



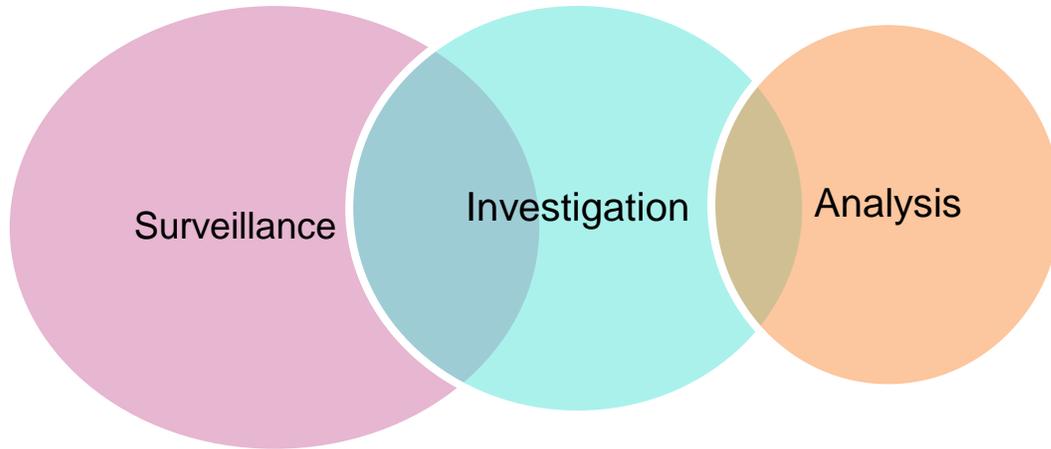
2012 Epidemiology Report
Shelby County Health Department
Epidemiology Section



Public Health
Prevent. Promote. Protect.
Shelby County Health Department:

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INTRODUCTION 1|ONE

Introduction

The Epidemiology Section of the Shelby County Health Department (SCHD) is responsible for many aspects of ensuring and protecting the health of Shelby County residents. This group investigates and implements control measures for all reportable diseases except Tuberculosis, HIV infection and the majority of sexually transmitted infections. The Epidemiology Section also monitors environmental issues and responds when necessary. Those diseases have specific dedicated programs and staff that monitor and control them. This report focuses on the diseases and conditions that the Epidemiology Section tracks and monitors.

A reportable disease is one that state, federal or international public health authorities have identified as being critical to collect information on and report about in order to monitor disease trends or implement control measures. It is required by law that all physicians, hospitals, laboratories or anyone knowing of a suspected case must report all cases to the SCHD. There are categories of reportable diseases that signify severity and level of public health threat to the community. The categories are ordered as 1 through 5.

Category 1 diseases are considered the most dangerous threat to public health and must be reported immediately over the phone to the SCHD Epidemiology Section. Category 2 diseases are not considered as severe a threat as category 1 diseases. These diseases must be reported within one week of being suspected or diagnosed. Category 3 diseases are required to be reported within a week of diagnosis but require special confidential reporting methods due to the nature of the diseases (e.g. the sexually transmitted infections and HIV/AIDS). Category 4 diseases are required to be reported monthly and no later than 15 days following the end of the month. The final category of reportable diseases are required to be reported monthly and no later than 30 days following the end of the month through the National Healthcare Safety Network.

The Epidemiology Section routinely monitors and investigates Categories 1 and 2 reportable diseases. Categories 3 and 4 diseases are managed by different sections of the

Shelby County Health Department. Category 5 diseases, which are hospital acquired infections (HAI), are reported directly from hospitals to the State Department of Health's HAI division.

The Epidemiology Section investigates the Category 1 and 2 diseases in order to ensure the public's health through proper identification and follow-up of those who are ill. The public health nurses within the section ensure that people who are ill receive the proper treatment for their disease. They investigate the contacts of the sick person in order to make sure that those who have come in contact with a sick person receive the appropriate vaccine, treatment, quarantine, and education necessary for the particular disease. These measures are necessary to stop outbreaks that may occur from spreading. Several of the reportable diseases listed on pages 5-7 are spread through food and water; others are spread through person to person contact.

The Epidemiology Section also provides educational information to the public and other agencies on the nature, cause, spread, and control of both reportable and non-reportable infectious diseases as needed. Educational materials may include fact sheets and web updates about specific diseases; brochures or presentations regarding safe food handling, proper hand washing procedures and other disease prevention measures.

Foodborne and waterborne illnesses that are investigated by the SCHD Epidemiology Section include *Salmonella*, *E. coli* O157:H7, *Legionella*, *Listeria*, *Shigella*, *Yersinia*, *Vibrio* infections, *Cryptosporidiosis* and *Campylobacter* infections. Cases of these illnesses are usually identified through physicians' offices or other health care facilities, reports from individual institutions, reports from sick individuals, laboratory reports and other health departments. Reports of foodborne illness may involve restaurants, schools, churches, long-term care facilities or day care centers. During an investigation of a foodborne or waterborne illness the Epidemiology section works closely with the Environmental Sanitation and Laboratory sections of the Health Department to ensure correction of any problems involving food handling procedures and sanitation. The Environmental Sanitation section may assist with visits to facilities for inspections and collection of patient specimens and environmental samples. The Laboratory section may assist in testing these specimens to confirm the causative agent. Together with these sections, the Epidemiology section monitors, investigates and responds to reports of foodborne and waterborne illness in the county.

Along with diseases, the Epidemiology section also monitors environmental health including carbon monoxide and lead poisoning. The temporal and geographic distributions of cases are analyzed to see if any commonalities are found. Educational information is distributed to physicians and the public to prevent future cases. Cases are usually identified through physicians' offices, ER departments, reports from sick individuals and laboratory reports. During an investigation of an environmental issue, the Epidemiology section works closely with the Environmental and Laboratory sections of the Health Department and the Environmental Epidemiology section of the Tennessee Department of Health.

Acknowledgments

The Epidemiology Section acknowledges and appreciates the support of our partners in finding cases of reportable diseases and their assistance with implementing appropriate control and response measures. The physicians, laboratorians, nurses, infection control practitioners, and other allied health professionals in Shelby County who report these cases to us are vital for alerting us about emerging outbreaks or changing disease patterns. Our public health partners in the Tennessee Department of Health and the other county and local health departments in the state as well as our partners in neighboring states and federal agencies like the U.S. Centers for Disease Control and Prevention help us understand disease patterns and trends affecting our region and the country as a whole.

Finally, we wish to acknowledge our internal partners within the Shelby County Health Department, particularly our partners in the Tuberculosis Elimination Program, the Infectious Diseases Section, and the Bureau of Environmental Health Services. These partners provide vital response efforts and control measures on a wide variety of health issues affecting the citizens of Shelby County and often assist us when the Epidemiology Section notices trends or emerging issues as we monitor data streams and case reports. Protecting the public health of our community is always a team effort requiring the collaboration of multiple disciplines and the expertise of many people.

Data Interpretation

The data used in this report are gathered through investigations of disease occurrences in Shelby County, which are reported to SCHD's Epidemiology section by health-care providers, laboratories, and other public health personnel. The data are managed and stored in the National Electronic Disease Surveillance System (NEDSS).

In the United States, requirements for reporting diseases are mandated by state laws or regulations, and the list of reportable diseases in each state differs. The Centers for Disease Control and Prevention (CDC) in collaboration with the Council of State and Territorial Epidemiologists published case definitions for public health surveillance in October of 1999 and update them regularly with new information. This document provided uniform criteria for reporting cases throughout the State and Nation. The document is updated periodically based on emerging infections around the country.

The case definitions vary by disease. All disease reports are assigned one of the following statuses based on the disease presentation and laboratory testing conducted. A tiered system with the following level is used:

- Suspect/possible case: indicative clinical picture without being confirmed or probable case.
- Probable case: in this tier, there is a clear clinical picture, or an epidemiological link to a confirmed case. An epidemiological link is a case that either has been exposed to a confirmed case, or has had the same exposure as a confirmed case, such as eating or drinking the same food or water, having the same sexual contacts, attending the same daycare, etc.
- Confirmed case: A confirmed case has the appropriate clinical characteristics and is verified by laboratory analysis.

- Not a case: This status is assigned when none of the above criteria is met.

Unless specifically stated, only symptomatic cases are to be reported. Asymptomatic infections are to be regarded as cases, however, if the infections have therapeutic or public health implication.

The case definitions are important to assist in properly investigating and classifying diseases. Moreover, the case definitions facilitate interpretation of data of these diseases.

Data presented in this report are limited to number and rate of all reported and confirmed cases. All reported cases include confirmed, probable, suspect and not a case reports.

The number of reports is simply the counts of reportable diseases received over the period of time. The incidence rate is the frequency of reports per every one hundred thousand population.

List of Reportable Diseases and Conditions in Tennessee, 2012

Category 1A: Requires immediate telephonic notification (24 hours a day, 7 days a week), followed by a written report using the PH-1600 within 1 week.

- [002] Anthrax (*Bacillus anthracis*)B
- [005] Botulism-Foodborne (*Clostridium botulinum*)B
- [004] Botulism-Wound (*Clostridium botulinum*)
- [505] Disease Outbreaks (e.g., foodborne, waterborne, healthcare, etc.)
- [108] Encephalitis, Arboviral: Venezuelan EquineB
- [023] Hantavirus Disease
- [096] Measles-Imported
- [026] Measles-Indigenous
- [095] Meningococcal Disease (*Neisseria meningitidis*)
- [516] Novel Influenza A
- [032] Pertussis (Whooping Cough)
- [037] Rabies: Human
- [112] Ricin Poisoning^B
- [132] Severe Acute Respiratory Syndrome (SARS)
- [107] SmallpoxB
- [110] Staphylococcal Enterotoxin^B (SEB)
- Pulmonary Poisoning^B
- [111] Viral Hemorrhagic Fever^B

Category 1B: Requires immediate telephonic notification (next business day), followed by a written report using the PH-1600 within 1 week.

- [006] Brucellosis (*Brucella* species)B
- [010] Congenital Rubella Syndrome
- [011] Diphtheria (*Corynebacterium diphtheriae*)
- [121] Encephalitis, Arboviral: California/LaCrosse Serogroup
- [123] Encephalitis, Arboviral: Eastern Equine
- [122] Encephalitis, Arboviral: St. Louis
- [124] Encephalitis, Arboviral: Western Equine
- [506] Enterobacteriaceae, Carbapenem-resistant
- [053] Group A Streptococcal Invasive Disease (*Streptococcus pyogenes*)
- [047] Group B Streptococcal Invasive Disease (*Streptococcus agalactiae*)
- [054] *Haemophilus influenzae* Invasive Disease
- [016] Hepatitis, Viral-Type A acute
- [513] Influenza-associated deaths, age <18 years
- [520] Influenza-associated deaths, pregnancy-associated
- [515] Melioidosis (*Burkholderia pseudomallei*)
- [102] Meningitis-Other Bacterial
- [031] Mumps
- [033] Plague (*Yersinia pestis*)B
- [035] Poliomyelitis-Nonparalytic
- [034] Poliomyelitis-Paralytic
- [119] Prion disease-variant Creutzfeldt Jakob Disease
- [109] Q Fever (*Coxiella burnetii*)B
- [040] Rubella
- [041] Salmonellosis: Typhoid Fever (*Salmonella* Typhi)
- [131] *Staphylococcus aureus*: Vancomycin non-sensitive – all forms
- [075] Syphilis (*Treponema pallidum*): Congenital
- [519] Tuberculosis, confirmed and suspect cases of active disease (*Mycobacterium tuberculosis* complex)
- [113] Tularemia (*Francisella tularensis*)B

Category 2: Requires written report using form PH-1600 within 1 week.

- [501] Babesiosis
- [003] Botulism-Infant (*Clostridium botulinum*)
- [007] Campylobacteriosis (including EIA or PCR positive stools)
- [503] Chagas Disease
- [069] Chancroid
- [055] Chlamydia trachomatis-Genital
- [057] Chlamydia trachomatis-Other
- [056] Chlamydia trachomatis-PID
- [009] Cholera (*Vibrio cholerae*)
- [001] Cryptosporidiosis (*Cryptosporidium* species)
- [106] Cyclosporiasis (*Cyclospora* species)
- [504] Dengue Fever
- [116] Ehrlichiosis-HGE (*Anaplasma phagocytophilum*)
- [051] Ehrlichiosis-HME (*Ehrlichia chaffeensis*)
- [117] Ehrlichiosis/Anaplasmosis-Other
- [060] Gonorrhea-Genital (*Neisseria gonorrhoeae*)
- [064] Gonorrhea-Ophthalmic (*Neisseria gonorrhoeae*)
- [061] Gonorrhea-Oral (*Neisseria gonorrhoeae*)
- [063] Gonorrhea-PID (*Neisseria gonorrhoeae*)
- [062] Gonorrhea-Rectal (*Neisseria gonorrhoeae*)
- [133] Guillain-Barré syndrome
- [058] Hemolytic Uremic Syndrome (HUS)
- [480] Hepatitis, Viral-HbsAg positive infant
- [048] Hepatitis, Viral-HbsAg positive pregnant female
- [017] Hepatitis, Viral-Type B acute
- [018] Hepatitis, Viral-Type C acute
- [021] Legionellosis (*Legionella* species)
- [022] Leprosy [Hansen Disease] (*Mycobacterium leprae*)
- [094] Listeriosis (*Listeria* species)
- [024] Lyme Disease (*Borrelia burgdorferi*)
- [025] Malaria (*Plasmodium* species)
- [118] Prion disease-Creutzfeldt Jakob Disease
- [036] Psittacosis (*Chlamydia psittaci*)
- [105] Rabies: Animal
- [042] Salmonellosis: Other than *S. Typhi* (*Salmonella* species)
- [517] Shiga-toxin producing *Escherichia coli*
(including Shiga-like toxin positive stools, *E. coli* O157 and *E. coli* non-O157)
- [043] Shigellosis (*Shigella* species)
- [039] Spotted Fever Rickettsiosis (*Rickettsia* species including Rocky Mountain Spotted Fever)
- [130] *Staphylococcus aureus*: Methicillin resistant Invasive Disease
- [518] *Streptococcus pneumoniae* Invasive Disease (IPD)
- [074] Syphilis (*Treponema pallidum*): Cardiovascular
- [072] Syphilis (*Treponema pallidum*): Early Latent
- [073] Syphilis (*Treponema pallidum*): Late Latent
- [077] Syphilis (*Treponema pallidum*): Late Other
- [076] Syphilis (*Treponema pallidum*): Neurological
- [070] Syphilis (*Treponema pallidum*): Primary
- [071] Syphilis (*Treponema pallidum*): Secondary
- [078] Syphilis (*Treponema pallidum*): Unknown Latent
- [044] Tetanus (*Clostridium tetani*)
- [045] Toxic Shock Syndrome: Staphylococcal
- [097] Toxic Shock Syndrome: Streptococcal
- [046] Trichinosis

- [101] Vancomycin resistant enterococci (VRE) Invasive Disease
- [114] Varicella deaths
- [104] Vibriosis (Vibrio species)
- [125] West Nile virus Infections-Encephalitis
- [126] West Nile virus Infections-Fever
- [098] Yellow Fever
- [103] Yersiniosis (Yersinia species)

Category 3: Requires special confidential reporting to designated health department personnel within 1 week.

- [500] Acquired Immunodeficiency Syndrome (AIDS)
- [512] Human Immunodeficiency Virus (HIV)

Category 4: Laboratories and physicians are required to report all blood lead test results monthly and no later than 15 days following the end of the month.

- [514] Lead Levels (blood)

Category 5: Events will be reported monthly (no later than 30 days following the end of the month) via the National Healthcare Safety Network (NHSN - see <http://health.state.tn.us/ceds/hai/index.htm> for more details); Clostridium difficile infections (Davidson County residents only) will also be reported monthly to the Emerging Infections Program (EIP).

- [508] Healthcare Associated Infections, Central Line Associated Bloodstream Infections
- [509] Healthcare Associated Infections, Clostridium difficile
- [510] Healthcare Associated Infections, Methicillin resistant Staphylococcus aureus positive blood cultures
- [511] Healthcare Associated Infections, Surgical Site Infections

The following pathogens do not need to be reported using form PH-1600, but a reference culture is required to be sent to the State Public Health Laboratory.

- [502] Burkholderia malleiB
- [507] Francisella speciesB

^B Possible Bioterrorism Indicators



Table A. Shelby County and Tennessee Intercensal Population Estimates, 2000-2012

Year	Shelby County	Tennessee
2000	898,211	5,703,719
2001	899,345	5,750,789
2002	902,634	5,795,918
2003	906,733	5,847,812
2004	909,643	5,910,809
2005	913,201	5,991,057
2006	920,106	6,088,766
2007	921,119	6,175,727
2008	920,685	6,247,411
2009	922,541	6,306,019
2010	927,644	6,346,105
2011	934,405	6,399,787
2012	940,764	6,456,243

Table B. Shelby County Population by Age Group, Gender, Race, 2012

Shelby County Population by Age Group, Gender, Race, 2012			
Age Group	0 to 4	68,322	
	5 to 9	65,166	
	10 to 14	67,392	
	15 to 19	69,213	
	20 to 24	71,500	
	25 to 29	67,936	
	30 to 34	65,150	
	35 to 39	59,336	
	40 to 44	63,312	
	45 to 49	63,184	
	50 to 54	65,798	
	55 to 59	62,068	
	60 to 64	51,105	
	65 to 69	34,420	
	70 to 74	23,233	
	75 to 79	17,080	
	80 to 84	13,026	
	85+	13,523	
Gender	Female	Male	
	491,611	449,153	
Race	White	Black	Other
	403,747	496,686	40,331

Table C. Confirmed Cases of Reportable Diseases in Shelby County, 2003-2012

Condition	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Total
Campylobacteriosis	39	36	26	65	60	57	56	51	57	76	523
Cryptosporidiosis	1	4	8	6	2	10	8	2	2	1	44
Group A Streptococcal Invasive Disease (Streptococcus pyogenes)	35	18	21	25	26	29	32	41	30	28	285
Group B Streptococcal Invasive Disease (Streptococcus agalactiae)	62	66	104	115	68	71	84	71	76	59	776
Haemophilus Influenza Invasive Disease	12	7	14	13	15	20	26	14	18	16	155
Hepatitis, Viral-Type A acute	25	8	5	9	11	4	2	1	1	4	70
Hepatitis, Viral-Type B acute	60	39	41	24	31	19	38	31	18	18	319
Hepatitis, Viral-Type C acute	0	0	1	0	0	0	2	0	0	0	3
Legionellosis											0
Listeriosis											0
Lyme Disease	6	2	1	1	6	1	2	2	0	0	21
Malaria											0
Neisseria Meningitis	6	3	4	2	3	4	1	3	0	2	28
Mumps	2	0	0	1	0	0	1	0	0	0	4
Pertussis	8	3	14	6	9	12	13	29	3	14	111
Rocky Mountain Spotted Fever	7	0	0	1	1	1	0	0	0	0	10
Salmonellosis: Other than S. Typhi	164	105	170	143	134	146	137	214	194	179	1586
Shiga toxin-producing Escherichia coli (STEC)	0	0	0	6	13	2	3	8	5	6	43
Shigellosis	152	29	9	127	44	100	55	154	132	97	899
Staphylococcus aureus: Methicillin resistant Invasive Disease	0	243	534	552	477	439	347	321	205	268	3386
Streptococcus Pneumoniae Invasive Disease (IPD)	0	0	0	0	0	0	0	89	86	116	291
Vancomycin resistant enterococci (VRE) Invasive Disease	218	86	122	210	121	93	72	58	29	23	1032
Total	797	649	1074	1306	1021	1008	879	1089	856	907	9586

Table D. Confirmed/Probable Cases of Reportable Diseases in Shelby County by Age Group, 2012

	<1	1-4	5-9	10-14	15-19	20-24	25-34	35-44	45-54	55-64	65+	Unk	Total
Campylobacteriosis	1	8	3	1	7	1	9	14	10	8	13	1	76
Carbapenem Producing Enterococci	0	0	0	0	0	0	0	0	1	1	0	0	2
Cryptosporidiosis	0	0	0	0	0	1	0	0	0	0	0	0	1
Group A Streptococcal Invasive Disease (Streptococcus pyogenes)	0	3	1	1	1	1	1	1	1	7	11	0	28
Group B Streptococcal Invasive Disease (Streptococcus agalactiae)	18	0	0	0	0	0	4	5	6	9	17	0	59
Haemophilus Influenza Invasive Disease	1	0	3	0	0	0	3	1	1	1	6	0	16
Hepatitis, Viral-Type A acute	0	0	0	0	1	0	0	1	0	0	2	0	4
Hepatitis, Viral-Type B acute	0	0	0	0	0	3	10	0	2	2	1	0	18
Hepatitis, Viral-Type B Chronic	0	0	0	3	7	25	66	57	37	20	10	0	225
Hepatitis, Viral-Type C Chronic	0	0	0	0	0	0	0	0	5	7	2	0	14
Legionellosis	0	0	0	0	0	0	1	2	3	2	4	0	12
Listeriosis	0	0	0	0	0	0	0	0	1	0	0	0	1
MRSA	11	2	1	1	2	4	18	27	54	56	92	0	268
Malaria	0	0	0	0	0	0	0	0	0	0	1	0	1
Meningitis Neisseria	1	1	0	0	0	0	0	0	0	0	0	0	2
Pertussis	9	2	0	1	1	0	0	1	0	0	0	0	14
Shiga toxin-producing Escherichia coli (STEC)	0	3	0	1	1	0	1	0	0	0	0	0	6
Salmonellosis	20	43	11	12	7	5	9	16	16	17	23	0	179
Shigellosis	4	42	18	8	3	4	8	6	2	1	1	0	97
Streptococcus Pneumoniae Invasive Disease (IPD)	2	6	4	0	0	2	13	6	20	28	35	0	116
Vancomycin resistant enterococci (VRE) Invasive Disease	0	0	0	0	0	0	2	2	0	7	12	0	23
Vibriosis (non-cholera Vibrio species infections)	0	0	0	0	0	0	0	1	0	0	0	0	1
West Nile Virus, Neuro Invasive	0	0	0	0	0	0	1	1	2	2	1	0	7
West Nile Virus, non-Neuro Invasive	0	0	0	0	0	0	0	0	1	0	0	0	1
Yersiniosis	2	3	1	0	0	0	0	0	0	0	0	0	6
Total	69	113	42	28	30	46	146	141	162	168	231	1	1177

VACCINE PREVENTABLE DISEASES 2|TWO

Vaccine-preventable diseases are infectious diseases for which effective vaccines exist. Examples of vaccine preventable diseases include: Hepatitis B, Tetanus, Pertussis, Diphtheria, Polio, Measles, Mumps, Rubella, Rotavirus, and Meningitis. A complete list of vaccine-preventable diseases is published on the Centers for Disease Control and Prevention website (<http://www.cdc.gov/vaccines/vpd-vac/vpd-list.htm>). The Advisory Committee on Immunization Practices (ACIP) publishes immunization schedules for persons from birth through 18 years of age.

