Department of Education | LEAD Conference

Data Tools for Understanding District Performance

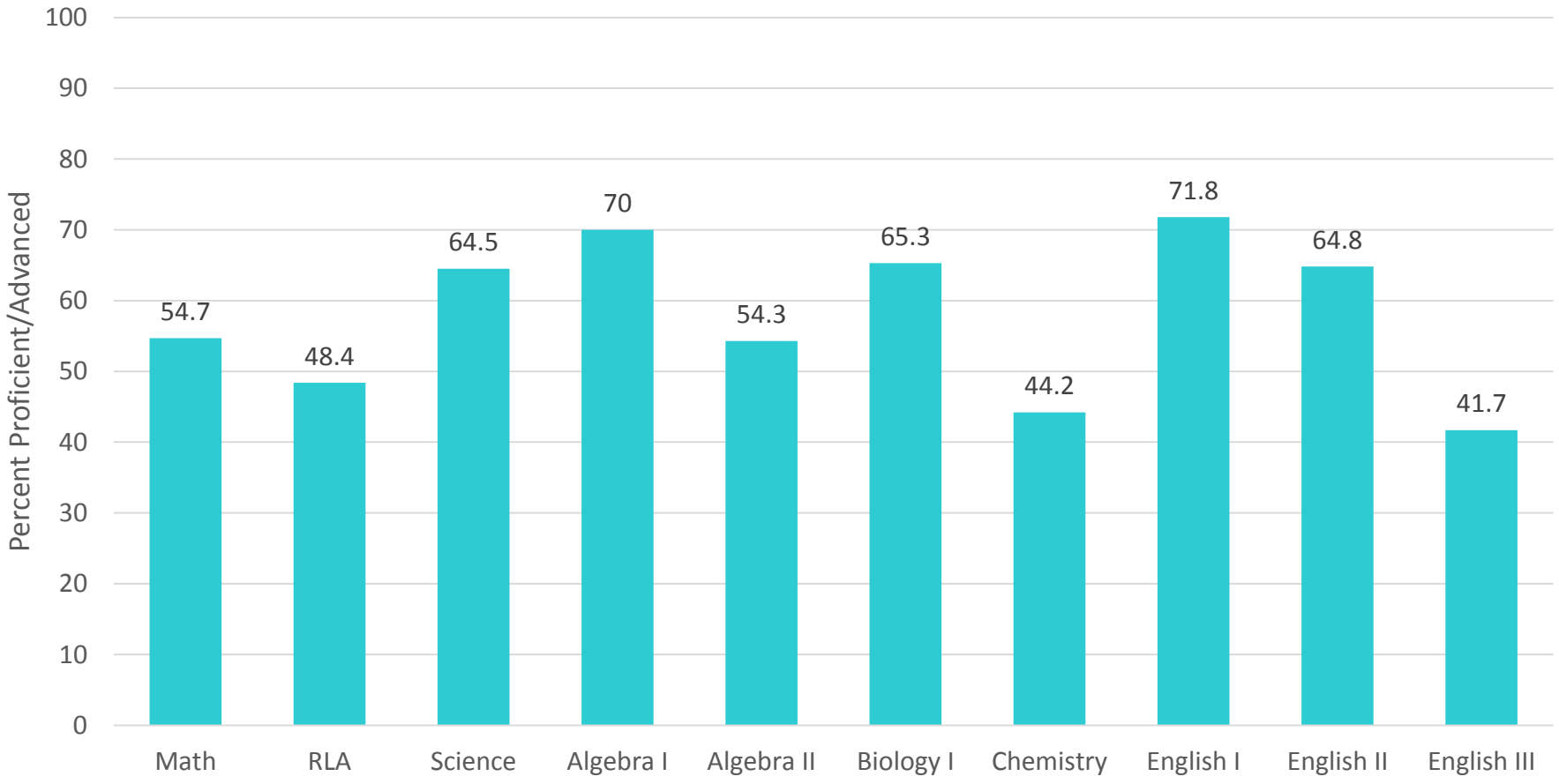
Alexander Poon

Motivation

Accountability = providing information about school/district performance

Motivation

Difficult to understand a district's performance in a vacuum:



Motivation

Clearly, some point of comparison is helpful.

How to determine a suitable comparison point?

- The state?
- All other districts?
- Similar districts?
  - What matters when determining similarity?
    - Geography?
    - Size?
    - Urbanicity?
    - Economic Disadvantage?
- Prior years?

Data Tools

We are working on a couple of tools to facilitate these comparisons.

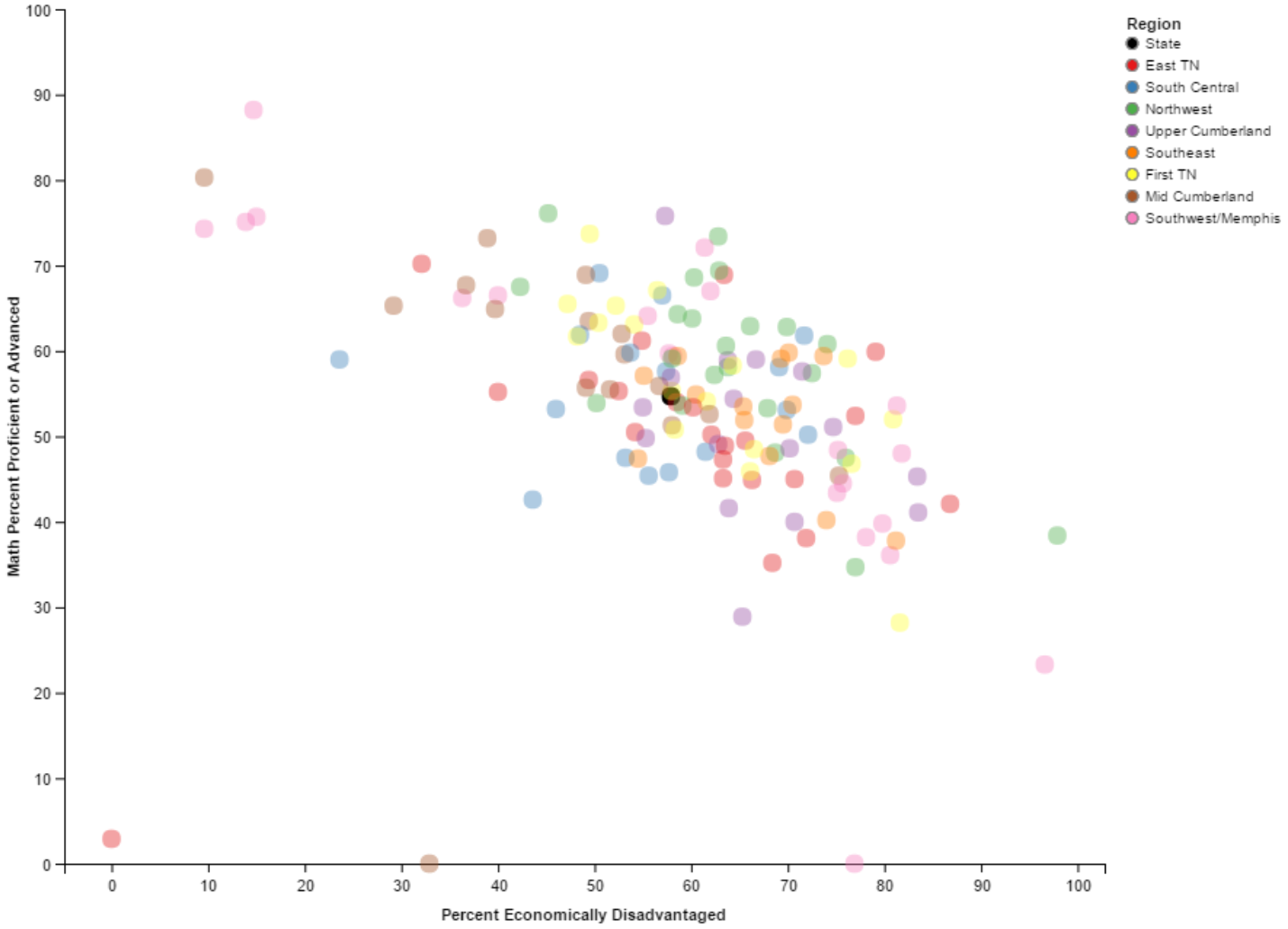
Tools will be released alongside the redesigned report card this year.

The goal: Create something accessible, interactive, and visual which makes it easy for people to engage with data.

Data Explorer

- Creates a scatterplot of an outcome against a characteristic.

Data Explorer



Data Explorer

- Creates a scatterplot of an outcome against a characteristic.
- Helpful for comparison against all other districts, or districts with a similar value of a characteristic.
- Also helpful for seeing the distribution of some outcome or some characteristic.

