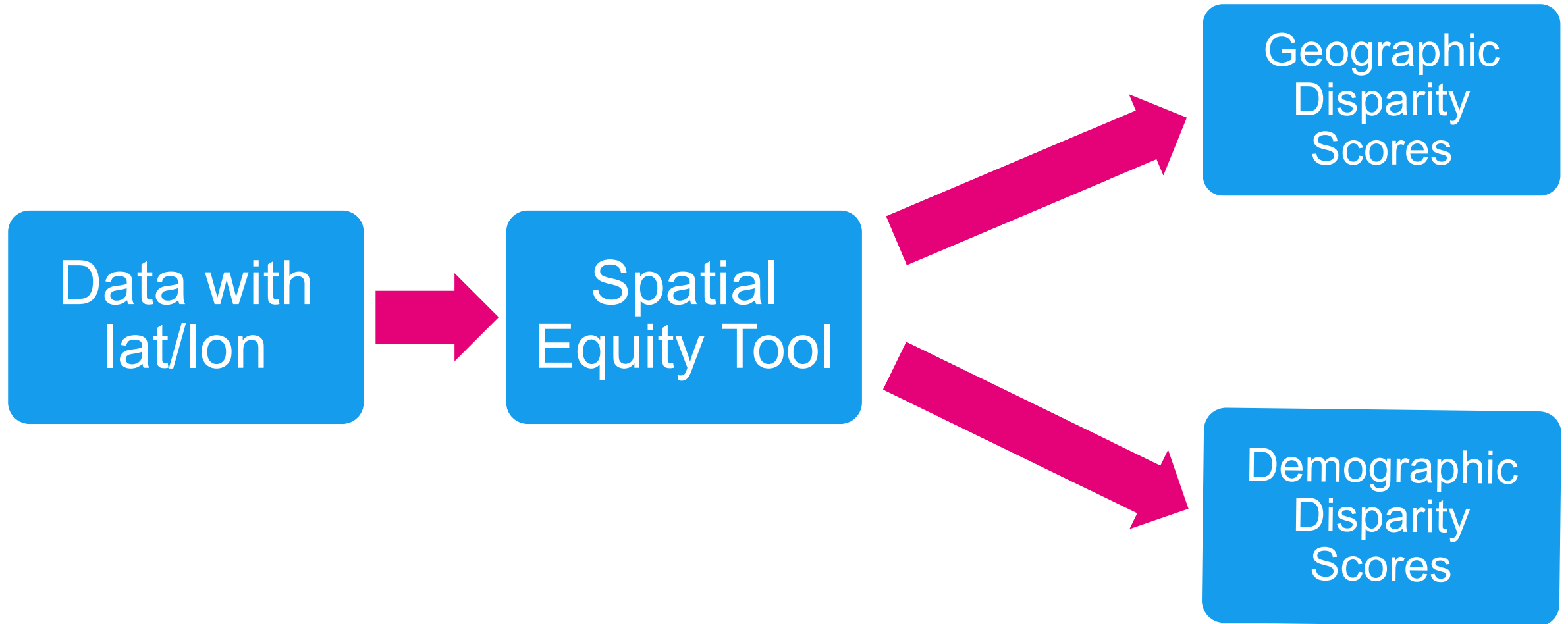2021

Spatial Equity Tool

Ajjit Narayanan

Introduction

- Governments want to make equitable policy decisions using reliable, representative data

- Measuring representativeness of data is hard, time consuming, and expensive

How the tool works

```
Data with
lat/lon        →    Spatial
                    Equity Tool    →    Geographic
                                        Disparity
                                        Scores

                                   →    Demographic
                                        Disparity
                                        Scores
```

Live Demo!

Couple of Caveats…

Questions this tool can answer

- Compared to the population distribution in a city:

  - Are certain areas of the city over/underrepresented in my data?

  - Are certain demographic groups over/underrepresented in my data?

  - Are these results significant after taking into account margins of error in Census figures?

Questions this tool **can't** answer

- *Why* are certain areas / demographic groups overrepresented in my data?

- Is the quality/accessibility of the services equal across the city?

- Is the population distribution the right measure to compare my data against?