It is important for parents to adhere to immunization recommendations for their children from birth to adulthood. This ensures that a large proportion of individuals are immune or less susceptible if they come in contact with an infectious individual. Vaccines have proven effective in preventing epidemics and outbreaks of diseases by reducing unnecessary illnesses, disabilities, and deaths among the population. Within the last two decades, the decline in the number of children being vaccinated has made the general population more susceptible to diseases such as measles and Pertussis which previously had been nearly eradicated in the United States.

Fortunately, most parents do vaccinate their children and for many of these diseases it is rare that any actual cases are diagnosed and reported to the Shelby County Health Department. In this section we will present information about Pertussis, the most common vaccine preventable disease. Information about Hepatitis B and Influenza, both of which are also vaccine preventable diseases, will be discussed in other sections of the annual report.

Mumps is a viral infection that is caused by the mumps virus, affecting the parotid glands (salivary glands). There is no specific treatment. It is transmitted from person to person by droplets of saliva or mucus from the mouth, nose, or throat of an infected person who coughs, sneezes, or talks. There was a suspect case of mumps reported in 2012, but no confirmed cases diagnosed.

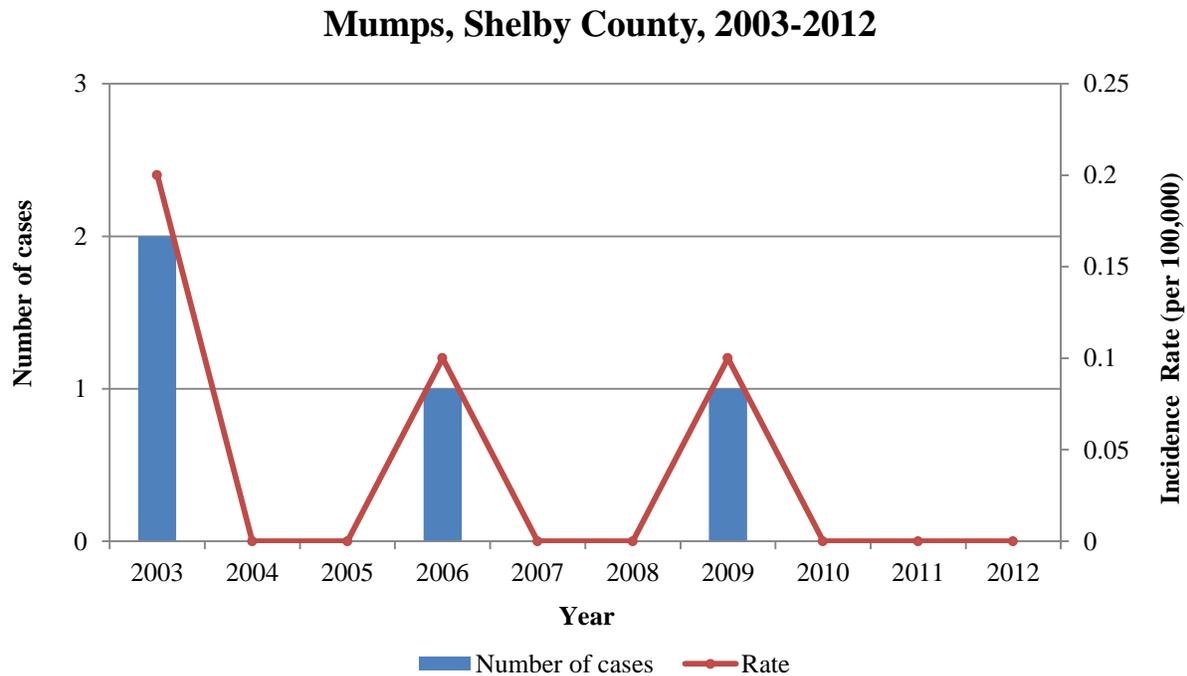
Pertussis is a respiratory disease caused by the bacteria *Bordetella pertussis*. Commonly known as “Whooping Cough” it is highly contagious and can cause serious illness especially in infants who are not fully vaccinated. It is an airborne pathogen that is spread from person to person while in close contact. It is sometimes transmitted from parents, older siblings, or caregivers who may not know they have the disease to infants and small children who are not fully vaccinated.

In 2012, there were 55 confirmed and probable cases of Pertussis reported in Shelby County (Table 1) and an incidence rate of 1.5 confirmed cases per 100,000 persons. There was one suspect case of Mumps reported in 2012, but no confirmed or probable cases. There were no cases of Measles, Rubella or Diphtheria reported in 2012.

Highlights

A total of four confirmed Mumps cases were reported in Shelby County from 2003 to 2012, with two cases in 2003, one case in 2006 and one case in 2009. There have been no confirmed or probable Mumps cases reported in the past three years.

Figure 1: Number of Cases and Incidence Rate of Mumps, Shelby County, TN, 2003-2013



Pertussis

Summary of the Disease

Pertussis, also known as whooping cough, is a respiratory disease caused by a type of bacteria called *Bordetella pertussis*. It is highly contagious and can cause serious illness especially in infants who are young and not fully vaccinated. The vaccine is recommended for children beginning at 2 months of age, teens, and adults. The vaccine effectiveness decreases over time. Teens and adults should be revaccinated, even if fully vaccinated as a child. It is one of the most common vaccine-preventable diseases that occur in the United States.

Pertussis starts similar to a common cold, with runny nose or congestion, sneezing, and sometimes mild cough or fever. After 1–2 weeks, severe coughing can begin. Unlike the common cold, Pertussis can become a series of coughing fits that continues for weeks. Pertussis can cause violent and rapid coughing, over and over, until the air is gone from the lungs and you are forced to inhale with a loud "whooping" sound. In infants, the cough can be minimal or not there at all. They may instead have life-threatening pauses in breathing (apnea).

Pertussis is spread from person to person while in close contact with others who breathe in the airborne pertussis bacteria. Many infants who get Pertussis are infected by parents,

older siblings, or other caregivers who might not even know they have the disease. In 30-40% of infant infections, the infant is infected by the mother. Pertussis is more severe in infants less than one year old. Infants typically have pneumonia (lung infection) and slowed or stopped breathing.

The CDC defines a confirmed pertussis case as a cough illness lasting at least 2 weeks with one of the following: paroxysm (sever rapid cough stage) of coughing, inspiratory “whoop” or post-tussive vomiting, and without other apparent cause (as reported by a healthcare professional). In addition, a laboratory criterion for diagnosis is the isolation of *B. pertussis* from a clinical specimen, or Positive polymerase chain (PCR) reaction assay for *B. pertussis*.

Table 1. Incidence of Pertussis, Shelby County, TN, 2012

Number of Confirmed Cases for 2012		14
2012 incidence rate per 100,000		1.5
Age (yrs)		
	Mean	5 years
	Median	3.5 months
	Min. - Max.	1 month - 42 years

Highlights

In 2012, there were 14 confirmed cases of Pertussis reported in Shelby County (Table 1) and an incidence rate of 1.5 confirmed cases per 100,000 persons. The age range of cases was 1 month to 42 years. Persons most affected are infants, with a median age of 3.5 years.

Figure 2 depicts the number of confirmed cases and incidence rate of Pertussis from 2003 to 2012 in Shelby County. A total of 111 cases were reported over this time period and incidence has fluctuated. In 2010, there were 29 confirmed cases and an incidence rate of 3.1 per 100,000 persons, which is two times higher than any other year in the past decade.



Figure 2: Number of Cases and Incidence Rate of Pertussis, Shelby County, TN, 2003-2012

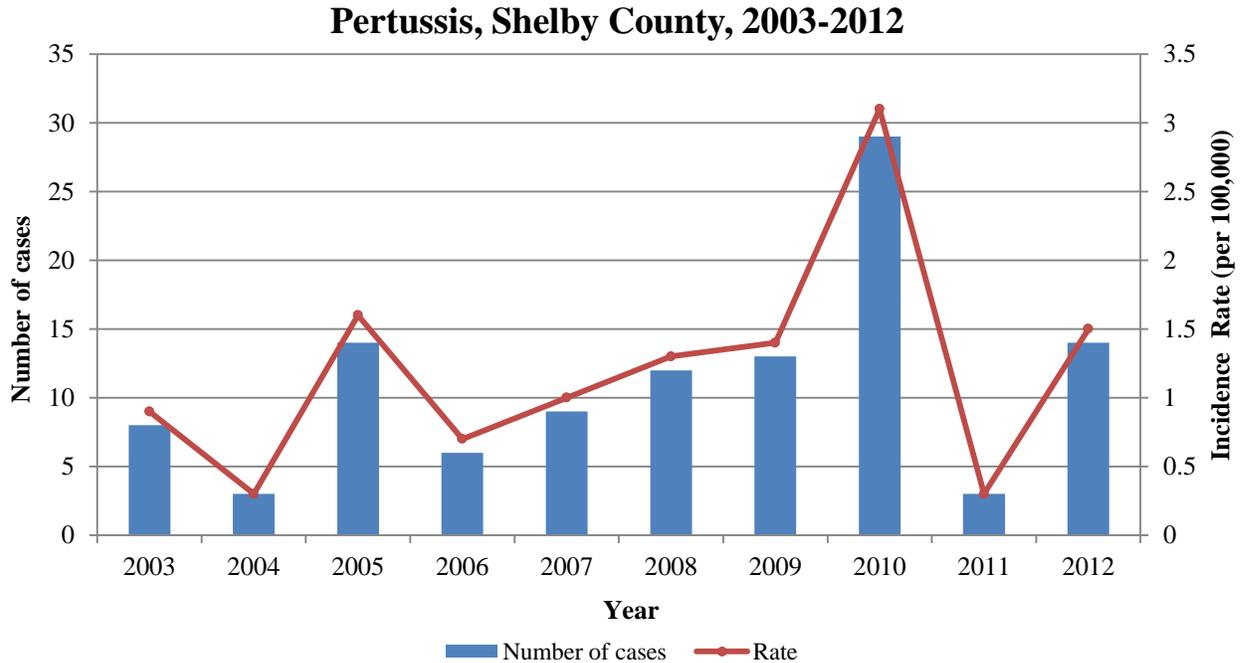


Figure 3 shows the five-year average incidence rate of confirmed Pertussis cases for 2002-2006 and 2007-2011 in Shelby County and Tennessee, as well as the single-year 2012 incidence rate for Shelby County. The five-year average incidence rate increased in Shelby County nearly doubled (from 0.8 per 100,000 in 2002-2006 to 1.5 per 100,000 in 2007-2011) while the statewide rate declined by about 8% (from 2.6 per 100,000 in 2002-2006 to 2.4 per 100,000 in 2007-2011). However, for both data points, the rate is less in Shelby County than it is statewide.

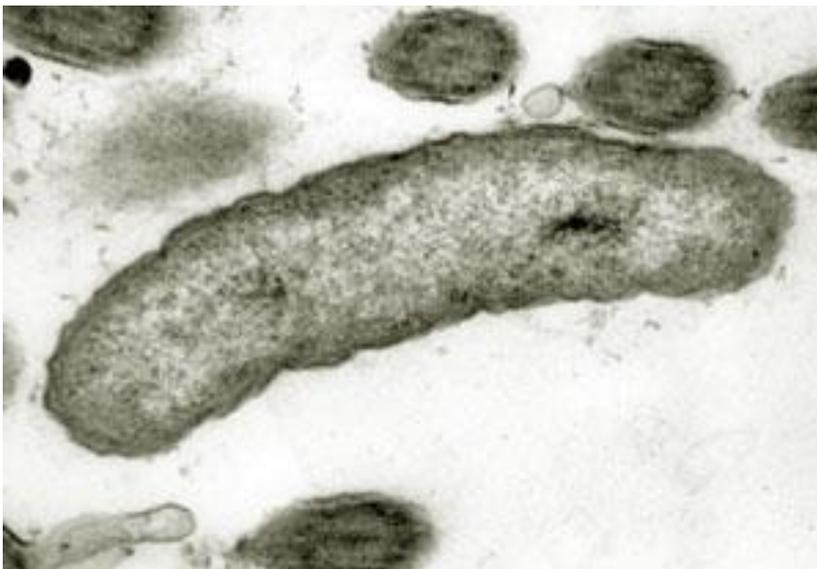


Figure 3: Pertussis Incidence Rate by 5 Year-Average, Shelby County, Tennessee and Tennessee, 2002-2012

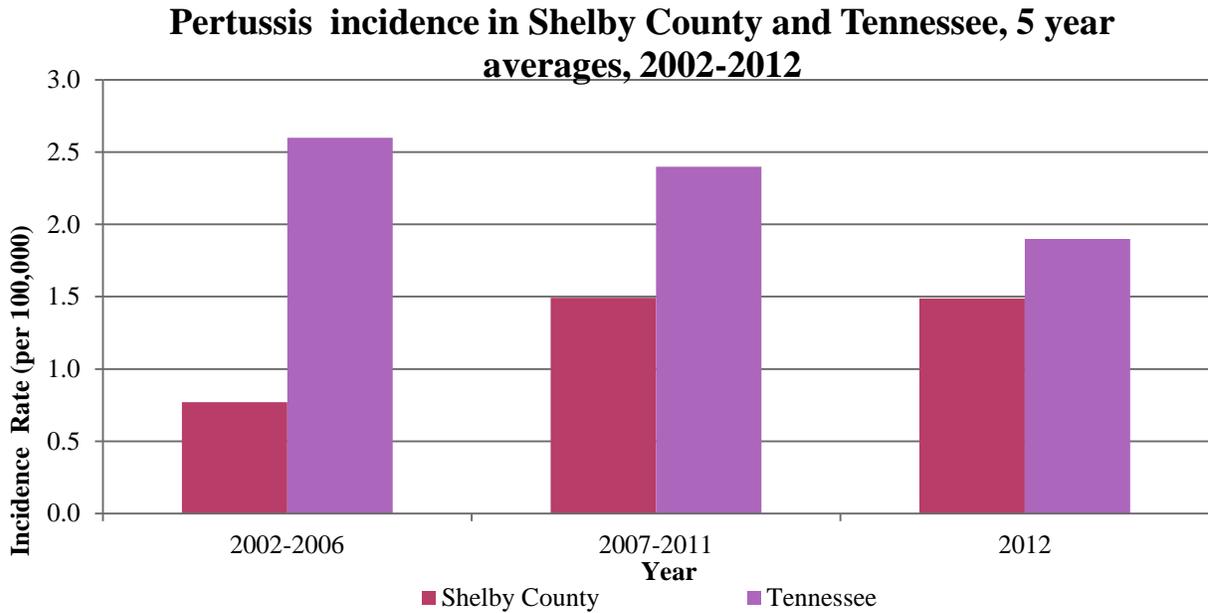
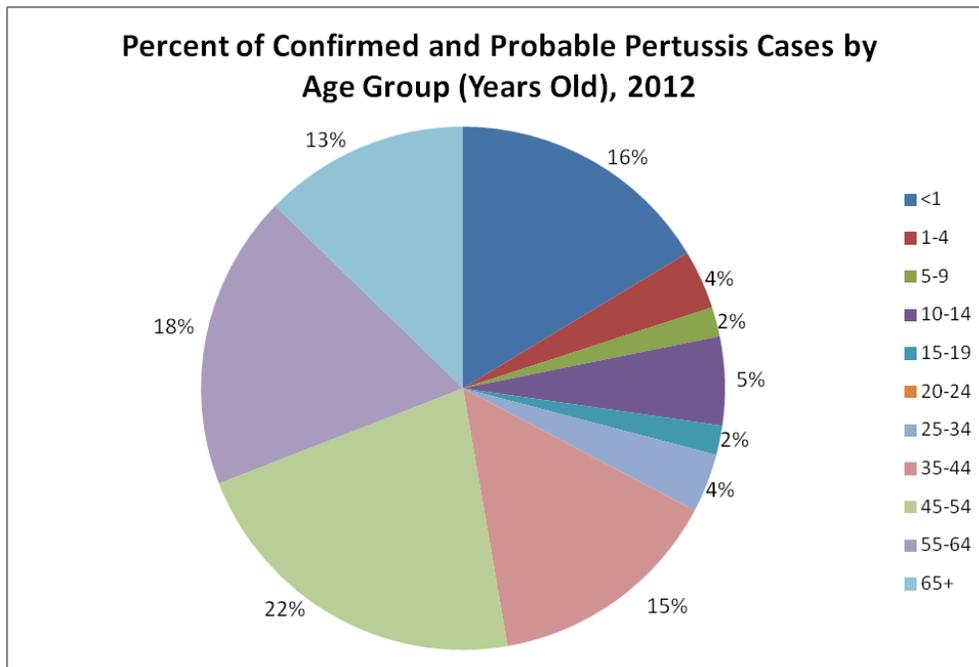
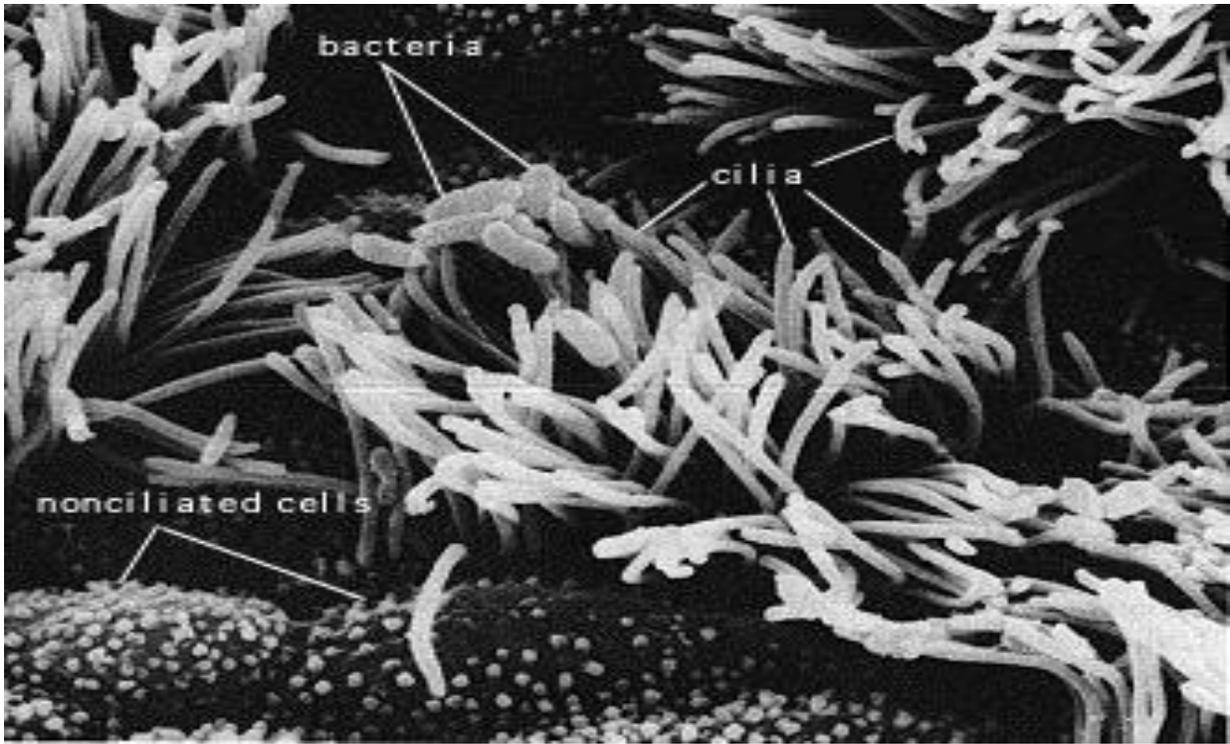


Figure 4 shows the percentage of confirmed and probable Pertussis cases by age group in 2012. Based on the data, 28% of cases were diagnosed in children and 20% occurred among children less than 5 years old. Fifty-three percent of cases were diagnosed in adults > 45 years old. The best way for families to protect infants and small children from Pertussis is to ensure that the adults around the children are current on their vaccinations, particularly the Diphtheria, Tetanus and Pertussis (DTaP) vaccine.

