

Initial Efforts and Early Thoughts From Exploring Current and Potential Poverty Metrics Using the National Center for Education Statistics Spatially Interpolated Demographic Estimates Project

April 23, 2022



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Session Overview

- The SIDE Project – Doug Gevert
- Statewide Longitudinal Data Systems Grant Program Overview – Charles McGrew
- State Perspective
 - Hawai'i – Shane Hedani
 - Wisconsin – Carl Frederick

The SIDE Project (Spatially Interpolated Demographic Estimates)



[Visit mapED](#)



ACS-ED Maps



Locale Lookup



ACS-ED Tables



ACS-ED Dashboard



EDGE Open Data

Issues with Traditional School Poverty Indicator

- Education programs tend to rely on indicators of Free/Reduced-price lunch eligibility to identify economic need for students and schools
- Notable limitations:
 - Multiple uses create incentives for over-participation
 - Misidentification results in over-participation
 - Little capacity for income verification
 - Categorical measure (eligible/not)
 - Program changes affect data comparability and usability
- *We need multiple measures of poverty in/around schools*

How to Implement a New School Poverty Indicator?

- How to create a new poverty indicator?
 - What metric, properties, and data sources?
 - What production constraints?
 - How to update regularly?
- How to apply a new poverty indicator?
 - How would we access sensitive student data?
 - How would we keep student data safe (if accessible)?
 - What IT/administrative infrastructure would be required?
- How to build local capacity to use a new poverty indicator?
 - Do states have the necessary spatial data infrastructure?

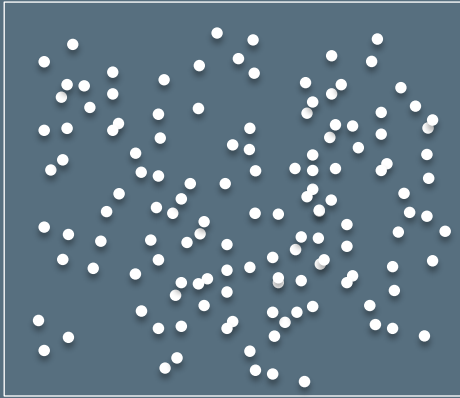
#1 Design a new poverty indicator

- Ask the right question
 - What's our best guess of the economic condition for household at XY location?
 - Point-based estimate, not an area-based estimate
- Rely on a common metric from an authoritative source
 - ACS Income-to-poverty ratio (IPR)
 - Continuous measure (0-999); standard poverty criteria (IPR ≤ 100)
 - Free and Reduced-price lunch eligibility relies on IPR of < 130 and 130-185
- Apply a location-specific, privacy-protected estimation approach
 - Bayesian kriging produces a continuous prediction surface
 - Point-based estimates informed by neighbors (neighbor-based neighborhoods)
- Rasterize estimates to support simple, scalable application

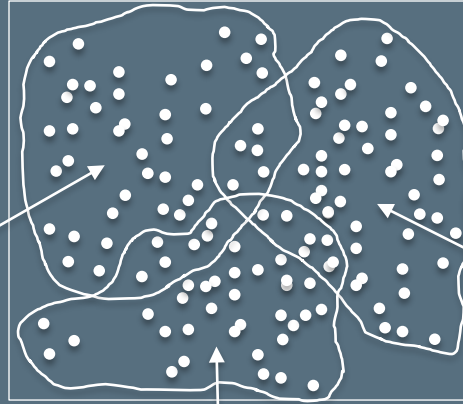
Estimation Approach

- Bayesian kriging (Krivoruchko & Gribov 2019; Gribov & Krivoruchko, 2020)
- Geostatistical interpolator that uses information from measured locations to predict values at unmeasured location
- Two-stage strategy:
 - Model semivariogram in local areas to quantify spatial structure in the data (i.e., how differences in paired income responses vary by distance)
 - Applies weights from local models to nearest neighbors (25) to predict value at unsampled location
- Neighbor-based point estimates = ‘centered’ neighborhood estimates
“All models are wrong, but some are useful” – George Box

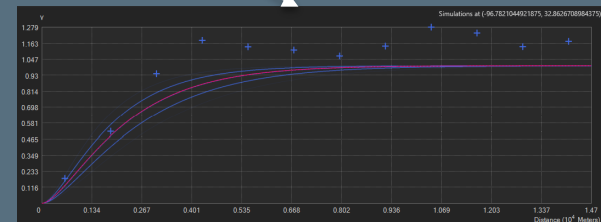
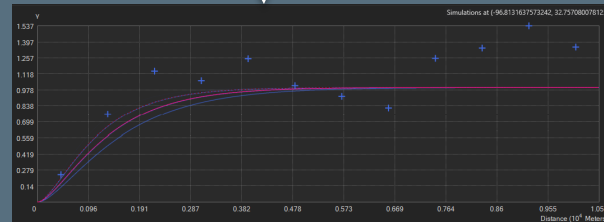
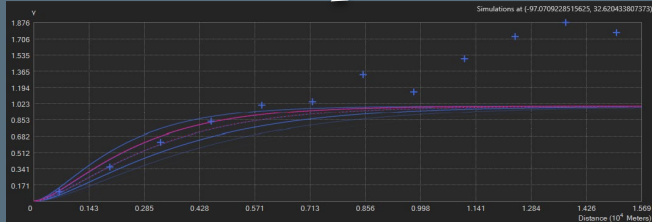
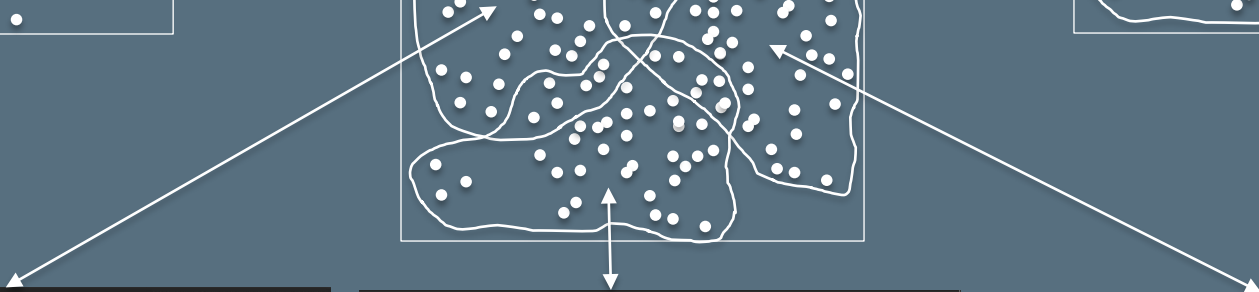
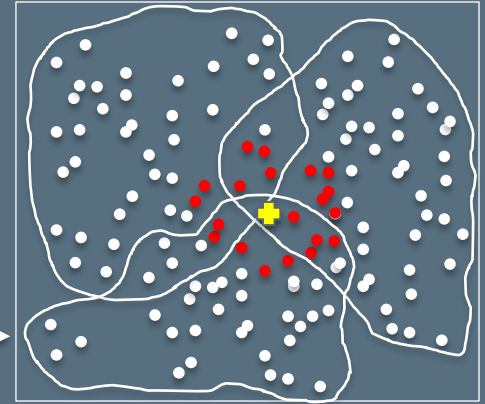
Model Stages

