Tennessee Department of Health

Communicable and Environmental Disease Services

2002 Annual Report

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Epidemiology at any given time is something more than the total of its established facts. It includes their orderly arrangement into chains of inference, which extends more or less beyond the bounds of direct observation. Such of these chains as are well and truly laid guide investigations to the facts of the future.

W. H. Frost

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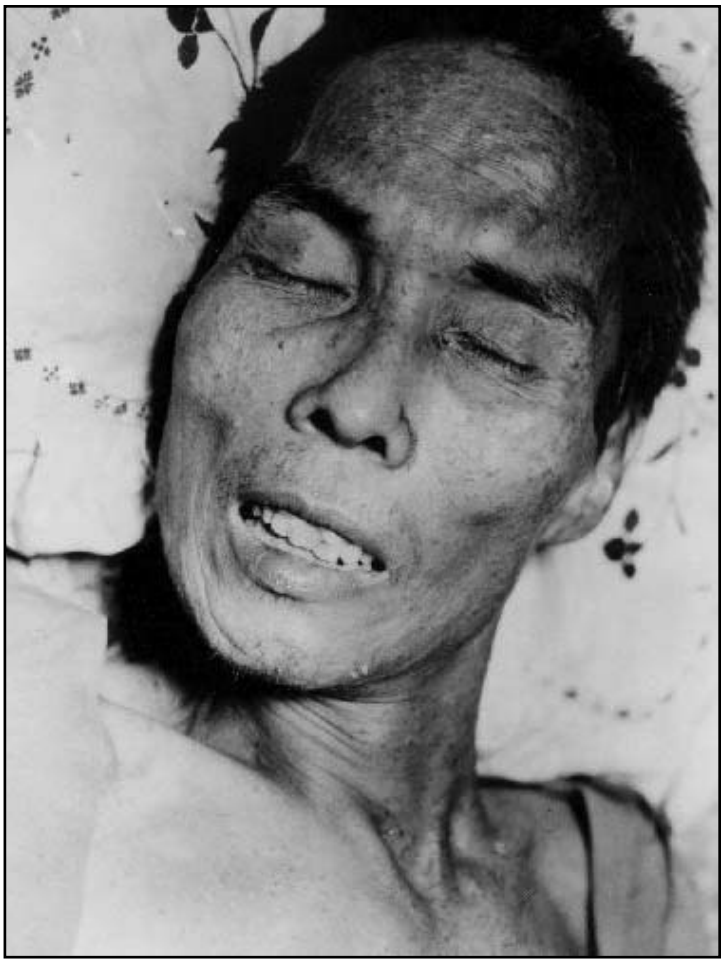
Electronically available at the Tennessee Department of Health website
http://tennessee.gov/health

This report reflects the contributions of the many committed professionals who are part of the Communicable and Environmental Disease Services Section, Tennessee Department of Health.



Tetanus in a 46-year old man, Manila. Muscular spasms, abdomen and limbs, from tetanus due to shell fragments wound on hand.

Armed Forces Institute of Pathology, C. Farmer

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Section I
Introduction

Some of the most important contributors to human capability may be hard to sell exclusively to one person at a time. This is especially so when we consider the so-called public goods which people consume together rather than separately. This applies particularly in such fields as environmental preservation, and also epidemiology and public health care. I may be willing to pay my share in a social program of malaria eradication, but I cannot buy my part of that protection in the form of "private good" (like an apple or a shirt). It is a "public good"—malaria-free surroundings—, which we have to consume together.

Amarty Sen, recipient of the 1998 Nobel Prize in Economics

Survivors of a measles outbreak at Fort Lewis College, Colorado, 1987-88, which resulted in 84 cases

Centers for Disease Control and Prevention (Undated)

A. Purpose of Report

Communicable and Environmental Disease Services (CEDS) is one of the thirteen sections of the Bureau of Health Services, Tennessee Department of Health. The twelve other sections in the Bureau include the following: Nutrition, Community Services, General Environmental Health, Maternal and Child Health, HIV/STD, Medical Services, Fiscal Services, Cost Allocation, Administrative Services, Personnel, Nursing Services, and Oral Health Services. The seven rural health regions also report to the bureau.

Communicable and Environmental Disease Services is assigned the responsibility of detecting, preventing, and controlling infectious and environmentally-related illnesses of public health significance. A unique attribute of infectious diseases is that they can often be prevented, and thus, efforts to that end result in lower expenditures for health care and less personal discomfort and pain. Environmentally-related illnesses are often the result of the interaction of external physical and chemical factors with other variables, including life style, nutrition, and genetics. Detecting, preventing, and controlling both infectious and environmental disease provides enormous financial and emotional benefits to the citizens of Tennessee.

The CEDS Annual Report is designed to provide health care organizations and providers, government and regulatory agencies, and other concerned individuals and groups, with important statistical information about potentially preventable diseases. The report can serve as one source of data for them and can help assure that involved individuals and organizations have access to the same information. The annual report also provides an assessment of the efforts undertaken by CEDS over a period of years.

Surveillance, tracking infectious disease incidence and prevalence, is at the heart of the work of CEDS. The reporting and tracking of cases of illness is essential to knowing who is involved in disease and where the problems are occurring. Examining descriptive epidemiologic data over time is the foundation for knowing where prevention and control efforts need to be focused. One important goal of this report is to assist providers, laboratorians, and infection control practitioners with reporting of notifiable diseases. Health department addresses, telephone numbers and policies relative to surveillance are presented to assist with this important task. This report is a summary of surveillance data from 1995 through 2002 and builds upon the 1999, 2000, and 2001 Annual Reports that were previously published by CEDS.

We acknowledge, with gratitude, the efforts of the many committed health care professionals throughout Tennessee who contribute to the ongoing reporting of disease. Surveillance is dependent on reporting. This annual report could not be developed without the assistance of personnel in local and regional health departments, physicians, infection control practitioners, and laboratory staff who have reported cases as required by law.

B. Notifiable Diseases in Tennessee

A notifiable disease is one for which regular, frequent, and timely information regarding individual cases is considered necessary for the prevention and control of disease. In 1893, Congress authorized the weekly report-

ing and publication of notifiable diseases, collected from state and municipal authorities. The first annual summary of The Notifiable Diseases was published in 1912 and included reports of 10 diseases from 19 states, the District of Columbia, and Hawaii; by 1928, all states participated in the reporting. In 1961, the Centers for Disease Control assumed responsibility for the collection and publication of data concerning nationally notifiable diseases. As world travel becomes increasingly more common, the comparison of data about infectious diseases across states, nations, and continents is crucial.

The list of notifiable diseases is revised periodically. As new pathogens emerge, a disease may be added to the list, or, one might be deleted as its incidence declines. Public health officials at state health departments and the Centers for Disease Control and Prevention collaborate in determining which diseases should be notifiable, however, laws at the state level mandate reporting. In Tennessee, State Regulations 1200-14-1-.02 to .08 require the reporting of notifiable diseases by physicians, laboratorians, infection control personnel, nurses and administrators in settings where infectious diseases are diagnosed.

The Tennessee Department of Health List of Notifiable Diseases was last revised in 1999 and was put into effect in 2000. The list is presented in Section H. Section I lists those diseases for which microbial isolates are to be sent to the Tennessee Department of Health State Laboratory.

C. Reporting Notifiable Diseases

There are four categories of reporting notifiable diseases: immediate telephone reporting, followed with a written report; written report only; special confidential reporting of HIV/AIDS; and laboratory reporting of all blood lead test results. Reports of infectious diseases are usually sent first to the local (county) health department, which is responsible for providing basic public health intervention. Regional health departments can also be called; they submit reports of notifiable diseases to the Tennessee Department of Health central office in Nashville on a weekly basis.

Form PH1600 is used for written reports to the health department. It can be obtained by calling your local health department or CEDS at 615-741-7247/800-525-2437. It can also be downloaded from the CEDS website; the address is tennessee.gov/health. CEDS as well as regional and local health departments welcome questions about disease reporting.

Notifiable disease data are submitted electronically by the Tennessee Department of Health to the Centers for Disease Control and Prevention on a weekly basis. There they are combined with all state data for national analyses and are reported in the weekly publication, *Morbidity and Mortality Weekly Report*. Ongoing analyses of this extensive database have led to better diagnostic and treatment methods, national vaccine schedule recommendations, changes in vaccine formulation, and the recognition of new or resurgent diseases.

The numbers of cases of reported disease presented in the annual report should be considered as the minimum number of cases of actual disease. There are several reasons for this: a person must seek medical care to receive a diagnosis, not all cases are confirmed with laboratory testing, and not all confirmed cases

are reported. The data in this annual report track the geographic distribution of disease, as well as trends over time, and serve as the foundation for the efforts of the Department of Health to control communicable disease.

D. Isolate Characterization at the State Laboratory

Laboratory regulations require clinical laboratories to forward isolates of selected pathogens to the Tennessee Department of Health State Laboratory in Nashville. The isolates provide an important resource for further characterization and tracking of disease in Tennessee. The list of required isolates is presented in Section I.

E. Emerging Infections and the Emerging Infections Program

One important emphasis of CEDS is on new and emerging infections. These include antibiotic resistant infections and emerging foodborne pathogens such as *Listeria, E.coli* O157:H7, *Cyclospora cayetanensis*, and multi-drug resistant *Salmonella* serotype Newport. Emerging vector borne diseases include ehrlichiosis, West Nile virus and La Crosse encephalitis. Meningococcal serogroup Y, adult and adolescent pertussis, and multi-drug resistant tuberculosis are other emerging and re-emerging pathogens.

The Emerging Infections Program (EIP) is a population-based network of CDC and state health departments, working with collaborators (laboratories, academic centers, local health departments, infection control practitioners, and other federal agencies) to assess the public health impact of emerging infections and to evaluate methods for their prevention and control.

Currently, the EIP Network consists of ten sites: California (the San Francisco Bay Area), Colorado, Connecticut, Georgia, Maryland, Minnesota, New Mexico, New York, Oregon, and Tennessee.

The Tennessee Emerging Infections Program (EIP) is a collaborative effort of CEDS, the Vanderbilt University School of Medicine, Department of Preventive Medicine, and the Centers for Disease Control and Prevention. From December 1999 until December 2002, the following eleven counties in Tennessee were involved in the EIP: Cheatham, Davidson, Dickson, Hamilton, Knox, Robertson, Rutherford, Shelby, Sumner, Williamson, and Wilson. In January 2003, the entire state will become part of one major program of the EIP, the Foodborne Diseases Active Surveillance Network (FoodNet).

The core activity of the EIP is active surveillance of laboratory-confirmed cases of reportable pathogens. Laboratory directors and staff, physicians, nurses, infection control practitioners, and medical records personnel are key participants in EIP. Components of the EIP in Tennessee investigate foodborne infections (FoodNet and EHS-Net), invasive bacterial infections (the ABCs program), unexplained encephalitis (TUES), and *Campylobacter*-associated Guillain-Barre syndrome.

F. Communicable and Environmental Disease Services Website

Further tabulations of data regarding disease surveillance in Tennessee are available at the CEDS web site. To access the site go to http://tennessee.gov/health.

G. Useful Contact Persons, Telephone Numbers, E-Mail and US Mail Addresses

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H. List of Notifiable Diseases

The diseases and conditions listed below are declared to be communicable and/or dangerous to the public and are to be reported to the local health department by all hospitals, physicians, laboratories, and other persons knowing of or suspecting a case in accordance with the provision of the statutes and regulations governing the control of communicable diseases in Tennessee.

Category 1: Immediate telephonic reporting required followed with a written report using PH 1600

Anthrax
Botulism
1. Foodborne
2. Wound

Diphtheria
Disease Outbreaks
1. Foodborne
2. Waterborne
3. All Other

Encephalitis, Arboviral
1. California/LaCrosse serogroup
2. Eastern Equine
3. St. Louis
4. Western Equine
5. West Nile

Group A Streptococcal Invasive Disease
Group B Streptococcal Invasive Disease
Haemophilus influenzae Invasive Disease
Hantavirus Disease
Hepatitis – Type A acute
Listeriosis
Measles
Meningococcal Disease
Meningitis – Other Bacterial
Mumps
Pertussis
Plague
Poliomyelitis
Rabies – Human
Rubella & Congenital Rubella Syndrome
Typhoid Fever

Possible Bioterrorism Indicators
Anthrax
Plague
Venezuelan Equine Encephalitis
Smallpox
Botulism
Q Fever
Staph enterotoxin B pulmonary poisoning
Viral Hemorrhagic Fever
Brucellosis
Ricin poisoning
Tularemia

Category 2: Only written report using form PH 1600 required

Botulism – infant
Brucellosis
Campylobacteriosis
Chanchroid
Chlamydia trachomatis
Cholera
Cyclospora
Cryptosporidiosis
Ehrlichiosis
Escherichia coli O157:H7
Giardiasis (acute)
Gonorrhea
Hemolytic Uremic Syndrome
Hepatitis, Viral
1. Type B acute
2. HBsAg positive pregnant female
3. Type C acute

Influenza – weekly casecount
Legionellosis
Leprosy (Hansen Disease)
Lyme Disease
Malaria
Psittacosis
Rabies – Animal
Rocky Mountain Spotted Fever
Salmonellosis – other than *S.* typhi
Shiga-like Toxin positive stool
Shigellosis
Streptococcus pneumoniae Invasive Disease
1. Penicillin resistant
2. Penicillin sensitive

Syphilis
Tetanus
Toxic Shock Syndrome
1. Staphylococcal
2. Streptococcal

Trichinosis
Tuberculosis – all forms
Vancomycin Resistant Enterococci
Varicella deaths
Vibrio infections
Yellow Fever
Yersiniosis

Category 3: Requires special confidential reporting to designated health department personnel

Acquired Immunodeficiency Syndrome (AIDS) Human Immunodeficiency Virus (HIV)

Category 4: Laboratories required to report all blood lead test results, both normal and abnormal

Lead poisoning is a blood lead level ≥ 10 ug/dl for children 0-72 months of age

Revised November 1999

I. Referral of Cultures to the Department of Health State Laboratory

According to Statutory Authority T.C.A. 68-29-107, and General Rules Governing Medical Laboratories, 1200-6-3-.11 Directors of Laboratories are to submit cultures of the following organisms to the Department of Health, Laboratory Services, for confirmation, typing, and/or antibiotic sensitivity including but not limited to:

Salmonella species, including *S. typhi*
Shigella species
Corynebacterium diphtheria
Brucella species
Mycobacterium species
Legionella species
Clostridium tetani
Listeria species*
Plasmodium species
Vibrio species
Clostridium tetani
Francisella species
Yersinia pestis
Escherichia coli O157:H7
Clostridium botulinum
*Haemophilus influenzae**
*Neisseria meningitidis**
*Streptococcus pneumoniae**
Group A *Streptococcus**

For pathogens marked with an asterisk (*), only isolates from sterile sites are required to be submitted. Sterile sites include blood, CSF, pleural fluid, peritoneal fluid, joint fluid, sinus surgical aspirates, or bone. Group A *Streptococcus* will be considered in isolates from intraoperative cultures and tissues obtained during surgery.

Information for Sending Cultures
Please include the patient's full name, address, age, and sex, the physician's name and address, and the anatomic source of culture.

For UPS and Federal Express Items:
Tennessee Department of Health
Laboratory Services
630 Hart Lane
Nashville, TN 37247-0801
Phone 615-262-6300

For U.S. Mail:
Tennessee Department of Health
Laboratory Services
PO Box 305130
Nashville, TN 37230-5130

J. Tennessee Population Estimates, 2002

The following statewide population estimates were prepared by the Tennessee Department of Health, Bureau of Health Informatics, Division of Health Statistics and Research and were used in calculating rates in this report. These population estimates were also utilized in the following sections, K and M.

SEX	FREQUENCY
Female	2,965,778
Male	2,820,749

RACE SEX	FREQUENCY
White Male	2,319,877
White Female	2,407,022
Black Male	456,85
Black Female	513,304
Other Male	44,015
Other Female	45,452
Total	5,786,527

AGE GROUP (years)	FREQUENCY
1-4	307,234
5-9	395,065
10-14	402,762
15-19	401,132
20-24	392,929
25-29	400,456
30-34	412,980
35-39	438,894
40-44	452,331
45-49	426,994
50-54	388,508
55-59	319,498
60-64	255,015
65-69	211,097
70-74	177,930
75-79	144,554
80-84	98,447
85+	85,546

K. Tennessee Department of Health Regions

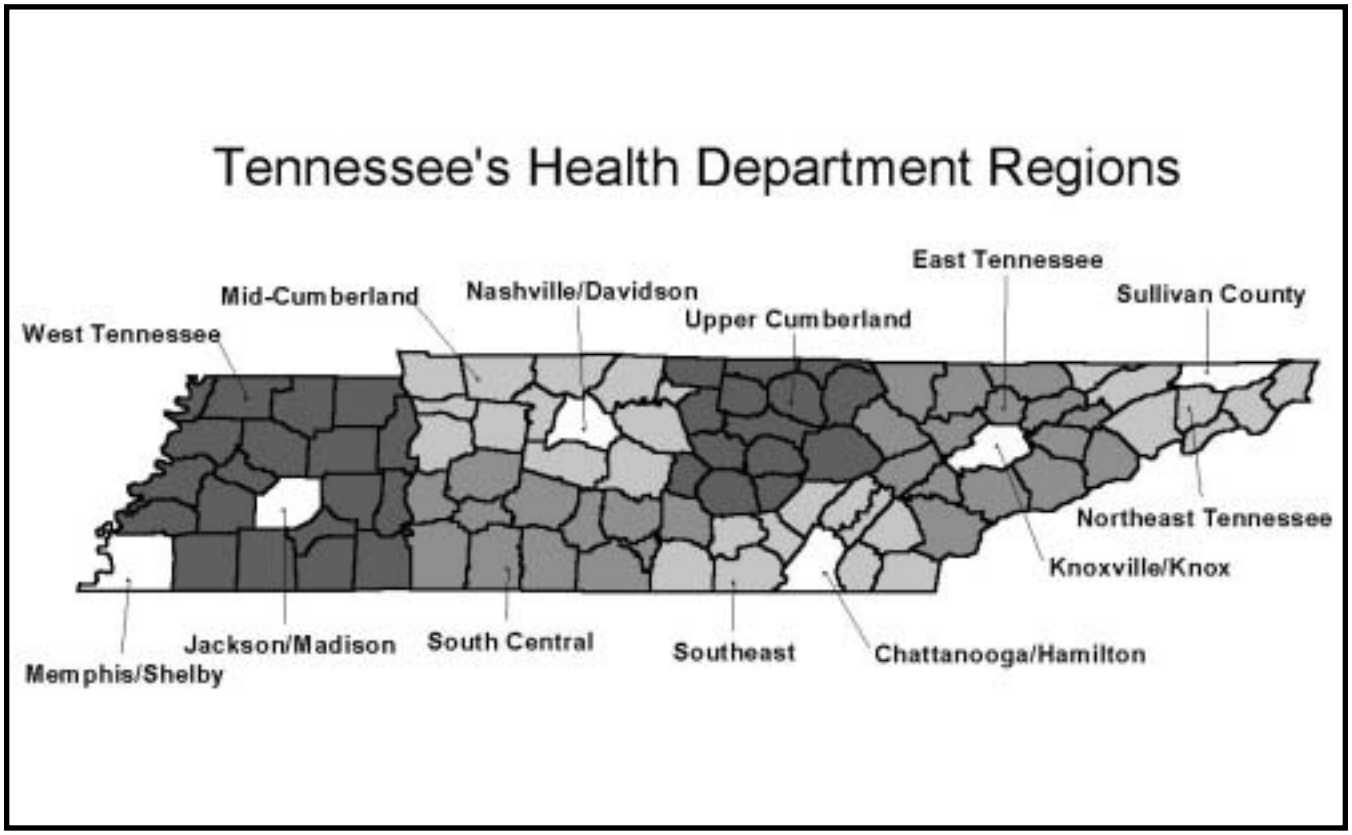
Metropolitan regions include six counties: Davidson (population 577,962), Hamilton (population 309,389), Knox (population 387,453), Madison (population 93,149), Shelby (population 908,264), and Sullivan (population 153,381).

Nonmetropolitan regions are comprised of the seven clusters of counties.

L. Notes on Sources Utilized in Preparing the Report

Statistics utilized in the various disease sections throughout this Annual Report present the year the disease was diagnosed.

Disease rates for the United States come from the Centers for Disease Control and Prevention. Summary of notifiable diseases, United States, 2001, *MMWR 2001*; 50, No.53.



M. Tennessee's Department of Health Nonmetropolitan Regions: Counties and Population

Northeast
(Population 326,340)

Carter (56,983)
Greene (63,621)
Hancock (6,801)
Hawkins (54,391)
Johnson (17,758)
Unicoi (17,742)
Washington (109,044)

East
(Population 675,875)

Anderson (71,480)
Blount (108,166)
Campbell (40,219)
Claiborne (30,251)
Cocke (34,110)
Grainger (21,102)
Hamblen ((58,943)
Jefferson (45,612)
Loudon (40,010)
Monroe (39,973)
Morgan (20,073)
Roane (52,402)
Scott (21,578)
Sevier (73,586)
Union (18,406)

Southeast
(Population 302,311)

Bledsoe (12,540)
Bradley (89,733)
Franklin (39,781)
Grundy (14,486)
Marion (27,964)
McMinn (49,813)
Meigs (11,309)
Polk (16,189)
Rhea (28,818)
Sequatchie (11,678)

Upper Cumberland
(Population 310,785)

Cannon (13,045)
Clay (8,002)
Cumberland (48,037)
DeKalb (17,754)
Fentress (16,863)
Jackson (11,148)
Macon (20,828)
Overton (20,315)
Pickett (5,005)
Putnam (63, 797)
Smith (18,112)
Van Buren (5,548)
Warren (38,912)
White (23,419)

Mid-Cumberland
(Population 871,690)

Cheatham (36,948)
Dickson (44,140)
Houston (8,128)
Humphreys (18,112)
Montgomery (138,477)
Robertson (56,316)
Rutherford (190,246)
Stewart (12,698)
Sumner (134,278)
Trousdale (7,387)
Williamson (133,076)
Wilson (91,884)

South Central
(Population 353,198)

Bedford (38,844)
Coffee (48,909)
Giles (29,678)
Hickman (23,000)
Lawrence (40,427)
Lewis (11,550)
Lincoln (31,756)
Marshall (27,363)
Maury (71,148)
Moore (5,813)
Perry (7,654)
Wayne (17,056)

West
(Population 516,730)

Benton (16,624)
Carroll (29,674)
Chester (15,862)
Crockett (14,711)
Decatur (11,756)
Dyer (37,560)
Fayette (29,676)
Gibson (48,274)
Hardeman (28,651)
Hardin (25,913)
Haywood (19,782)
Henderson (25,897)
Henry (31,328)
Lake (7,944)
Lauderdale (27,582)
McNairy (24,823)
Obion (32,587)
Tipton (52,948)
Weakley (35,138)

Section II.

Tennessee Reported Cases by Year of Diagnosis, 1995-2002

So, naturalists observe, a flea
Has smaller fleas that on him prey;
And these have smaller still to bite 'em;
And so proceed ad infinitum.

Jonathan Swift (1667-1745)

A tobacco field in rural North Carolina adjacent to a cemetery. 1997

Courtesy of James Gathany and the Centers for Disease Control and Prevention

Tennessee Reported Cases by Year of Diagnosis, 1995-2002

DISEASE	1995	1996	1997	1998	1999	2000	2001	2002
AIDS	930	881	749	790	650	674	606	663
Botulism, Foodborne	0	1	0	0	2	0	0	0
Botulism, Infant	0	0	0	1	2	1	4	3
Brucellosis	0	2	1	1	0	0	1	0
Campylobacteriosis	346	335	299	285	251	272	364	298
Chlamydia	13152	13121	12501	13717	14216	15073	15556	16042
Cryptosporidiosis	1	5	17	11	12	12	25	60
E. Coli 0157:H7		*45	46	55	53	59	50	51
Ehrlichiosis		*2	5	6	19	46	20	26
Giardiasis	146	155	175	207	159	184	190	188
Gonorrhea	13894	11710	11018	11840	11366	11877	10144	9348
Group A *Streptococcus*		*13	87	42	50	83	87	89
Group B *Streptococcus*						*87	157	164
Haemophilus influenzae		*29	31	33	36	26	48	37
Hepatitis B Surface Antigen Positive, Pregnant				*2	3	36	104	103
Hepatitis A	1993	737	407	224	190	154	187	122
Hepatitis B, acute	640	517	437	266	228	213	272	128
Hepatitis C, acute	958	373	232	166	96	97	64	26
Hemolytic Uremic Syndome		*3	1	1	8	12	10	7
HIV	1080	972	966	840	803	1127	606	833
La Crosse Encephalitis		*1	8	9	6	19	17	15
Legionellosis	25	27	32	23	23	14	20	
Listeriosis		*6	14	13	7	13	9	12
Lyme Disease	29	25	47	45	39	28	30	27
Malaria	10	14	12	16	7	13	14	4
Measles (indigenous)	0	2	0	1	0	0	0	0
Meningococcal Disease	51	62	81	69	61	56	63	38
Meningitis, Other Bacterial			*41	36	44	52	54	39
Mumps	6	1	9	2	0	2	1	2
Penicillin-resistant *Streptoccus pneumoniae*		*6	82	192	291	266	226	125
Pertussis	210	27	42	41	40	41	72	119
Rocky Mountain Spotted Fever	33	47	38	31	55	57	87	81
Rubella	1	0	0	2	0	1	0	1
Salmonellosis, Non-Typhoidal	463	507	439	587	548	693	724	853
Shigellosis	390	216	285	884	622	344	124	175
Syphilis, Congenital	33	33	38	13	11	18	24	11
Syphilis, Early Latent	1129	957	984	659	649	627	553	390
Syphilis, Late Latent	529	472	595	499	426	511	570	424
Syphilis, Neurological	10	7	9	15	12	14	10	17
Syphilis, Primary	283	279	235	143	223	162	89	40
Syphilis, Secondary	623	571	512	424	418	370	242	128
Tetanus	1	1	2	1	0	0	1	1
Tuberculosis	465	504	467	439	382	383	313	308
Toxic Shock *Staphylococcus*	5	1	2	4	3	3	1	2
Toxic Shock *Streptococcus*				*6	5	1	0	0
Trichinosis	0	3	1	4	0	0	0	1
Tularemia	2	1	0	0	0	1	6	4
Typhoid	1	3	1	2	1	2	1	0
Vancomycin Resistant *Enterococci*			*46	322	447	524	711	649
Yersiniosis						*7	14	19

*Indicates year the disease became reportable

Number of Reported Cases of Selected Notifiable Diseases with Rates Per 100,000 Population by Age Group, Tennessee, 2002

