Two questions

▶ Do socioeconomic differences affect the rate of SeeClickFix usage?

▶ My analysis suggests: **No** (or not strongly).

▶ Is the County more likely to close issues based on socioeconomic differences?

▶ My analysis suggests: **yes**.

Combining two types of data

SeeClickFix reports to Anne Arundel County

- 11/7/21 – 10/31/22
- For 35 zip codes, excluding ones that are almost completely nonresidential
  - Unfortunately, some extend into other counties.
- Total: 20,733 records

Socioeconomic data

- Sources:
  - IRS
  - Census Bureau's American Community Survey
- Types of difference between zip codes:
  - Median **age**
  - **Income**
    - Average income (AGI)
    - Poverty rate (low correlation with average income)
  - **Ethnicity**: percentage identifying as non-Hispanic White
  - **Education**: percentage with Bachelor's degree
  - **Immigration**: percentage foreign-born

Socioeconomic clustering*

- Clearest separation mathematically is into two groups

    - But could produce any number, if desired

- Might get a different result by:

    - Weighting some factors more heavily

    - Choosing a different group of factors

- *Clustered using the K-means method

	0	1	2	3	4	5	6	7	8	9	10	11	12	13
0	Building Violation	21061	17865	Building Violation	I&P	Code Complaince	1.0	55020.0	36.1	56.5	7.5	27263.0	16.3	10.3
1	Traffic Signs	21054	20136	Traffic Signs	DPW	Traffic Engineering	1.0	11697.0	41.7	74.9	2.5	73008.0	29.5	10.8
2	Road Maintenance	21113	20142	Road Maintenance	DPW	Highways	1.0	35210.0	35.9	51.1	5.0	44866.0	25.9	10.7
3	Tree Trimming	21012	23261	Tree Trimming	DPW	Highways	1.0	22746.0	38.5	78.9	3.9	59722.0	33.3	7.4
4	Street Light Outage	21114	17933	Street Light Outage	DPW	nan	1.0	26460.0	35.5	63.3	1.1	47417.0	34.9	10.8
5	Abandoned Vehicle on the Street	21122	20202	Abandoned Vehicle on the Street	Police	Police Non-Emergency	1.0	59664.0	40.8	82.1	5.5	44205.0	19.0	5.0
6	Report Missed Curbside Collection	20751	17704	Report Missed Curbside Collection	DPW	Waste Management	1.0	1972.0	47.7	90.0	3.7	59372.0	23.9	3.4
7	Junk Violation	21144	22050	Roadside Litter Pickup	DPW	Highways	1.0	35680.0	35.3	44.7	6.6	42230.0	24.4	13.1
8	Request a new Recycling Container	21114	19382	Request a new Recycling Container	DPW	Waste Management	1.0	26460.0	35.5	63.3	1.1	47417.0	34.9	10.8
9	Water/Wastewater Concern	21012	20384	Water/Wastewater Concern	DPW	Utilities	1.0	22746.0	38.5	78.9	3.9	59722.0	33.3	7.4
10	Schedule Bulk Metal Pickup	21225	17714	Schedule Bulk Metal Pickup	DPW	Waste Management	1.0	33227.0	34.9	38.4	24.7	17137.0	8.0	8.7
11	Comment On Trash Service	20764	17715	Comment On Trash Service	DPW	Waste Management	1.0	3482.0	47.5	75.0	0.0	53968.0	17.9	4.7
12	Request a new Recycling Container	21140	19382	Request a new Recycling Container	DPW	Waste Management	1.0	3862.0	48.8	93.0	2.8	60585.0	31.7	4.7
13	Tree Trimming	21122	23261	Tree Trimming	DPW	Highways	1.0	59664.0	40.8	82.1	5.5	44205.0	19.0	5.0
14	Tree Trimming	21108	23261	Tree Trimming	DPW	Highways	1.0	19136.0	41.0	76.8	2.7	56065.0	27.3	5.3
15	Carcass Removal	21108	19583	Carcass Removal	Animal Control	nan	1.0	19136.0	41.0	76.8	2.7	56065.0	27.3	5.3
16	Pothole	20733	17932	Pothole	DPW	Highways	1.0	2645.0	46.5	79.2	2.2	47237.0	30.0	2.8
17	Junk Violation	21012	19312	Trash, Garbage or Refuse	Health Department	nan	1.0	22746.0	38.5	78.9	3.9	59722.0	33.3	7.4
18	Pothole	21037	17932	Pothole	DPW	Highways	1.0	21134.0	40.5	86.7	7.1	60344.0	24.8	4.4

Do socioeconomic differences affect the rate of SeeClickFix usage?