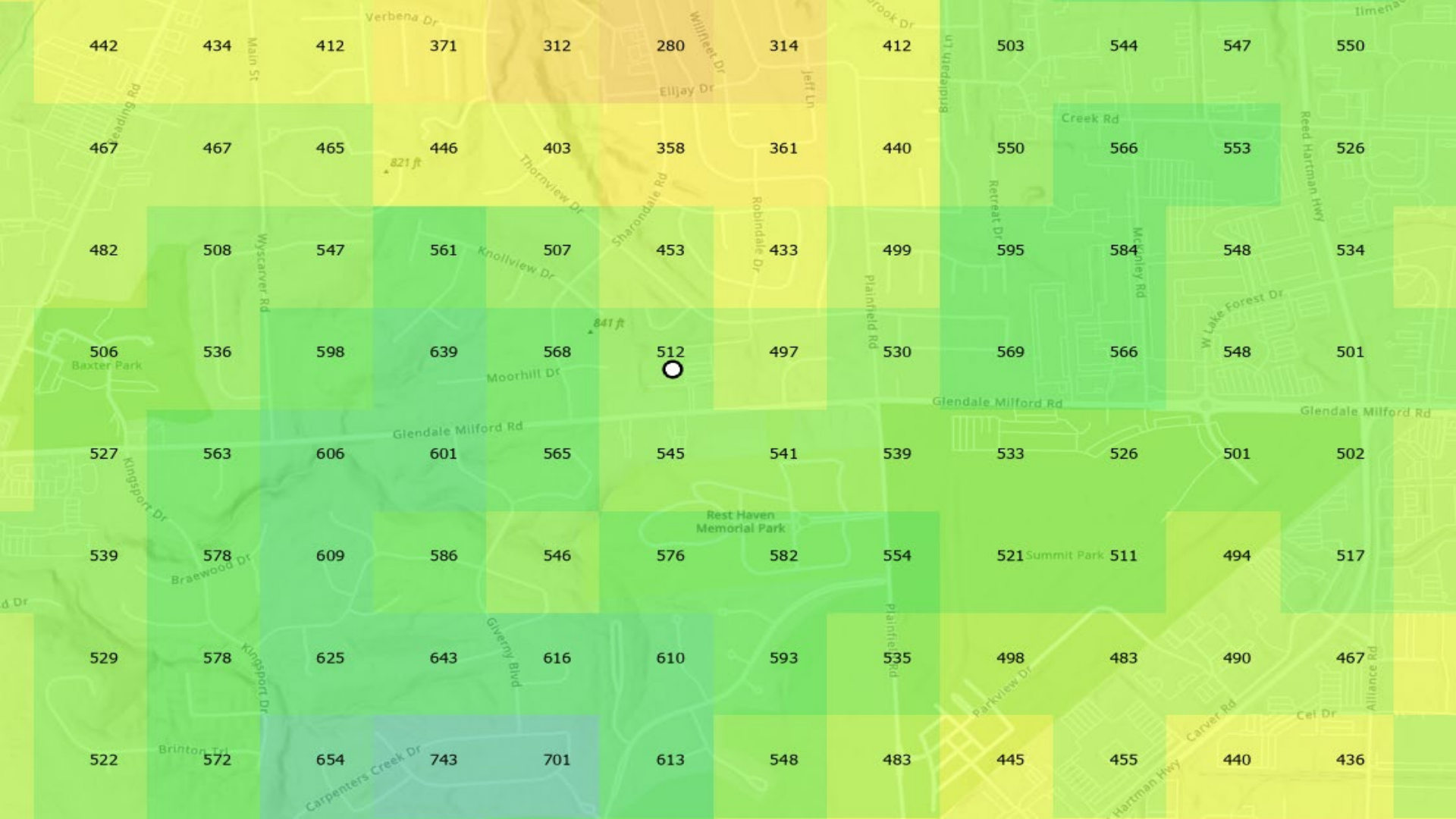


Stage 1

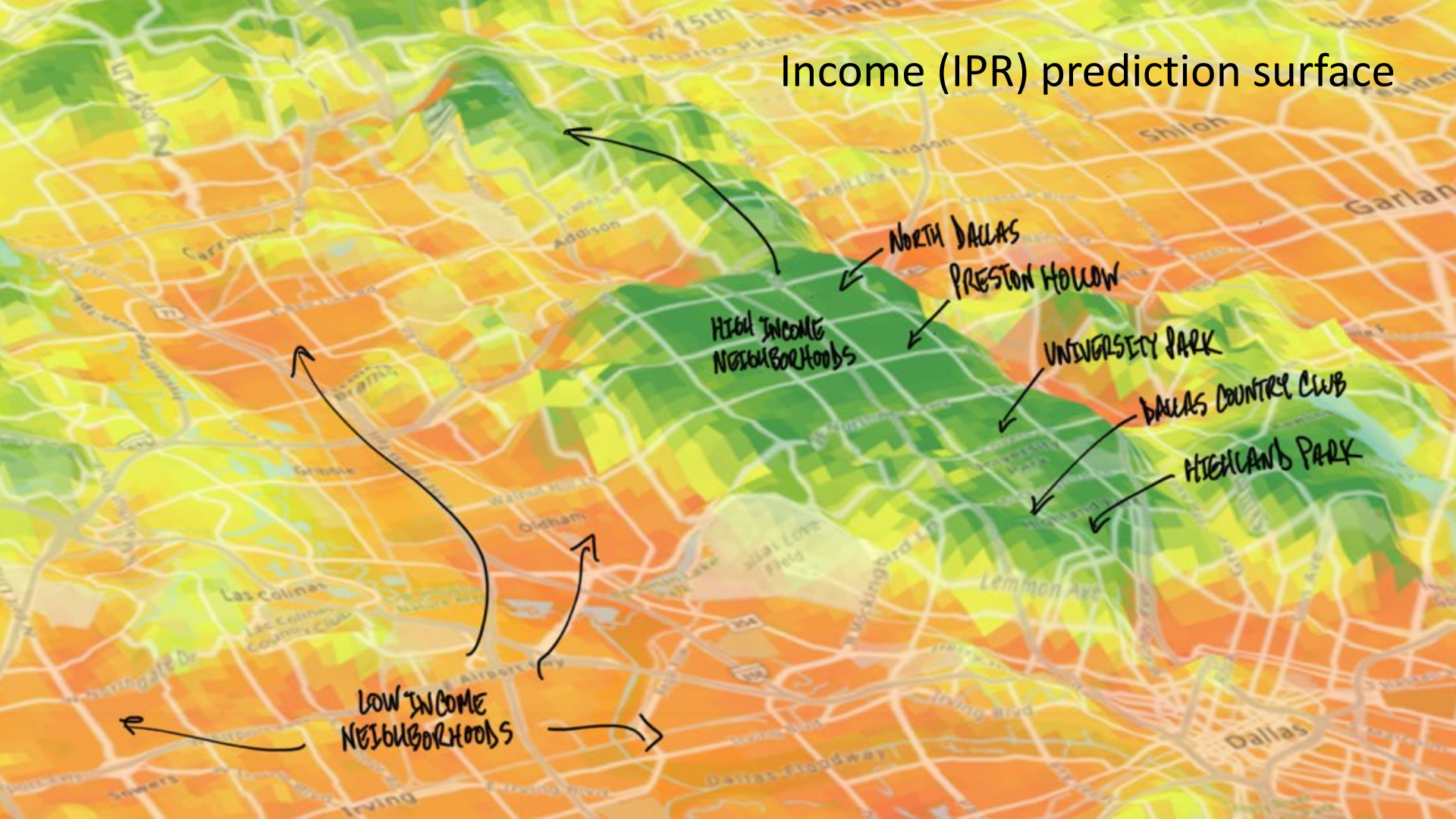


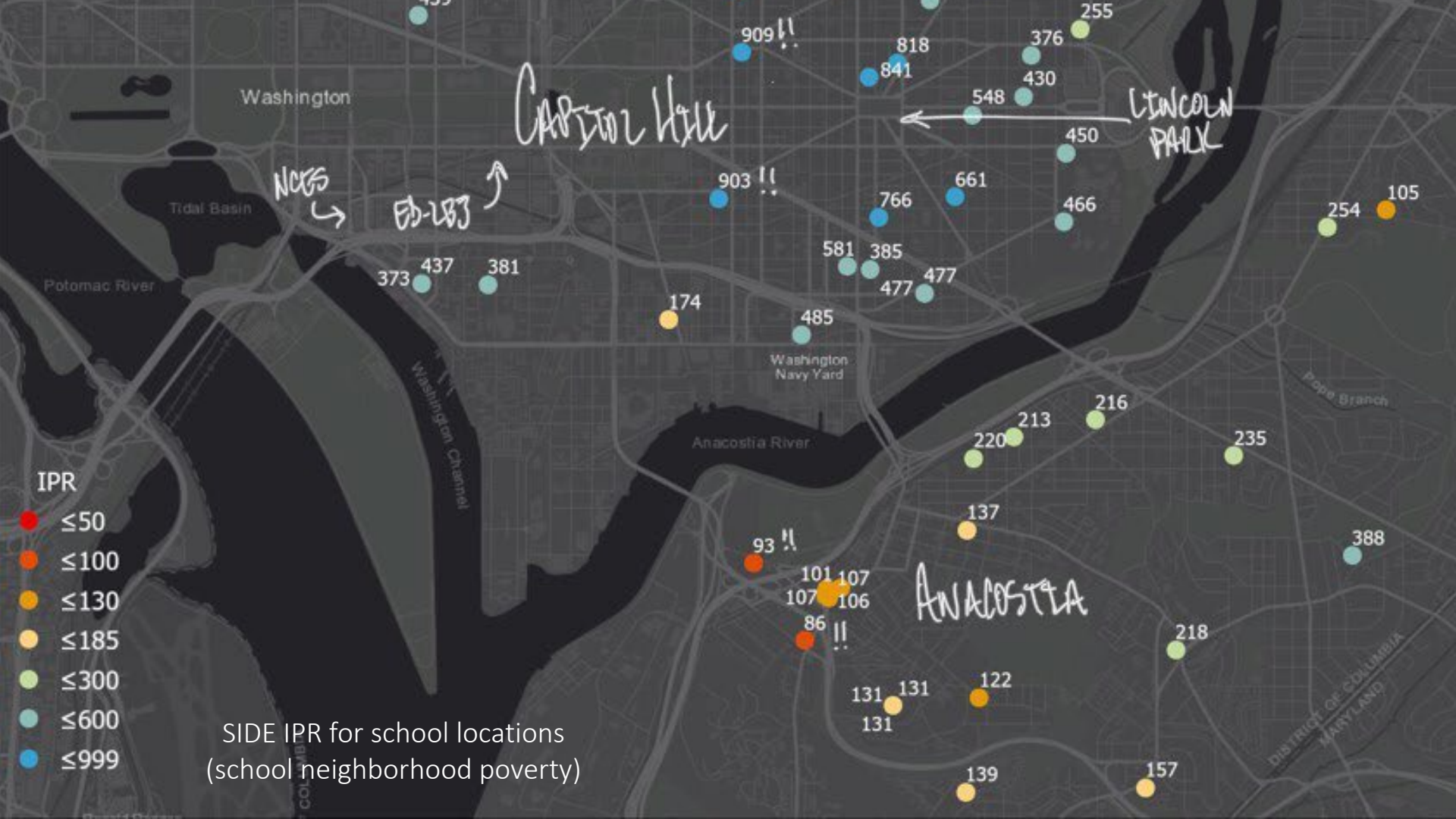
Stage 2





Income (IPR) prediction surface





IPR

- ≤50
- ≤100
- ≤130
- ≤185
- ≤300
- ≤600
- ≤999

SIDE IPR for school locations
(school neighborhood poverty)

Capitol Hill

Lincoln Park

Anacostia

NCRS

Ed-283

909 !!