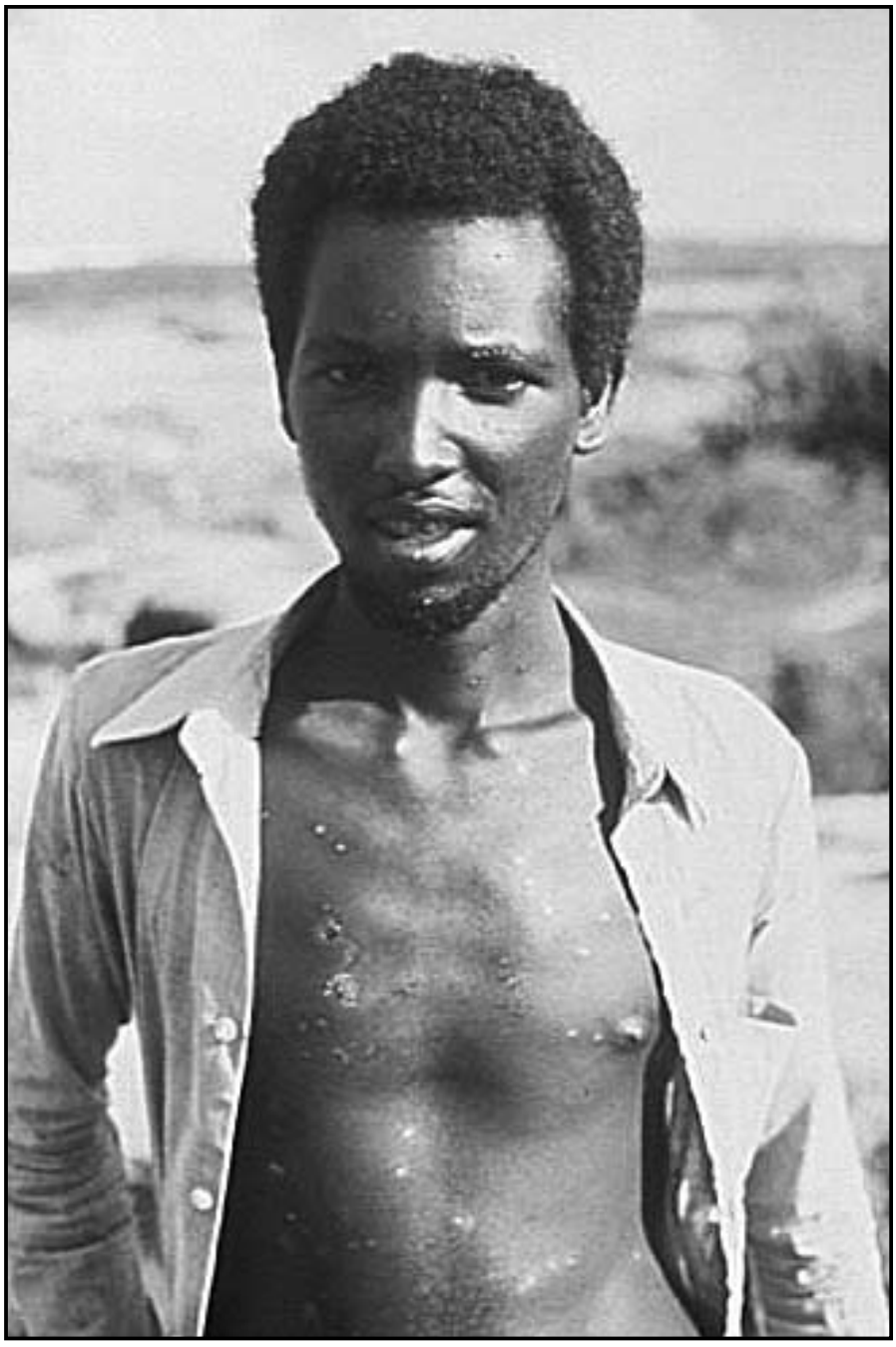
Disease		<1Y	1-4	5-16	17-25	26-45	46-65	>65
	Total population	75155	307234	958279	713698	1709968	1646836	675355
AIDS Cases	Number	*	*	*	56	506	181	7
	Rate	--	--	--	7.8	29.6	11.0	1.0
Campylobacteriosis	Number	29	48	38	24	75	60	24
	Rate	38.6	15.6	4.0	3.4	4.4	3.6	3.6
Chlamydia	Number	26	6	1926	11347	2723	111	110
	Rate	34.6	2.0	201.0	1589.9	159.2	6.7	16.3
Gonorrhea	Number	2	5	760	5406	2908	333	66
	Rate	2.7	1.6	79.3	757.5	170.1	20.2	9.8
Group A *Streptococcus*	Number	1	6	4	3	22	24	29
	Rate	1.3	2.0	0.4	0.4	1.3	1.5	4.3
Hepatitis A	Number	0	2	6	30	41	32	11
	Rate	0.0	0.7	0.6	4.2	2.4	1.9	1.6
HIV Cases	Number	*	*	*	159	574	148	5
	Rate	--	--	--	22.3	33.6	9.0	0.7
Meningococcal Disease	Number	10	6	4	5	4	5	4
	Rate	13.3	2.0	0.4	0.7	0.2	0.3	0.6
Pertussis	Number	56	17	13	3	19	9	2
	Rate	74.5	5.5	1.4	0.4	1.1	0.5	0.3
Rocky Mountain Spotted Fever	Number	0	5	11	7	22	25	11
	Rate	0.0	1.6	1.1	1.0	1.3	1.5	1.6
Salmonellosis, Non-Typhoid	Number	138	156	132	65	150	132	80
	Rate	183.6	50.8	13.8	9.1	8.8	8.0	11.8
Shigellosis	Number	8	69	52	9	19	11	7
	Rate	10.6	22.5	5.4	1.3	1.1	0.7	1.0
Syphilis, Early Latent	Number	0	0	5	91	223	66	4
	Rate	0.0	0.0	0.5	12.8	13.0	4.0	0.6
Syphilis, Late Latent	Number	1	0	1	49	263	96	24
	Rate	13.3	0.0	1.0	68.7	153.8	58.3	35.5
Syphilis, Neurological	Number	0	0	0	0	5	2	10
	Rate	0.0	0.0	0.0	0.0	0.3	0.1	1.5
Syphilis, Primary	Number	0	0	1	3	22	13	1
	Rate	0.0	0.0	0.1	0.4	1.3	0.8	0.1
Syphilis, Secondary	Number	0	0	6	60	53	17	2
	Rate	0.0	0.0	0.6	8.4	3.1	1.0	0.3

* Due to Confidentiality, categories with less than 5 cases are not shown.

Section III.
Disease Summaries

There are no conditions to which a man cannot become used, especially if he sees that all around him are living the same way.

Leo Tolstoy



The last known person in the world to have naturally occurring smallpox of any kind. Variola minor in 23-year old Ali Maow Maalin, Merka, Somalia.

World Health Organization, 1977

A. FOODBORNE DISEASE

The Tennessee FoodNet Program

The Foodborne Diseases Active Surveillance Network (FoodNet) is the principal foodborne disease component of CDC's Emerging Infections Program (EIP). FoodNet is a collaborative project of the CDC, ten EIP sites (California, Colorado, Connecticut, Georgia, Maryland, Minnesota, New York, New Mexico, Oregon and Tennessee), the U.S. Department of Agriculture (USDA), and the Food and Drug Administration (FDA). The project consists of active surveillance for foodborne diseases and related epidemiologic studies designed to help public health officials better understand the epidemiology of foodborne diseases in the United States. Foodborne diseases include infections caused by bacteria such as *Salmonella, Shigella, Campylobacter, Escherichia coli* O157, *Listeria monocytogenes, Yersinia enterocolitica*, and *Vibrio*, and parasites such as *Cryptosporidium* and *Cyclospora*. In 1995, FoodNet surveillance began in five locations: California, Connecticut, Georgia, Minnesota and Oregon. Each year the surveillance area, or catchment, has expanded, with the inclusion of additional counties or additional sites (New York and Maryland in 1998, eleven counties in Tennessee in 2000, Colorado in 2001, and New Mexico in 2002). The total population of the current catchment is 36 million persons, or 13% of the United States population.

FoodNet provides a network for responding to new and emerging foodborne diseases of national importance, monitoring the burden of foodborne diseases, and identifying the sources of specific foodborne diseases.

FoodNet goals

- Describe the epidemiology of new and emerging bacterial, parasitic, and viral foodborne pathogens
- Estimate the frequency and severity of foodborne diseases that occur in the United States
- Determine how much foodborne illness results from eating specific foods, such as meat, poultry, and eggs

Why is FoodNet important to public health?

Foodborne diseases are common; an estimated 76 million cases occur each year in the United States.[1] Although most of these infections cause mild illness, severe infections and serious complications do occur. The public health challenges of foodborne diseases are changing rapidly; in recent years, new and emerging foodborne pathogens have been described and changes in food production have led to new food safety concerns. Foodborne diseases have been associated with many different foods, including some previously thought to be safe, such as eggs and fruit juice, both of which have transmitted *Salmonella* during recent outbreaks. Public health officials in the ten EIP sites are monitoring foodborne diseases, conducting epidemiologic and laboratory studies of these diseases, and responding to new challenges from these diseases. Information gained through this network will lead to new interventions and prevention strategies for addressing the public health problem of foodborne diseases.

How is FoodNet different from other foodborne disease surveillance systems?

Current "passive" surveillance systems rely upon reporting of foodborne diseases by clinical laboratories to state health departments, which in turn report to CDC. Although foodborne diseases are extremely common, only a fraction of these illnesses are routinely reported to CDC via these surveillance systems. This

[1] Mead PS , Slutsker L, Dietz V et al. Food-related illness and death in the United States. *Emerg Infect Dis* 1999;5:607-25.

is because a complex chain of events must occur before such a case is reported, and a break at any link along the chain will result in a case not being reported. FoodNet is an "active" surveillance system, meaning public health officials regularly contact laboratory directors to find new cases of foodborne diseases and report these cases electronically to CDC. In addition, FoodNet is designed to monitor each of these events that occurs along the foodborne diseases pyramid and thereby allow more accurate and precise estimates and interpretation of the burden of foodborne diseases over time. Because most foodborne infections cause diarrheal illness, FoodNet focuses these efforts on persons who have a diarrheal illness.

FoodNet Components

Active laboratory-based surveillance:

The core of FoodNet is laboratory-based active surveillance at over 300 clinical laboratories that test stool samples in the ten participating states. In Tennessee, 50 hospitals have been served by 39 laboratories which are visited regularly by surveillance officers to collect information on laboratory-confirmed cases of diarrheal illnesses. Additionally, active surveillance for hemolytic uremic syndrome (HUS) (a serious complication of *E. coli* O157 infection), Guillain-Barré syndrome (a serious complication of *Campylobacter* infection) and toxoplasmosis takes place. The result is a comprehensive and timely database of foodborne illness in a well-defined population. Beginning in 2003, active surveillance will be conducted in the 136 hospital laboratories throughout the Tennessee.

Survey of clinical laboratories:

In October 1995, collaborating FoodNet investigators conducted a baseline survey of all clinical laboratories in the five original catchment areas to determine which pathogens were included in routine bacterial stool cultures, which tests had to be specifically requested by the physician, and what specific techniques were used to isolate the pathogens. In 1997, a baseline survey was conducted in the two new sites, and a follow-up survey in the five original sites to assess any recent changes in laboratory practices. Another survey was conducted in 2000. In Tennessee, all 39 (100%) of the qualifying laboratories participated; these laboratories process approximately 33,000 stool specimens per year. "Routine stool cultures" include culturing for *Salmonella, Shigella*, and *Campylobacter* in all of these laboratories. Most laboratories only culture for *Yersinia* and *Vibrio* by special request. Though most laboratories can culture *E. coli* 0157:H7, very few have the ability to isolate non- 0157:H7 Shiga toxin producing *E. coli* strains.

Survey of physicians:

To obtain information on physician stool culturing practices, collaborating FoodNet investigators mailed a survey questionnaire to 5,000 physicians during 1996 in five sites and 750 physicians in 1997 in the two new sites. Because laboratories test stool specimens from a patient only upon the request of a physician or other health care provider, it is important to measure how often and under what circumstances physicians order these tests. As changes occur in the way health care is provided in the United States, stool-culturing practices may also change over time. The practices of physicians who send stool samples to laboratories within the catchment areas will be monitored by surveys and validation studies.

Survey of the population:

Collaborating FoodNet investigators contact randomly selected residents of a catchment area and ask individuals if they had a recent diarrheal illness, whether he or she sought treatment for the illness, and whether he or she had consumed certain foods known to have

caused outbreaks of foodborne illness. Because many people who become ill with diarrhea do not see a physician, little is known about the number of cases of diarrhea in the general population and how often persons with diarrhea seek medical care. The population survey is an essential part of an evaluation for foodborne illness because it allows for an estimate of the population who seeks medical care when affected by diarrheal illness.

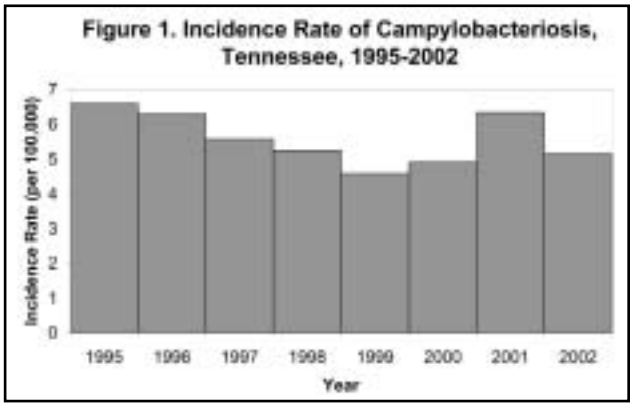
Epidemiologic Studies:
In 1996, FoodNet began epidemiologic studies of *E. coli* O157 and *Salmonella* serogroups B and D infections. More than 60% of *Salmonella* infections in the United States are caused by serogroups B and D *Salmonella*. In 1998, FoodNet began a case-control study of *Campylobacter*. *Campylobacter* is consistently the most frequently isolated pathogen in FoodNet sites. These large epidemiologic studies will provide more precise information about which food items or other exposures might be risk factors for infections with these organisms. To allow the most precise classification of the isolates from the patients in these studies, *Salmonella*, *E. coli* O157, and *Campylobacter* isolates from these patients are sent from FoodNet sites to CDC for further study, including antibiotic resistance testing, phage typing, and molecular subtyping. In 2002 three more case-control studies were initiated: infants under the age of one year with *Campylobacter* and *Salmonella*; *Salmonella Enteritidis*, and *Salmonella* Newport. They are expected to identify risk factors that can be addressed to prevent their occurrence.

EHS-Net
A new program under the FoodNet umbrella is the Environmental Health Specialist Network (EHS-Net). EHS-Net is a network of environmental health specialists and epidemiologists collaborating and exchanging ideas with laboratories, state food protection programs, the Environmental Health Branch of the National Center of Environmental Health at CDC, the Food and Drug Administration and FoodNet. EHS-Net's mission is to identify environmental antecedents to foodborne illness and foodborne disease outbreaks where active foodborne disease surveillance systems are in place (FoodNet). Additional information on FoodNet activities is available through the CDC website (www.cdc.gov/foodnet/).

Campylobacteriosis

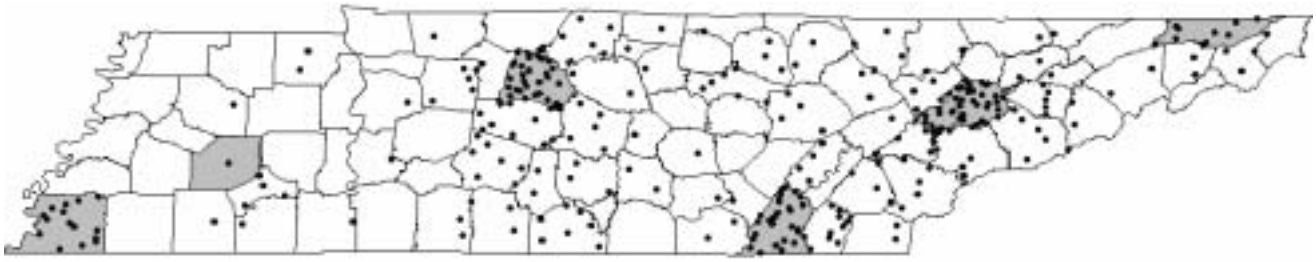
Campylobacteriosis is one of the most commonly reported gastrointestinal illnesses, both in the United States, and in Tennessee. The causative serotype is primarily *Campylobacter jejuni*. Persons infected with the bacterium usually develop diarrhea, cramping, abdominal pain and fever within two to five days after exposure; symptoms typically last one week.

Since 1995, rates of campylobacteriosis have been declining. However, in 2001 there was an increase to 6.3 cases per 100,000 persons from a rate of 4.9 per 100,000 in 2000. Only 298 cases were reported to CEDS in 2002, representing a decrease to 5.1 cases per 100,000 persons **(Figure 1)**.



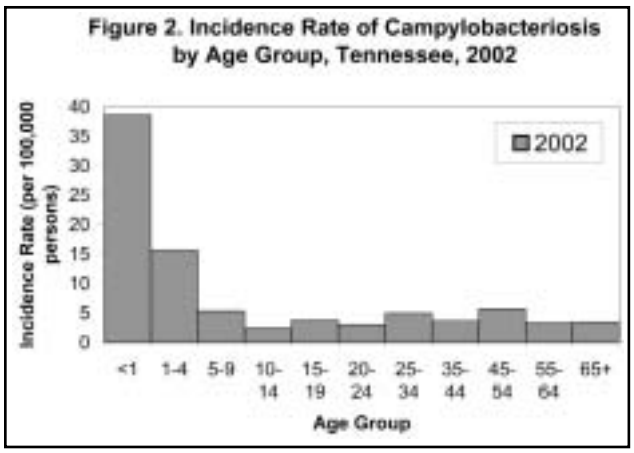
As shown in the **map** below, campylobacteriosis is a disease that affects more people in the eastern portion of Tennessee than in the western portion. This phenomenon is consistent

Distribution of Campylobacteriosis Cases, Tennessee, 2002



year after year. In 2002, the rates of disease varied region to region across the state, with the highest rate of 11.6 cases per 100,000 persons in the Knoxville/Knox County metropolitan area compared with 1.1 cases per 100,000 persons in the Jackson/Madison County metropolitan area.

From 1995 to 2002, reported cases of campylobacteriosis in Tennessee increased dramatically during the summer months with 66.3% of cases occurring from May to October. **Figure 2** illustrates that those at greatest risk of devel-



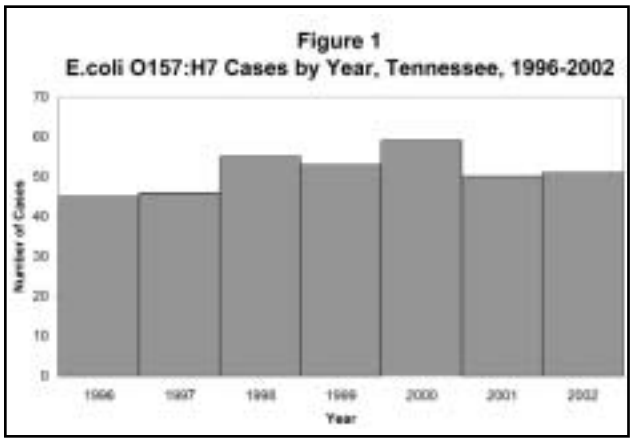
oping infection are those under the age of five years (20.1 cases per 100,000 persons). The risk for those under the age of one is particularly high (38.6 cases per 100,000 persons). Active laboratory surveillance for *Campylobacter* is carried out in Tennessee under the auspices of the FoodNet program. A case-control study is currently underway to identify the risk factors for infants with salmonellosis and campylobacteriosis. Inaugurated in March 2002, the study involves an interview with the parents of all infants under the age of one, who are diagnosed with either one of these two diseases. Controls selected randomly from the birth registry are interviewed as well. This important project should help to better understand the reasons for the disproportionately high rates of these diseases among one of the most vulnerable age groups.

Another study currently underway in the Emerging Infections Program is an investigation of the association between Guillan-Barre' Syndrome (GBS) and a preceding infection with *Campylobacter jejuni*. GBS is a relatively rare illness characterized by weakness and paralysis. Investigators at the Tennessee Department of Health and Vanderbilt University School of Medicine are interested in learning of newly diagnosed cases of GBS; please notify Dr. Ban Mishu Allos, the Principal Investigator, at 615-343-1743, of any such cases, if you would like to enroll a patient.

E. coli O157:H7 and Hemolytic Uremic Syndome.

Fifty-one cases of *E. coli* O157:H7 were reported in Tennessee in 2002. The recent

incidence of this disease has varied from a high of 59 cases in 2000 to a low of 45 in 1996. The disease became reportable in Tennessee in 1996 **(Figure 1)**. Active surveillance for *E. coli* O157:H7 is carried out in Tennessee under the auspices of the FoodNet program.

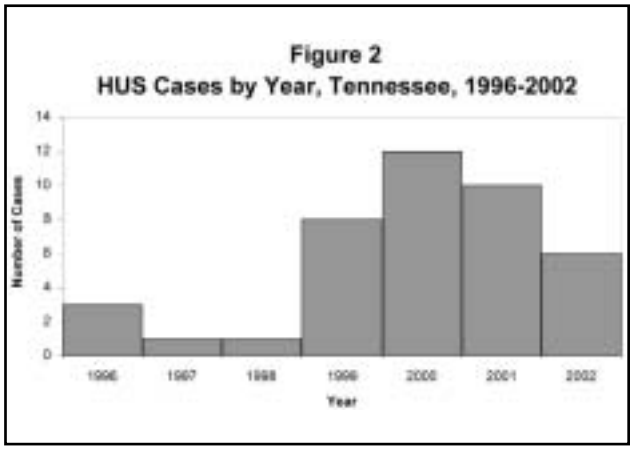


E. coli O157:H7 is found in the intestines of healthy cattle; meat may become contaminated during slaughter and the organisms thoroughly mixed into meat when it is ground into hamburger. The pathogen can be found in up to 89 percent of ground beef. Proper cooking of foods and thorough handwashing techniques can help to prevent *E. coli* O157:H7 infection. Ground beef should be cooked to an internal temperature of 160° F. Cross-contamination of uncooked meat and ready-to-eat foods must be avoided. Fruits and vegetables require thorough washing prior to eating. Milk, juice and cider should be pasteurized. Persons with diarrhea should avoid sharing swimming and bathing facilities or preparing food for others.

Outdoor summer activities such as swimming in contaminated water, contact with petting zoos or farm animals, and consumption of improperly prepared food and beverages have been associated with *E. coli* O157:H7 outbreaks.

Shiga toxin-producing *E. coli* (STEC), of which serotype O157 is but one, are a significant cause of hemorrhagic colitis and hemolytic uremic syndrome (HUS). These are diseases, which may result in severe complications such as renal failure and death. About two to seven percent of *E. coli* O157:H7 infections nationwide lead to HUS.

In 2002, six cases of HUS were reported in Tennessee, half as many as in 2001 **(Figure 2)**. Five (80%) of those cases were under the age of ten years.



The Tennessee Department of Health State Laboratory routinely tests suspected fecal cultures for shiga toxin-producing *E. coli* (STEC). Immunomagnetic separation can be used to enhance identification of *E. coli* O157:H7 in otherwise questionable cultures. Serologic testing for antibodies against the major STEC serotypes is available if microbiologic tests are not done or are negative and *E. coli* O157:H7 is strongly suspected, as in HUS cases. Shiga-like toxin positive stools were placed on the list of notifiable diseases in 2000.

Food and Waterborne Parasitic Diseases

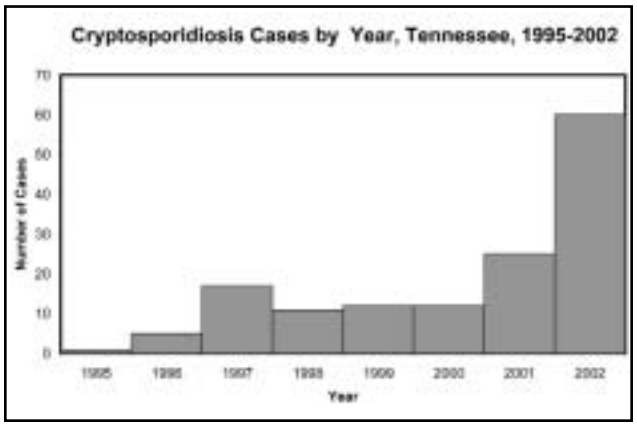
Parasites can cause diseases that range from the mildly annoying to the severe and even fatal. Many parasitic diseases have tradition-

ally been considered exotic, and therefore, frequently have not been included in the differential diagnoses of patients with diarrhea in Tennessee. Nevertheless, these organisms are among the common causes of morbidity and mortality in various and diverse geographic locations worldwide. Tourists returning to their own countries, immigrants from endemic areas, and immunocompromised persons are at risk for acquiring parasitic diseases in non-endemic areas. Three parasitic diseases are reportable in Tennessee: cryptosporidiosis, cyclosporiasis, and giardiasis.

Cryptosporidiosis

The characteristics of *Cryptosporidia* make them a major threat to both drinking and recreational water. They are ubiquitous to animals, resistant to chlorine, small and difficult to filter. Their oocysts (the protective shells that surround them) allow them to remain viable in the environment for a long period of time over wide extremes of temperatures. Though cryptosporidiosis is not new, there is evidence to suggest that contemporary living practices and demographics are creating an environment which enhances the spread of the disease. The expanding use of day care centers by infants and young children, the dramatic rise in the numbers of elderly people who live in institutions, the growing numbers of immunocompromised people living with acquired immunodeficiency syndrome, organ transplants, chemotherapy and radiation therapy, along with water supplies that may be piped long distances from their source to their point of use, are all factors that may contribute to the emergence of cryptosporidiosis as a threat. In 1993, the largest waterborne outbreak in U.S. history was caused by this pathogen. An estimated 403,000 persons served by the South Milwaukee, Wisconsin, water plant became ill, constituting a 52% attack rate. Several immunocompromised patients died.

The reported number of cases in Tennessee has been increasing, ranging from 1 in 1995, to 25 in 2001. In 2002 the number of reported cases was 60. The **figure** depicts the increase from 1995-2002. A standard screen for a



request for testing for ova and parasites is frequently done with a kit that tests both giardia and cryptosporidia. Heightened awareness about the pathogen, increasing numbers of people with the risk factors and increased testing may account for some of the rise in the reported cases of cryptosporidiosis.

The incidence of cryptosporidiosis in FoodNet sites in 2002 varied dramatically. The rate per 100,000 in Tennessee is 0.46, the lowest among the FoodNet sites; Minnesota reported a rate of 4.1. The overall incidence rate in FoodNet sites is 1.42.

Cyclosporiasis

Cyclosporiasis was first described in humans in New Guinea in 1977; however, the causative organism eluded taxonomic classification until 1993. Oocysts of this organisim are quite stable in the environment, surviving freezing, formalin, and chlorination. Oocysts can contaminate food and water but direct person-to-person transmission is considered unlikely.

From 1995-2000, large outbreaks of cyclosporiasis in North America were associ-

ated with the consumption of fresh Guatemalan raspberries. These outbreaks prompted intensive study of *Cyclospora* in the United States.

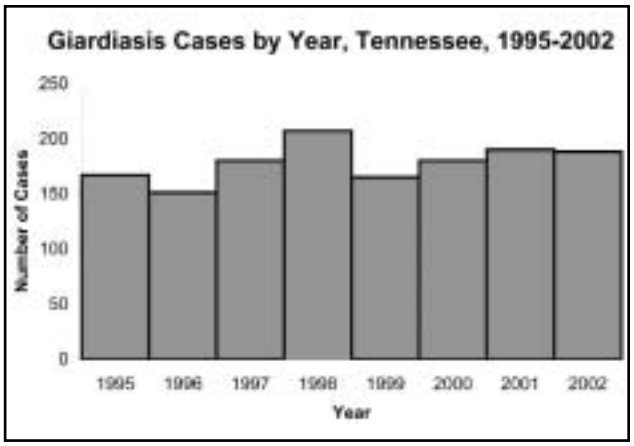
The incidence of *Cyclospora* infections in this country is not known but it is thought to be low. There was one case reported in Tennessee in 2002, none were reported in the previous seven years. In 2002 in FoodNet sites, the overall rate per 100,000 population was 0.11.

Giardiasis

This parasite is the most common cause of parasitic infection in the United States and Canada and is a common cause of endemic and epidemic diarrhea throughout the world. Nearly all children in the developing world become infected at some point in their lives. In Tennessee, children under four years of age accounted for 27% of the giardiasis cases from 1995 through 2002.

Acquisition of the parasite requires oral ingestion of *Giardia* cysts. This can occur in one of three ways: through the ingestion of contaminated water (the most frequent), via person-to-person transmission, and with the intake of contaminated food. Many waterborne outbreaks have involved the use of untreated or inadequately water. Person-to-person transmission occurs in small children in daycare centers, among persons in custodial living centers, and among men who have sex with men.