Figure 4: Percent of Pertussis Cases by Age Group, Shelby County, TN, 2012





BACTERIAL INVASIVE DISEASES 3|THREE

Bacterial Invasive Diseases

The bacterial invasive diseases reported in Shelby County in 2012 include the following: *Haemophilus Influenza* (Invasive Disease), Meningococcal (*Neisseria meningitidis*) Infection, Streptococcal Disease (Invasive Group A), Streptococcal Disease (Invasive Group B), Strep pneumoniae Drug-Resistant (Invasive Disease), Strep pneumoniae Drug-Susceptible (Invasive Disease). In 2012, there were 512 confirmed cases of bacterial invasive diseases reported in Shelby County (Figure 1). Bacterial invasive diseases accounted for 56% of all reportable diseases in Shelby County for 2012, with invasive MRSA and *Streptococcus Pneumoniae* infections contributing the greatest numbers of cases.

Table 2. Incidence of Bacterial Invasive Diseases in Shelby County, 2012

Reportable Disease	Case Status			
	Confirmed case	Not a case	Suspect	Total
Group A <i>Streptococcus</i>	28	2	0	30
Group B <i>Streptococcus</i>	59	2	0	61
<i>Haemophilus Influenza</i>	16	2	0	18
MRSA	268	55	0	323
Meningococcal (<i>Neisseria meningitidis</i>) Infection	2	4	1	7
<i>Streptococcus Pneumoniae</i> Invasive Disease (IPD)	116	5	0	121
VRE	23	0	0	23
Total	512	70	1	583
Frequency Missing = 5				

Haemophilus Influenza (Invasive Disease)

Summary of Disease

Haemophilus influenzae is a severe bacterial infection that primarily affects infants. This infection is caused by six serotypes of *Haemophilus influenzae* with type b (Hib) being the most significant for public health purposes. The invasive disease can cause various clinical syndromes such as meningitis, bacteremia or sepsis, epiglottitis, pneumonia, septic arthritis, osteomyelitis, empyema, and abscesses. The non-invasive Hib can produce mucosal infections such as bronchitis, sinusitis, and otitis. Symptom onset is often abrupt, and may include fever, headache, lethargy, anorexia, vomiting, nausea, and irritability. This infection is transmitted through direct contact with respiratory droplets from an infected person. Children less than 4 years old who have had prolonged household, daycare, or other close contact with an infected person are at increased risk of contracting the disease. The risk of secondary disease among household contacts is age dependent, with the youngest children being at greatest risk.

Table 3. Incidence of *Haemophilus Influenza* in Shelby County, 2012

Number of Confirmed Cases for 2012		16
2012 incidence rate per 100,000		1.7
Age (yrs)		
	Mean	49
	Median	54
	Min. - Max.	3 days-92 years

Highlights

Figure 4

***Haemophilus Influenza*, Shelby County, 2003-2012**

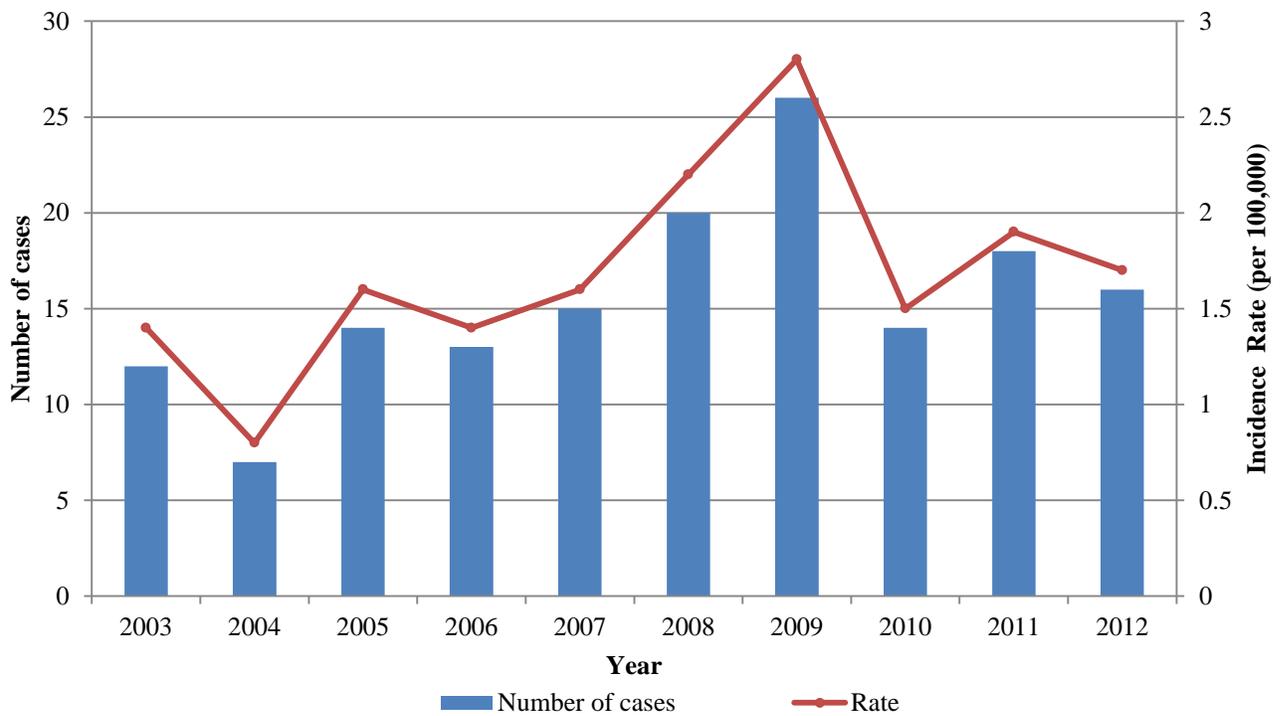
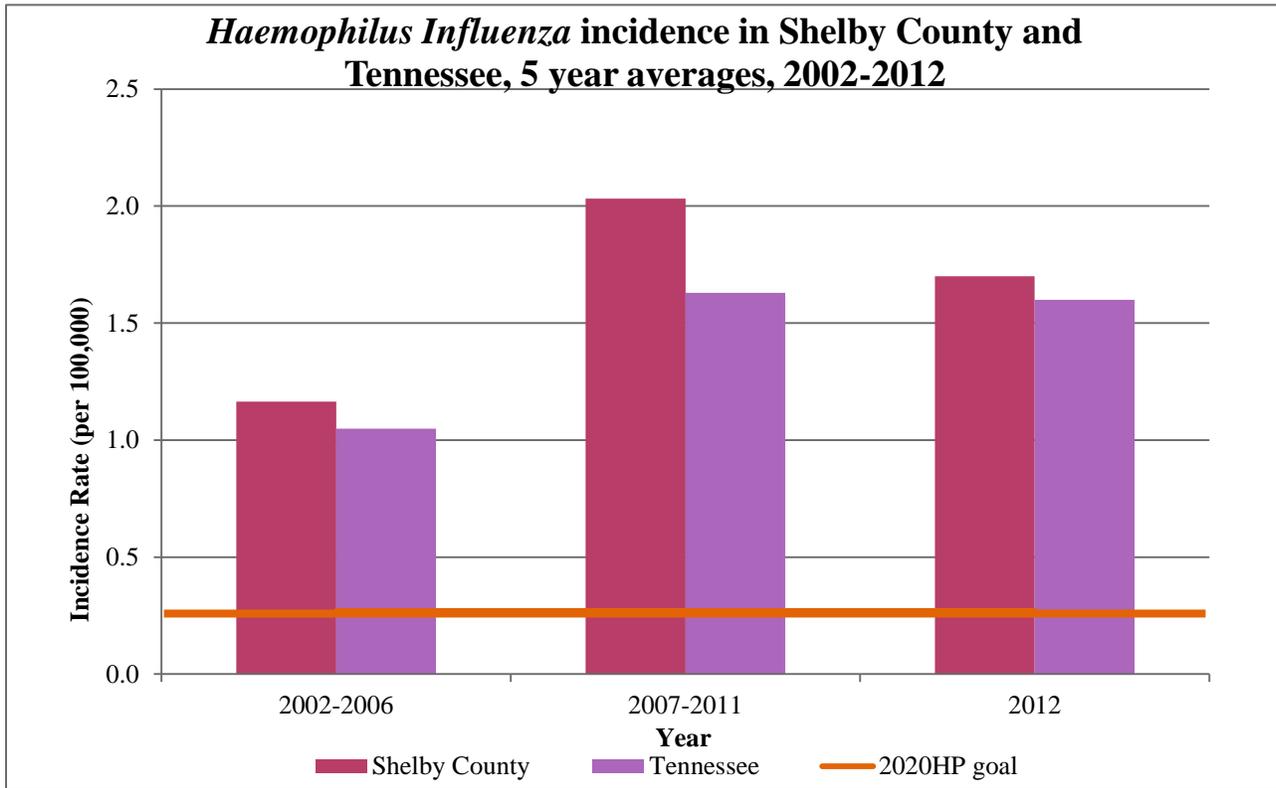


Figure 5



Meningococcal (*Neisseria meningitidis*) Infection

Summary of Disease

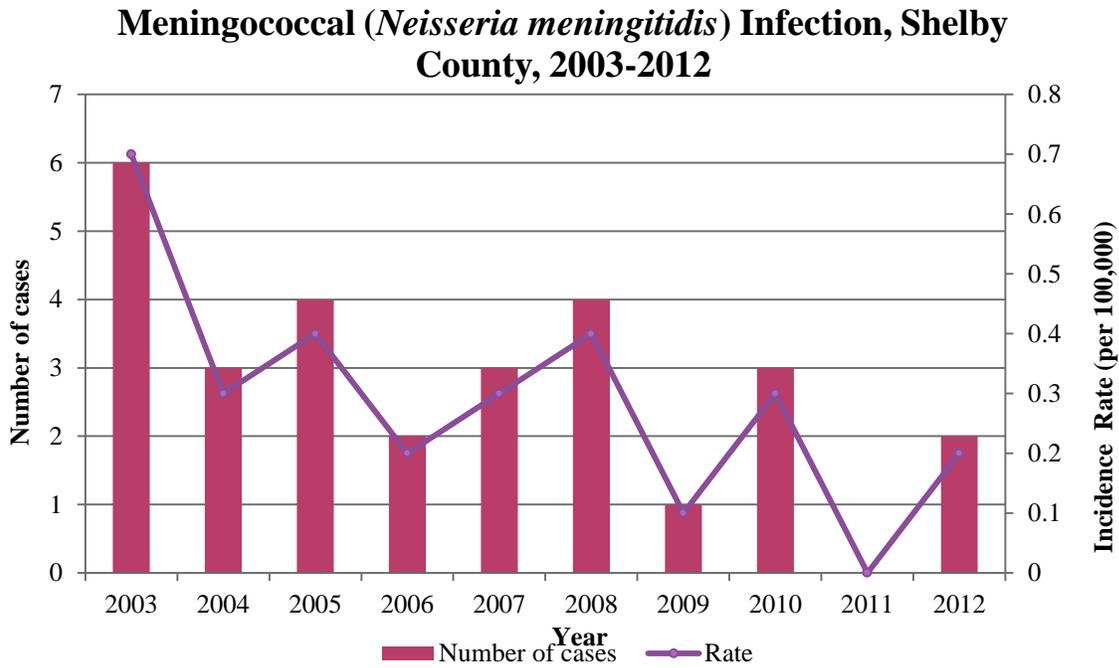
This infection is characterized by sudden onset of fever, intense headache, nausea, and often vomiting, stiff neck and frequently, a petechial rash. Delirium and coma are often associated with *Neisseria meningitidis*. Bacterial meningitis has a high case fatality rate (50% or higher) when left untreated. With early diagnosis and treatment the case fatality rate can be lowered to 5-15%. The infection is transmitted by direct contact with an infected person including respiratory droplets from the nose and throat. Meningococci usually disappear from the nasopharynx within 24 hours after treatment with antibiotics. Approximately 25% of people in the general population are colonized with the bacteria without causing illness or infection.

Table 4. Incidence of Meningococcal Infection in Shelby County, 2012

Number of Confirmed Cases for 2012	2
2012 incidence rate per 100,000	0.2
Age (yrs)	
Mean	2
Median	2.3
Min. - Max.	6 months-4 years

Highlights

Figure 6



Methicillin-Resistant *Staphylococcus aureus* (MRSA)

Summary of Disease

Methicillin-Resistant *Staphylococcus aureus* (MRSA) is a bacterial infection that is resistant to certain antibiotics called beta-lactams. About 5% of *S. aureus* bacterial strains are still susceptible to penicillin. The bacteria *staphylococcus* can either colonize or infect people. Colonization occurs when the bacteria is present on or in the body without causing illness. Infection occurs when the bacteria causes illness in the person. MRSA is mostly spread by direct physical contact. It not spread through the air. MRSA can also be spread indirectly when we come in contact with staphylococcus bacteria-contaminated objects such as sheets, wound dressing, workout areas, towels, cloths and sports equipment.

Table 5. Incidence of Confirmed MRSA Infection in Shelby County, 2012

Number of Confirmed Cases for 2012	268
2012 incidence rate per 100,000	28.5
Age (yrs)	
Mean	55
Median	56
Min. - Max.	21 days-104 years

Highlights

Figure 7

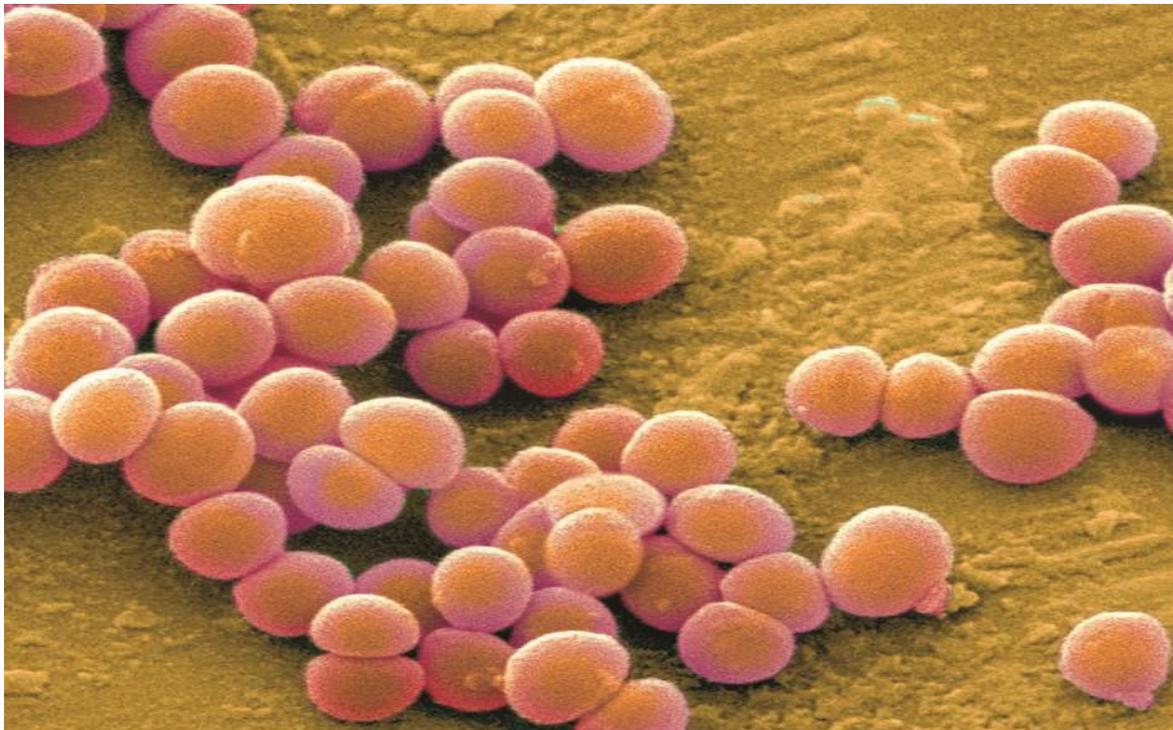
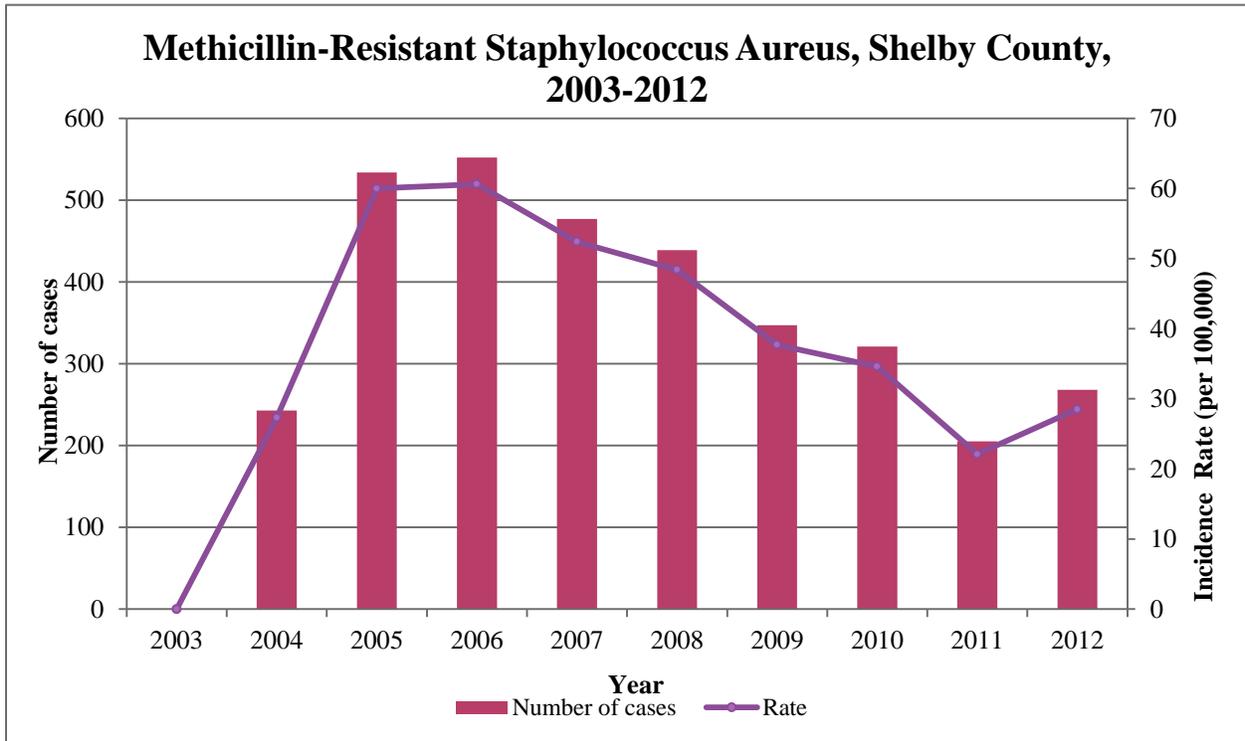


Figure 8

Staphylococcus aureus: Methicillin resistant Invasive Disease incidence in Shelby County and Tennessee, 5 year averages, 2002-2012



Streptococcal Disease (Invasive Group A)

Summary of Disease

Group A *Streptococcus* infections commonly cause non-invasive illnesses such as strep throat or impetigo. Invasive group A *Streptococcus* manifests in several clinical symptoms such as pneumonia, bacteria cutaneous infection, meningitis, peritonitis, osteomyelitis, septic arthritis, postpartum sepsis, neonatal sepsis and nonfocal bacteremia. Two of the most severe, but least common, forms of invasive group A *Streptococcus* diseases are called necrotizing fasciitis (NF) and streptococcal toxic shock syndrome (STSS). According to the CDC, 10%-15% of those with invasive group A streptococcus die from the infection and approximately 25% of patients with NF and more than 35% with STSS die from the infection.