903 !!

93 !!

86 !!

Washington

Tidal Basin

Potomac River

Washington Channel

Washington Navy Yard

Anacostia River

Popo Branch

DISTRICT OF COLUMBIA
MARYLAND

373 437 381

174

485

581 385

477 477

766

661

818 841

548

376 430

255

216

220 213

235

137

254

105

388

101 107

107 106

122

218

131 131

131

139

157

#2 Apply a New Poverty Indicator

- How to assign a location-based indicator if we don't know student locations?
- Share SIDE data with states so they don't have to share student data with us
- Create assignment tool (BlindSIDE) that allows states to apply SIDE indicators to student address geocodes safely behind organizational firewalls
- Converts and integrates SIDE surface into native browser environment
- Robust, account-controlled, and easy to use

Current file:
BLINDSIDE_CSV_POVERTY_ASSIGNMENT.csv
Contains 100,623 points

SELECT LOCATION FILE

Identify Fields

Record ID ID_SCHOOL
Longitude LON
Latitude LAT
School ID ID_SCHOOL

ASSIGN POVERTY INDICATORS

Ready to process

File Home Share View

BLINDSIDE_TEST

File Explorer window showing the file structure:

Name	Type
TEMP	File folder
TEST	File folder
Win10MigrationBackup	File folder
This PC	File folder
3D Objects	File folder
Desktop	File folder
Documents	File folder
Downloads	File folder
ETC	File folder
GRIP	File folder
UPDATE_210609_TEST	File folder
BLINDSIDE_CSV_POVERTY_ASSIGNMENT	CSV File

BLINDSIDE_CSV_POVERTY_ASSIGNMENT - Notepad

File Edit Format View Help

EXTRA, ID_STUDENT, LAT, LON, ID_SCHOOL

1001,010231000985,34.1167460000,-87.9943810000,01
1002,010231001455,34.2795200000,-87.6973400000,01
1003,010231001552,34.1337690000,-88.0019410000,01
1004,010231002160,34.2801920000,-87.8338090000,01
1005,010235000890,33.4586610000,-86.9116840000,01
1006,010235000891,33.4507420000,-86.9159130000,01
1007,010235000892,33.4494070000,-86.9422460000,01
1008,010235001381,33.4507310000,-86.9157600000,01
1009,010237000572,30.7464360000,-88.2861840000,01
1010,010237000895,30.3961320000,-88.2473300000,01
1011,010237000896,30.7006150000,-88.1349380000,01

Windows (CRLF) Ln 1, Col 6 100%

Resulting output: Student and School files

Original Student file items

+ SIDE assignment

School summary file

Excel spreadsheet showing original student file items. The columns are labeled EXTRA, ID_STUDENT, LAT, LON, ID_SCHOOL, SIDE_EST, and SIDE_SE. The data is organized in rows, with columns B through G containing numerical values. A red box highlights the columns labeled SIDE_EST and SIDE_SE.

	A	B	C	D	E	F	G	H
1	EXTRA	ID_STUDENT	LAT	LON	ID_SCHOOL	SIDE_EST	SIDE_SE	
2		1	10000200277	33.6737	-86.6288	1	274	62
3		2	10000201667	32.5192	-86.5327	1	239	77
4		3	10000201670	31.9378	-87.7502	1	331	121
5		4	10000201705	32.3757	-86.0832	1	268	101
6		5	10000201706	33.5867	-86.7106	1	158	43
7		6	10000201876	32.3757	-86.0832	1	268	101
8		7	10000500870	34.2602	-86.2062	1	239	73
9		8	10000500871	34.2622	-86.2049	1	189	49
10		9	10000500879	34.2733	-86.2201	1	170	90
11		10	10000500889	34.2533	-86.2218	1	221	99
12		11	10000501616	34.2898	-86.1933	1	477	119
13		12	10000502150	34.2533	-86.2218	1	221	99
14		13	10000600193	34.5337	-86.2541	1	254	47
15		14	10000600872	34.3625	-86.142	1	251	128
16		15	10000600876	34.4069	-86.2704	1	275	165
17		16	10000600877	34.1762	-86.3213	1	207	51
18		17	10000600878	34.1762	-86.3213	1	207	51
19		18	10000600880	34.3445	-86.4421	1	349	102
20		19	10000600883	34.5343	-86.2541	1	254	47

Excel spreadsheet showing school summary file. The columns are labeled ID_SCHOOL, Mean, Median, Count, SD, IQR, and CV. The data is organized in rows, with columns B through G containing numerical values. The spreadsheet shows summary statistics for each school ID.

	A	B	C	D	E	F	G	H
1	ID_SCHOOL	Mean	Median	Count	SD	IQR	CV	
2	1	247.33	224	1548	114.61	118.25	46.34	
3	2	299.47	296	520	123.63	156	41.28	
4	4	270.92	235	2408	139.96	162	51.66	
5	5	229.84	205.5	1108	92.92	90.25	40.43	
6	6	337.5	281	10406	195.57	236	57.95	
7	8	344.61	307	1898	156.22	202	45.33	
8	9	427.54	416	1373	199.61	239	46.69	
9	10	318.29	285.5	234	124.07	157.5	38.98	
10	11	394.57	336	231	250.08	324.5	63.38	
11	12	262.01	232	4417	122.21	139	46.64	
12	13	277.24	237	2327	150.05	154.5	54.12	
13	15	352.73	339	293	118.38	118	33.56	
14	16	249.64	229	757	82.57	80	33.08	
15	17	331.29	287	4216	172.26	184	52	
16	18	274.47	259	1938	108.27	114	39.45	
17	19	300.84	289	1357	87.26	96	29.01	
18	20	284.28	258	1328	115.62	97	40.67	
19	21	243.66	220	1556	109.63	107	44.99	

Sounds promising, but...

- Would this approach be useful to states and districts?
- Would states be willing to help NCES experiment?
- How could NCES help states and districts build capacity for geospatial data?

Statewide Longitudinal Data Systems Grant Program Overview

Statewide Longitudinal Data Systems (SLDS) Grant

Better decisions require better information. This principle lies at the heart of the Statewide Longitudinal Data Systems (SLDS) Grant Program. Through grants and a growing range of services and resources, the program has helped propel the successful design, development, implementation, and expansion of K12 and P-20W+ (early learning through the workforce) longitudinal data systems. These systems are intended to enhance the ability of states to efficiently and accurately manage, analyze, and use education data, including individual student records.

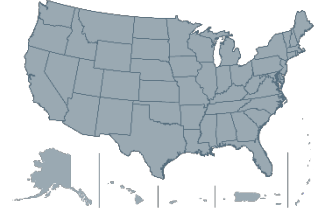
Program Goals

- Enable grantees to design, develop, and implement SLDSs to **efficiently and accurately manage, analyze, disaggregate, report, and use individual student P-20W+ data.**



Program Details

- The SLDS Grant Program was authorized in 2002 by the Education Sciences Reform Act and the Educational Technical Assistance Act.
- The grants are cooperative agreements, which have more active federal government involvement than typical grants.
- Grants are administered by the Institute of Education Sciences (IES) of the U.S. Department of Education.



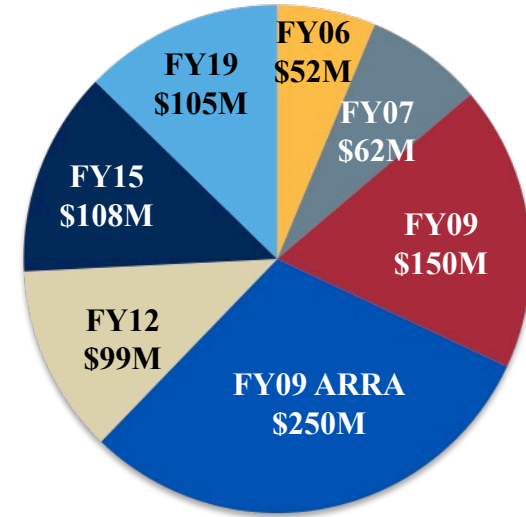
Eligible applicants:

- State education agencies of
 - 50 states
 - District of Columbia
 - Puerto Rico
 - U.S. Virgin Islands
 - American Samoa
 - Guam
 - Northern Mariana Islands

