Where Did We Come From:
How Did We Get HERE? The Role of Culturally Relevant Statistics Analysis

Dina A. Williams,
CMC ReMI Committee

Building a Wall

What are the costs/ benefits of building a wall?

What kind of data would you want to gather?

GoFundMe a Wall

- Trump supporter is all a Twitter

Today's learner outcomes:

Participants will:

- Develop an understanding of the GAISE framework.
- Explore component one of the framework, *Formulate Question.*
- Engage in several instructional routines that promote statistical reasoning and academic discourse for ALL students.
- Inspire and motivate each other to engage students in relevant statistical discussion

CORE IDEA - Launching your lessons

Launching a lesson:

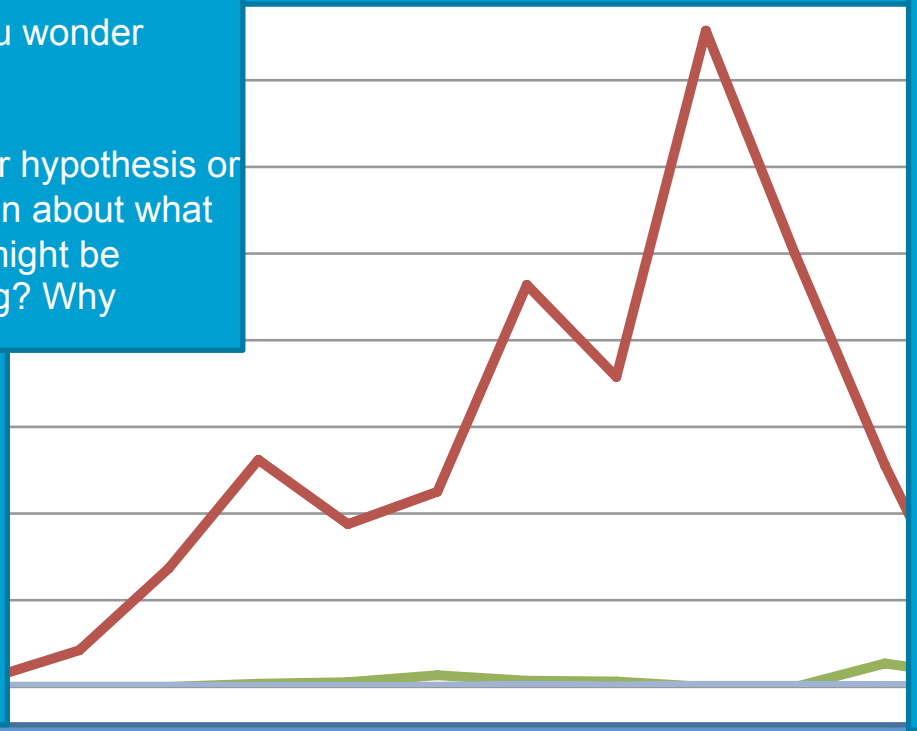
We can leverage our lesson launch to create the space for academic discourse that is centered around student thinking, questioning, and reasoning.

An instructional Routine:

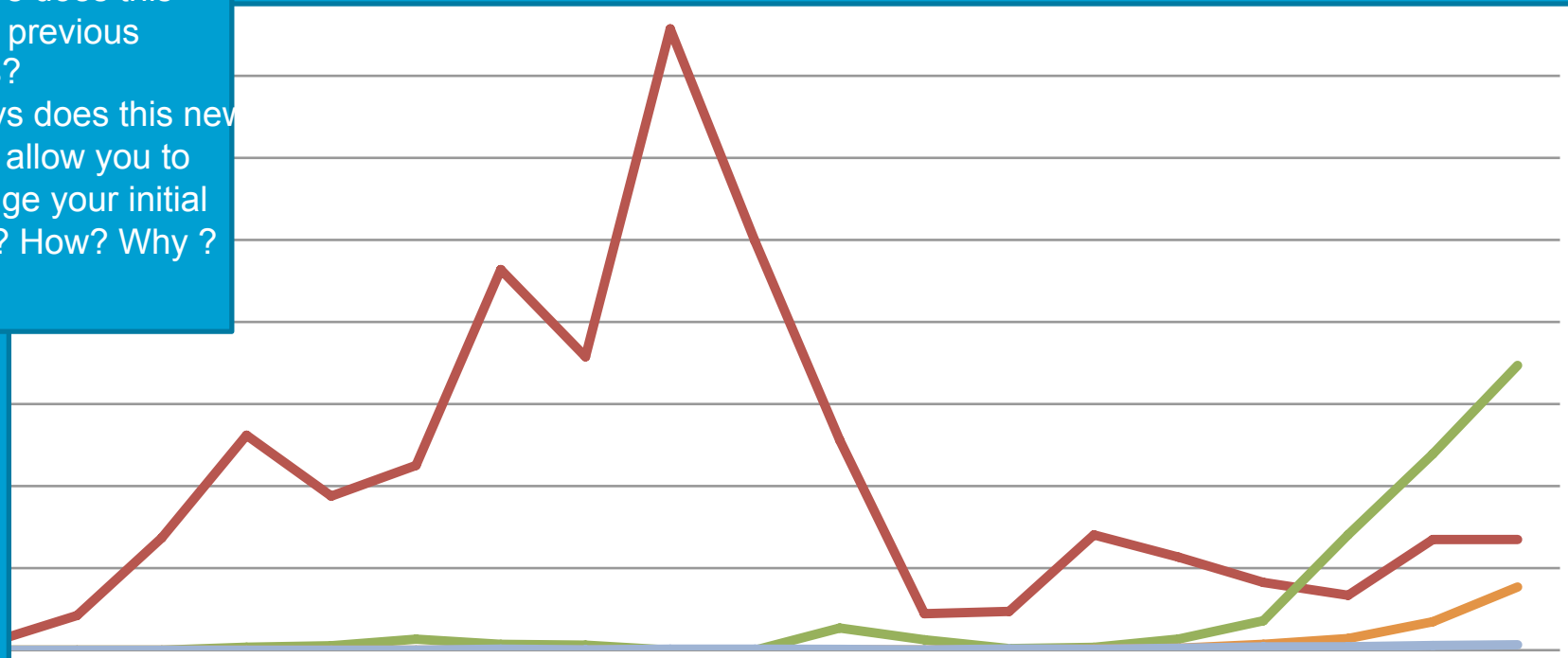
We can design routines to reinforce cultural expectations and to build equitable learning environments. Flow:

- launch
- independent think time
- partner work
- whole group discussion (cycle can repeat as needed) and
- end with meta reflection