Use Cases for Tool

1) Measuring equity in allocation of local infrastructure, investments, services, and hazards

- Park locations, affordable housing, building permits, trash collection centers, etc

2) Measuring under/over-reporting in resident generated data

- 311 data, Snowplow request data, etc

3) Any geographic data

Limitations

- Tool only works at the *tract* level for a city

- Tool only has a few curated baseline datasets which may not be appropriate for your data

- Tool doesn't take into account accessibility of each data point

- Tool is one part of a larger decision-making process including lived experiences, and community input

- You need access to geographic *point* data

Conclusion

- Our tool measures spatial and demographic representativeness of municipal datasets

- Compares uploaded data to 'ground truth' data from ACS population densities

- First step to:
  - operationalizing equity measures
  - democratizing data analysis tools for city leaders

Want our Code or Tool?

- Everything is open source!

  - **Code:** https://github.com/UrbanInstitute/ui-equity-tool

  - **Tool:** https://apps.urban.org/features/equity-data-tool/

- Happy to advise/help folks expand our methodology

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Questions/Feedback?

Twitter: @Ajjit10

anarayanan@urban.org

Technical Appendix:

How Does the Tool Work?

How the Tool Works

1) Geocode the dataset to a specific city

2) *Pull geographic and demographic data for that city*
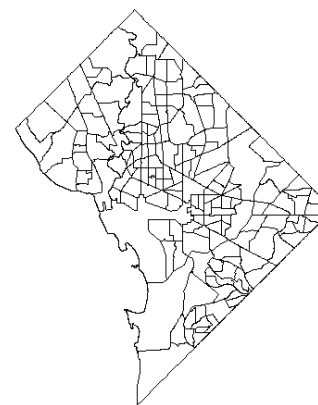
3) *Compute which Census tract each data point falls into*

4) *Calculate spatial equity metrics*

5) *Calculate demographic equity metric*

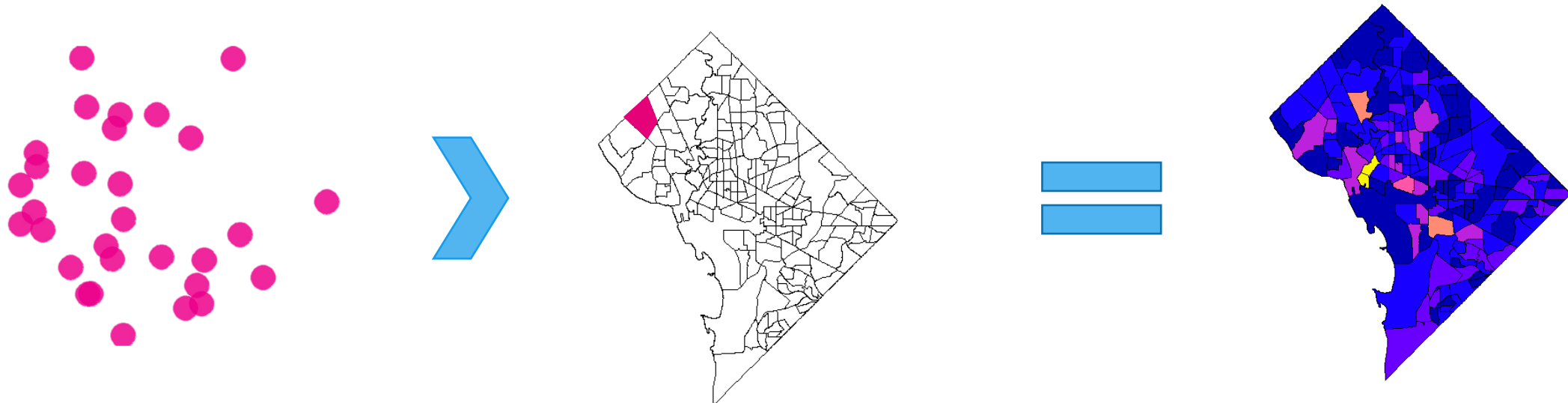6) *Assess statistical significance of our equity metrics*