Group A *Streptococcus* is spread from person to person by contact with infectious secretions. The bacteria can be carried asymptotically in the pharyngeal passage by all age groups, though it is commonly observed in children. Those who are nasal carriers of the infection are highly likely to spread the infections to others through direct contacts. Antibiotics can limit the spread of infection. If untreated, the infection is communicable 10 to 21 days. The elderly, immunosuppressed persons, those with chronic cardiac or respiratory disease, diabetics, and people with skin lesions are at high risk of contracting invasive group A *Streptococcus*. African Americans and American Indians are also high risk groups for invasive group A *Streptococcus*.

Table 6. Incidence of Invasive Group A Streptococcal Infection in Shelby County, 2012

Number of Confirmed Cases for 2012	28
2012 incidence rate per 100,000	3.0
Age (yrs)	
Mean	50
Median	56
Min. - Max.	1 year- 89 years

Highlights

Figure 9

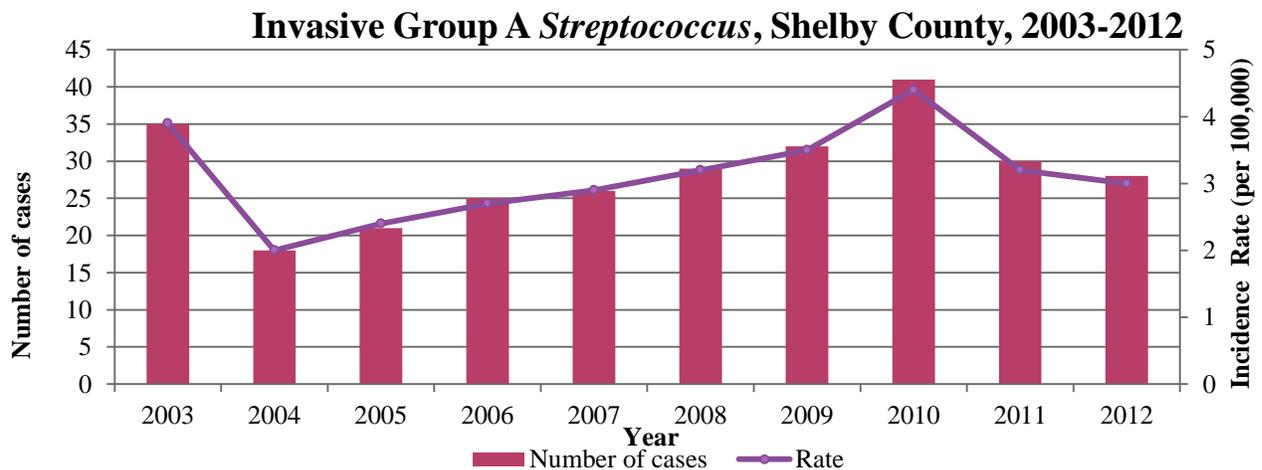
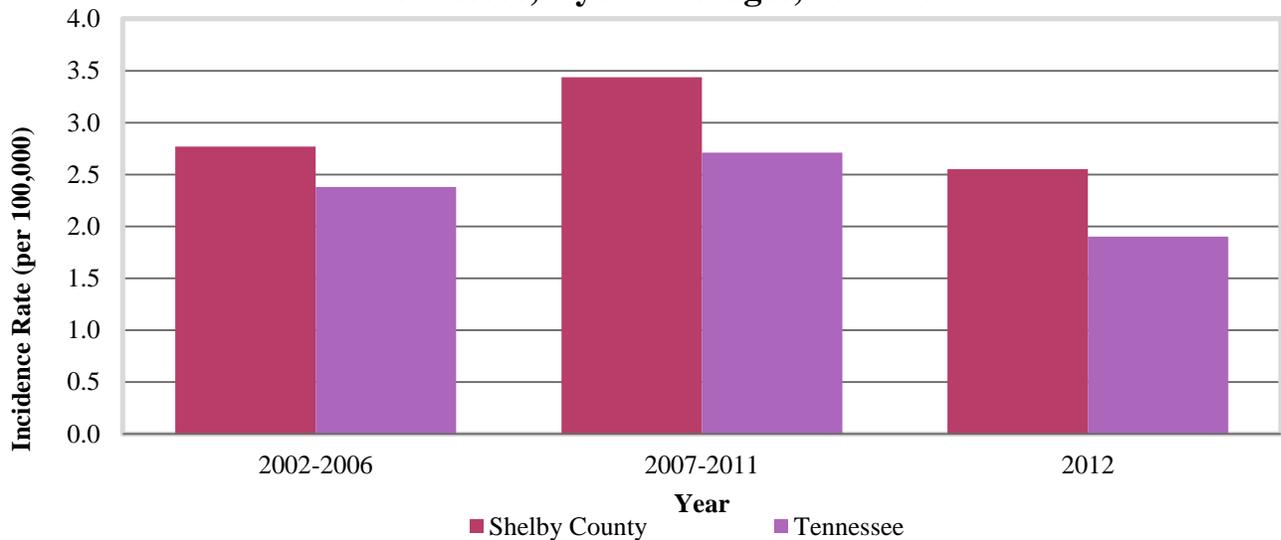


Figure 10

Invasive Group A *Streptococcus* incidence in Shelby County and Tennessee, 5 year averages, 2002-2012



Streptococcal Disease (Invasive Group B)

Summary of Disease

According to the CDC, Group B *Streptococcus* is the most common cause of meningitis and pneumonia in newborns and blood infections. It is also a chief cause of perinatal bacterial infections in women about to deliver. Furthermore, group B *Streptococcus* is known to cause focal and systemic infections in infants from birth to over 3 months old. This disease can be invasive or non-invasive, depending on the age of the infant. The early onset invasive type of group B strep often occurs in the first 24 hours of life, and ranges from 0-6 days. This stage is characterized by systemic infection, respiratory distress, shock, pneumonia, apnea, and meningitis. Late onset types of group B strep infections normally happen at 3 to 4 weeks old and ranges from 7 days to 3 months. This stage is characterized by focal infections such as osteomyelitis, septic arthritis, adenitis and cellulitis. Also, meningitis or occult bacteremia might occur. Systemic infections in non-pregnant adults who have chronic diseases such as diabetes, chronic liver or renal disease, cancer are also common.

Table 7. Incidence of Invasive Group B Streptococcal Infection in Shelby County, 2012

Number of Confirmed Cases for 2012	59
2012 incidence rate per 100,000	6.3
Age (yrs)	
Mean	42
Median	50
Min. - Max.	3 days-91 years

Highlights

Figure 11

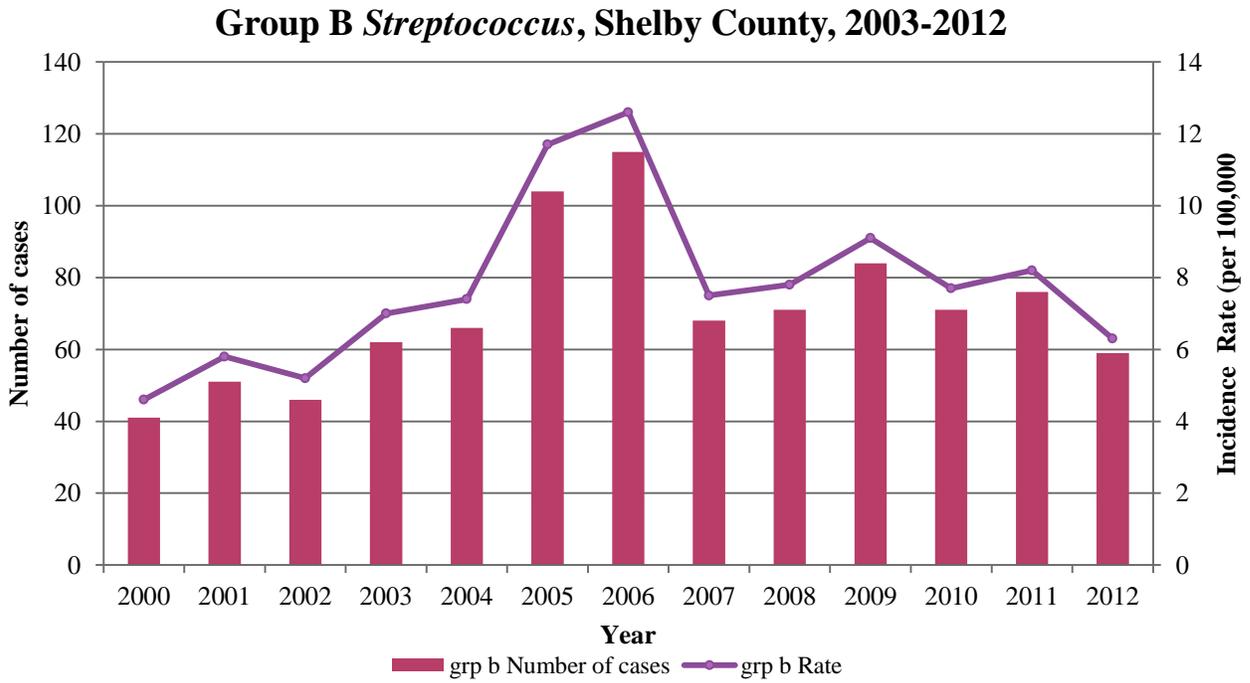
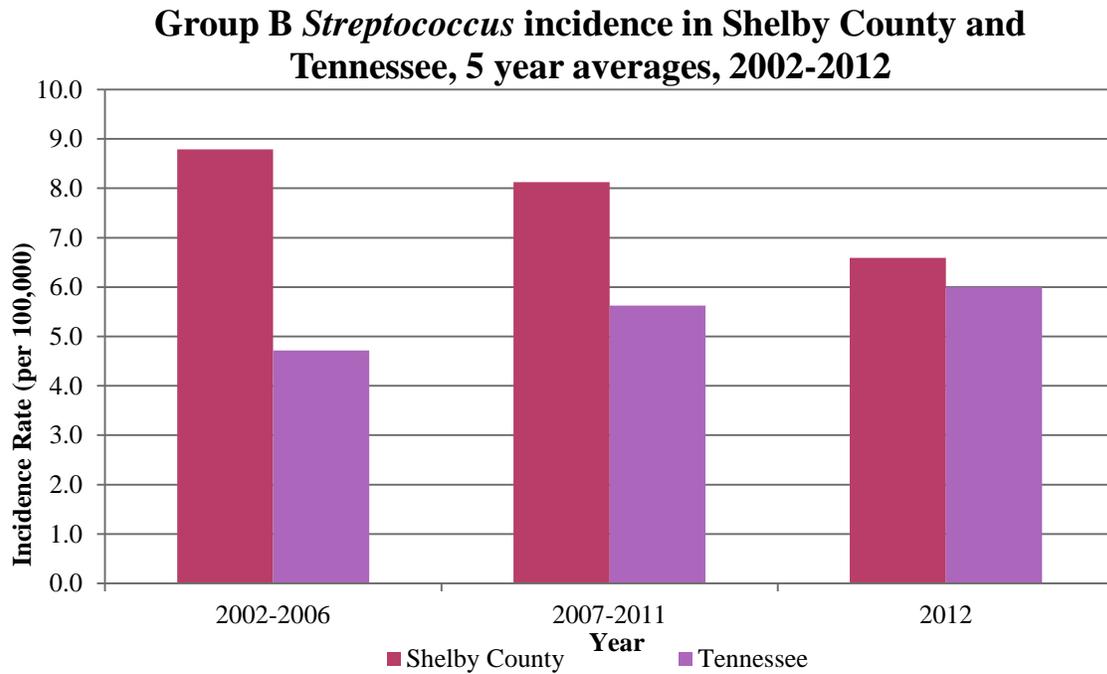


Figure 12



Streptococcus Pneumoniae Invasive Disease (IPD)

Summary of Disease

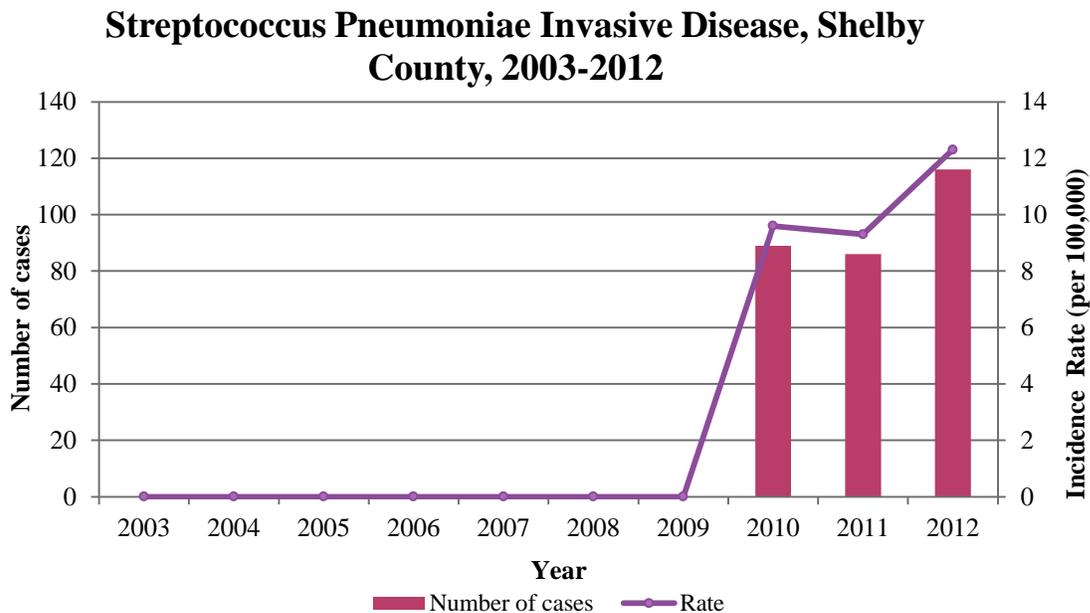
Streptococcus pneumoniae is a bacterial infection that affects different parts of the body and may either be invasive or non-invasive. The invasive infection is commonly found in early childhood years, though the number of cases is changing due to the new conjugate vaccine that was recently introduced. The signs and symptoms of invasive *Streptococcus pneumoniae* include bacteremia and meningitis. *Streptococcus pneumoniae* is now the predominant cause of meningitis in children since the decline of *Haemophilus influenzae* type b infections, and became reportable in Tennessee in 2010. *Streptococcus pneumoniae* is also the most common cause of community acquired pneumonia, sinusitis, and conjunctivitis. Infection is transmitted from person to person presumably through respiratory droplet contact. Those at increased risk for this infection include the elderly, children less than 2 years, children in child care facilities, Blacks, American Indians, and Alaskan Natives, and persons with underlying medical conditions.

Table 8. Incidence of Streptococcus Pneumoniae Invasive Disease in Shelby County, 2012

Number of Confirmed Cases for 2012		116
2012 incidence rate per 100,000		12.3
Age (yrs)	Mean	54
	Median	56
	Min. - Max.	3 months-97 years

Highlights

Figure 13



Vancomycin resistant enterococci (VRE) Invasive Disease

Summary of Disease

Vancomycin-resistant Enterococci are specific types of antimicrobial-resistant bacteria that are resistant to vancomycin, the drug often used to treat infections caused by enterococci. Enterococci are bacteria that are normally present in the human intestines and in the female genital tract and are often found in the environment. These bacteria can sometimes cause infections. Most vancomycin-resistant Enterococci infections occur in hospitals.

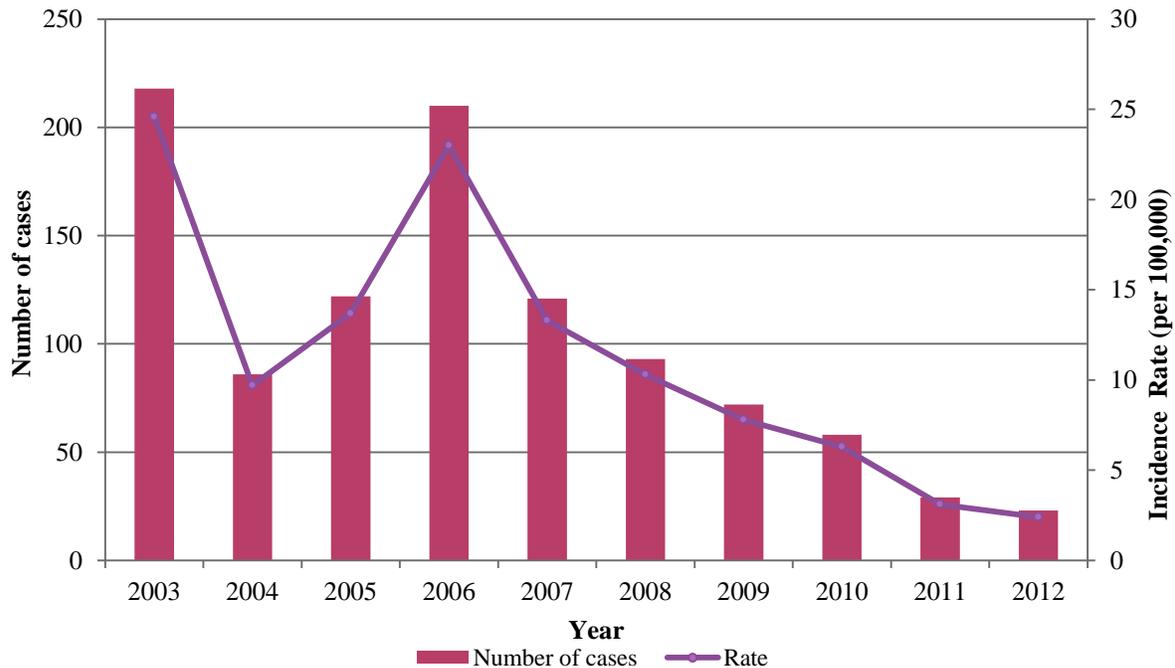
Table 9. Incidence of Vancomycin resistant enterococci (VRE) Invasive Disease in Shelby County, 2012

Number of Confirmed Cases for 2012		23
2012 incidence rate per 100,000		2.4
Age (yrs)	Mean	63
	Median	65
	Min. - Max.	29 years-94 years

