"Several of the words and terms in this glossary has been adapted from the report on Antibiotic Resistance Threats in the United States, 2013 (http://www.cdc.gov/drugresistance/threat-report-2013/)


Agent: A factor, such as a microorganism, chemical substance, or form of radiation, whose presence is essential for the occurrence of a disease.

Aminoglycoside: A type of antibiotic that destroys the functioning of gram-negative bacteria. Increased resistance to aminoglycosides has made them less useful.

Antibiotic: Type of medicine made from mold or bacteria that kills or slows the growth of other bacteria. Examples include penicillin and streptomycin.

Antibiotic class: A grouping of antibiotics that are similar in how they work and how they are made.

Antibiotic resistance: The result of bacteria changing in ways that reduce or eliminate the effectiveness of antibiotics. Antibiotic resistance is one type of antimicrobial resistance.

Antimicrobial: A general term for the drugs, chemicals, or other substances that either kill or slow the growth of microorganisms. Among the antimicrobial agents in use today are antibacterial drugs (which kill bacteria), antiviral agents (which kill viruses), antifungal agents (which kill fungi), and antiparasitic drugs (which kill parasites). The ResFinder tool uses the term "Antimicrobial configuration" for groups of antimicrobial agents.

Antimicrobial resistance: The result of microorganisms changing in ways that reduce or eliminate the effectiveness of drugs, chemicals, or other agents used to cure or prevent infections. In this report, the focus is on antibiotic resistance, which is one type of antimicrobial resistance.

Assembly: Process by which the short reads are put together to form longer, continuous stretches of DNA called contigs. Assembly can either be reference-based (when a reference genome from a closely related organism is available) or de novo (from scratch).

Azithromycin: A macrolide antibiotic used to treat infections caused by gram-positive bacteria and infections such as respiratory tract and soft-tissue infections.

Base call: The process in which a particular base is assigned to a particular position.

Carbapenem: A type of antibiotic that is resistant to the destructive beta-lactamase enzyme of many bacteria. Carbapenems are used as a last line of defense for many bacteria, but increased resistance to carbapenems has made them less useful.
Cefixime: A cephalosporin antibiotic that is resistant to the destructive beta-lactamase enzyme of many bacteria.

Ceftriaxone: A cephalosporin antibiotic that is resistant to the destructive beta-lactamase enzyme of many bacteria.

Cephalosporin: Cephalosporins are a class of antibiotics containing a large number of drugs. Some more recently developed cephalosporins are resistant to the destructive beta-lactamase enzyme produced by many bacteria.

Ciprofloxacin: A broad-spectrum fluoroquinolone antibiotic that is important in treating serious bacterial infections, especially when resistance to older antibiotic classes is suspected.

Clindamycin: An antibiotic used to treat certain types of bacterial infections, including infections of the lungs, skin, blood, female reproductive organs, and internal organs.

Contigs: (from contiguous) a set of overlapping DNA segments that together represent a consensus region of DNA.

Coverage: This is tricky, because it can both refer to "depth of" coverage and "breadth of" coverage. Depth of coverage is the average number of times the data is covered by the reads in the genome. Breadth of coverage is the percentage of the target genome that is covered (at all) by the assembly.

Draft genome: Genome separated in several contigs. The short reads, which are the immediate result of sequencing, are assembled into a set of contigs that represent a closed (finished) genome. Due to imperfections in the data quality (the reads) and the assembly algorithms, it is usually not possible to obtain a closed genome without further procedures. For most analysis a closed genome is anyway not necessary.

Endogenous flora: Bacteria that naturally reside in or on the body.

Epidemiology: The study of diseases to find out who is affected, how disease is spread, trends in illnesses and deaths, what behaviors or other risk factors might put a person at risk, and other information that can be used to develop prevention strategies. Epidemiologists use surveys and surveillance systems to track illnesses, and they often investigate disease outbreaks.

