

A Guide for Exploring Environmental Health Science



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Section 1: What is environmental health science?

Defining Environmental Health Science

“Environmental health science is a field that focuses on how the environment affects human health.”¹ This is done by assessing environmental exposures and determining if they harm health. This may result in public policies or legislation to prevent further injury or disease, or education to help citizens in adapting to environmental effects that are unavoidable.

The field of environmental health science includes professionals with backgrounds in atmospheric science, ecology, chemistry, geology, hydrology, geography, anthropology, and much more.

Check-out these videos describing environmental health:

- [How does the environment affect our health?](#)
- [Environment, Health, You](#)

Examples in the San Luis Valley

[Summitville Mine](#)

The [Summitville Mine](#) is located approximately 20 miles southwest of Del Norte in Rio Grande County. Abandoned in 1992, this open pit mine has been a significant source of heavy metal pollution (copper, cadmium, manganese, zinc, lead, nickel, aluminum, iron) to the Alamosa River. While these metals are naturally occurring, the additional contamination eradicated local aquatic life and negatively influenced agriculture operations relying on the Alamosa River for irrigation.^{2,3} While the scientific evidence on some metals is less robust, we know that elevated exposure to lead can result in a wide range of health effects including impaired neurologic and cognitive development for children, and cardiovascular disease.⁴ Manganese is a micronutrient and needed by our bodies in small quantities – however, excess exposure can result in impaired cognitive functioning and motor skills (especially in children).^{5,6}

[Regional Air Quality](#)

The San Luis Valley is the highest mountain plain desert in North America, and as a result, has a unique climate. With climate stressors driving increases in annual temperature, decreases in annual precipitation, and decreased presence of previously sparse vegetation – the region is prone to experiencing elevated levels of airborne *particulate matter* (dust). Combined with more frequent wildfires, residents are experiencing more days with overall poor air quality.

Exposure to poor air quality can contribute to conditions such as asthma, COPD, and other respiratory conditions.^{7,8} Check out these monitoring programs by [CDPHE](#) and [PurpleAir!](#)

[Heat Stress](#)

Heat stress is a significant burden on our bodies, as it requires a lot of energy to maintain *homeostasis*. People who have preexisting medical conditions, are older, or are exposed at elevated levels – the burden of this stress is even greater. The [Colorado EnviroScreen](#) identifies portions of the San Luis Valley that have many populations sensitive to climate stressors – including older adults and people with existing health conditions.⁹ Additionally, agriculture composes a large portion of the local economy.¹⁰ While this population is at an increased risk for direct outcomes such as *heat-related illnesses*, there is also a growing body of evidence suggesting that heat stress may also result in other occupational injuries.^{11–13}

Environmental Justice

Disparities may occur within environmental health if any group of people are disproportionately burdened by environmental stressors or hazards.

Environmental injustice, a concept related to social justice, occurs when marginalized or underrepresented groups are disproportionately affected by pollution, climate change, and other stressors/hazards.

To combat these inequities, the environmental justice movement focuses on “fair treatment of all people regardless of race, color, national origin, or income; with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.”¹⁴

See how the U.S. Environmental Protection Agency defines environmental justice: [Learn about environmental justice](#)

Examples in the San Luis Valley

[Hazardous Waste](#)

In 2009, large amounts of radioactive waste were being transported through [Conejos County](#). Specifically, just outside the town of Antonito, waste was being transferred between truck and train transportation. Upon becoming aware of this

activity, there were immediate concerns for the impact on local water quality. The site of transfer was within 100 yards of a headwater's tributary of the Rio Grande and no assessment was conducted to understand baseline water quality. In the event of an accident or waste spill, the extent of necessary remediation would have been unknown.^{15,16}

A convergence of multiple factors allows us to identify these events as an environmental injustice. Rural communities are known to have reduced access to healthcare resources and the San Luis Valley statistically shows considerable deficiency with respect to multiple public health measures.¹⁷ Notable portions of residents identify as Hispanic or hold a low socioeconomic status.¹⁸ The lack of notification and engagement for these activities, which pose potential environmental health risks for community members, disproportionately affects this underserved community. Activist and San Luis Valley native, [Sophie Mayott-Guerrero](#) said, "I definitely saw growing up that it's not just that laws aren't designed to protect places like the San Luis Valley, but they're also really specifically ignored for places like the San Luis Valley."¹⁹

Pollution and Human Health

Pollution is a central concern in environmental science, as it involves the study of contaminants in the natural environment and how they disrupt ecosystems. When humans are present in those ecosystems, we may be at risk of experiencing negative health effects - from respiratory and neurological damage to cardiovascular disease and cancer.