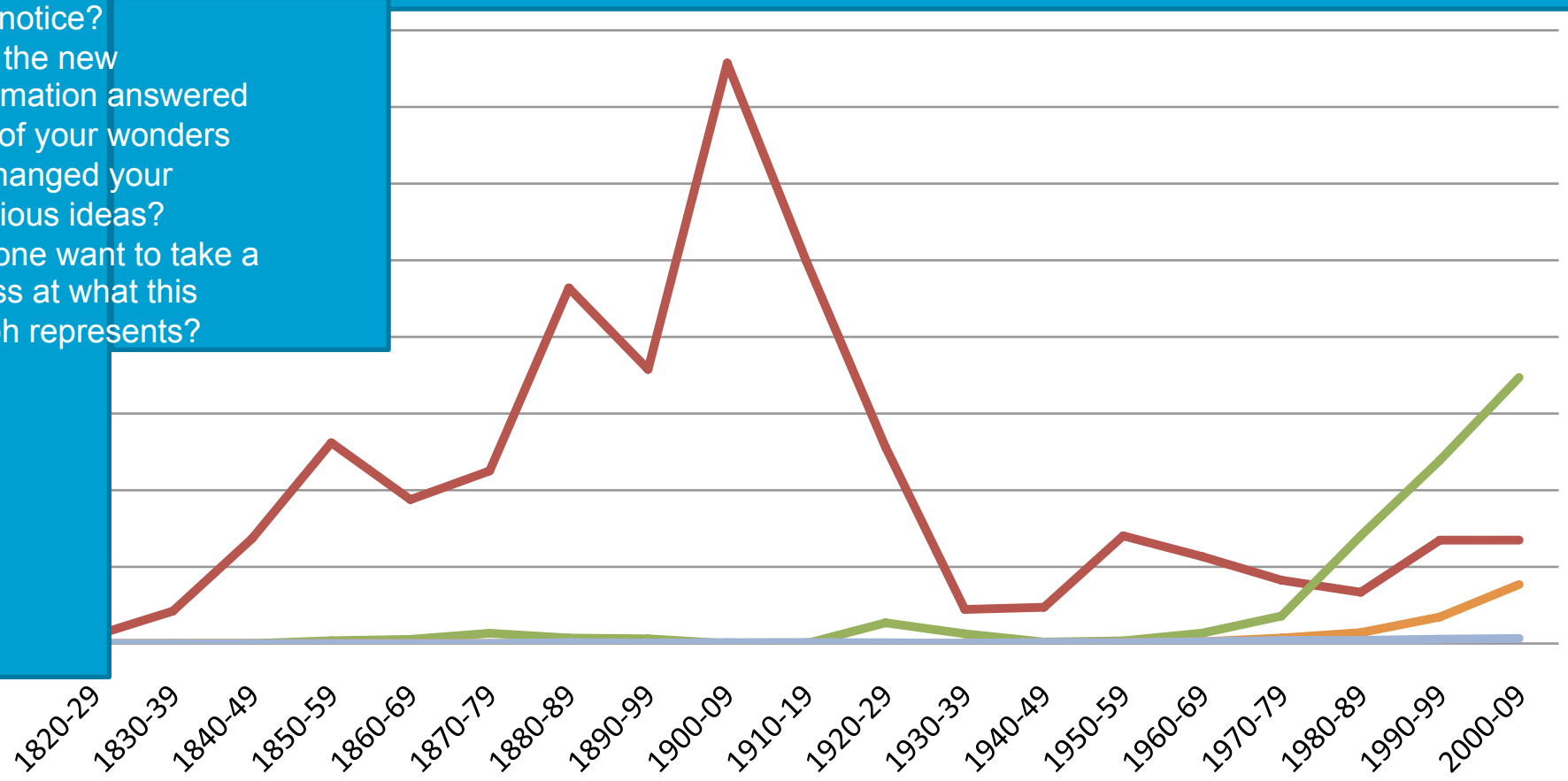
- What do you notice?
- What do you wonder about?
- What is your hypothesis or interpretation about what this graph might be representing? Why