Washington DC

How the Tool Works

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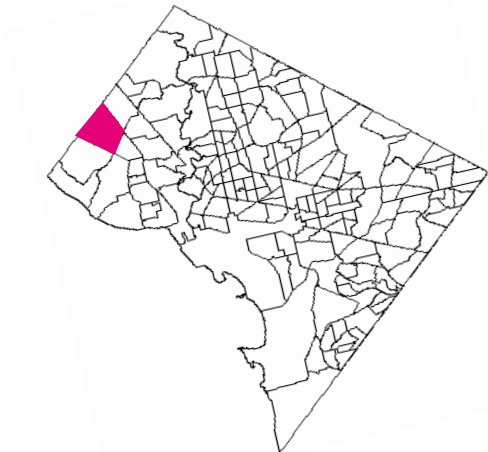
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Tool

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How the Tool Works

1) *Geocode the dataset to a specific city*

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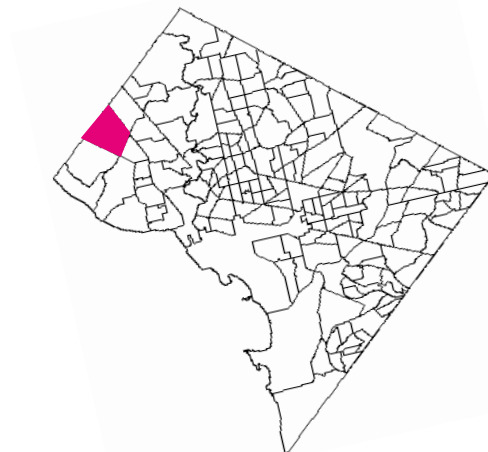## 3) Compute which Census tract each data point falls into

4) *Calculate spatial equity metrics*

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How the Tool Works

1) *Geocode the dataset to a specific city*

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3) *Compute which Census tract each data point falls into*

4) Calculate spatial equity metrics

5) *Calculate demographic equity metric*

6) *Assess statistical significance of our equity metrics*

40% of Data   10% of Population   30%

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How do we measure equity in data?

- Need 'ground truth' dataset to compare to

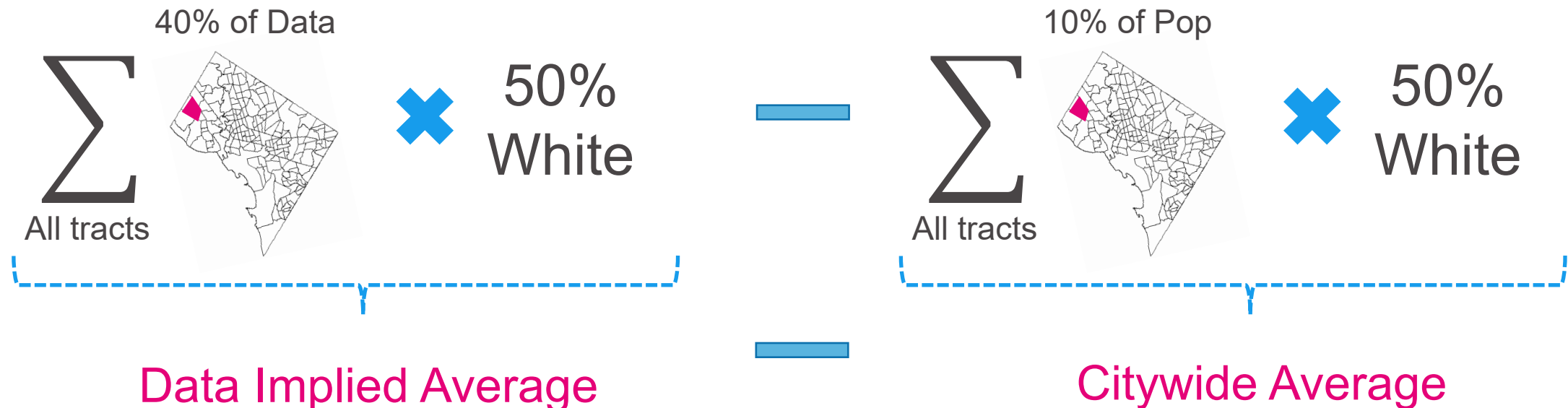- For now, we use population density from ACS

