Data Science for Operations and Planning at Durham Public Schools (DPS)

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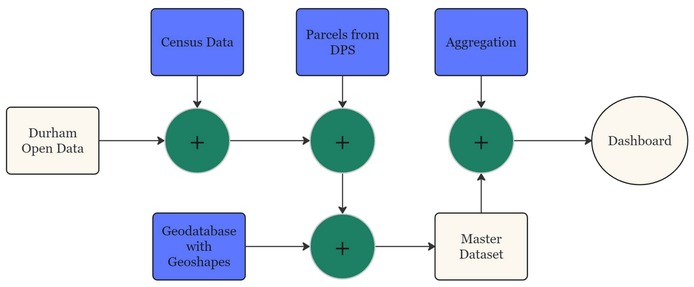
Project Overview

- Currently, there is no data that ties Socioeconomic Status (SES) with DPS
- We use land parcel property values to granularly assess SES within DPS geographies
  - Census geographies
    - Blocks
    - Block Groups
    - Tracts
  - School geographies
    - Planning Units
- We then export our findings to a dashboard to be used by DPS for better school resource allocation & possible redistricting

Methods

Data Pipeline



- We join Durham Open parcel data with DPS parcels that contain student housing information
  - Census data is also joined to acquire rent values for multi-family homes
- After our datasets are spatially joined and mapped to their respective geographies, we can aggregate them by using unit value and rent value
  - Unit Value = $\frac{Total\ Property\ Value}{\#\ Dwelling\ Units}$

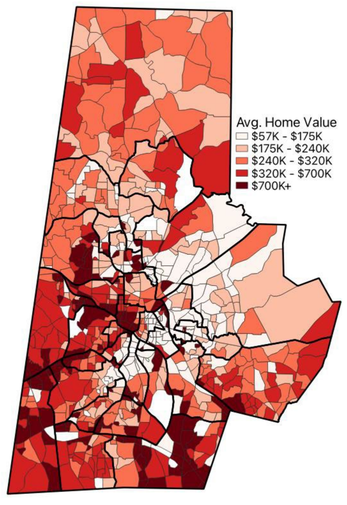
Parcel ID	Unit Value	Quartile	SF Quartile	MF Quartile	PU Unit Value Avg	PU SF Quartile	PU MF Quartile
001	$80,510	1		2	$300,282	3	3
002	$90,278	1		3	$300,282	3	3
003	$83,593	1		2	$300,282	3	3
004	$670,055	4	4		$300,282	3	3

* Master dataset sample with school planning unit aggregations (SF = Single Family MF = Multi Family PU = Planning Unit)

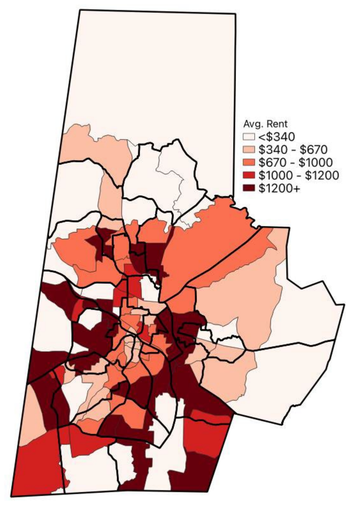
Results

- **Diverse Views of Socioeconomic Status (SES) Indicators:** We developed multiple perspectives of SES indicators across various geographic regions. The figures below illustrate three such metrics - housing unit value, monthly rent, and home built year. These indicators help paint a picture of SES conditions in DPS school districts. Thick black lines outline the DPS school districts and the faint lines outline the different geographies that we collected data on.
- **Limitations of Unit Value as an SES Indicator:** Unit value alone cannot reliably indicate SES due to certain discrepancies. For instance, in the first figure, the lower central region, specifically Durham Downtown, had lower unit values compared to the suburbs, which seems counterintuitive because one would associate downtown area with expensive condos and luxury apartments. A deeper analysis revealed that the apartment complexes were actually small rental units, thus bringing down the unit values substantially.
- **Comprehensive Analysis Approach:** To address these discrepancies, we consider additional factors such as average monthly rent, property age, and other relevant indicators, alongside unit value.
- **Final Product and Visualization:** Our final product is a single script that integrates data from the sources listed in the Methods section and aggregates it across various geographies. This data is then imported into QGIS to create visualizations that highlight different SES indicators across different geographies. Users can select from 15 geographies and 12 SES indicators to explore.

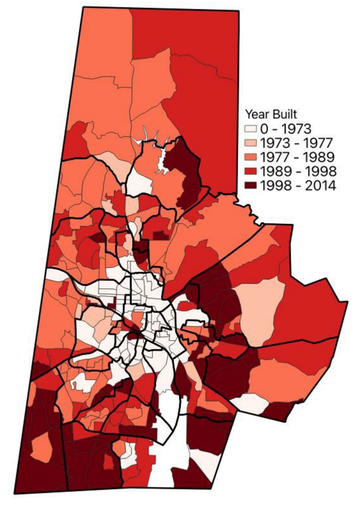
Unit Value variation
by DPS Planning Units



Monthly Rent Variation
by Census Tracts



Home Built Year Variation
by Census Block Group



Conclusions

- **Enhanced Understanding for Equitable Resource Allocation:** DPS can utilize the dashboard to gain a more granular understanding of their students' SES, ensuring a more equitable allocation of resources.
- **Informed Planning and Future Trends:** By integrating their student data with our dataset, DPS can engage in more informed planning and better anticipate future trends.
- **Overcoming Socioeconomic Biases:** The dashboard will help mitigate socioeconomic biases within the school system, providing equal opportunities to all schools in the district.

Future Work

We can add more SES indicators by aggregating by:

- **Housing Type** (subsections within the single and multi-housing designations).
- **Parcel Ranks:** Ordering parcels ascendingly based on unit value.
- **Predicted Rent Value of all Parcels:** By converting all property values to predicted rent values, we can compare all parcels in a more accurate way than simply using unit value.
- **Demographic Data:** Integrating demographic information would allow us to better understand the socio-economic context of each geography.

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