Check-out these examples of air/water pollution and health effects: [Pollution and human health](#)

Climate Change

Climate change is transforming the world as we know it. Unlike weather, which describes short-term atmospheric conditions (like daily temperature, precipitation, and wind) over hours or days, climate change encompasses broader trends and averages over time. In some regions, it may result in milder or harsher winters, extreme periods of heat or drought, and altered annual precipitation.

Direct effects of climate change can include injuries, death, and displacement due to an increase in extreme weather events. However, there are many indirect

effects such as vector-borne diseases (i.e. malaria or dengue), food and water insecurity, and undernutrition that are of concern as well.

Check-out this video explaining why climate change is a public health issue: [Why is climate change a public health issue?](#)²⁰

Climate change can often exacerbate existing environmental health issues. For example, hot and arid regions can put outdoor workers at risk for heat-related illnesses. In a changing climate, these temperatures may be increased, posing an even bigger risk to human health.



Examples in the San Luis Valley

Wildfires in the SLV

The San Luis Valley, like most of the Mountain West, has been experiencing a drought for the last two decades. The aquifer that lives below the valley is dwindling; decreased precipitation combined with a steady demand for water has led to a shrinking supply, leaving less water available to meet the needs of agriculture, ecosystems, and communities in the region. At the same time, dust storms have become more common in the area. When dust settles on snow, it makes the surface darker, in turn attracting the sun and leading to snow melting earlier in the season.^{21,22} This change in timing disrupts the continuous flow of water that is expected from snowmelt throughout the summer months.

All of these factors work together to put the valley at higher risk of wildfires. Unfortunately, this risk has already become a reality for certain communities. One of the largest wildfires in Colorado's history occurred in the valley in 2018; the Spring Creek fire burned through over 100,000 acres of land and destroyed around 100 homes before being contained.²³ These wildfires can have lasting effects on air quality, water quality, and of course, the communities that they burn through.

Temperature, Drought, and Air Quality

The San Luis Valley is a high mountain plain desert. It's naturally arid climate has allowed the Great Sand Dunes to form, with winds displacing the top layer of soil and moving it across the region.²⁴ Knowing that airborne particulate matter in

rural regions is primarily larger granules originating from windborne crustal elements^{25,26} and that this particulate can result in a health outcomes associated with upper respiratory health outcomes,²⁷⁻³⁰ this puts SLV residents at increased risk. As climate change increases annual regional temperatures,³¹ it reduces the availability of the necessary groundwater supporting the life of ground vegetation^{32,33} and therefore exacerbating existing respiratory health outcomes from airborne dust.

Section 2: Designing an Experiment

The Scientific Method

The *scientific method* is crucial for maintaining confidence in science. It offers an organized, objective, and repeatable approach to understanding and explaining the world around us.³⁴ It is important to note that the scientific method is a cyclical process, meaning results can be further tested and built upon with future research studies.



https://st4.depositphotos.com/3900811/38175/v/450/depositphotos_381756660-stock-illustration-the-scientific-method-vector-illustration.jpg

Experiments are a fundamental part of the scientific method as they provide a systematic way to observe, describe, predict, and explain phenomena within our natural world. They allow scientists to test hypotheses and theories, gather data, and draw conclusions.

Watch this video to learn more about the scientific method: [The Scientific Method](#)

Introduction to Experimental Design

Planning is a critical component of the scientific method. It allows scientists to anticipate potential challenges, devise strategies to address them, and ensure that resources are used efficiently.

Part of experimental design includes choosing your *control group* and your *experimental group*. These groups should be as similar as possible, with the only

difference being whatever you are researching. This way, you can compare the two groups to see the effect of your topic of interest. Note that you can have more than one control and experimental group! For example, your experimental groups could be split into levels such as people exposed to high amounts of a pollutant and people exposed to low amounts of a pollutant. In this scenario, your control group should have *no exposure* to the pollutant being studied.

