

Find a Healthier Commute

In Step 5 you evaluated your exposure to air pollution using fixed indoor and outdoor monitoring. During this next step, you'll use mobile monitoring to examine how your exposure to air pollution changes based on how you commute. Both the path you take and your mode of transportation have an impact on how much air pollution you're exposed to. You'll plot multiple routes, monitor each route with your AirBeam, and determine the healthiest way to get to and from school or work.

RECORD MOBILE AIRCASTING SESSION

Plot Your AirCasting Routes

- Begin by using a paper or online map to plot two or more routes to and from school or work. Choose different paths, and if possible, different modes of transit.

Get Ready to go AirCasting

- Watch the [“Mobile Monitoring with AirBeam3”](#) video.
- Identify the AirBeam intake and exhaust, always make sure they are not covered as you transport the AirBeam.
- Decide how you'll carry the AirBeam. You can attach a lanyard and hang it from your neck or use the AirBeam belt clip or carabiner to attach it to your clothing or backpack.
- If you're traveling by car, you can keep the AirBeam inside the vehicle or clip it to the exterior of the car window. If traveling by bike, you can attach the AirBeam to your clothing or bag or fasten it to your handlebars.
- When traveling by car, bike or other fast-moving mode of transport, face the AirBeam intake and exhaust away from your direction of travel if it's exposed to the wind.
- If it's raining or snowing, do not monitor by bike or from the exterior of a car or other fast-moving vehicle. If walking, make sure the AirBeam intake and exhaust are pointed toward the ground so the electronics don't get wet.
- Consider what session naming and tagging conventions you'll use to make it easy to identify and differentiate your various commuting trips at a later date. For example, you may want to name the sessions after the primary roadway you're traveling on and tag them with your mode(s) of transit.
- Record a test session, or several, to get familiar with how the AirCasting app and AirBeam work.

AirCasting Your Commute

- When you're ready to begin your commute, launch the AirCasting app and sign-in to your profile (if you're not already signed in).
- Go outside and begin recording a “Mobile” AirCasting session. Wait until you get a location fix before starting to record.
- Navigate to the map for your mobile session and when it's safe to do so, e.g. you're not driving or crossing the street, check your measurements as they are being recorded and mapped.

- When PM2.5 measurements are higher or lower than the average you can use the “Add a Note” feature to map your observations, like noting suspected pollution sources.
- When you arrive at your destination, finish recording your mobile session.
- Repeat these steps during your subsequent commutes.

VIEW & ANALYZE YOUR SESSIONS

Search For & View Your Mobile AirCasting Sessions

- Launch a web browser and navigate to **aircasting.org**
- At the top of the page, hover your mouse over the text reading “AirCasting” and select “AirCasting Maps” from the dropdown
- By default, you will be on the “MOBILE” tab of the maps page.
- By default, the “Parameter” selection will be “Particulate Matter” and the “Sensor” selection will be “AirBeam-PM2.5 (ug/m3)”. If these are not the default selections, please update them accordingly. If you recorded with an instrument other than the AirBeam3, please update the selections accordingly.
- Under “Location”, enter a city or zip code then select the correct suggestion from the dropdown.
- Click the refresh icon inside the “Time Frame” field to ensure you’re searching for sessions recorded during the past year, including today.
- Under “Profile Names”, enter your AirCasting profile name then select the correct suggestion from the dropdown.
- Once you’ve completed your search, a list of session cards matching your search criteria will appear along the bottom of the screen and the map will display the starting location of each mobile session. Click on the card for the session you plan to analyze and interpret.
- Along the bottom of the screen, identify the horizontal-colored line; this is referred to as the Heat Legend. In the lower right-hand corner, click the connected up and down arrow to the right of the Heat Legend; this will fit the graph to your measurements.
- Sometimes this can help visually highlight where measurements were highest and lowest. If it doesn’t help, try adjusting the thresholds between colors manually using the Heat Legend sliders, these are the white dots with black numbers above them.
- Drag the sliders or update the min/max values on the Heat Legend to adjust the relationship between measurements and colors on the graph and map. If it doesn’t help, simply click the refresh arrow to reset the thresholds on the Heat Legend.
- Hover your mouse over the graph to see the corresponding location on the map.
- Click and drag your mouse over the graph to zoom to a specific time frame or use the zoom buttons along the top of the graph. Drag the scroll bar along the bottom of the graph to make further adjustments to the time frame.
- Zoom and pan the map to explore your mapped measurements.

