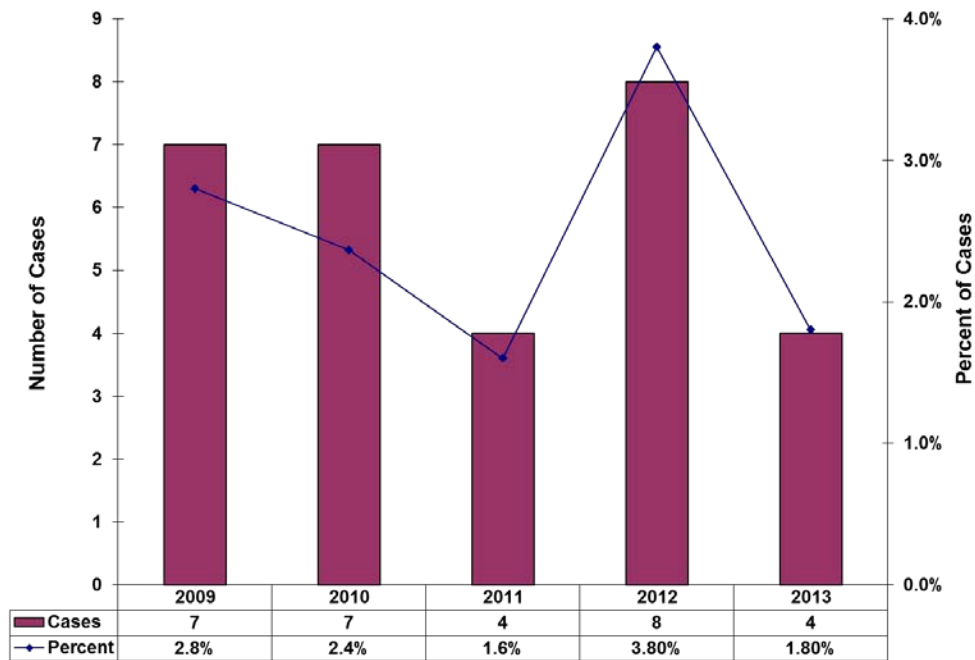
Figure 13. N.C. TB Cases Homeless in Year Prior to Diagnosis: 2009 - 2013



DATA SOURCE: North Carolina Electronic Disease Surveillance System (NC EDSS)

Long Term Care Facilities: The number of TB cases diagnosed in Long Term Care Facilities from 2009 to 2013 remained fairly low (between four and eight cases per year). [See Figure 14.]

Figure 14. N.C. TB Cases That Were Residents of a Long-Term Care Facility at Time of Diagnosis: 2009 – 2013



DATA SOURCE: North Carolina Electronic Disease Surveillance System (NC EDSS)

Correctional Facilities: The percentage of cases diagnosed in correctional facilities is usually around 2 percent to 4 percent of the total cases. [See Figure 15.]

Figure 15. N.C. TB Cases Residing in Correctional Facility at Time of Diagnosis: 2009 - 2013

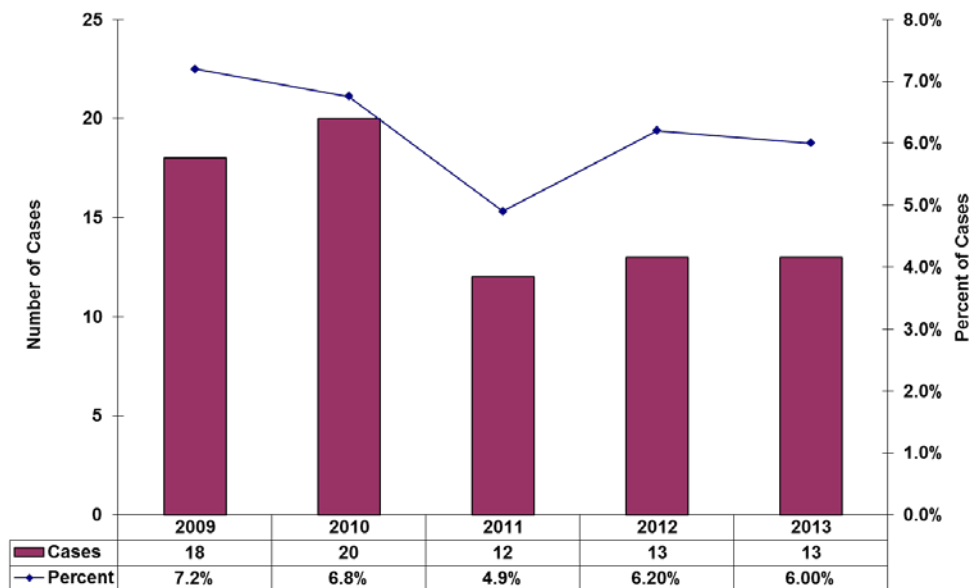


DATA SOURCE: North Carolina Electronic Disease Surveillance System (NC EDSS);

2012 Tuberculosis Statistics for North Carolina, Tuberculosis Control Program, N.C. Division of Public Health July 2013

HIV Status: Worldwide, co-morbidity of HIV and TB is the single largest contributor to mortality where TB disease is a factor. Figure 16 shows the number and percentage of North Carolina cases reported between 2009 and 2013 that had HIV infection. Table 5 presents the distribution of HIV and TB co-morbidity by age. In 2013, all co-infected cases were between the ages of 23 and 45 with the exception of a baby that was foreign-born and began treatment overseas.

Figure 16. N.C. TB Cases with HIV Infection: 2009 – 2013



DATA SOURCE: North Carolina Electronic Disease Surveillance System (NC EDSS)

Table 5: TB Cases with HIV Infection by Age Group 2009 - 2013

Table 5	TB Cases with HIV Infection by Age Group 2009 - 2013*				
Age Group	2009	2010	2011	2012	2013
0-4	0	0	0	0	1
5-14	0	0	0	0	0
15-24	0	0	0	0	2
25-44	8	12	5	6	4
45-64	10	7	7	7	6
≥65	0	1	0	0	0

*DATA SOURCE: North Carolina Electronic Disease Surveillance System (NC EDSS)

Table 6 and Figure 17 show the progress that has been made in North Carolina with respect to standard of care and HIV status— in 2013 all cases that were alive at diagnosis were tested for HIV. Since November 2007, the standard of care has been to offer HIV testing as part of routine screening. Patients are informed that HIV testing is part of the screening and may decide to “opt-out” of that test. Before this practice went into effect, state TB nurse consultants spent a lot of time training in local health departments to encourage HIV testing. Consequently, the number of cases where HIV status is unknown has decreased greatly over the past 10 years. Fewer patients refuse testing (down from 18.1

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% in 2000 to 0% refusing in 2013) and there are fewer patients who are not being offered testing (down from 10.7% in 2000 to less than 0% in 2013).