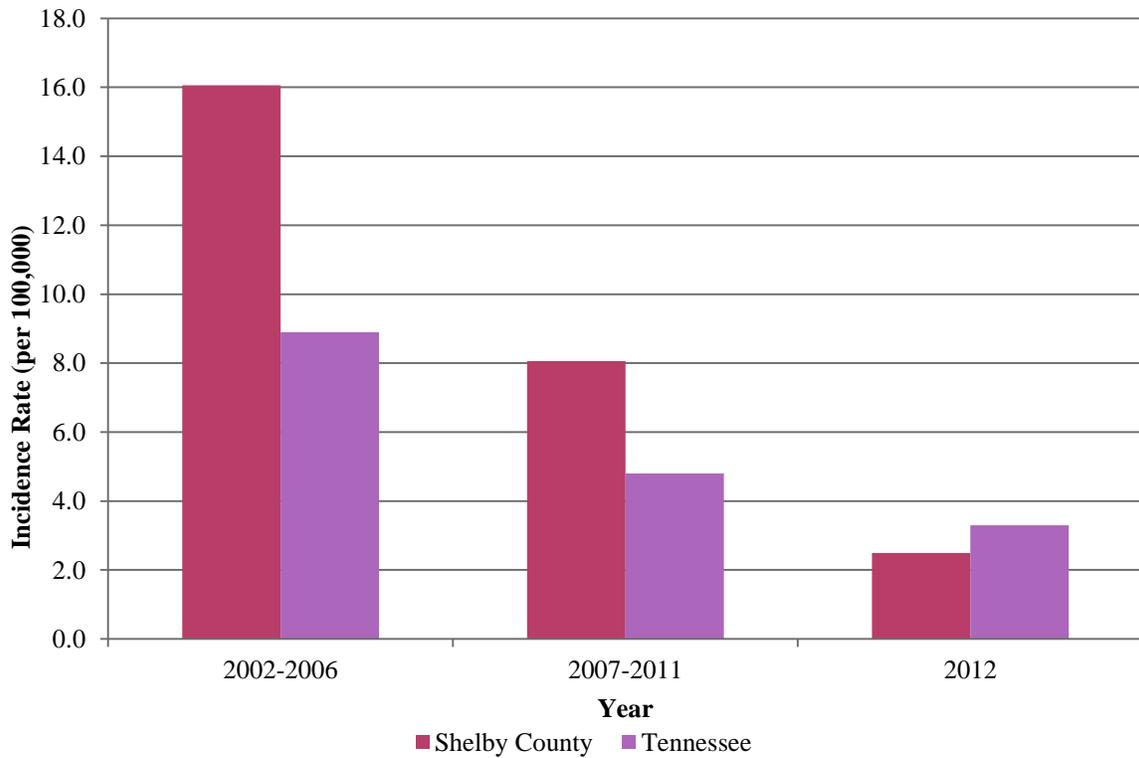
Highlights

Figure 14

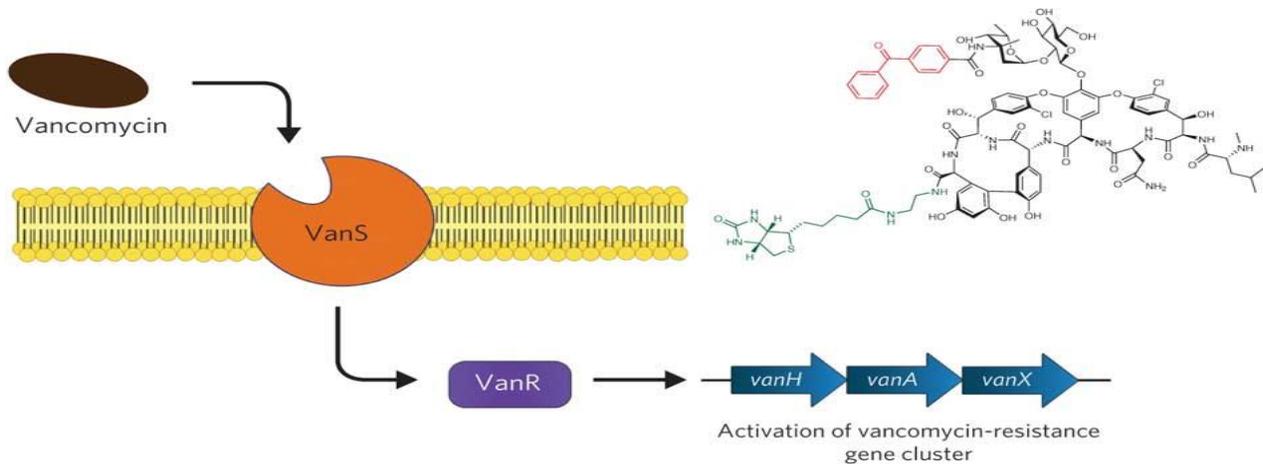
Vancomycin resistant enterococci (VRE) Invasive Disease, Shelby County, 2003-2012



Vancomycin resistant enterococci (VRE) Invasive Disease in Shelby County and Tennessee, 5 year averages, 2002-2012



The number of VRE infections reported to the Shelby County Health Department has steadily declined each year since 2006. It is difficult to know precisely why the number of infections and infection rates are declining, but public health campaigns targeting improvements in infection control methods used in health care settings and efforts to ensure antibiotic treatments are appropriately prescribed by doctors and taken by patients may be part of the success story.



ENTERIC DISEASES 4|FOUR

Enteric diseases usually are introduced into the body through the mouth and intestinal tracts. They are often spread through contaminated foods and water or through contact with the vomit or feces of an infected person or animal. Many of these enteric diseases are caused by bacteria, but viruses and parasites also cause illness as well. Enteric diseases include campylobacteriosis, cryptosporidiosis, cyclosporiasis, giardiasis, salmonellosis, and shigellosis. In Tennessee, all those except giardiasis are reportable and they are notifiable in the United States. In 2012, almost 400 reports of these enteric diseases were made to the Shelby County Health Department, 376 of which were considered cases (Table 10). Enteric diseases accounted for about 40% of all reportable diseases in Shelby County for 2012.

Confirmed and probable cases accounted for 91% of the enteric diseases reported in 2012. Salmonellosis was the most commonly reported enteric disease in Shelby County with 179 cases and an incidence rate 19 cases per 100,000. This marks a 16% decrease in the number of cases for salmonellosis from 2010. However, salmonellosis still remains significantly higher than in the previous years of 2006 through 2009. The enteric disease with the second highest number of reports was shigellosis followed by campylobacteriosis.

Table 10. Incidence of Enteric Diseases in Shelby County, 2012

Reportable Disease	Case Status				Total Investigated
	Confirmed case	Probable case	Suspect case	Not a case	
Campylobacteriosis	76	0	2	3	81
Cryptosporidiosis	1	0	0	0	1
Shiga Toxin Producing E-Coli	6	0	3	4	13
Salmonellosis	179	4	3	8	194
Shigellosis	97	0	5	6	108
Total	359	4	13	21	397

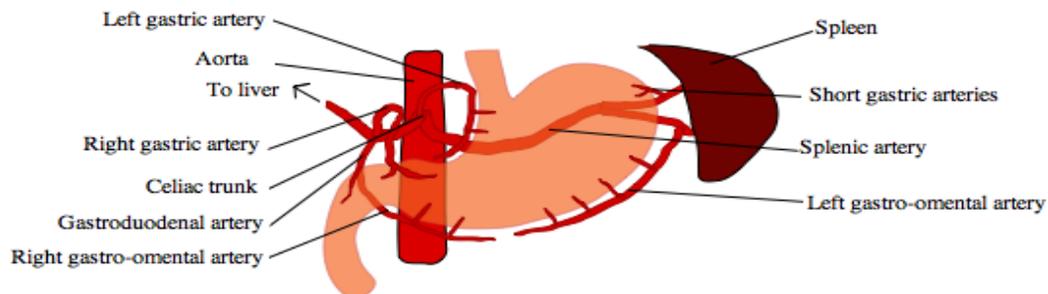


Table 11. Incidence* of laboratory-confirmed bacterial and parasitic infections, and post diarrheal hemolytic uremic syndrome (HUS), by year and pathogen, Foodborne Diseases Active Surveillance Network (FoodNet), United States, 2003–2012†

Pathogen/Syndrome	Year										2010 National health objective [§]	2020 National health objective [¶]
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012		
Surveillance population (millions) ^{†††}	41.75	44.34	44.77	45.32	45.84	46.33	46.76	47.14	47.51	47.51		
<i>Campylobacter</i>	12.63	12.82	12.71	12.73	12.81	12.64	12.96	13.52	14.28	14.30	12.3	8.50
<i>Listeria</i> **	0.31	0.26	0.29	0.28	0.26	0.26	0.32	0.27	0.28	0.25	0.24	0.20
<i>Salmonella</i>	14.46	14.65	14.53	14.76	14.89	16.09	15.02	17.55	16.45	16.42	6.8	11.40
<i>Shigella</i>	7.28	5.07	4.68	6.10	6.26	6.57	3.96	3.77	3.24	4.50	N/A ^{††}	N/A
STEC ^{§§} O157	1.06	0.91	1.06	1.30	1.20	1.12	0.99	0.95	0.97	1.12	1.0	0.60
STEC non-O157	0.17	0.25	0.30	0.53	0.62	0.53	0.61	0.95	1.10	1.16	N/A	N/A
<i>Vibrio</i>	0.26	0.28	0.27	0.34	0.24	0.29	0.34	0.41	0.33	0.41	N/A	0.20
<i>Yersinia</i>	0.39	0.39	0.36	0.36	0.36	0.36	0.33	0.34	0.34	0.33	N/A	0.30
<i>Cryptosporidium</i>	1.09	1.44	2.96	1.94	2.67	2.27	2.88	2.75	2.85	2.60	N/A	N/A
<i>Cyclospora</i>	0.03	0.03	0.15	0.09	0.03	0.04	0.07	0.06	0.05	0.03	N/A	N/A
HUS***	1.33	1.05	1.48	2.21	2.02	1.67	1.45	1.82	1.09	–	N/A	0.90

Source: Centers for Disease Control and Prevention. National Center for Emerging and Zoonotic Infectious Diseases (NCEZID) Division of Foodborne, Waterborne, and Environmental Diseases (DFWED)

*Per 100,000 population

†Data are preliminary

§Healthy People 2010 objective targets for incidence of *Campylobacter*, *Listeria*, *Salmonella*, and Shiga toxin-producing *Escherichia coli* O157

¶Healthy People 2020 objective targets for incidence of *Campylobacter*, *Listeria*, *Salmonella*, Shiga toxin-producing *Escherichia coli* O157, *Vibrio*, and *Yersinia* infections, and HUS

***Listeria* cases defined as isolation of *L. monocytogenes* from a normally sterile site or, in the setting of miscarriage or stillbirth, isolation of *L. monocytogenes* from placental or fetal tissue

††No national health objective exists for these pathogens

§§Shiga toxin-producing *Escherichia coli*

¶¶Surveillance not conducted for this pathogen in this year

***Incidence of postdiarrheal HUS in children aged <5 years; denominator is surveillance population aged <5 years

†††U.S. Census Bureau population estimates for the surveillance area for 2011. Final incidence rates will be reported when population estimates for 2012 are available.

Campylobacteriosis

Summary of the disease

Campylobacteriosis is one of the most common bacterial infectious diseases in the United States. Illness is usually caused by the *Campylobacter jejuni* species. Most infections are associated with handling raw poultry or eating raw or undercooked poultry such as chicken and turkey. Symptoms include diarrhea, cramping, abdominal pain and fever within 2 to 5 days of being exposed to the bacteria. Some cases also involve nausea and vomiting. Symptoms can last for about one week.

Most cases of campylobacteriosis do not occur as part of a large outbreak but are isolated cases with no epidemiological links. Illness occurs most frequently during the summer months and typically affects infants and young adults more often than other age groups. Also, males are affected more than females.

Table 12. Incidence of Campylobacteriosis in Shelby County, 2012

Number of Confirmed Cases for 2012	76
2012 incidence rate per 100,000	8.2
Age (yrs)	
Mean	39
Median	40
Min. - Max.	9month-95 years

Highlights

The mean age of the 2012 cases was 39 years with the youngest affected being under a year old. There has been a general increase in campylobacter incidence since 2005, likely due to a new and simpler laboratory test being introduced, making it easier for doctors to test for this illness. In the decade of data represented, the highest incidence of disease was reported in 2012. The pattern of data trend is an upward pattern for cases in Shelby County since 2003. Over the past 10 years, the number of campylobacter cases has grown considerably. Between 2003 and 2004, the average number of reports was about 40 cases. Then there was a considerable decrease in 2005, but in the following year, there was a significant increase in the number of cases in 2006 compared to the previous years. The number of cases have essentially remained that high since then.

Figure 16

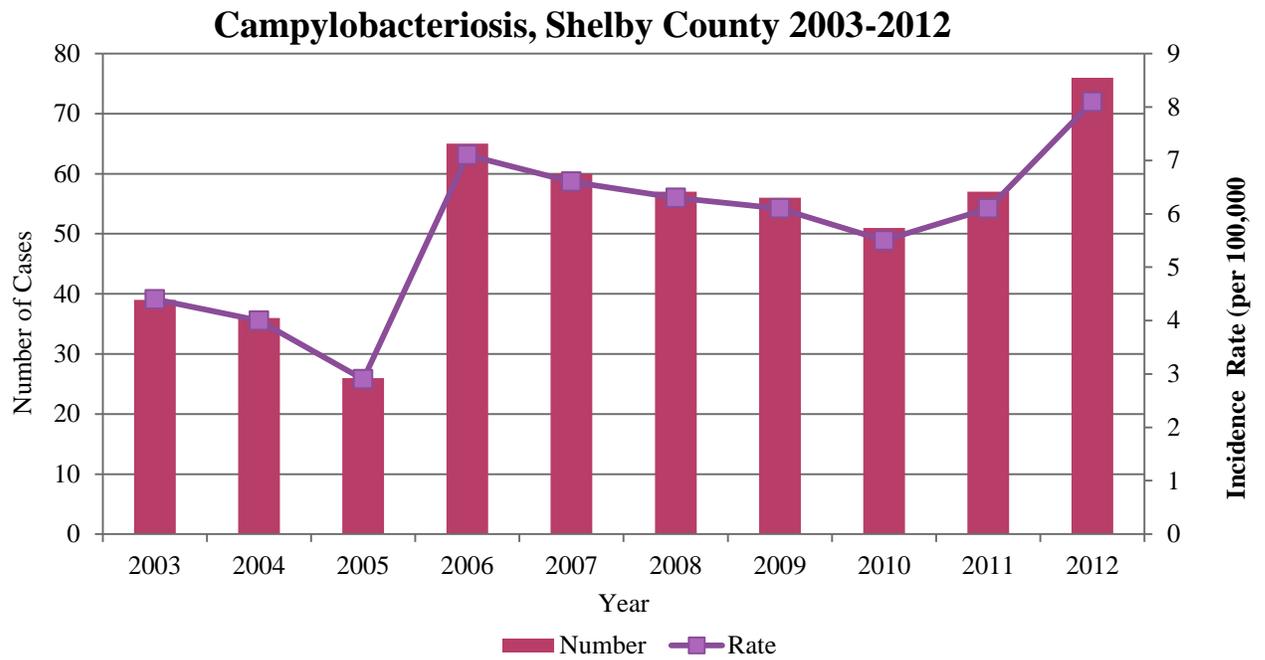
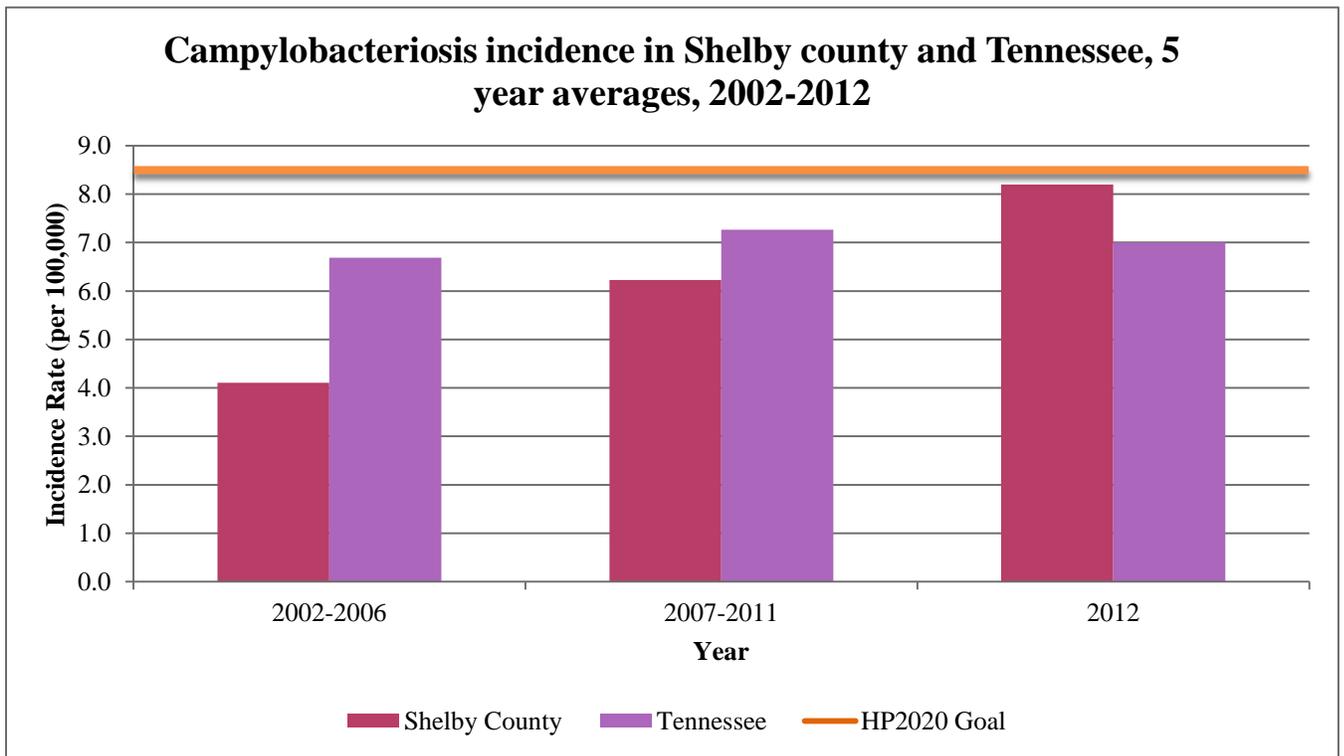


Figure 17



The incidence of campylobacteriosis in Tennessee as a whole on average is higher compared to the incidence in Shelby County for 2002-2006 and 2007-2011. In 2012, Shelby County reported a higher incidence of *Campylobacter* infections compared to Tennessee as a whole. As shown in Figure 17 the incidence of campylobacter has increased over the past years for both Shelby County and Tennessee. This increase could be a result of new, available, and quick testing methods. There is an increase in the use of culture independent methods as the sole method of isolating campylobacter from stools, which has in turn increased the number of reports and cases of campylobacter infections.

In regards to meeting the 2020 national health objective for the incidence of *Campylobacter*, which is 8.5 cases/100,000 population, both Shelby County and Tennessee appear to be meeting that goal for 2012.

Cryptosporidiosis

Summary of the disease

Cryptosporidiosis (Crypto) is an illness caused by the protozoan *Cryptosporidium parvum* and characterized by diarrhea, abdominal cramps, loss of appetite, low-grade fever, nausea and vomiting. It is possible that persons infected with the disease will not show any symptoms. The illness may be life threatening to those with compromised immune systems. Those most likely to be infected include children less than 2 years of age, animal handlers, international travelers, men who have sex with men (MSM) and anyone in close personal contact with someone who is infected. Outbreaks have occurred in day care centers and have been associated with drinking water, recreational use of water and consumption of contaminated beverages.

Cryptosporidiosis has become the most common waterborne disease in the United States over the past two decades. Cryptosporidiosis can be spread from person to person, animal to person, or through foodborne and waterborne transmission.

Table 13. Incidence of Cryptosporidiosis in Shelby County, 2012

Number of Confirmed Cases for 2012		1
2012 incidence rate per 100,000		0.1
Age (yrs)	Mean	*
	Median	*
	Min. - Max.	*

*Only one case reported

Highlights

In 2012, there was one case of cryptosporidiosis reported in Shelby County. There has been a steady and significant decline in the number of cases reported in Shelby County since 2008. There was an upward and downward pattern in cases of cryptosporidiosis from 2003 through 2008, but we have seen a steady decline since then. The highest number of cases reported occurred in 2008. Many of the cases reported in that year reported a common risk factor associated with the incidence of this disease, contact with recreational water.