Erythromycin: An antibiotic used to treat certain infections caused by bacteria, such as bronchitis, diphtheria, Legionnaires’ disease, pertussis (whooping cough), pneumonia, rheumatic fever, sexually transmitted diseases, and infections of the ear, intestine, lung, urinary tract, and skin. It is also used before some surgery or dental work to prevent infection.

Extended-spectrum antibiotic: An antibiotic that has been chemically modified to attack additional types of bacteria, usually those that are gram-negative.
**Extensively drug-resistant (XDR):** Resistance to nearly all drugs that would be considered for treatment. Exact definitions for XDR differ for each type of bacteria.

**Fluoroquinolones:** Broad-spectrum antibiotics that play an important role in treatment of serious bacterial infections, especially hospital-acquired infections and others in which resistance to older antibacterial classes is suspected. Increasing resistant to fluoroquinolones is making them less effective.

**HAI s:** Healthcare-associated infections are those that occur in hospitals, outpatient clinics, nursing homes, and other facilities where people receive care.

**Homopolymer-length error:** A type of indel (insertion or deletion) specific to the 454 and ion torrent sequencing method. For these methods, each homopolymer sequence is called in a single flow, indicated by a light signal. The brightness of the light indicates the length of the homopolymer. When the same base appears several times in a row, it may be hard to distinguish the exact brightness of the light, resulting in (for example) the sequence AAAAA being called as AAAAAA, or vice versa.

**Hypervirulent:** Increased ability to cause severe disease, relapse rates, and death. Invasive disease: A disease that can spread within the body to healthy tissue.

**Illumina:** Second generation sequencing method that employs cyclic reversible terminator sequencing. The HiSeq and the MiSeq are two different platforms from Illumina.

**Ion Torrent:** Second generation sequencing method that does not make use of optical signals, but rather exploit the fact that addition of a dNTP to a DNA polymer releases an H+ ion.

**Isolate/bacterial isolate:** A pure culture or sample of bacteria used to study their properties.

**Isoniazid (INH):** A first-line drug used to treat tuberculosis. Strains of tuberculosis resistant to INH and rifampin are considered to be multidrug resistant.

**Macrolide:** A type of antibiotic used to treat infections caused by gram-positive bacteria and infections such as respiratory tract and soft-tissue infections. Macrolides are often used in people allergic to penicillin, but resistance to macrolides is increasing and has made them less useful.

**Methicillin:** An antibiotic derived from penicillin. It was previously used to treat bacteria such as Staphylococcus aureus.

**Microbiology:** The study of microorganisms.

**Microorganism:** Organisms so small that a microscope is required to see them. This term includes bacteria, fungi, parasites, and viruses.

**Morbidity:** The number of people who are infected with a specified illness in a given time period.
Mortality: The number of people who die in a given time from a specified illness.

MRSA: Methicillin-resistant Staphylococcus aureus is used to describe any strain of S. aureus that is resistant to all types of penicillin (not just methicillin) as well as cephalosporin.

Multidrug-resistant (MDR): Microorganisms that are resistant to multiple classes of antimicrobials. The exact number of drugs that a microorganism is resistant to varies depending on the infection or pathogen.

N50: Statistical measure used to describe the quality of a draft genome. The N50 value for a set of contigs (a draft genome) is defined as the length of the shortest contig, in the set of largest contigs that represents at least 50% of the assembly.

Narrow-spectrum antibiotic: An antibiotic that is active against a limited range of bacteria.

Next-generation sequencing (NGS): Also known as high-throughput sequencing, is the catch-all term used to describe a number of different modern sequencing technologies including: Illumina (Solexa) sequencing, Roche 454 sequencing, Ion torrent: Proton / PGM sequencing, SOLiD sequencing. These recent technologies allow us to sequence DNA and RNA much more quickly and cheaply than the previously used Sanger sequencing.

Outbreak: When a group of people develop the same illness around the same time, and the number of people affected is higher than normal. Outbreak investigations are conducted to identify what exposure the affected people had in common.