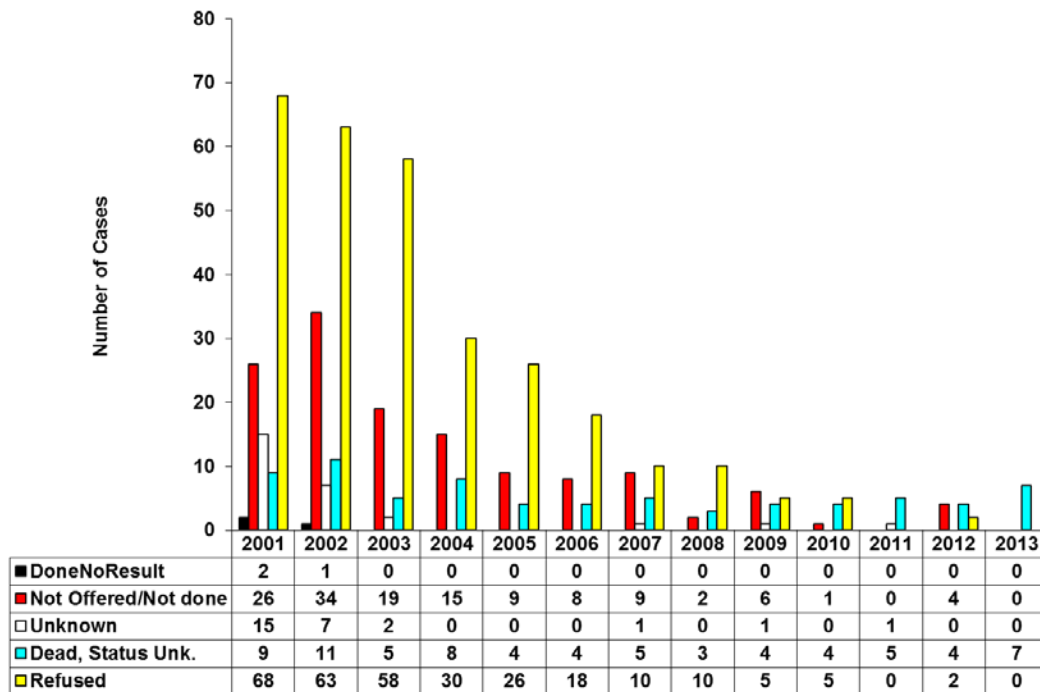
Table 6: Reported HIV Results 2009 – 2013

Table 6	Reported HIV Results 2008 – 2012				
	2009	2010	2011	2012	2013
Status					
Negative	217	266	226	188	196
Positive	18	20	12	13	13
Refused	5	5	0	2	0
Not Offered	6	1*	0	3*	0
Tested No Result	0	0	0	1**	0
Unknown	1	0	1*	0	0
Dead and Status Unknown	4	4	5	4	7

DATA SOURCE: North Carolina Electronic Disease Surveillance System (NC EDSS)

- These patients died shortly after starting treatment or while still in hospital and there was not an opportunity to offer HIV testing.
- ** An attempt was made to test but they were unable to obtain blood for testing.

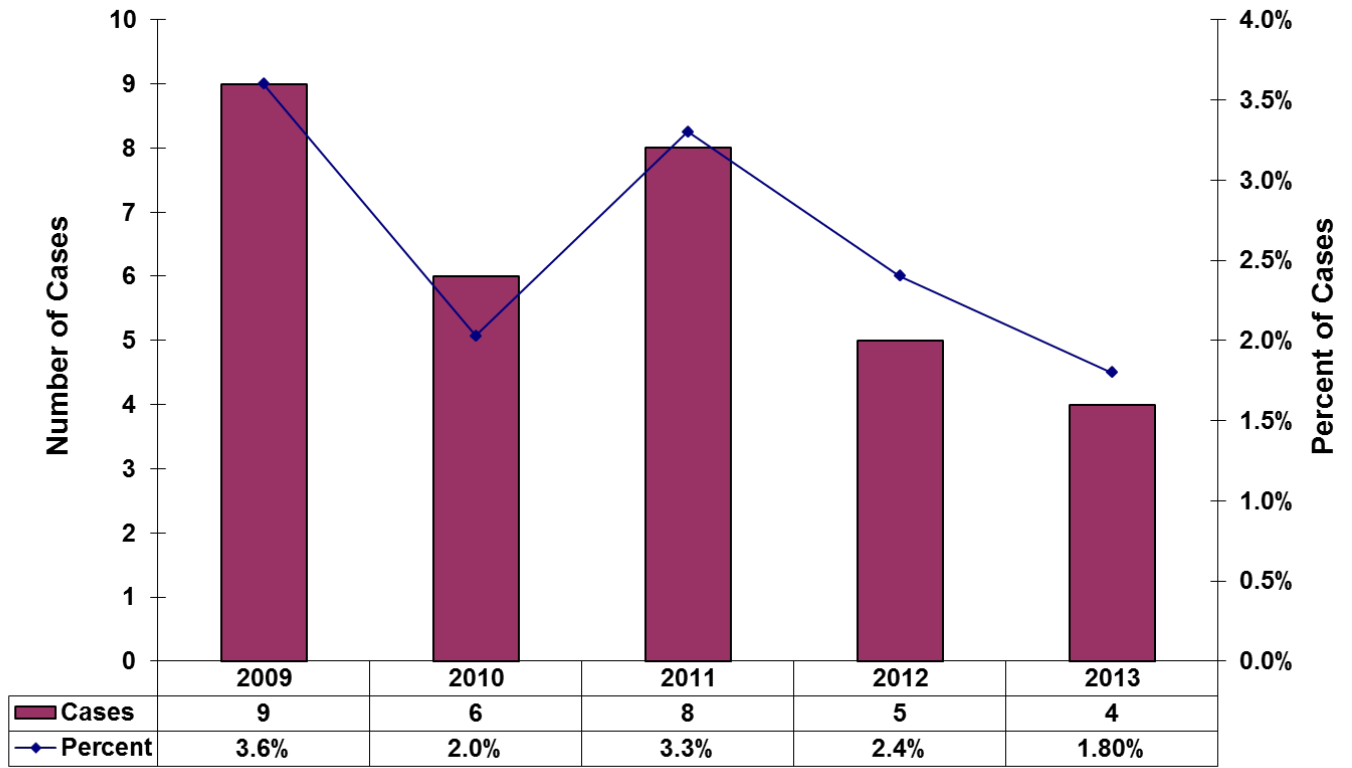
Figure 17: N.C. TB Cases with Unknown HIV Status: 2001 - 2013