The **figure** depicts the number of cases of giardiasis reported in Tennessee from 1995 through 2002; the numbers have remained fairly constant ranging from a low of 151 in 1996 to a high of 207 in 1998. For the eight-



year period, 1995-2002, giardiasis reports followed a typical seasonal trend with 65% of cases occurring during the summer and fall.

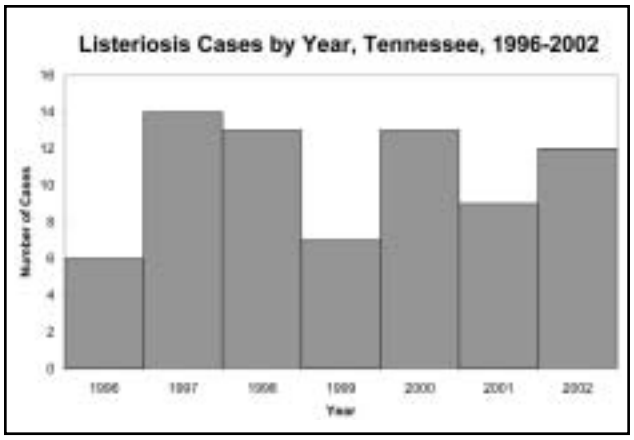
Listeriosis

The bacterium *Listeria monocytogenes* causes listeriosis, a rare but serious foodborne disease. Though it results in only about 2,500 cases of the estimated 76-million foodborne illnesses per year in the U.S., listeriosis accounts for 27% of the deaths from foodborne pathogens. The case-fatality rate for the disease is 15%. Listeriosis also produces the highest rate of hospitalization of any foodborne illness. *Listeria* may cause meningitis and severe neurological sequelae, spontaneous abortion, and infection in the newborn infant.

In Tennessee, listeriosis became a reportable disease in 1996. That year 6 cases were reported; the next year that number jumped to 14. In 1998, a multistate outbreak of listeriosis resulted from post-processing contamination in a hot dog manufacturing plant in another state. Tennessee Department of Health staff assisted in the early identification of that outbreak.[1] The number of cases in Tennessee has remained fairly constant since 1998; the **figure** depicts the trend.

Among FoodNet sites during 1996-2002, the

[1] Centers for Disease Control and Prevention. Multistate outbreak of Listeriosis-United States, 1998.*MMWR* 1998;47:108.



incidence of listeriosis has decreased 38%. In 2002, rates per 100,000 ranged from a low of 0.10 in Minnesota to a high of 0.45 in New York. In Tennessee that rate was 0.11. The overall rate per 100,000 in FoodNet sites was 0.27. The decline occurred in the context of control measures instituted by the U.S. Department of Agriculture's Food Safety Inspection Service (FSIS); FSIS originated the Pathogen Reduction/Hazard Analysis Critical Control Point (HACCP) systems which regulates meat and poultry slaughter and processing plants. However, listeriosis continues to cause significant outbreaks and deaths nationwide.

In 2000, a three-year long FoodNet listeriosis case-control study was inaugurated. It was designed to identify risk factors for listeriosis in FoodNet sites and to describe the spectrum of illness in patients with the disease.

Norovirus

Noroviruses (genus *Norovirus*, family *Caliciviridae*) are a group of related, single-stranded RNA, nonenveloped viruses that cause acute gastroenteritis in humans. Norovirus was recently approved as the official genus name for the group of viruses provisionally described as "Norwalk-like viruses" (NLV). This group of viruses is also referred to as caliciviruses (because of their virus family name).

For many years, failure to isolate causative agents from apparently infectious outbreaks of diarrhea and vomiting led to the widely held assumption that undetected viruses were responsible for such disease. Despite extensive virologic investigations in laboratories around the world, relatively little progress were made in this area until 1972, when the Norwalk virus was described and partially characterized. It was initially detected in diarrheal stools obtained from people during an outbreak of gastroenteritis in Norwalk, Ohio, that involved elementary school students and family contacts. Subsequently, additional viruses with similar properties were discovered in other geographic locations, including Hawaii, Montgomery County, and Snow Mountain. All of them had similar morphology by electron microscopy, and all were observed in the stools of individuals with gastroenteritis. Subsequent molecular studies have clearly identified them as members of the *Caliciviridae* family.

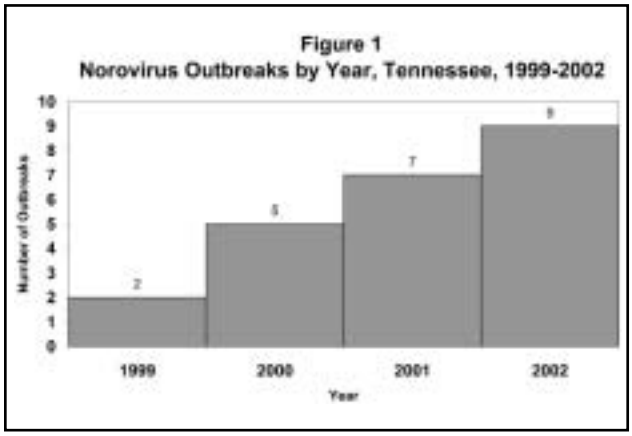
Noroviruses were first recognized in association with point-source outbreaks of gastroenteritis. Features that are characteristic of such outbreaks include the following: an incubation period of 24 to 48 hours, a short-lived illness of 2-3 days' duration with vomiting as a prominent symptom in most affected individuals, high secondary attack rates, and lack of other identifiable pathogens on routine stool culture.

Almost any type of food may serve as a vehicle for outbreaks of gastroenteritis associated with norovirus. Other sources of infection are drinking contaminated water and swimming in pools or lakes in which ill individuals have been swimming, an indication of the highly infectious nature of this virus. Contamination of foodstuffs has been traced to both pre-symptomatic and post-symptomatic food han-

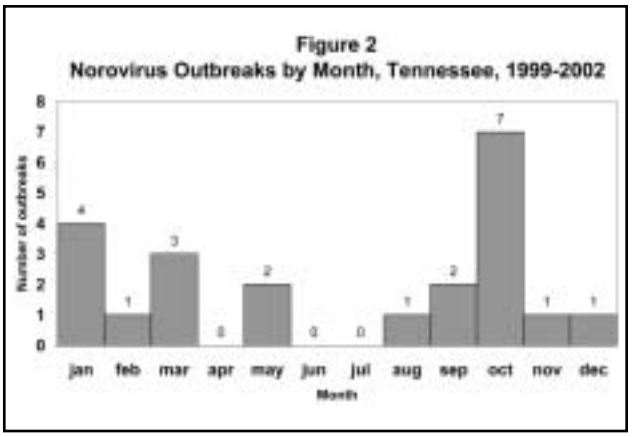
dlers, thus complicating infection control recommendations. Outbreaks are particularly common in closed settings such as hospitals, nursing homes, ships, and the military. Secondary transmission is a prominent feature as well.

Noroviruses are estimated to cause 57% of the foodborne illnesses in the United States and 33% of all the foodborne hospitalizations annually. By comparison the most common bacterial cause of foodborne infections is *Campylobacter*, which is estimated to result in 14% of the foodborne illness in this country. Sporadic disease due to norovirus is not reportable in Tennessee, and thus incidence and prevalence data are not available. However, all foodborne outbreaks are reportable and so these types of data are collected annually.

There were nine norovirus outbreaks in Tennessee in 2002 with a total of 32 laboratory confirmed cases and 213 probable cases. The number of Norovirus outbreaks reported has been on the rise since 1999 **(Figure 1)**. In the past four years, Norovirus outbreaks have been fairly well distributed throughout the



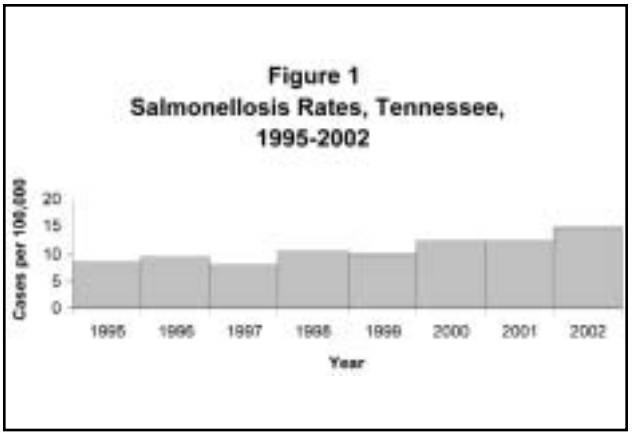
year, the exception being a sharp increase in outbreaks during the month of October **(Figure 2)**.



In four of the nine outbreaks, at least one contamination factor was documented. Barehanded contact with food by a food handler was documented as the source of contamination in two of the outbreaks. Three outbreaks implicated handling of food by an infected person as the source of contamination. In one outbreak, inadequate cleaning of processing/preparation equipment was cited. Five of the nine outbreaks involved food prepared exclusively in a restaurant or deli. One of the outbreaks involved food prepared only in the home.

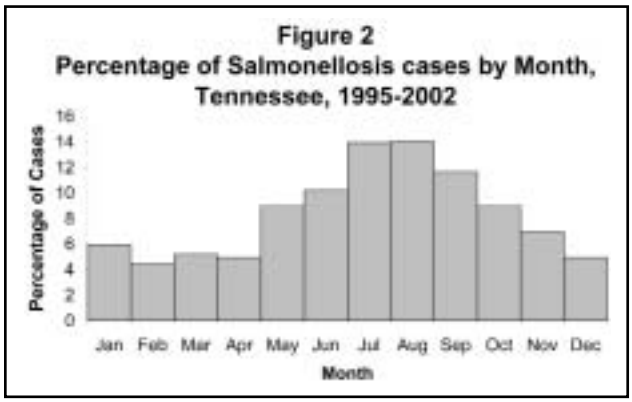
Salmonellosis

The incidence of salmonellosis in Tennessee in 2002 was higher than in the preceding eight years **(Figure 1)**. A total of 853 cases were reported to CEDS representing an 18%



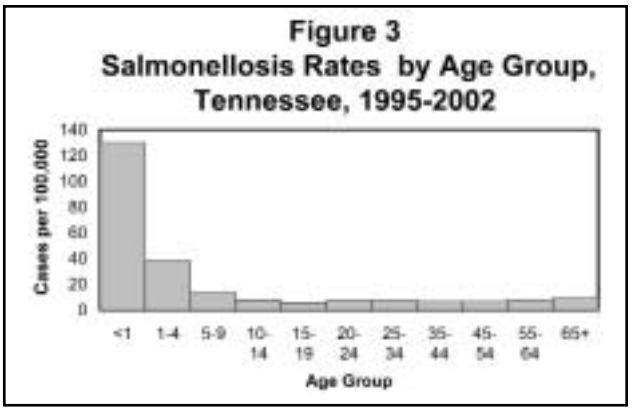
increase over the rate in 2001. The rate of salmonellosis in Tennessee in 2002 was 14.7 cases per 100,000 persons compared to the 1995 rate of 8.8 cases per 100,000 and the 2001 rate of 14.4 cases per 100,000. Rates of infection varied by region. For the second year, Hamilton County reported the highest rate of salmonellosis: 28.8 per 100,000, compared with 5.2 per 100,000 in Sullivan County.

From 1995 to 2002, salmonellosis reports followed a typical seasonal trend with more than two-thirds of cases occurring during the summer and fall **(Figure 2)**. For the eight-year period 1995-2002, 67.7% of cases were

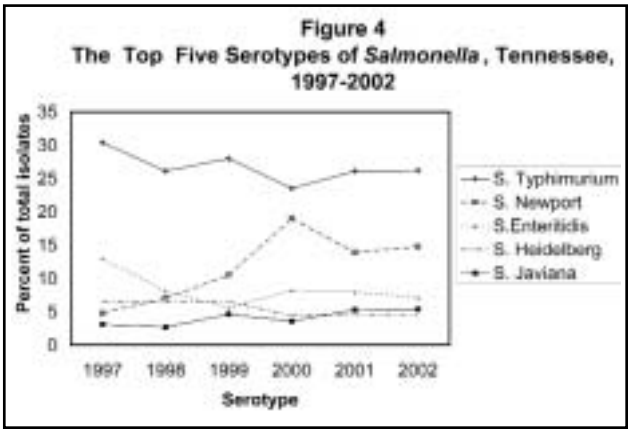


reported during the months of May through October; 32.3% of cases were reported for the months of November through April. In 2002, salmonellosis peaked in July with 152 (17.8%) cases.

From 1995 to 2002, children within the first four years of life accounted for 36% of salmonellosis cases; the highest incidence rate (130.3 cases per 100,000) occurred among children aged <1 year **(Figure 3)**. In 2002, children aged <1 year and 1-4 years represented 16.2% and 18.3% of cases respectively. The distribution of isolates between the sexes was similar during this eight-year period.



There are >2000 known *Salmonella* serotypes. *Salmonella Typhimurium*, *S. Newport* and *S. Enteritidis* accounted for nearly 50% of all *Salmonella* isolates sent to the Tennessee Department of Health State Laboratory in 2002 **(Figure 4)**. *Salmonella Typhimurium* was the most common serotype in Tennessee from



1997-2002. Beginning in 1999, *S. Newport* emerged as the second most common serotype, accounting for 14.8% of all *Salmonella* reported in Tennessee in 2002.

Multi-drug resistant strains of *S. Newport* have emerged and are widely disseminated throughout the United States. In 2000, 22% (27/124) of the *S. Newport* isolates submitted to the National Antimicrobial Resistance Monitoring System for Enteric Bacteria (NARMS) at CDC were resistant to eight or more antimicrobials. These strains are rare in Tennessee.

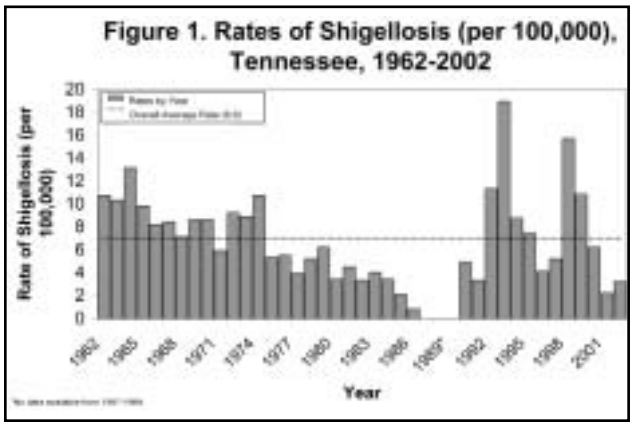
Shigellosis

Shigellosis is an infectious disease caused by a group of bacteria called *Shigella*. Most of those infected with *Shigella* develop diarrhea, fever and stomach cramps within one or two days after they are exposed to the bacterium. The diarrhea is often bloody. Shigellosis usually resolves in five to seven days. In some persons, especially young children and the elderly, the diarrhea can be so severe that the patient needs to be hospitalized.

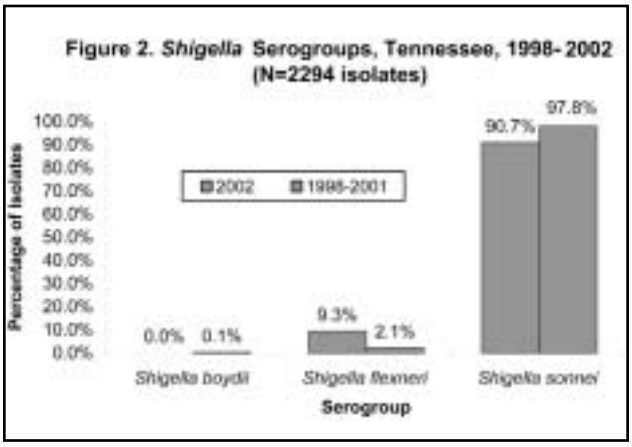
Although some infected persons may never show any symptoms at all, they have the capacity to transmit the *Shigella* bacteria to others. Transmission occurs person-to-person, primarily, by the fecal-oral route, with only a few organisms (10-100) needed to cause infection. Currently, active laboratory surveillance is being conducted for *Shigella* in Tennessee under the auspices of the FoodNet program.

The number of cases of this disease in Tennessee has varied over the years, with a high of 963 in 1993 to a low of 38 in 1986. In 2002, there were 175 cases of shigellosis reported in Tennessee (3.2 cases per 100,000 persons). Of those 175 cases, close to 70% are under the age of ten.

As shown in **Figure 1**, the rate of disease declined from 1962 to the 1980's. However, in the early 1990s, this trend began to change. With the major increases in incidence in 1993 (18.9 cases per 100,000 persons) and 1998 (15.7 cases per 100,000 persons), shigellosis now appears to be entering a six-year cycle of peaks in the incidence of the disease.



Although there are four serogroups into which *Shigella* may be subdivided (*S. boydii, S. dysenteriae, S. flexneri* and *S. sonnei*), only two were reported in Tennessee in 2002, *S. sonnei* and *S. flexneri*. Most of those infected with shigellosis in Tennessee are infected with the *S. sonnei* serogroup. But if results are compared to previous years, *S. flexneri* appears to be on the rise with over a four-fold increase over previous years **(Figure 2)**.



The spread of *Shigella* from an infected person to other persons can be easily controlled with frequent and careful hand washing. When possible, young children with a *Shigella* infection, who are still in diapers, should not be in contact with uninfected children. In addition, people who have shigellosis should not prepare food for others until they have been shown to no longer be carrying the *Shigella* bacterium. Basic food safety precautions can help prevent shigellosis.

If a child in diapers has shigellosis, everyone who changes the child's diapers should be sure the diapers are disposed of properly in a

closed-lid garbage can, and should wash his or her hands carefully with soap and water immediately after changing the diapers. After use, the diaper changing area should be wiped down with a disinfectant such as dilute household bleach, Lysol, or bactericidal wipes.

Foodborne Outbreaks

Foodborne outbreaks are defined as the occurrence of two or more cases of a similar gastrointestinal illness resulting from the ingestion of a common food. Foodborne diseases pose the greatest risk to the very young, the elderly and those with compromised immune systems.

The detection and investigation of foodborne outbreaks in Tennessee have improved in recent years with aggressive local health department support and the increased resources available through the Tennessee Emerging Infections Program. From 1993-1995, no outbreaks were reported to CDC from Tennessee. In 1996 there was one and in 2002, there were 32.

Two areas of concern about foodborne disease detection remain: there are a high number of foodborne outbreaks in which the etiology remains unknown, and second, the food vehicle is often difficult to identify. The collection of stools from persons involved in foodborne outbreaks is essential to determining the etiology. In 2002, 61% of foodborne outbreaks in Tennessee had a laboratory-confirmed etiology.

Timely reporting of foodborne outbreaks has allowed for rapid acquisition of both stool and food cultures. Collecting specimens has been facilitated by the development of stool kits, which contain all of the necessary materials and instructions; they can be mailed or delivered by courier to ill persons. Pulsed-field gel electrophoresis (PFGE) for DNA finger printing of bacteria and polymerase chain reaction (PCR) for norovirus identification are now employed by the Tennessee Department of Health State Laboratory. This improved laboratory capacity has improved the ability to determine the etiology and vehicle of foodborne outbreaks.

Foodborne Disease Outbreaks, Tennessee, 2002

Onset Date	County	# Ill	Etiology	Site	Vehicle
1/7/2002	Davidson	11	Norovirus	Restaurant	Unknown
1/14/2002	Rutherford	8	*Staph aureus*	Restaurant	Multiple foods
1/23/2002	Hamilton	12	Norovirus	Potluck	Unknown
1/27/2002	Dickson	16	Unknown	Banquet hall	Unknown
2/3/2002	Davidson	4	Unknown	Restaurant	Unknown
2/19/2002	Hamilton	4	Unknown	Restaurant	Unknown
2/25/2002	Knox	44	*Clostridium* perfringens	Restaurant	Chili
3/5/2002	Shelby	18	*Salmonella* Heidelberg	Private home	Sausage/eggs
3/31/2002	Maury	25	Norovirus	Private home	Unknown
4/5/2002	Davidson	11	Unknown	Deli	Unknown
4/6/2002	McNairy	26	*E.Coli* O157:H7	Restaurant	Unknown
5/3/2002	Gibson	5	*Staph* aureus	Restaurant	Unknown
5/12/2002	Madison	15	*Staph* aureus	Church	Barbeque
6/16/2002	Davidson	16	*Salmonella* Anatum	Restaurant	Unknown
6/21/2002	Hamilton	178	*Salmonella* Miami	Restaurant	Unknown
6/30/2002	Perry	24	Unknown	Restaurant	Unknown
7/28/2002	Washington	6	Unknown	Restaurant	Unknown
7/28/2002	Davidson	12	Unknown	Catered event	Unknown
8/19/2002	Sullivan	26	Norovirus	Church	Unknown
10/4/2002	Hamilton	77	Norovirus	Restaurant	Salad
10/4/2002	Williamson	3	Norovirus	Restaurant	Unknown
10/5/2002	Hamilton	33	Norovirus	Catered event	Unknown
10/7/2002	Hamilton	7	Unknown	Restaurant	Unknown
10/11/2002	Shelby	21	Unknown	Restaurant	Unknown
10/17/2002	Bradley	8	Norovirus	Restaurant	Unknown
10/20/2002	Blount	17	*Salmonella* Typhimurium	Church	Unknown
10/24/2002	Morgan	64	*Clostridium* perfringens	Prison	Taco
11/7/2002	Henry	50	Norovirus	Community	Turkey/stuffing
11/20/2002	Rutherford	23	*Staph* aureus	Catered event	Potatoes
12/18/2002	Washington	3	Unknown	Restaurant	Unknown
12/19/2002	Washington	9	Unknown	Restaurant	Unknown
12/20/2002	Sullivan	3	Unknown	Restaurant	Unknown

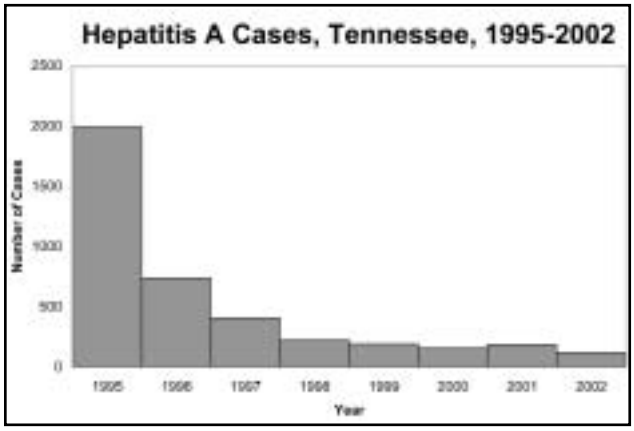
B. HEPATITIS

Hepatitis A

Hepatitis A (HAV) is an RNA virus from the family *Picornaviridae*. In most cases, the disease is acquired through the fecal-oral route, either via person-to-person contact or less commonly, through ingestion of contaminated food or water. Spread of the virus is enhanced by poor personal hygiene, improper sanitation, and overcrowding. Onset of illness in adults in nonendemic areas is usually abrupt with fever, malaise, anorexia, nausea, and abdominal discomfort. Jaundice follows in a few days. Over 70% of children six years or younger who acquire the virus are asymptomatic.

In the past four years, rates in the United States have fallen to historic lows. This may be due in part to widespread use of inactivated hepatitis A vaccine in Native American children and counties and states and in the western United States with high rates of disease. Because of the cyclic nature of hepatitis A outbreaks, it will take 5-10 years to see if these lower rates are sustained.

Since a major outbreak of hepatitis A in Memphis and Shelby County, which began in 1994, hepatitis A cases reported in Tennessee have continued to decline **(Figure)**. At the



peak of the outbreak in 1995, nearly 2000 cases were reported with about 1600 from Shelby County. In contrast, in 2002, only 122 cases were reported. The rate of hepatitis A in Tennessee as a whole for 2002 was 2.1, which is below the national average of 4.9 cases per 100,000 population.

Persons at elevated risk of HAV infection include the following: household contacts of infected persons, sexual contact of infected persons, persons (especially children) living in regions of the U.S. with consistently increased rates of hepatitis A, persons traveling to countries where hepatitis A is common, men who have sex with men, and injecting and non-injecting drug users.

Short-term protection against hepatitis A is available from immune globulin. It can be given before or within two weeks of exposure to HAV. One simple and inexpensive measure that decreases disease spread is thorough hand washing with soap and water after defecating, after changing a diaper, and before preparing and eating food.

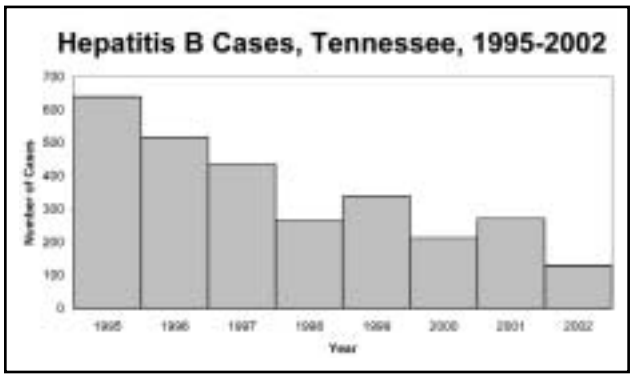
Hepatitis A vaccine is the best protection against disease. The vaccine is licensed for use in persons aged two years or older and is advised for the following: travelers to areas with increased rates of hepatitis A, men who have sex with men, injecting and non-injecting drug users, persons with clotting-factor disorders (e.g. hemophilia), persons with chronic liver disease, laboratorians who work with hepatitis A or with primates, and children living in regions of the United States with consistently increased rates of hepatitis A.

The FDA has licensed Twinrix, which is a hepatitis A/B combination vaccine for use in adults 18 years and older. Use of this vaccine in young adults who have not been vaccinated against hepatitis A or B will be helpful in protecting this group. The availability of a hepatitis A vaccine that is effective in infants and

can be incorporated into the routine childhood immunization schedule is needed to completely control hepatitis A in Tennessee and move closer to hepatitis A elimination in the United States.

Hepatitis B

Acute hepatitis B (HBV) case reports in Tennessee have decreased precipitously, from 640 in 1995 to 128 in 2002 **(Figure)**.



Tennessee hepatitis B rates of 2.2 per 100,000 are now lower than the 2000 United States rate of 2.8 per 100,000 people.

The Healthy People 2010 objective for hepatitis B rates for people aged <25 years is 0. In 2002, Tennessee had 29 cases of hepatitis B in people aged < 25 years. Males accounted for 60.9% of the caseload and females for 39%. Race-specific rates were four times higher in blacks than in whites (5.1 vs. 1.3 per 100,000). Areas reporting the highest case rates of hepatitis B per 100,000 in 2002, in descending order were Shelby County (5.0), Hamilton County (3.9), and East Tennessee Region (3.7).

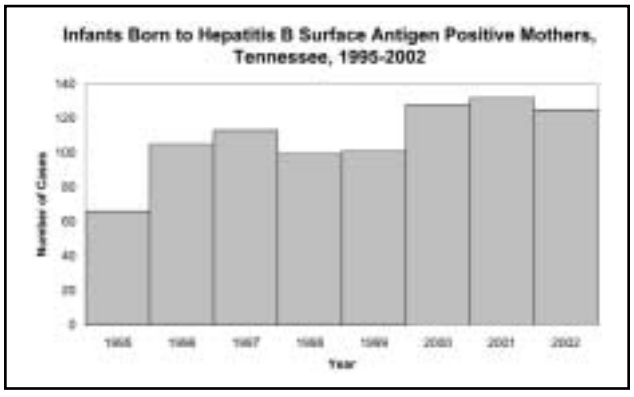
While there is no cure for hepatitis B, it can be prevented. Vaccination with hepatitis B vaccine is the most effective means of preventing HBV infection and its consequences. The vaccine is administered in three doses: the initial dose, followed in one month by dose two, with the final dose given at 6 months. The first dose of vaccine can be administered as early as the day of birth.

