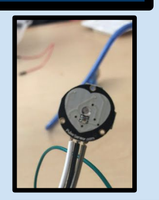
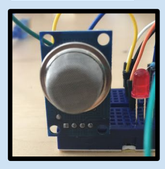
Asthma in the USA

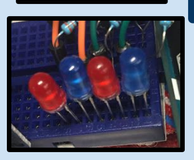
- In the United States, about 25.7 million people have asthma.
- “Prenatal exposure to air pollution has been shown to increase the risk of wheezing and asthma development in children.“ - **American Academy of Allergy Asthma and Immunology**
- “Research shows that air pollution can worsen asthma symptoms on high pollution summer days than on days with average pollution levels.”
  - **Asthma and Allergy foundation of America:**
- “Each day, ten Americans die from asthma, and in 2015, 3,615 people died from asthma.” **- Asthma and Allergy Foundation of America**

Device Information

- **Heart Beat** Sensor
- **MQ-135** (Air Quality Sensor)
- Two sets of LED lights (red and blue)
- **Red** LED flashes for **high heart beat** and **poor air quality**
- **Blue** LED flashes for **normal heartbeat** and **good air quality**
- Wearable with buckelable wrist band







IMPROVE

With the creation of our device there are also lots of things that we improved as well as things we wish to improve on if we were to be given more resources as well as time.

Things We Improved

- Got a smaller breadboard
- Changed Parameters to better fit whether or not the person was in danger of an asthma attack.

Things We Wished To Improve

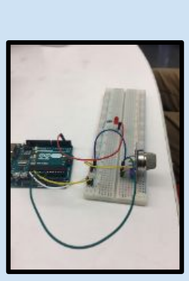
- Solder the pieces together
- Get different sensors for other triggers of asthma
- “Break in the sensor” for accurate readings

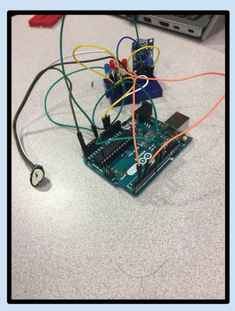
CREATE

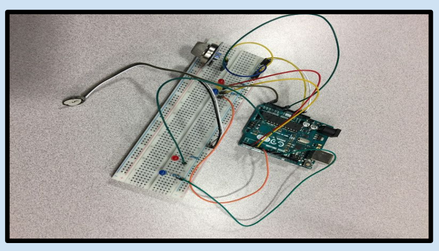
1. **Air Quality sensor:**
   - Measures smoke, alcohol and benzine
   - Red light flash when the levels are high
   - Smoke is a very common asthma attack trigger
   - Alcohol contains substances that can worsen and trigger asthma attacks
2. **Heart Rate sensor:**
   - Measures the heart rate
   - Red light flashes when the heart rate is high
   - The wheezing and breathlessness cause an increase heart rate and blood pressure

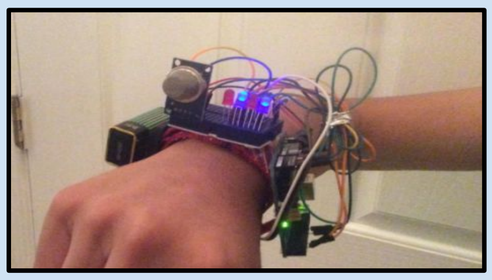
Prototype

The air quality sensor was successfully working. The heart rate sensor was very sensitive and had many issues but were eventually fixed.