Demo

https://tnedu.shinyapps.io/data-explorer

Data Explorer

User Inputs

Select a District Characteristic:

Percent Economically Disadvantaged

Select an Outcome:

Math Percent Proficient or Advanced

Adjust Range:

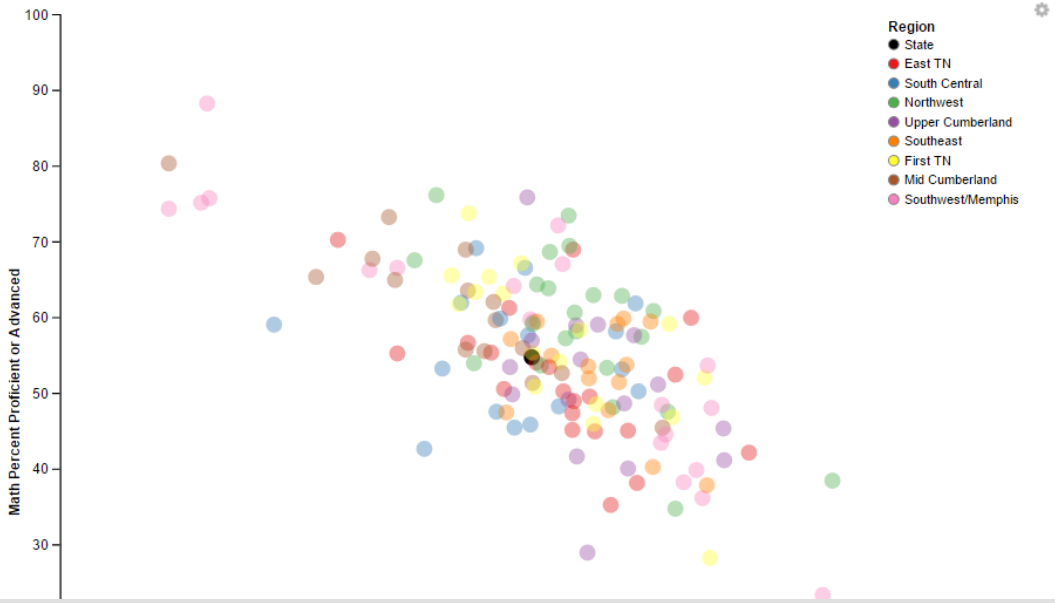
0 — 97.9

Optional: Highlight a District

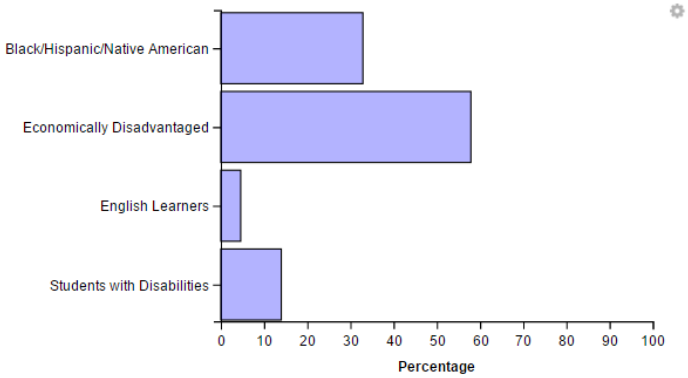
This tool allows users to explore relationships between district characteristics and outcomes for Tennessee school districts.

Use the dropdowns on the left to select a district characteristic and an outcome to plot.

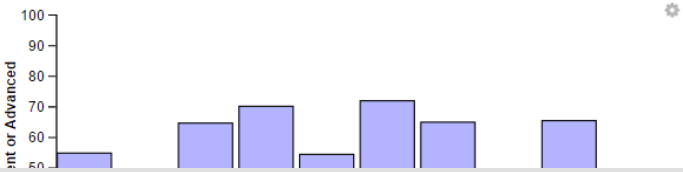
District Data



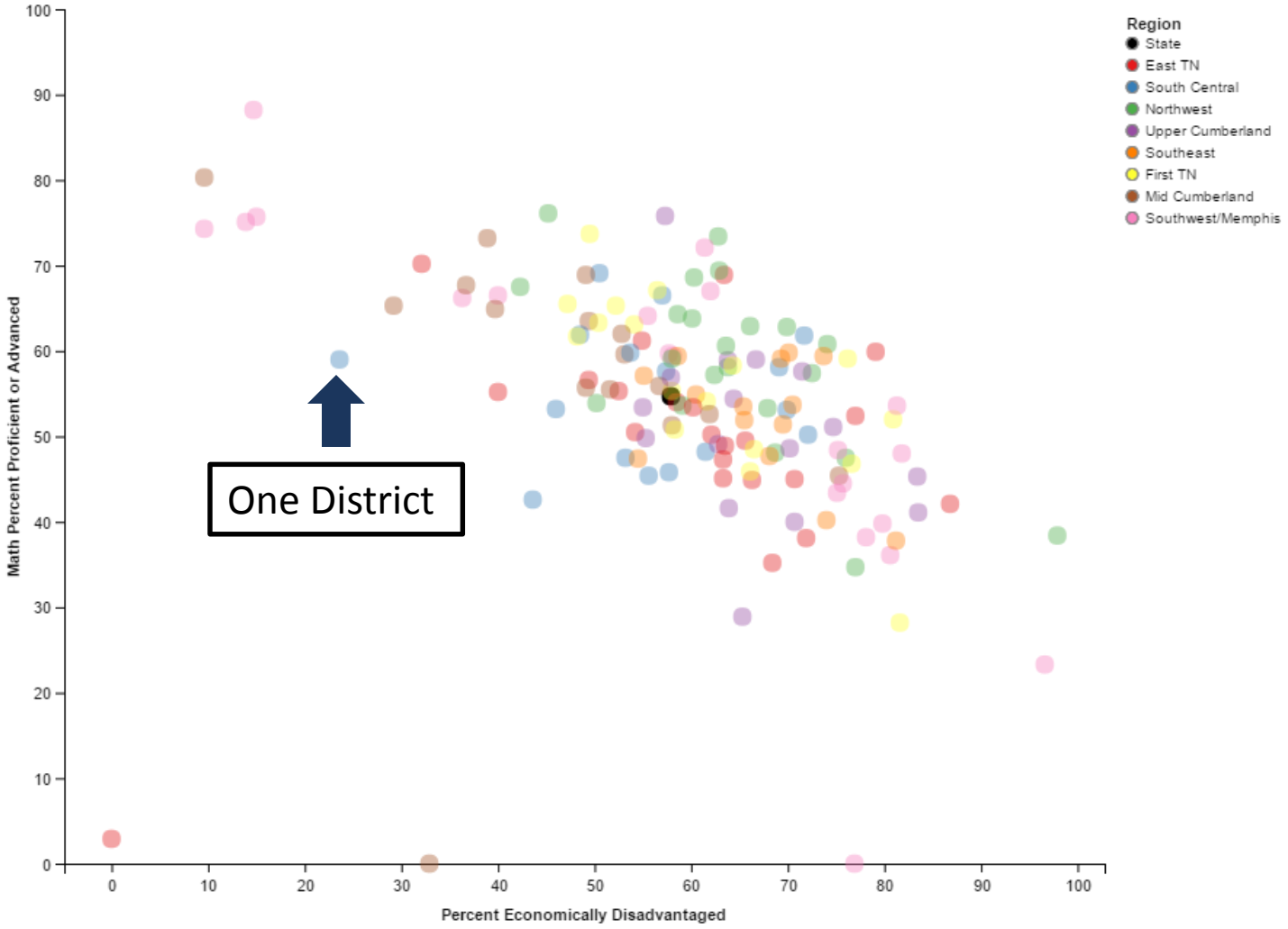
State of Tennessee Demographics



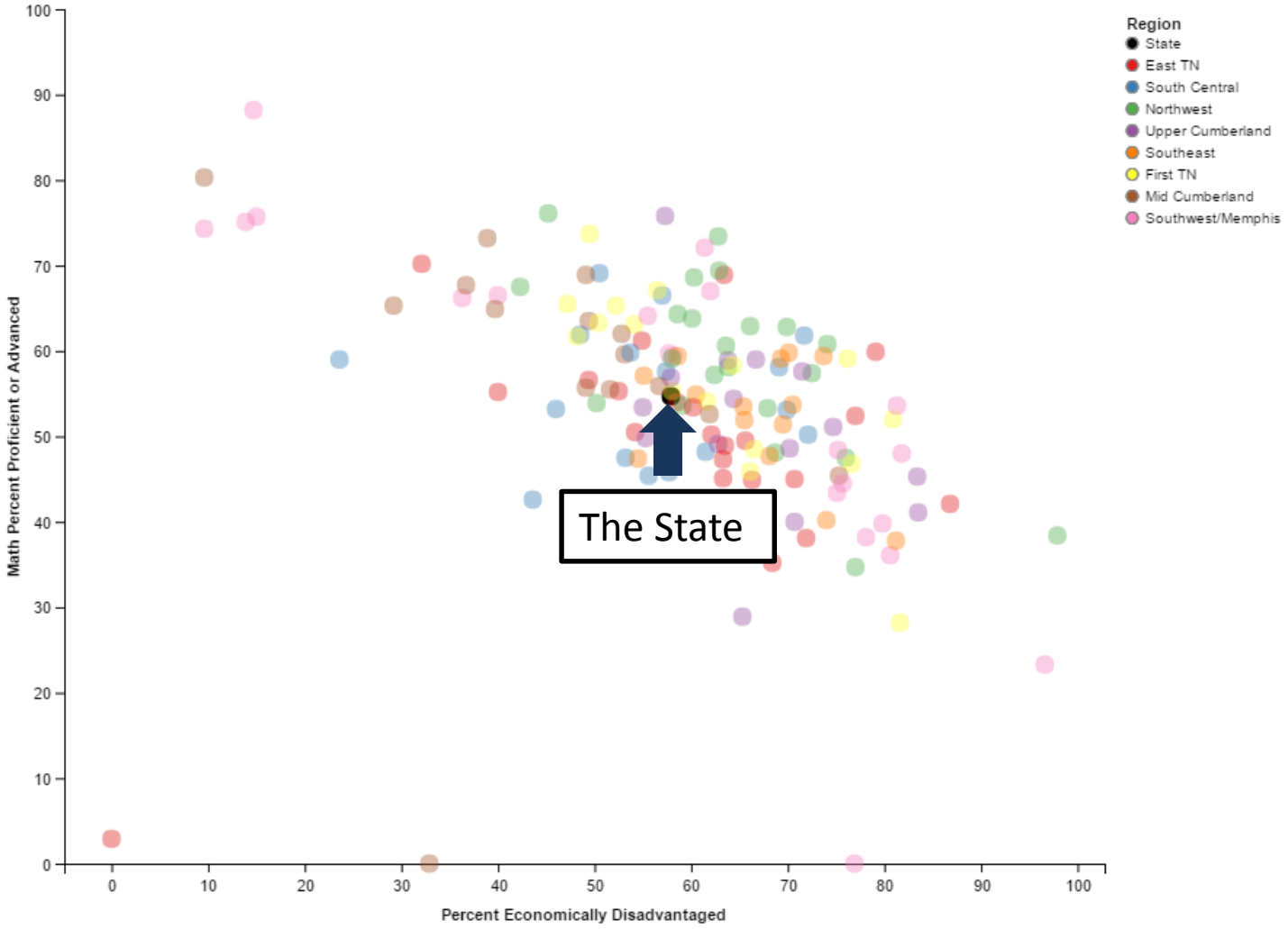
State of Tennessee Proficiency in All Subjects



