The U.S. Centers for Disease Control and Prevention (CDC) has defined the antimicrobial resistance problem as a “major blooming public health crisis.”¹ Drug resistant bacterial infections affect hundreds of thousands of Americans and cause tens of thousands of deaths each year. These infections are painful, difficult to treat, and this ‘silent epidemic’ costs the U.S. health care system many billions of dollars annually. And yet, an astoundingly diminutive amount of federal resources are being committed to address this staggering problem.

Antibiotic-resistant infections have become significant threats to citizens of TENNESSEE:

Drug-resistant *Staphylococcus aureus*:

- Although primarily affecting ill people in hospitals, Methicillin-resistant *Staphylococcus aureus* (MRSA), a drug-resistant bacteria, are infecting a growing number of people in the community and outside hospitals, including healthy athletes and children. A recent study in the *Journal of the American Medical Association* demonstrates that MRSA alone infects more than 94,000 people and kills nearly 19,000 annually in the United States – more deaths than those caused by emphysema, HIV/AIDS, Parkinson’s disease, and homicide.²

- Hospitalizations for or complicated by MRSA cost nearly double that for non-MRSA stays – $14,000 for MRSA stays compared with $7,600 for non-MRSA stays. The average length of stay in the hospital for a patient with MRSA infection was more than double that for non-MRSA stays – 10.0 days versus 4.6 days.³

- From July to December of 2004, there were 882 cases (30 cases per 100,000 persons) of MRSA reported. In 2005, the number of cases increased to 1,978 cases, with 2,005 cases in 2006 (33 cases per 100,000 persons). MRSA is the third-most common reportable communicable disease in Tennessee (after chlamydia and gonorrhea). Most (87%) invasive MRSA are hospital-associated.⁴

- In Tennessee, there has been a dramatic increase in the frequency of MRSA infections among otherwise healthy persons without typical healthcare-associated MRSA risk factors. These MRSA infections are referred to as community-associated MRSA (CA-MRSA).⁵

- A study at Children’s Hospital at Vanderbilt University in Tennessee showed that between 2002 and 2005, MRSA colonization in healthy children had increased 10 fold, leaving these children and other children at risk of serious infections of the skin, bloodstream, and heart.

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¹ Dr. Fred Tenover, quoted in “The Bacteria Fight Back” *Science*, July 18, 2008.
⁴ 2006 Annual Report, Communicable and Environmental Disease Services, Tennessee Department of Health
⁵ “Spider Bite?? Think MRSA!” EIP Bulletin, Tennessee Emerging Infections Program, Tennessee Department of Health; August 2005
Drug-resistant “gram negative” bacterial infections:

- Serious and life-threatening infections due to antibiotic resistant “gram negative” bacteria are on the rise across the United States. Gram negative bacteria primarily are differentiated from gram positive bacteria, like MRSA, by a cell wall that is particularly adept at preventing antibiotics from entering the bacteria. These infections, primarily acquired in hospitals and long term care settings, are extremely difficult to treat and cause significant numbers of illnesses and deaths. Bacteria in this group include: *Escherichia coli* (E. coli), *Klebsiella pneumonia*, *Pseudomonas aeruginosa*, and *Acinetobacter*.

- In March 2009, CDC published guidelines for detection and control of *E. coli* and *Klebsiella* species with increasing resistance to a subclass of antibacterial drugs known as carbapenems. Carbapenems are among the most potent antibiotics currently available and are often considered the “last line of defense” in the treatment of antibiotic resistant bacteria. Studies have shown that the mortality rate from infections caused by carbapenem resistant *Klebsiella* species is roughly 40%. CDC described this problem as “another in a series of worrisome public health developments regarding antimicrobial resistance among gram-negative bacteria [that] underscores the immediate need for aggressive detection and control strategies.”

- Noteworthy, these organisms are difficult to detect with the automated testing systems currently used in most hospital laboratories.7

- Of critical importance, there are few to no approved antibacterial drugs currently available to treat many gram negative bacterial infections and few to no new drugs in the pipeline; drug discovery in this area is extremely difficult due to challenges in overcoming the gram negative bacteria’s cell wall.

Other antimicrobial resistance issues:

- *Shigella* is a common cause of bacterial gastroenteritis, and causes substantial morbidity, particularly in daycare-aged children. Rates of *Shigella* infection in Tennessee have been increasing since 2001, and are 3 times higher in the first half of 2005 than they were at the same time last year. In 2002, of *Shigella* isolates submitted to the National Antimicrobial Resistance Monitoring System, 77% were resistant to amoxicillin, 37% to trimethoprim/sulfamethoxazole (TMP/SMX), 31% to tetracycline, 7% to cephalothin, and 3% to amoxicillin. Unfortunately, multidrug resistance is common, with 58% of isolates in 2002 resistant to two or more antimicrobial agents. Of 80 *Shigella* isolates from Shelby County, TN tested during a community-wide outbreak in 2003, 91% were resistant to amoxicillin, 88% to trimethoprim/sulfamethoxazole, and 80% to tetracycline.

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6 CDC MMWR “Guidance for Control of Infections with Carbapenem-Resistant or Carbapenemase-Producing Enterobacteriaceae in Acute Care Facilities” March 20, 2009 / Vol. 58 / No. 10
resistant to ampicillin/sulbactam, 56% were resistant to TMP/SMX, and 41% were resistant to tetracycline.  

- *Clostridium difficile (C. diff.)* is spawning infections in hospitals in the U.S. and abroad that can lead to severe diarrhea, ruptured colons, perforated bowels, kidney failure, blood poisoning and death. It is a common cause of antibiotic-associated diarrhea, accounting for 15-25% of all episodes. CDC estimates there are 500,000 cases of *C. diff.* infection annually in the U.S., contributing to between 15,000 and 30,000 deaths. Elderly hospitalized patients are at especially high risk and mortality in these patients may exceed 10%. The disease is very difficult to treat and recurs in at least 20% of cases, even when treated appropriately.
  
  - Deaths from *C. diff.* have increased steadily in Tennessee over the past few years. There were 26 in 2001, 41 in 2002, 58 in 2003, 105 in 2004, and 110 in 2005.  

- *Streptococcus pneumoniae* is the leading cause of meningitis and pneumonia in hospitalized patients. In 2006, there were 837 cases (14 cases per 100,000 persons) reported in Tennessee. Because of alarming rates of drug resistance in the late 1990’s, the Tennessee Department of Health has formed appropriate antibiotic use coalitions in Davidson and Knox counties with the aim to reduce inappropriate use of antibiotics and to reduce the spread of antibiotic-resistant bacteria that cause many upper respiratory illnesses.  

Public health laboratory capacity:

A key factor in Tennessee’s ability to detect, monitor and control antimicrobial resistance is its public health laboratory capacity. Across the nation, increasing cases of antimicrobial resistance are currently swamping the ability of each state's public health laboratory to keep pace. There has been limited funding in the past for antibiotic resistance education programs and surveillance, and even this limited funding is on the decrease. Approximately only half of state public health labs can provide some basic resistance testing. Like many states, Tennessee lacks the targeted technical ability to detect and characterize emerging resistance patterns promptly in a range of pathogens. Therefore, such resistant organisms continue to spread unrecognized and unimpeded throughout the state.

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9 CDC Wonder Death Certificate Data, cited in a July 28, 2008 communication to Senator Sherrod Brown
10 2006 Annual Report, Communicable and Environmental Disease Services, Tennessee Department of Health

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