An Example in the San Luis Valley

Let's focus on a [study](#) looking at how chronic pain affects physical performance of older people in the SLV. The *independent variable* for this study was chronic pain while the *dependent variable* was physical performance. The experimental group consisted of people who reported being troubled with pain most or some of the time during the past week. The control group consisted of people who reported rarely or never being troubled by pain during the past week. Notice how the researchers decided to lump five groups of pain levels into two groups. These are the types of decisions that you need to make during experimental design! The researchers used statistical modeling to include other variables that may impact this relationship and found that chronic pain did affect physical performance.

Watch this video to better understand experimental design: [Introduction to experimental design](#)

Data to Justify Experimental Claims (Examples)

Another essential component of science is the ability to understand data and how it relates to your experiment. Interpreting data allows scientists to objectively assess the results of their experiments, validate their hypotheses, and draw meaningful conclusions. In addition to ensuring reliability and validity of research, it allows scientists to communicate their findings effectively.

Watch this video to learn more about experimental data: [Data to justify experimental claims \(examples\)](#)

Section 3: Science with secondary data sources

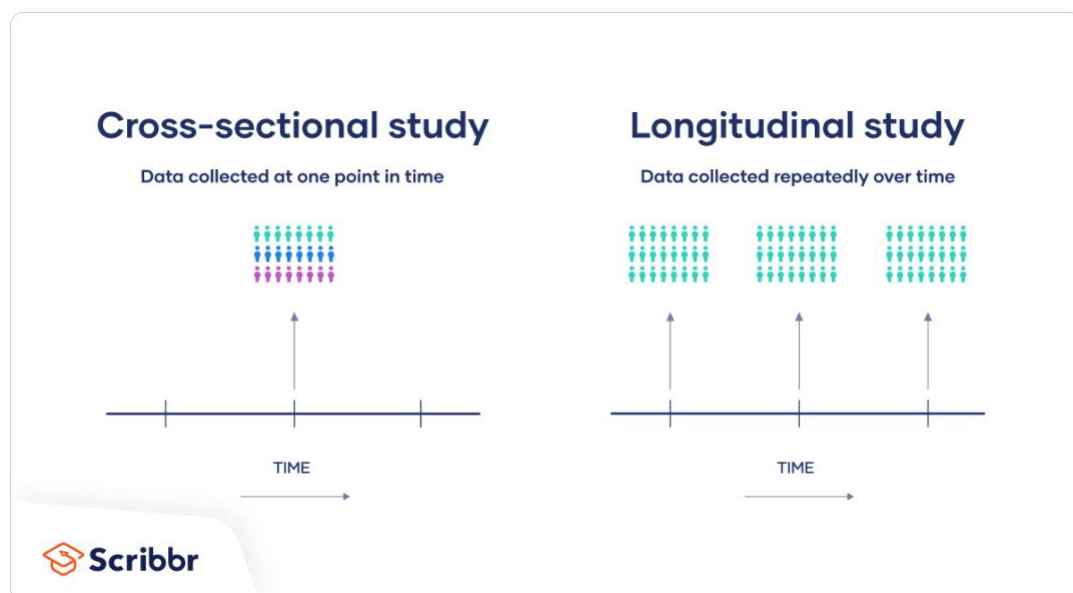
Primary and Secondary Data

Not all research requires the collection of new data (*primary data*). While some scientists collect new data, *epidemiologists* and environmental scientists frequently use existing data sources (*secondary data*). Secondary data can come from sources like literature reviews, historical records, government reports, or large databases. Scientists choose their data sources based on their research questions and available resources. For example, students may not have the time or funding to collect data for a study, so they can instead use secondary data to analyze and draw conclusions from.

Using Secondary Data

Before you use a secondary data source, it is important that you understand the type of data that you are using. Data can be classified as *qualitative* or *quantitative* and be collected in many different ways.

Depending on the *experimental design* from when data was collected, data may be collected at one single point in time, or at many points in time. These characteristics of experimental design provide a *cross-sectional* or *longitudinal* perspective.



<https://www.scribbr.com/methodology/cross-sectional-study/>

Learn more about using primary and secondary data in these videos:

- [Identifying individuals, variables and categorical variables in a data set](#)
- [Representing data](#)
- [Statistics intro: Mean, median, & mode](#)
- [Statistical questions](#)
- [Statistical and non-statistical questions](#)

Examples of Secondary Data Sources

1. [Colorado Health Information Dataset \(CoHID\)](#)

CoHID provides access to state and local-level data and resources compiled by the Colorado Department of Public Health and Environment and its partners to help understand health and related issues affecting people in Colorado.

