

▶ SCI 100

Who Bears the Burden?

An Introduction to Data Science Tools for Climate Justice

Learning Objectives

After our discussion and activity today, you should be able to

- ▶ Define "**climate justice**" and briefly describe the rationale behind David Suzuki's call in 2013 for the movement to focus on intergenerational justice,
- ▶ Distinguish between "**procedural**" and "**distributive**" justice,
- ▶ Explain how the amount of **arsenic** in drinking water in California might impact children and be related to climate change,
- ▶ Use **visualizations** to explore the relationship between a population characteristic and a possible effect of climate change using census tract data

What does **climate** refer to in the term “Climate Justice”?

“**Climate change** is a long-term change in the average weather patterns that have come to define Earth’s local, regional and global climates”

NASA, “What is Climate Change?”

<https://science.nasa.gov/climate-change/what-is-climate-change/>

Some Key Indicators of Climate Change

- ▶ global land and ocean temperature increases,
- ▶ rising sea levels,
- ▶ ice loss at Earth's poles and in mountain glaciers,
- ▶ frequency and severity changes in extreme weather such as hurricanes, heatwaves, wildfires, **droughts**, floods, and precipitation, and
- ▶ cloud and vegetation cover changes

NASA, "What is Climate Change?"

<https://science.nasa.gov/climate-change/what-is-climate-change>



What is justice?

And what does it take to achieve it?

What *words* come to mind when you hear the following phrases?

- ▶ Justice for Josiah
- ▶ Students for Justice in Palestine
- ▶ Cal Poly Homeless



Justice in a Court of Law

When a person is accused of a crime, we have a **system** for determining justice:

- ▶ **Law**

Rules that are ideally explicitly stated & with clear precedence for the scope of their application

- ▶ **Judge/Jury**

Unbiased person or group who decides if the rules have been broken

- ▶ **Default assumption**

In the absence of evidence, what should be assumed about someone's guilt?

- ▶ **Evidence**

Witnesses, expert testimony, physical

Did I miss any major components of our justice system?

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- ▶ **Advocates**

Lawyers for each side help ensemble, organize and present evidence as a *compelling narrative*

A concise history of Climate Justice

The movement of Environmental Justice (EJ)

“emerged from activism of communities of color in the United States in the latter half of the twentieth century...a global network of social movements fiercely critical of the disparities and depredations caused by the unchecked expansion and neocolonial logic of fossil fuel-driven modern industrial development”

Discussions at EJ Summits led to the creation of two guiding documents,

17 EJ Principles (1991) and Principles of Working Together (2012)

The **Climate Justice** Summit in 2000 in The Hague, Netherlands expanded on the 17 EJ principles:

- 1) Affirming the rights of all peoples, in particular those most adversely affected by climate change, to represent and speak for themselves
- 2) Affirming the sacredness of Mother Earth and the interdependence and unity of all species
- 3) Affirming the rights of all people, including women and low-income, rural and indigenous people to affordable and sustainable energy
- 4) Affirming the rights of youth to participate as equal partners in the movement, and
- 5) Recognizing the ecological debt that rich countries and corporations owe to the rest of the world, including compensation, restoration and reparation for the loss of land livelihood and ecological damages

From Key Words in Environmental Studies, “Environmental Justice” by Giovanna Di Chiro



It is even possible to achieve Climate Justice?

David Suzuki called for the movement to focus on **intergenerational justice**

“*active* hope is required to imagine and make manifest a just and sustainable future for all”

“an imaginary of hope must be driven by the primary commitment to intergenerational justice: the eco-politics of *caring* about the futures of all children; all their children’s children and all the great thriving diversity of earthly life”

“to make a better world we need to *care, think* and *act*”

*From Key Words in Environmental Studies, “Environmental Justice” by
Giovanna Di Chiro*

Procedural vs. Distributive Justice

Climate Justice concepts are sometimes categorized as either

distributive justice, which places the emphasis on who bears the costs of both climate change and the actions taken to address it

or

procedural justice, which emphasizes fair, transparent and inclusive decision making

Wikipedia, “Climate Justice”

https://en.wikipedia.org/wiki/Climate_justice

(but keep in mind some EJ activists seek to reduce the use of binary classifications...)

Procedural or Distributive Justice?

