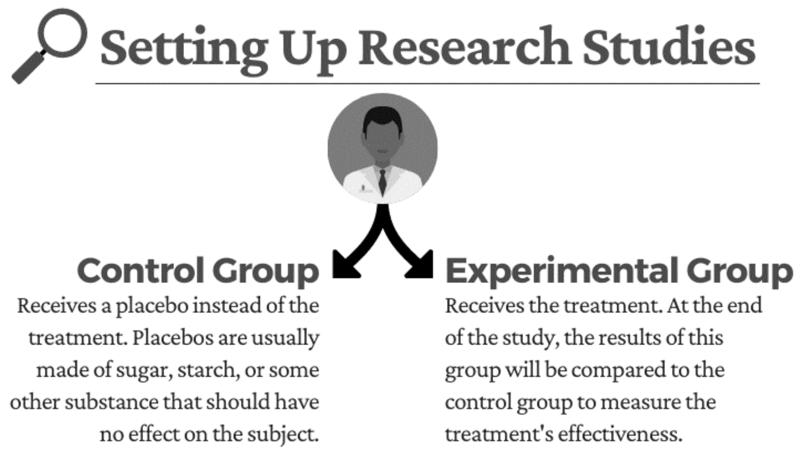
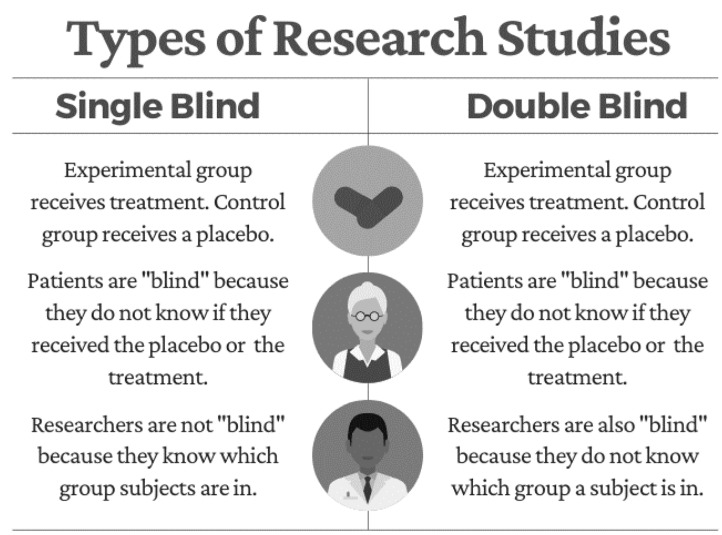
Investigating Influenza – Student Instructions

Investigate Common Myths Around Influenza

Up until around 1890, the predominant belief was that diseases were caused by “bad air” stemming from pollution and rotting organic matter. This was known as the miasma theory. Though many scientists over the centuries had theorized that diseases were caused by invisible particles and could spread from person to person, it wasn’t until the mid-19th century that the current germ theory began to take hold. Physician John Snow proposed that cholera was made of cellular units and solved an 1854 London cholera outbreak by blocking a contaminated water pump. In the 1860s, Louis Pasteur conducted experiments proving that bacteria were present in the air. Shortly thereafter, Robert Koch demonstrated that diseases are caused by specific microorganisms. Joseph Lister imposed sanitation requirements for surgeries and hospitals, resulting in dramatically lower rates of infection and death. The idea that diseases were caused by germs took hold, forever changing the face of **public health** and medicine.

Suffice to say, in the centuries leading up to the development of germ theory, incorrect ideas about the causes and cures of disease were plentiful. “Old wives’ tales” represent the oral tradition by which home remedies and superstitions were transmitted through communities and generations. Though many of these tales have no basis in fact, they provided people with a sense of control in situations where they had none. Many of those false ideas persist today, despite plenty of evidence to the contrary. In this activity, you will be thinking about some of the things you’ve heard about sickness, including causes, treatments, and cures.





Placebo Effect

Sometimes people begin feeling better after receiving a placebo for purely psychological reasons. For instance, someone with a headache might begin feeling better after taking an aspirin, even if it has no physical effect. The placebo effect should be considered when looking at the results of any experiment

Design an Experiment

Choose one of your myths to investigate. You may also choose one of the given examples if it inspires you! If you were going to attempt to prove or disprove this statement, how would you do it? Before you get into this task, here is some information about experimental design.