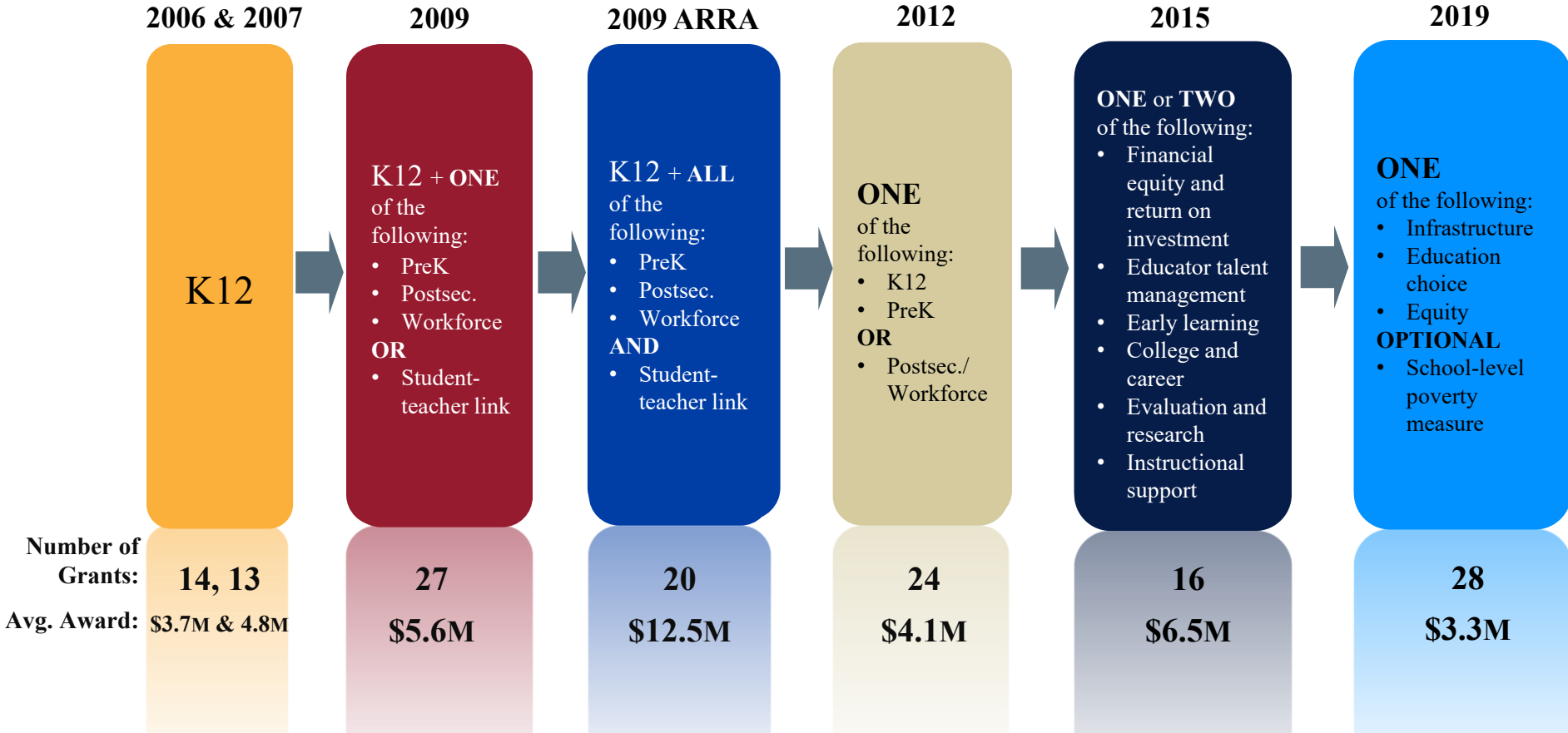
Grant Awards

To date, 49 states plus American Samoa, the Commonwealth of the Northern Mariana Islands, the District of Columbia, Guam, Puerto Rico, and the U.S. Virgin Islands have received grants totaling \$826 million in 7 rounds of grants.

1. **FY06** (November 2005): 14 grantees awarded more than \$52 million
2. **FY07** (June 2007): 13 grantees awarded more than \$62 million
3. **FY09** (April 2009): 27 grantees awarded more than \$150 million
4. **FY09 ARRA** (May 2010): 20 grantees awarded \$250 million under the American Reinvestment and Recovery Act
5. **FY12** (May 2012): 24 grantees awarded nearly \$99 million
6. **FY15** (September 2015): 16 grantees awarded nearly \$108 million
7. **FY19** (March 2020): 28 grantees awarded nearly \$105 million



Program Evolution



FY19 SLDS SIDE Opportunity

- We wanted to learn more about states' general capacity for geospatial data. The SIDE/BlindSIDE experiment aims to help us learn more about what states were already doing with geospatial data or what they might be able to do in the future with some assistance. We also wanted to learn more about how current indicators are being used.
- FY19 SLDS grant applicants could receive additional funds to help the Department test new poverty estimates.
- Fifteen grantees were funded to participate in the SIDE opportunity. They are creating geocoded student address files, using the BlindSIDE application to join address data to SIDE estimates locally. No data leave the participants' systems.
- Participants are comparing the SIDE estimates to other information such as free and reduced-price lunch data, outcomes metrics, and other information. They share the results of these observations with the Department.

SLDS SIDE Subgroups

After the project began, states were divided into three working groups based on their capabilities at the time.

- Subgroup 1: States without addresses or geocodes (3 states)
- Subgroup 2: States with addresses but without geocodes (5 states)
- Subgroup 3: States with geocoded student data (7 states)

Participating grantee states included Hawai‘i, Iowa, Indiana, Kansas, Kentucky, Maine, Montana, Nebraska, Nevada, North Dakota, South Carolina, Tennessee, Texas, Virginia, and Wisconsin. Additional states have asked to participate without funding.

SLDS SIDE Current Status

- Half or more of participants have created student-level geocoded files and connected with SIDE poverty estimates.
- Two states are working with districts to use the BlindSIDE application.
- The remaining participants will connect local data and SIDE estimates and conduct at least initial analyses by the end of the summer.

SLDS SIDE Initial Observations

- Many state education agencies do not currently have student addresses or geocodes.
- Among those that do, address information has not been widely used and the data quality varies. Cleaning and converting addresses into geocodes takes effort.
- States are interested in the better utilizing geospatial information and having more granular, accurate poverty information both at the school and student levels.

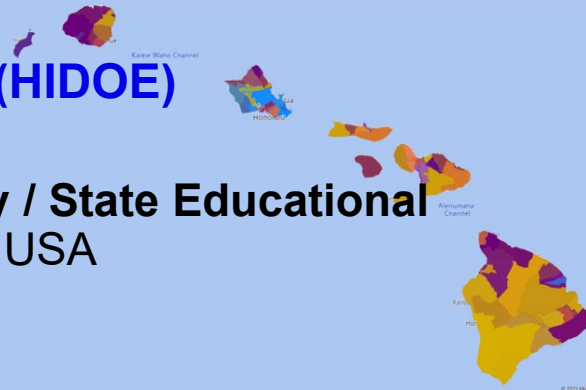
State Perspective: Hawai‘i



Shane Hedani, Hawai‘i State Department of Education



Hawaii Department of Education (HIDOE)



Single Local Educational Agency / State Educational Agency, 12th largest district in the USA

Demographics

- 173,200 students
- 294 schools (257 regular, 37 charter) over 15 Complex Areas
- 47% of students are disadvantaged (~81,000 students)
- 36% of schools are Community Eligibility Provision (CEP)

- **Race/Ethnicities**

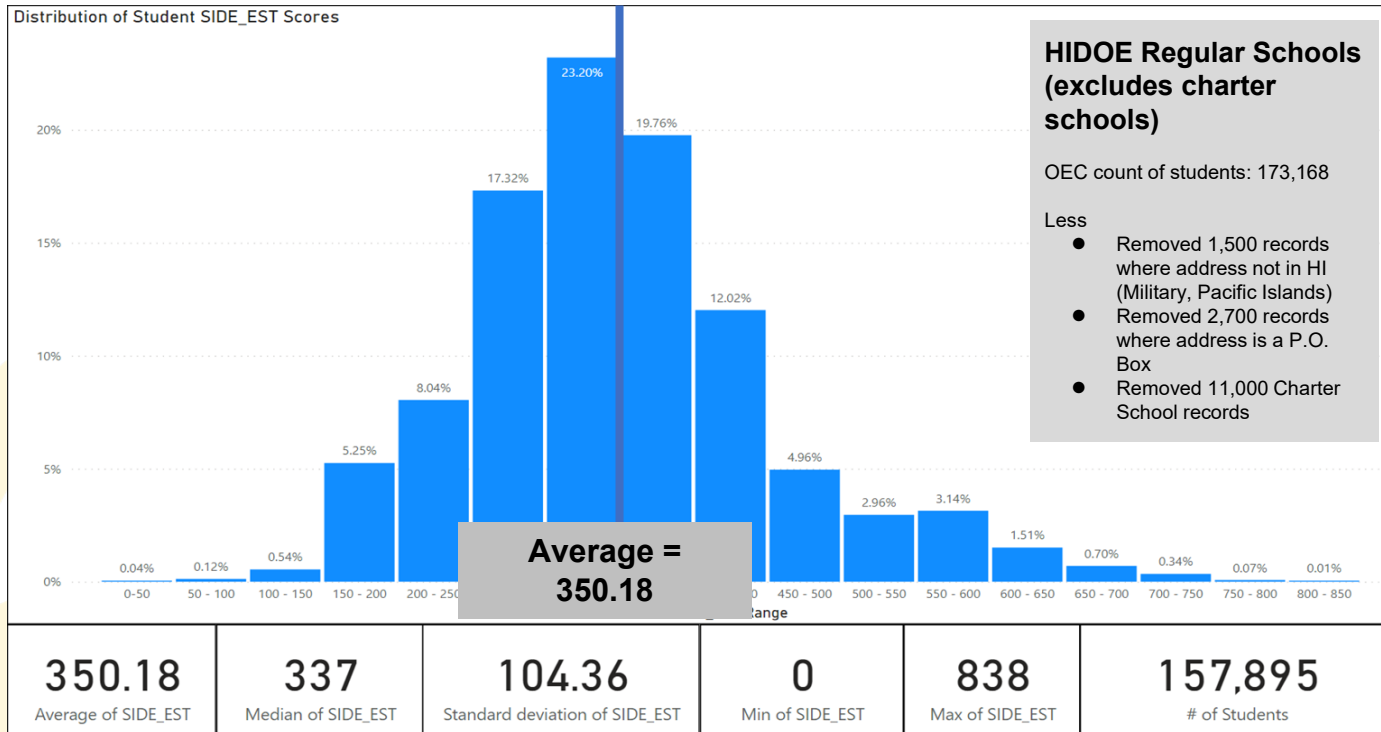
American Indian or Alaska Native	0.1%
Asian	25.7%
Black	1.4%
Hispanic	17.8%
Multiple	18.0%
Pacific Islander	26.1%
White	10.9%