DATA SOURCE: North Carolina Electronic Disease Surveillance System (NC EDSS)

Occupation: The occurrence of TB in persons identified as healthcare workers remains an area that receives close scrutiny and intensive investigation. Figure 18 does NOT indicate TB exposure in health care settings, but rather is an indication of persons who, given their occupation, might represent a risk of acquisition or transmission in healthcare settings. The percent of cases is generally around 2 percent.

Figure 18. N.C. Health Care Workers with TB Disease: 2009 - 2013



DATA SOURCE: North Carolina Electronic Disease Surveillance System (NC EDSS)

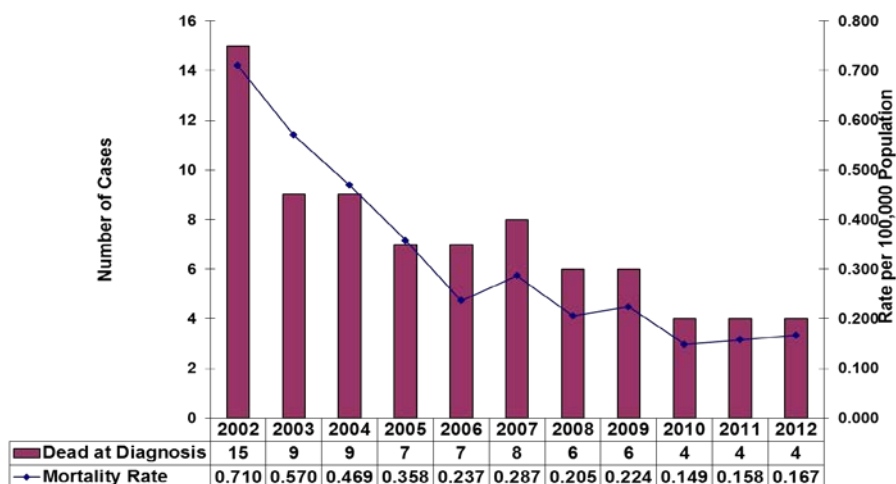
CLINICAL DATA

CLINICAL DATA FOR NORTH CAROLINA

Mortality of TB Cases in NC

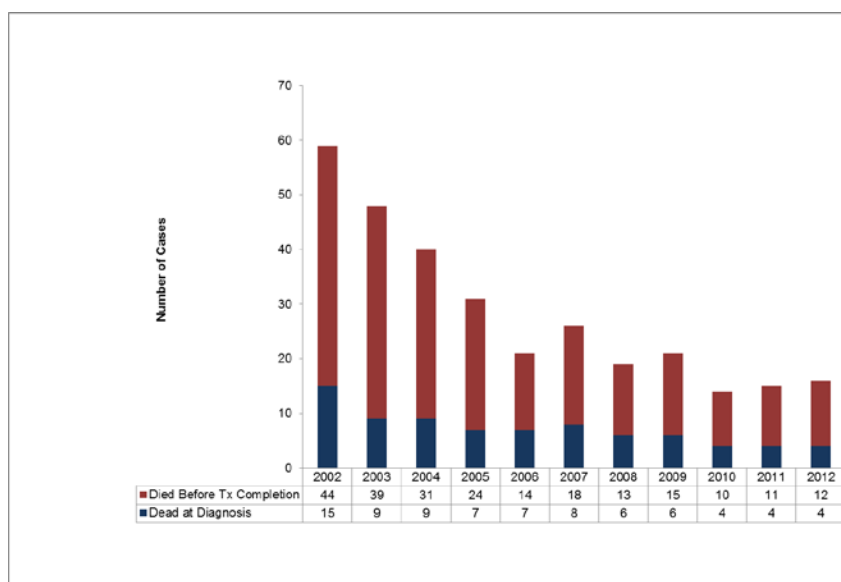
As can be seen from Figures 19 and 20, mortality of TB cases from diagnosis to treatment completion has decreased over the past several years. In 2002, there were 59 deaths (15 dead at diagnosis and 44 who died before completion of treatment); by 2012, there were 15 deaths (four dead at diagnosis and 11 who died before completion of treatment). Prompt diagnosis and treatment is the key to reducing the “dead at diagnosis” category, and close coordination with primary care physicians to address co-morbidities may decrease the number who die before the end of treatment, though more research is needed to better understand the characteristics of those in the two categories. Both categories have decreased over time.

Figure 19. N.C. TB Case Mortality and Rates: 2002 – 2012



DATA SOURCE: North Carolina Electronic Disease Surveillance System (NC EDSS)

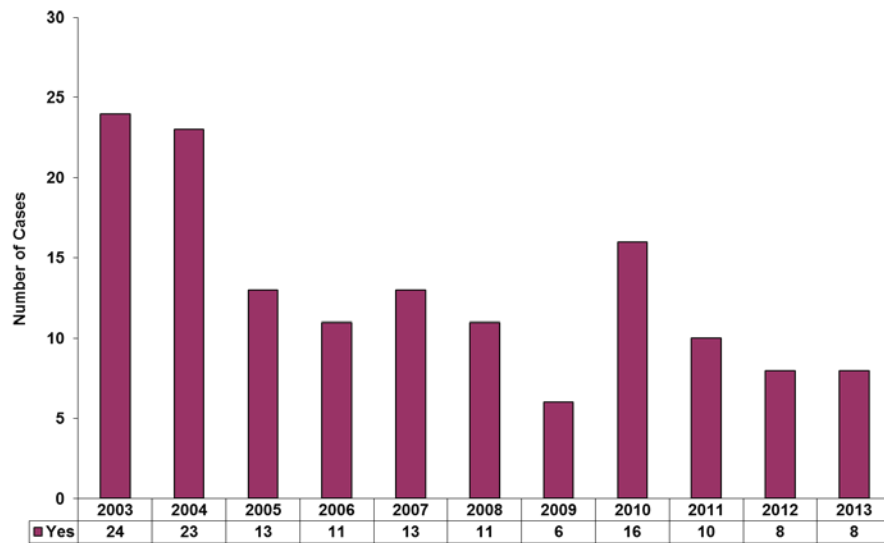
Figure 20. Timing of Death among TB Cases in N.C.: 2002 – 2012



DATA SOURCE: North Carolina Electronic Disease Surveillance System (NC EDSS)

Previous Diagnosis of TB: The number of TB patients who had a previous diagnosis of TB decreased from 24 cases in 2003 to eight cases in 2013.