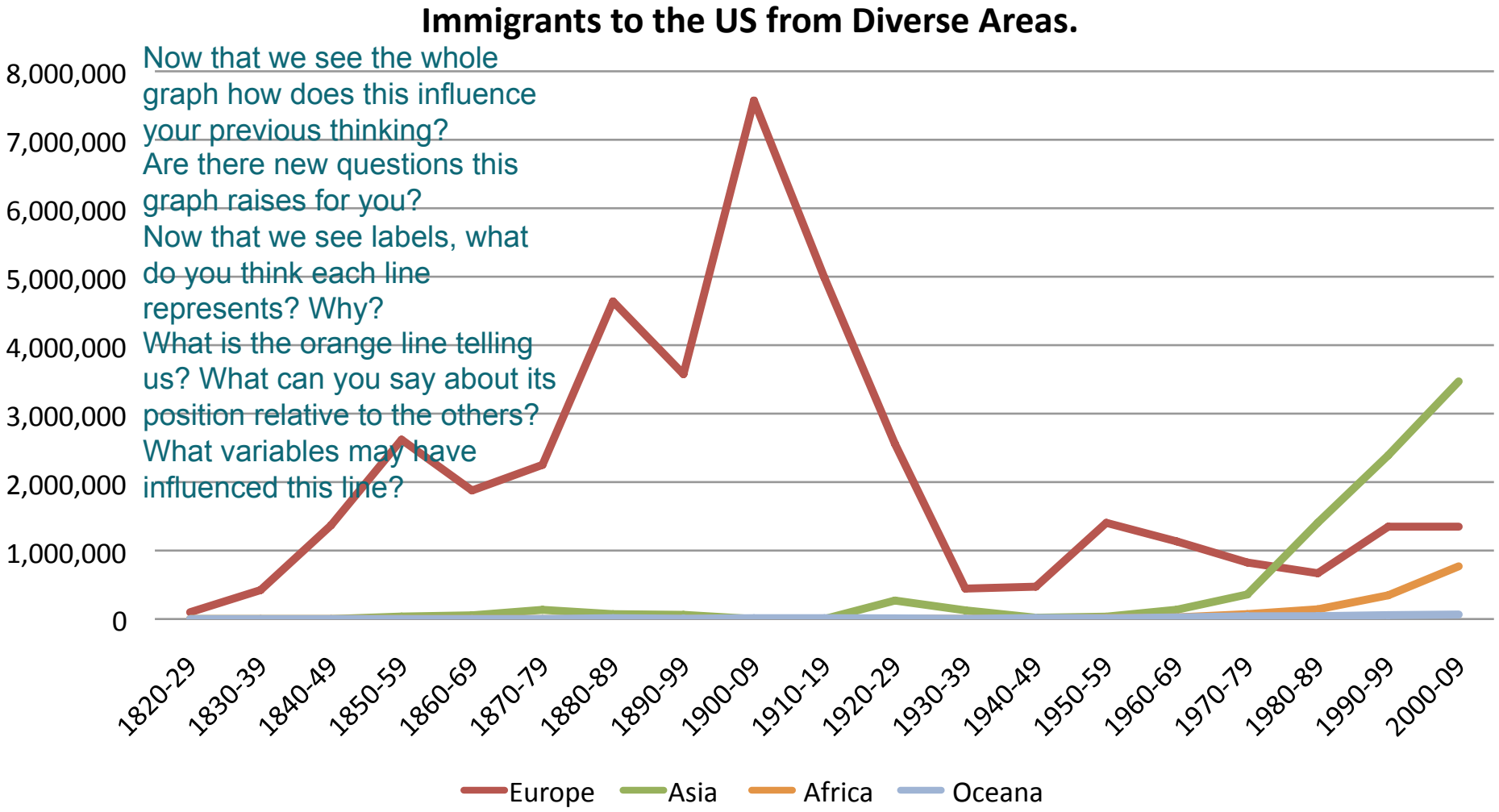


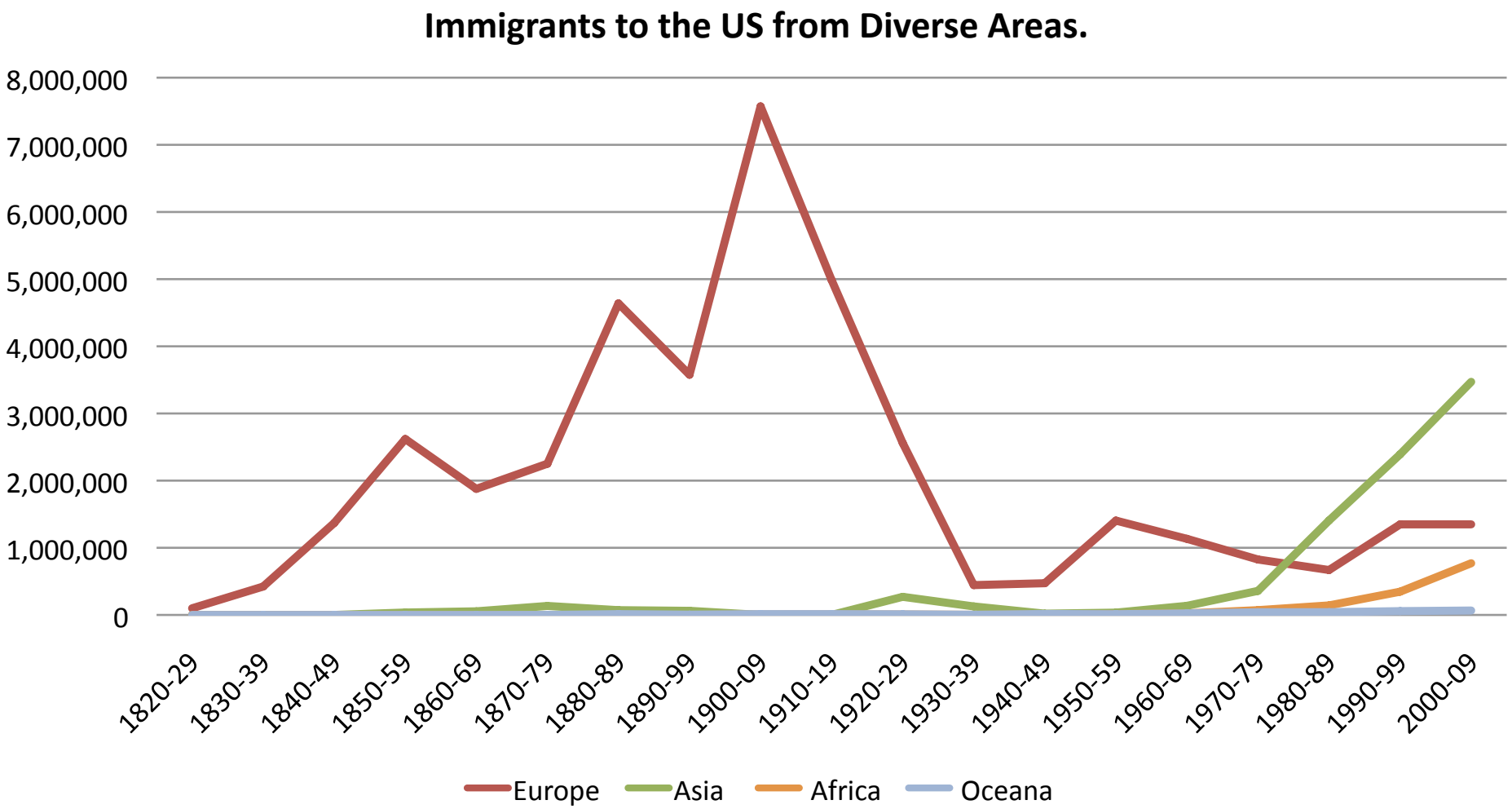
- What do you notice now?
- In what ways does this inform your previous wonderings?
- In what ways does this new information allow you to revise/change your initial hypothesis? How? Why ?



What other things do you notice?
Has the new information answered any of your wonders or changed your previous ideas?
Anyone want to take a guess at what this graph represents?

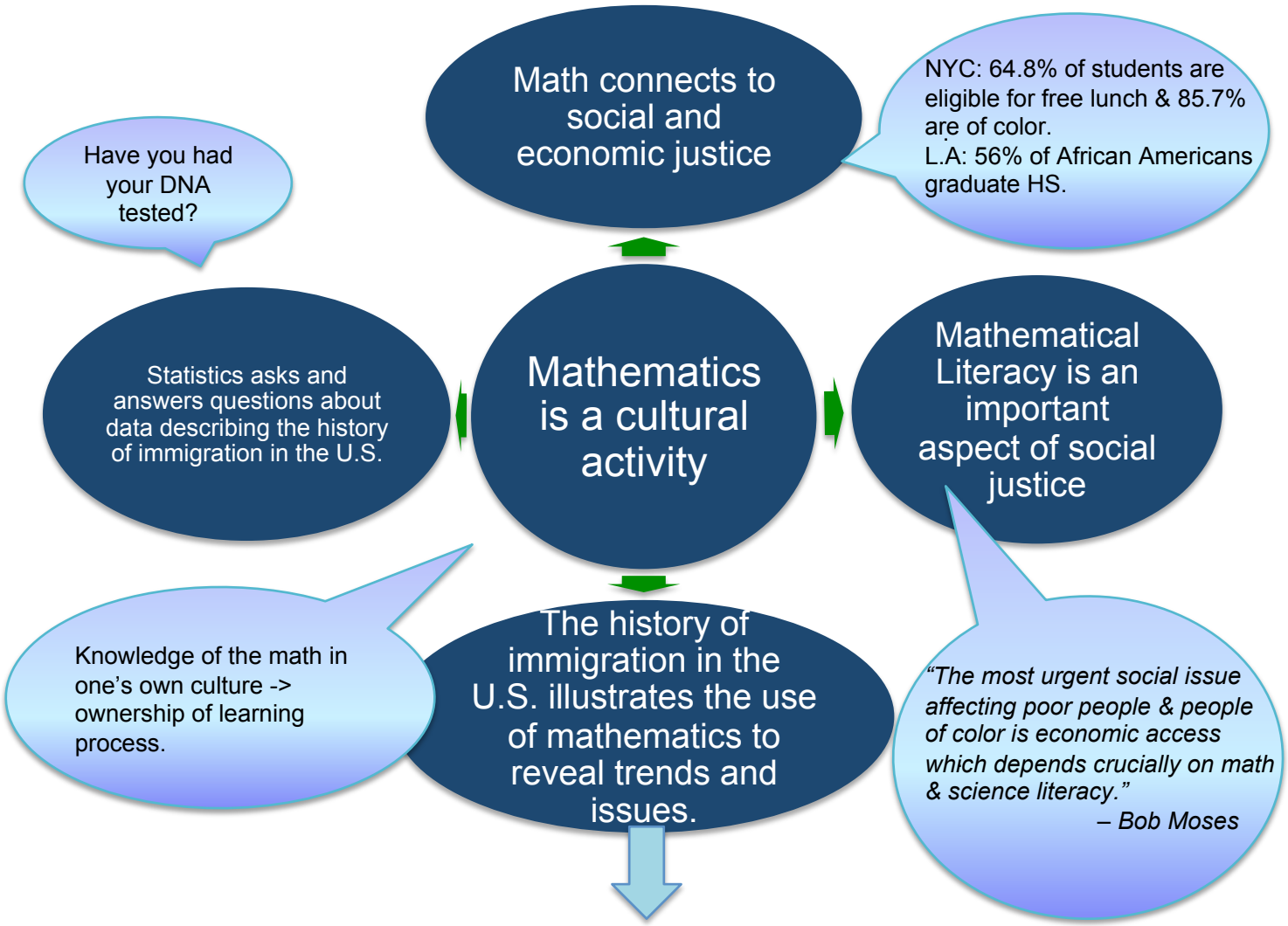



Immigrants to the US from Diverse Areas.
Now that we see the whole graph how does this influence your previous thinking?
Are there new questions this graph raises for you?
Now that we see labels, what do you think each line represents? Why?
What is the orange line telling us? What can you say about its position relative to the others?
What variables may have influenced this line?
8,000,000
7,000,000
6,000,000
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
1820-29
1830-39
1840-49
1850-59
1860-69
1870-79
1880-89
1890-99
1900-09
1910-19
1920-29
1930-39
1940-49
1950-59
1960-69
1970-79
1980-89
1990-99
2000-09
Europe
Asia
Africa
Oceana


Immigrants to the US from Diverse Areas.
8,000,000
7,000,000
6,000,000
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
1820-29
1830-39
1840-49
1850-59
1860-69
1870-79
1880-89
1890-99
1900-09
1910-19
1920-29
1930-39
1940-49
1950-59
1960-69
1970-79
1980-89
1990-99
2000-09
Europe
Asia
Africa
Oceana