Perinatal Hepatitis B

Children born to hepatitis B surface antigen (HBsAg) positive women are at high risk of becoming chronic carriers for hepatitis B. If these children are administered hepatitis B immune globulin (HBIG) and hepatitis B vaccine at birth, their chances of being protected from the illness are greatly increased.

Tennessee Code Annotated 68-5-602 (a) requires that all women in Tennessee be tested for hepatitis B during the prenatal period, and that positive test results be passed on to the delivering hospital and the health department. A woman with no test results at delivery is to be tested at that time. The law requires that an infant born to an HBsAg positive mother receive in a timely manner, the appropriate treatment as recognized by the Centers for Disease Control and Prevention.

The **figure** shows the number of infants reported as being born to an HBsAg positive mother. The Tennessee Department of Health receives

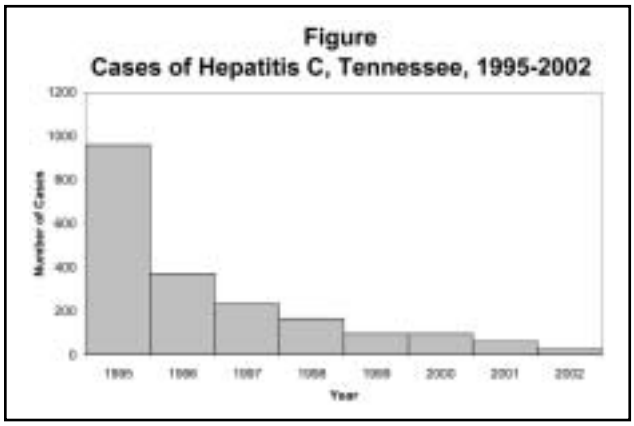


the test results and counsels all women who are reported as HBsAg positive. The department also identifies and treats their contacts, confirms that the information is in medical records, insures that the delivering hospital has a record of the mother's status, and that it has HBIG and vaccine available.

Hepatitis C

The number of new hepatitis C (HCV) infections per year in the U.S. declined from an average of 240,000 in the 1980s to about 25,000 in 2001. Most new HCV infections are suspected to be due to illegal injecting drug use; transfusion-associated cases occurred prior to blood donor screening but now HCV occurs in less than one per million transfused units of blood. There are an estimated 3.9 million (1.8%) Americans infected with HCV, of whom 2.7 million are chronically infected.

As noted in the **figure**, reported cases of acute hepatitis C in Tennessee fell dramatically from



1995 to 1996 because guidelines for reporting only acute hepatitis C cases were widely distributed. The number of acute hepatitis C cases reported in Tennessee has continued to decline yearly since 1996.

Injecting drug users are at high risk for HCV. Other risky behaviors include sharing of personal care items that may have blood on them such as razors or toothbrushes. Noncommercial tattoo and body piercing are also high-risk behaviors because of the potential of hepatitis C infected blood on poorly sterilized instruments. HCV positive persons should not donate blood, organs, or tissue. Persons at risk for HCV might also be at risk for infection with hepatitis B virus (HBV) or human immune deficiency virus (HIV). Health care workers who handle needles or other sharps are at risk for HCV and HIV and should be vaccinated against hepatitis B.

To diagnose HCV, the EIA (enzyme immunoassay) test is done first to detect antibodies to HCV (anti-HCV). If this test is positive, it should be confirmed using the RIBA (recombinant immunoblot assay). The anti-HCV EIA alone does not tell whether the infection is new (acute), chronic (long-term) or past.

Long-term consequences of HCV infection are serious and include the following: 75-85% develop long-term infection; 70% may develop chronic liver disease; and 15% may develop cirrhosis over a period of 20-30 years. Less than 3% die from the consequences of long-term infection (liver cancer or cirrhosis).

There is no vaccine to prevent hepatitis C, thus it is a leading indication for liver transplants. Aspects of CEDS initiatives include informing high-risk individuals about the importance of screening for hepatitis C along with integrating hepatitis C prevention into ongoing HIV and sexually transmitted disease (STD) prenatal and counseling activities. Funding from CDC has been provided to educate medical providers, medical staff and field workers in Tennessee about HCV infection, epidemiology, transmission routes, risk factors, co-infection with HIV, disease outcomes, and prevention.

C. MENINGITIS/ENCEPHALITIS AND SEPTICEMIA

Active Bacterial Core Surveillance: The ABCs Program

One of the programs under the umbrella of the Emerging Infections Program is Active Bacterial Core Surveillance (ABCs). Active laboratory surveillance is conducted for invasive bacterial diseases due to pathogens of public health importance. For each case of invasive disease in the study population, a case report with basic demographic information is filed and, in most cases, bacterial isolates from a normally sterile site from patients are sent to CDC for further study. ABCs has been in place in Tennessee in the four major metropolitan areas (Chattanooga/Hamilton, Knox/Knoxville, Memphis/Shelby, and Nashville/Davidson) since 1988.

Objectives

- To determine the incidence and epidemiologic characteristics of invasive disease due to group A *Streptococcus*, group B *Streptococcus, Haemophilus influenzae, Neisseria meningitidis*, and *Streptococcus pneumoniae* in major metropolitan areas in Tennessee.
- To determine molecular epidemiologic patterns and microbiologic characteristics of public health relevance for isolates causing invasive infections from select pathogens.
- To provide an infrastructure for further research, such as special studies aimed at identifying risk factors for disease, post-licensure evaluation of vaccine efficacy, and monitoring effectiveness of prevention policies.

Pathogen Specific Objectives

Group A *Streptococcus* (GAS)

- To determine the distribution of serotypes, define the prevalence of new serotypes and determine the association between specific serotypes and disease severity.
- To determine the incidence of severe GAS disease and the potential risk of subsequent disease among household members.
- To identify potentially modifiable risk factors for community-acquired GAS infections and evaluate the relative importance of various underlying diseases as risk factors.

Group B *Streptococcus* (GBS)

- To provide health care workers with information about newly-published prevention guidelines.
- To determine the extent to which continuing cases of early-onset GBS disease are preventable through current prevention strategies.
- To identify serotypes responsible for disease in order to guide vaccine development.

Haemophilus influenzae

- To evaluate progress in the elimination of serotype b disease.
- To detect possible emergence of disease due to other capsular types.
- To determine possible preventable reservoirs of the bacteria.

Neisseria meningitidis

- To monitor trends in serogroup specific disease.
- To acquire baseline data in preparation for the availability of infant meningococcal conjugate vaccine.
- To evaluate trends in molecular subtypes and the emergence of antimicrobial resistance.

Streptococcus pneumoniae

- To track emerging antimicrobial resistance in pneumococcal isolates.
- To evaluate the impact the effectiveness of pneumococcal conjugate vaccines for infants on disease burden.
- To evaluate prevention among the elderly through the pneumococcal polysaccharide vaccine use.

Under the auspices of the ABCs program, a number of studies have been undertaken to reach some of the objectives listed above. They are in various stages of completion. An assessment of the effectiveness of current prenatal Group B *Streptococcus* screening guidelines was completed in 2002[1]. A multistate study to assess the field effectiveness of the new conjugate pneumococcal vaccine has been underway since 2000. This vaccine covers the seven most common pneumococcal serotypes causing invasive disease in children. In 2002 a pneumococcal preventability project was initiated. The purpose of the project is to assess the burden of invasive pneumococcal disease that could have been prevented had current adult vaccination recommendations been followed. The project will also examine the burden of fluoroquinolone resistance in the ABC's surveillance area.

Tennessee Unexplained Encephalitis Study (TUES)

Encephalitis, infection of the brain parenchyma, is a potentially devastating neurologic disease. Over 100 different viral, bacterial, fungal and parasitic agents have been associated with this syndrome, however in up to 85% of cases no pathogen is ever identified.[2] One reason for the high proportion of unexplained cases is the difficulty in culturing organisms causing encephalitis from cerebrospinal fluid (CSF). In the last decade, diagnostic tests targeting species-specific DNA sequences such as the polymerase chain reaction (PCR) have emerged as rapid, highly sensitive methods to detect pathogens in the central nervous system (CNS).[3]

In response to the development of these improved diagnostic methods, the Emerging Infections Program (EIP) initiated encephalitis surveillance at three sites. The Tennessee Unexplained Encephalitis Surveillance (TUES), begun in January 2000, was inaugurated to better characterize the epidemiology and microbiology of encephalitis. Cases of encephalitis are identified by passive surveillance through clinician referral. Criteria for enrollment include:

Altered mental status > 24 hours

At least one of the following:
- Fever
- Seizure
- Focal neurologic abnormality
- Abnormal neuroimaging study or EEG
- Cerebrospinal fluid pleocytosis

Cases <6 months of age and patients with severe immunocompromise are excluded. After study personnel obtain informed consent, physicians are asked to submit cerebrospinal fluid, acute and convalescent serum, nasopha-

1 Schrag SJ, Zell ER, Lynfield R, et.al. a population-based comparison of strategies to prevent early-onset group B Streptococcal disease in neonates. *N Engl J Med* 2002;347:233-9.

2 Nicolosi A, Hauser WA, Beghi E, Kurland LT. Epidemiology of central nervous system infections in Olmsted County, MN, 1950-1981. *J Infect Dis* 1986;154:399-408.

3 Tang YW, Hibbs JR, Tau KR, Qian Q, Skarhus HA, Smith TF, Pershing DH. Effective use of polymerase chain reaction for diagnosis of central nervous system infections. *Clin Infect Dis* 1999; 29:803-6.

ryngeal and rectal swabs, and brain tissue (if available). Specimens are tested for a number of core pathogens, with supplementary tests for less common pathogens performed as indicated by specific epidemiological factors or exposures. The testing protocol is listed in the **table** below.

(median age of 29 years). Cases were evenly divided among males and females, and the racial and ethnic distribution reflected state demographics. Cases were often critically ill: 57% required ICU care, 20% were comatose at the time of study entry, and 12% died within 3 months of study entry.

Core Testing Protocol for the TUES Study

Class	Agent	CSF PCR	NP PCR	Serology	Other
Viral					
	Herpes simplex virus	X			
	Epstein-Barr virus	X			CI
	Varicella zoster virus	X			
	Influenza A & B*	CI	X	X	
	Adenovirus	CI	X	CI	
	Parainfluenza 1-3*	CI	X		
	Parvovirus B-19	CI		X	
	Rotavirus*				Ag
	Arboviruses*				
	LaCrosse			X	
	Eastern equine			X	
	Western equine			X	
	St.Louis			X	
	West Nile			X	
Bacterial					
	Bartonella (Cat Scratch Fever)	CI		X	
	Chlamydia pneumoniae		X		
	Coxiella (Q-fever)			CI	
	*Ehrlichia**	CI		X	
	Mycobacterium tuberculosis	CI			
	Mycoplasma pneumoniae	X	X	X	
	Rickettsia rickettsia (Rocky Mountain Spotted Fever)*			X	
	Treponema (syphilis)				CI

CSF-Cerebrospinal fluid, NP-nasopharyngeal swab, *-Performed during appropriate season, CI-clinical indication (not done routinely), Ag-antigen

A total of 220 patients meeting the case definition for encephalitis have been enrolled into the study through December 2002. While the majority of cases were referred from acute care facilities in Tennessee, 20% lived in adjacent states, and 4% were from distant states. Cases ranged in age from 6 months to 84 years

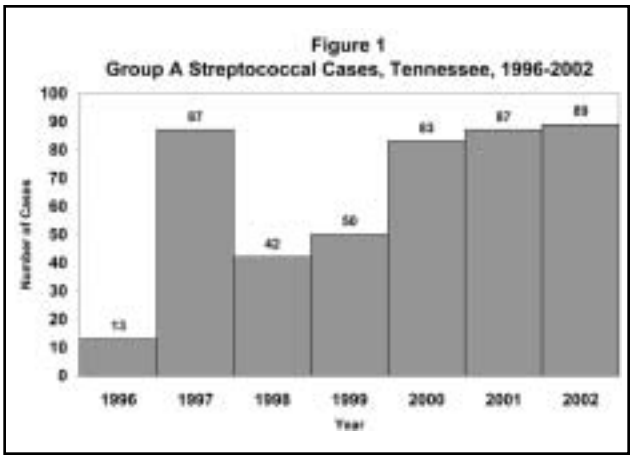
Diagnoses were classified as infectious, non-infectious, or unexplained. Infectious diagnoses were sub-classified based on standardized, organism-specific criteria as confirmed, probable, or possible. Of cases initially believed to represent acute encephalitis, 9% were ultimately diagnosed with a non-infectious

condition. Diagnoses for these cases included lymphoma, multiple sclerosis, vasculitis, mitochondrial disorders, cerebrovascular accidents, and psychiatric conditions. In 45% of cases, the cause of the encephalitis-like illness was not determined despite extensive testing. In one-third (35%) of cases, a confirmed or probable infectious etiology was identified. Of the confirmed or probable pathogens, viral agents accounted for 24% of cases. Organisms identified include HSV, EBV, VZV, LaCrosse virus, West Nile virus, rabies virus, parvovirus B-19, and rotavirus. Bacteria comprised 8%, with the most frequently identified agents being bartonella, rickettsia, and ehrlichia. Other infectious agents (fungal, parasitic, prion) were found in 1% of cases.

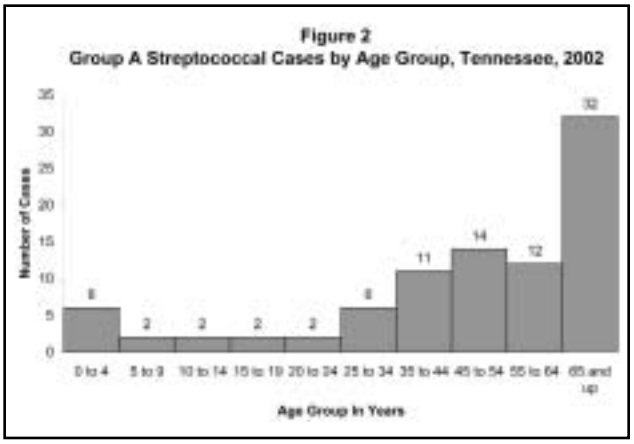
Results from the first three years of the study suggest that encephalitis is a relatively common and life-threatening syndrome. The range of pathogens causing this syndrome is broader than frequently appreciated in the literature, and includes many reportable and potentially treatable agents. PCR of spinal fluid appears to be a sensitive method for diagnosing herpes group viruses, but despite extensive molecular and serologic testing, no diagnosis is found in more in almost 50% of cases. To find out more about the TUES study, or to enroll a patient, please call the TUES Study Coordinators (Diane Levine or Delia Woods), at (615) 322-1519 or toll-free (877) 756-5800. Karen Bloch, MD, the Principal Investigator can be reached at (615) 222-6611.

Group A Streptococcal Disease

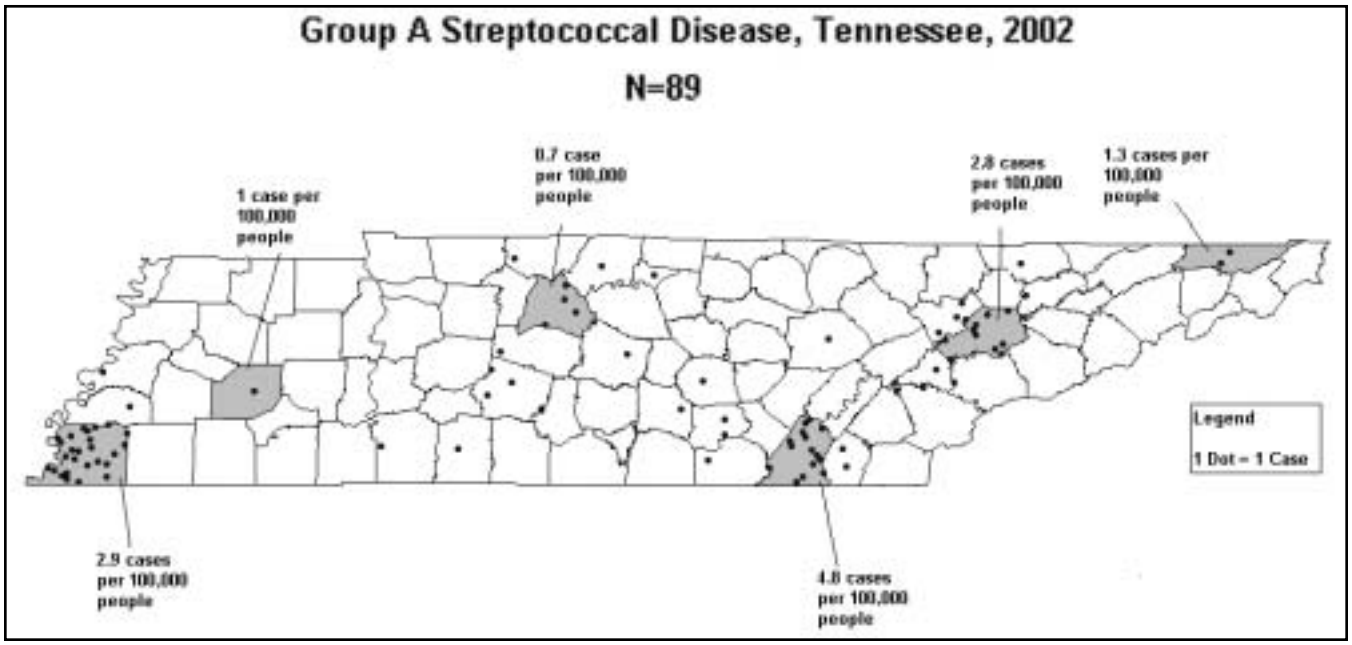
Group A streptococcal disease (GAS) reporting began in 1996 in Tennessee. Group A *Streptococcus* case reports in Tennessee increased dramatically from 1999 to 2000 and since then have remained fairly stable **(Figure 1)**. The group A streptococcal rate (1.5 per 100,000) was lower than the 2001 United States rate of 3.2 per 100,000 population. Nationally approximately 6% of invasive cases were classified as Streptococcal Toxic Shock Syndrome and 7% were necrotizing fasciitis (NF).



Tennessee data indicates Group A streptococcal cases were most frequent in persons aged 65 and over (4.5 cases per 100,000 people) **(Figure 2)**. The older adult age group exhibited the greatest increase from 1999 to 2000 (nearly 62%) and has continued to change with a 31% increase in cases from 2001 to 2002.



As depicted in the **map**, GAS rates in the metro areas ranged from less than 1 case per 100,000 people to almost 5 cases per 100,000 people. Nashville/Davidson County had the lowest rate of any metro area at



0.7 per 100,000 people. The rate in Chattanooga/Hamilton County was 5 times greater (4.8 per 100,000 people). Group A streptococcal cases in rural regions were more frequent in the Middle Tennessee area. The South Central region had the highest rate (2.3 cases per 100,000 people) of GAS among the rural regions.

The diseases of STSS and NF occur more often among persons infected with GAS serotypes M-1 and M-3, which are toxin-producing strains. Over 10 million noninvasive GAS infections (primarily throat and skin infections) occur annually in the United States.

GAS invasive disease occurs primarily among the elderly, the immunosuppressed, and those with chronic cardiac or respiratory disease, and diabetes. Persons with skin lesions (i.e. children with varicella) and injecting drug users are other groups at risk for GAS. Blacks (3 cases per 100,000 people) are more often affected than whites (1 case per 100,000 people).

There has been national passive surveillance for GAS invasive infection and STSS since 1999. Active laboratory-based surveillance for invasive GAS is conducted within the nine states that are participating in the Emerging Infection Program (total population: 36 million).

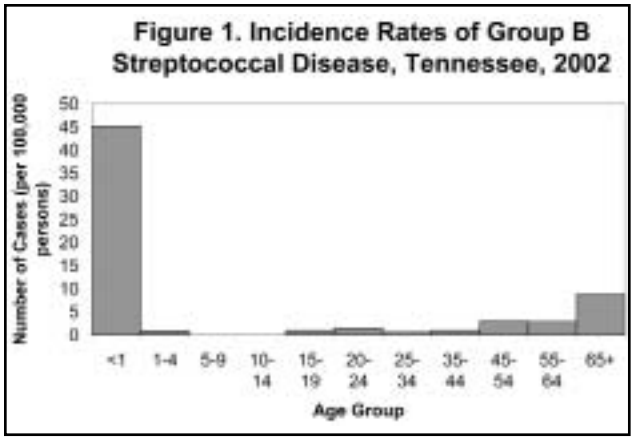
Worldwide, rates of GAS invasive disease, STSS, and NF, increased from the mid-1980s to early 1990s. Increases in the rate and severity of GAS invasive disease are associated with increases in the prevalence of M-1 and M–3 serotypes. CDC development of a new genotyping system for GAS isolates (*emm* typing) allows better strain identification. Investigating clusters of disease will help to identify interventions that can help to prevent the spread of infection. A CDC-sponsored work group recently published guidelines for the infection control/health department response to post-partum and post-surgical GAS cases.[1]

[1] The Prevention of Invasive Group A Streptococcal Infections Workshop Participants. Prevention of invasive group A streptococcal disease among household contacts of case patients and among postpartum and post surgical patients: recommendations from the Centers for Disease Control and Prevention. *Clin Infect* Dis 2002; 35:950-9.

Group B Streptococcal Disease

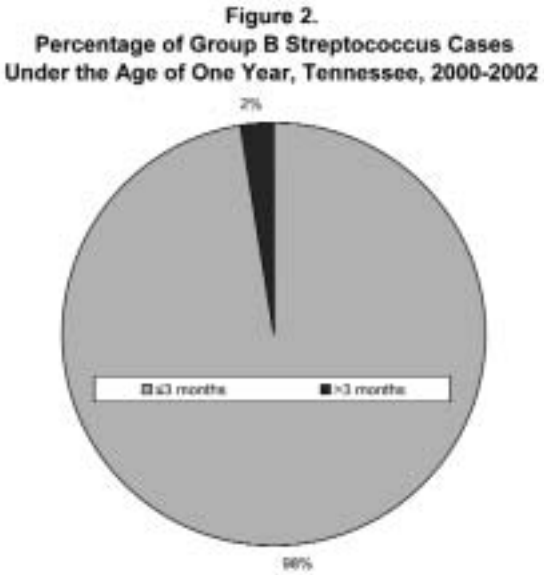
Group B Streptococcus (GBS) is an infectious disease caused by the bacteria *Streptococcus agalactiae*. It emerged as the leading infectious cause of neonatal morbidity and mortality in the United States in the 1970s. The requirement to report GBS cases in Tennessee did not begin until 2000: that year only 87 cases were reported. In 2002, however, that number nearly doubled to 164.

Those persons at greatest risk of developing infection are newborns, pregnant women, those over the age of 65 and adults with underlying illnesses, such as diabetes mellitus and/or liver disease. The rate of disease is highest for those under the age of one, representing 45.2 cases per 100,000 persons, followed by those over the age of 65 at a distant second, with 8.8 cases per 100,000 persons **(Figure 1)**.



Infection in newborns is classified into two distinct categories: early onset disease (0-6 days) and late onset disease (7 days to several months). Early onset disease is characterized by sepsis, respiratory distress, apnea, shock and pneumonia. The case fatality rate among this group is 50%. Infection is either acquired *in utero* or during delivery. Newborns delivered at less than 37 weeks gestation are more likely than full-term infants to develop early onset disease.

In contrast, late onset disease is characterized by sepsis and meningitis. This type of disease is not as fatal as early onset disease, with a case fatality rate of 25%. Infection is usually caused by person-to-person contact and occurs more frequently in full-term infants. Ninety-eight percent of GBS cases among infants occur prior to three months of age **(Figure 2)**. In 2002, all of those cases reported under the age of one were three months of age or younger.



Infection with GBS in adults is more often systemic, especially for those with other underlying illnesses. As shown in **Figure 1**, rates of disease begin to increase among those ages 45-54 to 2.9 cases per 100,000 persons, and continue to do so through the upper ages.

In 2002, the recommended guidelines for screening for GBS in pregnant women changed **(table)**. It is now recommended that all pregnant women be screened for vaginal and rectal GBS colonization between 35 and 37 weeks gestation. Colonized women are then offered antibiotics at the time of labor.

Group B *Streptococcus* is one of the five pathogens under active laboratory surveil-

lance in Tennessee under the auspices of the Active Bacterial Core Surveillance (ABCs) program, a division of the Emerging Infections Program.

Differences and similarities between current and previous guidelines

Following are major differences in the new guidelines:

- Recommendation of universal prenatal culture-based screening for vaginal and rectal GBS colonization of all pregnant women at 35-37 weeks' gestation
- Updated prophylaxis regimens for women with penicillin allergy
- Detailed instruction on prenatal specimen collection and expanded methods of GBS culture processing, including instructions on susceptibility testing
- Recommendation against routine intrapartum antibiotic prophylaxis for GBS-colonized women undergoing planned cesarean deliveries who have not begun labor or had rupture of membranes
- A suggested algorithm for management of patients with threatened preterm delivery
- An updated algorithm for management of newborns exposed to intrapartum antibiotic prophylaxis

Although important changes have been instituted, many recommendations remain the same:

- Penicillin remains the first-line agent for intrapartum antibiotic prophylaxis, with ampicillin an acceptable alternative.
- Women whose culture results are unknown at the time of delivery should be managed according to the risk-based approach; the obstetric risk factors remain unchanged (i.e., delivery at <37 weeks' gestation, duration of membrane rupture >18 hours, or temperature >100.4ºF [>38.0ºC]).
- Women with negative vaginal and rectal GBS screening cultures within 5 weeks of delivery do not require intrapartum antimicrobial prophylaxis for GBS even if obstetric risk factors develop (i.e., delivery at <37 weeks' gestation, duration of membrane rupture >18 hours, or temperature >100.4ºF [>38.0ºC]).
- Women with GBS bacteriuria in any concentration during their current pregnancy or who previously gave birth to an infant with GBS disease should receive intrapartum antimicrobial prophylaxis.
- In the absence of GBS urinary tract infection, antimicrobial agents should not be used before the intrapartum period to treat asymptomatic GBS colonization.

Source: CDC. Prevention of perinatal group B streptococcal disease: Revised guidelines from the CDC. MMWR 2002;51[RR-11]:1--22.

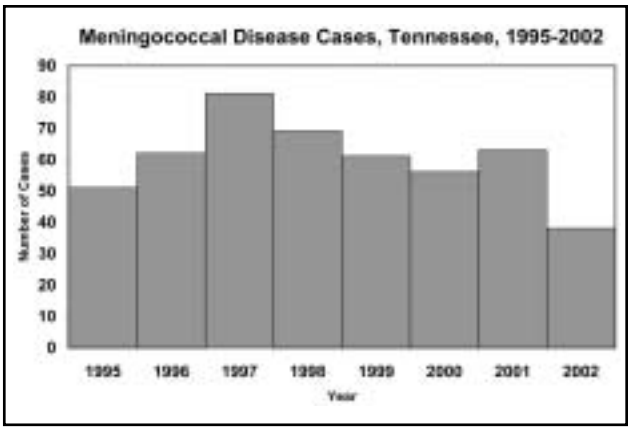
Meningococcal Disease

Meningococcal disease is a bacterial infection caused by *Neisseria meningitides* that may result in meningitis or sepsis. A case is confirmed by a positive antigen test of cerebrospinal fluid (CSF), clinical purpura fulminans or a positive blood or CSF culture. Clinical features include fever, headache, and stiff neck in meningitis cases, and sepsis and rash in meningococcemia. Approximately 10-15% of meningococcal disease cases are fatal. Of the patients who recover, 10-15% have permanent hearing loss or other serious sequelae.

Transmission generally occurs through direct contact with respiratory secretions from a nasopharyngeal carrier. Risk groups include infants and young children (for endemic disease), refugees, household contacts of case patients, military personnel, college freshman (who live in dormitories), and people exposed to active and passive tobacco smoke.

Surveillance for this disease is conducted worldwide through the National Electronic Telecommunication Surveillance System (NETSS), the National Bacterial Meningitis and Bacteremia Reporting System, and the Emerging Infection Program's Active Bacterial Core Surveillance (ABCs). Immediate reporting via telephone is required in Tennessee followed with a written report within one week. Serotyping of meningococcal isolates is performed routinely at the Tennessee Department of Health Laboratory.

