Illnesses that occur when harmful forms of bacteria multiply inside the body. They range from mild to severe.
How Does Bacteria Spread?

- contaminated water (cholera and typhoid fever)
- contaminated food (botulism, *E coli* food poisoning, salmonella food poisoning)
- sexual contact (syphilis, gonorrhea, chlamydia)
- the air, when infected people sneeze or cough (tuberculosis)
- contact with animals (anthrax, cat scratch disease)
- touching infected people (strep throat)
- from one part of the body, where they are harmless, to another part, where they cause illness (as when *E coli* spread from the intestines to the urinary tract).
How does resistance occur?

As bacteria reproduce, mutations in their genes. One of these mutations may happen, by chance, to make one bacterium in a person's body less vulnerable to a drug. This bacterium multiples along with other bacteria. While other bacteria are killed off by the drug, the mutated—or resistant—bacterium thrives, and eventually spreads from person to person.
A PERFECT STORM

As bacterial infections grow more resistant to antibiotics, companies are pulling out of antibiotics research and fewer new antibiotics are being approved.

[Graph showing the increase in antibiotic-resistant infections from 1980 to 2010, with a peak in 2005 and a decrease after 2010.]
Resistant bacteria on the rise

Antibiotics on the fall
Deaths From Drug-Resistant Infections Set To Skyrocket

Deaths from antimicrobial resistant infections and other causes in 2050

<table>
<thead>
<tr>
<th>Cause</th>
<th>Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antimicrobial resistant infections</td>
<td>10.0m</td>
</tr>
<tr>
<td>Cancer</td>
<td>8.2m</td>
</tr>
<tr>
<td>Diabetes</td>
<td>1.5m</td>
</tr>
<tr>
<td>Diarrhoeal disease</td>
<td>1.4m</td>
</tr>
<tr>
<td>Road traffic accidents</td>
<td>1.2m</td>
</tr>
<tr>
<td>Measles</td>
<td>130,000</td>
</tr>
<tr>
<td>Cholera</td>
<td>120,000</td>
</tr>
<tr>
<td>Tetanus</td>
<td>60,000</td>
</tr>
</tbody>
</table>

Source: Review on Antimicrobial Resistance
Was called consumption disease, because people with TB tended to waste away as if they were being slowly consumed from the inside.
TB can move through the blood and settle in almost any other part of the body, including the urinary tract, brain, lymph nodes, bones, joints, peritoneum, and heart. In 2016, it was estimated to cause about 8 million new cases of illness and about 2 million deaths, on top of 16 million existing cases of illness.
Lyme Disease

An infection that is passed to humans by the bite of tiny ticks.
Ticks that cause Lyme Disease
The ticks that most commonly become infected with these bacteria often feed and mate on deer during the adult part of the tick's life cycle.
One of three types of **plague** caused by bacterium Yersinia pestis. One to seven days after exposure to the bacteria, flu-like symptoms develop. These symptoms include fever, headaches, and vomiting. Swollen and painful lymph nodes occur in the area closest to where the bacteria entered the skin.
The bacteria multiply inside the flea, sticking together to form a plug that blocks its stomach and causes it to begin to starve. The flea then voraciously bites a host and continues to feed, even though it is unable to satisfy its hunger. During the feeding process, blood cannot flow into the blocked stomach, and consequently the flea vomits blood tainted with the bacteria back into the bite wound.
Bubonic plague if untreated, the rate of mortality for bubonic plague is 50-90%.
In septicemic plague, there is bleeding into the skin and other organs, which creates black patches on the skin. Untreated septicemic plague is fatal, but early treatment with antibiotics reduces the mortality rate to between 4 and 15 percent. People who die from this form of plague often die on the same day symptoms first appear.
The Plague of Justinian in A.D. 541–542 is the first known pandemic on record. The huge city of Constantinople imported massive amounts of grain. The grain may have been the source of contamination for the city, with massive public granaries nurturing the rat and flea population. At its peak the plague was killing 10,000 people in Constantinople every day and ultimately destroyed 40 percent of the city's inhabitants. It went on to destroy up to a quarter of the human population of the eastern Mediterranean.
During the mid-14th century, from about 1347 to 1350, Black Death, a massive deadly pandemic, swept through Eurasia, killing one third of the population. It is estimated that anywhere from a quarter to two-thirds of Europe's population became victims to the plague, making the Black Death the largest death toll from any known non-viral epidemic.
Anthrax