Figure 18

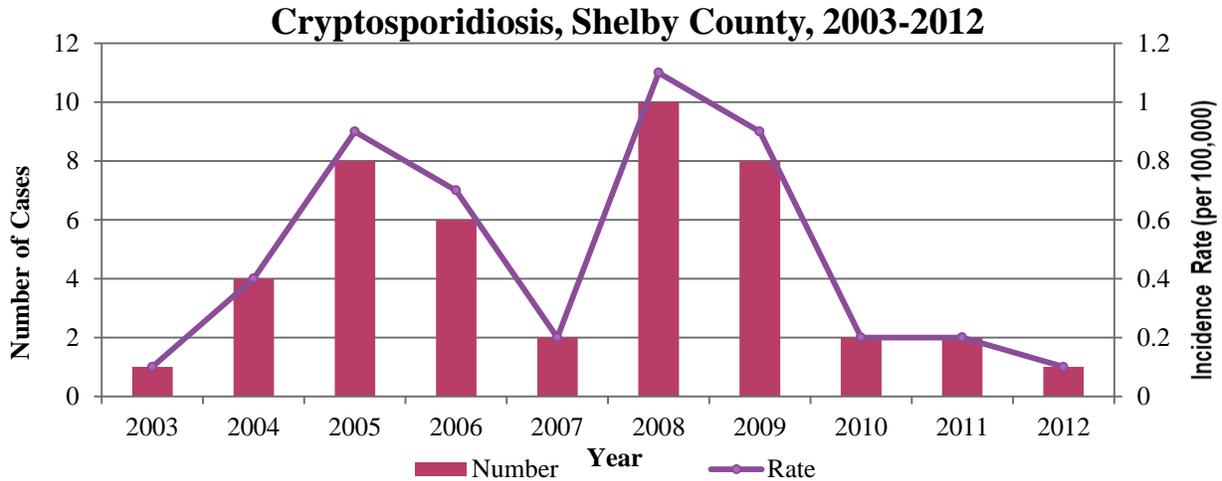
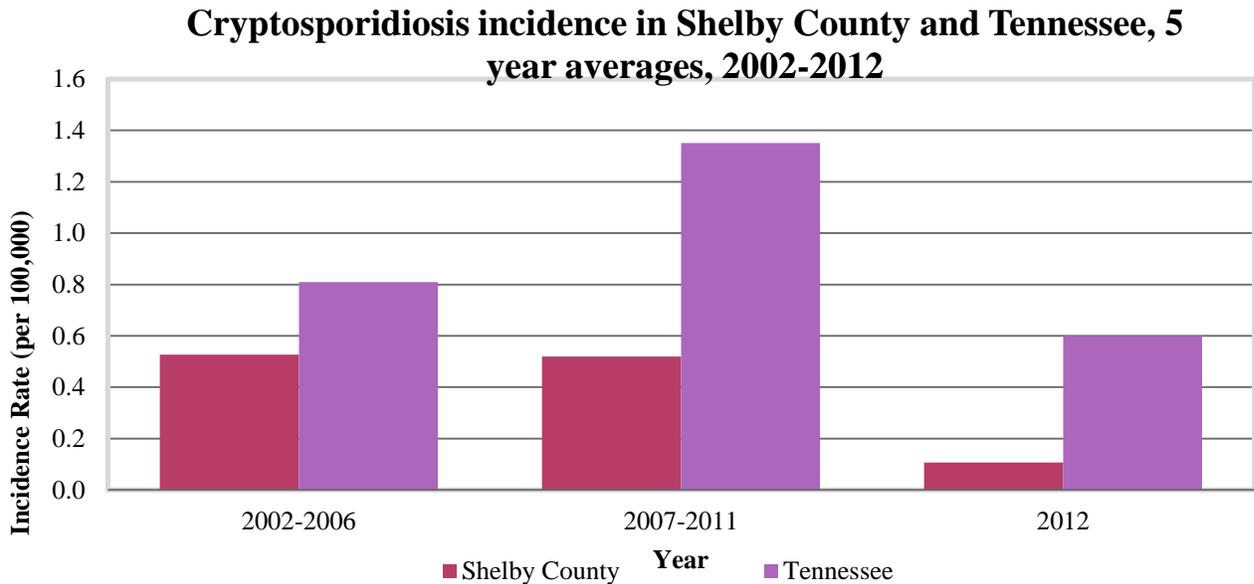


Figure 19



The burden of cryptosporidiosis has been insignificant in both Shelby County and Tennessee as whole over the years compared to other communicable diseases. On average, there is often less than one case of cryptosporidiosis per every 100,000

population in either Shelby County or the state. Between 2007 and 2011, the incidence rate for cryptosporidiosis was slightly greater than 1.4 in Tennessee, which means there was a nearly one and a half case of cryptosporidiosis reported for every 100,000 people in Tennessee overall.

Escherichia Coli, Shiga Toxin-Producing (STEC)

Summary of the disease

Shiga toxin-producing *Escherichia coli* (also known as STEC) is an infection characterized by diarrhea and abdominal cramps. Illness may become complicated by a condition called hemolytic uremic syndrome (HUS). Those infected by the organisms that cause STEC do not always show symptoms; and the organisms may cause extra-intestinal infections. There are many different serotypes of STEC, but there is one serotype (*E. coli* O157:H7) that is known to be cause of most outbreaks and most cases of HUS in the United States. The number of laboratory confirmed STEC infections have increased exponentially between 2008 and 2012 since all STEC infections (not just those caused by serotype O157:H7) became nationally notifiable in 2000.

The isolation of Shiga toxin-producing *Escherichia coli* from clinical specimens using an appropriate laboratory testing is required to determine the presence of STEC. To be considered as suspect case, a report of postdiarrheal HUS or thrombotic thrombocytopenic purpura (TTP) or demonstration of Shiga toxin in a specimen from a clinically compatible case without the isolation of the organism is required. A report is classified as a probable case if isolation of *E. coli* O157 from a clinical specimen, without confirmation of H antigen or Shiga toxin production is made, or a clinically compatible case that is epidemiologically linked to a confirmed or probable case or identification of an elevated antibody titer to a known Shiga toxin-producing *E. coli* serotype from a clinically compatible case.

Table 14. Incidence of Shiga toxin-Producing *E. coli* (STEC) Infection in Shelby County, 2012

Number of Confirmed Cases for 2012		6
2012 incidence rate per 100,000		0.6
Age (yrs)	Mean	11
	Median	7
	Min. - Max.	2-30years

Highlights

There were no confirmed cases of STEC between 2003 and 2005 in Shelby County. There was a significant jump in the reports of STEC from 2005 to 2006. As shown in Figure 20 below, the trend of STEC cases shows an upward and downward pattern since 2006 with the highest number of cases reported in 2007. Since that year, the number of cases of STEC has reduced considerably.

Figure 20

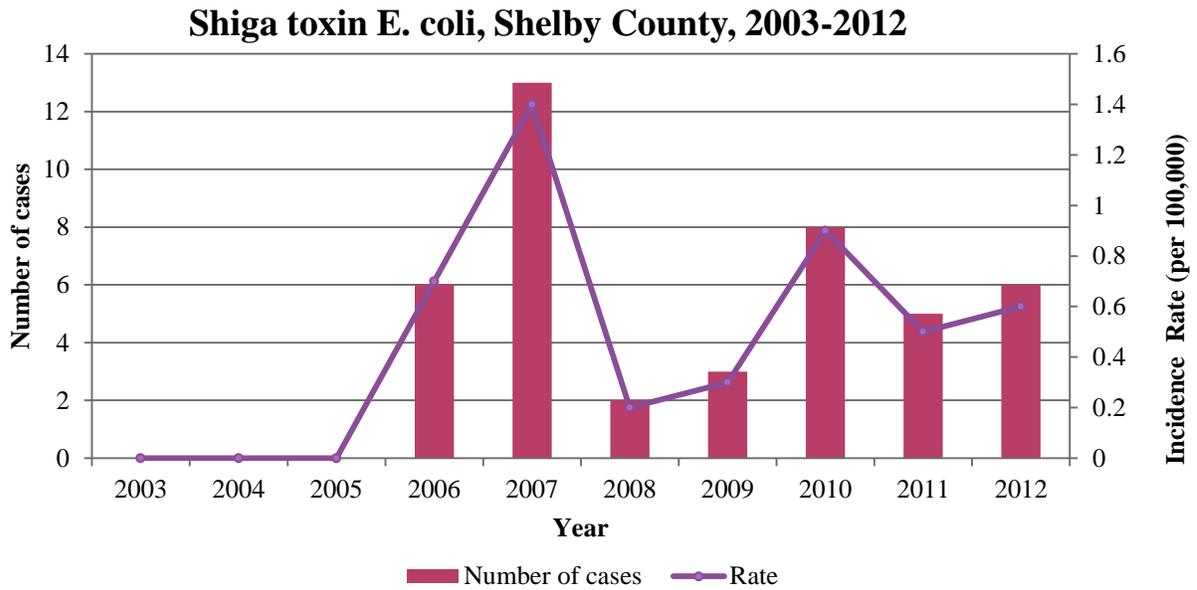
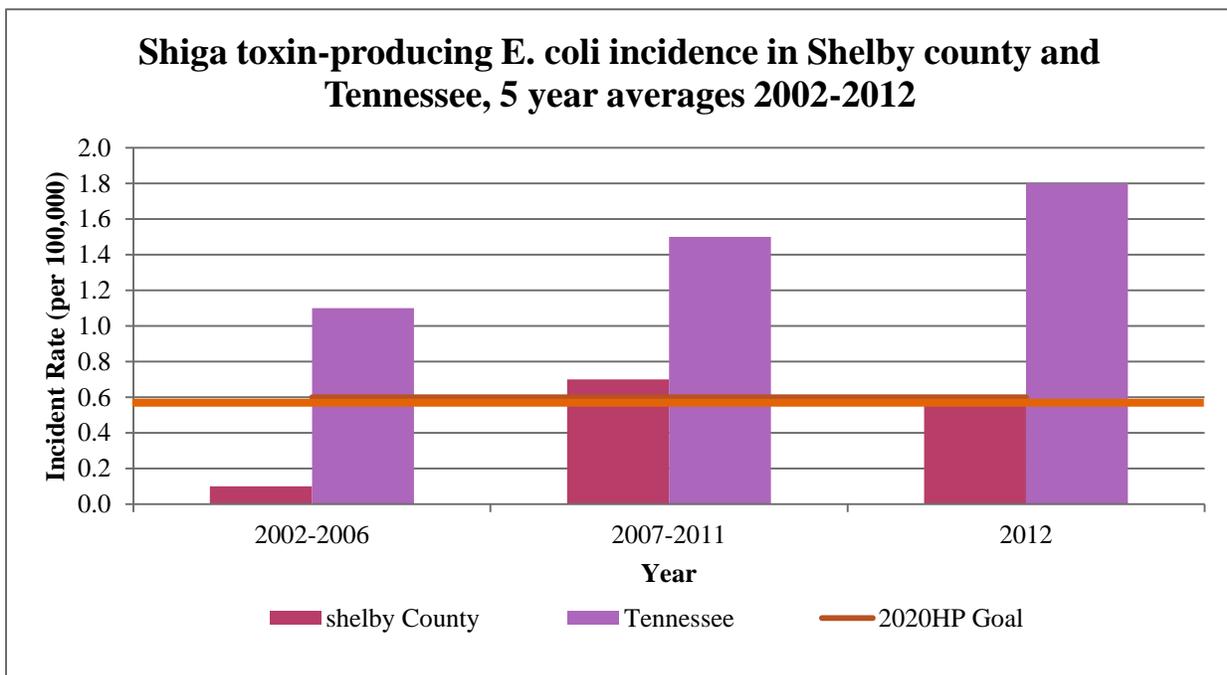


Figure 21



Incidence of STEC has been rising in both Shelby County and Tennessee since 2002 (Figure 21). However, the incidence rate of STEC is higher in Tennessee as a whole when compared to Shelby County.

The burden of STEC in Shelby County has been considerably lower than Tennessee over the years. On average, there is often less than one case of STEC per every 100,000 population in Shelby County compared to the average 1 to 2 cases per every 100,000 people in Tennessee. The 2010 national health objective for the incidence of STEC is 1.0 and according to the data, Shelby County has achieved that goal for all years up to 2012. The 2020 national health objective is targeting a much lower incidence of STEC, 0.3. As of 2012, Shelby County and Tennessee exceed the national 2020 target for the incidence of STEC.

Salmonellosis

Summary of the disease

The bacterium *Salmonella* causes an illness called Salmonellosis. *Salmonella* species come in many different types; the most common types in the United States are Typhimurium and Enteritidis. The symptoms of infection with the bacteria include diarrhea, fever and abdominal cramps. Those infected with *Salmonella* begin to feel sick within 12 to 72 hours of exposure to the bacteria and symptoms usually resolve without treatment within 4 to 7 days. Severe dehydration requiring hospitalization may develop in some cases.

Salmonella is usually transmitted through ingestion of contaminated food. This includes contaminated or undercooked beef, poultry, unpasteurized milk and raw or undercooked eggs, although fresh fruits and vegetables are increasingly recognized as vehicles associated with transmission in outbreaks.

Table 15. Incidence of Salmonellosis in Shelby County, 2012

Number of Confirmed Cases for 2012		179
2012 incidence rate per 100,000		19.0
Age (yrs)	Mean	28
	Median	15
	Min. - Max.	1month-87years

Highlights

Salmonellosis is one of the most commonly reported bacterial infections in Shelby County over the past 10 years. The bacteria infection affects people of all ages as is represented in the above age data. The youngest case of salmonellosis in 2012 was reported among a one month old child; the oldest case was 87 years old. There were 19 cases per every 100,000 people in Shelby County for 2012. The trend of salmonellosis cases in Shelby County over the past 10 years shows an upward and downward pattern. The highest number of cases in the 10 year period was reported in 2010 (214 cases) and lowest number of cases was reported in 2004 (105 cases). The number of salmonella cases reported in Shelby County has decreased since 2010.

Figure 22

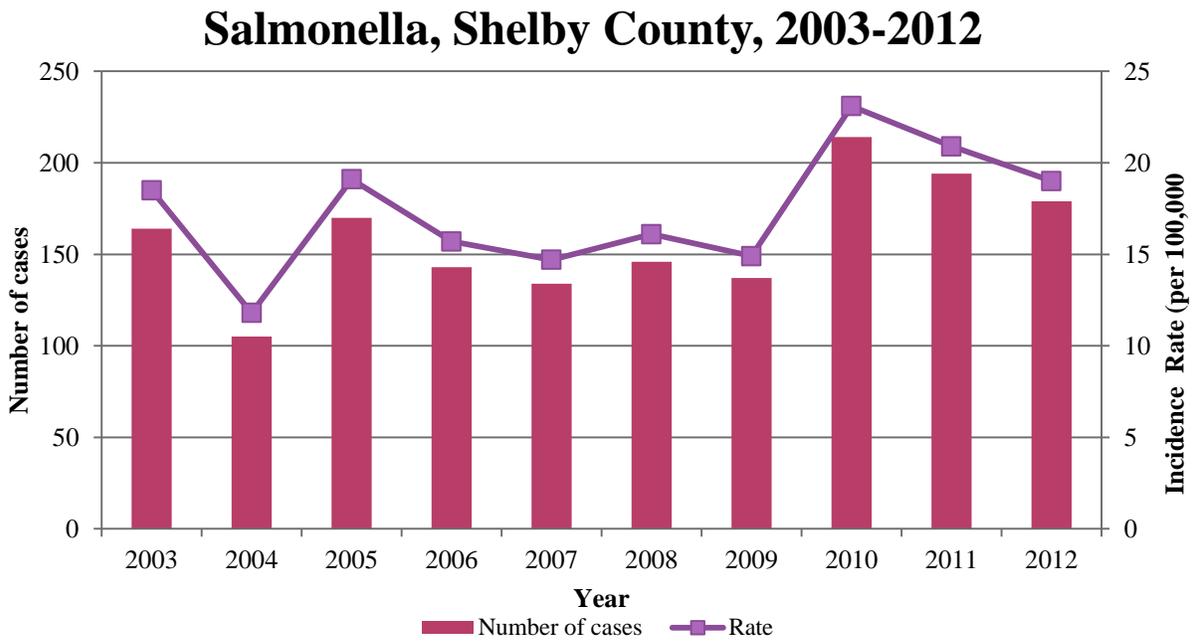
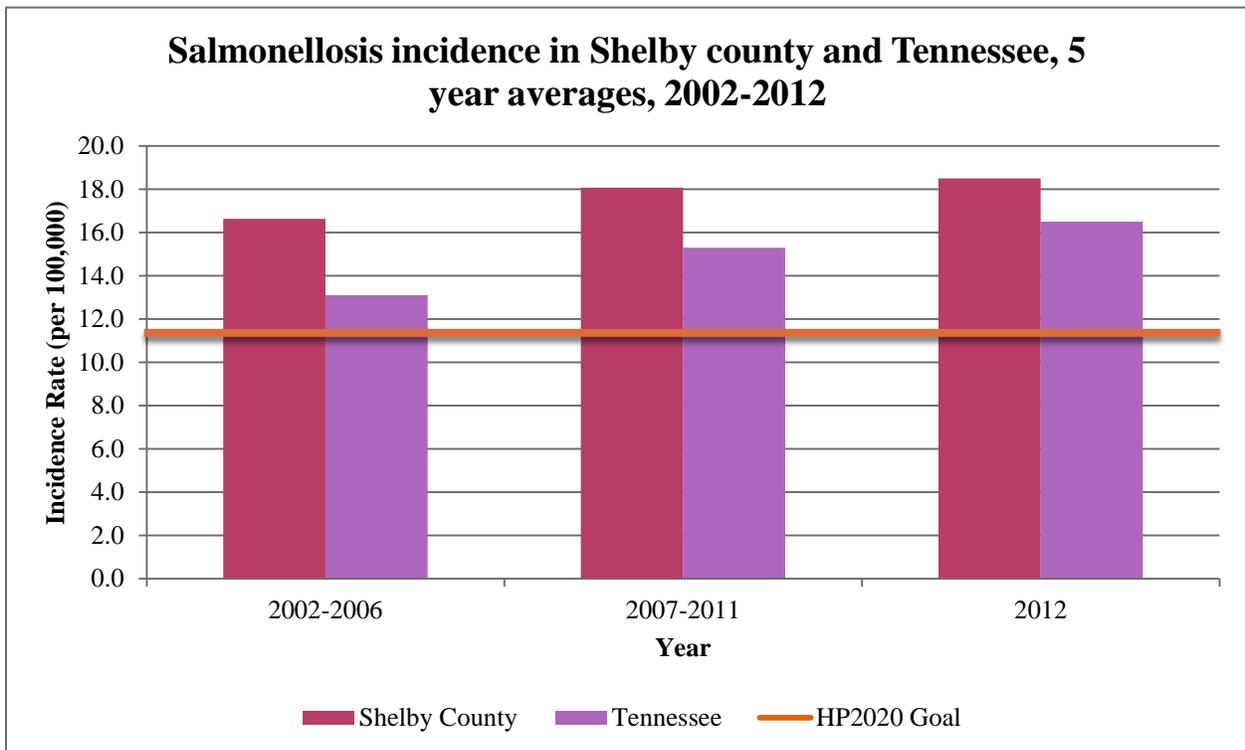
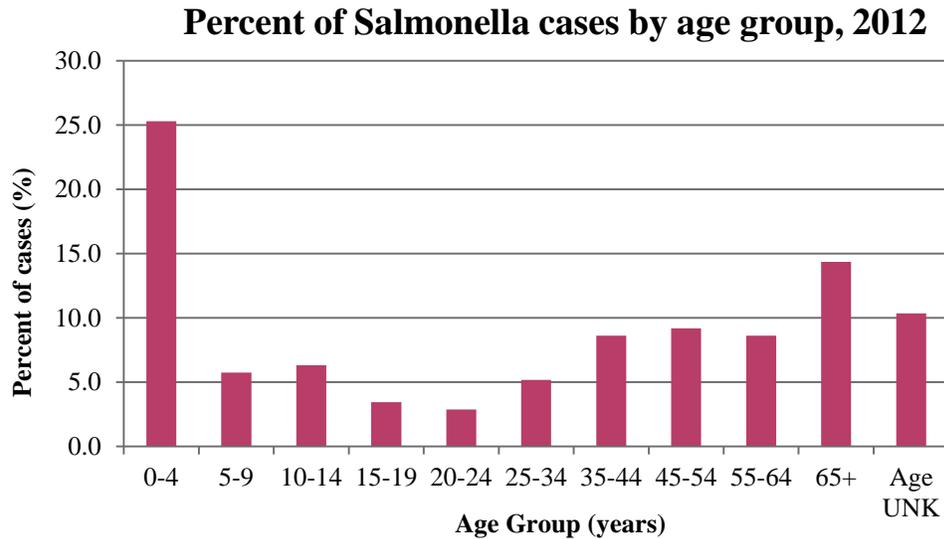


Figure 23



On average, the incidence rate of salmonellosis has been higher in Shelby County compared with Tennessee since 2002. The trend of salmonellosis incidence over the past 10 years shows an upward pattern for both Shelby County and Tennessee. As of 2012, neither Shelby County nor Tennessee as whole had achieved the 2020 national health objective for the incidence of salmonellosis per year, which is 11.4 cases per every 100,000 population.