Today's Agenda

1. Zoom in Thinking Instructional Routine #1
2. Purpose, Outcomes, and Introductions
3. GAISE - a Framework for Statistical Inquiry
4. Think, Ink, Pair, Share (TIPS) Instructional Routine #2
5. The Opportunity Atlas
6. Component 1 of the Framework: Generating questions with the *Opportunity Atlas*
7. Choose your own adventure
8. Summarize and share our experiences


Math connects to social and economic justice
NYC: 64.8% of students are eligible for free lunch & 85.7% are of color.
L.A: 56% of African Americans graduate HS.
Have you had your DNA tested?
Statistics asks and answers questions about data describing the history of immigration in the U.S.
Mathematics is a cultural activity
Mathematical Literacy is an important aspect of social justice
Knowledge of the math in one's own culture -> ownership of learning process.
The history of immigration in the U.S. illustrates the use of mathematics to reveal trends and issues.
"The most urgent social issue affecting poor people & people of color is economic access which depends crucially on math & science literacy."
– Bob Moses

ReMI - Just Math: Social Justice and Relevant Mathematics

- What does this title mean for you?
- Why teach math? “To promote creativity helping people to fulfill their potential and rise to the highest of their capability, but being careful not to promote docile citizens. We do not want our students to become citizens who obey and accept rules and codes which violate human dignity” **Ubiratan D’Ambrosio (Ubi)**
- “In my work, I argue that K-12 students need to be prepared through their mathematics education to investigate and critique injustice (such as racism and language discrimination), and to challenge, in words and actions, oppressive structures and acts,” **Eric ‘Rico’ Gutstein**
- “I argue that all real-life mathematical word problems contain non-numerical “hidden” messages, and that, if those problems are presented as neutral, they can stifle creative thought and questioning, by increasing the aspects of our society that people take for granted.” **Marilyn Frankenstein**

ReMI: Why we are asking you to engage in this work?

- CSU Quantitative Reasoning Task Force revised college pathways to include quantitative literacy.
- CSU and UC Universities are working on a 4th year math requirement for HS students that includes quantitative literacy.
- Common Core Standards for Mathematical Practice 4: Model with Mathematics.
- Promotes engaged and active citizenry.
- “A statistically competent workforce will allow the United States to compete more effectively in the global market and to improve its position in the international economy.” (GAISE Report pp2).
- When working with youth, statistical literacy ensures they are able to navigate through the onslaught of predatory practices that typically target mathematical illiteracy and can ensure our young scholars are not victims of or perpetraters of; these actions as adults.

Introducing the ReMI Committee

Michael Farber, Fearless leader and man of many ideas.

Melanie Maxwell, Background support.

Jennifer Hagman, Glue and taskmaster.

Dina Williams, Inspiration and questioner.

Stephen Sher, Brilliant mind and man of many resources.

Bruce Grip, Fascination and new lense.

Bruce Arnold & Sarah Munshin, Support in spirit.

Diane Kinch & Annette Kitagawa, OG inspiration and leadership.

Who said this? What does this mean?

. “There are three types of lies
- lies, damn lies,
and **statistics**.” … Benjamin Disraeli

Today's Agenda

1. Zoom in Thinking Instructional Routine #1
2. Purpose, Outcomes, and Introductions
3. GAISE - a Framework for Statistical Inquiry
4. Think, Ink, Pair, Share (TIPS) Instructional Routine #2
5. The Opportunity Atlas
6. Component 1 of the Framework: Generating questions with the *Opportunity Atlas*
7. Choose your own adventure
8. Summarize and share our experiences

Who is at your table?

- Introduce yourself
- Where do you teach?
- What do you teach (content and grade level)?
- Who are your students?
- What inspires / excites you most about statistical inquiry **or** what question / challenge / problem brought you here today?

CORE IDEA - Purpose

Quantitative literacy empowers a learner to explore how mathematics can be used to understand the world we live in.

It is possible to infuse content, essential questions and tasks that promotes the use of mathematics to think critically about our society as learners develop their identity as an active citizen.

Today's Agenda

1. Zoom in Thinking Instructional Routine #1
2. Purpose, Outcomes, and Introductions
3. GAISE - a Framework for Statistical Inquiry
4. Think, Ink, Pair, Share (TIPS) Instructional Routine #2
5. The Opportunity Atlas
6. Component 1 of the Framework: Generating questions with the *Opportunity Atlas*
7. Choose your own adventure
8. Summarize and share our experiences

Guidelines for Assessment and the Instruction in Statistics Education

- The **GAISE document** provides a two-dimensional **framework**, specifying four components used in statistical problem solving (formulating questions, collecting data, analyzing data, and interpreting results) and three levels of conceptual understanding through which a student should progress (Levels A, B, and C).
- **Publisher:** American Statistical Association
- **Subject:** Statistics Education

Explore & Share GAISE

I. Formulate Questions

→ clarify the problem at hand

→ formulate one (or more) questions that can be answered with data

II. Collect Data

→ design a plan to collect appropriate data

→ employ the plan to collect the data

III. Analyze Data

→ select appropriate graphical and numerical methods

→ use these methods to analyze the data

IV. Interpret Results

→ interpret the analysis

→ relate the interpretation to the original question

Handout: excerpts from GAISE framework

Think, Ink, Pair, Share (TIPS): Close Reading excerpts from the GAISE Framework, focusing on component one, Formulating Questions.

- Read each section and answer *literal* and *inferential* questions and discuss with elbow partner
- After completing questions 1-6 with your partner, talk about questions 4 & 6 with your table group