Data Used for Analysis	Observations & Findings
HIDOE Official Student Enrollment Count (OEC)	SY 2021-2022 (173,200 students)
OEC with Geocode (SmartyStreets)	Invalid and missing residential address (1.6%, 2,700)
NCES BlindSIDE (student and school)	2013-2017 vintage – non-Hawaii address (0.9%, 1,500)
CEP School List	SY 2021-2022 (106 schools - 46,000 students)
NCES School Locales List	2019 vintage
Cost of Living Index	2021



Distribution of Student NCES SIDE Histogram





Analysis of Findings

Comparison using
recommended NCES-
SIDE poverty index

Comparison using
modified poverty
threshold (island
median)

Comparison using
modified poverty
threshold (COLA)

NCES-SIDE Threshold: 185

Island	Median of SIDE_EST
Hawaii	282
Kauai	319
Mauai/Molokai/Lanai	345
Oahu	362
Total	337

COLA Calculation

2021 Cost of Living Index - 192.9

SIDE Indicator Score - 185

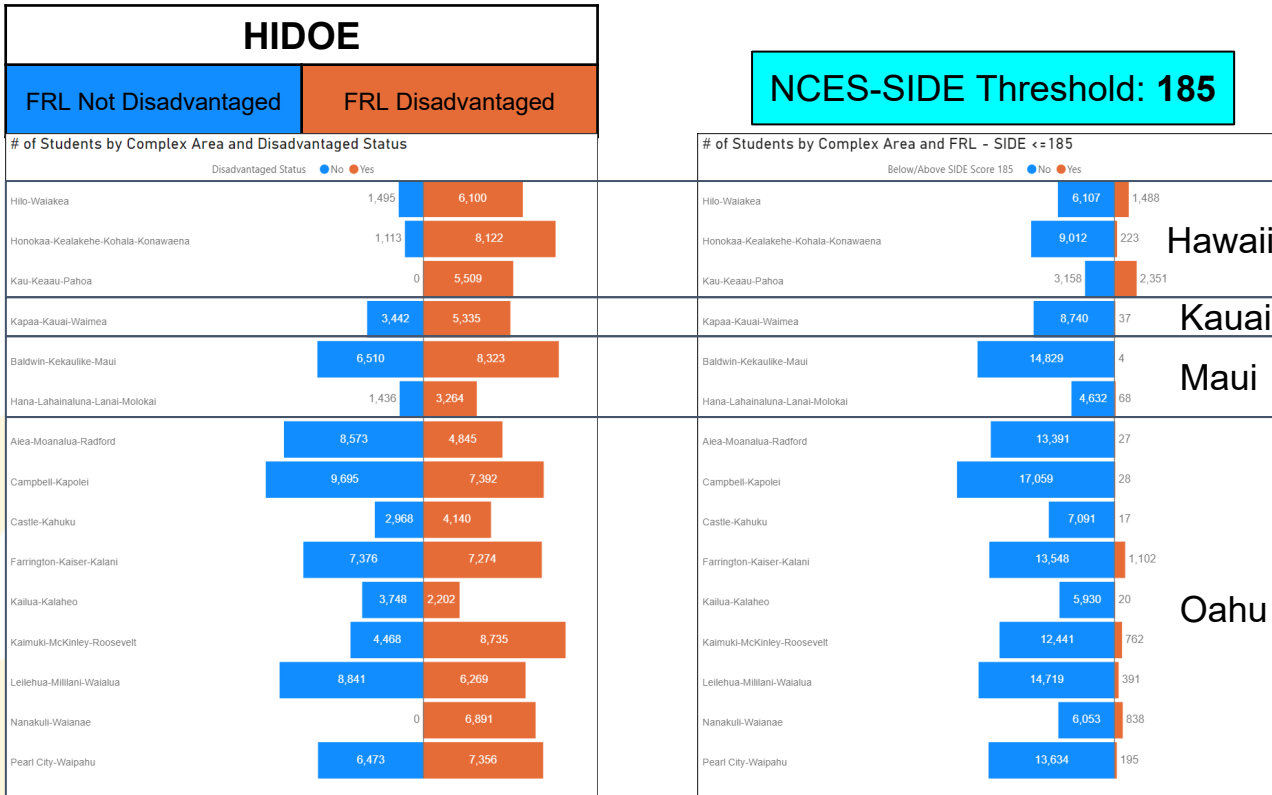
$185 \times 192.9 = 356.9$

New Adj. SIDE Score - 357



HIDOE's Disadvantaged and NCES-SIDE

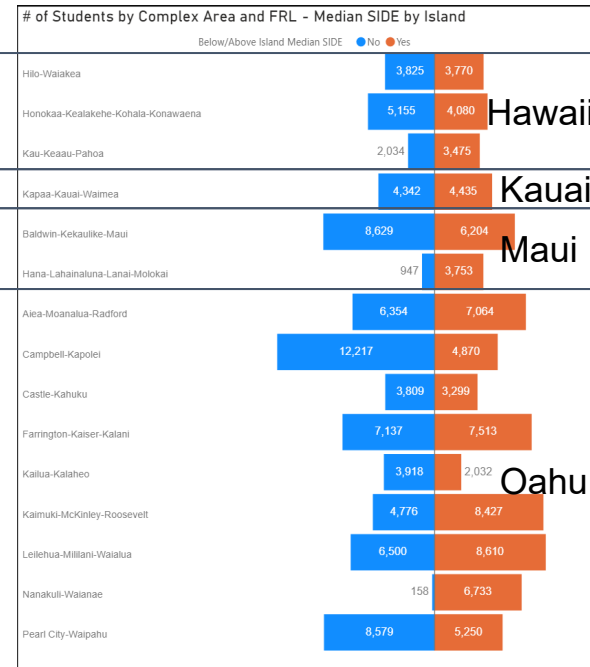
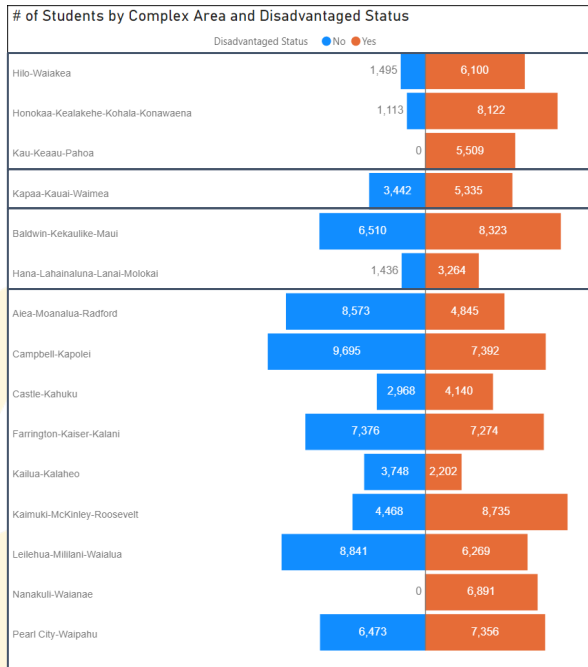
Comparison of Free and Reduced-Price Lunch (FRL) and NCES-SIDE poverty threshold





HIDOE's Disadvantaged and NCES-SIDE Comparison using modified poverty threshold (island median)

Island	Median of SIDE_EST
Hawaii	282
Kauai	319
Maui/Molokai/Lanai	345
Oahu	362
Total	337

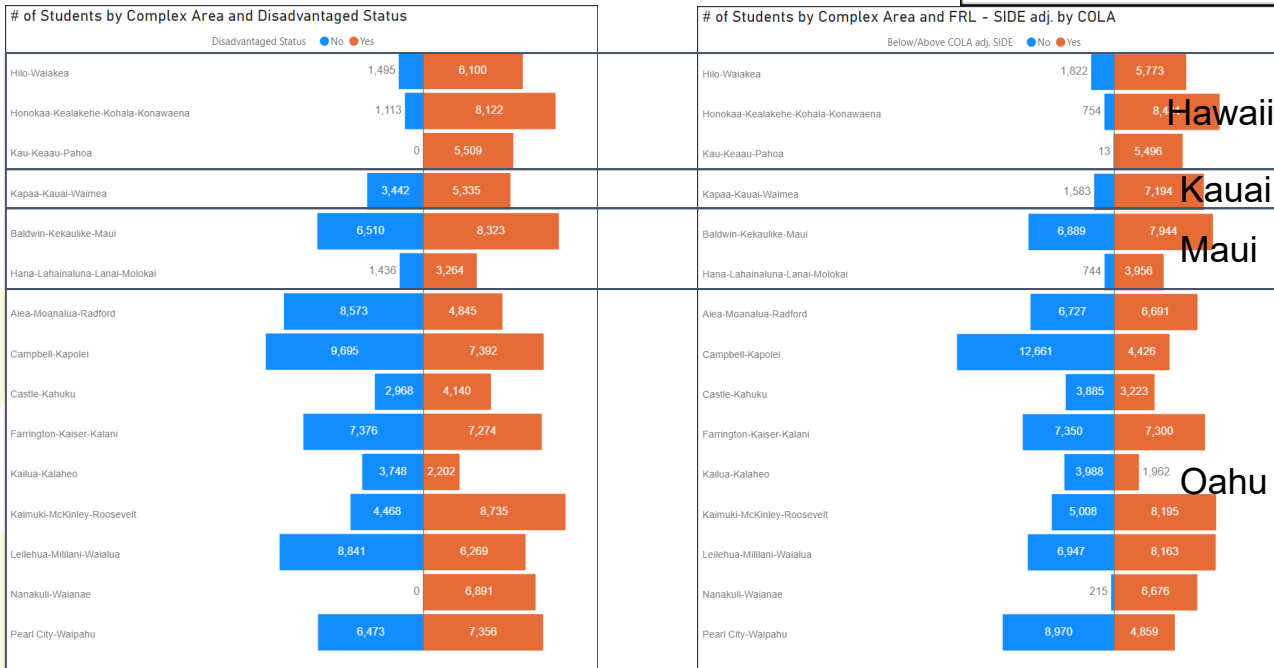




HIDOE's Disadvantaged and NCES-SIDE Comparison using modified poverty threshold (COLA)