CrowdMap Your Air Quality Data

- Copy the URL from the address bar, open a new browser tab, paste the URL into the

address bar, and click enter. This will reproduce the search you just conducted when viewing your mobile AirCasting sessions.

- Under CrowdMap click “On”. The CrowdMap averages together all the measurements from all your commuting sessions listed on the sessions list and displays these averages as colored grid cells. The color of each grid cell corresponds to the average intensity of all the measurements recorded in that area. Click on a grid cell to view the underlying data.
- Along the bottom of the screen, identify the horizontal-colored line; this is referred to as the Heat Legend. Drag the Heat Legend sliders, these are the white dots with black numbers above them or update the min/max values on the Heat Legend to adjust the relationship between measurements and colors on the CrowdMap. Adjusting the thresholds between colors can visually highlight where measurements were highest and lowest. If it doesn’t help, simply click the refresh arrow in the lower right-hand corner to reset the Heat Legend.

Analyze Your Air Quality Data

- Were the PM2.5 measurements from your mobile AirCasting session(s) what you expected? If so, why? If not, why not?
- Where were PM2.5 levels highest? Where were they lowest? Why do you think this was?
- Did any measurements surprise you? If so, why?
- How do you think the time of day, day of the week, and season may have affected your measurements?
- Were the particle sources you could identify the ones you were expecting to find?
- Looking at the CrowdMap, where were PM measurements highest? Where were they lowest? Why do you think this was?

WHAT LEVEL OF FINE PARTICULATE MATTER EXPOSURE IS CONSIDERED DANGEROUS?

Long-term exposure to fine particulate matter or PM2.5 has been linked to a range of health problems including asthma and respiratory inflammation, lung cancer, heart attack, and stroke. The U.S. Environmental Protection Agency establishes the National Ambient Air Quality Standards (NAAQS) and Air Quality Index (AQI) on the best science available, which typically uses averaging time periods of 24 hours or longer when examining PM2.5 data and relating it to health outcomes. The AirCasting app and website uses the NAAQS standards for PM2.5 exposure and the AQI to relate colors to measurements: 0-12 ug/m³ is green, 13-35 ug/m³ is yellow, 36-55 ug/m³ is orange, and 55-150 ug/m³ is red. (The relationship between colors and measurements can be changed inside the AirCasting app and website.) These ranges/colors roughly correspond to increased health risks as the concentration of PM2.5 in the environment rises. However, there are some big caveats that should be noted. First, data shows that health effects occur at levels well below current regulatory thresholds, especially for the most toxic aerosols, like those from diesel exhaust. Second, as mentioned, most health studies have primarily examined long-term exposures to air pollution, not short-term exposures, leaving the potential health implications of such exposures unclear. Current health studies are only just

beginning to establish the relationships between short-term exposures to fine and ultra-fine particles and health effects, including blood inflammation and increased likelihood of heart attack. Third, because AirBeam3 does not meet the US government's performance or quality assurance requirements (there are no Federal Equivalency Method or Federal Reference Method low-cost, mobile instruments for measuring PM2.5 on the market) this introduces uncertainty in the interpretation of the AirBeam3's particle measurements.

HOW CAN I REDUCE MY AIR POLLUTION EXPOSURES DURING MY COMMUTE?

There is no straightforward answer to this question, but here are some tips:

- When traveling by bike or foot, use secondary and tertiary roadways as they generally tend to have less vehicle traffic and therefore less air pollution. This benefit typically disappears if backroads are congested with traffic, particularly if they're narrow and lined with tall buildings. Walking as far away from traffic as possible may also reduce air pollution exposures.
- When traveling by car, the biggest influence on your air quality is the vehicle directly in front of you. Try to avoid driving behind vehicles with visible exhaust, smelly exhaust, or diesel vehicles - especially diesel trucks and buses.
- If your car has AC or heat then it most likely includes an air filter. Set your system to recirculate the air, close your windows, and turn on your AC or heat.
- When traveling by subway, consider wearing a well fitted N95 or K95 mask when waiting on platforms. Many subway systems all around the world have notoriously high PM2.5 levels. While the subway cars normally have air filtration systems this is not typically the case for underground platforms.
- When traveling by train, if the train utilizes diesel engines, try and ride on trains that are pushed by the locomotive rather than pulled. If riding on a train that's pulled by a diesel engine, ride in the train car that's furthest from the engine.
- If traveling via diesel-powered school bus ask your school to ensure that the buses don't idle during pick-up and drop-off. If possible, experiment with how PM2.5 levels are influenced by whether you leave bus windows open or closed and do whichever reduces your exposure.