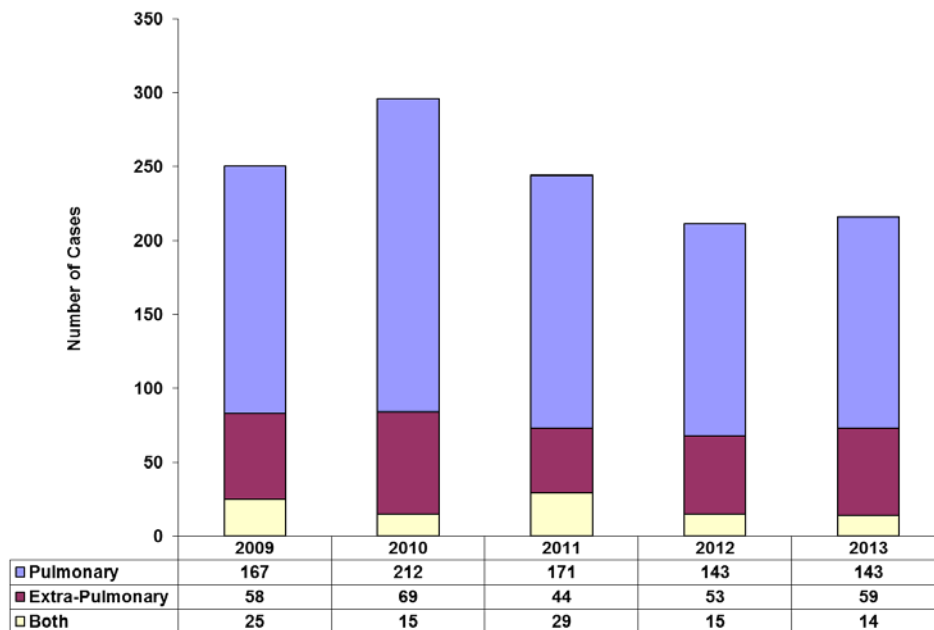
Figure 21. Previous Diagnosis of TB for TB Patients in N.C.: 2003 - 2013



DATA SOURCE: North Carolina Electronic Disease Surveillance System (NC EDSS)

Site of TB Disease: Figure 22 shows the number and percentage of Pulmonary, Extra-pulmonary and combinations of both Pulmonary and Extra-pulmonary sites of TB disease for years 2009 through 2013. These percentages have remaining very similar during this time period. Table 7 provides a more detailed breakout for the major disease sites.

Figure 22. Major Site of Disease for TB Patients in N.C.: 2009 -2013



DATA SOURCE: North Carolina Electronic Disease Surveillance System (NC EDSS)

Table 7. Site of Disease for N.C. TB Patients: 2009 - 2013

Site	2009	2010	2011	2012	2013
Bone/Joint	4	10	2	3	2
Bone/Joint, Other	0	0	1	1	1
Genitourinary	5	2	2	4	3
Genitourinary, Meningeal	0	0	1	0	0
Lymphatic: Axillary	0	0	3	1	1
Lymphatic: Cervical	14	12	5	12	12
Lymphatic: Intrathoracic	0	0	1	3	3
Lymphatic: Intrathoracic, Meningeal	0	0	1	0	0
Lymphatic: Intrathoracic, Other	0	1	0	0	0
Lymphatic: Other	2	11	2	4	4
Lymphatic: Other, Peritoneal	1	0	0	0	0
Lymphatic: Unknown	0	0	0	1	1
Meningeal	2	5	10	2	2
Meningeal, Other	0	1	0	0	0
Other	7	11	2	4	3
Peritoneal	3	2	11	2	2
Pleural	13	11	1	14	14
Pleural, Bone and/or Joint	0	1	1	0	0
Pleural, Lymphatic: Axillary	0	0	0	1	1
Pleural, Lymphatic: Cervical	0	1	0	0	0
Pleural, Lymphatic: Unknown	0	0	0	1	1
Pleural, Other	2	1	0	0	0
Pleural, Peritoneal	1	0	0	1	0
Pulmonary	178	212	171	143	143
Pulmonary, Bone and/or Joint	3	0	2	1	1
Pulmonary, Bone and/or Joint, Meningeal, Other	1	0	0	0	0
Pulmonary, Genitourinary	1	1	0	0	0
Pulmonary, Lymphatic: Axillary	0	0	1	0	0
Pulmonary, Lymphatic: Cervical	4	2	4	1	0
Pulmonary, Lymphatic: Cervical, Bone and/or Joint	0	1	0	0	0
Pulmonary, Lymphatic: Cervical, Lymphatic, Other	0	0	0	1	1
Pulmonary, Lymphatic: cervical, Genitourinary, Other	0	1	0	0	0
Pulmonary, Lymphatic: Intrathoracic	0	1	1	0	0
Pulmonary, Lymphatic: Intrathoracic, Lymphatic: Other	0	0	0	1	1
Pulmonary, Lymphatic: Other	1	1	3	0	0
Pulmonary, Lymphatic: Unknown	0	0	1	0	0
Pulmonary, Meningeal	1	2	0	2	2
Pulmonary, Meningeal, Other	0	0	2	0	0
Pulmonary, Other	4	1	4	3	3
Pulmonary, Peritoneal	1	1	0	0	0
Pulmonary, Pleural	2	4	10	5	5
Pulmonary, Pleural, Lymphatic: Intrathoracic	0	0	1	0	0
Pulmonary, Pleural, Lymphatic: Intrathoracic, Lymphatic, Unknown	0	0	0	1	1

DATA SOURCE: North Carolina Electronic Disease Surveillance System (NC EDSS).