COLA Calculation

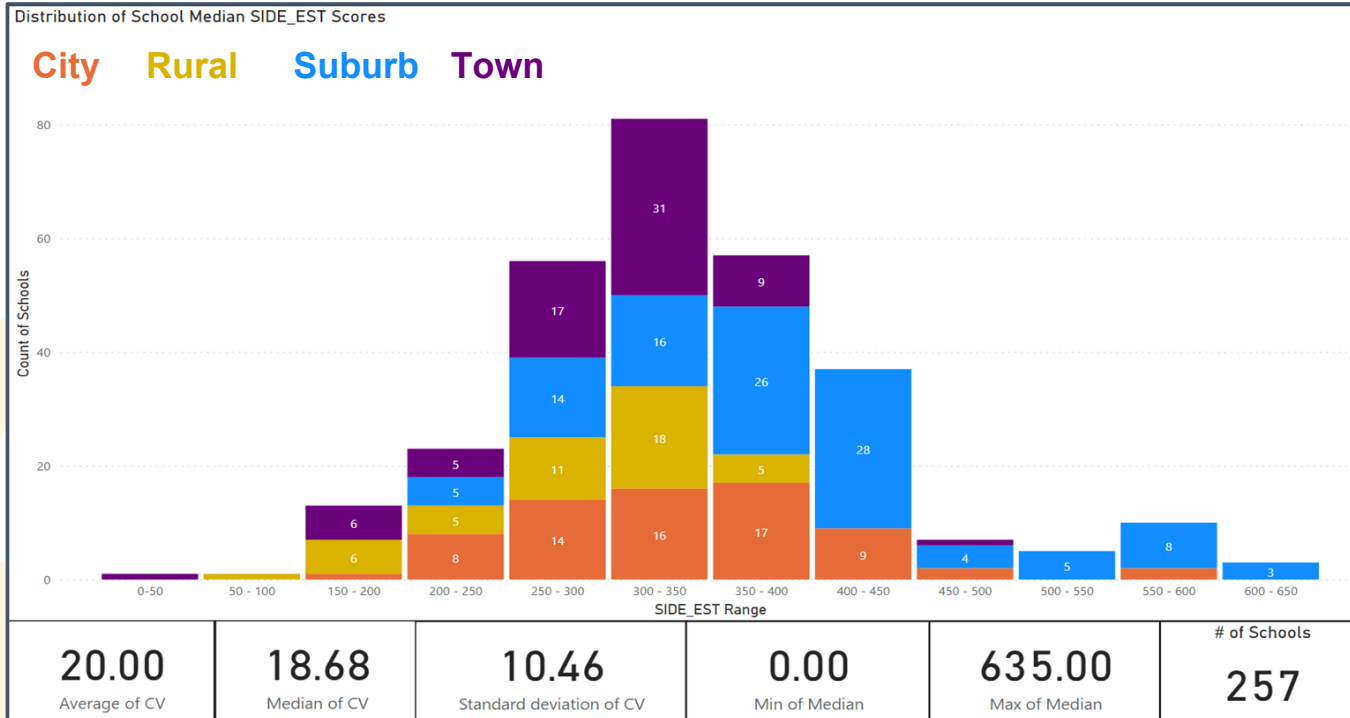
2021 Cost of Living Index - 192.9
 SIDE Indicator Score - 185
 $185 \times 192.9 = 356.9$
New Adj. SIDE Score - 357





Summary Statistics: School NCES-SIDE Histogram

School Locale as defined by the NCES School Locale Classifications
257 Regular Schools (noncharter)

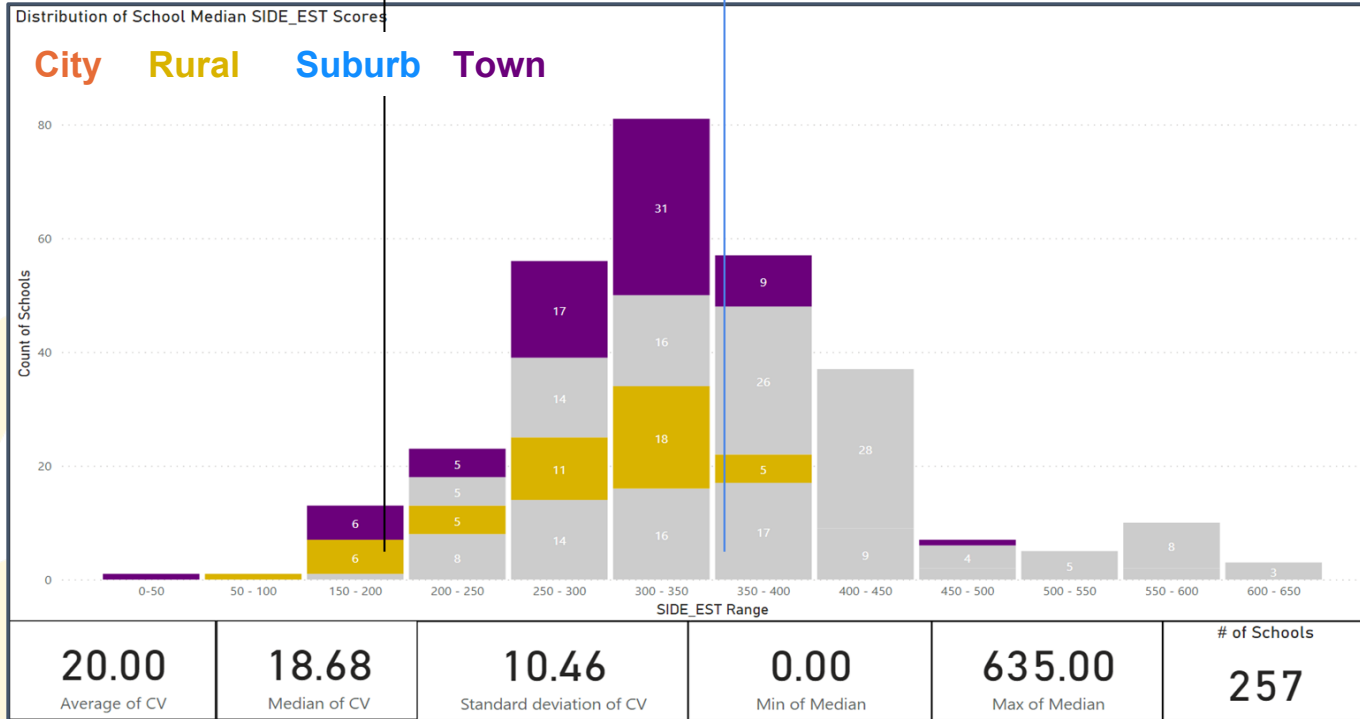




Summary Statistics: School NCES-SIDE Histogram

SIDE = 185

SIDE (COLA adj) = 355





Summary

- The recommended poverty/**SIDE score of 185** appears too low for Hawaii. The NCES-SIDE adjusted index **with COLA of 357** has a higher match with the distribution of disadvantaged FRL/CEP students.
- More analysis is needed to increase the population size: improve the **accuracy of HIDOE addresses**, use more **up-to-date reference values** for NCES-SIDE, COLA, etc.
- The **majority** of HIDOE's schools designated in "**rural**" or "**town**" locales are **below** the NCES-SIDE (COLA adjusted) index.
- The **majority** of HIDOE's schools designated in "**suburb**" locales are **above** the NCES-SIDE (COLA adjusted) index.

Next Steps

- Disaggregate summary analysis by race/ethnicities.
- Analyze and compare Hawaii's SIDE with U.S. Census SVI.
- Improve the quality of student address information.
- Refine and confirm model with updated data sources.
- Explore possible uses of SIDE data with School Food Services and identification of Title I schools.

State Perspective: Wisconsin



Carl Frederick, Wisconsin Department of Public Instruction

Why collect student address data?