2. [National Environmental Public Health Tracking Network](#)

The National Environmental Public Health Tracking Network brings together health data and environmental data from national, state, and city sources and provides supporting information to make the data easier to understand. The tracking network has data and information on environments and hazards, health effects, and population health.

3. [EPA EJScreen](#)

EJScreen is the EPA's environmental justice mapping and screening tool that provides a nationally consistent dataset and approach for combining environmental and socioeconomic indicators.

4. [Colorado EnviroScreen](#)

The Colorado EnviroScreen is an interactive environmental justice mapping tool. The tool enables users to identify disproportionately impacted communities based on the definition in Colorado's Environmental Justice Act (HB21-1266) so that communities can directly benefit from equitable distribution of money and other resources, enhanced opportunities to participate in environmental policy/rule making, and priority enforcement/compliance initiatives for environmental contaminants.

Section 4: Mentorship and current research in the San Luis Valley

What is mentorship?

Mentorship is a relationship where an experienced individual (the mentor) guides and supports a less experienced person (the mentee) in various aspects of personal or professional development. Mentorship involves sharing knowledge, providing feedback, and fostering growth.

How to find a mentor

Finding a mentor can look different depending on your needs, but there are some common practices to make this process a little easier:

1. Set clear goals

Define what you hope to gain from the mentorship. What do you want to learn?

2. Use your network

Students or early career professionals may not have a large network, so maximize the connections you do have! Ask relatives, teachers, friends, or community members if they know anyone with experience related to your goals.

Check out the mentor and project list that accompanies this guide!

3. Schedule the first meeting

Take the initiative and reach out! Ask to set up an informational interview or chat over coffee. Use this time to better understand their background and confirm that they are a good fit to be your mentor.

4. Formalize the relationship (or don't)

Hopefully in your first meeting, you were able to gauge compatibility with your potential mentor. If your interests align, take things a step further by expressing interest in learning from them! Some people prefer a more formalized relationship, and others are content with informal relationships.

Don't get discouraged if you didn't sense compatibility with your potential mentor. Take the time to find someone who aligns with your professional interests and personality. At the very least, you've just expanded your network!

5. Structure your mentorship

If you choose a more formalized mentorship, be sure to set expectations! Make sure your mentor understands the type of guidance you're looking for. Respect their boundaries by asking if they have a preferred communication channel and how often they're willing to meet.

6. Show gratitude

In most circumstances, mentors are not required to share their knowledge and experience. Express gratitude for their time and guidance.

7. Know when to look for a new mentor

Dynamics change over time. As a student or early professional, you may outgrow your needs for a specific mentor. Stay open to new mentors – you can have more than one!

Section 5: DIY - Do it yourself!

Remember, planning is an essential component for any successful experiment. Let's brainstorm how we would plan for an environmental health experiment. Topics could include air or water quality, drought, heatwaves, or waste management to name a few. Do your best to follow the scientific method and plan through every stage of the project.

Research Question

Make an observation – what do you want to learn?

Hint: Pick a topic you are interested in. What could be potential consequences of this topic? Who could be affected?

Hypothesis

Propose an explanation for your question – what do you think will happen?

Hint: use your existing knowledge to make an educated guess. Remember your hypothesis does not have to be correct, in fact, disproving your hypothesis can provide just as much useful information as supporting it!

Independent variable(s)

This is the variable that you change or control in an experiment. It's what you think will cause a change in something else. Think of it as the "cause."

What are your control and experimental groups? How many levels are there of your experimental group?