An acute infectious disease caused by the spore-forming bacterium *Bacillus anthracis.*
Anthrax infection can occur in three forms: cuts in the skin, inhalation, and gastrointestinal.
Skin infected with anthrax.
Gonorrhea

“The Clap”

A sexually transmitted infection (STI). It also can be transmitted from an infected mother to a baby during childbirth. If untreated, gonorrhea may result in infertility in women, among other problems.
Gonorrhea may be spread by genital, anal, or oral sex. Symptoms may include:
- a burning sensation when urinating
- frequent urination
- pus-like discharge from the vagina or penis
- tenderness or pain in the genital area or abdomen
- for women, bleeding between menstrual cycles
Gonorrhea can be treated with antibiotics.

Non-genital sites include the rectum, the throat, and the eyes. Doctors apply silver nitrate or other antibiotics to the eyes of all newborn infants to prevent the possible transmission from mother to baby during delivery.
Caused by Chlamydia trachomatis can cause eye or lung infections and can also infect the urinary and genital areas of both men and women. Chlamydia pneumoniae causes infections of the respiratory tract, and parrot fever, that is similar to the flu.
Chlamydia can spread from the genitals to the eyes, joints, soles of feet, mouth and finger tips.
Syphilis

Syphilis is caused by Treponema pallidum, a bacteria that spreads throughout the body and can infect almost any organ.
The symptoms of syphilis appear in stages. The first stage, called primary syphilis, usually occurs about three weeks after infection when a sore called a chancre (SHANG-ker) appears on the body, usually in the genital area.
Secondary syphilis
The secondary stage, usually starts about six weeks after infection. People feel achy, tired, and feverish. They usually have a rash that may be prominent on the palms of the hand and soles of the feet. They often lose patches of hair, giving their head a moth-eaten appearance.
Leprosy damages the nerves, skin, and mucous membranes. It is caused by the Mycobacterium leprae.
Treatment of leprosy today is with a prescription drug that kills the bacteria. Other drugs have lately been added to treatment because of the growing resistance of the bacteria to the original drug in recent years.
Staphylococcus can live harmlessly on many skin surfaces, especially around the nose, mouth, genitals, and anus. But when the skin is punctured or broken for any reason, staph bacteria can enter the wound and cause an infection.
People can get staph infections from contaminated objects, but staph bacteria often spread through skin-to-skin contact.
Usually this happens when people with skin infections share things like bed linens, towels, or clothing. Warm, humid environments can contribute to staph infections.
Botulism is a rare but serious kind of food poisoning. Most outbreaks are caused by improperly preserved home-canned foods, but some are caused by improperly cooked foods.
Symptoms of botulism include blurred vision, difficulty swallowing, body weakness, dry mouth, abdominal pain, vomiting, shortness of breath, and muscle paralysis. When death occurs, it is usually caused by paralysis of the respiratory muscles.
Strep throat, an infection of the throat common in children, is caused by bacteria in the Streptococcus family. Its main symptoms are sore throat and fever.
If a streptococcal infection does not go away on its own or respond to treatment, there are a number of possible serious complications.

Nephritis - an inflammation of the kidneys
Rheumatic fever - a condition involving the heart, joints and other parts of the body, which can cause permanent damage to heart valves.
Flesh-Eating Disease (necrotizing fasciitis)

Caused by a group A streptococcus.

Occurs in the tissues below the skin, affecting the fat, fascia (coverings of the muscles and tendons) and muscles. The tissues can quickly die because of poor blood supply, possibly leading to the death of the patient.
• Efforts are made to keep the skin intact.