TB Drug Susceptibility/Resistance Testing: Drug susceptibility testing is routinely performed on newly reported, culture-positive TB cases. In any given year, zero to three cases are reported without associated susceptibility testing. In 2013, all of the culture-proven cases of TB have drug susceptibility results. Drug resistance to isoniazid (INH) in North Carolina decreased from 12 cases (6%) in 2009 to eight cases (5%) in 2013. Generally, the number of Multi-Drug Resistant (MDR) cases has ranged from one to two cases per year. However, in 2013, North Carolina had five cases (3% of all cases). In 2012, there were 83 MDR cases (0.8%) in the United States.

Table 8. First-Line Primary TB Drug Resistance in N.C. Patients: 2009-2013

Table 8 Year	First-Line Primary TB Drug Resistance Over Time 2009-2013*									
	2009		2010		2011		2012		2013	
	#	%	#	%	#	%	#	%	#	%
INH ¹	12	6	15	5	13	7	15	9	8	5
MDR (I NH & RIF) ²	1	0	1	0	2	1	1	0.6	5	3
**Total Positive Cultures	197		216		183		169		164	

*DATA SOURCE: NC EDSS.

**Total positive cultures with susceptibility results known.

¹Includes INH and any other drugs except Rifampin (RIF). Resistance may have been found at either initial or final testing.

²Includes INH, RIF and any other drugs. Resistance may have been found at either initial or final testing.

A closer look at drug resistance by foreign-born and U.S.-born status reveals that there are differences between the two groups. While over the period 2009-2013 the percentage of foreign-born persons with drug resistance is higher overall than for U.S.-born persons (14.2% v. 7.9%), the rate of MDR in North Carolina is greater (six times as high) in foreign-born cases as compared with U.S.-born persons. (1.9% vs. 0.3%.)

Table 2. Comparison of Drug Resistance in US-Born and Foreign-Born Patients: 2009 – 2013 (Years Combined)

Table 9	Drug Resistance by US and Foreign-born – 2009 – 2013 (years combined)			
	Foreign born		US	
	#	%	#	%
INH ¹	31	6.0	27	3.8
INH & SM ²	7	1.3	6	0.9
MDR (I NH & RIF) ³	10	1.9	2	0.3
Any Other Drug Resistance	26	5.0	20	2.9
<i>Total Drug Resistance</i>	74	14.2	55	7.9
No Drug Resistance	447	85.8	641	92.1

*Data source: NC EDSS.

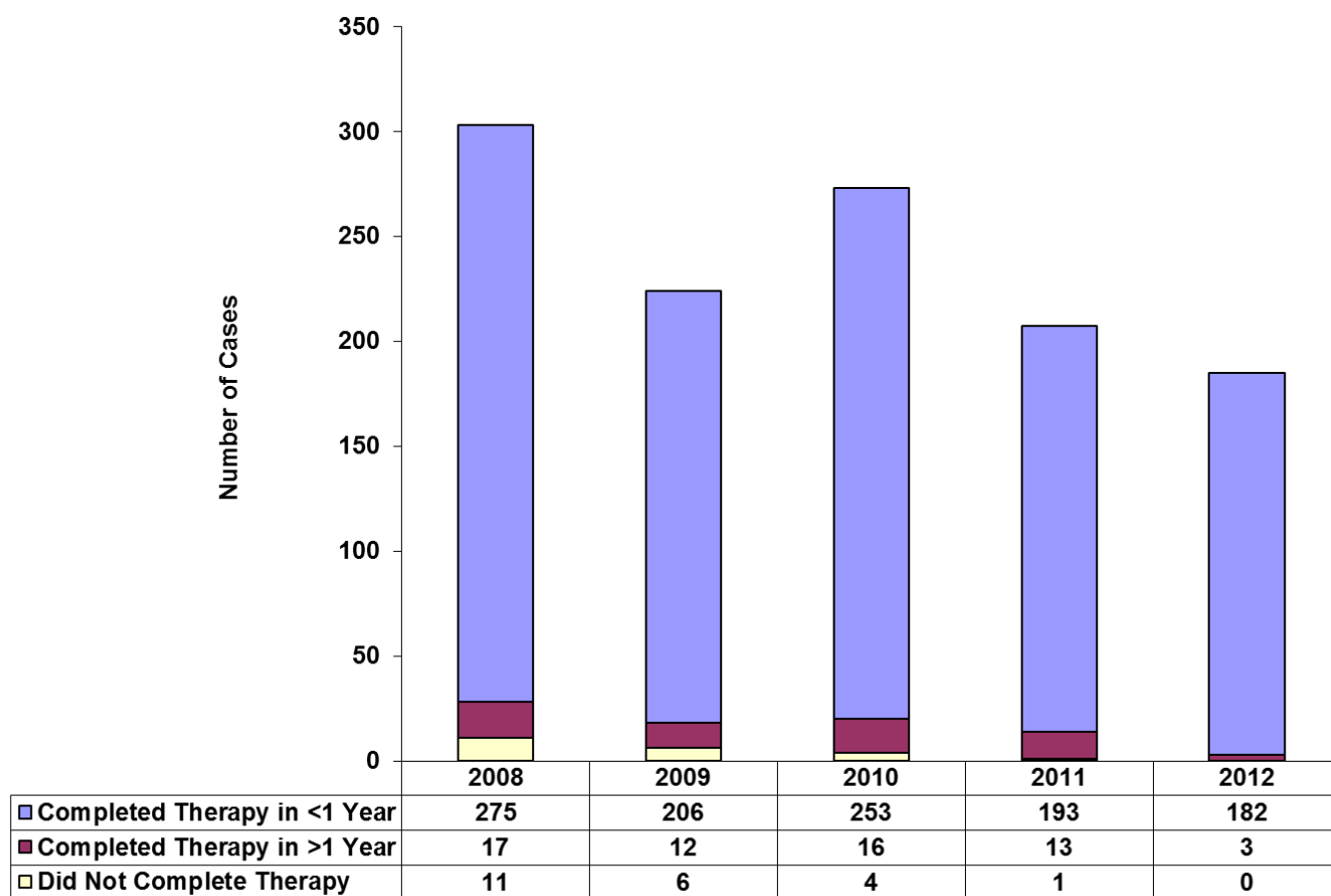
¹Includes INH and any other drugs except Streptomycin (SM) or RIF. Resistance may have been found at either initial or final testing.