CORE IDEA - GAISE Framework

The GAISE Framework

1. Formulate Question
2. Collect / Find Data
3. Analyze Data
4. Interpret Results

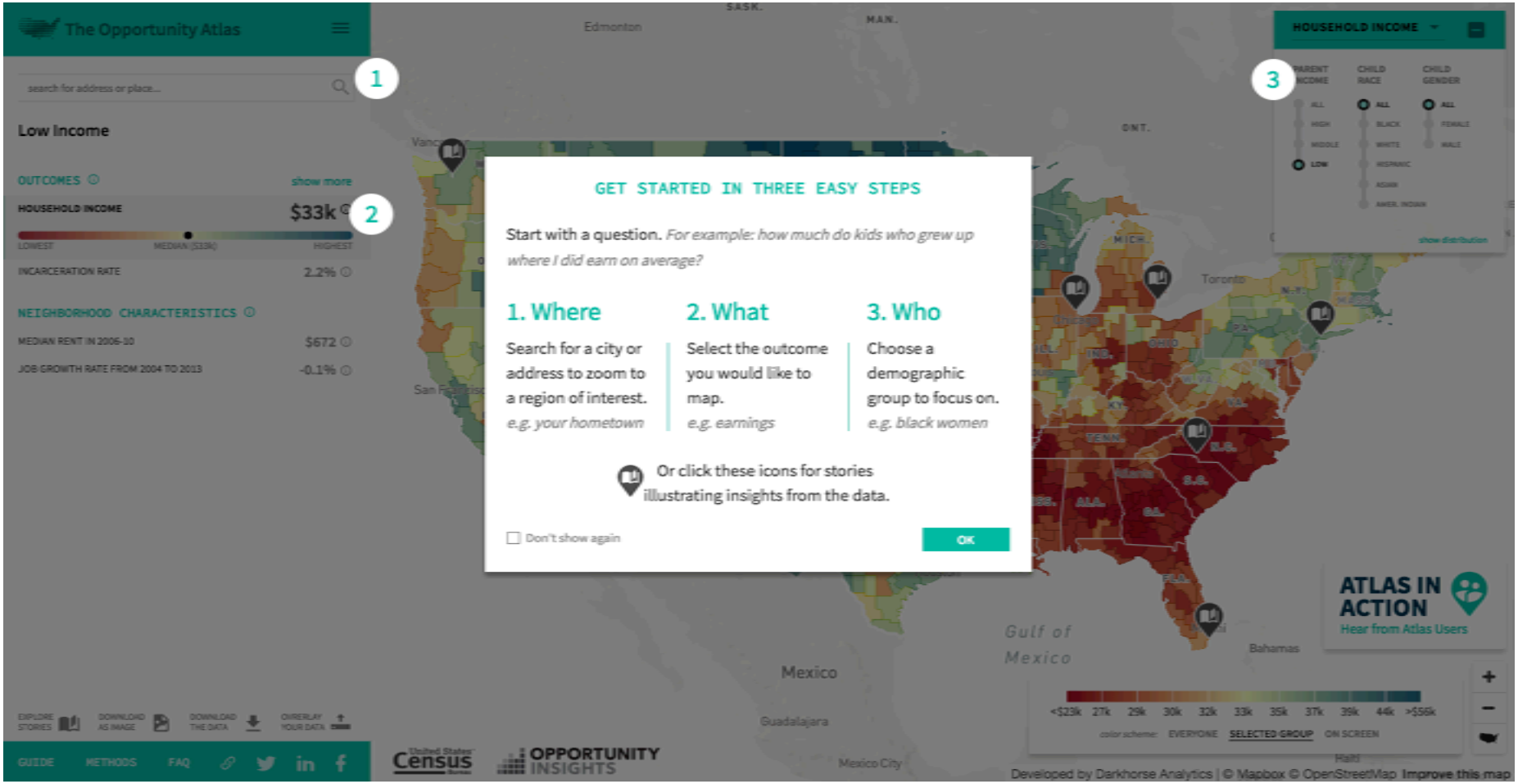
Component 1: Formulating Questions

Statistics question requires a question that anticipates an answer based on **data that vary** (CC.6.SP.A.1)