Glossary

climate change – long-term alterations in Earth’s climate patterns³⁵

control group – a control group consists of participants who do not receive any experimental treatment. The control participants serve as a comparison group

cross-sectional studies – where all data is collected at the same point in time; data provides a “snapshot” of information³⁶

dependent variable – the dependent variable is what is being observed and recorded because of the independent variable; the dependent variable *depends* on the independent variable

epidemiologist – an epidemiologist is a scientist who studies the determinants, occurrence, and distribution of health and disease in a defined population³⁷

experimental group – an experimental group is a group that receives the variable, or treatment, that the researchers are testing

heat stress – the general term for being exposed to heat in the environment

heat-related illness – a group illness that occurs when the body is no longer able to cope with heat stress (e.g. heat exhaustion, heat stroke)

homeostasis – the ability of the body to maintain the conditions needed to function (e.g. sweating helps keep the body cool; shivering helps keep the body warm)

independent variable – the independent variable is changed or controlled in a scientific experiment to test its effects on another variable

longitudinal studies – where data is collected across more than one point in time; data can be used to describe changes over time³⁶

particulate matter – a mixture of solid particles and/or liquid droplets found in the air; particulate matter ranges in size and is often denoted PM with the size of the particles in subscript (e.g. PM_{2.5}, PM₅, PM₁₀)

pollution – the introduction of harmful materials into the environment; these materials can be solid, liquid, or gas substances, or even forms of energy such as heat, sound, and radioactivity³⁸

primary data – new data specifically collected in current projects to answer research questions; the researchers is the *primary* user³⁶

qualitative data – data that is not expressed as numbers and consists mostly of words, pictures, or symbols; can be collected from interviews, focus groups, or other written materials (e.g. doctors’ notes in medical records)³⁶

quantitative data – data that is quantifiable and expressed as numbers (e.g. census/housing information, electoral statistics, survey responses)³⁶

secondary data – data that has already been collected for a set purpose by other sources and is readily available for use; the researcher is the *secondary* user³⁶

vectors – living organisms that carry infectious pathogens between humans, or from animals to humans; vectors are often bloodsucking insects (e.g. mosquitoes, ticks)³⁹

vector-borne diseases – human illnesses caused by parasites, viruses, and bacteria transmitted by vectors (e.g. malaria, dengue, Zika virus, West Nile fever)³⁹

References

1. School of Public Health University of Minnesota. What is environmental health? Accessed August 1, 2024. <https://www.sph.umn.edu/academics/degrees-programs/4-1-environmental-health/what-is-environmental-health/>
2. Colorado Department of Public Health & Environment. Summitville Mine. CDPHE. 2024. Accessed August 16, 2024. <https://cdphe.colorado.gov/hm/summitville-mine>
3. U.S. Geologic Survey, U.S. Department of the Interior. *The Summitville Mine and Its Downstream Effects.*; 2026. Accessed August 16, 2024. <https://pubsdata.usgs.gov/pubs/of/1995/ofr-95-0023/summit.htm>
4. U.S. Department of Health and Human Services. Centers for Disease Control and Prevention (U.S.). Agency for Toxic Substances and Disease Registry. *Toxicological Profile for Lead.* Agency for Toxic Substances and Disease Registry; 2020. doi:10.15620/cdc:95222
5. Kondakis XG, Makris N, Leotsinidis M, Prinou M, Papapetropoulos T. Possible Health Effects of High Manganese Concentration in Drinking Water. *Arch Environ Health Int J.* 1989;44(3):175-178. doi:10.1080/00039896.1989.9935883
6. U.S. Department of Health and Human Services. Centers for Disease Control and Prevention (U.S.). Agency for Toxic Substances and Disease Registry. *Toxicological Profile for Manganese.* Agency for Toxic Substances and Disease Registry; 2012. Accessed August 16, 2024. <https://wwwn.cdc.gov/TSP/substances/ToxSubstance.aspx?toxid=23>
7. Nakhjirgan P, Kashani H, Kermani M. Exposure to outdoor particulate matter and risk of respiratory diseases: a systematic review and meta-analysis. *Environ Geochem Health.* 2024;46(1):20. doi:10.1007/s10653-023-01807-1
8. Canaday FT, Georas SN, Croft DP. Examining the impact of air pollution, climate change, and social determinants of health on asthma and environmental justice. *Curr Opin Pulm Med.* 2024;30(3):276-280. doi:10.1097/MCP.0000000000001065
9. Colorado Department of Public Health & Environment. Colorado EnviroScreen. Published online June 9, 2022. Accessed August 9, 2024. <https://cdphe.colorado.gov/enviroscreen>
10. San Luis Valley Development Resources Group, San Luis Valley Council of Governments. *San Luis Valley Statistical Profile.*; 2021:1-5. <https://www.slvdr.org/wp-content/uploads/2021/03/2021-SLV-Statistical-Profile.pdf>