• Skin that is allowed to slide off opens “windows” for more oxygen to get in, fueling the spread of the infection.
Diphtheria

A highly contagious throat infection. Although it is now rare in the United States and Europe, it was a leading cause of death in infants and children until the twentieth century.
Diphtheria is spread into the air when sneezing or even talking. At first, the infection feels like a bad sore throat. A person may also have a mild fever and swollen glands. Children frequently have nausea, vomiting, chills, headache, and fever. The thick coating that forms in the nose, throat, or airway can make it hard to breathe or to swallow.
Viral Infections

Viruses are about a thousand times smaller than bacteria. Viruses are so small that most cannot be seen with a light microscope, but must be observed with an electron microscope.
How Do Viruses Infect the Body?

Viruses can enter the human body through any of its openings, but most often they use the nose and mouth. Once inside, the virus attaches itself to the outside of the kind of cell it attacks, called a host cell.

After entering the cell, the virus begins making identical viruses from the host cell's protein. These new viruses may make their way back out through the host cell's membrane, sometimes destroying the cell, and then attacking new host cells.
A highly contagious virus, which is very easily spread through body fluids such as mucus, saliva or blood. It displays itself with flu like symptoms, vomiting and bloody diarrhoea up to 10 days after contact with the virus. After 10-15 days, bleeding occurs through the mouth, nose and eyes.
Norwalk virus infection is an intestinal illness that often occurs in outbreaks. Symptoms include:

- Nausea
- Vomiting
- Diarrhea
- Stomach cramps
Influenza

Influenza is a viral infection of the respiratory tract. The flu virus spreads through the air and is easy to catch.

A flu vaccination can prevent infection most of the time. As many as 20,000 Americans, however, die each year from the flu or its complications.
1918 Flu Pandemic
8 million soldiers and 7 million civilians died during World War 1. But as the war was ending in 1918, another killer was rising: influenza. More than 20 million people died, including 500,000 Americans. Symptoms - high fever, head, muscles, and whole body aches. Chest congested. Throat sore, cough and sneeze.
HIV infection can spread only when an infected person's body fluid (blood, semen, vaginal fluid, breast milk, or any body fluid containing blood) enters the bloodstream or contacts the mucous membrane* of another person.

Since the beginning of the epidemic, more than 70 million people have been infected with the HIV virus and about 35 million people have died of HIV. Globally, 36.9 million people were living with HIV at the end of 2017.
Before treatments became available in the 1990s, life expectancy for HIV-positive people in the U.S. was 10 to 12 years after diagnosis.

In the mid-1990s, people with HIV/AIDS took a complicated regimen of up to 20 pills per day to treat the disease.

In 1995, more than 48,000 people died at the peak of the epidemic in the U.S., making it the leading cause of death among Americans ages 25 to 44.

In 1986, AZT, the first drug used to treat HIV/AIDS, began clinical trials.

In 1982, the Gay Men’s Health Crisis, the first provider of HIV/AIDS prevention and treatment in the U.S., opened in New York City.

Until recently, the only way to lower your risk of getting sexually transmitted HIV was to practice safe sex and use condoms consistently and correctly.

With improvements in treatment, life expectancy is now in the early 70s for some groups. It’s lower for other groups, such as nonwhites and those with a history of drug use or a weaker immune system.

Medical advances made treatments more effective so that today, most people with HIV/AIDS take just one pill per day.

In 2014, 6,721 people in the U.S. died from HIV/AIDS.

By 2015, 15.8 million people worldwide were on antiretroviral treatment — medications that slow the progression of HIV.

Today, there are testing clinics and service providers across the U.S. Find one near you at gettested.cdc.gov.

In 2012, the FDA approved a medication called PrEP that helps reduce the odds of HIV infection in high-risk groups. You can reduce the risk of infection up to 72 hours after possible exposure by starting a medicine called PEP. It’s still important to practice safe sex.
Small Pox

Smallpox is an infection caused by the variola virus. The virus was spread when one person breathed in droplets from the air that an infected person had breathed out, for instance by sneezing or coughing. It could also be spread by simply touching someone with the disease.
Once inside the body, the virus multiplies and spreads throughout the bloodstream, invading the various tissues of the body. It destroys the cells of the skin, and these dying cells form blisters. The eyes and internal organs such as the liver and spleen are also affected by the virus.
The last known outbreak of the disease, which killed 2 million people in 1967, was in Somalia in 1977. In 1980, the World Health Assembly declared the world free of smallpox. The world health organization is currently deciding whether to destroy the remaining smallpox virus stocks at the CDC in Atlanta and in Moscow.
German Measles (Rubella virus)