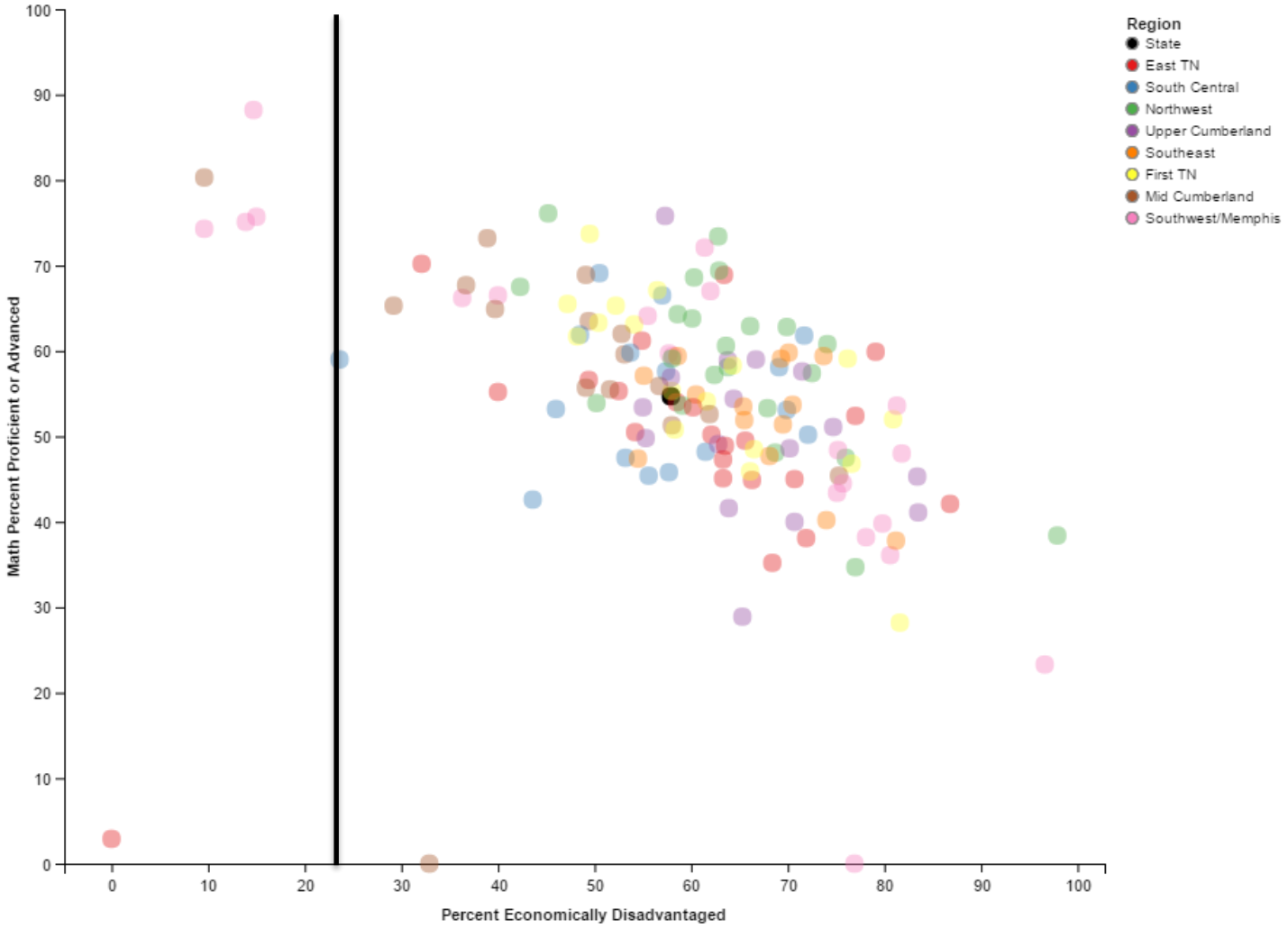
Each point represents one district.



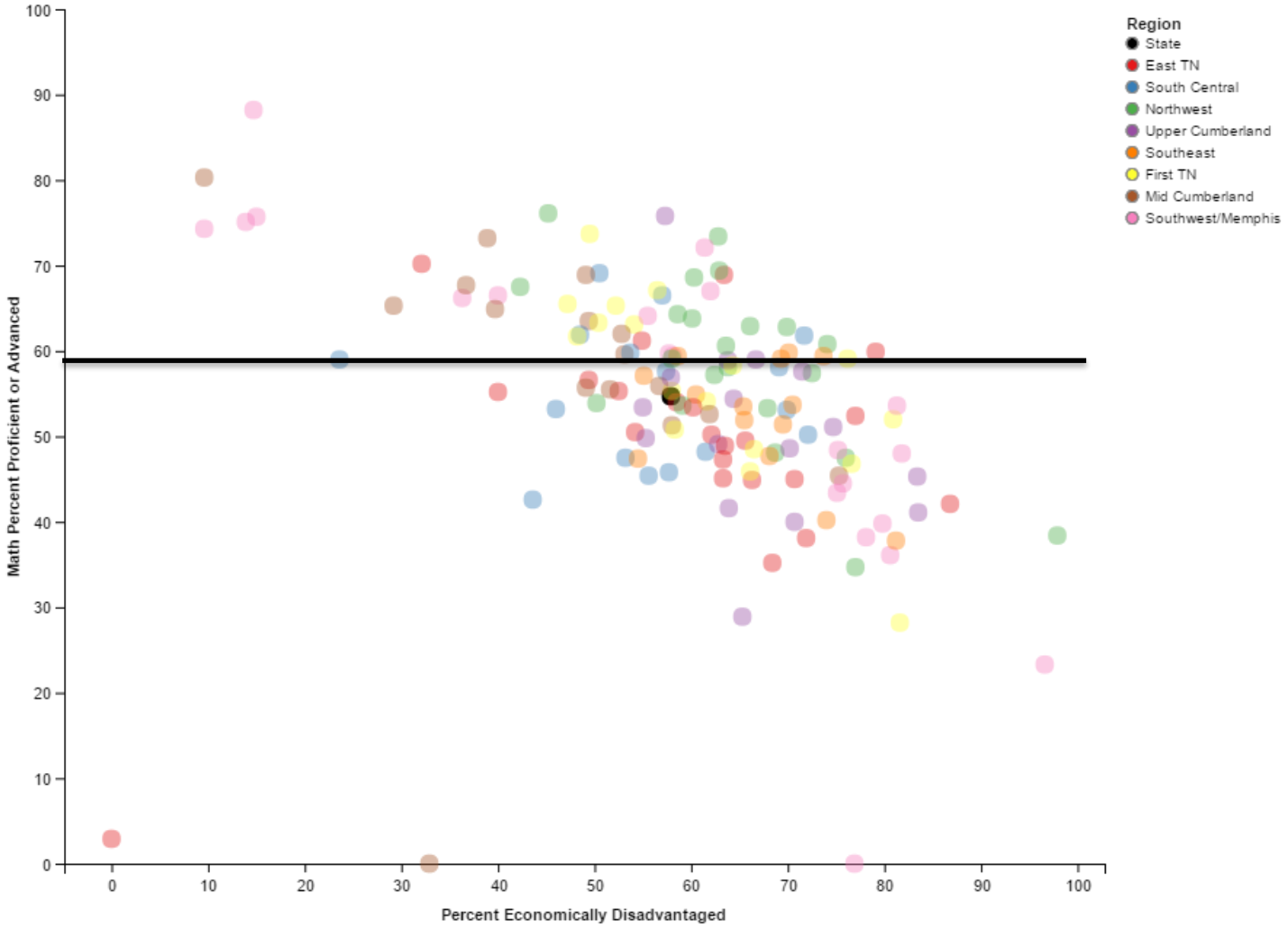
The black point represents the state.