- ▶ Deciding the penalties for violations of a carbon emissions agreement
- ▶ Creating a process to allocate funds for research projects related to climate change between students in a School of Engineering and a School of Art
- ▶ Assessing whether music students and healthcare students have equal access to sustainable transportation options, such as biking or car-pooling, to their places of study.

CalEnvironScreen 4.0

- ▶ This tool can be used to work towards both distributive and procedural justice.
- ▶ Today, we'll explore the data via the provided mapping tool and in a customizable Jupyter Notebook
- ▶ Our goals will be to explore the ***distribution*** of a variable related to climate change across census tracts in California and to assess its relationship with a population characteristic

[CalEnviroScreen 4.0](#) | [OEHHA](#)

<https://oehha.ca.gov/calenviroscreen/report/calenviroscreen-40>

[Home](#) | [CalEnviroScreen](#) | [CalEnviroScreen 4.0](#)

CalEnviroScreen 4.0



May 1, 2023

A new version of the California Communities Environmental Health Screening Tool: CalEnviroScreen 4.0 was released in October 2021. CalEnviroScreen is a screening methodology that can be used to help identify California communities that are disproportionately burdened by multiple sources of pollution.



See our [StoryMap Commemorating 10 Years of CalEnviroScreen](#) (May 2023)

[SB 535 Disadvantaged Communities \(2022\)](#)

[En español aquí](#)

Where is arsenic found in the U.S.?

This map shows estimates of arsenic in many private domestic water users in each county.

Drinking Water Quality

- ▶ One effect of **drought** is to lower the level of ground water.
- ▶ When water is extracted from deeper in the earth, it might contain more matter, such as **arsenic**.
- ▶ **Children** are at increased risk to health from exposure to arsenic because they eat and drink more per pound of body weight than adults.
- ▶ Early-life exposure to arsenic has been linked to an increased risk of **infection, lung and liver function, neurodevelopment and cognitive effects, skin changes** and the development of **cancer** later in life.
- ▶ The Environmental Protection Agency (EPA) recommends that drinking water contain no more than **10 µg/l of inorganic arsenic**.

Estimated Population

Arsenic > 10 µg/l

0 - 50

50 - 500

500 - 5,000

> 5,000

credit: U.S. Geological Survey

From the National Institute of Environmental Health Sciences' pamphlet "Arsenic and Your Health"
https://www.niehs.nih.gov/sites/default/files/health/materials/arsenic_and_your_health_508.pdf

Who bears the burden of climate change in California?

I'll give a brief demo of how to use a Jupyter Notebook and then give the rest of the class time to you to work through the questions in this notebook:

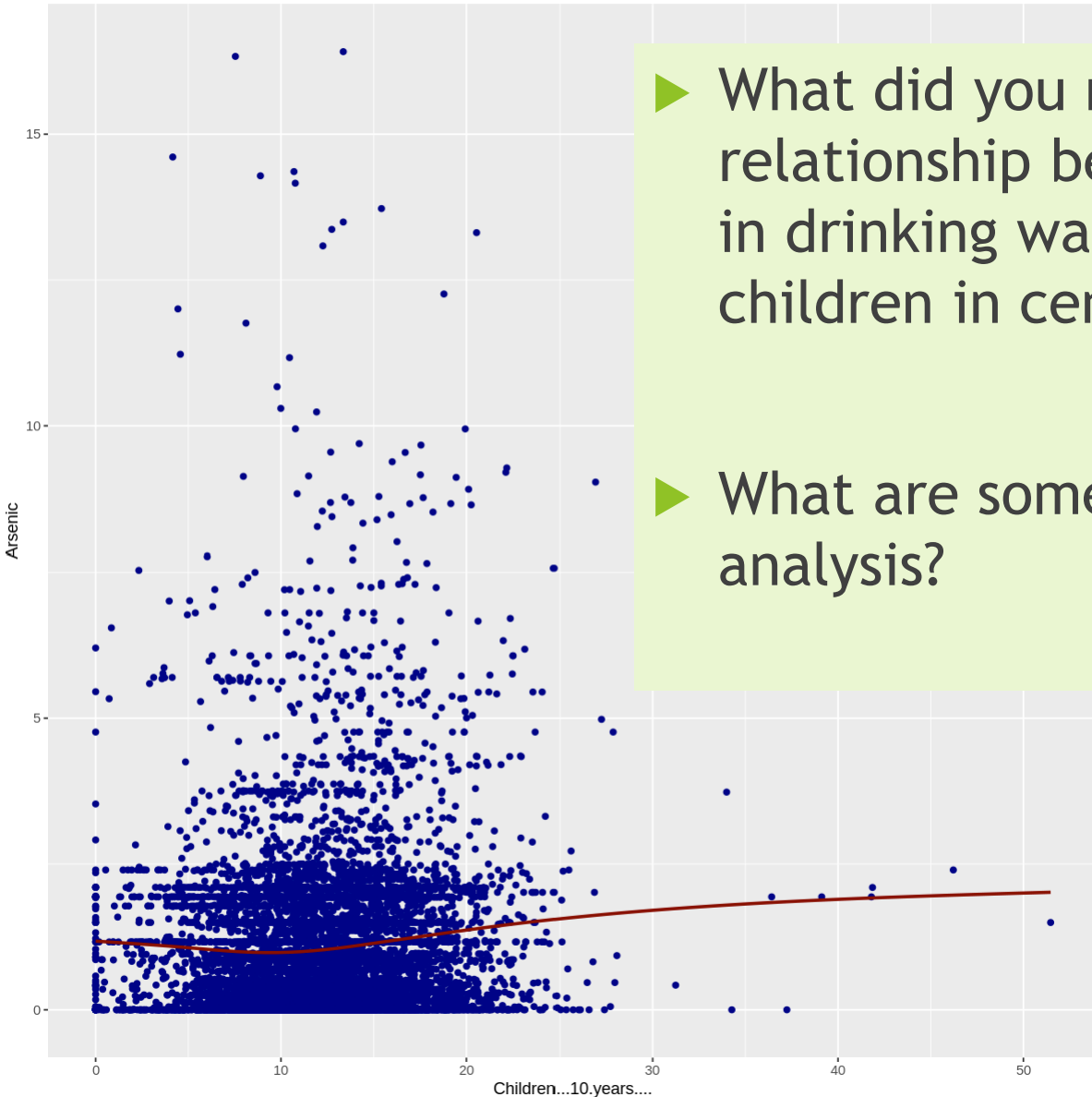
[Jupyter Notebook in Colab](#)

Please click on above link, then go to “File” and “save in Drive” to save and edit the notebook in your own Google Drive .

Read through the text and answer Questions 1-9 as time allows.

Be sure to review the data visualizations associated with Question 10 as we'll discuss the answer to this question at the end of class.