ANNE ARUNDEL COUNTY · OFFICE OF THE COUNTY EXECUTIVE

Does the rate of SCF reports differ across zip codes?
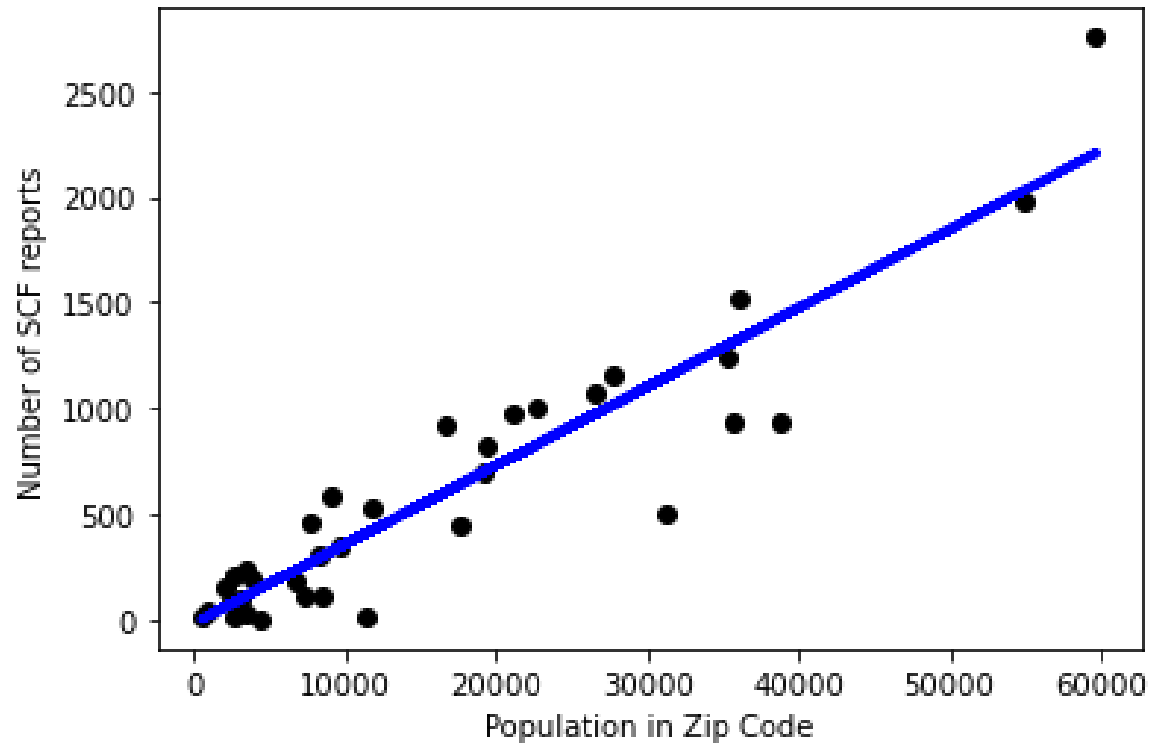
The per-capita rate of reports is similar across zip codes with different socioeconomic profiles.

Knowing the population size accounts for *83 percent** of the differences in reports among zip codes.

Socioeconomic differences explain, *at most*, 12 percent of the differences in reporting – and probably less.

Most of the remaining variation is probably due to differences in other, unrelated features of the zip codes, such as the existence of major roads, parks, or businesses that would provoke additional reports.

*The percentages come from random forest regression.
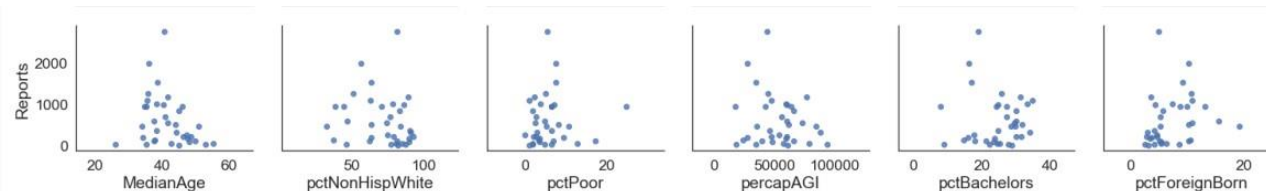
Summary of Part 1

▶ Socioeconomic differences do not lead to large differences in SCF reporting.