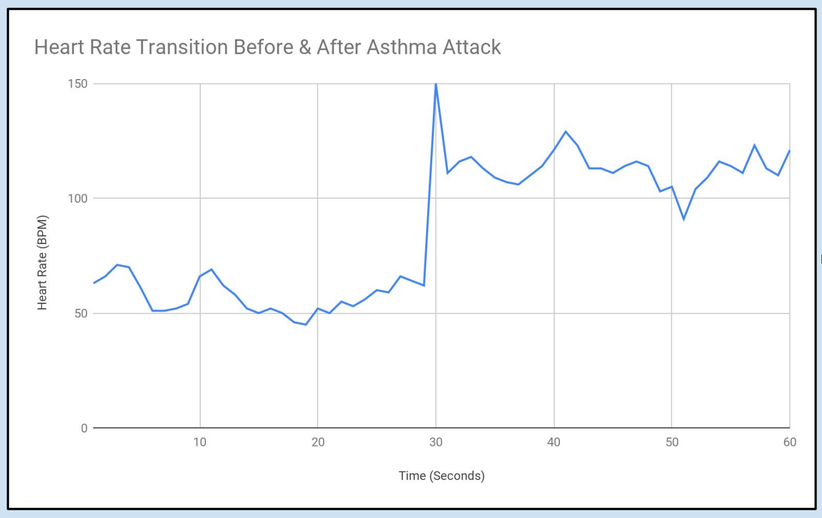




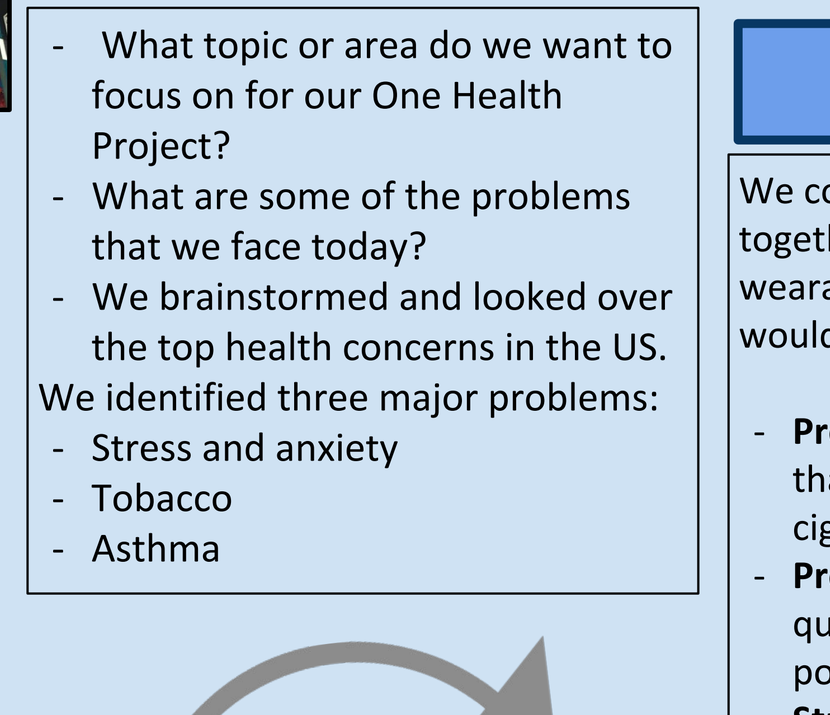




Data Analysis



- First 30 seconds is **before the** simulated asthma attack
- Last 30 seconds is **after** the simulated asthma attack
- Heart rate for normal person is obviously **less** than someone during an asthma attack
- Gives idea about **normal** heartbeat vs heartbeat of someone during an **attack**



- First 30 seconds is **ordinary** room
- Last 30 seconds is in **poor air quality**
- Better air quality is around **250 ppm** **(measuring benzene, alcohol, and smoke)**
- Poor air quality ppm is **higher** and less stable. However, still relatively stable.
- Gives idea about how to code LED’s to flash

ASK

- What topic or area do we want to focus on for our One Health Project?
- What are some of the problems that we face today?
- We brainstormed and looked over the top health concerns in the US.

We identified three major problems:

- Stress and anxiety
- Tobacco
- Asthma

Engineering Design Process

Sources:

IMAGINE

We collectively brought all of our ideas together and thought of some ideas of a wearable device we could create that would solve a health issue.

We brainstormed 3 ideas:

- **Prevent Smoking:** A wearable device that would measure that amount of cigarettes a person is smoking a day
- **Prevent asthma attacks :** Use air quality sensors to alert the person of potential danger
- **Stress reliever:** A fashionable necklace that also functions as a stress monitor

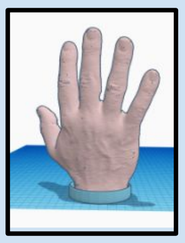
PLAN

- Changed our “Quit smoking“ idea because it was not possible to test and get data
- We decided to switch to the prevention detection of asthma attack idea.

The device

- Shaped as a bracelet

Designed it on Tinkercad ->



Materials:

We researched how to use these sensors and materials and thought about how we could use them to solve our problem.

- Heart Rate sensor
- Air quality sensor
- Arduino Uno
- Breadboard
- Jumper Wires