PHRED score: Quality score related to each base call to characterize the quality of DNA sequences. PHRED scores are integers between 0 - 60 (typically), but to save space, they are converted to single-characters using ASCII encoding, when written in the FASTQ format.

Pan drug-resistance (PDR): Resistance to all drugs that would be considered for treatment. Exact definitions for PDR differ for each bacteria.

Pathogenicity: This is the potential capacity of certain species of microbes to cause an infectious process.

Pathovar: A way to differentiate between different pathogenic groups within a bacterial species (E.g. E. coli). These pathogenic groups are defined by their route of transmission, the symptoms they give, their behavior under the microscope (e.g. how they adhere to or kill specific human cell lines) and by which virulence factors (genes) they produce.

Penicillins: A class of antibiotics including amoxicillin, methicillin, piperacillin and other drugs based on the first true antibiotic discovered in 1928 by Dr. Alexander Fleming. Increased resistance has made many types of penicillins less useful.
**Reads (short reads/raw reads):** The immediate output from any sequencing procedure. Often the next step is to assemble the reads into contigs that together form a draft genome.

**Reservoir:** The habitat in which an infectious agent normally lives, grows and multiplies

**Resistant bacteria:** Microorganisms that have changed in ways that reduce or eliminate the effectiveness of drugs, chemicals, or other agents to cure or prevent infections.

**Rifampin:** A first-line drug used to treat tuberculosis. Strains of tuberculosis resistant to isoniazid (INH) and rifampin (RMP) are considered to be multidrug resistant.

**Sanger sequencing:** First-generation sequencing method. Employes chain-termination and requires a single-stranded DNA template, a DNA primer, a DNA polymerase, normal deoxynucleosidetriphosphates (dNTPs), and modified di-deoxynucleotidetriphosphates (ddNTPs), the latter of which terminate DNA strand elongation, since they lack the 3'-OH group required for the formation of a phosphodiester bond between two nucleotides. The ddNTPs may be fluorescently labeled for detection.

**Second generation sequencing:** Also called next generation sequencing. High throughput sequencing. Template amplification is necessary. Examples include 454, Illumina and Ion torrent.

**Strain/bacterial strain:** A strain is a genetic variant or subtype of a microorganism (for example, a flu strain is a subtype of the flu virus). Some strains of bacteria are resistant to antibiotics, and others are not. When bacteria become resistant to antibiotics, they can share their resistance with other bacteria to create new resistant bacterial strains.

**Superinfection:** An infection following a previous infection, especially when caused by microorganisms that are resistant or have become resistant to the antibiotics used earlier.

**Susceptible bacteria:** When antibiotics are effective at killing or stopping the growth of a certain bacteria, the bacteria is known as susceptible to antibiotics. Susceptible infections are infections that can be treated effectively with antibiotics.

**Systemic agents:** Drugs that travel through the bloodstream and reach cells throughout the body.

**Tetracyclines:** A class of broad-spectrum antibiotics including tetracycline, doxycycline, minocycline, and other drugs. Increased resistance has made many types of tetracyclines less useful.

**Third generation sequencing:** Also called next-next generation sequencing. No template amplification step - sequencing of single DNA molecules. PacBio and Oxford Nanopore are examples, neither is easily available and have not been used much for microbial diagnostics purposes (yet).

**Transmission:** Mechanism by which an infectious agent is spread through the environment or to another person.
**Vancomycin:** A drug that is frequently used to treat methicillin-resistant "Staphylococcus aureus" infections and that is also effective against other bacteria.

**Vector:** An animate intermediary in the transmission of an agent from a reservoir to the host.

**Vehicle:** An inanimate intermediary in the transmission of an agent from a reservoir to the host.

**Virulence:** Signifies the degree of pathogenicity of the given strain. Virulence, therefore, is an index of the qualitative individual nature of the pathogenic microorganism.