▶ That is, this tool seems to have similar adoption across zip codes despite their different mixes of ages, incomes, ethnicities, education, and immigration.

The Best Place – For All

	0	1	2	3	4	5	6	7	8	9	10	11	12	13
0	Building Violation	21061	17865	Building Violation	I&P	Code Complaince	1.0	55020.0	36.1	56.5	7.5	27263.0	16.3	10.3
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17	Junk Violation	21012	19312	Trash, Garbage or Refuse	Health Department	nan	1.0	22746.0	38.5	78.9	3.9	59722.0	33.3	7.4

Do socioeconomic differences lead to different responses by the County?

Preliminaries

Two methods of analysis

1. Comparing socioeconomic clusters to closure rates

2. 'Random forests'
   - A flexible and accurate approach
   - It measures:
     - The influence of all factors combined
     - The contribution of each factor

'Closed' = response

The analysis assumes that the SeeClickFix status of "Closed" reflects a meaningful response by the County
- Vs. "Open" and "Acknowledged"
- Due to anomalies, I didn't analyze the time until closure – but this could be used for analyses in the future.

Unknown processes

This analysis can reveal unequal results but not the processes that produce them.

Clustering: demographics vs. closure rates

The amount of overlap (**76%***) suggests that these ***socioeconomic differences are a modestly good predictor*** of the County's response to SCF reports. Thus, by this measure *socioeconomic differences seem to matter*.

Zip codes clustered by socioeconomic indicators:

Data for the entire zip code is included for those that extend beyond the county's border.
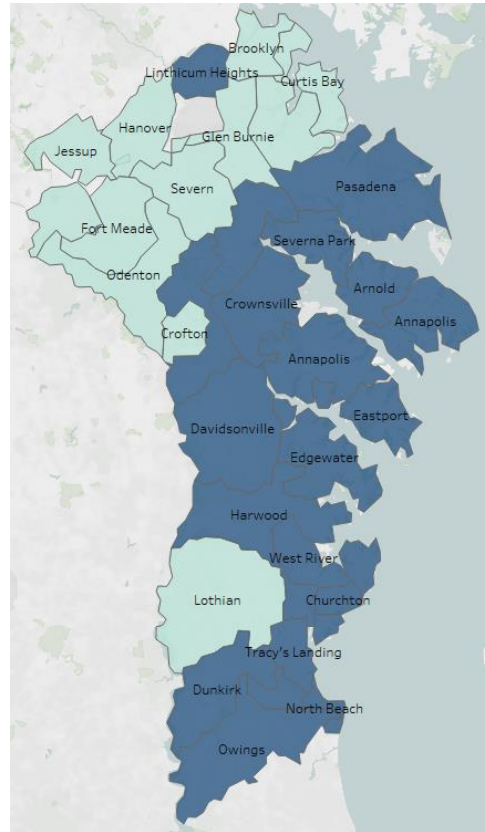
Zip codes grouped by SCF closure rates:

The closure rates apply only to the parts in Anne Arundel County.

The 22 zip codes with the highest closure rates are dark.