Figure 24



About a quarter of the salmonellosis infections reported for 2012 in Shelby County for 2012 were reported among children under the age of 5 years old. As reported by the Centers for Disease Control and Prevention, children are the most likely to be infected by with *Salmonella* species. The rate of diagnosed infections in children between the ages of 0 and 4 years old is about five times higher than the rate in all other age groups. Severe cases of salmonellosis are usually reported among young children, the elderly and immune-compromised people.

Shigellosis

Summary of the disease

Shigellosis is an infectious disease caused by bacteria from *Shigella* species. Symptoms of infection with this bacterium include diarrhea (often bloody diarrhea), fever and stomach cramps beginning a day or two after exposure. The illness usually resolves without treatment in 5 to 7 days. Young children and older adults may develop severe diarrhea requiring hospitalization. In children under 2 years of age, *Shigella* infection can cause high fever leading to seizures. Some infected individuals do not show symptoms but can still spread the disease to others.

Shigellosis can be passed from one person to the next. The bacteria are present in the stool of infected persons while they are sick and for up to two weeks after symptoms resolve. It is common among children who are not fully toilet trained and among family members and playmates of these children. Infection may be acquired from eating contaminated foods or by drinking or swimming in contaminated water. There have been several reports of isolated cases and outbreaks of shigellosis among men who have sex with men. In order to control and prevent cases of shigella, health education and promotion of vigorous hand/toilet hygiene practices are necessary.

Table 16. Incidence of Shigellosis in Shelby County, 2012

Number of Confirmed Cases for 2012	97
2012 incidence rate per 100,000	10.3
Age (yrs)	
Mean	12
Median	5
Min. - Max.	1 month-82years

Highlights

Shigellosis, like salmonellosis is a commonly reported bacterial infection in Shelby County and has one of the higher rates of incidence of all the enteric diseases. Like salmonellosis, the trend of shigellosis cases in Shelby County over the past 10 years shows an upward and downward pattern. There was a significant decrease in cases reported in 2004 and 2005 compared to the previous year of 2003. The number of cases increased significantly again in 2006 and decreased yet again 2007. This pattern of decrease and increase in Shigellosis cases continued for the next couple years. In 2010, the number of Shigellosis cases increased from the previous year's number of cases. The number of cases of shigellosis has declined steadily since 2010.

Figure 25

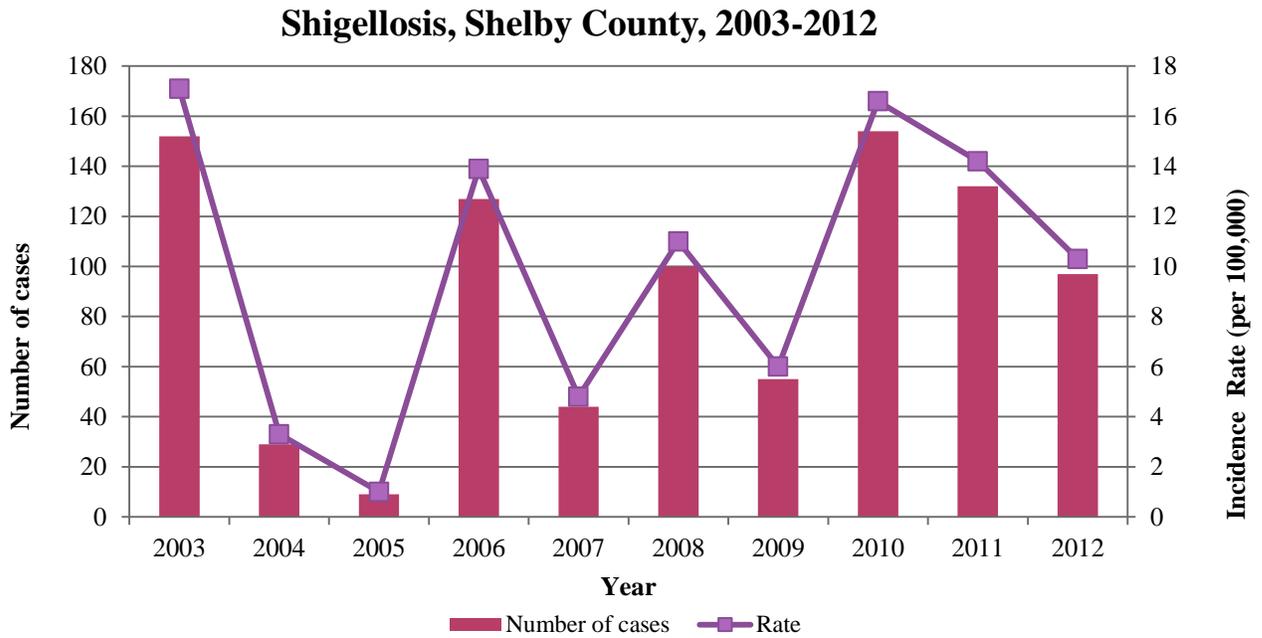
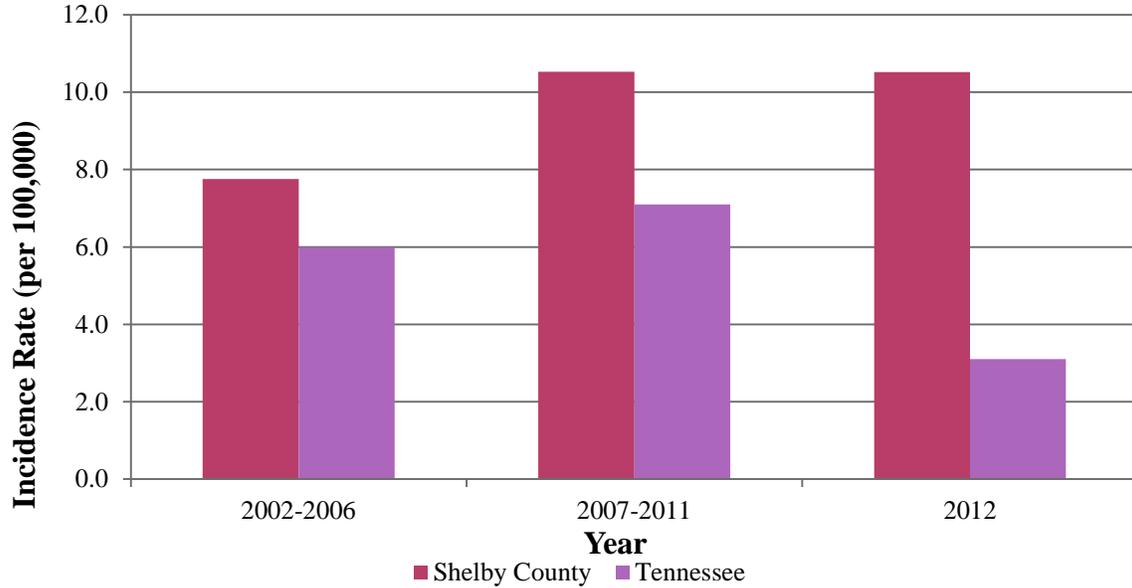


Figure 26

Shigellosis incidence in Shelby County and Tennessee, 5 year averages, 2002-2012

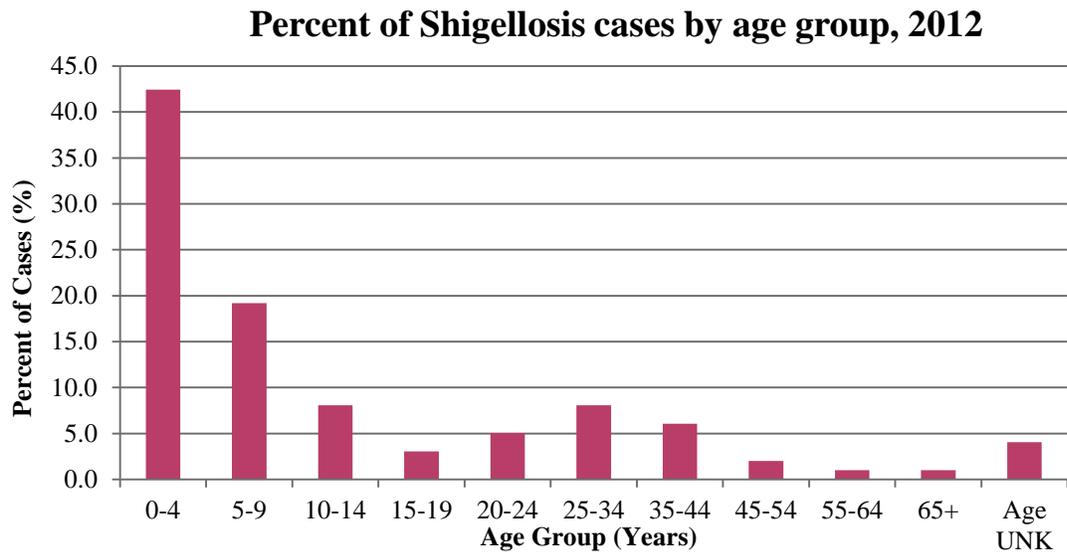


On average, for 2002 through 2011, the incidence of shigellosis in Shelby County has been higher compared to incidence of shigellosis in Tennessee. There was an increase in the incidence rate for the averaged years of 2002-2006 and 2007-2011 in Shelby County, however, the incidence rate remained about same the following year in 2012. In Tennessee, the incidence rate for the averaged years of 2002-2006 and 2007-2011 increased slightly and then decreased considerably in 2012.

There are no national health objectives for the *Shigella* pathogen.

Again, children under the age of 5 years are often more likely to be affected by this infection compared to other age groups. In the figure below, over 40% of the shigellosis cases in Shelby County for 2012 were among children between the ages of 0 and 4 years. Not only is shigellosis widespread among children, it is known to be widespread in families with small children also. Many of shigellosis cases are related to the spread of illness in child-care settings.

Figure 27



RESPIRATORY DISEASES 5|FIVE

Respiratory Diseases

The respiratory diseases reported in Shelby County include the novel influenza A or the pandemic strain of H1N1 in 2009, influenza associated pediatric deaths and Legionellosis (Legionnaire's Disease). Influenza associated pediatric deaths are also reportable; fortunately there were no influenza associated pediatric deaths or novel influenza virus cases reported in 2012.

Table 17. Incidence of Respiratory Diseases in Shelby County, 2012

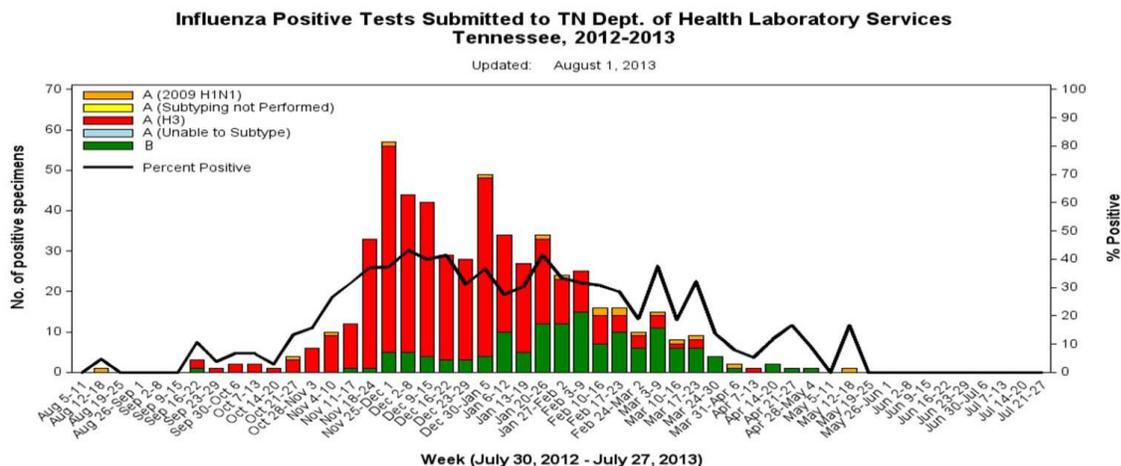
Reportable Disease	Case Status				
	Confirmed case	Not a case	Probable case	Suspect case	Total
Novel Influenza A					
Influenza Associated Pediatric Deaths					
Legionellosis	12	1	0	0	13
Total					

Influenza 2012-2013 Season Highlights

Influenza is an acute viral disease caused by multiple strains of respiratory viruses, primarily characterized by fever, body aches, sore throat and a cough. Although influenza infections are not routinely reportable they do contribute significantly to disease morbidity and mortality, particularly for infants, elderly persons and those with compromised immune systems. Annual vaccinations can protect people from infection or reduce symptoms for those who get infected.

Influenza season in Tennessee began in mid-September 2012 and continued until early May 2013, with the peak months of disease transmission and intensity of reported cases occurring from November 25, 2012-January 5, 2013. The predominant virus circulating was Influenza A (H3), although Influenza B viruses were also circulating and a few cases were diagnosed with infection of the Influenza A 2009 H1N1 pandemic strain. The annual epidemic in Tennessee mirrored what was being reported nationally.

Figure 28



Legionellosis

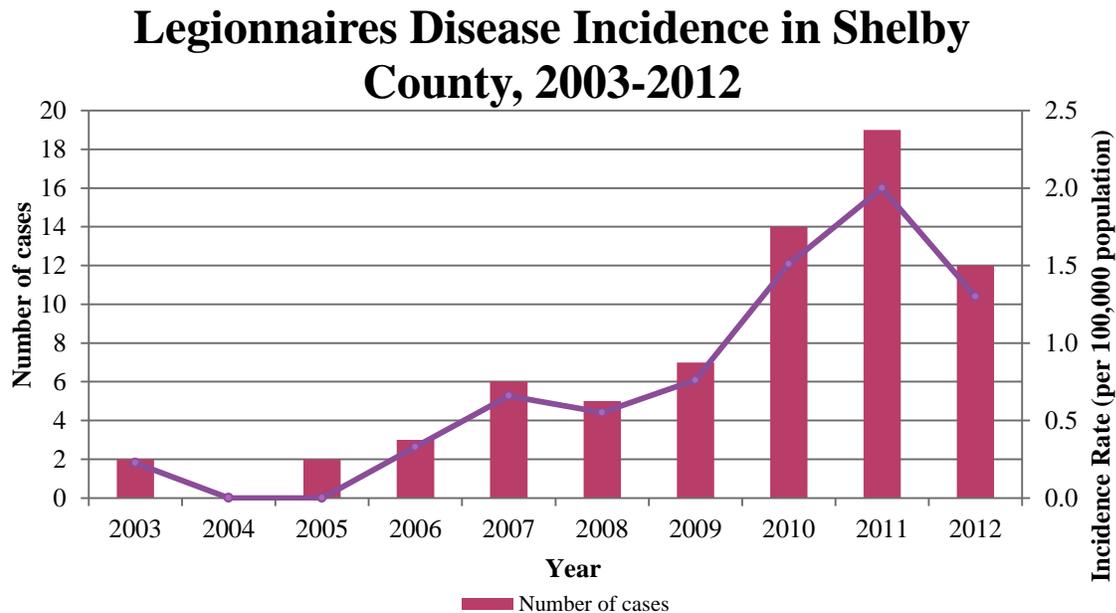
Summary of Disease

Legionellosis is a respiratory disease caused by strains of bacteria from the *Legionella* species. Many of these bacteria can cause illness but most cases of Legionellosis are caused by *Legionella pneumophila* serotypes 1-6. *Legionella* species are bacteria that live primarily in warm moist environments including soil and warm water that is 75-125 ° F in temperature. Symptoms of Legionellosis include cough, fever, fatigue, difficulty breathing and pneumonia. Most cases of Legionellosis are sporadic cases that cannot be associated with a particular source or exposure but outbreaks have been associated with decorative fountains, air conditioning systems, hot tubs and hot water systems in hotels or hospitals. People with a history of smoking or other conditions and exposures that damage the lungs and people older than 55 years old are at increased risk to become infected and develop the disease.

Table 18. Incidence of Legionellosis in Shelby County, 2012

Number of Confirmed Cases for 2012	12
2012 incidence rate per 100,000	1.3
% change from average 5-year (2002-2011)	
Age (yrs)	
Mean	55
Median	52
Min. - Max.	29-79

Figure 29



VECTOR-BORNE DISEASES 6|SIX

Vector-borne Diseases

The vector-borne diseases reported in Shelby County in 2012 include the following: Lyme Disease, Malaria, Rocky Mountain Spotted Fever (RMSF), West Nile Virus. In 2012, there were 58 cases of vector-borne diseases reported in Shelby County (Figure 1). Vector-borne diseases accounted for 0.05% of all reportable diseases (58/1177) in Shelby County for 2012. Shelby County's vector-borne disease incidence rate of 41.75 cases per 100,000 population was lower than the overall statewide incidence rate of 62.7 cases per 100,000 population for 2012.

Confirmed and probable cases accounted for 56.9% (33/58 cases) of vector-borne diseases for 2012 (Figure 1). The most clinically significant vector-borne disease in Shelby County which focuses the most attention and prevention efforts is West Nile Virus. In 2012, there were 15 total cases of West Nile Virus in Shelby County. 8 of these cases were confirmed cases and 7 were probable cases.

Rocky Mountain Spotted Fever (Spotted Fever Rickettsiosis) was the most commonly reported vector-borne diseases with 22 cases (16 probable and 6 suspect).

Lyme disease had the second largest number of cases with 19 total suspect cases. There were no confirmed or probable Lyme disease cases for 2012.

There were two cases of Vector-borne diseases in Shelby County that are not endemic to the region and were acquired as a result of international travel. The first was a confirmed case of Malaria and the second was a probable case of Dengue fever.

Malaria is caused by a parasite that infects the Anopheles mosquito, which feeds on humans. Malaria can be a very serious and sometimes fatal disease. The symptoms of malaria usually include fever and a flu-like illness, including chills, headache, muscle aches, tiredness and occasionally nausea, vomiting, and diarrhea. Most people begin to feel sick 10 days to 4 weeks after infection although some people may feel ill as early as 7 days or as late as 1 year later. Malaria is not spread from person to person, only through the bite of an infected mosquito. Malaria can be treated. Prompt and effective treatment of all cases is essential to reduce the risk of severe disease and prevent death. Any traveler outside of the United States, Canada and Western Europe may be at risk for malaria. Large areas of Central and South America, Africa, South and Southeast Asia, the Middle East and Oceania are considered malaria-risk areas. The CDC provides information about precautions that travelers should take if visiting an area with a malaria risk. A healthcare provider can decide on the best antimalarial drugs depending on a traveler's plans, medical history, age, drug allergies and other health factors. Travelers should visit a healthcare provider at least 4 to 6 weeks prior to traveling to allow time for the medication to become effective.

Dengue is caused by any of the four closely related flaviviruses named Dengue 1, 2, 3, and 4. Infection with one virus does not protect you from infection with the others viruses. Sequential infections increase the risk for dengue hemorrhagic fever and dengue shock syndrome. In the majority of cases, dengue is transmitted through mosquito bites from the vectors, *Aedes aegypti* and *Aedes albopictus*. Dengue is normally transmitted through mosquito bites; therefore, it cannot be spread by casual contact between persons. There is no treatment available for dengue. Supportive therapy is recommended. There are no vaccines available to prevent infection. The best prevention measures are those taken in avoiding mosquito bites if you live in or are traveling to an endemic area.