- Imperfect but useful

How the Tool Works

1) *Geocode the dataset to a specific city*
2) *Pull geographic and demographic data for that city*
3) *Compute which Census tract each data point falls into*
4) *Calculate spatial equity metrics*
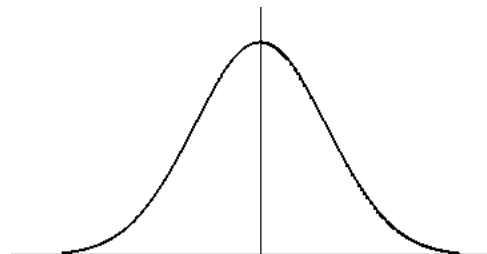
5) *Calculate demographic equity metric*

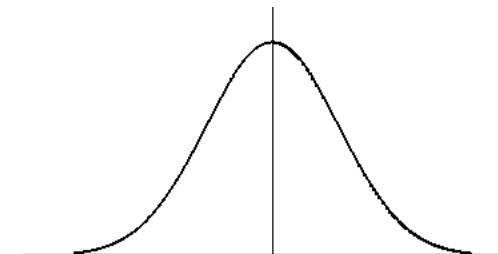6) *Assess statistical significance of our equity metrics*

40% of Data   10% of Pop

$$\sum_{\text{All tracts}} \times 50\% \text{ White} \; - \; \sum_{\text{All tracts}} \times 50\% \text{ White}$$
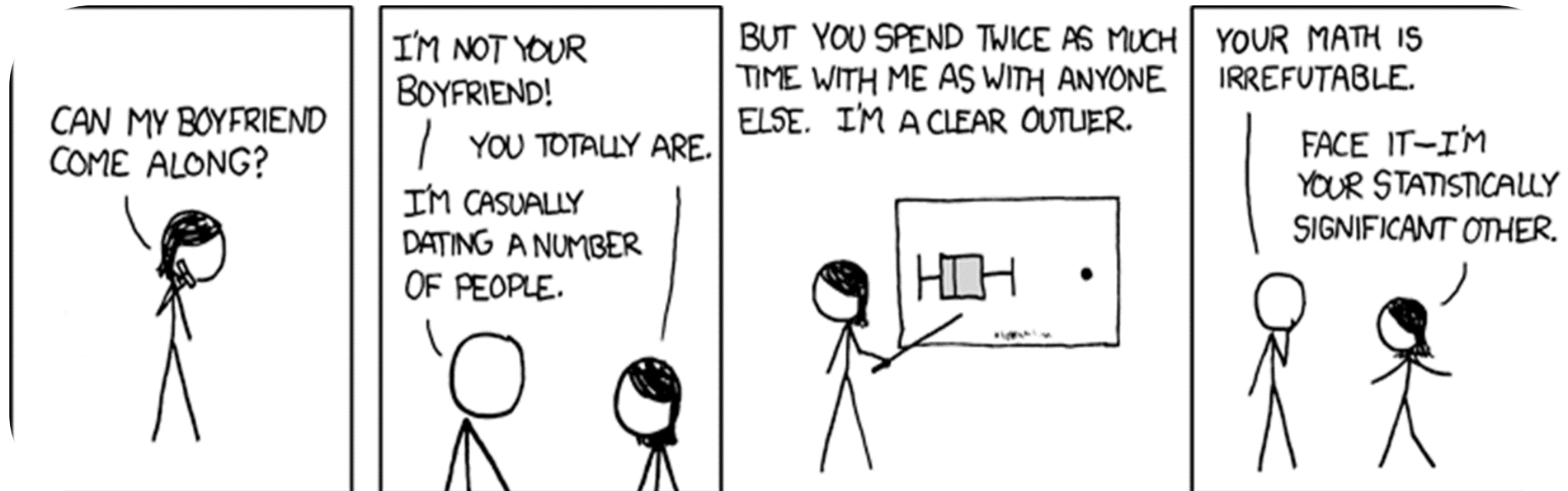
Data Implied Average   Citywide Average

How the Tool Works

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6) Assess statistical significance of our equity metrics