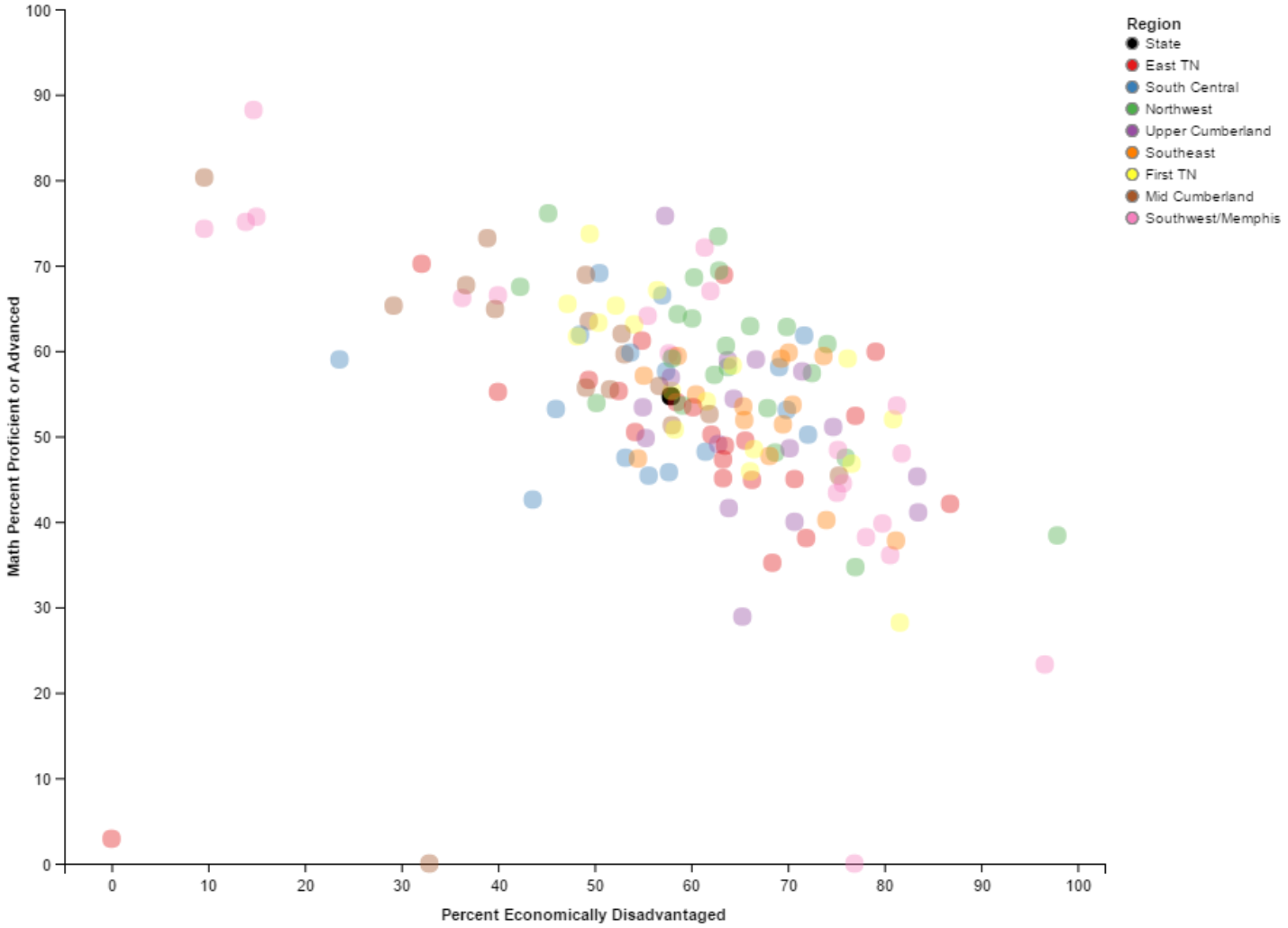
The horizontal placement of a point corresponds to the value of a selected characteristic.



The vertical placement of a point corresponds to the value of a selected outcome.



Compare districts based on their position relative to one another.



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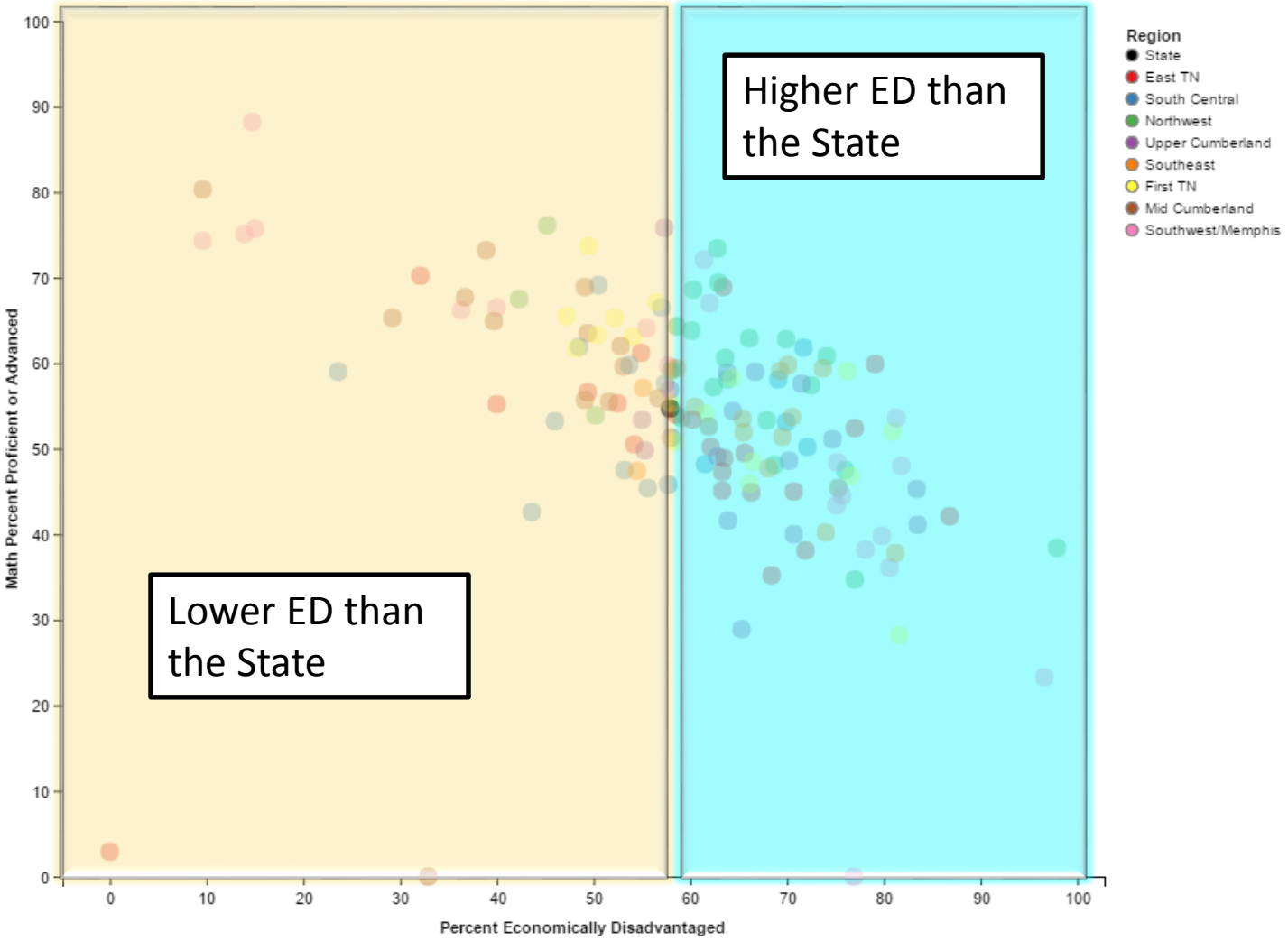

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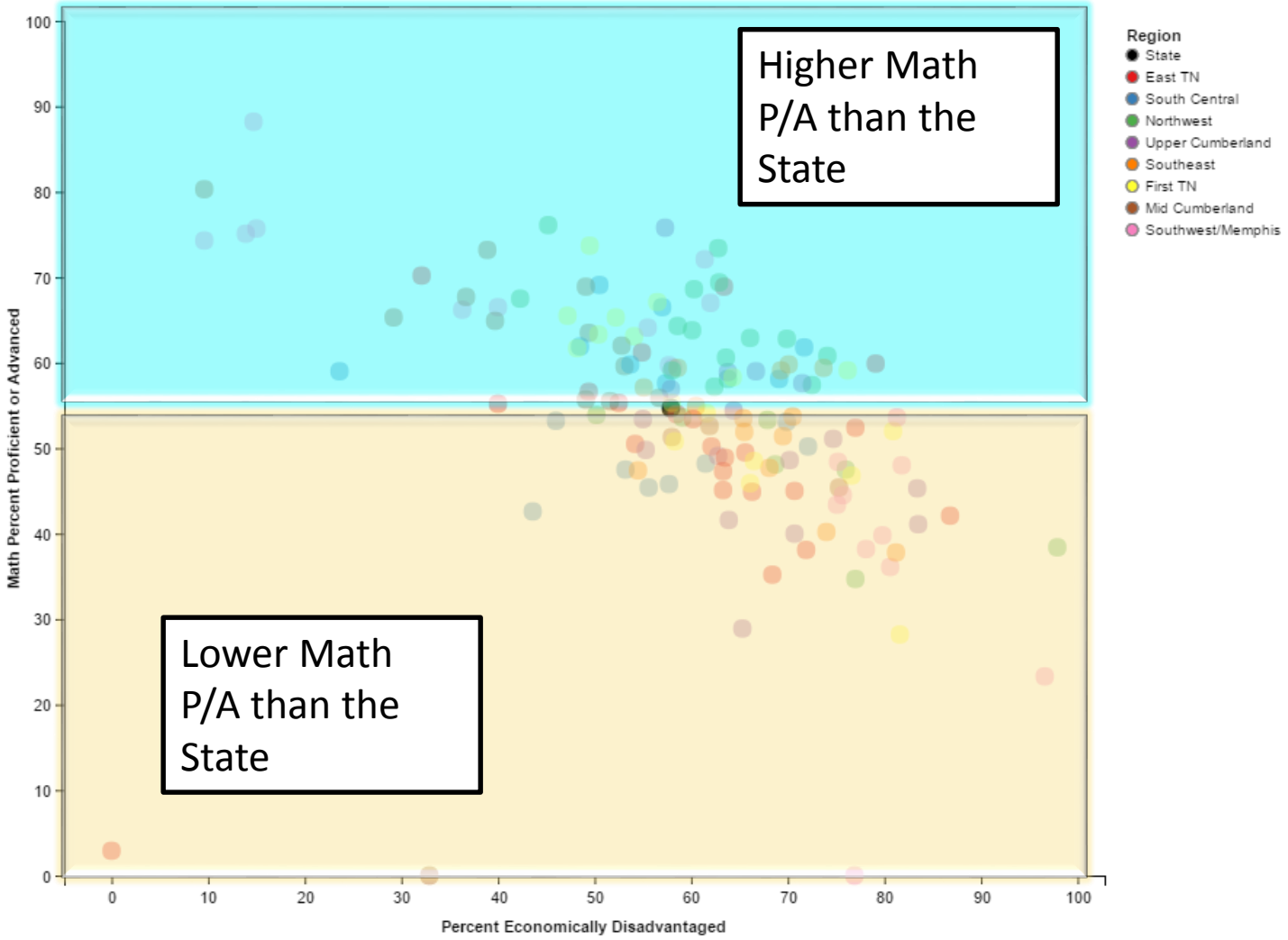