11. Moda HM, Filho WL, Minhas A. Impacts of Climate Change on Outdoor Workers and Their Safety: Some Research Priorities. *Int J Environ Res Public Health*. 2019;16(18):3458. doi:10.3390/ijerph16183458
12. Dally M, Butler-Dawson J, Sorensen CJ, et al. Wet Bulb Globe Temperature and Recorded Occupational Injury Rates among Sugarcane Harvesters in Southwest Guatemala. *Int J Environ Res Public Health*. 2020;17(21):8195. doi:10.3390/ijerph17218195
13. Habibi P, Moradi G, Dehghan H, Moradi A, Heydari A. The impacts of climate change on occupational heat strain in outdoor workers: A systematic review. *Urban Clim*. 2021;36:100770. doi:10.1016/j.uclim.2021.100770
14. U.S. Environmental Protection Agency. Environmental justice. June 25, 2024. Accessed August 1, 2024. <https://www.epa.gov/environmentaljustice>
15. Hildner M. Conejos board rejects Los Alamos waste. *The Pueblo Chieftain*. December 7, 2010:Online.
16. Berwyn B. San Luis Valley residents question nuclear waste transport. *Summit County Citizens Voice*. November 2, 2010:Online.
17. San Luis Valley Health. *2022 Community Health Need Assessment*. San Luis Valley Health; 2024. Accessed August 20, 2024. <https://www.sanluisvalleyhealth.org/about-us/in-the-community/community-health-needs-assessment/>
18. Emerson A. San Luis Valley CHNA. Published online March 25, 2023. <https://public.tableau.com/app/profile/amanda.emerson/viz/SanLuisValleyCHNA/DEMOgraphics>
19. Conservation Colorado. Sophia Mayott-Guerrero. Our Moment for Change. 2024. Accessed August 20, 2024. <https://conservationco.org/2022/11/02/climate-justice-leaders-sophia-mayott-guerrero/>
20. American Public Health Association. Climate, health and equity. Accessed August 1, 2024. <https://www.apha.org/topics-and-issues/climate-health-and-equity>
21. Sustainable Development Strategies Group. Dust Deposition on Snow. stsg.org. Accessed November 7, 2024. <https://www.sdsg.org/dust-deposition-on-snow#:~:text=The%20deposited%20dust%20drastically%20reduces,the%20snow%20to%20melt%20sooner.>
22. Derry J. Dust-on-snow: Impacts on snowmelt & streamflow. *Water Rep*. 2019;(190):15-24.

23. Colorado Division of Fire Prevention & Control. Historical Wildfire Information. Fire Prevention and Control. Accessed November 7, 2024. <https://dfpc.colorado.gov/sections/wildfire-information-center/historical-wildfire-information>
24. National Park Service. Great Sand Dunes. National Park Service. March 6, 2024. Accessed August 28, 2024. <https://www.nps.gov/grsa/learn/nature/geology.htm#:~:text=The%20dunes%20were%20formed%20by,tall%20dunes%20you%20see%20today>.
25. Sharratt BS, Lauer D. Particulate Matter Concentration and Air Quality Affected by Windblown Dust in the Columbia Plateau. *J Environ Qual*. 2006;35(6):2011-2016. doi:10.2134/jeq2006.0212
26. Kundu S, Stone EA. Composition and sources of fine particulate matter across urban and rural sites in the Midwestern United States. *Env Sci Process Impacts*. 2014;16(6):1360-1370. doi:10.1039/C3EM00719G
27. Hime N, Marks G, Cowie C. A Comparison of the Health Effects of Ambient Particulate Matter Air Pollution from Five Emission Sources. *Int J Environ Res Public Health*. 2018;15(6):1206. doi:10.3390/ijerph15061206
28. Anderson JO, Thundiyil JG, Stolbach A. Clearing the Air: A Review of the Effects of Particulate Matter Air Pollution on Human Health. *J Med Toxicol*. 2012;8(2):166-175. doi:10.1007/s13181-011-0203-1
29. Brunekreef B, Holgate ST. Air pollution and health. *The Lancet*. 2002;360(9341):1233-1242. doi:10.1016/S0140-6736(02)11274-8
30. Brook RD, Rajagopalan S, Pope CA, et al. Particulate Matter Air Pollution and Cardiovascular Disease: An Update to the Scientific Statement From the American Heart Association. *Circulation*. 2010;121(21):2331-2378. doi:10.1161/CIR.0b013e3181d8ce1
31. Mix K, Lopes V, Rast W. Annual and Growing Season Temperature Changes in the San Luis Valley, Colorado. *Water Air Soil Pollut*. 2011;220:189-203. doi:10.1007/s11270-011-0746-4
32. Zuazo VHD, Pleguezuelo CRR. Soil-Erosion and Runoff Prevention by Plant Covers: A Review. In: Lichtfouse E, Navarrete M, Debaeke P, Véronique S, Alberola C, eds. *Sustainable Agriculture*. Springer Netherlands; 2009:785-811. doi:10.1007/978-90-481-2666-8_48
33. Wang J, Zheng H. Experimental study on the effect of temperature and flux conditions on moisture distribution in vadose zone soil. *Water Sci Technol*. 2016;75(4):881-889. doi:10.2166/wst.2016.569