- Digital Equity Gap
(<https://dpi.wi.gov/broadband>)
- Improve matching within our Early Childhood Integrated Data System (ECIDS).
- 2019 SLDS supplemental award

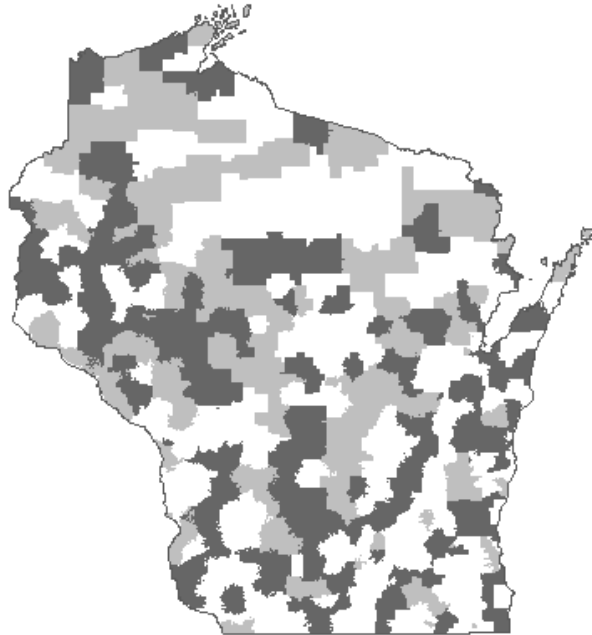


From Addresses to SIDE Scores

- Voluntary data collection
- Address cleaning and geocoding
- BlindSIDE application
- Packaged and sent to the analyst
 - What to do with students with multiple addresses?
 - How to operationalize?



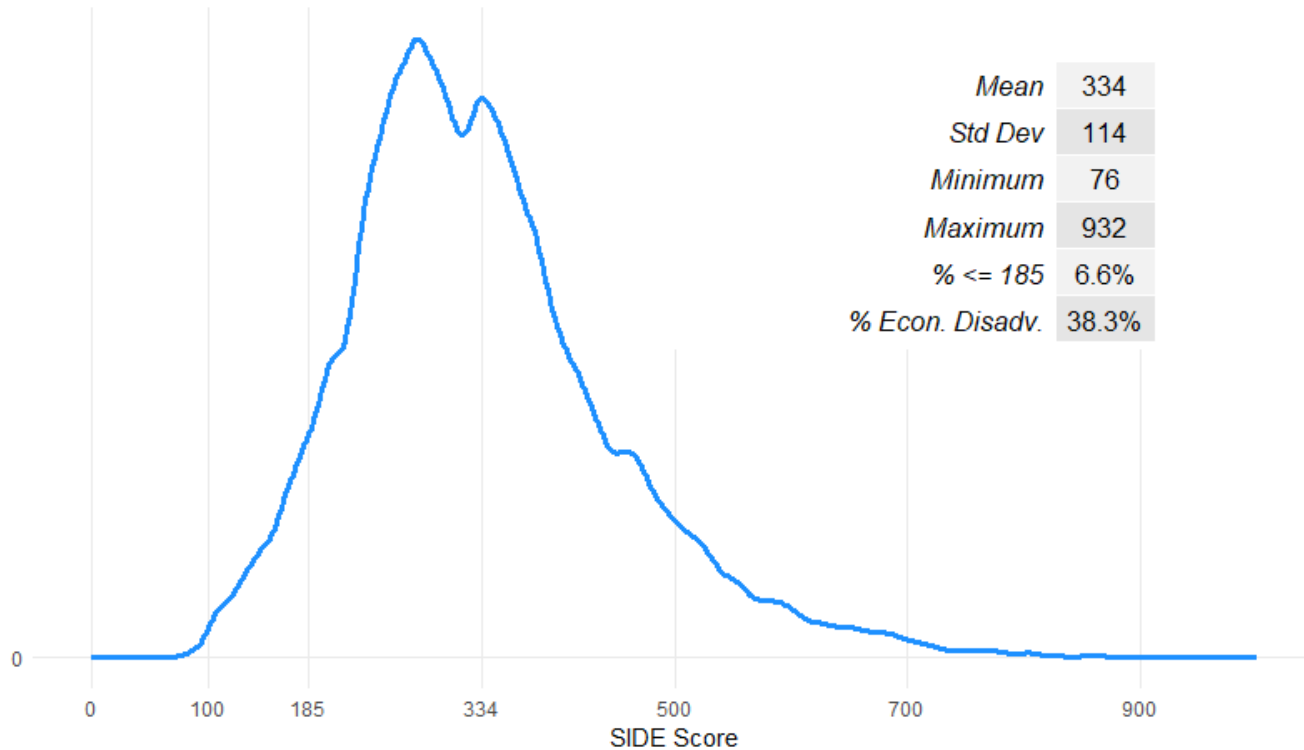
Who Do We Have Addresses For?



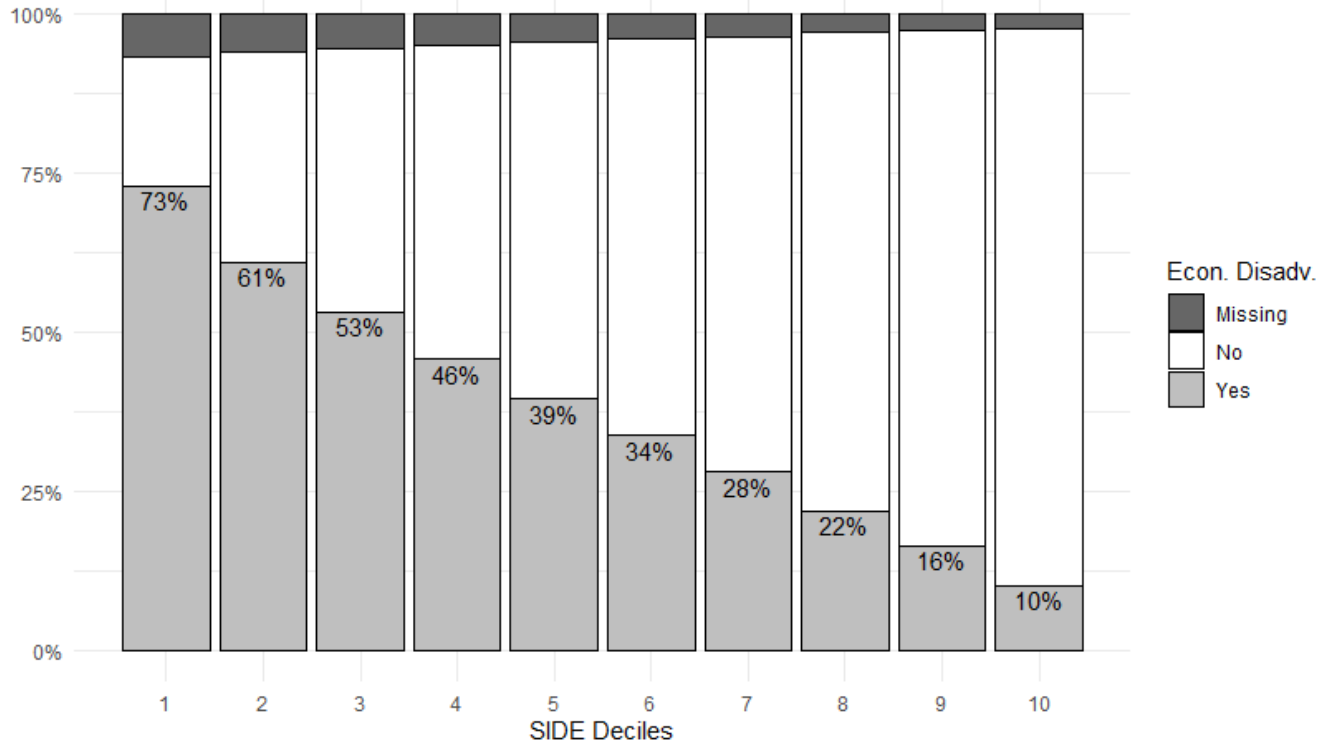
	Matched	Not Matched
City	17.7%	36.6%
Suburb	29.2%	28.6%
Town	26.2%	13.7%
Rural	26.7%	20.8%
Econ Disadvantage	40.1%	46.5%
English Learner	4.8%	5.7%
American Indian	1.0%	1.1%
Asian	3.0%	5.1%
Black	3.5%	13.1%
Hispanic	10.8%	14.4%
Two or More	4.4%	4.7%
White	76.9%	61.5%
# Unique Students	367,047	462,888



SIDE Score Descriptive Statistics



SIDE Scores and Economic Disadvantage



SIDE Scores and Income Inequality

One interesting benefit of SIDE scores is that we can look at income inequality within schools.