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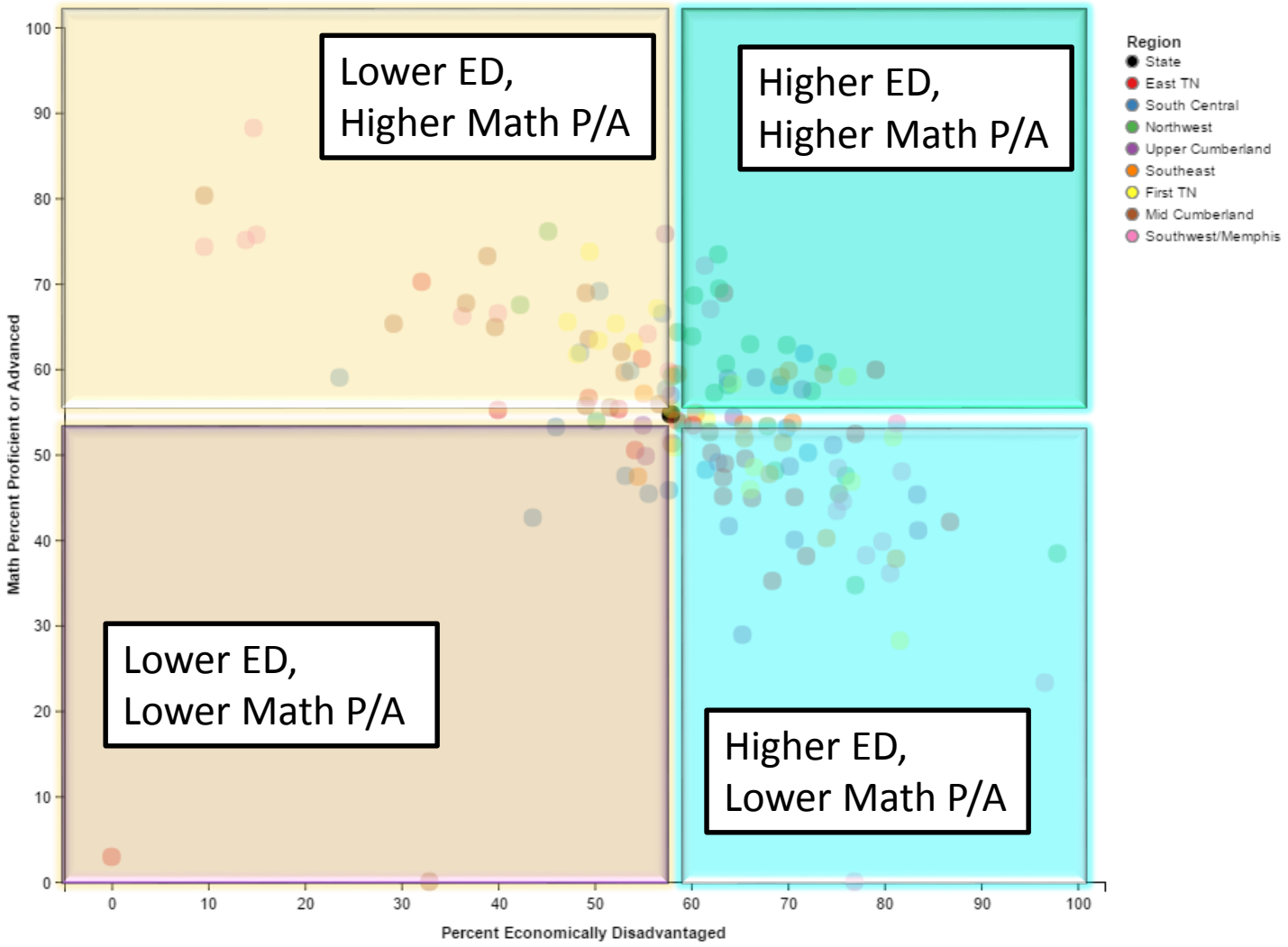
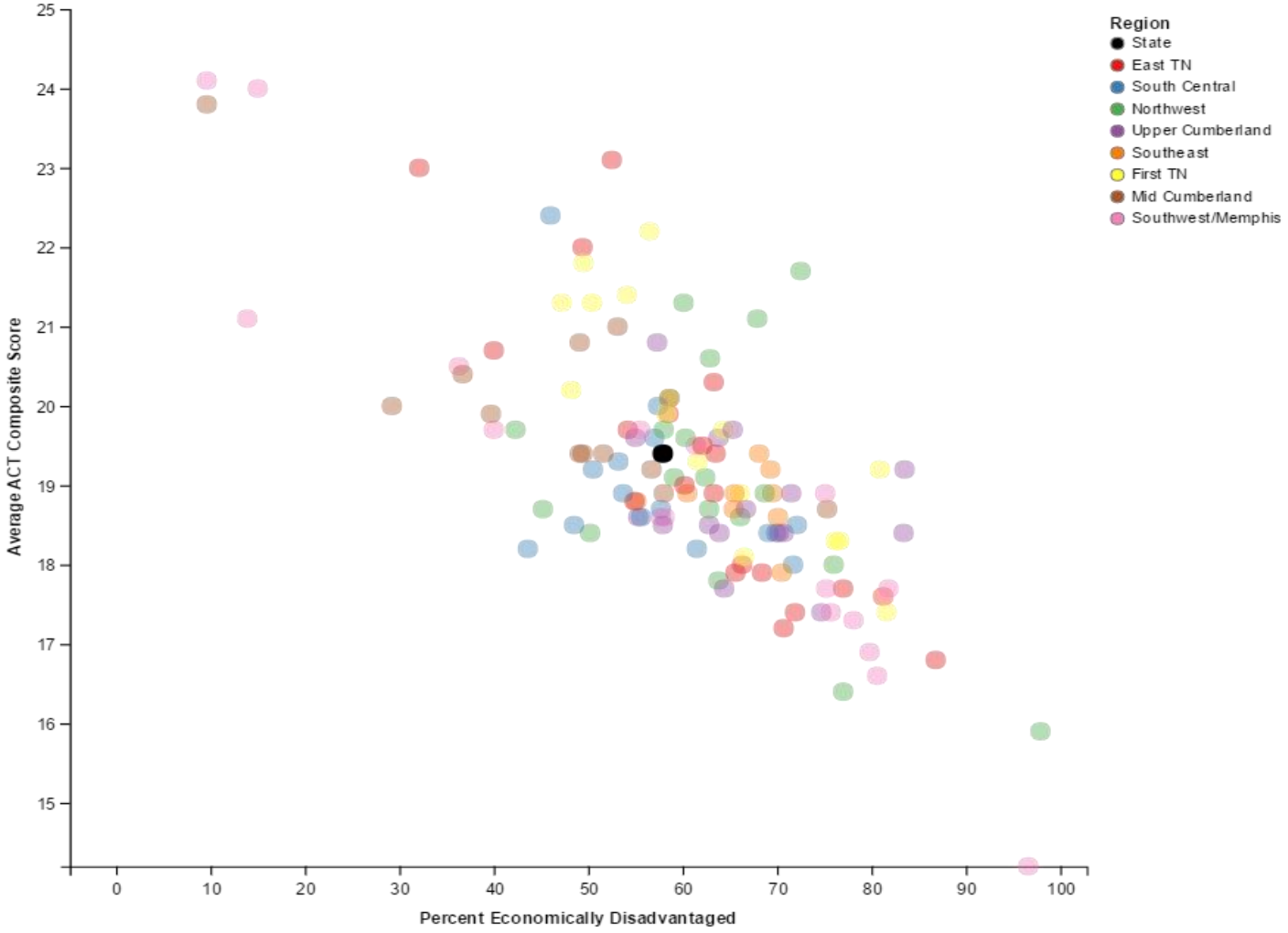
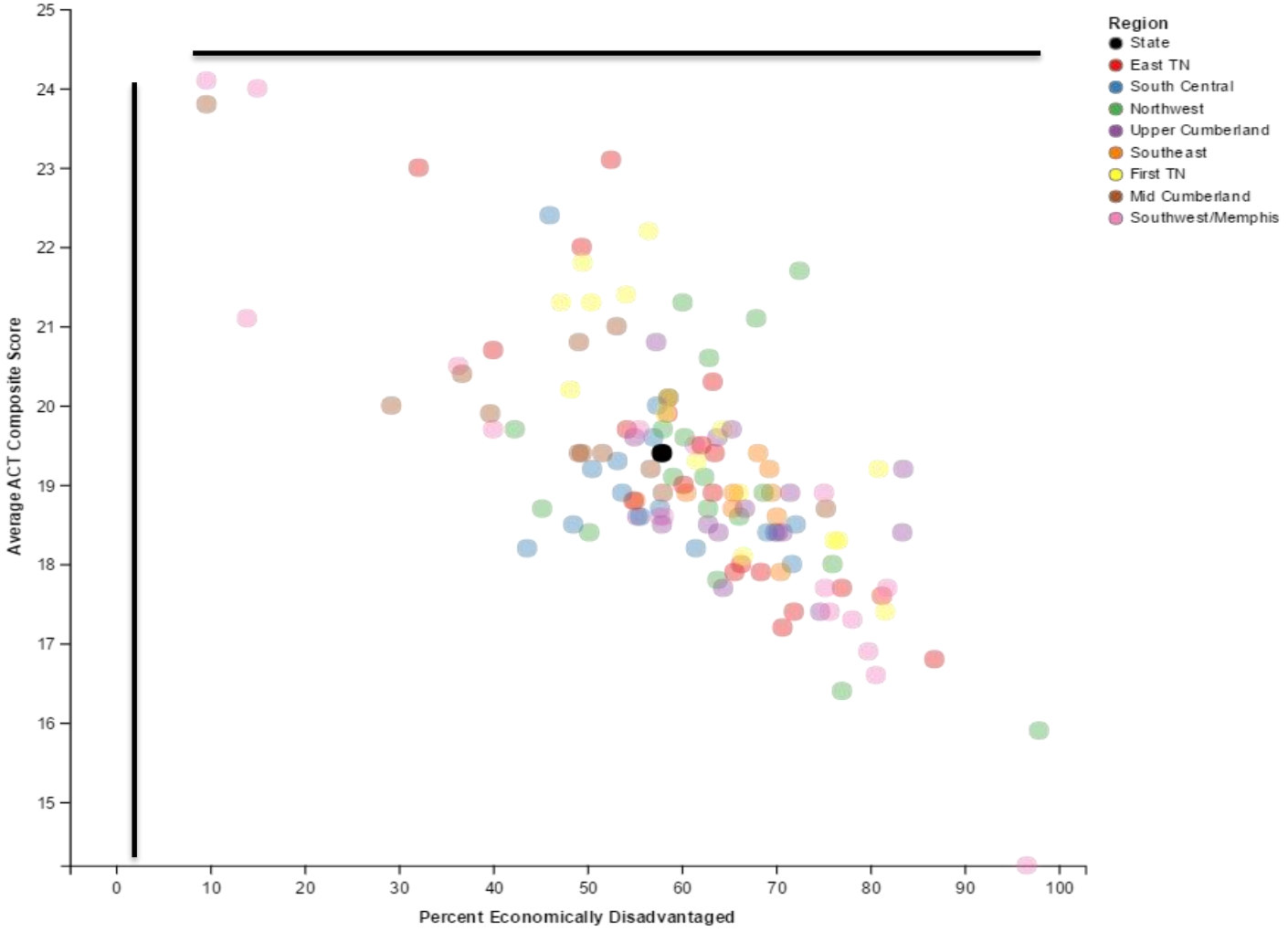