²Includes INH, SM and any other drugs except RIF. Resistance may have been found at either initial or final testing.

³Includes INH, RIF and any other drugs including SM. Resistance may have been found at either initial or final testing.

Completion of Therapy: Completion of therapy within one year remained between 90 percent and 92 percent between 2002 and 2004; however, in 2005 and 2006, there was a drop to 85 percent. In 2006, North Carolina passed legislation requiring all TB cases be placed on Directly Observed Therapy (DOT). This was expected to increase the percentage of cases completing therapy within one year. Although some of our cases are not total DOT, if they were on DOT for more than 26 weeks they are considered to meet the DOT criterion. The percentage of 2012 cases that completed therapy in one year was 98 percent, with another 2 percent completing after one year. In 2012, for the three cases taking longer than 12 months to complete, there were non-adherent issues, one was lost to follow-up intermittently, one had cavity issues, and there was some treatment deviation due to hepatotoxicity issues.

Figure 23. Patients Completing Therapy in N.C.: 2008 -- 2012



DATA SOURCE: North Carolina Electronic Disease Surveillance System (NC EDSS)

This includes all patients alive at diagnosis and who did not die during treatment. Patients with any rifampin-resistant TB or meningeal TB, and children aged 14 or younger with disseminated TB are excluded.

SUPPLEMENTAL TABLES

Table10: NC COUNTY TB CASES AND CASE RATES 2009-2013*

	2009		2010		2011		2012		2013	
COUNTY	CASES	RATE	CASES	RATE	CASES	RATE	CASES	RATE	CASES	RATE
Alamance	5	3.3	5	3.3	2	1.3	0	0.0	4	2.6
Alexander	0	0.0	0	0	0	0.0	0	0.0	0	0.0
Alleghany	0	0.0	0	0	0	0.0	1	9.2	0	0.0
Anson	0	0.0	1	3.9	0	0.0	1	3.8	3	11.5
Ashe	0	0.0	0	0	0	0.0	0	0.0	0	0.0
Avery	0	0.0	0	0	0	0.0	0	0.0	0	0.0
Beaufort	0	0.0	1	2.1	4	8.4	1	2.1	0	0.0
Bertie	0	0.0	2	10.0	0	0.0	3	14.5	0	0.0
Bladen	1	3.1	2	6.0	3	9.0	2	5.7	0	0.0
Brunswick	5	4.7	0	0	1	0.9	0	0.0	1	0.9
Buncombe	6	2.6	2	0.8	1	0.4	0	0.0	3	1.2
Burke	2	2.2	1	1.1	0	0.0	7	7.7	2	2.2
Cabarrus	1	0.6	1	0.6	2	1.1	2	1.1	0	0.0
Caldwell	2	2.5	2	2.4	0	0.0	0	0.0	2	2.4
Camden	0	0.0	0	0	1	10.0	0	0.0	0	0.0
Carteret	1	1.6	1	1.5	2	3.0	3	4.4	1	1.5
Caswell	1	4.3	0	0	0	0.0	1	4.3	0	0.0
Catawba	4	2.5	2	1.3	2	1.3	7	4.5	1	0.6
Chatham	2	3.1	1	1.5	0	0.0	1	1.5	1	1.5
Cherokee	0	0.0	1	3.7	0	0.0	1	3.7	0	0.0
Chowan	0	0.0	1	6.6	1	6.6	0	0.0	2	13.6
Clay	0	0.0	0	0	0	0.0	0	0.0	1	9.4
Cleveland	1	1.0	1	1.0	0	0.0	0	0.0	0	0.0
Columbus	2	3.7	1	1.8	1	1.8	0	0.0	3	5.2
Craven	5	5.1	3	3.0	1	1.0	1	1.0	1	1.0
Cumberland	9	2.9	6	1.9	11	3.4	5	1.5	7	2.1
Currituck	0	0.0	0	0	0	0.0	0	0.0	0	0.0
Dare	1	2.9	0	0	0	0.0	0	0.0	1	2.9
Davidson	3	1.9	0	0	3	1.8	0	0.0	4	2.4
Davie	0	0.0	0	0	0	0.0	0	0.0	1	2.4
Duplin	4	7.5	6	11.0	3	5.5	2	3.3	5	8.3
Durham	12	4.4	14	5.2	9	3.4	10	3.6	6	2.1
Edgecombe	2	3.9	2	3.7	1	1.9	3	5.4	1	1.8
Forsyth	8	2.2	11	3.1	12	3.4	6	1.7	6	1.7
Franklin	1	1.7	2	3.2	1	1.6	0	0.0	0	0.0
Gaston	1	0.5	2	1.0	0	0.0	3	1.4	4	1.9
Gates	0	0.0	0	0	0	0.0	0	0.0	0	0.0
Graham	0	0.0	0	0	0	0.0	0	0.0	0	0.0
Granville	0	0.0	1	1.7	0	0.0	1	1.7	2	3.4
Greene	2	9.7	6	28.2	3	14.1	2	9.3	2	9.4
Guilford	21	4.4	31	6.3	22	4.5	17	3.4	19	3.8
Halifax	2	3.7	5	8.9	1	1.8	4	7.4	1	1.9
Harnett	3	2.6	5	4.2	0	0.0	0	0.0	3	2.4