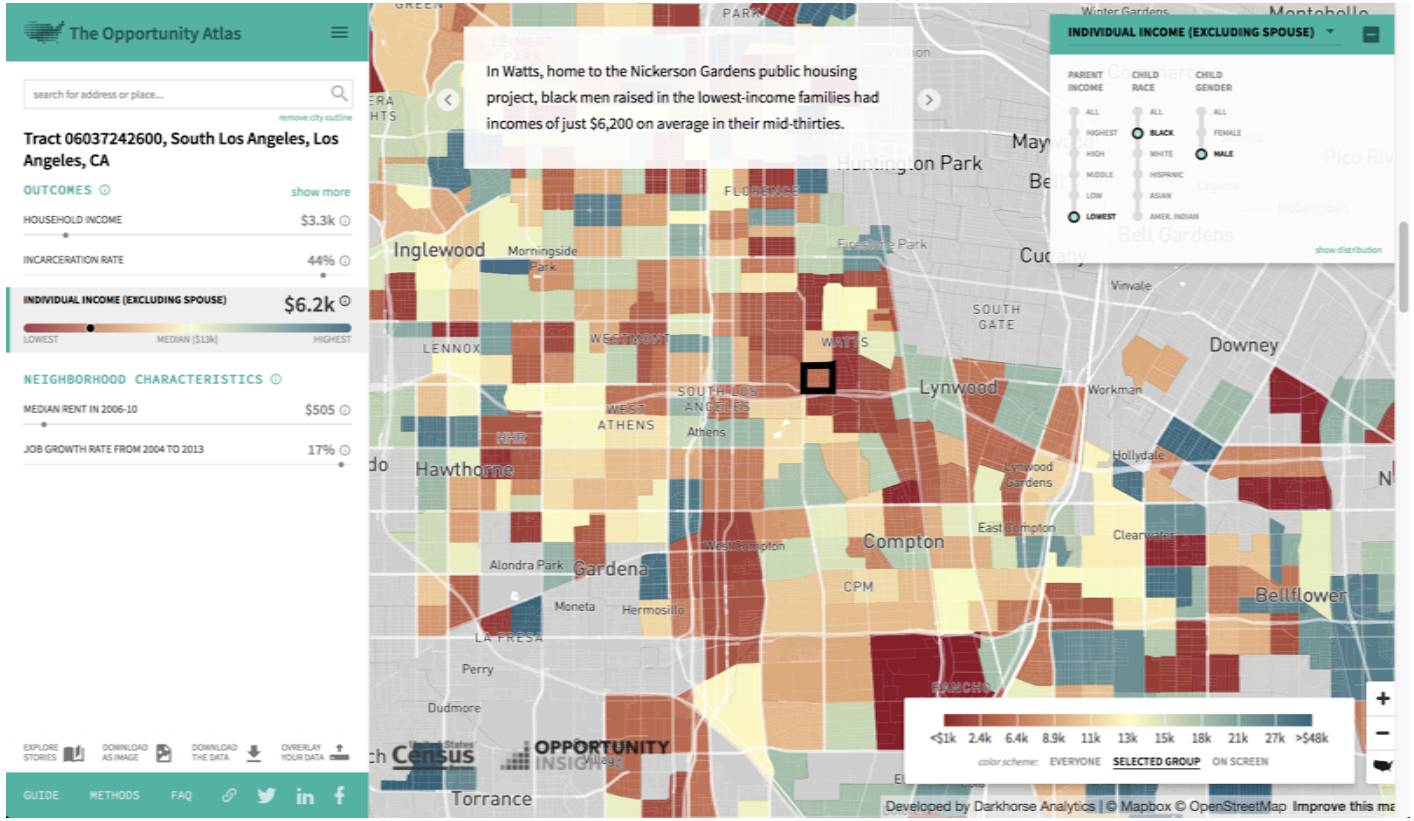
Today's Agenda

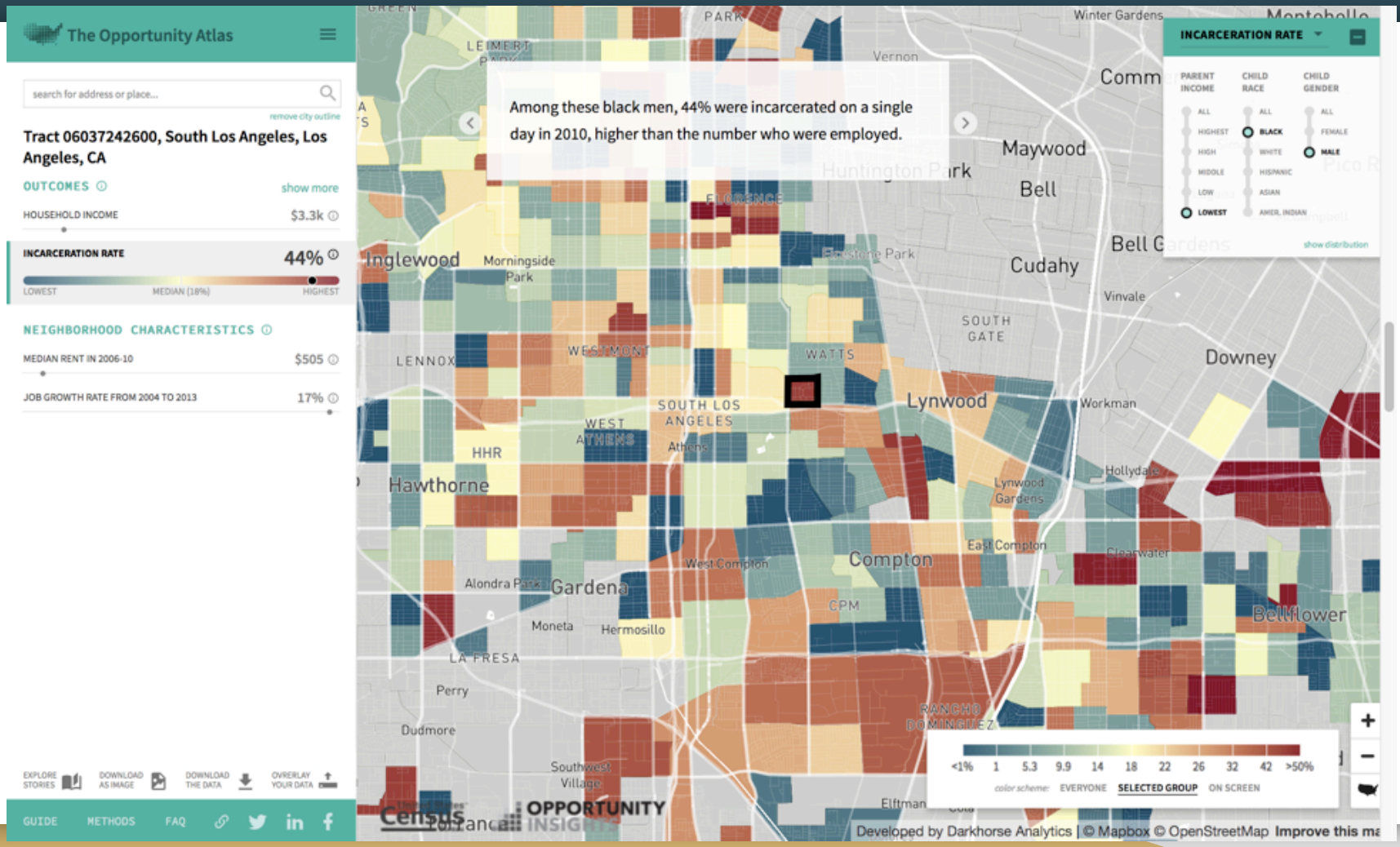
1. Zoom in Thinking Instructional Routine #1
2. Purpose, Outcomes, and Introductions
3. GAISE - a Framework for Statistical Inquiry
4. Think, Ink, Pair, Share (TIPS) Instructional Routine #2
5. The Opportunity Atlas
6. Component 1 of the Framework: Generating Questions with the *Opportunity Atlas*
7. Choose Your Own Adventure
8. Summarize and Share our Experiences

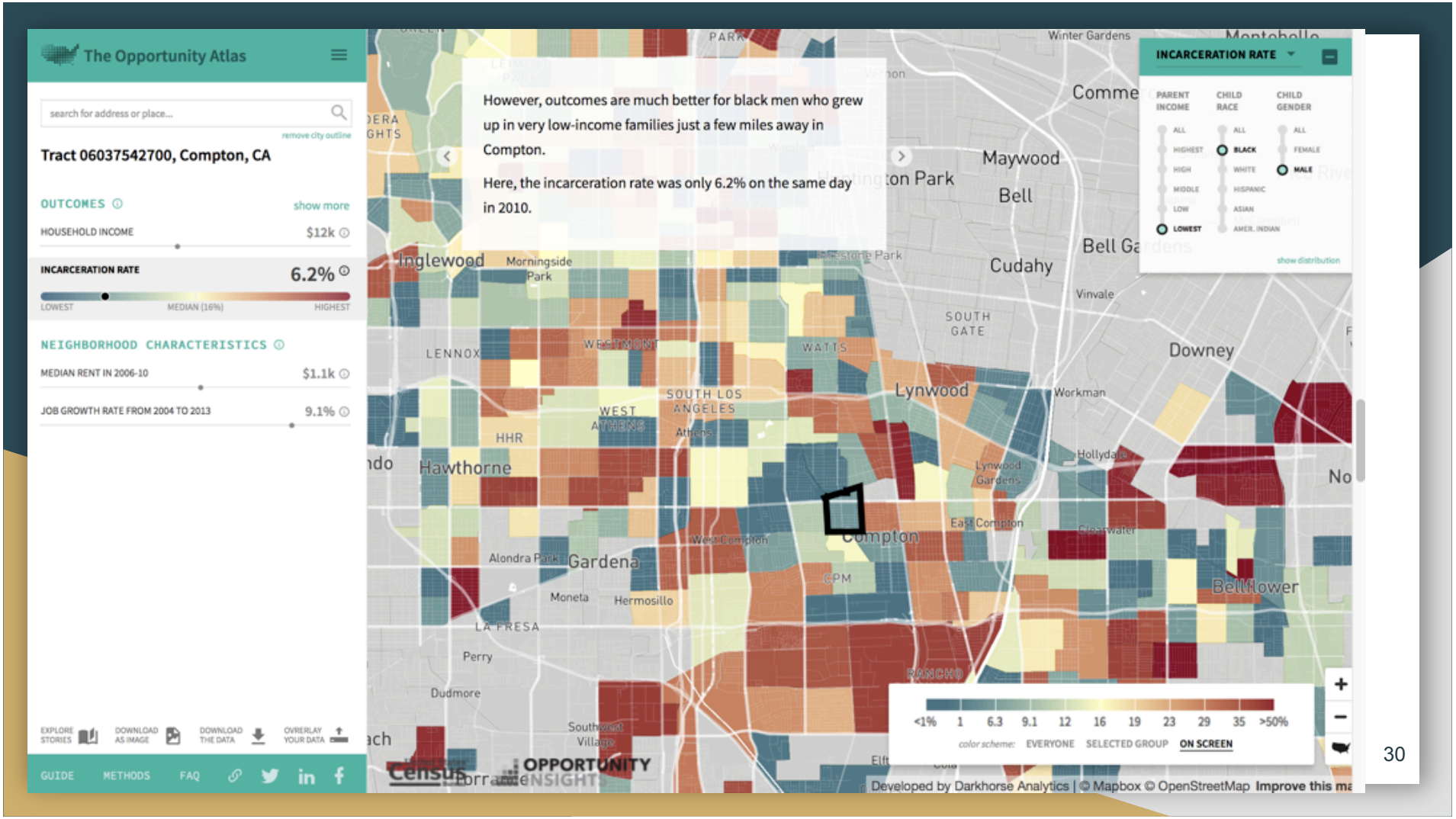
https://www.opportunityatlas.org - *Which neighborhoods in America offer children the best chance to rise out of poverty?*