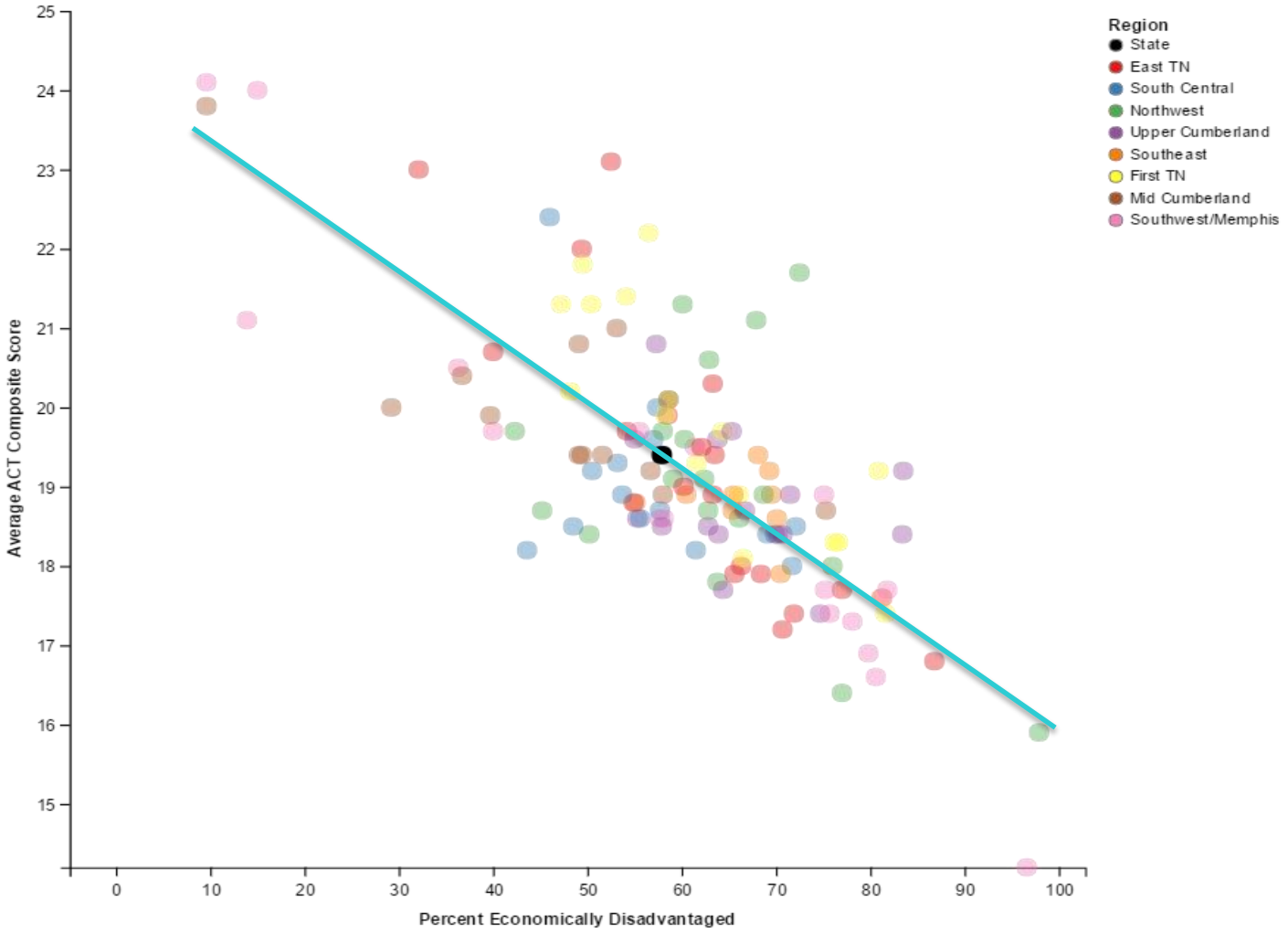
Things to Consider:



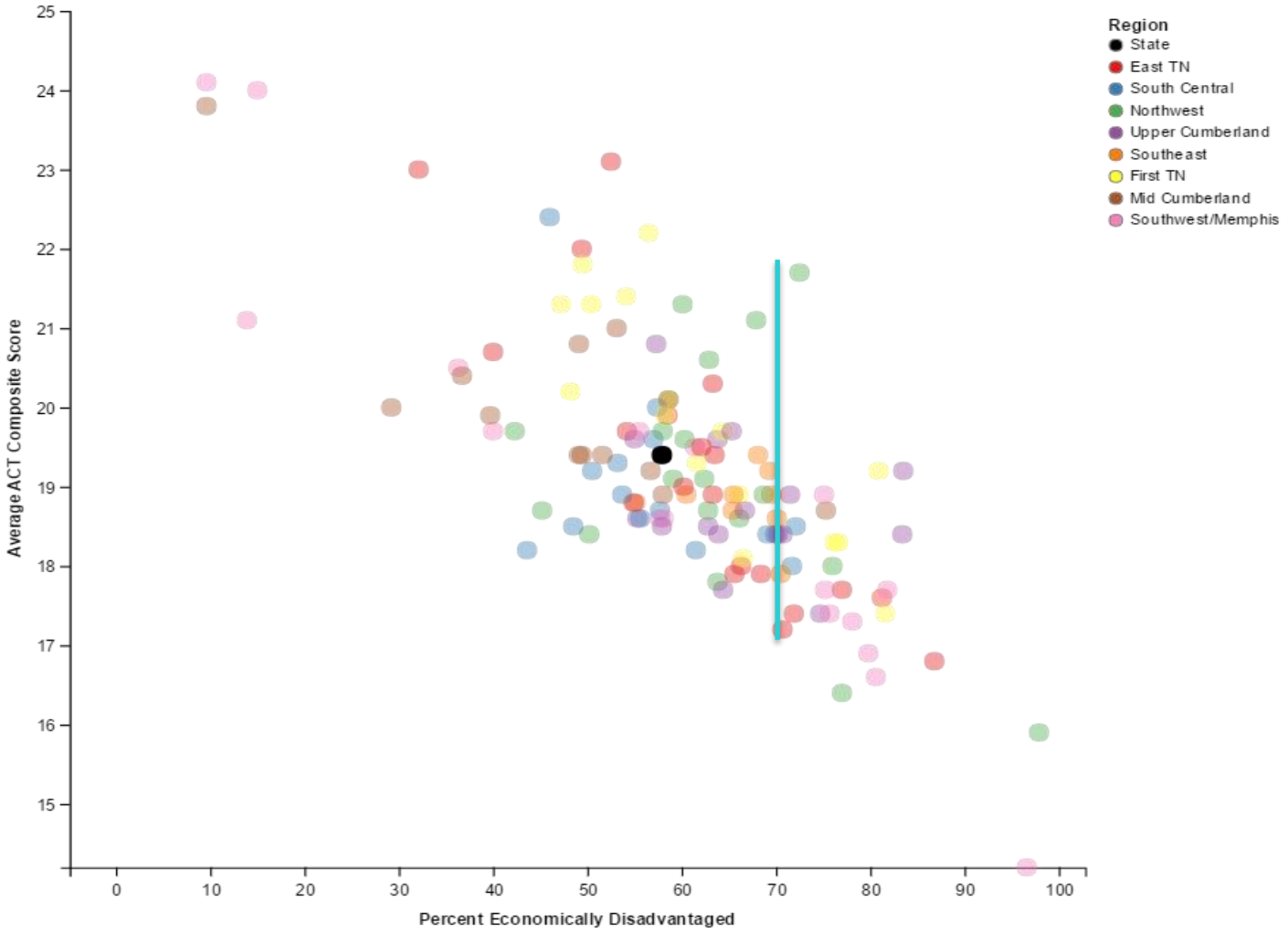
What is the range of values of a given characteristic/outcome?