It is spread through the air from an infected person to another person.
The main symptom of rubella is a rash that appears first on the face. It then spreads to a person's arms, legs, and body. The rash generally lasts for 2 to 3 days. Some people with rubella also develop a slight fever. Sometimes the lymph nodes at the back of the neck become swollen.
With its rash and fever, chickenpox is common in children and usually mild. But it can be serious, especially in infants, adults, and people with weak immune systems. Chickenpox is caused by varicella, a virus in the herpesvirus family.
The chickenpox virus spreads from person to person by contact with the fluid in chickenpox blisters or through droplets in the air. It is very contagious. About 4 million people in the United States get chickenpox each year; about 10,000 of these people get sick enough to go to the hospital, and about 100 die.
Immunization of children with the chickenpox vaccine now available.

Varicella (Chickenpox) Deaths
1972-2013

The varicella vaccine was introduced in 1995. There were 115 deaths from the virus that year.
Polio Virus - Polio epidemics have crippled thousands of people, mostly young children; the disease has caused paralysis and death for much of human history.
The polio vaccine was introduced in 1955. There were 13,850 cases of paralytic polio that year.

Note: 1937-1949 may include non-paralytic polio cases. 1950-1953 includes non-paralytic polio cases.
Warts are small, hard bumps on the skin or inner linings of the body that are caused by a virus—to too small to be seen with the naked eye—called human papillomavirus.
HPV Vaccine

• HPV stands for human papillomavirus. There are lots of different types of HPV.

• Genital HPV is a very common sexually transmitted infection which usually has no symptoms and goes away by itself, but can sometimes cause serious illnesses.

• Almost all cases of genital warts and cervical cancer are due to HPV.

• HPV also causes some other genital cancers in women and men including vaginal, vulva, penile and anal.
How do you get HPV? Part 1

• 9 out of 10 people have HPV at some time in their lives.

• Both men and women can get HPV.

• You can be exposed to HPV the first time you’re sexually active, from only one sexual partner.
How do you get HPV? Part 2

The virus is transferred from one person to the other through tiny invisible breaks in the skin.

• The types of HPV that cause genital cancers and warts are passed on by genital-skin to genital-skin contact.

• Condoms offer some but not total protection from HPV, as they don’t cover all of the genital skin. However, condoms do protect against other sexually transmitted infections and help prevent unwanted pregnancy.
HPV and cancer

• Usually, HPV leaves the body naturally and you never know you had it.

• Sometimes HPV doesn’t leave the body naturally. We call this ‘persistent’ HPV infection.

• Persistent HPV infection can cause abnormal cells to develop.

• These cells may develop into cancer, usually over many years, if they aren’t treated.
There is a vaccine that can stop girls and boys getting nine HPV types that cause:

- 90% of cervical cancers
- most genital HPV-related cancers in males
- 90% of genital warts.
How successful is the vaccine?

We have already seen some great results from the HPV vaccine. These include:

1. A reduction in HPV types responsible for most cervical cancers
2. Halving the number of abnormal Pap test results that can lead to cervical cancer
3. The near disappearance of genital warts
Will girls still need Cervical Screening Tests?

Girls will still need Cervical Screening Tests in the future if they have the vaccine.

This is because the vaccine doesn’t protect you against all of the HPV types that can lead to cervical cancer.

You will need Cervical Screening Tests every 3 years from the age of 25 if you have ever been sexually active.
Immunization is our Best Defence Against Viral Infections
### Canada’s Immunization Record

<table>
<thead>
<tr>
<th>Vaccine Preventable Disease</th>
<th>Cases In Canada before Immunization Program</th>
<th>Cases in Canada in 2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diphtheria</td>
<td>9000</td>
<td>1</td>
</tr>
<tr>
<td>Influenza b</td>
<td>2000</td>
<td>68</td>
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<tr>
<td>Hepatitis B</td>
<td>3000</td>
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<tr>
<td>Measles</td>
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<tr>
<td>Mumps</td>
<td>52,000</td>
<td>32</td>
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<tr>
<td>Pertussis (Whooping Cough)</td>
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<tr>
<td>Polio</td>
<td>20,000</td>
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<tr>
<td>Rubella</td>
<td>69,000</td>
<td>9</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>480,000</strong></td>
<td><strong>3658</strong></td>
</tr>
</tbody>
</table>
The science facts about AUTISM AND VACCINES

WHAT STARTED THE RUMORS?