Discussion of Data Exploration



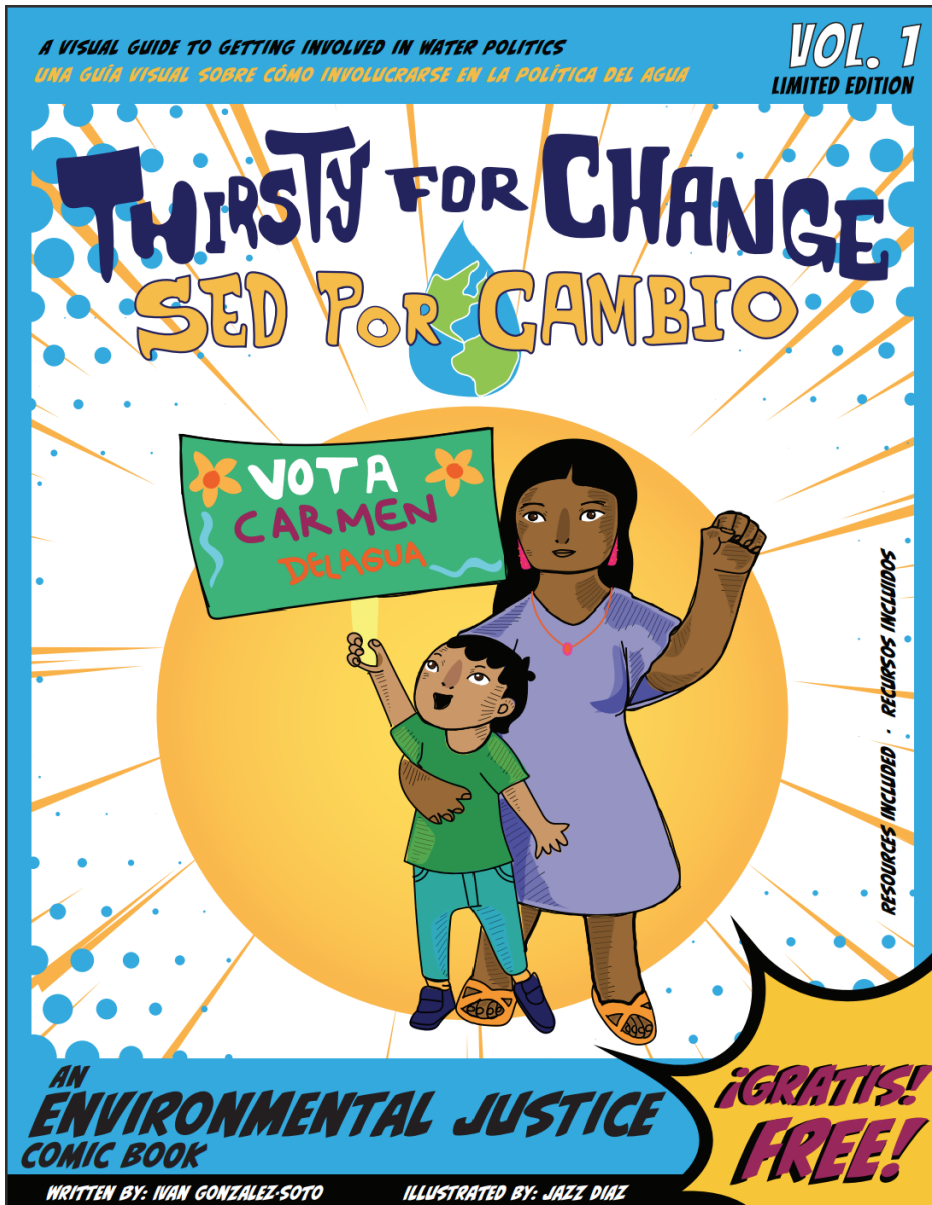
- ▶ What did you notice about the relationship between the level of arsenic in drinking water and the proportion of children in census tracts?
- ▶ What are some limitations of this data analysis?

Did we achieve our objectives?

Do you feel you're able to

- ▶ Define "**climate justice**" and briefly describe the rationale behind David Suzuki's call in 2013 for the movement to focus on intergenerational justice?
- ▶ Distinguish between "**procedural**" and "**distributive**" justice?
- ▶ Explain how the level of **arsenic** in drinking water in California might impact children and be related to climate change?
- ▶ Use **visualizations** to explore the relationship between a population characteristic and a possible effect of climate change using census tract data?

Are you ready be an **advocate** who *cares, thinks* and *acts*?



Dig deeper on your own! Selected references & recommending reading

- ▶ [17 Principles of Environmental Justice / Environmental Justice Principles \(ejnet.org\)](#)
- ▶ [Environmental Justice Principles of Working Together - EJnet.org/ej](#)
- ▶ *Key Words in Environmental Studies, “Environmental Justice” by Giovanna Di Chiro (check your university library for access to this textbook)*
- ▶ [David Suzuki - David Suzuki Foundation](#)
- ▶ [*Thirsty for Change: A visual Guide to Getting Involved in Water Politics*](#)
- ▶ [Arsenic and Your Health fact sheet \(nih.gov\)](#)
- ▶ [CalEnviroScreen 4.0 | OEHHA](#)
- ▶ [Grammar of Graphics in R: ggplot2: Elegant Graphics for Data Analysis \(3e\) - 2 First steps \(ggplot2-book.org\)](#)
- ▶ [Grammar of Graphics in Python: plotnine 0.13.4 - A Grammar of Graphics for Python](#)

Dig Deeper with faculty and students at Cal Poly Humboldt

There are many ways to get involved in Climate Justice on campus!

Here are a few ways to add relevant skills to your academic transcript & resume:

- ▶ Minor in Environmental Ethics
- ▶ Minor in Environmental Policy
- ▶ Minor in Geospatial Analysis
- ▶ Minor in Applied Statistics
- ▶ Upcoming certificate in Data Science
 - *DATA 111 is an introduction to programming and statistical thinking for data science*