The number of cases reported in Tennessee since 1990 has ranged from a low in 1992 of



36 cases to high in 1997 of 81 cases. Thirty-eight cases were reported in 2002 **(Figure)**. The trend in the U.S. is increased frequency of outbreaks and changes in distribution of serogroups responsible for endemic disease as well as increased disease among adolescents and young adults. A total of 38 isolates were sent to the Tennessee Department of Health Laboratory for serotyping in 2002. Of these, Group Y (10) was most frequent followed by Group C (8) and Group B (3). Serogroup Y accounted for 34% of the total isolates submitted in 1995. It increased to 41% in 1997, and declined in 2002 to 26%. However, it continues to be the most common serogroup over the past six years. The same trend has been observed throughout the United States.

Rabies

Rabid bats are of increasing interest since 90% of human rabies deaths in the United States over the past 20 years have been due to bat exposures. In 2002, a male from Franklin County, Tennessee, died from rabies caused by the rabies virus strain associated with silver-haired and eastern pipistrelle bats. The last human cases prior to 2002 were a Cumberland County female who died in 1994[1] and a female Kentucky resident who died in a Tennessee hospital in 1996.[2] These cases also tested positive for the rabies virus strain associated with silver-haired and eastern pipistrelle bats. Rabid bats can be found

[1] Centers for Disease Control and Prevention. Rabies-Alabama, Tennessee, and Texas, 1994. MMWR 1995;44:269-272.

[2] Centers for Disease Control and Prevention. Human rabies-Kentucky and Montana, 1996. MMWR 1997;46:397-400.

in any area of the state; the normal background rate of rabies in bats tested at the Tennessee Department of Health State Laboratory is less than 0.5%.

Skunk rabies remains the most common of the two variants of the rabies virus found in Tennessee, which include skunk and bat. **The table** depicts the total number of positive immunofluorescent antibody test by type of animal for 1995-2002. The **map** depicts the location of positive rabies tests by species in Tennessee in 2002.

Immunofluorescent Antibody Positive Animal Specimens, Tennessee, 1995-2001

Species	1995	1996	1997	1998	1999	2000	2001	2002
Skunk	82	80	135	127	79	88	98	76
Bat	7	12	8	5	10	15	11	27
Cat						1		
Cow	3			1				1
Dog	3	6	3	6	5	3	2	2
Fox	4	1	1	1	1			1
Goat				1				
Horse	1	1	2	1				
Raccoon								1
Total	**100**	**100**	**149**	**142**	**95**	**107**	**111**	**108**

Streptoccus pneumoniae Invasive Disease

Streptococcus pneumoniae is the leading cause of meningitis, pneumonia and otitis media in hospitalized patients. It is the second leading cause of bacteremia in the very young and very old; in these age groups, it produces serious invasive disease.

Because of alarming rates of drug resistance, the Tennessee Department of Health formed appropriate antibiotic use coalitions in Davison and Knox counties. These consist of members from physician groups, managed care organizations, hospitals, pharmaceutical companies, nurse practitioner groups, child-care centers and others interested in antibiotic resistance. The coalition's missions are to reduce inappropriate use and the spread of antibiotic-resistant bacteria that cause many upper respiratory illnesses. This mission is being accomplished through state and local

partnerships across Tennessee to further educate parents of young children and practitioners about the importance of appropriate antibiotic use. In addition, Tennessee's Appropriate Antibiotic Use Campaign encourages the use of the pneumococcal conjugate vaccine (Prevnar®) in young children. This vaccine is recommended for all children under two years of age and for children aged 2-5 with high-risk medical conditions.

In Tennessee, statewide routine reporting of invasive penicillin resistant pneumococcal disease began in 1996. In 2000, reporting expanded to include penicillin susceptible strains. As can be seen in **Figure 1**, the introduction of Prevnar® appears to be having a major impact in reducing the incidence of invasive pneumococcal disease in children aged 0-4 years.

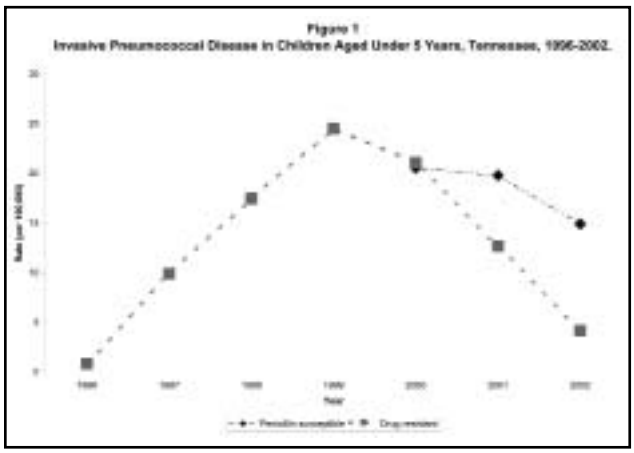
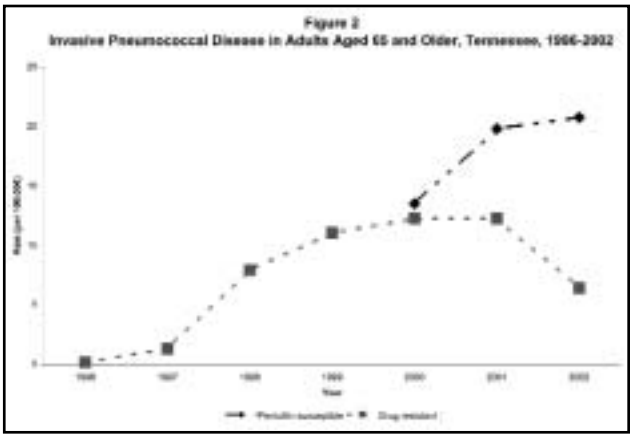


Figure 2 shows rates of invasive pneumococcal disease in adults aged 65 and older. The decrease in invasive disease due to drug resistant strains may be a secondary effect of

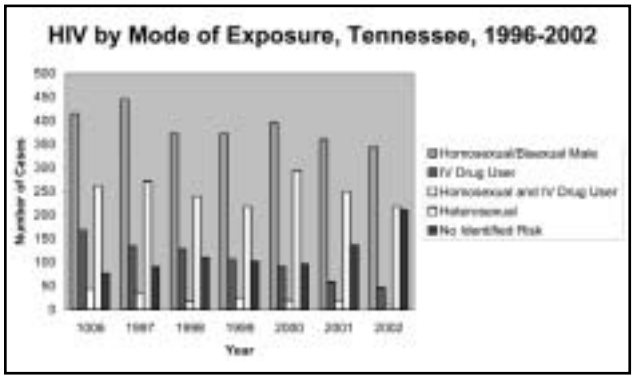


the Prevnar® vaccine—reducing the incidence of pneumococcal disease in young children may decrease transmission of *S. pneumoniae* from children to older adults. However, further efforts should be made to increase uptake of pneumococcal vaccination in the adult population.

D. SEXUALLY TRANSMITTED DISEASES

HIV (Human Immunodeficiency Virus)

In 1992, human immunodeficiency virus (HIV) infection became a reportable disease in Tennessee. From 1992 through 2002, the number of reported cases of newly diagnosed HIV, which includes only persons with HIV who have not developed AIDS, was 6,598. The number of persons reported to be living with HIV infection or AIDS in Tennessee through 2002 is 12,143. Historically, cases are assigned to the year of earliest reported diagnosis. The largest number of reported cases is among blacks. Males have more reported cases of HIV than females. The **figure** indicates that the highest risk of HIV infection is for

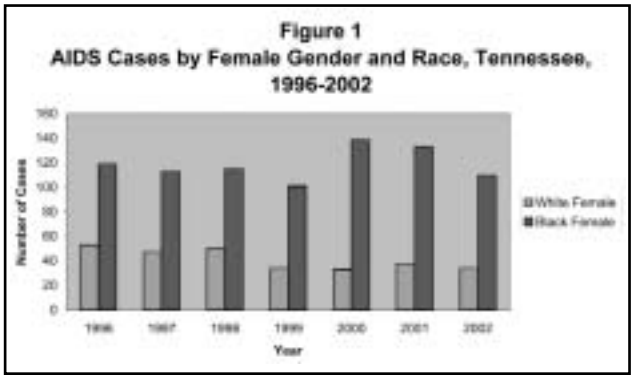


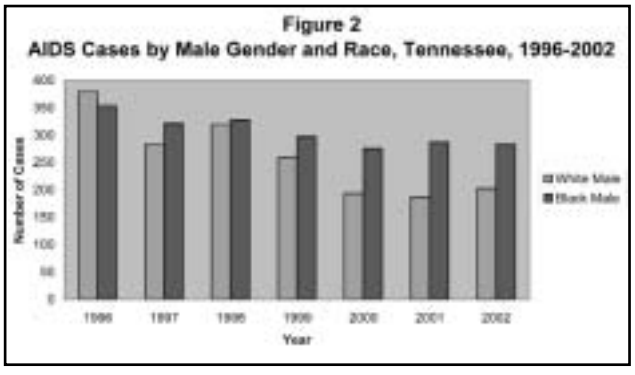
men having sex with men (MSM). The next highest risk behavior for adults is heterosexual contact with at risk individuals followed by intravenous drug use (IDU). A total of 78 infants were perinatally exposed to HIV in 2002; of these infants, 99% were exposed through their birth mothers and 1% exposed through other means.

The overall state HIV incidence rate per 100,000 in 2002 is 15.4. Department of Health regional HIV rates per 100,000 population are as follows: Northeast, 10.8; East, 4.2; Southeast, 3.3; Upper Cumberland, 2.9; Mid-Cumberland, 5.2; South Central, 4.6; West, 6.8; and the Metropolitan regions, 36.9. The counties with the highest reported incidence rates include, in descending order: Shelby (47.2), Davidson (29.9) and Washington (22.1).

AIDS (Acquired Immunodeficiency Syndrome)

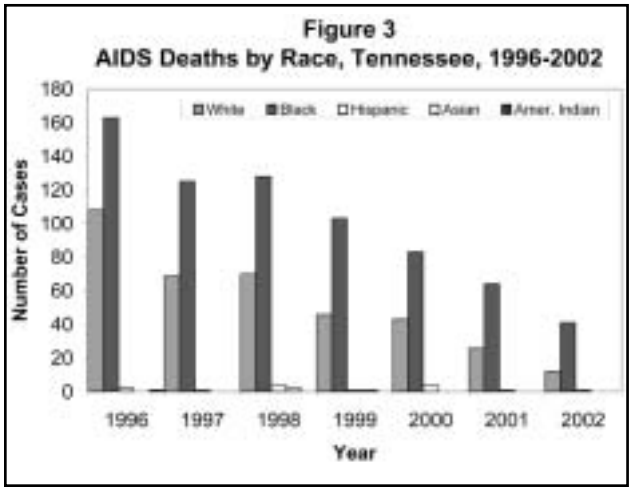
The total number of reported cases of acquired immunodeficiency syndrome (AIDS) in Tennessee from 1982 (the year AIDS data were first recorded) through 2002 is 6,419. These patients were initially reported as having AIDS-related symptoms, and do not include those patients with HIV infections who were later diagnosed with AIDS. The number of new cases of AIDS has decreased among whites, from 510 cases in 1995 to 252 cases in 2002. New AIDS cases among the black population have increased slightly from 415 in 1995 to 429 cases in 2002. **Figures 1 and 2** depict the changes in the number of cases





among females by race and among males by race. The total number of Hispanic cases diagnosed with AIDS in 2002 was 15. In general, males have higher rates of AIDS than females. The overall state AIDS incidence rate per 100,000 population in 2002 was 13.0. The

2001 rate within the United States was 14.9 The regional AIDS rates per 100,000 in 2002 are as follows: Northeast, 4.6; East, 4.2; Southeast, 4.7; Upper Cumberland, 3.9; Mid-Cumberland, 4.6; South Central, 4.3; West, 5.1; and the Metropolitan regions, 24.5. The counties with the highest incidence rates in 2001 include, in descending order: Shelby (37.7), Davidson (28.8), Haywood (20.2), and Hamilton (14.3). The number of deaths among patients with AIDS in 2002 was 65. The total number of deaths from complications related to AIDS, from 1982 through 2002 was 4,909. **Figure 3** depicts the overall decline in deaths. Highly active anti-retroviral therapy and other advances in medical treatments have been effective in prolonging the life of a person living with AIDS.



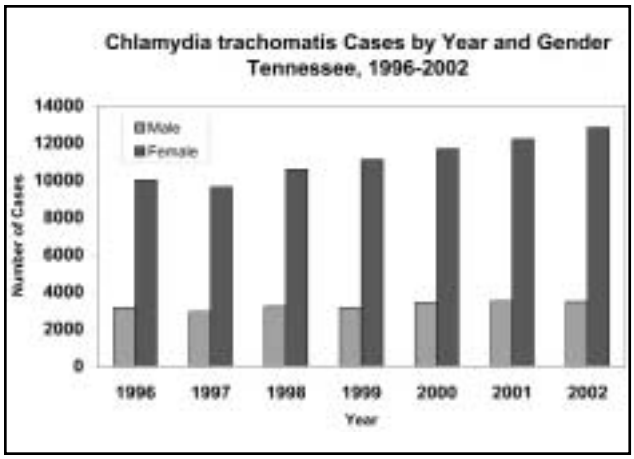
Pediatric HIV/AIDS Due to Perinatal Risk

From 1995 through 2002, 137 perinatally exposed infants were reported as being exposed to mothers with HIV infection and/or an AIDS diagnosis. The reporting of infants infected with HIV/AIDS peaked in 1993 with 15 infants. From 1995 to 2002, that number has remained fairly constant with five cases in 1995, to four in 2002. Due to reporting delays, there may be additional infants born during this time period that are infected with HIV/AIDS. However, current trends are encouraging and point to improved interventions including anti-retroviral agents used during pregnancy and labor, and improved medical care for women and their newborns.

Chlamydia

Infections due to *Chlamydia trachomatis* are among the most prevalent of all sexually transmitted diseases (STD). In women, these infections often result in pelvic inflammatory disease, which can cause infertility, ectopic pregnancy, and chronic pain. In addition, pregnant women infected with *Chlamydia* can infect their babies during delivery. *Chlamydia* became reportable in Tennessee in July 1987. In 1988, 1,880 cases were reported and the number of cases increased steadily through 1991, when 5,359 cases were reported. Cases increased modestly through 1994 when 6,787 cases were reported.

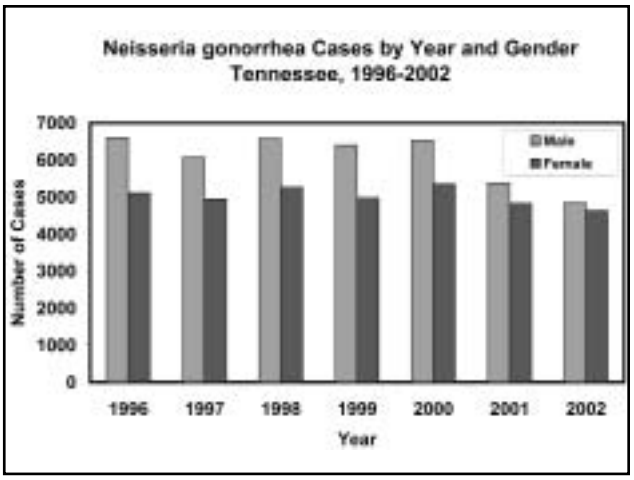
In 1995, a significant increase in state funding was made available for testing in STD and family planning clinics. As a result, 13,152 cases were reported in 1995, a 94% increase from 1994. This same level of funding was available in 1996 and 1997. In 1998, the introduction of funding for the Region IV Infertility Project led to a modest increase in testing each year through the present. As a result, the number of cases increased to 16,249 in 2002. Reported cases among patients aged 15- 19 years (6,330) and 20-29 years (7,966) represented 88% of the *Chlamydia* morbidity in 2002. Females comprised 79% of all reported cases; this reflects the fact that most *Chlamydia* tests are performed on women visiting family planning, maternity, and STD clinics **(Figure)**. In 2002, 34% percent of female morbidity was reported in black females and 36 percent in white females; 29% of all cases reported had no race category identified. Black females aged 15-19 years have the highest rate of infection



with 2,399 cases per 100,000 population. In 2002, screenings of just over 80,400 patients for *Chlamydia* in health department STD, prenatal, and family planning clinics, resulted in a range of 4% to 10% positivity rates in metropolitan areas and 4% to 6% positivity rates in rural areas. The overall statewide screening positive rate was 7%.

Gonorrhea

Infections due to *Neisseria gonorrhea* remain a major cause of pelvic inflammatory disease, infertility, ectopic pregnancy, and chronic pelvic pain. Epidemiologic studies provide strong evidence that gonococcal infections facilitate HIV transmission. Following a record high of 35,362 gonorrhea cases reported in 1976 (a rate of 817 per 100,000 population), the number decreased 73 percent to 9,480 cases in 2002 **(Figure)**. In Tennessee, 62% of all reported cases of gonorrhea in 2002 were black patients. The metropolitan regions of the state have consistently accounted for 79-85% of the state's morbidity during this time period. The 9,480 gonorrhea cases reported in 2002 represent an overall rate of 165 cases per 100,000 population. In contrast to the first half of the 1990s when cases decreased dramatically, the decrease in reported cases has been less striking in the past few years. In 2002, an overall decrease of 7% compared to 2001 was broadly based with decreases in half of the 95

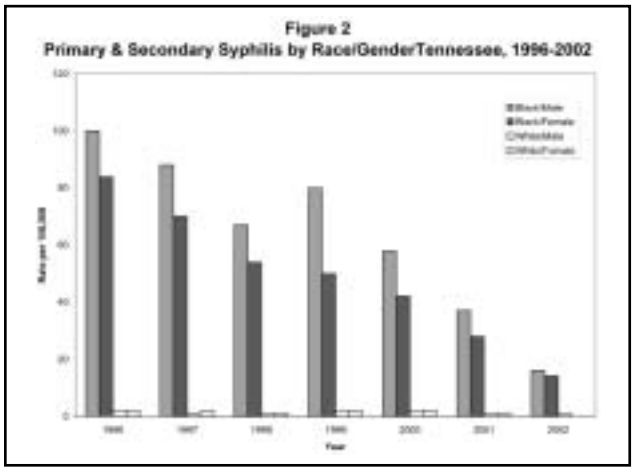


counties. The overall rate of 165 per 100,000 population was well above the *Healthy People 2010* national goal of 19. Among women, those aged 15-19 years had the highest rate (877 per 100,000) while men aged 20-29 had the highest rate (583 per 100,000). Screening of just over 80,400 patients for gonorrhea in health department STD, prenatal, and family planning clinics in 2002 detected a range of 2% to 11% positivity rates in metropolitan areas and 1% to 3% positivity rates in the more rural areas of the state. These screening activities are directed primarily at women, particularly those aged 15-19 years. Funding for screening activities undoubtedly plays a role in year-to year trends.

Syphilis

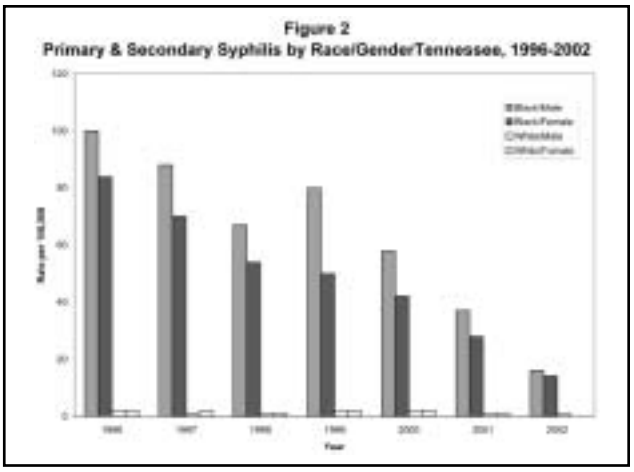
Most syphilis cases in Tennessee occur in large metropolitan areas. Six Tennessee metropolitan regions represent approximately 42% of the state's population; they account for 83% of the 557 cases of early syphilis (primary, secondary, and early latent) cases in 2002. These six metropolitan regions include the following: Chattanooga-Hamilton County, Jackson-Madison County, Knoxville-Knox County, Nashville-Davidson County, Memphis-Shelby County, and Sullivan County. In 2002 two metropolitan areas, Memphis and Nashville, reported 541 and 294 cases, respectively, or 77% of the state's total syphilis cases. The

seven rural regions comprise 58% of the state's population but accounted for only 10% of the early syphilis cases in 2001. Cases of early syphilis have decreased steadily in Tennessee since 1996 **(Figure 1)**. Early syphilis cases have been fairly evenly distributed by gender; however, syphilis rates among both male and female blacks are disproportionately high. For example, blacks make up 16% of the state's



population but consistently represent 80% or more of the reported cases. In 2002, the overall rate for primary and secondary syphilis within Tennessee was 19 cases per 100,000; the rate for blacks was 47. Since 1996, syphilis rates have decreased 63% to 6 cases per 100,000, and rates among blacks have decreased 66% to 31 cases per 100,000 **(Figure 2)**. In 1996, blacks aged 20-29 and 30-39 had rates of 211 and 198 per 100,000 respectively. By 2002, the rate for these groups had fallen 78 and 88 percent, to 47 and 23 cases per 100,000.

Despite the decrease in syphilis during the last several years in Tennessee, there is great concern that in 2001, two cities in the state ranked fourth and ninth among selected United States cities with populations >200,000 for reported rates of primary and secondary syphilis. Memphis, with a rate of 23.2 per 100,000 was ranked number 4; Nashville's rate per 100,000 was 13.3 and gave it a ranking of 9



on the list. Detroit, with a rate of 28.6 was ranked number 1, Atlanta, with a rate of 27.5 was ranked number 2, and Baltimore, with a rate of 24.7 was number 3. At the time of this printing, 2002 STD Surveillance Data was unavailable for the Centers for Disease Control and Prevention.

In 2002, 168 cases were diagnosed as primary or secondary syphilis, 389 as early latent (less than one year) syphilis, 508 were late or latent cases, and 11 were congenital cases. Statewide, the 168 primary and secondary cases combined represent a rate of 2.9 cases per 100,000 population, greater than, but within reach of, the Healthy People 2010 national objective of 0.2 cases per 100,000.

On October 8, 1999, the National Syphilis Elimination Campaign was inaugurated in Nashville. Nashville/Davidson County, Memphis/Shelby County, and the Tennessee Department of Health State Laboratory received federal funds to begin highly focused efforts to reduce the rates of this disease through early detection and treatment. These ongoing efforts are credited with helping decrease syphilis rates throughout Tennessee.

E. VACCINE-PREVENTABLE DISEASES

Vaccine-Preventable Disease

One of the most powerful public health tools available in the United States is vaccination, with its ability to eliminate or control vaccine-preventable diseases. Today the childhood immunization schedule recommends that all children in the United States be protected against eleven preventable, potentially crippling diseases. The incidence of some of these diseases in Tennessee has declined to the point that some of them are medical rarities. For example, since 1995, there have been only three cases of measles and five cases of rubella in Tennessee, all of which occurred in individuals who were not immunized. There were no cases of *Haemophilus influenza* B in this same time period.

The 2003 Childhood and Adolescent Immunization Schedule is presented at the end of the section; it can also be accessed at www.cdc.gov/nip. This is the website of CDC's National Immunization Program and it contains valuable information for both clinicians and the lay public about this important public health resource.

Childhood Immunization Levels

Since 1983, the Tennessee Department of Health has conducted an annual survey of the immunization status of Tennessee's children at their second birthday, the longest running survey of its type in the nation. The survey is a statistically valid sample of resident births and is further refined by creating a valid sample for each of the Department's thirteen regions. This year's survey results are based on a sample of 1,466 children. Records are considered valid only if there is written documentation of immunization. Completion rates are based on 4 doses of DTaP/DT, 3 doses of polio, and 1 dose of MMR. This standard is used to allow comparisons with previous surveys.

From 2001 to 2002, the overall completion rate decreased to 85.6%, a 3% decline. The decrease was noted in most areas of the state and in most of the sub-groups that are typically examined. The most significant declines were observed in TennCare enrollees and in African-Americans. Since January 2000, the nation has endured periodic and widespread shortages of most childhood vaccines, including MMR, varicella, pneumococcal, Td, DT, and DtaP vaccines. The continuing vaccine shortages experienced over the past two years had a noteworthy effect on completion rates. Follow up surveys by health department staff found children in all parts of the state who were unable to receive at least one dose of vaccine at the time of an immunization visit due to the shortage.

Completion Rates by Region

As the table below depicts, the highest completion rates in 2002 were in the South Central Region where 94.5% of the children were complete by their second birthday. This region includes the following counties: Bedford, Coffee, Giles, Hickman, Lawrence, Lewis, Lincoln, Marshall, Maury, Moore, Perry, and Wayne. The second highest rates were observed in Nashville/Davidson County, which reported a completion rate of 90.5%. The largest increase in rates was seen in the Southeast Region (the area around Hamilton County), which experienced a 9% increase over 2001 results. Only two regions, Shelby County and Mid-Cumberland (the suburban counties around Nashville) reported decreases of greater than 5%. However, these two regions represent almost 20% of the state's population and thus have a significant impact on the overall rates.

TennCare Status

TennCare enrollees have traditionally had lower immunization completion rates than pri-

vately insured children although the gap had narrowed in recent years. The 2002 Immunization Survey results revealed that the completion rates for TennCare enrollees were 81.8%; a decline of almost 5% from what was observed in 2001. The rates for privately insured children remained essentially the same as in 2001, 90.8%. As mentioned previously the effect of the vaccine shortage was most dramatically felt in the TennCare population. Regardless of their source of immunization (health department, private physician, or a combination of the two), TennCare enrollees had lower completion rates than children who were not dependent on publicly purchased vaccines.

Race

The completion rates among African-American children declined in 2002 to 78.2%, significantly lower than whites which were 87.4%. This is the largest gap between black and white completion rates in the past five years. The vaccine shortages, discussed previously, affected the African-American population disproportionately, given their higher percentage enrollment in TennCare. African-Americans comprises 16% of the state's population (2000 census) but constitute almost 33% of TennCare enrollees. The completion rates for other nonwhite racial groups, although high, represent a small (2%) portion of the population and have very little effect on overall completion rates.

Pertussis

Pertussis (whooping cough) is an acute infectious disease caused by the bacterium *Bordetella pertussis*. In the 20th century, pertussis has been one of the most common childhood diseases and a major cause of childhood mortality in the United States. Pertussis is primarily a toxin-mediated disease. The bacteria attach to the respiratory cilia, produce toxins that paralyze the cilia, and cause inflammation of the respiratory tract, thus interfering with the clearing of pulmonary secretions and potentially causing pneumonia.

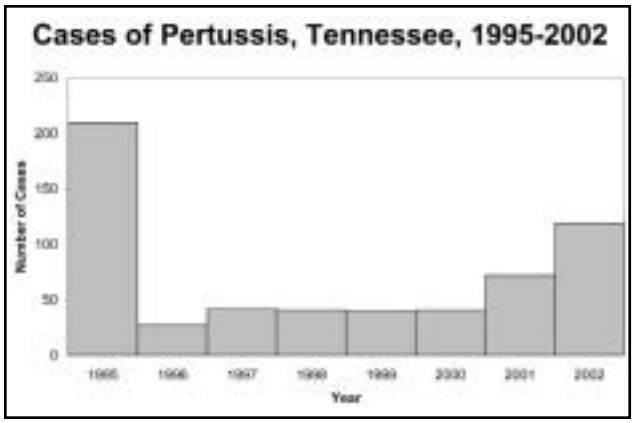
Immunization Completion Rates By Region Tennessee, 2002

Region	% Complete
Northeast	87.3%
East	81.2%
Southeast	87.5%
Upper Cumberland	84.6%
Mid Cumberland	82.7%
South Central	**94.5%**
West Tennessee	84.8%
Shelby Co.	76.4%
Davidson Co.	90.5%
Knox Co.	88.6%
Hamilton Co.	86.5%
Madison Co.	88.3%
Sullivan Co.	83.3%
STATE	85.6%

Children are the most frequent age group with reported pertussis. From 1985–2000 in the United States, 39% of reported cases were among children aged <1 year, and 54% were among children aged <5 years.