1998

The Study Had Some Problems

Lancet published a paper by Dr. Andrew Wakefield, a dramatic study that found a connection between autism and vaccines

- Not based on statistics
- No control group
- It relied on people's memories
- Made vague conclusions that weren't statistically valid
NO LINK WAS FOUND

So people started investigating his claims

1999
a study of 500 children
no connection was found

2001
a study of 10,000 children
still found no connection

2002
a study from Denmark of 537,000 children
found no connection

2002
a study from Finland of 535,000 children
once again found no connection

2005
A review of 31 studies covering more than 10,000,000 children
Also found no connection

2012
A review of 27 cohort studies, 17 case control studies, 6 self-controlled case series studies, 5 time series trials, 2 ecological studies, 1 case cross-over trial covering over 14,700,000 children

2004
Lancet released a statement REFUTING the original findings

NO LINK TO AUTISM WAS FOUND IN ANY CASE, IN ALL OF THE STUDIES.

"They had conducted invasive investigations on the children without obtaining the necessary ethical clearances... picked and chose data that suited their case; THEY FALSIFIED FACTS."
1/4 U.S. parents believe some vaccines cause autism in healthy children.

1.8% of parents opt out of vaccines for religious or philosophical reasons.

There have been 0 credible studies linking vaccines to autism.

Recently, an anti-vaccine religious community has seen measles outbreaks.

Although declared eradicated in 2000...

Before widespread vaccinations of babies:
- In 1980, 2.6 million deaths from measles.
- In 2000, 562,400 deaths, 72% of babies vaccinated.
- In 2012, 122,000 deaths, 84% of babies vaccinated.

France reported a massive measles outbreak with nearly 15,000 cases in 2011.

The U.K. reported more than 2,000 measles cases in 2012.
In the United States, whooping cough shot up in 2012 to nearly **50,000 cases**

- **150,000** cases in the 1960s
- **5,000** cases in the 1970s
- **2,900** cases in the 1980s
- **26,000** cases in 2004
- **50,000** cases in 2012

**20 deaths in the US**

A new study concluded that **vaccine refusals** were largely to blame for a 2010 outbreak of whooping cough in California.

Dr. Wakefield's paper published in 2001.
COMMON VACCINE MYTHS

Vaccines are ridden with toxic chemicals that can harm children

Thimerosal, the chemical being referenced, does contain mercury. However, thimerosal has been removed from scheduled vaccines and only resides in the seasonal flu vaccine.

The decision to not vaccinate my child only affects my child

Un-vaccinated children who contract a disease can infect infants yet to be inoculated, the small percentage of people whose vaccines did not take, and people with compromised immune systems.

Receiving too many vaccines at once can override a baby’s immune system

Baby’s immune systems are strong enough to defend from the day to day viruses and bacteria with which they come in contact; they can also handle the vaccines. Remember, vaccines use deactivated viruses in their ingredients.

Drug companies just do it to make profits

According to the WHO, estimated 2013 global revenues for all vaccines is around $24 billion, which only accounts for approximately 2 - 3% of the total pharmaceuticals market.
VACCINES WORK!

Positive effects of vaccines

- Helped eradicate Smallpox
- Save about 8 million lives every year
- Significantly reduce disease in the world
- New and underutilized vaccines could avert nearly 4 million deaths of children under the age 5 by 2015

SOURCES
bit.ly/vaccine_fraud
bit.ly/vaccine_outbreak
bit.ly/vaccine_preventable
bit.ly/vaccine_facts
bit.ly/vaccine_lancet
bit.ly/vaccine_profit
bit.ly/vaccine_deniers
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