COUNTY	2009		2010		2011		2012		2013	
	CASES	RATE	CASES	RATE	CASES	RATE	CASES	RATE	CASES	RATE
Henderson	3	2.9	10	9.4	3	2.8	1	0.9	2	1.8
Hertford	1	4.3	2	8.3	3	12.5	1	4.1	0	0.0
Hoke	3	6.6	1	2.2	1	2.2	1	2.0	1	1.9
Hyde	1	19.2	0	0	0	0.0	0	0.0	0	0.0
Iredell	1	0.6	0	0	1	0.6	2	1.2	2	1.2
Jackson	2	5.4	1	2.6	0	0.0	2	4.9	0	0.0
Johnston	7	4.2	5	3.0	1	0.6	4	2.3	3	1.7
Jones	0	0	0	0	0	0.0	0	0.0	0	0.0
Lee	1	1.7	4	6.4	2	3.2	0	0.0	1	1.7
Lenoir	2	3.5	6	10.3	2	3.4	8	13.5	5	8.5
Lincoln	0	0	0	0	1	1.3	1	1.3	1	1.3
Macon	1	3.0	0	0	0	0.0	0	0.0	0	0.0
Madison	0	0	0	0	0	0.0	0	0.0	0	0.0
Martin	1	4.3	0	0	0	0.0	1	4.2	0	0.0
McDowell	0	0	1	2.2	2	4.4	1	2.2	1	2.2
Mecklenburg	33	3.6	40	4.3	37	4.0	30	3.1	41	4.1
Mitchell	0	0	0	0	0	0.0	1	6.5	0	0.0
Montgomery	1	3.6	3	10.5	5	17.5	1	3.6	0	0.0
Moore	2	2.3	3	3.3	2	2.2	0	0.0	0	0.0
Nash	0	0	1	1.0	1	1.0	3	3.1	4	4.2
New Hanover	3	1.5	4	2.0	5	2.5	1	0.5	4	1.9
Northampton	0	0	0	0	1	4.8	4	18.7	3	14.4
Onslow	4	2.3	3	1.7	3	1.7	1	0.5	0	0.0
Orange	1	0.8	3	2.3	3	2.3	2	1.4	2	1.4
Pamlico	0	0	0	0	0	0.0	0	0.0	0	0.0
Pasquotank	0	0	1	2.3	0	0.0	0	0.0	0	0.0
Pender	2	3.8	0	0	1	1.9	2	3.7	0	0.0
Perquimans	0	0	0	0	0	0.0	0	0.0	0	0.0
Person	1	2.7	0	0	1	2.6	1	2.5	0	0.0
Pitt	6	3.8	6	3.6	7	4.2	5	2.9	3	1.7
Polk	2	10.4	0	0	0	0.0	0	0.0	0	0.0
Randolph	0	0	1	0.7	1	0.7	2	1.4	1	0.7
Richmond	1	2.2	3	6.3	1	2.1	0	0.0	3	6.5
Robeson	16	12.3	12	9.0	7	5.2	13	9.6	14	10.4
Rockingham	1	1.1	2	2.1	3	3.2	0	0.0	0	0.0
Rowan	3	2.1	2	1.4	3	2.2	3	2.2	0	0.0
Rutherford	1	1.6	0	0	0	0.0	0	0.0	1	1.5
Sampson	5	7.8	6	9.1	6	9.1	4	6.3	3	4.7
Scotland	0	0	0	0	5	13.4	0	0.0	0	0.0
Stanly	1	1.7	2	3.2	0	0.0	0	0.0	0	0.0
Stokes	0	0	0	0	1	2.1	0	0.0	0	0.0
Surry	0	0	1	1.3	0	0.0	2	2.7	0	0.0
Swain	0	0	0	0	0	0.0	0	0.0	0	0.0
Transylvania	0	0	1	3.2	1	3.2	0	0.0	0	0.0

COUNTY	2009		2010		2011		2012		2013	
	CASES	RATE	CASES	RATE	CASES	RATE	CASES	RATE	CASES	RATE
Tyrrell	0	0	0	0	0	0.0	0	0.0	0	0.0
Union	1	0.5	0	0	2	1.0	1	0.5	0	0.0
Vance	0	0	0	0	0	0.0	0	0.0	0	0.0
Wake	22	2.5	37	4.1	29	3.2	16	1.7	26	2.7
Warren	0	0	1	5.0	0	0.0	1	4.9	0	0.0
Washington	0	0	0	0	0	0.0	0	0.0	0	0.0
Watauga	1	2.2	0	0	0	0.0	0	0.0	0	0.0
Wayne	8	7.0	8	6.8	9	7.7	7	5.6	2	1.6
Wilkes	1	1.5	1	1.5	3	4.4	1	1.4	0	0.0
Wilson	3	3.8	5	6.2	4	5.0	1	1.2	4	4.9
Yadkin	0	0	0	0	0	0.0	0	0.0	0	0.0
Yancey	0	0	0	0	0	0.0	0	0.0	0	0.0
North Carolina	250	2.7	296	3.1	244	2.5	211	2.2	216	2.2

***1. Data source: NC EDSS TB Surveillance - Demographic Data Report. Rates are per 100,000 population.**
Suggested Citation for population estimates used to calculate rates: Annual Estimates of the Resident

Population: April 1, 2010 to July 1, 2013

Source: U.S. Census Bureau, Population Division

Release Dates: For the United States, regions, divisions, states, and Puerto Rico Commonwealth, December 2013. For counties, municipios, metropolitan statistical areas, micropolitan statistical areas, metropolitan divisions, and combined statistical areas, March 2014.

Table 11: Foreign-Born TB Cases by Country of Origin 2009-2013

Year	2009	2010	2011	2012	2013	Total Cases 2009 – 2013
Afghanistan	0	0	1	1	0	2
Angola	0	0	0	0	1	1
Bangladesh	0	0	1	0	1	2
Bhutan	0	5	3	6	3	17
Bosnia & Herzegovina	0	1	0	0	0	1
Cambodia	3	3	1	1	0	8
Cameroon	0	0	0	0	1	1
China	1	1	4	1	0	7
Colombia	1	2	1	0	1	5
Congo	0	0	3	1	3	7
Cote d'Ivoire	0	0	1	0	0	1
Denmark	0	1	0	0	0	1
Dominican Republic	0	0	0	0	1	1
Ecuador	0	0	1	2	1	4
Egypt	0	0	0	1	0	1
El Salvador	2	4	1	1	2	10
Eritrea	0	0	2	0	2	4
Ethiopia	1	2	2	2	4	11
Faeroe Islands	0	0	1	0	0	1
Germany	0	0	0	0	1	1
Ghana	1	0	0	0	0	1
Grenada	0	1	0	0	0	1
Guatemala	7	1	6	5	5	24
Guinea	0	1	0	0	0	1
Guyana	0	0	0	0	1	1
Haiti	1	1	2	2	0	6
Honduras	2	7	8	4	6	27
Hong Kong (China)	0	1	0	0	0	1
India	6	12	7	9	14	48
Indonesia	0	0	1	0	0	1
Iran	1	0	0	0	0	1
Jamaica	0	1	0	2	0	3
Jordan	1	0	0	0	0	1
Kenya	2	1	4	3	0	10
Korea Republic of	1	2	1	0	0	4
Kuwait	1	0	0	0	0	1
Laos	2	4	1	3	1	11
Latvia	0	0	0	0	1	1
Liberia	0	1	2	1	0	4