In Tennessee during 2002, there were 119 cases of pertussis reported. Of those cases, 56 were <1 year old (47%) and 74 were <5 years old (62%). Pertussis cases in Tennessee have increased since 2000, but are still well below the peak year of 1995 when there were 210 cases **(Figure)**. In recent years, the surveillance system has reflected an increase in the incidence of pertussis in all age groups, most notably among adolescents and adults.

No pertussis-containing vaccine is licensed for persons >6 years of age. Studies are currently underway to determine if a booster dose of



acellular pertussis vaccine administered to older children or adults may reduce the risk of infection with *B. pertussis*.

Adult pertussis has long been thought to be the source of most disease in infants and young children in this country. With the advent of more sophisticated laboratory techniques, cases that were previously only suspected are now being identified. The cause of this is the gradual loss of the immunity to disease that virtually all children have after they are vaccinated. The waning of vaccine acquired immunity generally begins in adolescence, about ten years after the last childhood dose of vaccine is given. By the early to mid-twenties, most of the population is without effective immunity. Because adult pertussis is often not clinically severe, many individuals do not seek medical attention for it, or if they do it is only after several weeks of coughing. This facilitates its spread in the community, and in the home or health care setting, its spread to young children. While the actual disease burden in adults is unknown, CDC estimates that 25% of non-productive coughs lasting more than 10 days may be due to pertussis. Advances in the laboratory diagnosis of pertussis have enabled more cases of adult disease to be identified than was the case with the smear and culture techniques that confirmed cases in the past.

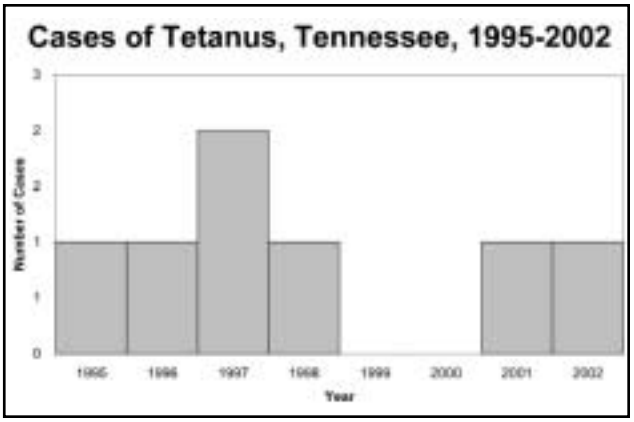
An adult formulation of pertussis vaccine is in the development stage. This vaccine, which will likely be given as a booster every ten years with the Td vaccine, should eventually eliminate pertussis in the adult population. It is only when the adult reservoir of infection is adequately addressed that pertussis can be eliminated.

Tetanus

Tetanus is an acute, often fatal, disease caused by an exotoxin produced by *Clostridium tetani*. It is characterized by generalized rigidity and convulsive spasms of skeletal muscles. The muscle stiffness usually involves the jaw (lockjaw) and neck and then becomes generalized.

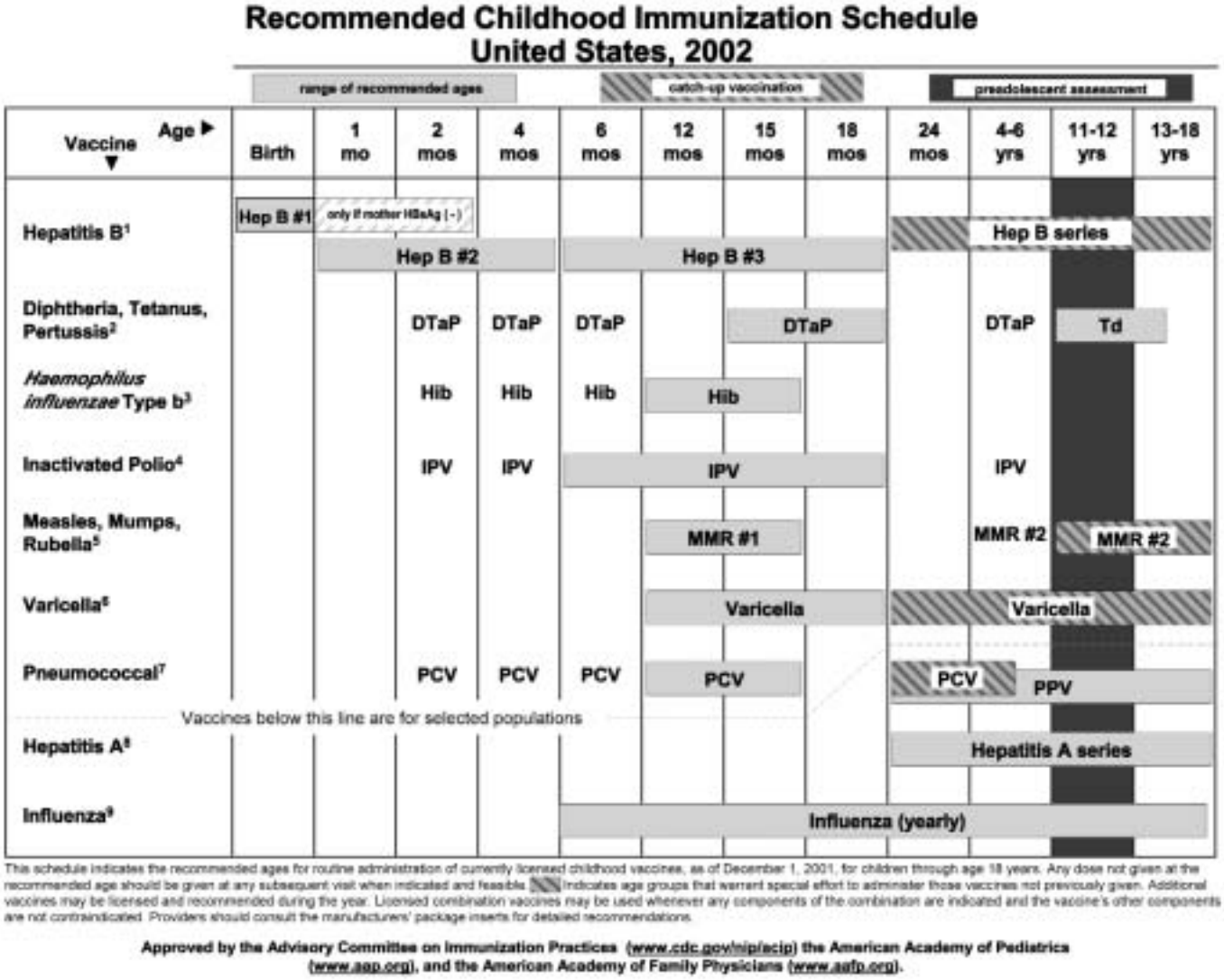
C. tetani produces spores which are widely distributed in soil and in the intestine and feces of horses, sheep, cattle, dogs, cats, rats, guinea pigs, and chickens. *C. tetani* usually enters the body through a wound. Almost all reported cases of tetanus are in persons who have either never been vaccinated, or who completed a primary series but did not have a booster in the 10 years preceding the infection.

In Tennessee, as shown in the **figure**, the number of tetanus cases have ranged from one each in 1995, 1996, 1998, and 2001 and 2002, to a high of two in 1997. There were



no cases in 1999 and 2000. A case in 2001 occurred in a 69-year-old male who suffered a significant wound to his foot while gardening with no history of tetanus vaccination during his adult life. He did not seek medical attention at the time of injury and developed symptoms consistent with tetanus within 11 days. He was hospitalized and died after a brief illness. The 2002 case was in a 57 year-old indigenous female who did not know her immunization history. She cut her finger on a shaving razor and eight days later developed symptoms consistent with tetanus. With administration of tetanus immunoglobulin and ventilatory assistance, she made a full recovery.

Today tetanus is uncommon in the United States and Tennessee. The current recommendation for protection from tetanus is a primary series of DTaP/DT/Td and a booster dose every 10 years (every 5 years for those who work with horses). Adherence to this schedule induces protection against disease that approaches 100% immunity.



This schedule indicates the recommended ages for routine administration of currently licensed childhood vaccines, as of December 1, 2001, for children through age 18 years. Any dose not given at the recommended age should be given at any subsequent visit when indicated and feasible. Indicates age groups that warrant special effort to administer those vaccines not previously given. Additional vaccines may be licensed and recommended during the year. Licensed combination vaccines may be used whenever any components of the combination are indicated and the vaccine's other components are not contraindicated. Providers should consult the manufacturers' package inserts for detailed recommendations.

Approved by the Advisory Committee on Immunization Practices (www.cdc.gov/nip/acip) the American Academy of Pediatrics (www.aap.org), and the American Academy of Family Physicians (www.aafp.org).

F. VECTOR-BORNE DISEASES

Arboviral Disease

Two arboviral diseases are currently prevalent in Tennessee: La Crosse encephalitis and West Nile fever.

La Crosse Encephalitis

The California serogroup viruses (Bunyaviridae) contain several antigenically similar arthropod-borne viruses that may cause human disease. La Crosse virus, the most medically significant of the California serogroup viruses in the United States, was initially discovered in 1963 in La Crosse, Wisconsin. From 1963 to 1996, a total of nine cases of La Crosse virus encephalitis were reported in Tennessee. In 1997, a cluster of ten cases was recognized in eastern Tennessee; since then, that number has ranged from a high of 19 in 2000 to a low of six in 1999 **(Table 1)**. Disease occurs primarily from late May through October with peak transmission in August **(Figure)**. As the **map** (next page) depicts, the traditional endemic foci of the disease have been in the Great-Lakes states, but an increase in case incidence has been detected in the Mid-Atlantic states in recent years.

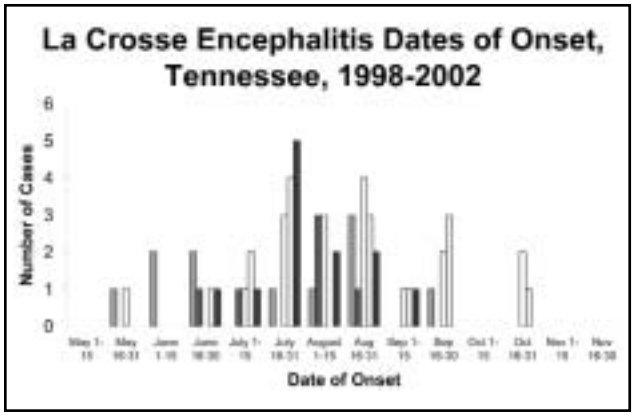
La Crosse virus primarily circulates between small vertebrate hosts (eastern chipmunks, squirrels, and foxes) and the primary vector, *Ochlerotatus triseriatus* (eastern tree hole mosquito). The Asian tiger mosquito, *Aedes albopictus*, is an exotic species that was initially introduced into the US in 1985. By 2000, it could be found in approximately 26 states. *Aedes albopictus* was first detected in eastern Tennessee in 1997. *Aedes albopictus* is a competent vector of La Crosse virus. In 1999, the virus was isolated from mosquitoes reared from field- collected *Aedes albopictus* eggs in east Tennessee. Subsequent ecological studies have suggested that the *Aedes albopictus* burden near childrens' homes may be associated with La Crosse encephalitis in eastern Tennessee. The dramatic increase in La Crosse cases in Tennessee since 1996 has coincided with the arrival of *Aedes albopictus* in the eastern Tennessee region, suggesting that this mosquito may become an important vector for the disease, potentially increasing the number of human cases in endemic foci or expanding the range of the disease.

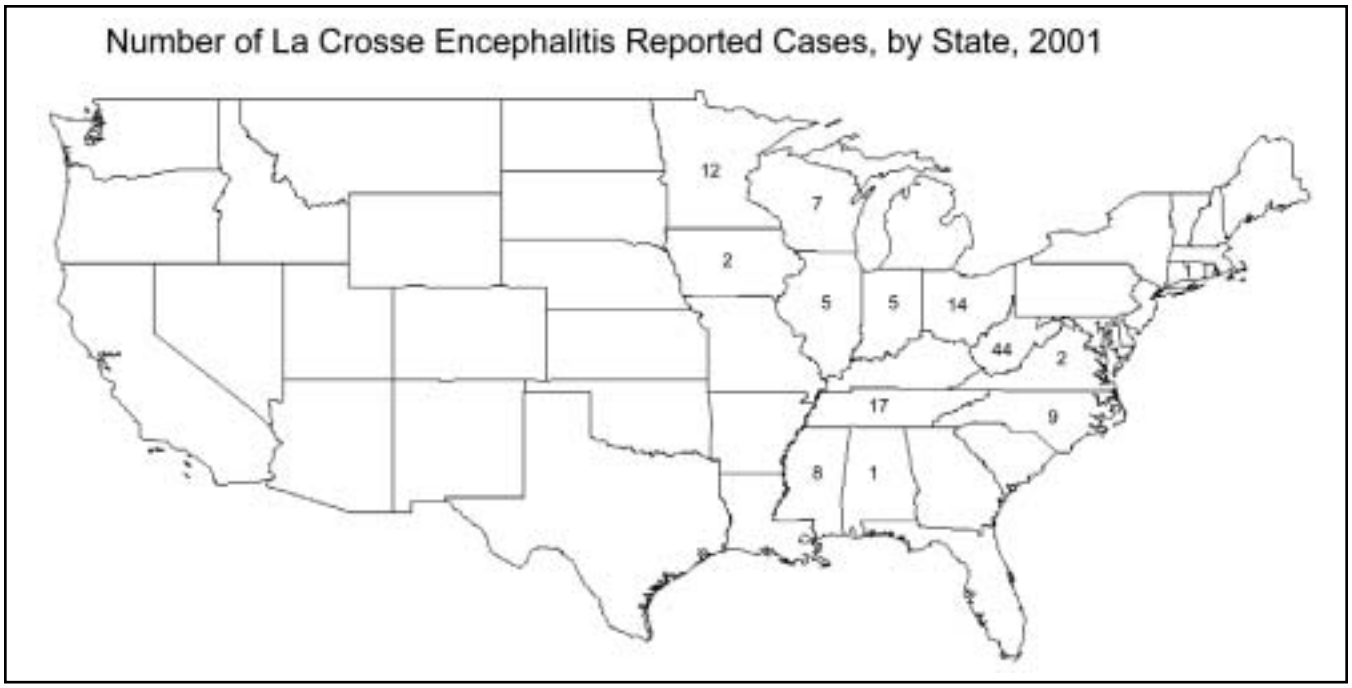
La Crosse virus can result in mild to severe infections and rarely death (cases fatality<1%). The ratio of inapparent to apparent infections may range from 26:1 to over 1500:1. A

Table 1. Reported Cases and Incidence Rates per 100,000 Population of La Crosse Encephalitis, 1995-2002 in Tennessee and the United States

	1995		1996		1997		1998		1999		2000		2001		2002	
	No.	IR	No.	IR	No.	IR	No.	IR	No.	IR	No.	IR	No.	IR	No.	IR
TN*	-	0	1	0.02	8	0.15	9	0.17	6	0.11	19	0.33	17	0.3	15	0.26
US**	11	#	123	#	129	#	97	0.04	70	0.03	114	0.04	128	0.05	NA	NA

NA=2002 Notifiable Diseases is not not compiled
# Not nationally notifiable
* 2002 Data
** 2001 Data





diagnosis of La Crosse infection can be confirmed by demonstration of a four-fold or greater change in virus-specific antibody between acute and convalescent sera.

Approximately 82% of the La Crosse cases reported in Tennessee in 2002 were children between the ages of 1-14 years **(Table 2)**. Tennessee had the second highest number of La Crosse cases in the United States in 2001. Since 1996, approximately 90% of the cases have occurred in the east Tennessee region, Knoxville/Knox County, and the Upper Cumberland region.

People can reduce their risk of mosquito-borne diseases by wearing insect repellents containing DEET. Reducing stagnant water sources around the home can reduce exposure to mosquitoes. Since the primary mosquito vectors of the disease develop in small containers and are active during the day, use of adulticides is not generally effective for preventing La Crosse transmission.

La Crosse infection should be considered in patients (particularly children) with fever and signs or symptoms of central nervous system infection (aseptic meningitis or encephalitis), presenting during summer months in Tennessee. Treatment is supportive. The diagnosis can be confirmed by demonstrating a four-fold or greater change in serum antibody titer between acute and convalescent specimens, or enzyme immunoassay antibody capture in CSF or serum. Antibody testing is

Table 2. Reported Cases and Incidence Rates per 100,000 of La Crosse Encephalitis in Tennesssee (2002) and the United States (2001)

	<1 year		1-4 years		5-14 years		15-24 years		25-39 years		40-64 years		>65 years	
	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate
TN*	0	0	3	0.98	10	1.25	0	0	2	0.16	0	0	0	0
US**	6	0.16	18	0.12	90	0.22	4	0.01	4	0.01	4	0	2	0.01

* 2002 Data
** 2001 Data

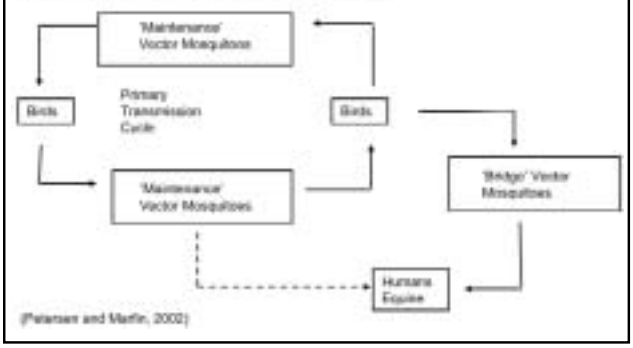
available free of charge at the Tennessee Department of Health State Laboratory, and can be arranged by contacting the local health department.

West Nile Virus

The natural transmission cycle of West Nile virus (WNV) involves birds and mosquitoes that primarily feed on birds **(Figure 1)**.

During optimal environmental and biological conditions, the viral load of both the birds and the mosquitoes builds gradually through the early months of the summer until viral transmission may spill over into humans. Humans and horses do not circulate enough virus to re-infect a blood-feeding mosquito, and thus are referred to as dead-end hosts.

Figure 1: Transmission Cycle of WNV



Tennessee experienced widespread WN virus activity in 2002, with 56 documented human cases and six deaths **(Table 1)**. The majority (87%) of the human cases were from the western region of the state: Memphis/Shelby County reported 71% of the total cases from a high-risk area in downtown Memphis. Human cases peaked in late August with onsets ranging from July 22-October 19, 2002 **(Table 2)**.

In 2002, 333 equine specimens were tested by the Tennessee Department of Agriculture. Of these, 148 were positive for WN virus. The majority of the documented WN virus equine activity was found in the west Tennessee region (49%). One five-year-old canine from Davidson County was found WN virus positive with an onset of symptoms August 23, 2002.

Of 1178 blue jays and American crows tested in the state, approximately three-fourths were positive. The first positive birds were identified about two months prior to the first human cases in the state. Mosquitoes trapped in Memphis/ Shelby County were found to have an average minimum infection rate of 16.2 per 1000 mosquitoes.

Of 304 human specimens submitted to the state laboratory for serological testing, 56 human

Table 1. West Nile Virus Human Cases and Deaths in the United States and Tennessee from 1999-2002.

Year	# of States with WNV Activity	Number of Human Cases US	Number of Human Cases TN	Number of Deaths US	Number of Deaths TN
1999	5	62	0	7	0
2000	12	21	0	2	0
2001	27	66	0	9	0
2002*	42	4008	56	263	6

* As of February 5, 2003 (www.cdc.gov)

Table 2. Summary of West Nile Virus Cases in Tennessee and the United States, 2002

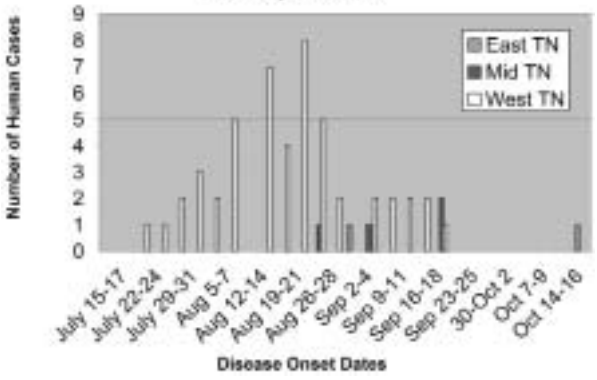
	# Cases TN	# Cases US	Tennessee Median Age	Tennessee Age Range	United States Median Age	United States Age Range
WNF[1]	8	702	48	22-75	48	1-93
WNME[2]	42	2155	64	17-94	59	1-99
Deaths	6	201	80	60-99	78	24-99
Total	56	3058*	64	17-99	55	1-99

*This total number does not include 331 (10%) of the human cases since they were classified as an unspecified (WNV or WNME) reported from January 1-November 30, 2002.
[1]West Nile Fever (WNF)
[2]West Nile Meningoencephalitis (WNME)

WN virus cases were identified. West Nile meningoencephalitis infections made up 86% of reported human cases in Tennessee; the remainder was diagnosed as West Nile fever. **(Table 2)**.

The human epidemic curve **(Figure 2)** depicts the first case on July 22 with the epidemic

Figure 2: West Nile Virus Human Epidemic Curve, TN 2002



transmission peak of August 22-25. The first of the four identified human cases from middle Tennessee developed onset of symptoms during the last week of August. The first two of the three human cases in east Tennessee developed onset of symptoms during early September. The final case documented for the year was from Grainger County and had symptoms onset October 19, 2002.

Table 1. Two Strains of Human Ehrlichiosis

Disease	Human Monocytic Ehrlichiosis	Human Granulocytic Ehrlichiosis
Fatality Rate	2-5%	7-10%
Year Discovered	1987	1994
Etiologic Agent	*Ehrlichia chaffeenisis*	*Ehrlichia phagocytophila*
Tick Vector	*Amblyomma americanum* (Lone Star Tick)	*Ixodes scapularis* (Midwestern, Northeast States)
	Dermacentor variabalis (Dog Tick)	*Ixodes pacificus* (California)
Reservoir	White tailed deer, dogs, small rodents	White-tailed deer, small rodents
US Cases/year	150	275
US Distribution	Southern, South Central States	Northeast, Upper Midwest

Tick-Borne Diseases

Ehrlichiosis

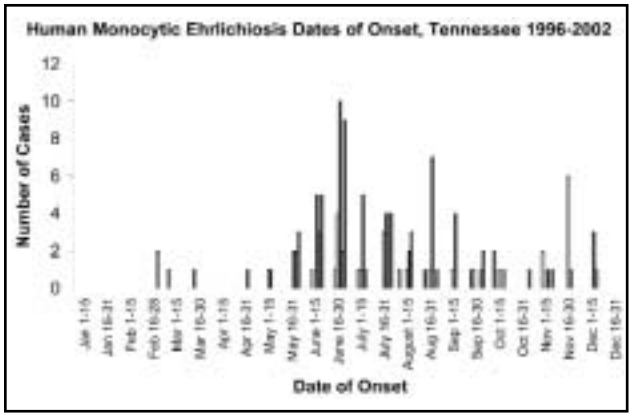
Human ehrlichiosis is an emerging tickborne disease that became nationally notifiable in 1999; Tennessee has been tracking cases since 1996. As with many arboviral diseases, human ehrlichiosis is probably underreported. Since its initial discovery in 1986, two strains of human ehrlichiosis have been identified in the United States **(Table 1)**. These include human monocytic ehrlichiosis (HME) and human granulocytic ehrlichiosis (HGE); HME is the only strain that has been reported in Tennessee.

Human monocytic ehrlichiosis is transmitted to humans by *Amblyomma americanum* (the lone star tick). This tick is ubiquitous in Tennessee. The tick vector responsible for HGE, *Ixodes scapularis*, is rarely found in Tennessee. The primary host for the lone star tick is the white-tailed deer.

HME is characterized by an acute onset of high fever, severe headache, myalgia, rigors and/or malaise with leukopenia, thrombocytopenia, elevated liver enzymes and other non-specific signs and symptoms. Rashes are not common but may occur in 20-30% of cases; they usually do not involve the palms or soles. More severe symptoms are expected in older individuals and in the immunocompromised. Three-fourths of the patients diagnosed with HME are male and 70% of the cases occur in people over 40 years of age.

Since 1996, approximately 46% of the human cases of in Tennessee have been reported

in the Mid-Cumberland region and Nashville/Davidson metropolitan area, with another 20% of the cases coming from the West Tennessee region. Peak incidence in Tennessee is June-September, which reflects the longer summer season and peak activity of the tick vector **(Figure)**. The incidence of Ehrlichiosis in Tennessee in 2001 was 0.35/100,000, seven-fold higher than the overall US rate **(map)**.

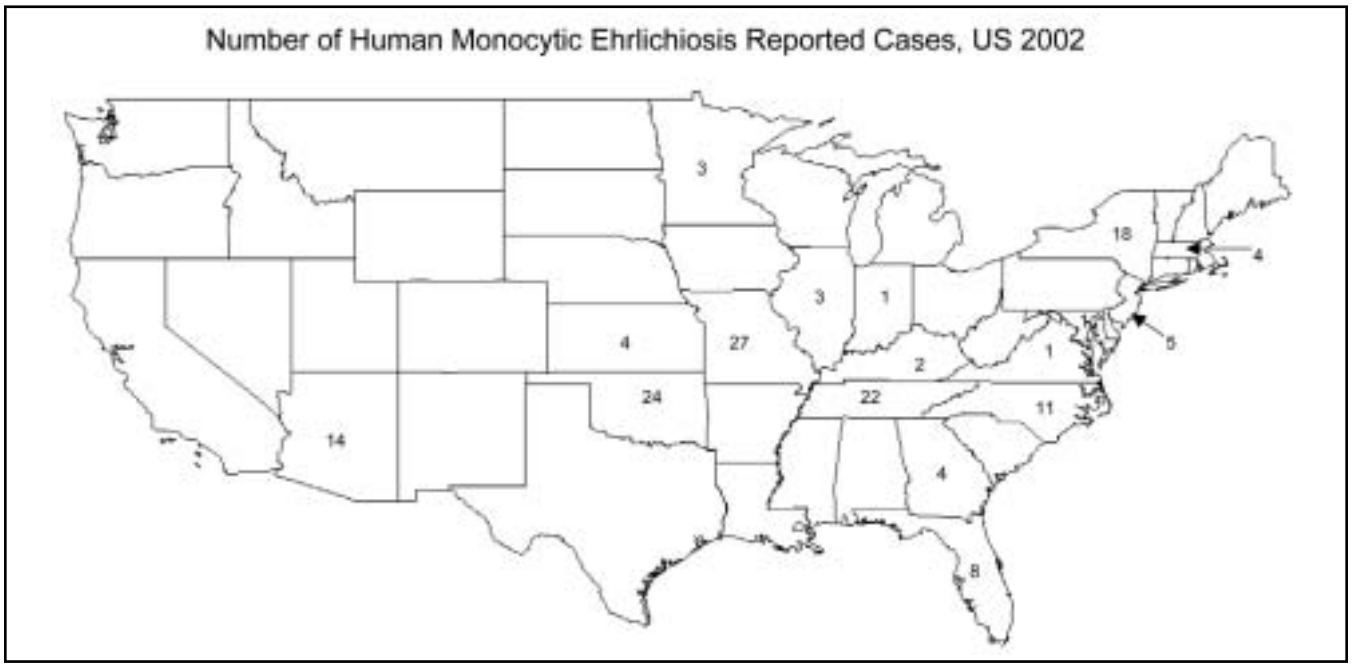


Lyme Disease and Other Tick-Associated Rash Illnesses

Tick-associated rash illnesses include Lyme disease and southern tick-associated illness (STARI), a newly recognized condition. STARI has also been called "Lyme-like disease".