When designing an experiment, it is important that you have a **control** group and an **experimental** group. The **experimental** group will receive whatever treatment or variable is being tested in the experiment, but the **control** group will not. By examining the different outcomes of the two groups, researchers can then determine whether a treatment is effective or not. Experiments can be conducted as single-blind experiments where the test subjects do not know which group they are in, but the researchers do. A better model is a double-blind experiment where the groups are hidden from both the test subjects and the researchers who are directly conducting the tests. Researchers who know what groups subjects are in might unconsciously give clues to subjects that impact their perception and outcomes, so using a double-blind model helps eliminate that bias.

As you design your experiment, it may be helpful to focus on your independent and dependent variables. An independent variable, sometimes called a manipulated variable, is the thing you will be changing. The dependent variable, sometimes called a responding variable, is the thing you will be measuring or observing to look for a change.

Here is a simple example of how these principles are used to design an experiment investigating treatments for influenza. If you are investigating the claim that vitamin C helps you recover from flu faster, you cannot simply give everyone vitamin C and note that they all got better. It could be that all participants would have gotten better in the same time frame regardless of whether they received the vitamin C or not. Instead, you would need two groups: a vitamin C group (**experimental**) and a placebo group (**control**). Both groups would receive doses of a substance they believe is vitamin C, but only one group would actually get the vitamin. The other would get an inactive placebo pill usually made of starch or sugar. The test subjects should have no idea which they are receiving. In a single-blind experiment, the people handing out the pills would know whether they were vitamin C or placebo, but in a double-blind experiment they would not. If the vitamin C group showed a faster recovery, it could indicate that taking vitamin C helps to decrease duration of illness. If both groups fared the same, it likely has no effect. Having the two groups allows for the effects of vitamin C to be better isolated and compared.

Example Experiment

Carrying forward with the same vitamin C experiment, here is what the general **experimental** design would look like:

- **Ask a question:** How does vitamin C affect the duration of flu symptoms?
- **Do background research:** What is vitamin C? How does it affect the immune system? How much vitamin C is recommended? What are the safety considerations with using vitamin C? What do current studies about vitamin C indicate as far as its effectiveness in helping to fight disease?
- **Construct a hypothesis:** If flu patients are given 500 mg daily vitamin C doses, the duration of flu infection will decrease. The independent variable in this experiment is whether or not a person is given vitamin C, while the dependent variable is how long their flu lasts.
- **Test with an experiment:** Find a population of people with influenza through a health clinic or doctor's office. Provide patients with vitamin C or a placebo using a double-blind **experimental** model. Have patients record symptoms and temperature readings every 24 hours for 10 days.
- **Analyze data:** Determine how long severe illness lasted for each person and determine average duration for both groups to look for differences between **control** and **experimental** groups.
- **Draw conclusions:** Look for any differences in outcomes between the two groups.
- **Communicate results:** Publish findings in a scientific journal or in CDC's *MMWR* (*Morbidity and Mortality Weekly Report*) for other health care professionals to review.

Analyze Influenza Data

CDC tracks instances of about 120 diseases through the National Notifiable Disease Surveillance System, including infectious diseases, bioterrorism agents, sexually transmitted diseases, and noninfectious conditions. About 3,000 local **public health** departments send disease data to 60 state, territorial, and other **public health** departments, who then send the data to CDC.

What story does the data tell?
If you collected data during routine disease **surveillance**, what would you do with them? Using the data to make recommendations to health officials and the general public is one of CDC's most important duties. In this activity, you will examine three graphs related to influenza and other respiratory illnesses and use them to describe associated risks and consequences of influenza outbreaks.

Just for Fun: Take it Further!
The National Center for Health Statistics (NCHS) maintains a dashboard of influenza data that is updated weekly at https://gis.cdc.gov/grasp/fluview/mortality.html. You can find current mortality **surveillance** information for the United States, plus more information about current influenza rates.

For an in-depth exploration of respiratory illnesses based on the information above, read the article "Changes in Influenza and Other Respiratory Virus Activity During the COVID-19 Pandemic — United States, 2020-2021." https://www.cdc.gov/mmwr/volumes/70/wr/mm7029a1.htm

Share Your Findings

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The Influenza Division of the National Center for Immunization and Respiratory Diseases (NCIRD) improves global control and prevention of seasonal and novel influenza and improves influenza pandemic preparedness and response. In collaboration with domestic and global partners, the influenza division builds **surveillance** and response capacity, monitors and assesses influenza **viruses** and illness, improves **vaccines** and other interventions, and applies research to provide science-based enhancement of prevention and control policies and programs. Connect with them on Twitter using **@CDCFlu**.