Does there appear to be a correlation between a characteristic and an outcome?



Is there a range of values of the outcome at a given level of a characteristic?



Comparison Tool

- Allows for comparisons based on more than one characteristic.
- Allows for comparisons of trajectories across time.

Demo

https://tnedu.shinyapps.io/comparison-tool

Comparison Tool

Identify Similar Districts

Select a District:

Anderson County

Select One or More District Characteristics:

- [x] Student Enrollment
- [x] Per-Pupil Expenditures
- [x] % Economically Disadvantaged
- [x] % Students with Disabilities
- [x] % English Learner Students
- [x] % Black Students
- [x] % Hispanic Students
- [x] % Native American Students

Adjust any of the inputs in the left panels to update the output.

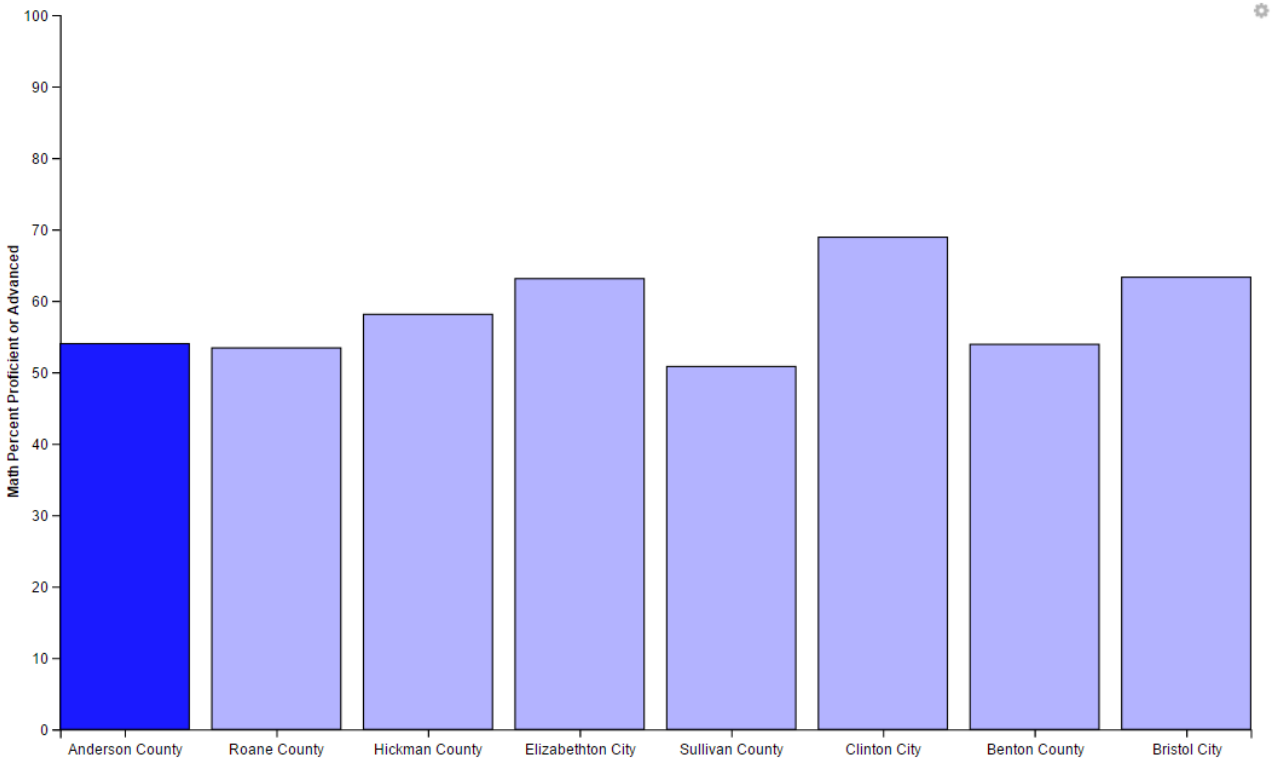
Outcome

Select an outcome to plot:

Math Percent Proficient or Advanced

Math Percent Proficient or Advanced for districts most similar to Anderson County

Current Year | Historical Data



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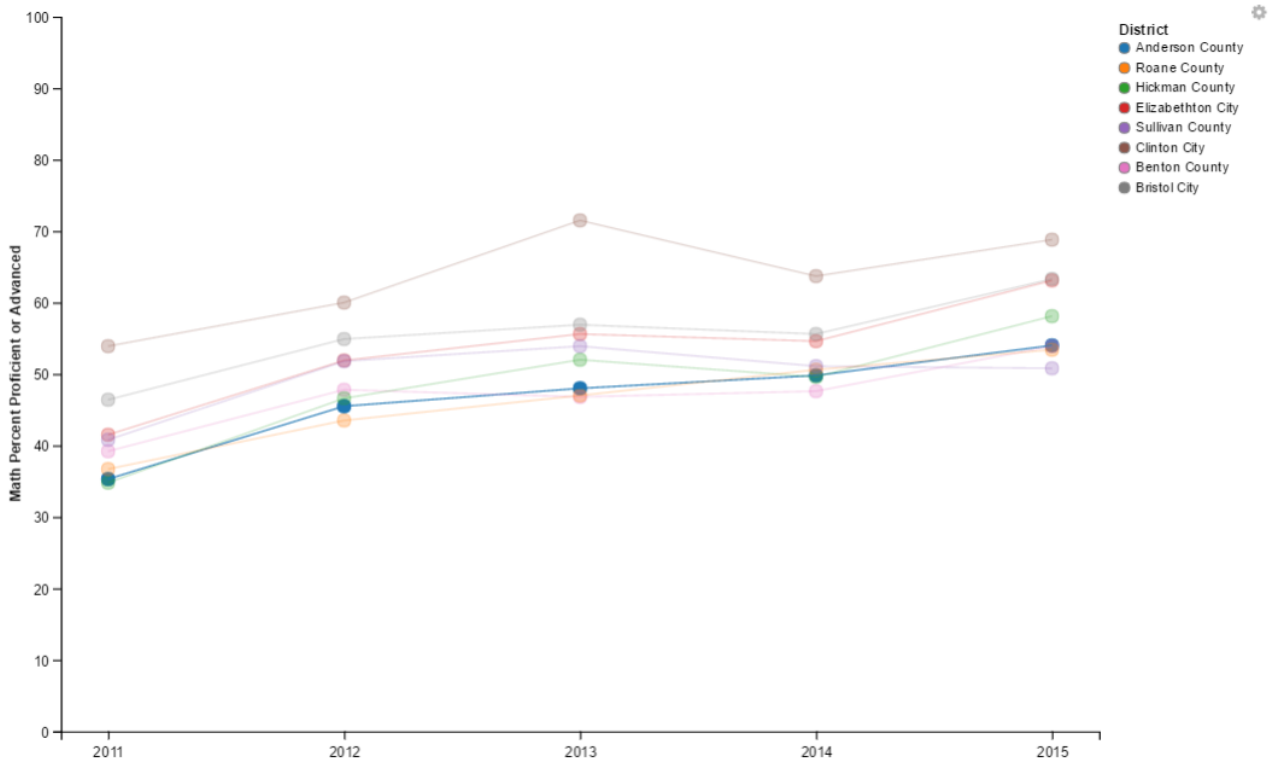

Comparison Tool

- Identifies similar districts based on selected characteristics.
- Options are:
  - Student Enrollment
  - Per-Pupil Expenditures
  - % Economic Disadvantaged
  - % Students with Disabilities
  - % English Learners
  - % Black Students
  - % Hispanic Students
  - % Native American Students
- Currently, all characteristics count equally in identifying similar districts.