34. Khan Academy. The scientific method. Accessed August 1, 2024. <https://www.khanacademy.org/science/biology/intro-to-biology/science-of-biology/a/the-science-of-biology>
35. World Health Organization. Climate change. October 12, 2023. Accessed August 1, 2024. <https://www.who.int/news-room/fact-sheets/detail/climate-change-and-health>
36. James KA. Introduction to Secondary Data. Lecture presented at: EPID 7605; 2024; Colorado School of Public Health.
37. Brachman PS. Epidemiology. In: Baron S, ed. *Medical Microbiology*. 4th ed. University of Texas Medical Branch at Galveston; 1996. Accessed August 16, 2024. <http://www.ncbi.nlm.nih.gov/books/NBK7993/>
38. Boudreau D, McDaniel M, Sprout E, Turgeon A. Pollution. *Natl Geogr*. Published online March 6, 2024. Accessed August 2, 2024. <https://education.nationalgeographic.org/resource/pollution/>
39. World Health Organization. Vector-borne diseases. March 2, 2020. Accessed August 2, 2024. <https://www.who.int/news-room/fact-sheets/detail/vector-borne-diseases>

Appendix: Email templates for requesting mentorship

Template 1

Use this template if you have a good idea of what you want your project to look like and have a specific mentor that you would like to connect with.

Subject Line: Inquiry for Science Fair Mentorship

Hello [Dr./Mr./Ms. Last name],

I hope this email finds you well. My name is [Your Name], and I am a high school student at [Your School's Name]. I am currently preparing for my regional science fair, and I am reaching out with hope that you would be willing to provide guidance and mentorship on my project.

I have chosen to focus on [briefly describe your project topic], and I am particularly interested in this area because [explain your interest and any relevant background]. After researching potential mentors, I was impressed by your work in [specific area or research of the professional] and believe that your insight would be invaluable to my project.

I would be grateful for the opportunity to discuss my project with you and receive your insights and advice. I am eager to learn from your experience and would greatly appreciate any guidance you can provide. If you are available, I would love to schedule a meeting at your convenience to discuss this further. I recognize that my student schedule will likely conflict with your professional schedule, and appreciate any flexibility you can afford.

Thank you very much for considering my request.

Best regards,

[Your name]

Template 2

Use this template if you have a general interest and are seeking to explore options within an area of the professional's expertise.

Subject Line: Inquiry for Science Fair Mentorship

Hello [Dr./Mr./Ms. Last name],

I hope this email finds you well. My name is [Your Name], and I am a high school student at [Your School's Name]. I am currently preparing a project for my regional science fair, and was hoping I could ask for your feedback/insight around [their field of interest] as I draft my proposal.

After researching various experts, I was particularly interested in your work in [specific area of work] because [describe your reason of interest].

I would be grateful for the opportunity to receive your guidance on exploring project ideas in [specific field of interest]. If you are available in the next 1-2 weeks, would you mind scheduling a virtual 30-min meeting with me to discuss ideas further? I recognize that my student schedule will likely conflict with your professional schedule, and appreciate any flexibility you can afford.

Thank you very much for considering my request. I look forward to the possibility of learning from your expertise and contributing to your work.

Best regards,

[Your Full Name]