Lyme disease is caused by *Borrelia burgdorferi* infection that produces a characteristic erythema migrans (EM)-like rash following a tick bite. As the **map** depicts, most Lyme disease is reported in the northeast and upper midwestern states. The primary vector of Lyme disease, *Ixodes scapularis*, is rare in Tennessee. The **table** depicts the reported cases and incidence rates by sex in the United States and Tennessee.

In recent years, patients from southern and southwestern states have been reported with rash illnesses following tick bites, but without laboratory confirmation of Lyme disease; this newly recognized disease has been called Southern tick-associated rash illness (STARI). STARI infections are characterized by an expanding circular skin rash, similar to EM in Lyme disease, at the site of a tick bite. Symptoms can include generalized fatigue, headache, stiff neck, fever and other non-specific symptoms. STARI should be considered in patients with localized rash, history of tick



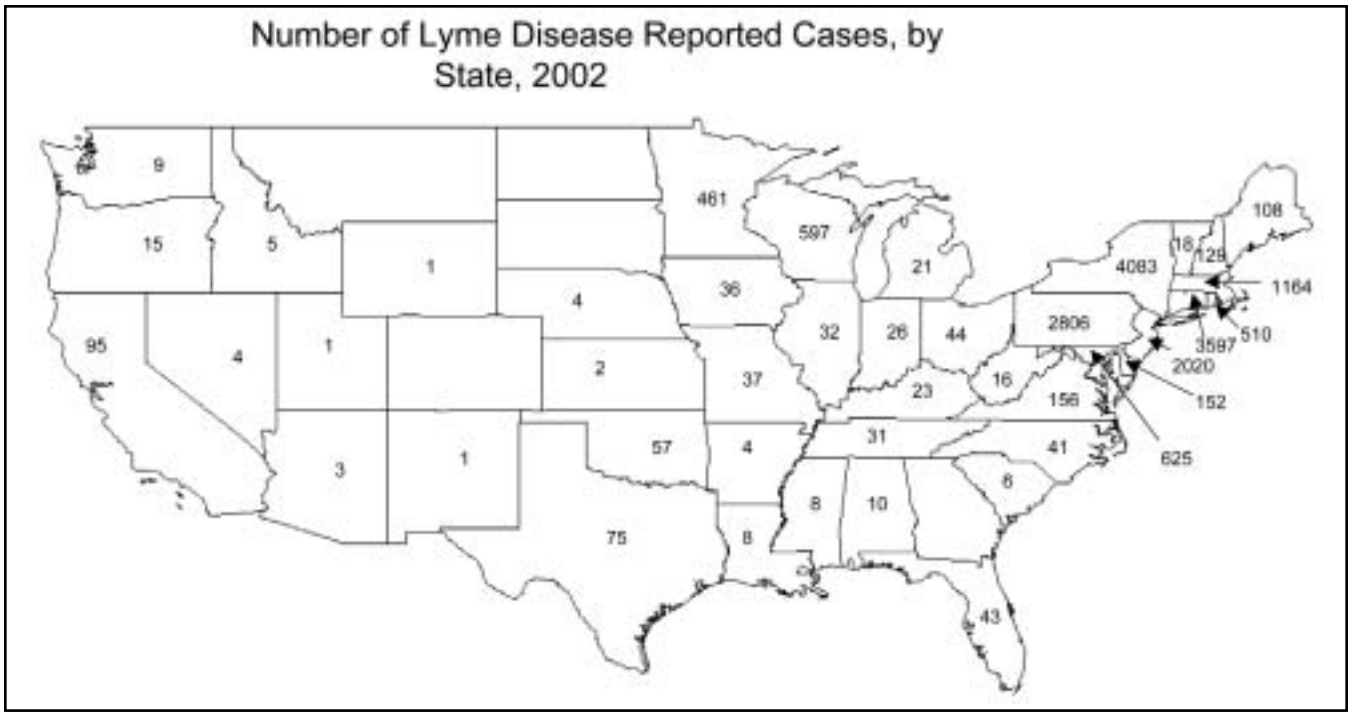


Table. Reported Cases and Incidence Rates per 100,000 Population of Lyme Disease, By Sex, Tennessee (2002) and the United States (2001)

	Male		Female		Not
	No.	IR	No.	IR	Stated
TN*	10	0.35	17	0.57	0
US**	9044	6.55	7875	5.49	110

* 2002 Data
** 2001 Data

exposure, and absence of antibodies to *B. burgdorferi* using standard serologic Lyme disease methods. Symptoms resolve quickly with antibiotic therapy. STARI patients do not normally experience disseminated disease or long-term sequelae.

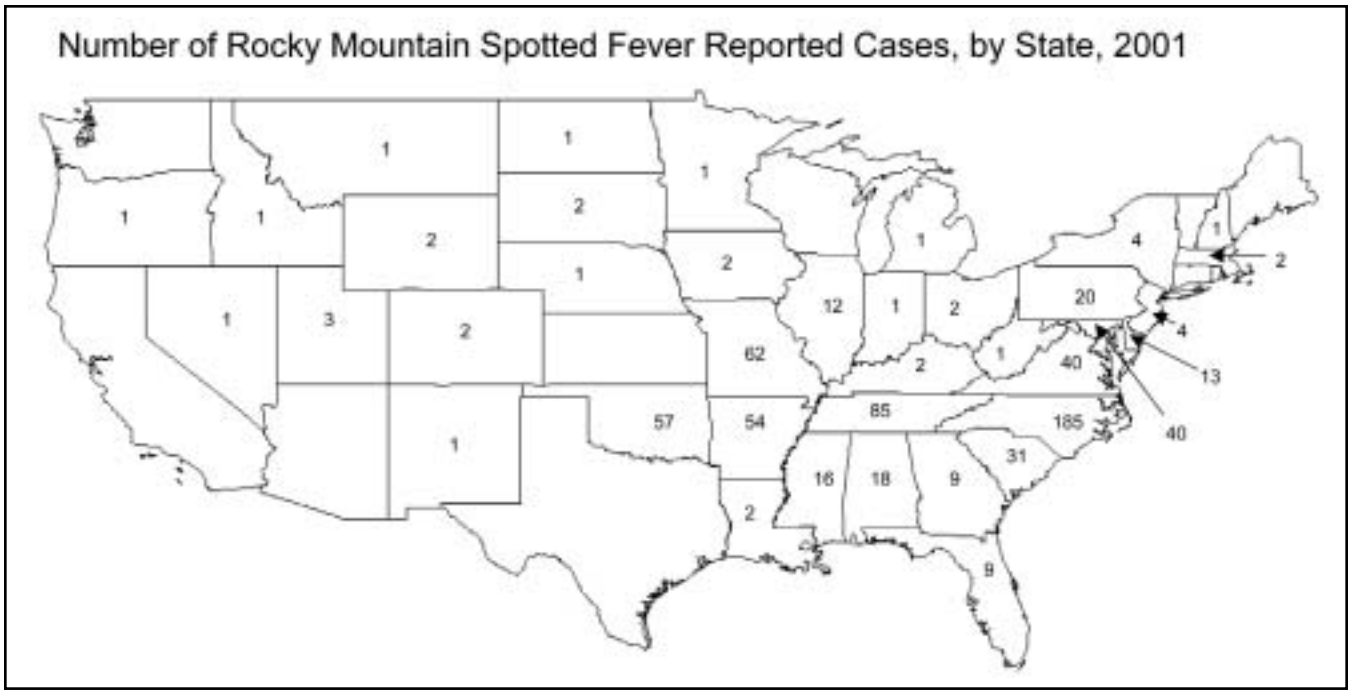
The lone star tick (*Amblyomma americanum*) is the suspected vector of STARI; it is the most abundant tick species in Tennessee. A new *Borrelia*, tentatively named *B. lonestarii*, has been identified in this tick species and is currently under investigation to determine its potential association with STARI.

STARI is not a nationally notifiable disease and the true prevalence/incidence is not known. There is currently no commercially available diagnostic test for STARI. It is possible that some of the Lyme disease cases reported in Tennessee are actually STARI. Patients suspected of having possible STARI can be enrolled in a CDC study by contacting CEDS.

Rocky Mountain Spotted Fever

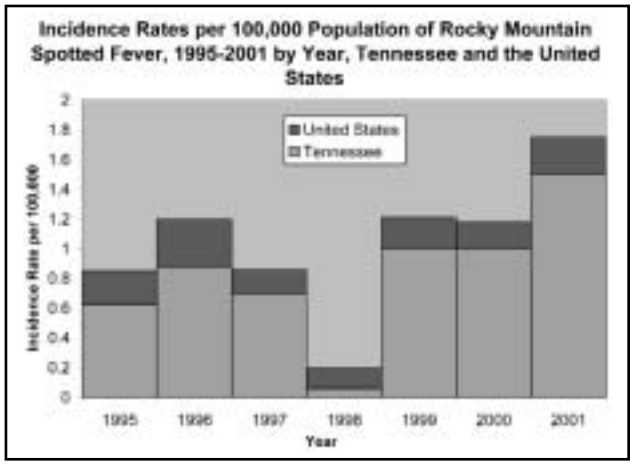
Rocky Mountain spotted fever (RMSF) is a tick-borne disease caused by infection with *Rickettsia rickettsii*. It is the most frequently reported tick-borne rickettsial disease in the United States.

The primary tick vector in Tennessee is *Dermacentor variabalis* (the American dog tick). *Rickettsia rickettsii* have been isolated from the *Amblyomma americanum* (lone star



tick) but that species is probably a minor vector. Both species of ticks are ubiquitous throughout Tennessee. *Rickettsia rickettsii* normally circulate in nature between ticks and small rodents (ground squirrels, chipmunks, mice and voles). As with many zoonoses, humans and companion animals (canines) are incidental hosts. Even in areas of human RMSF activity, only 1-3% of the tick population carries the pathogen.

As the **map** depicts, most RMSF activity is reported in the south Atlantic and south central regions of the country . Tennessee accounts for approximately 12% of cases nationwide. Cases have been reported throughout Tennessee; approximately 30% of them have come from the Mid-Cumberland and Upper Cumberland regions. With the exception of 1998, the incidence rates in Tennessee have been significantly higher than the national incidence rates **(Figure)**. In 2002, 58% of



cases were reported in persons over 39 years of age **(Table)**. Males (55%) appear to be

Table. Reported Cases and Incidence Rates per 100,000 Population of Rocky Mountain Spotted Fever by Age Group, in Tennessee (2002) and the United States (2001)

	<1 year		1-4 years		5-14 years		15-24 years		25-39 years		40-64 years		>65 years		Not
	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	#	Rate	Stated
TN*	2	2.66	3	0.98	10	1.25	8	1.01	11	0.88	34	1.85	13	1.81	0
US**	0	0	19	0.12	82	0.2	85	0.22	152	0.24	246	0.29	102	0.29	9

* 2002 Data
** 2001 Data

slightly more at risk than females (45%). Dates of onset have occurred throughout the year in Tennessee, although the peak transmission time is generally between April and September.

The incubation period for RMSF ranges from 2-14 days, although the majority of cases are symptomatic within 5-7 days. The initial symptoms can include fever, headache, malaise, myalgia, nausea and gastrointestinal involvement. The typical rash generally occurs 3-5 day after symptoms begin. The rash, if present, usually begins on the ankles and/or wrists, and extremities and then spreads to the rest of the body. Even with antibiotic therapy, the mortality rate for this disease is approximately 5%.

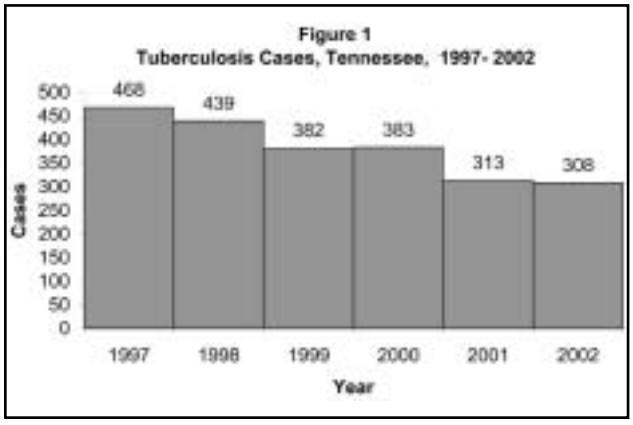
Prevention of Tick-borne Diseases

The best prevention for tick-borne diseases is avoidance of tick-infested habitats and tick bites. Products containing N,N-diethyl-meta-toluamide (DEET) can be used on exposed skin or clothing; products containing permethrin can be used on clothing or shoes. Wearing light colored clothing can enable prompt recognition of ticks. Tucking pant legs into socks or boots can create a physical barrier to exposed skin. Full body checks for ticks after potential exposures and prompt removal of ticks are critical to disease prevention. Removal of a tick shortly after it is imbedded in a host will significantly decrease the chance of disease transmission. Ticks must stay attached and feed on the host 24-48 hours before the transfer of organisms can occur. Attached ticks should be removed with tweezers by gently squeezing the head and applying slow firm pressure to ensure that the head of the tick is removed with the body.

G. TUBERCULOSIS

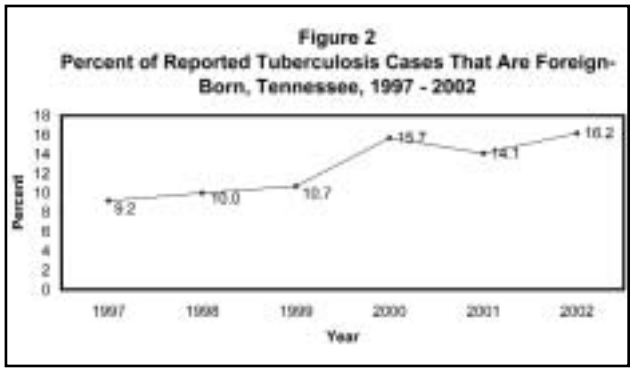
Tuberculosis Elimination Program

Tennessee reported 308 cases of tuberculosis (TB) in 2002, representing a decrease of 1.6% compared with the 313 TB cases reported in 2001. The corresponding TB case rate of 5.3 per 100,000 population is the lowest ever recorded for the state. However, Tennessee is slightly above the national 2002 case rate of 5.2 cases per 100,000 population. Tennessee's two largest metropolitan areas have the highest burden of TB disease in the state, with Memphis/Shelby County reporting 80 cases (8.9 per 100,000 population) and Nashville/Davidson County reporting 66 cases (11.7 per 100,000 population) for 2002. The Centers for Disease Control and Prevention (CDC) ranked Tennessee 12th in the nation for TB case rates and 11th in the number of TB cases. **Figure 1** illustrates the



steady decline of TB morbidity in Tennessee from 1997 through 2002. Of the 308 cases reported in 2002, 45% were non-Hispanic whites, 44% were non-Hispanic blacks, 7% were Hispanics (all races) and 4% were Asian or Pacific Islanders. Tuberculosis case distribution by sex indicates that males accounted for 66% of the total morbidity.

From 1998 through 2002, the percentage of TB cases occurring among foreign-born persons and the demographics of those cases have changed remarkably. These changes reflect both the prevalence of TB globally and immigration trends in Tennessee. The total number of foreign-born cases and the percentage of the total morbidity they represent are illustrated in **Figure 2**. The increasing



number of foreign-born cases has prompted the Tennessee TB Elimination Program to implement a targeted testing and treatment initiative to identify and treat members of this population for latent TB infection (LTBI).

In March of 2002, the Tennessee Department of Health's Targeted Testing Initiative (TTI) began. The TTI's mission is to provide TB/LTBI education and screening to groups at high-risk for infection. Throughout 2002, regional and metropolitan TB programs provided education and screening for individuals at high risk for TB infection at local health departments and in the community. A strong emphasis was placed on educating and screening foreign-born persons, since the incidence of LTBI/TB is high in this population. Individuals with specific medical conditions, exposure risk factors and a history of LTBI/TB infection are also categorized as being high risk for TB infection.

During the first year of the initiative, beginning March 2002, approximately 52,900 foreign-born persons were educated and screened for LTBI; 36.1% of those persons tested were diagnosed with LTBI, and four cases of active TB were detected. Over 16,400 non foreign-born persons considered high risk for TB/LTBI were screened, educated and tested for LTBI;

7.6% were diagnosed with LTBI and one active TB case was discovered. The Tennessee Department of Health continues to discourage the testing of low risk individuals for TB/LTBI, since only 1.3% out of 10,503 tested positive for LTBI. The **table** illustrates the TTI program outcomes by risk for TB/LTBI.

The incidence of drug-resistant tuberculosis continues to decline in Tennessee. In 2002, there were no reported cases of multi-drug resistant tuberculosis (MDR-TB), defined by CDC as those cases with organisms resistant to at least isoniazid and rifampin. However, a total of 6% of TB cases reported in Tennessee in 2002 had resistance to at least one TB medication, including 3% of TB cases with initial isoniazid resistance. Therefore, the CDC, the Tennessee Department of Health and the Tennessee TB Advisory Committee strongly recommends that all patients diagnosed with active TB begin treatment with four first-line TB medications (usually isoniazid, rifampin, pyrazinamide and ethambutol) pending the results of drug susceptibility testing.

The treatment of TB disease is complicated and is typically prescribed for duration of six to nine months. Directly observed therapy (DOT) is an essential tool, which is utilized to enable monitoring for potential toxicity and to ensure adherence. In Tennessee and the United States, DOT is recommended as the standard of care for all patients with TB disease. In 2002, approximately 44% of TB cases reported in Tennessee received strict DOT, 52% were treated with a combination of DOT and self-administered therapy, and only 2% of patients were allowed completely self-administered therapy. In 2003, the Tennessee TB Elimination Program will continue to increase provider and patient awareness of the benefits of utilizing DOT throughout the duration of TB treatment.

Targeted Testing Initiative Program Outcomes
By Risk for TB/LTBI
March 1, 2002-December 31, 2002*

	Total Screened and Educated	Total Tested	Total TST + (%)
High –risk	19,200	18,700	2819 (15.0)
• Foreign-born	5,300	5000	1789 (35.8)†
• Other risk	13,800	13,700	1030 (7.5) ††
Low-risk	14,600	8,800	112 (1.3)

† 4 cases of TB detected in foreign-born persons
†† 1 case of TB detected in homeless person
*Estimated data

Section IV.
Environmental Health

We did not inherit the earth from our ancestors.
We borrow it from our children.

Old Pennsylvania Dutch saying.

Huge tire, Aedes aegypti mosquito breeding site.

Centers for Disease Control and Prevention

Putting the 'E' in CEDS

Issues surrounding the environment are divided among three different areas of state government. General Environmental Health (GEH) is one of the thirteen sections of the Bureau of Health Services. This section is charged with maintaining healthful standards for potentially harmful environments such as swimming pools and ensuring that food service establishments meet appropriate standards. The Tennessee Department of Environment and Conservation (TDEC) has the responsibility to ensure a clean and safe environment in the state's parks, natural areas, and communities. Within the Department of Health's Communicable and Environmental Disease Services section, the Environmental Epidemiology unit is responsible for environmental public health activities that relate to chemical exposures and pollution. The unit investigates disease clusters that may be environmentally related, primarily environmental exposure to chemicals or radionuclides. Most investigations are related to hazardous waste sites, but cases do arise from emergencies and public complaint.

Environmental Epidemiology is funded through a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). ATSDR is a federal public health agency whose mission is to prevent exposure to hazardous substances which may result in adverse human health effects and diminished quality of life. Many of these exposures are associated with waste sites, unplanned releases, and other sources of pollution.

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

Environmental Epidemiology frequently collaborates with TDEC, the U.S. Environmental Protection Agency (EPA), and other local and state agencies.

Environmental Epidemiology conducts a variety of activities to carry out its mission and to serve the needs of the public. These activities include: *public health assessments* (PHAs), *public health consultations* (HCs), exposure investigations, and health education. PHAs are written, certified publications that evaluate data and information on the release of hazardous substances into the environment in order to assess any past, current, or future impact on public health. PHAs are a three-step project starting with draft review, a public comment period, and then the final printed publication. Environmental public health questions commonly answered include:

- How can chemicals at a hazardous waste site affect public health?
- Is there a present health hazard to people living near the site?
- Will there be a future public health hazard from the site?
- What actions are recommended to protect public health from pollutants?
- How can the State, ATSDR, or EPA best protect public health?

The most common environmental health investigation takes the form of a *health consultation*. Consultations are similar to PHAs, but usually discuss one specific, site-related public health question. HCs can determine whether removal actions are necessary to protect the public health or address EPA requests such as reviewing sampling plans and feasibility studies. If site conditions or data change, a series of *health consultations* may be written for one site. These investigations are intended to prevent or mitigate environmental exposure by

recommending a public health action plan. Recommendations might include restricting land use, changing a drinking water source, conducting additional environmental sampling, restricting site access, implementing health education campaigns, or removing contaminated material. In 2002, the Tennessee Environmental Epidemiology unit published six *health consultations*:

Yorkville, Gibson County: The Tennessee Department of Environment and Conservation (TDEC) alerted Environmental Epidemiology to a backyard in Yorkville where soil was contaminated with lead and PCBs left over from the site's former use as an electric transformer recycling facility. Of primary concern was the possibility that children in the household playing outdoors could ingest small amounts of soil through hand-to-mouth behaviors. Polychlorinated biphenyls (PCBs) and lead concentrations in the soil were screened. The amounts of pollutants were below guidance levels. As a precautionary measure, TDEC removed contaminated soil and replaced it with new topsoil.

Rossville, Fayette County: Ross Metals, Inc. is an inactive secondary lead smelter. When Environmental Epidemiology was brought in to the case, the EPA was already at Phase II of their remediation plan. Mounds of residual blast slag that contained high levels of metals including lead, were being cleaned up. The EPA asked Environmental Epidemiology to perform a site visit with members of ATSDR staff to ensure that a family living nearby was not being exposed to lead dust during the remediation.

Lead is known to cause developmental delays in children. Therefore, after wipe samples showed increased levels of lead outside the home, the family was encouraged to have their blood screened. Blood lead levels are commonly used to identify individuals exposed to lead. Working through the Fayette County Health Department, Environmental Epidemiology assisted the family in determining that their children's blood lead levels were below the standard level of concern for young children.

Chattanooga, Hamilton County: From 1954 to 1956, 79 multi-unit buildings were built by the Chattanooga Housing Authority (CHA). These homes were known as McCallie Homes. After many years of use structural problems were evident. As part of a Hope VI project, the old homes were demolished and new public and private residential housing were planned. During the demolition, it was discovered that foundry sand containing lead was used to construct some of the building foundations.

Environmental Epidemiology reviewed soil contamination data to assist TDEC with determining clean up options. Since the contamination was limited to earth under the large buildings, it was easily dug up and then properly disposed of. During the process, it was necessary to prevent fugitive dust from carrying lead away from the demolition area. TDEC and CHA entered into a "Brownfields Agreement" to remove the contamination and make the land suitable for residential use. A "Brownsfields Agreement" is a term used by environmentalists to describe the cleaning of polluted land for future clean use.

Lewisburg, Marshall County: Following a train derailment in 1990, chloroform and styrene were released into Wilson Spring near Big Rock Creek. More than a decade later, the styrene is no longer a problem; however, the chloroform concentration in the surface water still exceeds an acute exposure risk level.

Several control measures have successfully been put in place. A series of riprap material (crushed rock and concrete) creates turbulence to aid the chloroform in volatilizing into the atmosphere, and fences have limited access to the site. Therefore, no apparent public health hazard remains.

Adamsville, McNairy County: A 3,000 square foot warehouse in an industrial zone of Adamsville was acquired by a family who desired to use the building as both a residence and antique restoration business. Local rumors suggested that the building once housed chemicals. TDEC had knowledge that the building was indeed formerly used to store some 300 drums of unknown contents. Environmental Epidemiology was asked to determine if polychlorinated biphenyls or polycyclic aromatic hydrocarbons discovered in a soil screening test were likely to cause health concerns. In the end, the family moved to another residence. In addition, they were advised to limit time working within the building until clean up was completed.

Memphis, Shelby County: Within the fences of the North Hollywood Dump landfill in Memphis, the abandoned dredge pond fills a scenic 38-acre gravel pit. Now, the tree-lined pond has fish that are both plentiful and sizable. The abandoned dredge pond was used by the community as both a recreational and subsistence fishing pond.

Chlordane pesticides from past manufacturing and disposal are contained in sediment lining the large pond. Chlordane is a persistent pesticide that is able to accumulate in the fatty tissues of animals. In this case, chlordane concentrations in fish were above recommended safe consumptions limits. Although recreational catch-and-release fishing would not ordinarily be problematic, the pond is located in a lower socioeconomic area where residents were known to consume the fish caught. Occasional incidental ingestion of chlordane may not be a serious health risk; however, the effect of chlordane on developing children in the womb or through nursing mothers is unknown. In a community already faced with a high percentage of low-birth-weight children, a public health hazard warning was issued recommending that future chlordane exposure be prevented. Following is the plan that was developed.

Together, Environmental Epidemiology, the North Hollywood Dump Steering Committee, and the Memphis-Shelby County Heath Department developed and implemented a public health education plan to protect the North Hollywood residents. Recommendations presented in the publication have promoted a number of changes, including the removal of a makeshift boat ramp and junked automobiles. New easy-to-understand

signage was posted. To prevent access to the site, a chainlink fence was installed in addition to the concrete barriers pictured. A collaboration of agencies, including TDH, EPA, and the North Hollywood Dump Steering Committee, created a fact sheet that was creatively distributed throughout the neighborhood on trash collection day.

Environmental Epidemiology also can perform exposure investigations to gather and analyze site-specific information to evaluate whether human populations have been exposed to hazardous substances. While no formal exposure investigations were conducted in 2002, Environmental Epidemiology did perform a cluster investigation in Dickson County. Agenesis of the corpus callosum is a rare neurological condition where the connection between the right and left brain hemispheres does not develop correctly. Four cases of agenesis of the corpus callosum were identified in births between 1999 and 2001 by the Dickson Foundations Early Intervention Services. After interviewing the mothers, reviewing medical histories, and searching available literature, the four cases were determined to be part of different syndromes and, therefore, not a single disease cluster.

Last but perhaps most important, Environmental Epidemiology performs health education to address concerns from communities living near hazardous waste sites. Fact sheets and brochures on the health effects of toxic substances are frequently provided to the general public, concerned communities, physicians, and other health care providers. Environmental Epidemiology presents general environmental health or site-specific information to community groups, other government agencies, schools, and health professionals at public meetings and community events.

Health concerns related to mold and mildew have become common topics in the news media. Environmental Epidemiology receives frequent inquiries about mold in homes, apartments, workplaces, and schools. Sources of excess moisture can harbor mold and mildew. For example, heavy rains lead to mold concerns in flooded basements. As a health education tool, Environmental Epidemiology staff utilize booklets, created by the U.S. Environmental Protection Agency, that provide accurate information about mold and moisture issues. In response to the growing mold concerns, the Tennessee Department of Health developed a pamphlet, *Guidance on Mold Issues*.

Tennessee Department of Health Guidance on Mold Issues

SYNOPSIS:
Current evidence indicates that allergies are the type of diseases most often associated with molds.

There is no practical way to eliminate all molds and mold spores in the indoor environment; the way to control indoor mold growth is to control moisture.

The Tennessee Department of Health and Department of Environment and Conservation do not inspect homes, schools or other buildings or test for molds. While the Tennessee Department of Health has the authority to close a building, it would be extremely unlikely to close a building because of a health threat from molds.

The Tennessee Department of Health and Department of Environment and Conservation do not recommend sampling to identify or quantify molds in homes, schools, or other buildings. If someone can see or smell mold, the source of the excess moisture necessary for mold growth should be determined.

Any mold contamination existing inside homes, schools, and other buildings should be approached with common sense. Any source of moisture that could support mold growth should be eliminated (i.e., leaking roof, flooded basement, plumbing leaks, etc).