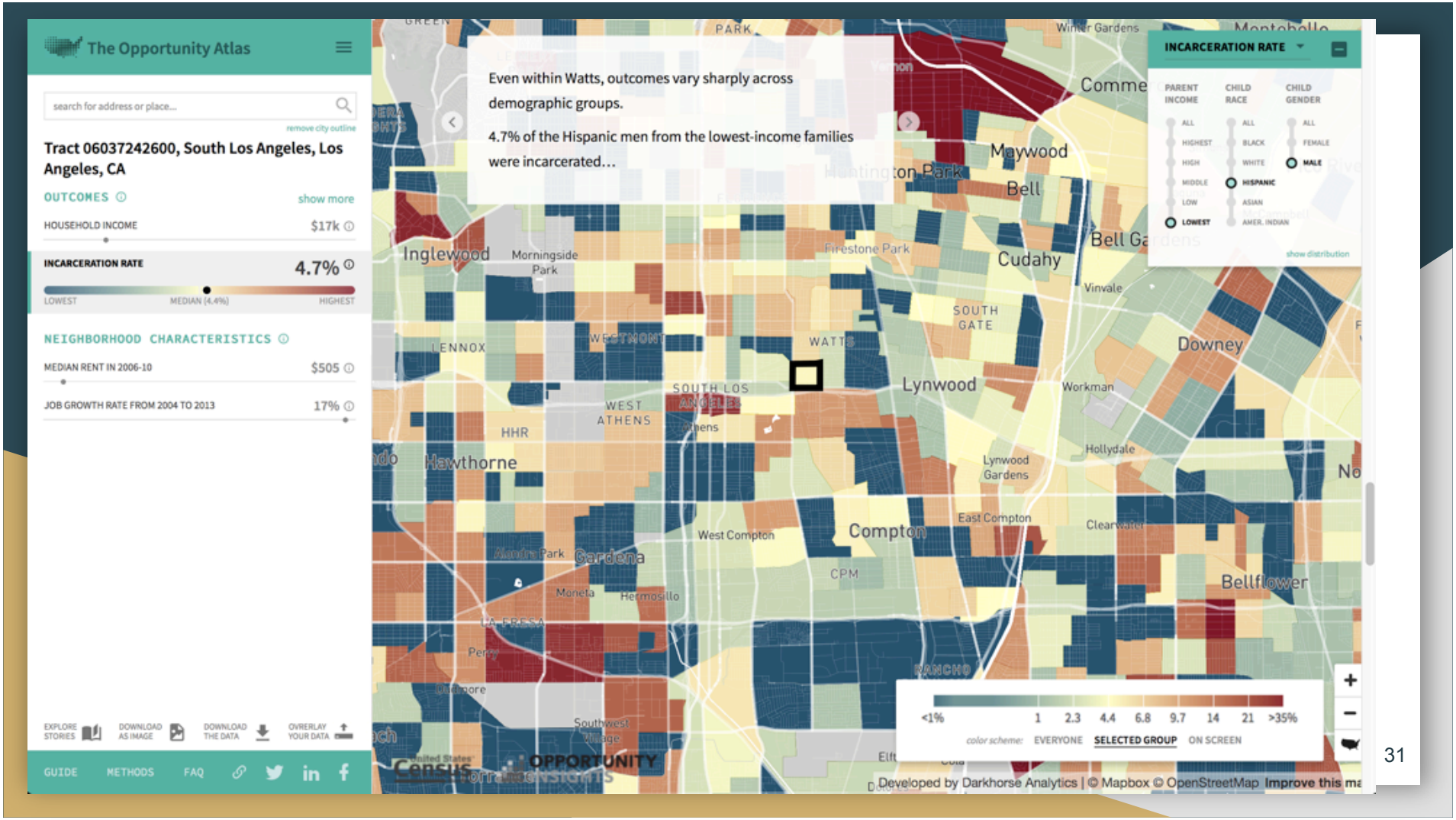


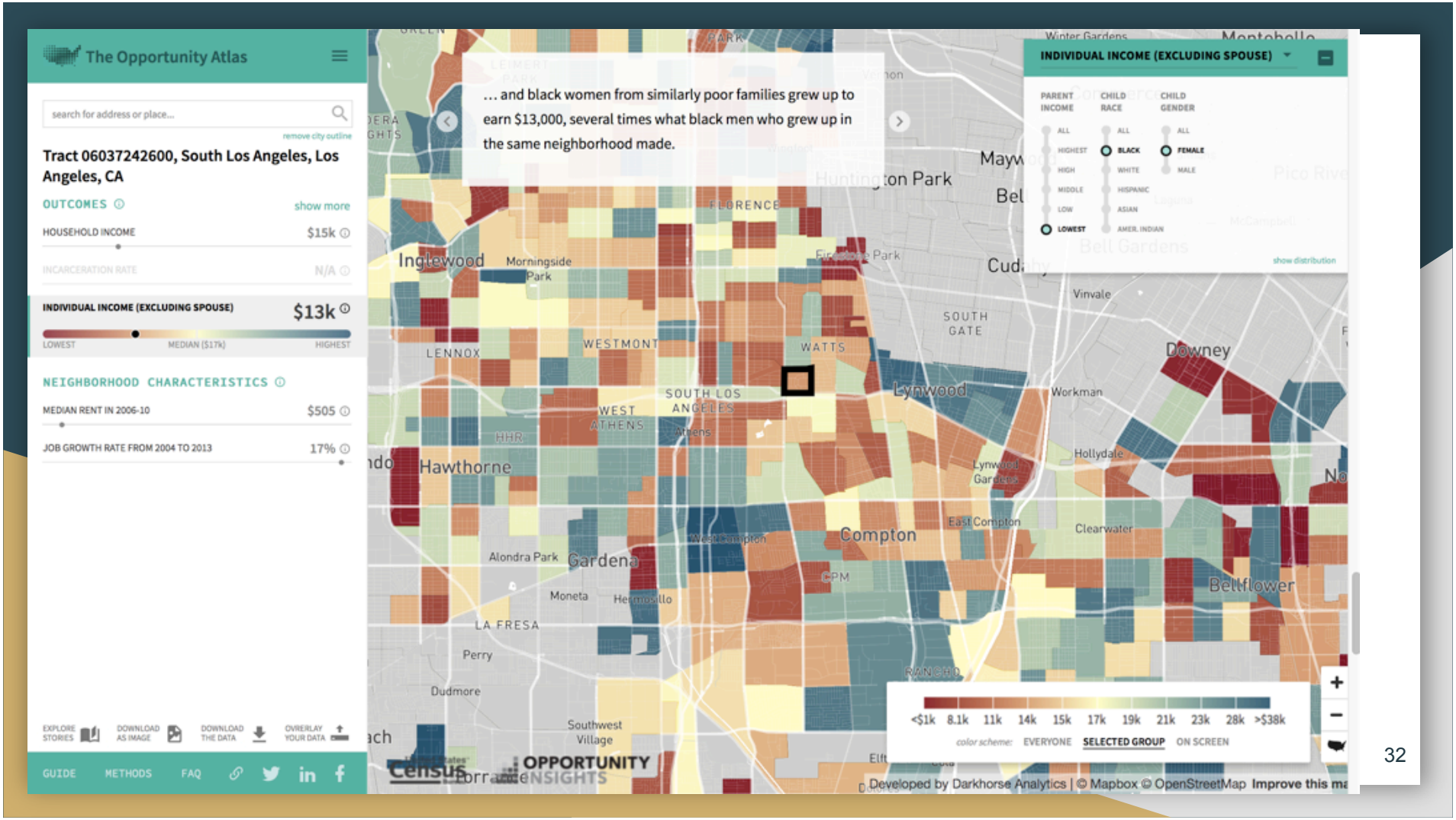
The Opportunity Atlas




The Opportunity Atlas
search for address or place...
remove city outline
Tract 06037242600, South Los Angeles, Los Angeles, CA
OUTCOMES
show more
HOUSEHOLD INCOME
$3.3k
INCARCERATION RATE
44%
LOWEST
MEDIAN (18%)
HIGHEST
NEIGHBORHOOD CHARACTERISTICS
MEDIAN RENT IN 2006-10
$505
JOB GROWTH RATE FROM 2004 TO 2013
17%
EXPLORE STORIES
DOWNLOAD AS IMAGE
DOWNLOAD THE DATA
OVERLAY YOUR DATA
GUIDE
METHODS
FAQ
Among these black men, 44% were incarcerated on a single day in 2010, higher than the number who were employed.
INCARCERATION RATE
PARENT INCOME
CHILD RACE
CHILD GENDER
ALL
HIGHEST
HIGH
MIDDLE
LOW
LOWEST
BLACK
WHITE
HISPANIC
ASIAN
AMER. INDIAN
FEMALE
MALE
show distribution
<1%
1
5.3
9.9
14
18
22
26
32
42
>50%
color scheme:
EVERYONE
SELECTED GROUP
ON SCREEN
Developed by Darkhorse Analytics | © Mapbox © OpenStreetMap Improve this ma
Inglewood
Morningside Park
Hawthorne
LENNOX
WESTMONT
WATTS
SOUTH LOS ANGELES
WEST ATHENS
Athens
HHR
Lynwood
Workman
SOUTH GATE
Cudahy
Bell
Maywood
Vernon
Downey
Vinvale
Lynwood Gardens
Hollydale
Compton
East Compton
West Compton
Clearwater
Gardena
Alondra Park
Moneta
Hermosillo
LA FRESA
Perry
Dudmore
CPM
Bellflower
RANCHO DOMINGUEZ
Southwest Village
Elftman
Florence
Winter Gardens
Census
OPPORTUNITY