Year	2009	2010	2011	2012	2013	Total Cases 2009 – 2013
Malaysia	1	0	0	0	0	1
Mexico	33	31	23	21	15	123
Micronesia, Federated States of	0	2	1	0	0	3
Morocco	1	0	0	0	0	1
Myanmar	0	5	5	4	2	16
Nepal	0	1	0	1	1	3
Netherlands	1	0	0	0	0	1
Niger	0	1	0	0	0	1
Nigeria	3	0	0	2	2	7
Pakistan	1	0	1	1	2	5
Peru	1	0	2	0	1	4
Peru	0	0	0	0	1	1
Philippines	4	10	6	5	9	34
Puerto Rico	1	0	0	0	0	1
Russian Federation	0	0	2	0	0	2
Rwanda	0	0	0	1	0	1
Senegal	1	1	0	0	0	2
Sierra Leone	0	0	0	0	3	3
Somalia	0	2	0	1	1	4
Spain	0	1	0	0	0	1
Sri Lanka	0	0	0	0	1	1
Sudan	1	0	2	0	1	4
Syria Arab Republic	0	0	0	1	0	1
Taiwan	0	0	0	0	0	0
Tanzania	0	0	1	0	0	1
Thailand	0	1	0	1	0	2
Turkmenistan	0	0	0	0	0	0
Uganda	0	0	0	0	1	1
Vietnam	10	14	10	13	13	60
Yemen	0	0	0	1	0	1
Zimbabwe	1	0	0	0	0	1
Total	92	121	107	97	102	519

DATA SOURCE: North Carolina Electronic Disease Surveillance System (NC EDSS)

***Does not include persons born in U.S. territories.**

Table 12: Hispanic TB Cases by County 2009-2013

Hispanic TB Cases by County 2009-2013						
County	2009	2010	2011	2012	2013	Total Cases 2009 - 2013
Alamance	2	2	2	0	1	7
Alexander	0	0	0	0	0	0
Alleghany	0	0	0	1	0	1
Anson	0	0	0	0	0	0
Ashe	0	0	0	0	0	0
Avery	0	0	0	0	0	0
Beaufort	0	0	0	0	0	0
Bertie	0	1	0	0	0	1
Bladen	1	0	1	0	0	2
Brunswick	2	0	0	0	1	3
Buncombe	2	0	0	0	1	3
Burke	0	0	0	5	0	5
Cabarrus	0	0	1	2	0	3
Caldwell	2	0	0	0	0	2
Camden	0	0	0	0	0	0
Carteret	0	0	0	0	0	0
Caswell	0	0	0	0	0	0
Catawba	0	1	1	1	0	3
Chatham	1	0	0	1	0	2
Cherokee	0	0	0	1	0	1
Chowan	0	0	0	0	0	0
Clay	0	0	0	0	0	0
Cleveland	0	0	0	0	0	0
Columbus	0	0	0	0	0	0
Craven	1	0	0	0	1	2
Cumberland	1	0	0	0	0	1
Currituck	0	0	0	0	0	0
Dare	0	0	0	0	1	1
Davidson	2	0	1	0	0	3
Davie	0	0	0	0	0	0

Duplin	3	4	2	1	1	11
Durham	2	3	4	3	0	12
Edgecombe	0	0	0	0	0	0
Forsyth	4	5	2	3	2	16
Franklin	0	0	0	0	0	0
Gaston	0	0	0	0	0	0
Gates	0	0	0	0	0	0
Graham	0	0	0	0	0	0
Granville	0	1	0	0	1	2
Greene	0	0	0	0	1	1
Guilford	3	2	2	1	1	9
Halifax	0	0	0	0	0	0
Harnett	1	0	0	1	1	3
Haywood	0	0	0	0	1	1
Henderson	0	2	1	0	0	3
Hertford	0	0	0	0	0	0
Hoke	0	0	0	0	0	0
Hyde	1	0	0	0	1	2
Iredell	0	0	0	0	0	0
Jackson	1	1	0	1	0	3
Johnston	1	1	0	2	2	6
Jones	0	0	0	0	0	0
Lee	1	2	1	0	0	4
Lenoir	0	0	1	4	0	5
Lincoln	0	0	0	0	1	1
Macon	0	0	0	0	0	0
Madison	0	0	0	0	0	0
Martin	0	0	0	0	0	0
McDowell	0	0	1	0	0	1
Mecklenburg	5	11	11	3	5	35
Mitchell	0	0	0	1	0	1
Montgomery	0	1	2	0	0	3
Moore	1	0	0	0	0	1
Nash	0	0	0	0	0	0
New Hanover	1	0	2	1	1	5
Northampton	0	0	0	0	0	0

Onslow	0	0	0	0	0	0
Orange	0	0	0	0	0	0
Pamlico	0	0	0	0	0	0
Pasquotank	0	0	0	0	0	0
Pender	1	0	1	1	0	3
Perquimans	0	0	0	0	0	0
Person	0	0	1	0	0	1
Pitt	1	2	0	1	1	5
Polk	1	0	0	0	0	1
Randolph	0	0	1	0	1	2
Richmond	0	0	1	0	0	1
Robeson	1	2	0	0	2	5
Rockingham	0	1	0	0	0	1
Rowan	1	1	1	1	0	4
Rutherford	0	0	0	0	0	0
Sampson	1	0	2	2	1	6
Scotland	0	0	0	0	0	0
Stanly	0	0	0	0	0	0
Stokes	0	0	0	0	0	0
Surry	0	0	0	0	0	0
Swain	0	0	0	0	0	0
Transylvania	0	0	0	0	0	0
Tyrrell	0	0	0	0	0	0
Union	0	0	0	0	0	0
Vance	0	0	0	0	0	0
Wake	8	11	3	1	7	30
Warren	0	0	0	0	0	0
Washington	1	0	0	0	0	1
Watauga	0	0	0	0	0	0
Wayne	0	0	0	1	0	1
Wilkes	0	0	0	0	0	0
Wilson	1	2	2	0	1	6
Yadkin	0	0	0	0	0	0
Yancey	0	0	0	0	0	0
North Carolina	54	56	47	39	36	232

DATA SOURCE: North Carolina Electronic Disease Surveillance System (NC EDSS)