% Data

% Population

% White

40%

10%

50%

How the Tool Works

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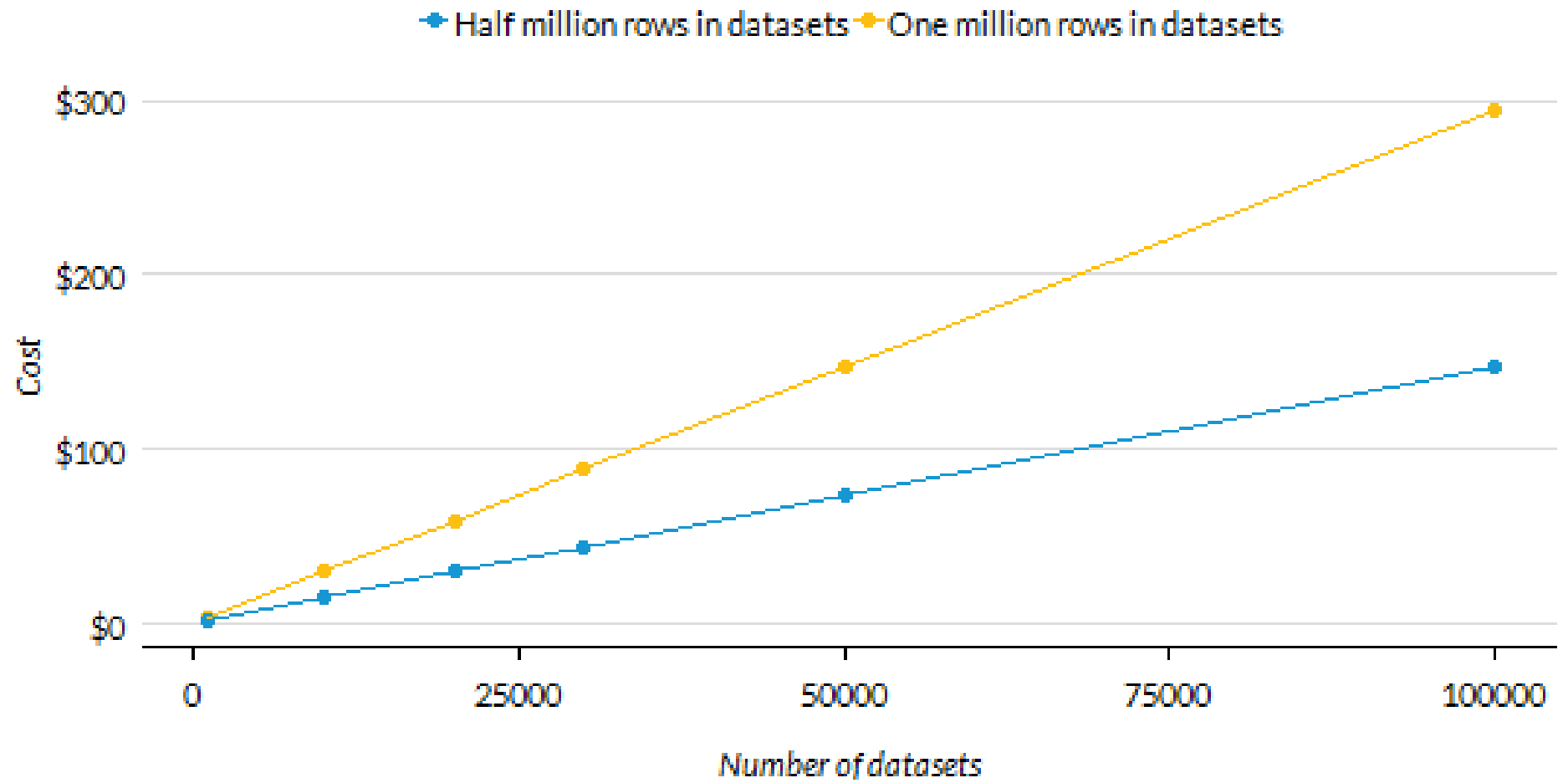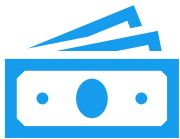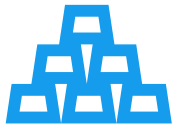
How we built the tool

Serverless Architecture

python

\+

Geo

on

Source: https://dashbird.io/lambda-cost-calculator/

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· U R B A N · I N S T I T U T E ·

- 1 dataset

- 100 datasets

- 1,000,000 datasets

- Doesn't matter!

Seconds vs. Number of rows in data