The Opportunity Atlas
search for address or place...
remove city outline
Tract 06037542700, Compton, CA
OUTCOMES
show more
HOUSEHOLD INCOME
$12k
INCARCERATION RATE
6.2%
LOWEST
MEDIAN (16%)
HIGHEST
NEIGHBORHOOD CHARACTERISTICS
MEDIAN RENT IN 2006-10
$1.1k
JOB GROWTH RATE FROM 2004 TO 2013
9.1%
EXPLORE STORIES
DOWNLOAD AS IMAGE
DOWNLOAD THE DATA
OVERLAY YOUR DATA
GUIDE
METHODS
FAQ
However, outcomes are much better for black men who grew up in very low-income families just a few miles away in Compton.
Here, the incarceration rate was only 6.2% on the same day in 2010.
INCARCERATION RATE
PARENT INCOME
CHILD RACE
CHILD GENDER
ALL
HIGHEST
HIGH
MIDDLE
LOW
LOWEST
BLACK
WHITE
HISPANIC
ASIAN
AMER. INDIAN
FEMALE
MALE
show distribution
Inglewood
Morningside Park
Maywood
Bell
Cudahy
Bell Gardens
Vinvale
SOUTH GATE
Downey
LENNOX
WESTMONT
WATTS
SOUTH LOS ANGELES
WEST ATHENS
Athens
HHR
Hawthorne
Lynwood
Workman
Lynwood Gardens
Hollydale
East Compton
Compton
West Compton
Alondra Park
Gardena
Moneta
Hermosillo
LA FRESA
Perry
Dudmore
CPM
Bellflower
RANCHO
Southwest Village
<1%
1
6.3
9.1
12
16
19
23
29
35
>50%
color scheme:
EVERYONE
SELECTED GROUP
ON SCREEN
Census
OPPORTUNITY
INSIGHTS
Developed by Darkhorse Analytics | © Mapbox © OpenStreetMap Improve this ma


The Opportunity Atlas
search for address or place...
remove city outline
Tract 06037242600, South Los Angeles, Los Angeles, CA
OUTCOMES
show more
HOUSEHOLD INCOME
$17k
INCARCERATION RATE
4.7%
LOWEST
MEDIAN (4.4%)
HIGHEST
NEIGHBORHOOD CHARACTERISTICS
MEDIAN RENT IN 2006-10
$505
JOB GROWTH RATE FROM 2004 TO 2013
17%
EXPLORE STORIES
DOWNLOAD AS IMAGE
DOWNLOAD THE DATA
OVERLAY YOUR DATA
GUIDE
METHODS
FAQ
Even within Watts, outcomes vary sharply across demographic groups.
4.7% of the Hispanic men from the lowest-income families were incarcerated…
INCARCERATION RATE
PARENT INCOME
CHILD RACE
CHILD GENDER
ALL
HIGHEST
HIGH
MIDDLE
LOW
LOWEST
BLACK
WHITE
HISPANIC
ASIAN
AMER. INDIAN
FEMALE
MALE
show distribution
Inglewood
Morningside Park
Firestone Park
Maywood
Bell
Cudahy
Vinvale
SOUTH GATE
LENNOX
WATTS
Lynwood
Workman
Downey
WEST ATHENS
SOUTH LOS ANGELES
Athens
HHR
Hawthorne
Lynwood Gardens
Hollydale
West Compton
Compton
East Compton
Clearwater
Gardena
CPM
Bellflower
Moneta
Hermosillo
Perry
Southwest Jfrage
<1%
1
2.3
4.4
6.8
9.7
14
21
>35%
color scheme:
EVERYONE
SELECTED GROUP
ON SCREEN
Developed by Darkhorse Analytics | © Mapbox © OpenStreetMap Improve this ma


The Opportunity Atlas
search for address or place...
remove city outline
Tract 06037242600, South Los Angeles, Los Angeles, CA
OUTCOMES
show more
HOUSEHOLD INCOME
$15k
INCARCERATION RATE
N/A
INDIVIDUAL INCOME (EXCLUDING SPOUSE)
$13k
LOWEST
MEDIAN ($17k)
HIGHEST
NEIGHBORHOOD CHARACTERISTICS
MEDIAN RENT IN 2006-10
$505
JOB GROWTH RATE FROM 2004 TO 2013
17%
EXPLORE STORIES
DOWNLOAD AS IMAGE
DOWNLOAD THE DATA
OVERLAY YOUR DATA
GUIDE
METHODS
FAQ
... and black women from similarly poor families grew up to earn $13,000, several times what black men who grew up in the same neighborhood made.
INDIVIDUAL INCOME (EXCLUDING SPOUSE)
PARENT INCOME
CHILD RACE
CHILD GENDER
ALL
HIGHEST
HIGH
MIDDLE
LOW
LOWEST
BLACK
WHITE
HISPANIC
ASIAN
AMER. INDIAN
FEMALE
MALE
show distribution
Inglewood
Morningside Park
FLORENCE
WESTMONT
LENNOX
WATTS
SOUTH GATE
Vinvale
Downey
Lynwood
Workman
SOUTH LOS ANGELES
WEST ATHENS
Athens
HHR
Hawthorne
Hollydale
Lynwood Gardens
Compton
East Compton
Clearwater
West Compton
Alondra Park
Gardena
Moneta
Hermosillo
Bellflower
LA FRESA
Perry
Dudmore
Southwest Village
<$1k 8.1k 11k 14k 15k 17k 19k 21k 23k 28k >$38k
color scheme: EVERYONE SELECTED GROUP ON SCREEN
Census
OPPORTUNITY INSIGHTS
Developed by Darkhorse Analytics | © Mapbox © OpenStreetMap Improve this ma

Explore & Share GAISE

I. Formulate Questions

→ clarify the problem at hand

→ formulate one (or more) questions that can be answered with data

II. Collect Data

→ design a plan to collect appropriate data

→ employ the plan to collect the data

III. Analyze Data

→ select appropriate graphical and numerical methods

→ use these methods to analyze the data

IV. Interpret Results

→ interpret the analysis

→ relate the interpretation to the original question

Handout: excerpts from GAISE framework

Generating your own statistical question(s)

- Return to your *Just Math: Close Reading* document
- Work on the section: *Time to Generate your own statistical question*

CORE IDEA - The Opportunity Atlas

The Opportunity Atlas is a web resource that brings data to our classrooms that can be used to engage students in relevant statistical problem solving and decision making

Today's Agenda

1. Zoom in Thinking Instructional Routine #1
2. Purpose, Outcomes, and Introductions
3. GAISE - a Framework for Statistical Inquiry
4. Think, Ink, Pair, Share (TIPS) Instructional Routine #2
5. The Opportunity Atlas
6. Component 1 of the Framework: Generating questions with the *Opportunity Atlas*
7. Choose your own adventure
8. Summarize and share our experiences

CORE IDEA - A Progression of Statistics in MS

6th grade: Generate statistical questions and collecting data and analyzing it for 1 variable

7th grade: collecting data for two separate variables and comparing measures of center and variability

8th grade: Collecting data for two variables and determining if there is a statistical correlation / relationship between the variables

A moment to inspire and motivate each other

Turn to your neighbor and express your commitment…

As a result of this experience I am interested in trying _____ sometime in the next two weeks in my classroom.

Thank you