Table 19. Incidence of Vector-Borne Diseases in Shelby County, 2012

Reportable Disease	Case Status				Total Investigated
	Confirmed case	Probable Case	Suspect case	Not a case	
Dengue Fever	0	1	0	1	2
Lyme Disease	0	0	19	32	51
Malaria	1	0	0	0	1
Spotted Fever Rickettsiosis	0	16	6	50	72
*West Nile Virus	8	7	0	0	15
Total	9	96	24	25	154

*West Nile Virus cases include neuroinvasive and non-neuroinvasive cases

Lyme Disease

Summary of Disease

Lyme disease is caused by a bacterium called *Borrelia burgdorferi*. This bacterium is transmitted to humans by the bite of an infected blacklegged tick. White-tailed deer ticks (*Ixodes Scapularis*) are the most likely type of tick that transmits Lyme disease in the eastern U.S.

In approximately 80% of those with Lyme disease, the first symptom is a characteristic “bull’s-eye” rash called erythema migrans. This rash usually develops 3 to 32 days after infection. Other early symptoms of Lyme disease include fever, headache, fatigue, malaise, stiff neck, muscle pain, joint pain, or swollen lymph nodes. These symptoms may last several weeks if untreated. Neurological symptoms such as aseptic meningitis and cranial neuritis may develop within weeks or months after the rash develops. Cardiac abnormalities may occur within weeks after rash onset. Weeks to years after illness onset, intermittent episodes of swelling and pain in large joints may develop and recur for several years, ultimately leading to chronic arthritis. Infection with Lyme disease usually occurs in summer, peaking in June and July. Prevention measures include insect repellent, avoiding areas with lots of ticks, checking your skin and clothes for ticks every day, removing the ticks promptly, and landscaping and integrating pest management. Patients with Lyme Disease are not infectious. There is no evidence that Lyme disease can be transmitted from air, food, water, sexual contact, insects such as mosquitoes, flies, or directly from wild or domestic animals.

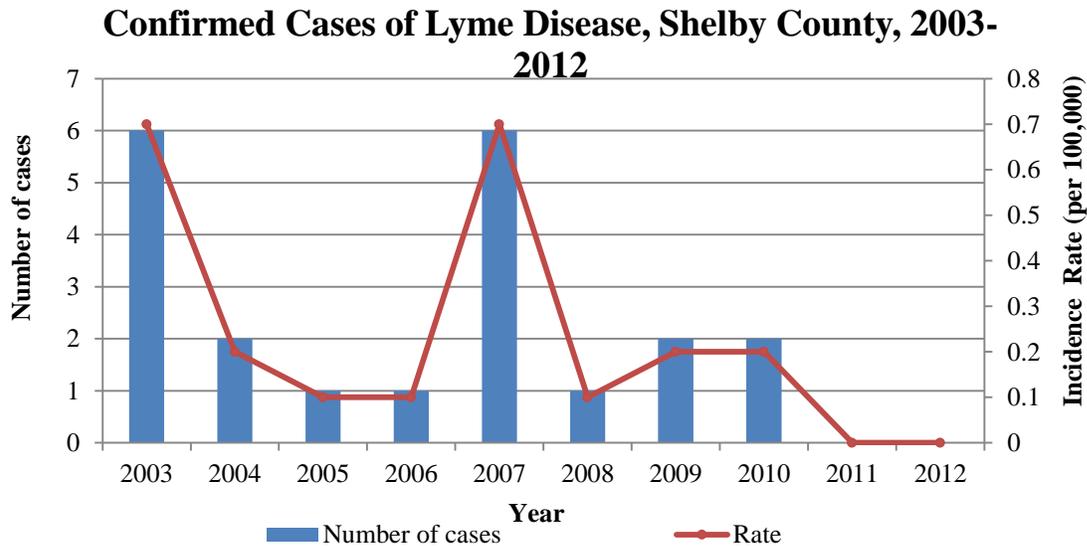
Treatment normally includes oral antibiotics administered over a few weeks. Doxycycline, amoxicillin, or cefuroxime are the most common antibiotics prescribed. If patients have some neurological or cardiac forms of the illness they may take ceftriaxone or penicillin intravenously. If the patient was diagnosed at a later stage of the disease and the symptoms continue to reoccur, they may need a second four week course of therapy.

There were no confirmed or probable cases of Lyme disease in Shelby County in 2012. There were 19 cases that were suspected to have an exposure, typically while traveling to areas of the country where Lyme disease is endemic. This is an increase from the 5 confirmed/probable cases in 2011 and 3 confirmed/probable cases in 2010.

Table 20. Incidence of Lyme Disease in Shelby County, 2012

Number of Suspect Cases for 2012	19
2012 incidence rate per 100,000	2.0
Age (yrs)	
Mean	41
Median	43
Min. - Max.	15-63

Figure 30



Rocky Mountain Spotted Fever (RMSF)

Summary of Disease

Rocky Mountain Spotted Fever, also known as Spotted Fever Rickettsiosis, is a tickborne illness caused by *Rickettsia rickettsii*, a bacterial pathogen transmitted to humans through contact with ticks.

Illness is characterized by acute onset of fever, and may be accompanied by headache, malaise, myalgia, nausea/vomiting, or neurologic signs; a macular or maculopapular rash appears 4-7 days following onset in many (~80%) patients, often present on the palms and soles. RMSF may be fatal in as many as 20% of untreated cases, and severe, fulminant disease can occur.

Rickettsia rickettsii can be transmitted to humans by ticks of the genera *Dermacentor*, *Amblyomma*, *Rhipicephalus*, and *Haemaphysalis*. The American dog tick (*Dermacentor variabilis*) and Rocky Mountain wood tick (*Dermacentor andersoni*) are the primary vectors and can live on small mammals, dogs, rabbits, and birds as hosts. Like other large mammals, humans are dead-end hosts. Transmission of the disease to humans typically requires that the tick be attached for at least 24-36 hours. Humans do not transmit the disease to other humans

RMSF is typically treated with an antibiotic in the tetracycline family such as doxycycline. Patients are treated for at least 3 days after the fever subsides. Standard duration of treatment is 5–10 days.

Because ticks transmit RMSF, limiting exposure to tick habitats is the best way to prevent the disease. Personal protection in tick habitats is also effective. Prompt removal of crawling or attached ticks is an important method of preventing disease.

To remove an attached tick:

1. Grasp the tick near the mouthparts with fine-tipped tweezers.
2. Remove gently to avoid leaving mouthparts embedded in skin.
3. Disinfect the bite site and wash hands with soap and water

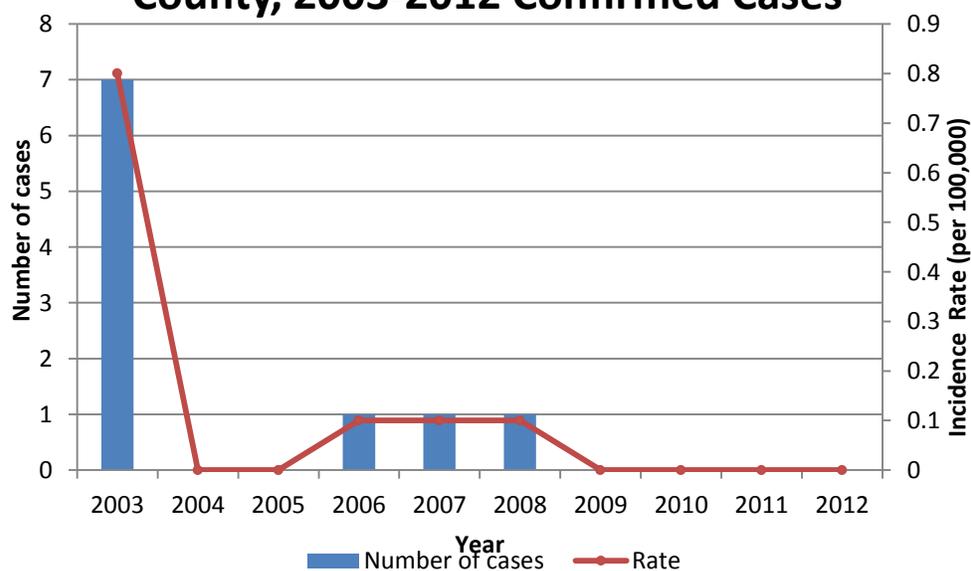
Although there were no confirmed cases of Rocky Mountain Spotted Fever in Shelby County in 2012, there were 16 probable cases and 6 cases that were suspected to have an exposure. In this instance, we will report on those cases.

Table 21. Incidence of Rocky Mountain Spotted Fever in Shelby County, 2012

Number of Probable/Suspect Cases for 2012		22
2012 incidence rate per 100,000		2.3
Age (yrs)		
	Mean	47
	Median	47
	Min. - Max.	3-65

Figure 31

Spotted Fever Rickettsiosis, Shelby County, 2003-2012 Confirmed Cases



West Nile Virus

Summary of Disease

West Nile Virus (WNV) is a potentially serious illness that is transmitted by mosquitoes. Mosquitoes become infected when they feed on infected birds. Infected mosquitoes can then transmit the virus to humans and animals while biting to take a blood meal. The virus may be injected into the animal or human while the mosquito is feeding, possibly causing illness. Although extremely rare, WNV also has been spread through blood transfusions, organ transplants, breastfeeding, and from mother to baby during pregnancy.

WNV does not cause any symptoms in approximately 80% of those infected. Of the 20% that develop symptoms, illness can include fever, headache, body aches, nausea, vomiting and sometimes swollen lymph nodes or a skin rash on the chest. These symptoms may last as short as a few days and long as several weeks. Less than 1% of persons infected with WNV will develop severe illness. Severe symptoms may include high fever, headache, neck stiffness, stupor, disorientation, coma, tremors, convulsions, muscle weakness, vision loss, numbness and paralysis. These symptoms may last several weeks and neurological symptoms could be permanent.

People who do become ill usually develop symptoms between 3 and 14 days after being bitten by an infected mosquito. There is no specific treatment for WNV infection. In milder cases, symptoms usually pass without treatment, although illness may last weeks to months. In more severe cases, people usually need to go to the hospital to receive supportive care such as intravenous fluids, help with breathing and nursing care.

Everyone living in an area where WNV has been identified among the mosquito population is at risk for infection. People over 50 years of age have the highest risk of severe disease. The best way to avoid WNV infection is to prevent mosquito bites. When outdoors, use insect repellants containing DEET, picaridin, oil of lemon eucalyptus, PMD, or IR3535. Take extra precaution to use repellant and protective clothing during evening and early morning hours, or consider avoiding outdoor activities at these times. Reduce the number of mosquitoes in outdoor areas by draining sources of standing water such as flowerpots, buckets and barrels.

Highlights

West Nile Virus was first detected in the bird population of Shelby County, Tennessee late in the season of 2001. The first human case occurred in September 2002, and there have been a total of 138 cases of WNV and 11 deaths through 2012. In 2012, there were 15 WNV cases and no fatalities in Shelby County. The majority of human cases of West Nile Virus within the state of Tennessee since 2002 have occurred in Shelby County.



Table 22. Human Cases of West Nile Virus and Deaths, Shelby County and State of Tennessee, 2002-2012

Year	Total Number of cases in Tennessee	Total Number of cases in Shelby County	Shelby County Fatalities
2002	56	40	7
2003	26	10	0
2004	14	12	0
2005	18	13	0
2006	22	14	0
2007	11	5	0
2008	19	10	1
2009	9	5	1
2010	4	2	0
2011	18	12	2
2012	33	15	0
TOTAL	230	138	11

Case counts include both confirmed and probable cases as determined by the case definitions established by the Centers for Disease Control and Protection⁸

The 2012 season had a similar level of activity for West Nile Virus in Shelby County compared to the previous season. For the entire season, there were a total of 15 cases (See Table 2) that were determined by the most recent standard criteria⁸ set forth by the Centers for Disease Control and Prevention (CDC) (See Appendix A for CDC criteria). Of these 15 cases, eight were confirmed and seven were probable. None of the 2012 human cases were fatal. In 2011, there were 12 total human cases with 2 fatalities.

Table 23. Human Cases of West Nile Virus by Sex, Age, Race, Month of Onset, and Clinical Status, Shelby County, TN, 2012

Profile of Human WNV Cases, 2012	
	Number of Cases*
Total Number of Cases	15
Sex	
Male	9
Female	6
Age	
Less than age 50	6
Greater than age 50	9
Race	
Black	6
White/Hispanic	9
Month of Onset	
August	6
September	6
October	2
December	1
Clinical Status	
Neuroinvasive	7
Non-neuroinvasive	8

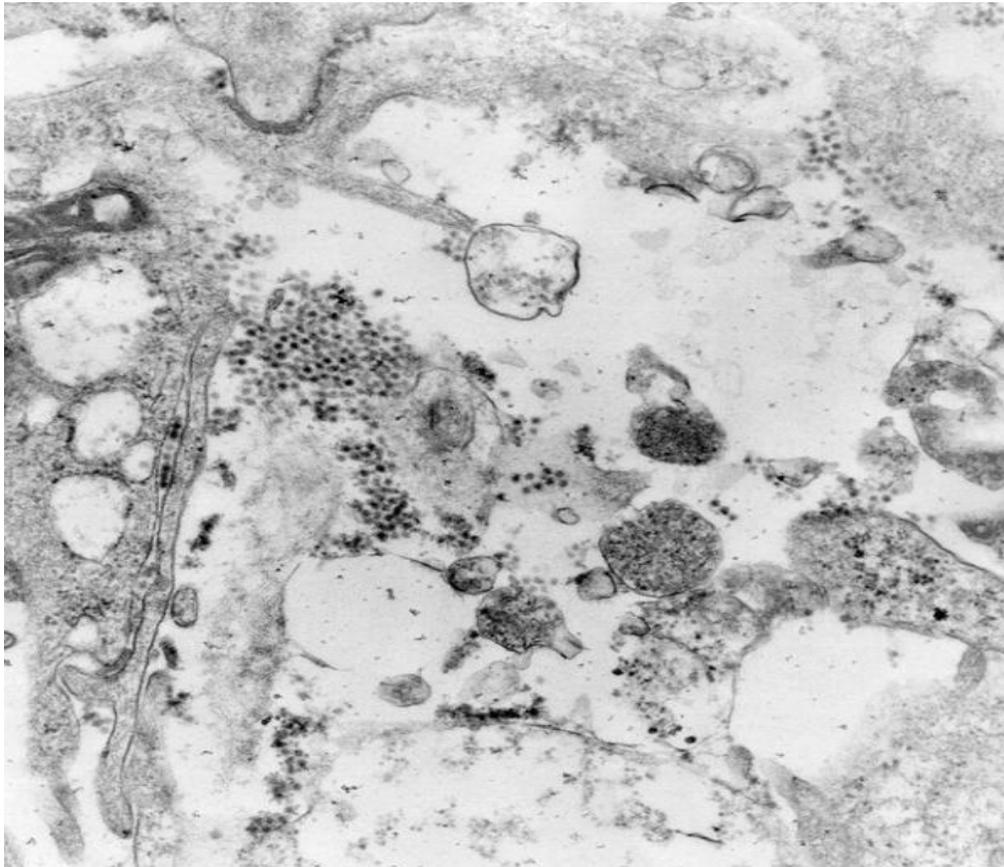
*Case counts include both confirmed and probable cases as determined the case definitions established by the Centers for Disease Control and Protection⁸

Table 24. Incidence of West Nile Virus in Shelby County, 2012

Number of Probable/Confirmed Cases for 2012		15
2012 incidence rate per 100,000		1.6
Age (yrs)	Mean	51
	Median	54
	Min. - Max.	25-71

† Number of cases includes probable cases

For additional information, please refer to the 2012 Shelby County West Nile Virus Report at <http://www.shelbycountyttn.gov/index.aspx?NID=2404>



CHEMICAL/TOXIN POISONING 7|SEVEN

Carbon Monoxide Poisoning

Summary

Carbon monoxide (CO) is an odorless, colorless, and poisonous gas. CO poisoning occurs when unsafe amounts of CO gas is inhaled. Certain groups that are more easily affected by carbon monoxide poisoning include unborn babies, infants, children, pregnant women, people with chronic health conditions and smokers. Males are more likely to die from CO poisoning than females, which is attributed to high-risk behaviors such as working in enclosed spaces with combustion-engine-driven tools. The CO poisoning death rate is highest among persons ≥ 65 years of age. CO poisoning often causes dizziness, headache, nausea, and shortness of breath. CO poisoning can cause death within minutes inside enclosed, semi-enclosed, or poorly ventilated areas. About 50% of all carbon monoxide poisonings occur inside the home, 40% are automobile-related, and 10% occur at work. It is produced by incomplete combustion of fuel. Operating or burning the following may produce CO:

- Gas furnaces and water heaters
- Cars, trucks, boats, and other vehicles
- Small gasoline-powered equipment like generators, weed trimmers, and chain saws
- Gas stoves, cooktops, and ovens
- Gas lanterns
- Wood and gas fireplaces
- Charcoal and wood stoves
- Any heating system or appliance that burns gas, oil, wood, gasoline, propane, or kerosene

A thorough medical history may provide clues that a patient has CO poisoning. Providers should ask specifically about home appliances used for heating, cooking and electrical generation and whether there has been any recent work to home heating or hot water systems. People who live or work together and present with similar, nonspecific symptoms increase the index of suspicion. Common symptoms of CO exposure include headache, dizziness, flushing, fatigue, nausea, vomiting, weakness and confusion.

Highlights

Carbon Monoxide poisoning has only recently been listed as a reportable disease in the state of Tennessee. No human case data is yet available specifically for Shelby County.

Lead Poisoning

Summary

Lead affects the central nervous system and can interfere with the production of hemoglobin (which is needed to carry oxygen to cells) and with the body's ability to use calcium. The most common symptom of acute lead poisoning is colicky abdominal pain evolving over days to weeks. Constipation, diarrhea, and nonspecific complaints of irritability, fatigue, weakness and muscle pain may also occur. Lifelong effects, such as lowered IQ, learning disabilities and behavioral problems can result from lead exposure. At very high levels, seizures, coma, and even death have also been reported.

Routes of exposure to lead include contaminated air, water, soil, food, and consumer products. Occupational exposure is a common cause of lead poisoning in adults. One of the largest threats to children is lead paint that exists in many homes, especially older ones; thus children in older housing with chipping paint are at greater risk. Over the long term, lead poisoning in children can lead to learning disabilities, behavior problems, and mental retardation. At very high levels, lead poisoning can cause seizures, coma, and even death. Lead is ingested or inhaled. The most common source of lead exposure is **inhalation** of lead containing dust.

A blood lead test is the **only** way to know if a child has been exposed to lead. There is no natural level of lead in the blood. The CDC defines lead poisoning as a blood lead level ≥ 5 $\mu\text{g/dL}$ from a venous specimen.

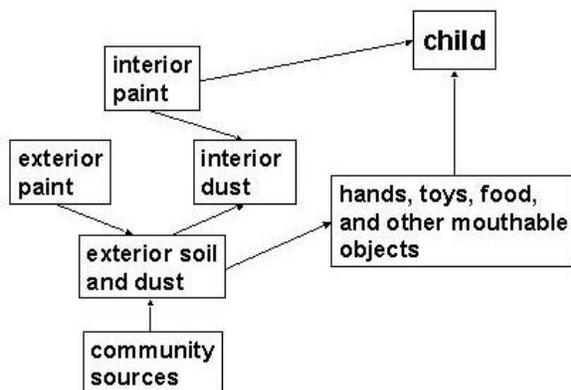
Highlights

Shelby County Childhood Lead Poisoning Prevention Program (CLPPP) conducts a variety of activities including screening children in high-risk areas at Head Start centers and local health fairs and identifying and providing case management of lead-poisoned children.

Table 25. CLPPP Childhood Lead Screenings 2003-2012

Year	Total Number of Initial BLL Screening Tests	Initial BLL > 10	Initial BLL 5 - 9
2012	18,246	66	721
2011	21,017	178	831
2010	18,344	127	946
2009	17,780	101	1,347
2008	18,497	101	1,999
2007	16,244	100	1,415
2006	15,139	134	1,124
2005	16,091	174	1,961
2004	16,486	254	2,762
2003	12,722	432	2,318

Figure 32: Pathways for Lead Exposure to a Child





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