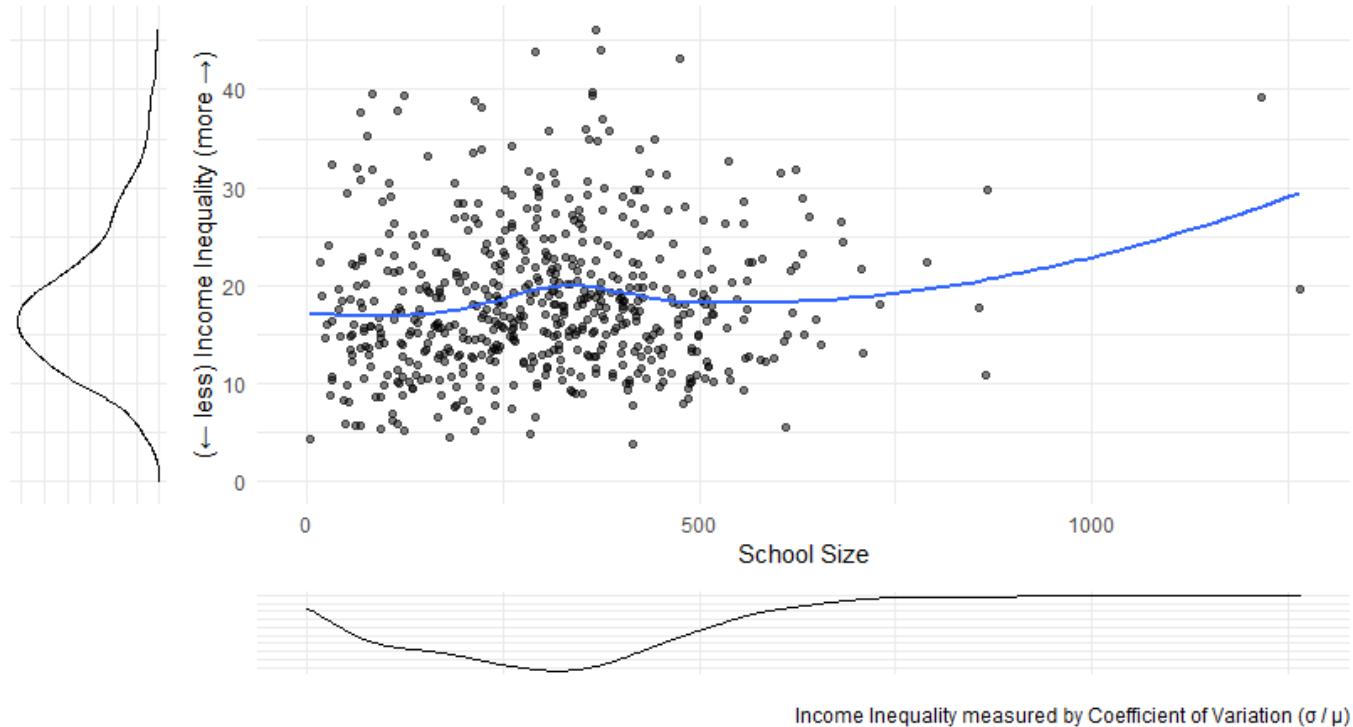
Aggregated SIDE School Reports even provide a measure we can use off the shelf:

Coefficient of Variation (σ/μ)



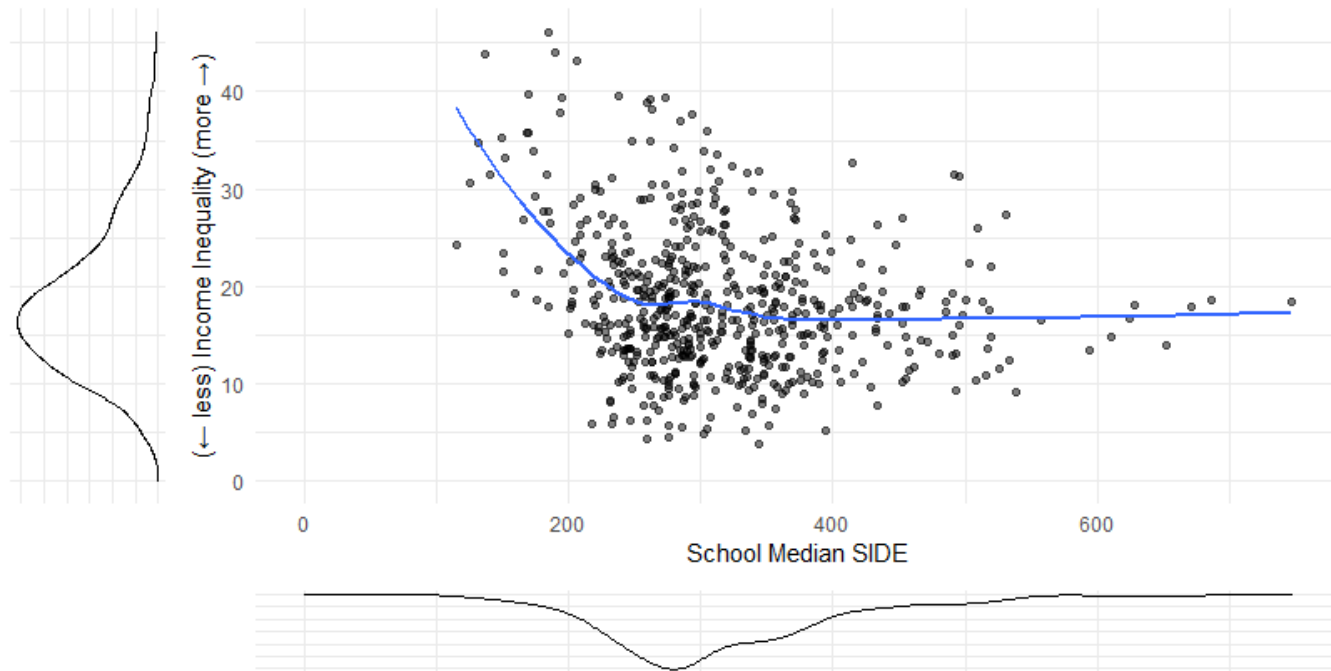
School Size (Number of SIDE Scores)

Within School Income Inequality by Number of SIDE Scores



School Median SIDE Scores

Within School Income Inequality by School Median SIDE Score

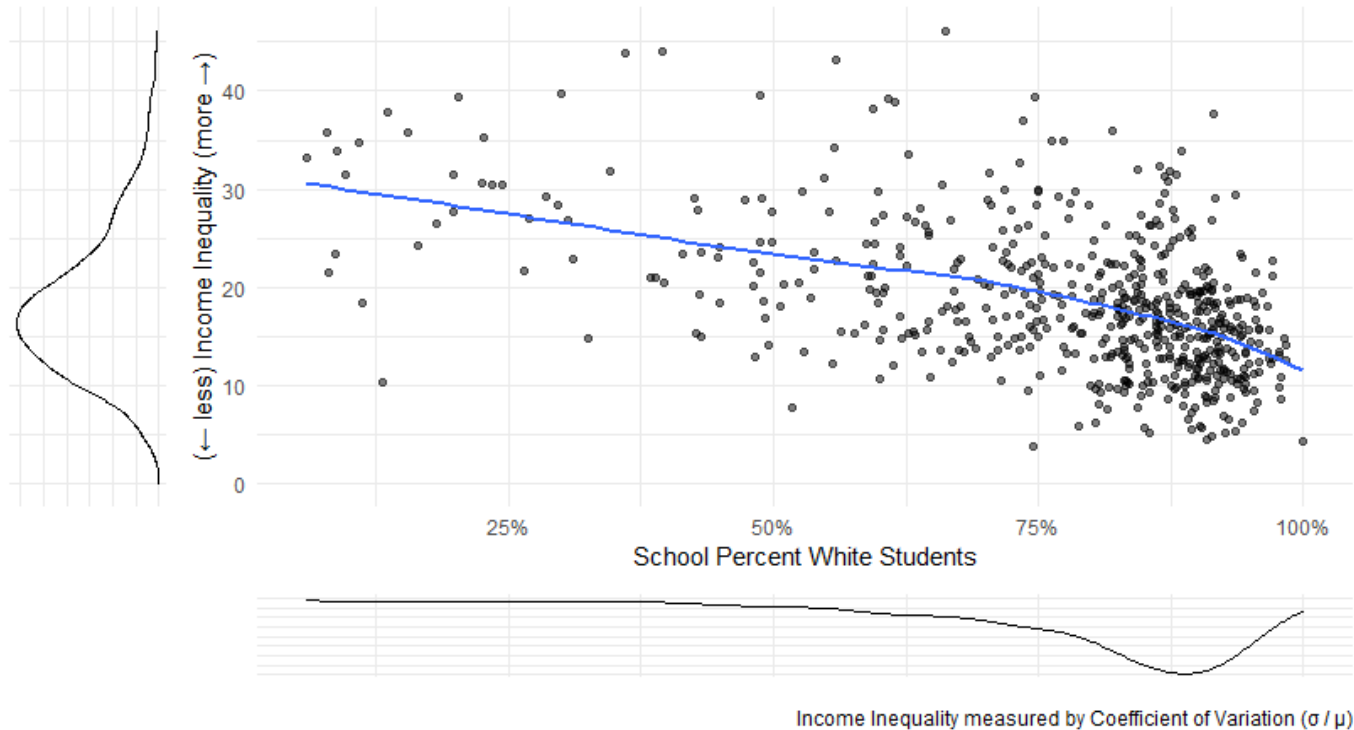


Income Inequality measured by Coefficient of Variation (σ / μ)



School Percent White Students

Within School Income Inequality by Percent White



Urban Status

Within School Income Inequality by Urban - Rural Status



Income Inequality measured by Coefficient of Variation (σ / μ)



Net Impact Four Factors

Explaining Elementary SIDE Coefficient of Variation ($R^2 = 0.35$, $N = 564$)

	Estimate	Std Error
(Intercept)	25.459	1.468
# SIDE Scores	0.002	0.002
School Median SIDE	-0.013	0.004
% White Students	-0.084	0.018
Town	2.241	0.665
Suburb	5.430	0.777
City	7.588	0.862



Contacts

Contact Information

- Shane Hedani, Hawai'i State Department of Education, shane.hedani@k12.hi.us
- Carl Frederick, Wisconsin Department of Public Instruction, carl.frederick@dpi.wi.gov
- Douglas Geverdt, National Center for Education Statistics, douglas.geverdt@ed.gov
- Charles McGrew, National Center for Education Statistics, charles.mcgrew@ed.gov

Thank you!