Methodology

Begin with district profile data, available on our website:

District	Enrollment	Percent Black	Percent Hispanic	Percent Native American	Percent English Learners	Percent Students with Disabilities	Percent Economically Disadvantaged	Per-Pupil Expenditures
Anderson County	6304	2.8	1.1	0.5	0.2	18.0	58.5	9535.7
Clinton City	894	5.7	2.8	0.3	1.0	18.1	63.4	9537.5
Oak Ridge City	4326	16.6	8.0	0.7	3.0	14.3	52.5	12355.5
Bedford County	8270	11.2	20.6	0.5	9.4	10.9	69.9	7756.2
Benton County	2133	3.9	2.1	0.3	0.0	18.8	50.2	9714.2

Methodology

First, standardize profile data, putting all on the same scale:

District	Enrollment	Percent Black	Percent Hispanic	Percent Native American	Percent English Learners	Percent Students with Disabilities	Percent Economically Disadvantaged	Per-Pupil Expenditures
Anderson County	-0.03	-0.58	-0.87	0.79	-0.64	1.15	-0.13	0.48
Clinton City	-0.44	-0.41	-0.54	-0.07	-0.37	1.19	0.19	0.48
Oak Ridge City	-0.18	0.24	0.46	1.65	0.28	-0.31	-0.51	3.29
Bedford County	0.12	-0.08	2.89	0.79	2.37	-1.65	0.61	-1.30
Benton County	-0.34	-0.52	-0.69	-0.07	-0.70	1.47	-0.66	0.66

Methodology

Then, look for smallest differences between standardized values of district characteristics:

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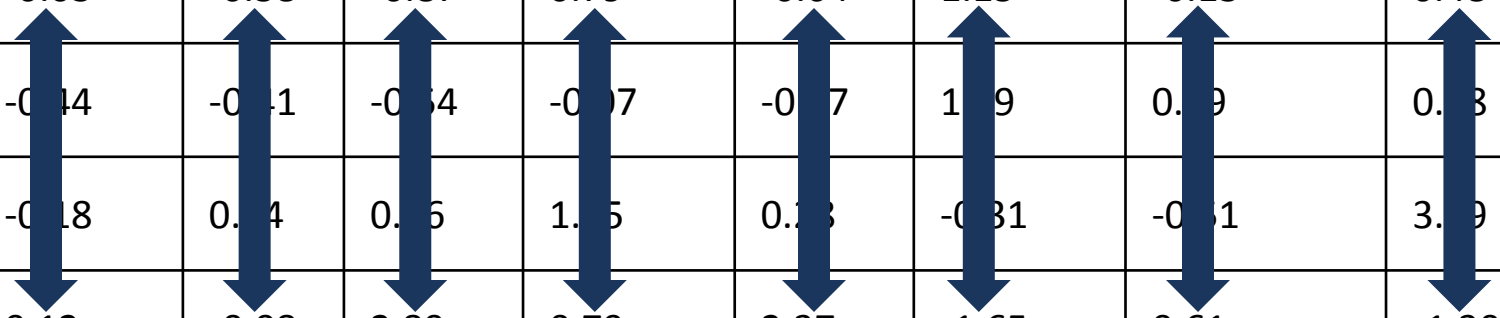

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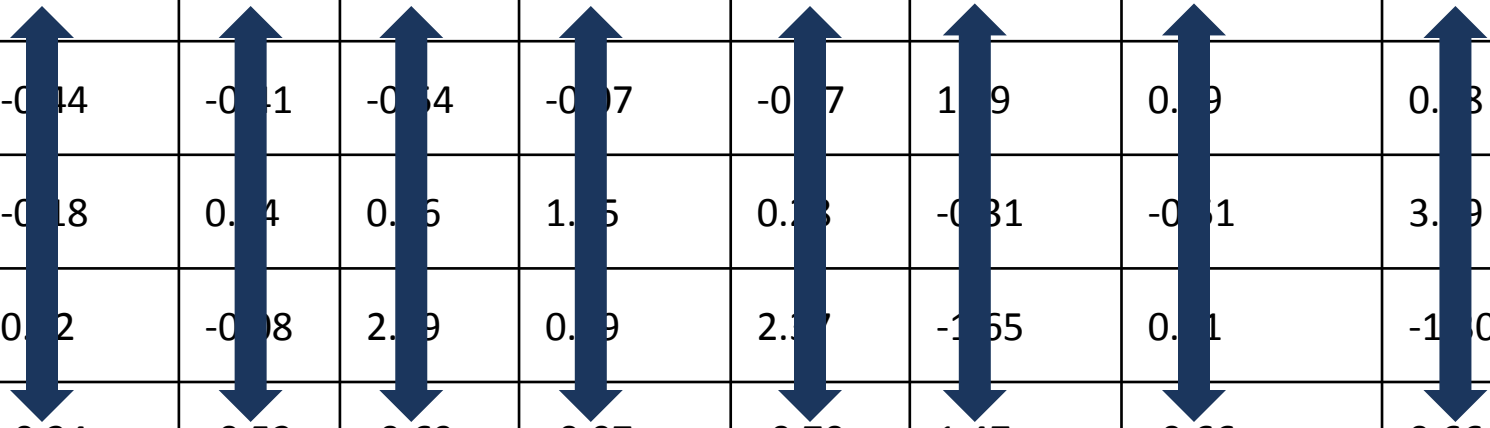

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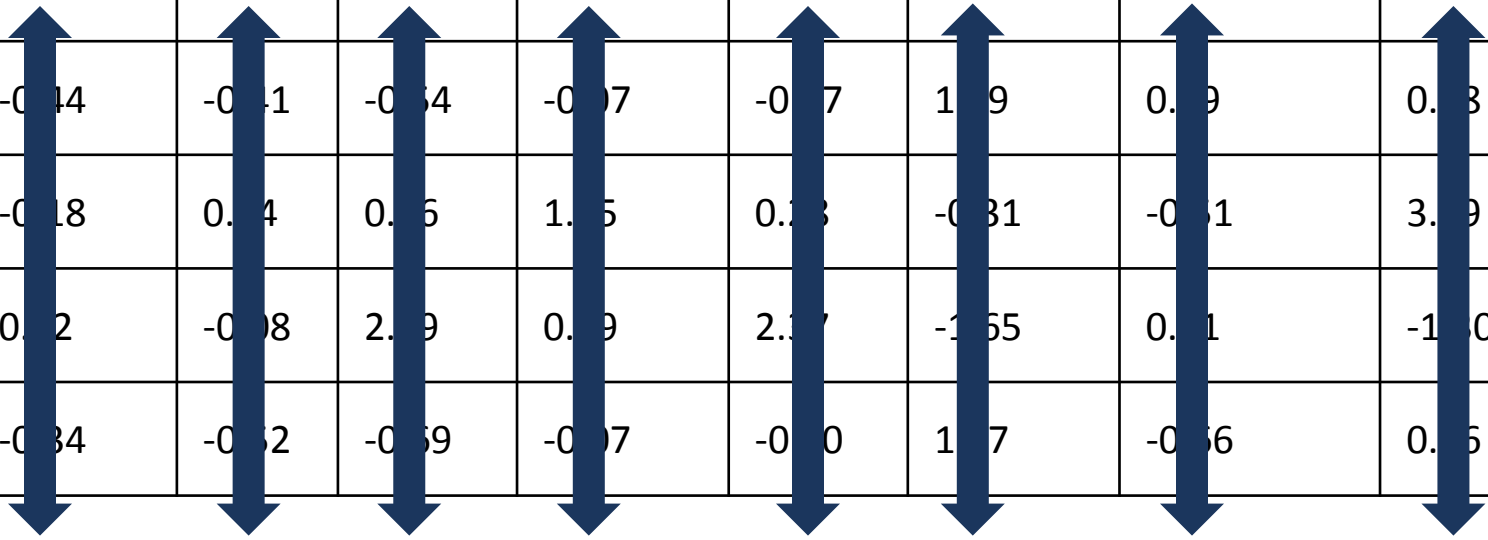

Caveats/Limitations

- Tool presents data for most similar districts; does not guarantee a high degree of similarity.
  - Secondary table provided for user to assess similarity
- Tool displays data for 7 most similar districts by default. Some districts have fewer (more) reasonable comparison points than others.
- Factors not accounted for by the comparison tool may also make comparison of district outcomes inappropriate.

Data Tools

We are working on a couple of tools to facilitate these comparisons.

Tools will be released alongside the redesigned report card this year.

The goal: Create something accessible, interactive, and visual which makes it easy for people to engage with data.

Future Work

- Gather feedback and refine tools
- School level versions of explorer and comparison tool
- Additional outcomes
- Weighting of characteristics for comparison tool
- Requests?

Find my code on GitHub:

https://github.com/tnedu/shiny-apps

Questions, Suggestions, Errors?

Alexander Poon
alex.poon@tn.gov

Extra Slides

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Methodology

Next, compute a similarity score between all districts and the selected district based on the selected characteristics $\{char_1, char_2, \ldots, char_n\}$.

The similarity score between district i and district j is:

$$similarity_{ij} = \sqrt{\sum_{k=1}^{n} \left(char_{ki} - char_{kj}\right)^2}$$

where $char_{ki}$ is the standardized value of characteristic k for district i.

Worked Example

We will calculate a similarity score for Davidson County and Shelby County based on Enrollment, % ED, and Per-Pupil Expenditures.

After standardizing, the district profile data looks like the following:

	Enrollment	% Economically Disadvantaged	Per-Pupil Expenditures
Davidson County	5.50	0.94	2.43
Shelby County	7.68	1.21	2.16

Worked Example

After standardizing, the district profile data looks like the following:

	Enrollment	% Economically Disadvantaged	Per-Pupil Expenditures
Davidson County	5.50	0.94	2.43
Shelby County	7.68	1.21	2.16

The similarity score based on the selected characteristics is the following:

$$\sqrt{(5.50 - 7.68)^2 + (0.94 - 1.21)^2 + (2.43 - 2.16)^2} = 2.21$$

Methodology

- Identical districts based on the selected characteristics produces a similarity score of 0.
- A lower score signifies more similar districts; otherwise hard to interpret the actual value of the score.