After the source of the excess moisture has been eliminated, the mold should be cleaned up. If a small amount of mold is growing on surfaces, it can be cleaned off with dilute chlorine bleach or other commercial product that kills mold.

If porous material (such as carpet, upholstery, or wallboard) is saturated, then the saturated material needs to be replaced.

DESCRIPTION: Molds are microscopic fungi that live on plant or animal matter. Thousands of species of mold have been identified. Most molds are thread-shaped (filamentous) organisms that usually reproduce by the production of spores. These spores can be spread through air or water. Some molds have beneficial uses, including the fermenting yeasts and the antibiotic-forming molds. Some molds that grow on grains or some vegetables produce chemicals that are toxic if eaten.

Molds can be found year-round indoors and outdoors in virtually every environment. Mold growth is encouraged by warm and humid conditions. Outdoors they are found in shady, damp areas or places where leaves or other vegetation are decomposing. Indoors they are found where humidity levels are high, such as basements and bathrooms. Areas where large amounts of mold have been found include antique shops, greenhouses, saunas, farms, mills, construction areas, flower shops, and summer cottages. There is no practical way to eliminate all mold or mold spores in the indoor environment. The best way to control indoor mold growth is to control moisture.

Some of the commonly found molds belong to the following genera: *Cladosporium, Penicillium, Alternaria, Aspergillus*, and *Mucor*. The mold most talked about, but less common, is *Stachybotrys chartarum* (black mold). The Centers for Disease Control and Prevention (CDC) does not have information about how often this mold is found in buildings and homes.

HEALTH EFFECTS: Some people are sensitive to molds. For these people, exposure to molds can cause hay fever like allergic symptoms - symptoms such as nasal stuffiness, eye irritation, or wheezing. Severe reactions may occur among workers exposed to large amounts of molds in occupational settings, such as farmers working around moldy hay. Severe reactions may include fever and shortness of breath. Certain individuals with chronic respiratory disease (such as chronic obstructive pulmonary disorder or asthma) may experience difficulty breathing if exposed to high mold levels. Individuals with immune suppression may be at increased risk for infection from molds. Sensitive individuals should avoid outdoor areas that are likely to have high concentrations of mold, such as compost piles, cut grass, and wooded areas.

Molds that contain mycotoxins, “toxic” molds, should not be considered any differently from other molds. There are very few reports that toxic molds inside homes or buildings can cause unique or rare health conditions, such as pulmonary hemorrhage or memory loss. No one has shown that the presence of toxic mold caused these conditions. There are no reliable blood tests for fungal toxins or any tests that are specific for the effects of fungal toxins or fungus exposure. A common-sense approach should be used for any mold contamination existing inside buildings and homes. People should be referred to their physician if they have questions about their health.

SAMPLING: In most cases, it is not necessary to identify the species of mold growing in a home or building. Additionally the CDC and the U.S. Environmental Protection Agency does not recommend routine sampling for molds. Current evidence indicates that allergies are the type of diseases most often associated with molds. Since the susceptibility of individuals can vary greatly either because of the amount or type of mold, sampling and culturing are not reliable in determining a health risk. If someone is sensitive to mold and mold is seen or

smelled, it should be removed. Standards for judging what is an acceptable, tolerable, or normal quantity of mold have not been established.

AVOIDING MOLD PROBLEMS: To avoid mold growth in homes or other buildings, people should:

- Keep the humidity level in the building below 40%.
- Use an air conditioner or a dehumidifier during humid months.
- Be sure the building has adequate ventilation, including exhaust fans in kitchen and bathrooms.
- Add mold inhibitors to paints before application.
- Clean bathrooms with mold killing products.
- Do not carpet bathrooms and basements.
- Remove or replace previously soaked carpets, upholstery, ceiling tiles, wallboard, or other porous material.
- Professional assistance may be needed to remediate the source of the moisture problem and with removal and replacement of large amounts of soaked material.

For more information contact the following:
CDC websites: http://www.cdc.gov/nceh/airpollution/mold
EPA websites: http://www.epa.gov/iaq/asthma/triggers/molds.html
Other: http://www.doctorfungus.org
Tennessee Department of Health: (615) 741-7247
Tennessee Department of Environment and Conservation: (615) 532-0554

Section V.
Investigations and Outbreaks

There is no reason to doubt, of course, the ability of the scientific method to solve each of the specific problems of disease by discovering causes and remedial procedures. Whether concerned with particular dangers to be overcome or with specific requirements to be satisfied, all the separate problems of human health and eventually will find their solution. But solving problems of disease is not the same thing as creating health and happiness.

Rene' Dubos, 1959

Sidewalk food vending stand with customers, Philadelphia, 2000.

Dr. Edwin P. Ewing, Jr., Centers for Disease Control and Prevention

Investigations and Outbreaks in Tennessee in 2002

The following section presents significant investigations that highlight efforts of the Communicable and Environmental Disease Services section (CEDS) and health department personnel from across the state in 2002. The investigations illustrate the burden of illness for patients and families as well as the actions taken by public health professionals to prevent a repetition of the events that occurred. There are a wide variety of problems encountered in the public health setting; strategies utilized to deal with them vary as well. Publications of findings such as these can lead to the prevention of future outbreaks which have the potential to harm large numbers of people.

Cluster of unexplained illness among Amish adolescents: evidence for group conversion disorder

In October 2001, a nurse practitioner reported unexplained neurologic illnesses in three Amish adolescent girls in a southern rural Tennessee county. Symptoms included headaches, dizziness, abdominal pain, anorexia, and lower extremity weakness to the point of being bedridden. By February 2002, five Amish girls from one county were identified with similar unexplained illnesses, and two were hospitalized at a regional teaching hospital. Clinical information was gathered from medical records, parents, and medical providers. Focus groups were also held with church leaders, school teachers, and community members. All five patients experienced incapacitating voluntary motor deficits, but despite extensive medical evaluations, no significant organic pathology was identified. All 5 patients met DSM-IV criteria for conversion disorder. Significant psychosocial stressors were identified within the families and the community. A meeting was held with the families, community leaders, and primary care providers to discuss the diagnosis and strategies to treat conversion disorder, including improving family and community dynamics. Since these interventions, three of five patients have improved and one is back to her normal state of health.

From Pigs to Pacifiers: An Outbreak of Yersiniosis in Infants

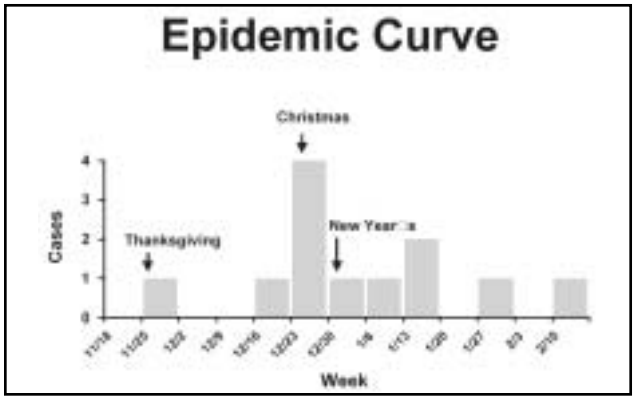
Yersinia enterocolitica is an uncommonly reported cause of foodborne disease outbreaks. Swine are known reservoirs of the pathogen. In January 2002, a FoodNet surveillance officer reported a cluster of seven cases of *Yersinia*, an unusual number of laboratory-confirmed cases of this pathogen in one of the laboratories she routinely visited. A closer examination revealed that all of the cases were black infants under the age of one year. A decision was made to investigate the outbreak. An hypothesis-generating questionnaire revealed that chitterlings had been prepared in all of the homes prior to the onset of the illness.

A case-control questionnaire was administered to the parents of cases and age- and race-matched controls, obtained from the hospital of the diagnosing laboratory. Cases were defined as residents of Tennessee less than one year of age with culture-confirmed *Y. enterocolitica* infection occurring between November 15, 2001 and February 15, 2002. Isolates of *Y. enterocolitica* from cases were serotyped at CDC. Samples of chitterlings from grocery stores were cultured for *Yersinia* and *Salmonella*.

Twelve cases of infant *Yersinia* infection were identified. All were in black infants; ten cases occurred in January, and ten were residents of the same city. Ten cases and 51 controls were interviewed in the case-control study. Mean

age of cases was 215 days (range 106-360 days). Chitterlings are the cooked intestines of swine and are frequently prepared for festive occasions such as Thanksgiving and Christmas by southern blacks. In this outbreak, they had been prepared in the homes of all cases shortly prior to their illness, compared with only 35% of controls ($p<0.001$).

The epidemiologic curve depicts the cases by week. Parents of seven cases acknowledged exposures that may have led to infection of the infant, such as handing the infant a pacifier during cleaning of chitterlings, or splashing contaminated water on a bottle.
This outbreak of yersiniosis in black infants



was associated with preparation of chitterlings in the home. While parents must be educated about safe preparation of chitterlings, decontamination of chitterlings prior to sale with methods such as irradiation should be strongly considered.

Outbreak of methicillin-resistant *Staphylococcus aureus* skin infections in a jail associated with tattooing

From October 2001 – February 2002, 11 cases of skin or soft-tissue infections were identified in a rural county jail in Dickson County. Methicillin-resistant *Staphylococcus aureus* was cultured from all six inmates with active lesions at the time of the investigation. A clonal strain was demonstrated by PFGE. A case-control study was performed. Risk factors included close contact with another case-patient and receiving a tattoo while in jail. Public health interventions, including confiscating tattoo devices, treating patients, and educating inmates regarding good hygiene, were effective in controlling the outbreak.

A Restaurant-Associated Outbreak of Pontiac Fever

Most outbreaks reported from restaurants are due to foodborne gastroenteritis. Outbreaks of Pontiac fever are seldom reported, but may be more common than generally recognized. Pontiac fever is usually a mild and self-limited illness. Urine antigen tests do not detect many *Legionella* species that can cause Pontiac fever, and cultures are usually negative. In April 2002, a local health department received reports of a cluster of influenza-like illness among patrons of a popular restaurant with numerous fountains, decorative pools and misting machines.

Restaurant patrons were identified using reservation lists, credit card receipts and self-report. A case-control interview was administered to ill and well patrons, and clinical specimens obtained. Cases were defined as persons with fever plus myalgias or headache. An environmental assessment was performed and water specimens were cultured. Sera were tested for antibody to *Legionella* species identified in environmental testing.

Questionnaires were administered to 173 persons; 120 (69%) met the case definition. Common symptoms included myalgias (93%), headache (88%), fatigue (80%), nausea (55%), cough (45%) and dizziness (38%). Of ill persons, 87% ate in the restaurant from 4/18 to 4/21. The mean incubation period was 54 hours and mean duration 74 hours. Viral cultures of nasopharyngeal specimens from eight ill persons were negative; urine Ag

tests on 24 patients were negative. Isolates cultured from swab and water samples from an ornamental pool in the restaurant were identified as *L. anisa* by slide agglutination and confirmed by sequencing the mip gene. Of 23 ill persons with acute and convalescent sera available, 12 (52%) had at least a four-fold rise in antibody titer to >256 to *L. anisa*, and an additional three (30%) had persistent titers of >512; 0/20 unexposed controls had single titers of >128.

This outbreak of Pontiac fever due to L. anisa occurred after exposure to ornamental water in a popular restaurant. Pontiac fever should be considered in acute outbreaks of influenza-like illness with a high attack rate and no other identified etiology.

Human Rabies in Tennessee

Since the control of canine rabies in the United States, most indigenous cases of human rabies have been associated with exposure to bats or with isolation of bat variants of the rabies virus. For most of these cases, no bat bite was documented. The last case of human rabies in Tennessee was reported in 1994, and a rabies virus variant associated with silver-haired and eastern pipistrelle bats was isolated.

On August 31, 2002, a boy aged 13 years residing in Franklin County, Tennessee died from silver-haired/eastern pipistrelle bat-variant rabies virus. Initial symptoms of headache and neck pain began on August 21. On August 25, he presented to the local hospital emergency department. Symptoms at this time included fever (102ºF), right arm weakness, slurred speech, diplopia, nuchal rigidity, and dysphagia. The patient was transferred to a regional children's hospital. On August 26, the patient was having difficulty maintaining his airway because of hypersalivation and decreased mental status. He was intubated, mechanically ventilated, and sedated because of agitation. Rabies was suspected on the basis of focal neurologic symptoms and hypersalivation, and the Tennessee Department of Health was notified. On August 31, the patient was pronounced brain dead, support was withdrawn, and the patient died. The patient had reportedly handled a dead bat around the date of July 4, 2002.

Patient samples, including serum, CSF, saliva, and a nuchal skin biopsy were collected and sent to CDC on August 27, 2002. No rabies virus antibodies were detected in these serum and CSF samples. The nuchal skin biopsy was negative for detection of rabies virus antigen by the direct fluorescent antibody test. Additional samples of serum, CSF, and saliva were sent to CDC on August 29, 2002. Rabies virus-specific antibody was detected in both the serum and CSF on August 30, 2002. The nuchal skin biopsy and saliva from August 29 were positive for rabies virus RNA by reverse transcription polymerase chain reaction (PCR). The virus was identified by genetic sequence analysis as a variant associated with silver-haired and eastern pipistrelle bats.

Section VI.
Bioterrorism

Could it not be contrived to Send the Small Pox among those Disaffected Tribes of Indians?

Sir Jefferey Amherst, British commander-in-chief, American colonies,
July 1763, writing in reference to an uprising among the Pontiac.
Two weeks previously, smallpox-infested blankets had been distributed
to the Shawnee and Delaware peoples.

Protective suits worn in a Biosafety Level Four laboratory, USA.

Centers for Disease Control and Prevention (undated)

Preparedness for Bioterrorism

In March of 2002, the Communicable and Environmental Disease Services section (CEDS) was granted $20 million dollars in supplemental federal funding, earmarked for public health and hospital preparedness and response to bioterrorism. Of these monies, $17.6M came from the Centers for Disease Control and Prevention (CDC) for upgrades to state and local public health jurisdictions with the remaining $2.4M coming from the Health Resources and Services Administration for hospital preparedness activities. This supplemental funding represented a tremendous boost to Tennessee's bioterrorism preparedness activities that had been ongoing well in advance of the receipt of this funding.

Early on, it was recognized that preparedness in Tennessee for bioterrorism naturally equated to the state public health system's ability to respond to all kinds of public health threats. This has been a recurring theme as the Bioterrorism Preparedness Program applies its funding toward areas of public health need. Sixty-eight percent (68%) of these monies were used for regional and local preparedness -- to ensure preparedness at the state, local and regional levels to respond to bioterrorism, infectious disease outbreaks, and other public health threats and emergencies.

Public Health Preparedness

The creation of eight new microbiology positions in the Tennessee Department of Health State Laboratory Services will help meet the increasing demands on this facilty. Enhancements to the laboratory's diagnostic capabilities were implemented in 2002 and include the expansion of PCR methodologies from the Nashville Laboratory to the Knoxville, Jackson, and Memphis branches. Also, expansion of the biosafety level three laboratory section was completed, improving the laboratory's ability to work with potentially more virulent organisms such as tularemia, multidrug resistant tuberculosis, and anthrax.

In 2001 in each regional health department, public health nurses, a physician, an emergency response coordinator, a network communications specialist, and an epidemiologist were hired. These additional positions effectively augmented planning and epidemiologic capacities within the traditionally understaffed metropolitan and regional health departments. Health departments have been able to more vigorously respond to everything from West Nile virus cases, to community tuberculosis treatment and outreach, to suspect bioterrorism-related illnesses.

The regional epidemiologists have also worked to enhance regional disease surveillance activities, particularly by implementing 24/7 systems to evaluate community and health indicators of syndromes that might signal a large-scale exposure to bioterrorist agents or other possible outbreaks. In 2001, each regional health department was charged with developing such a system. To date, each regional health department office has implemented aberration detection systems utilizing multiple data sources, including 911 call centers, ambulance dispatch volume, chief complaint information from hospital emergency departments, as well as work and school absenteeism.

Completion of high-speed internet access to all 95 county and 13 regional health departments was completed in June 2002. Personal computers and other hardware and software were installed to increase staff access to e-mail and the internet, enhancing high-speed communications capabilities. In the event of communications failures during an emergency, redundant communications systems, including e-

mail, beepers, cell phones and faxes, are in place and will be further augmented by the addition of HAM radios. These enhancements will not only augment public health personnel's ability to communicate with each other, but will improve communications with hospitals, EMS, emergency management agencies, and law enforcement. In late 2001, CEDS also invested in a Tennessee Emergency Management Agency maintained, computerized call-down system upgrade for broadcast emergency notification of key public health personnel across the state. Routine tests, with the objective of system improvement, of the call-down system will take place regularly.

With an emphasis on all-hazards planning, each regional and metropolitan health department assessed emergency response capacity at the county level. Regional emergency response coordinators began working with local public health emergency planning committees and regional emergency planning committees to develop integrated county and regional bioterrorism response plans in 2002. A high priority in the development of these plans was the inclusion of detailed plans concerning the receipt, staging, storing, and distribution of assets from the Strategic National Stockpile (formerly, the National Pharmaceutical Stockpile). In the fall of 2002, the CEDS laid down a framework for a post-event smallpox plan to vaccinate the entire populace of Tennessee in ten days. The plan will be updated and refined as necessary in response to current contingencies and capabilities. This plan, including a network of clinics, each responsible for vaccinating 50,000 persons in 10 days, will serve as the model for mass antibiotic distribution plans in the event of a large scale outbreak of other diseases. In the winter of 2002, CEDS hired a Strategic National Stockpile Coordinator and a Senior Bioterrorism Planner. These two key personnel will be charged with further refinement and development of a statewide Tennessee Department of Health response plan. They will also assist the Emergency Response Coordinators in the regional health departments with the development of regional plans.

It is important that health care providers be able to identify unusual patterns or signs of disease. For this reason, a poster differentiating chickenpox from smallpox was distributed to hospital emergency departments, dermatologists, infection control practitioners, and infectious disease physicians across the state. Quick clinical identification is important in ensuring prompt reporting to appropriate public health officials. In turn, this will translate into timely public health response.

The Tennessee Department of Health (TDH) has continued to be an active participant in conferences and meetings to educate health professionals and the public about the threats of emerging infections and bioterrorism. At Belmont University in May 2002, the department hosted a conference on Bioterrorism and Public Health with approximately 100 attendees from the public, hospitals and the media. In September 2002, TDH was a major sponsor of the 3-day Tennessee Public Health Association Conference, which had a bioterrorism theme with several nationally recognized speakers and over 800 attendees. In October of 2002, 75 attendees from health departments and clinical laboratories attended the Tennessee Emerging Infections Presentation Day at the Scarrett-Bennett Center in Nashville. Additionally, in April and May, TDH conducted five regional smallpox tabletop exercises with approximately 400 attendees from health departments, law enforcement, fire departments, emergency management, ambulance services, and hospitals.

Also of note is the focus of emergency response plans on risk communication and health information dissemination. In a public health emergency, such as the identification of a case of smallpox, the overwhelming number of people rushing to emergency rooms, hospitals, and physicians will be the worried well. The likely result will be the overwhelming of the health care system. Collaboration between health educators, emergency response coordinators, public information officers, and the media resulted in the development of a risk communication plan. Future refinement of the plan will include reaching traditionally underserved groups including minorities, non-English speakers, and the homeless populations.

Hospital Preparedness

As part of the 2002 bioterrorism funding, $2.4 million was received by TDH from the Department of Health and Human Services, Health Resources and Services Administration for a Bioterrorism Hospital Preparedness Program. These funds have been used to upgrade the ability of hospitals and other health care entities to respond to bioterrorist attacks and other outbreaks of infectious disease.

A Hospital Advisory Committee composed of representatives from health care organizations and governmental entities was established in 2002 to oversee the development of a multi-tiered system in which local health care entities are prepared to triage, isolate, treat, stabilize and refer multiple casualties of a bioterrorist incident to identified regional referral centers. In cooperation with the Tennessee Hospital Association, the TDH developed six regions based on the normal referral pattern of patients to the medical centers in each region. In August 2002, the Hospital Preparedness Program hired a program director who has been charged with the oversight of the entire program.

TDH contracted with General Physics Corporation to conduct a hospital survey, to be completed by February 2003, that assesses the hospitals' preparedness to respond to a bioterrorism attack. After the final survey results are presented to TDH, General Physics will develop six regional bioterrorism response plans by May 2003. General Physics will then facilitate hospitals --in collaboration with regional/metropolitan heath departments and other health care entities-- to develop these regional plans to enable health care entities to respond to incidents requiring mass immunization, treatment, isolation, and quarantine in the aftermath of a bioterrorism attack or other outbreaks of infectious disease. Once the plans are developed, General Physics will conduct six regional tabletop exercises in the summer and fall of 2003 to test the plans and the capability of the health care entities in each region to provide care to the people in their communities after a bioterrorism attack. The information from the survey, regional planning and the tabletop exercises will be used to update the Tennessee Department of Health Bioterrorism Response Plan. Specifically, each exercise will address the need to accommodate a surge of 500 acutely ill patients.

Section VII.
Epidemic Intelligence Service

In order to renovate our state apparatus we must at all costs set out first, to learn, secondly, to learn, and thirdly, to learn, and then to see to it that learning shall not remain a dead letter, or a fashionable catch-phrase (and we should admit in all frankness that this happens very often with us), that learning shall really become part of our very being, that it shall actually and fully become a constituent element of our social life.

Lenin, March 2, 1923

David Kirschke, MD, EIS Officer, Tennessee, 2002, carrying out investigations

Epidemic Intelligence Service (EIS)

Centers for Disease Control and Prevention

The EIS was established in 1951 following the start of the Korean War as an early warning system against biological warfare and man-made epidemics. The program, composed of medical doctors, researchers, and scientists who serve in two year assignments, today has expanded into a surveillance and response unit for all types of epidemics, including chronic disease and injuries.

Over the past 50 years, EIS officers have played pivotal roles in combating the root causes of major epidemics. The EIS played a key role in the global eradication of smallpox by sending officers to the farthest reaches of the world; discovering how the AIDS virus is transmitted; investigating the first outbreaks of Legionnaires' disease, hantavirus and *E. coli* O157; responding to the introduction of West Nile virus in the U.S.; and responding to bioterrorism attacks and improving the public health preparedness for future events. Many of the nation's medical and public health leaders, including CDC directors and deans of the country's top schools of public health, are EIS alumni. Approximately 70% of alumni pursue careers in public health after their EIS training.

EIS officers are physicians or personnel with advanced degrees and training in public health. Officers are assigned to positions at the Centers for Disease Control and Prevention headquarters in Atlanta, or positions based at state health departments. In those positions, they gain experience and provide important support for a variety of epidemiologic investigations.

The Tennessee Department of Health has been hosting EIS officers since 1970. Recent graduates include Dr. Allen Craig, State Epidemiologist, and Dr. Tim Jones, Deputy State Epidemiologist. Dr. David Kirschke served as an EIS officer from July 2001 to July 2003 in Tennessee.

Following is a sample of Dr. Kirschke's investigations thus far as an EIS officer:

- Human rabies death in Tennessee
- Outbreak of methicillin-resistant *Staphylococcus aureus* skin infections in a jail associated with tattooing
- Outbreak of conversion disorder among Amish adolescent girls
- Connecticut bioterrorism-related anthrax investigation
- *Pseudomonas aeruginosa* and *Serratia marcescens* associated with a manufacturing defect in bronchoscopes
- Q fever in Tennessee
- Outbreak of joint and soft-tissue infections associated with injections from a multiple-dose medication vial
- Outbreak of aseptic meningitis associated with echovirus 13
- Outbreaks of photokeratitis and "sunburn" associated with damaged metal halide lights
- Analysis of the effects of Medicaid managed care on childhood immunization rates in Tennessee

Epidemic Intelligence Service Officers, 1970-2003

Tennessee Department of Health

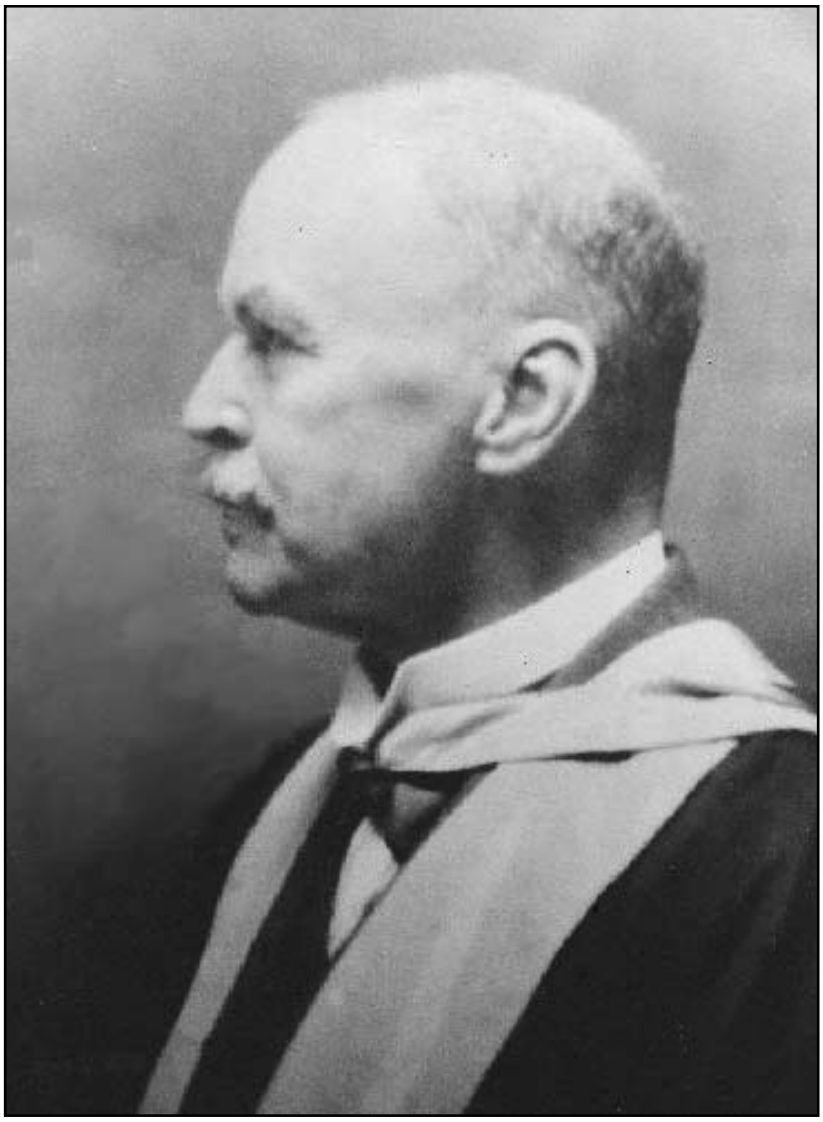
1970-1971	G. Doty Murphy, M.D.
1971-1972	David L. Freeman, M.D.
1972-1974	Bernard Guyer, M.D.
1974-1976	David S. Folland, M.D.
1976-1977	R. Campbell McIntyre, M.D.
1977-1979	Timothy J. Dondero, M.D.
1980-1982	Tracy L. Gustafson, M.D.
1982-1984	Michael D. Decker, M.D., M.P.H.
1984-1986	William T. Brinton, M.D.
1986-1988	Melinda Wharton, M.D.
1988-1990	Ban Mishu, M.D.
1990-1992	Peter A. Briss, M.D.
1992-1994	Steven M. Standaert, M.D.
1995-1997	Allen S. Craig, M.D.
1997-1999	Timothy F. Jones, M.D.
1999-2001	Joseph F. Perez, DrPH
2001-2003	David L. Kirschke M.D.

Section VIII.

Publications by Communicable and Environmental Disease Services and Tennessee Emerging Infections Program Authors, 1998-2002

Even if you are on the right track, you will get run over if you just sit there.

Will Rogers



Ronald Ross, one of the discoverers of the malaria parasite (undated photo).

Centers for Disease Control and Prevention

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