(No reports from Owings)
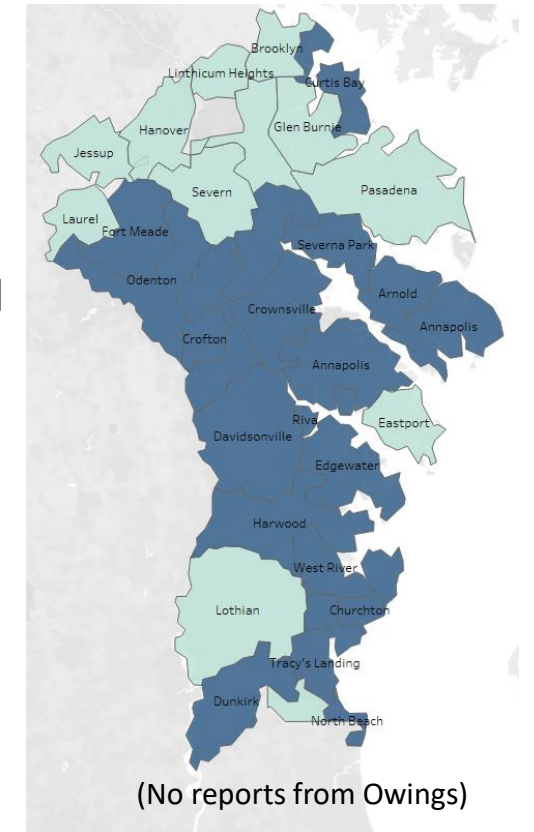
*In this case, a useless predictor would produce an overlap of 65%, versus 100% for a perfect predictor.
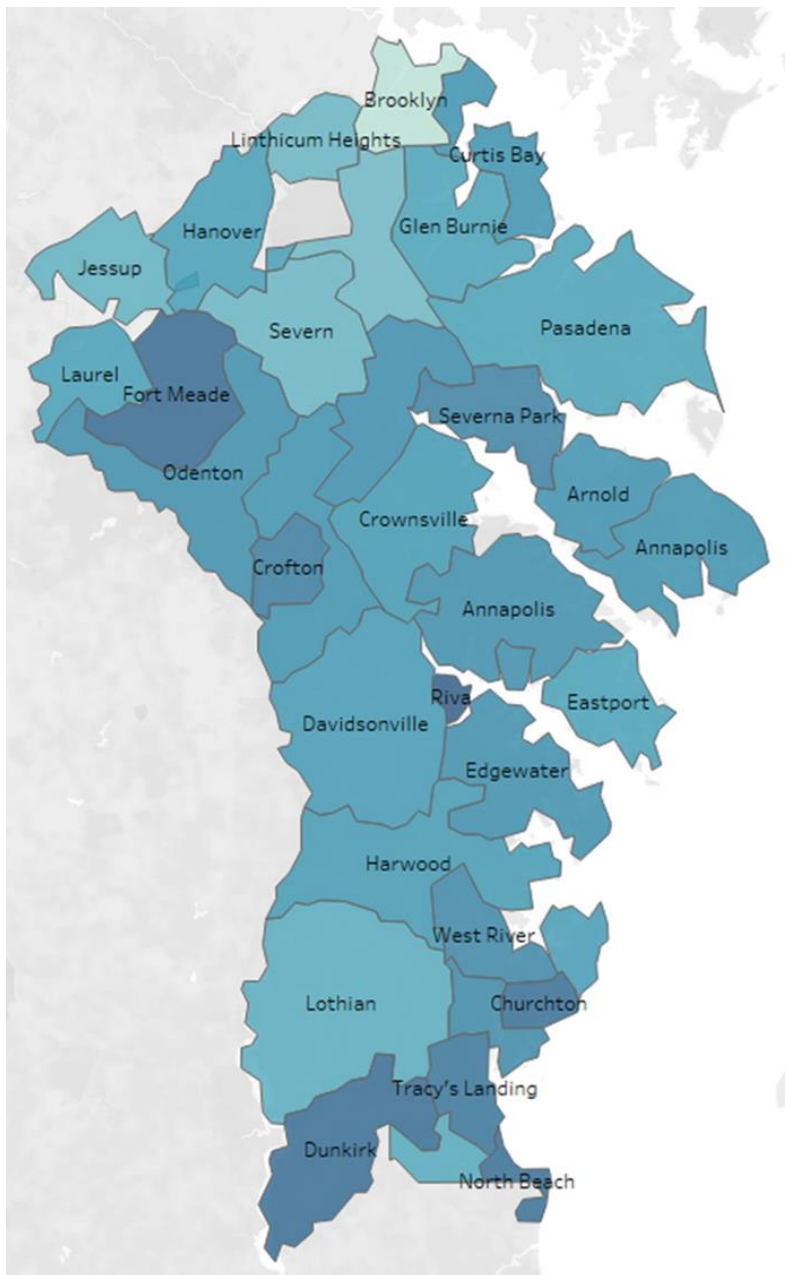
Heat map of closure rates

- 75% ('Brooklyn') to 96% (Riva)

- Other features, including the distance from County facilities, are also influential.

The Best Place – For All

Random forests:
All issues combined

▶ 87% of the reports were closed. We are interested in explaining the 13% that remained open.

▶ By themselves, socioeconomic indicators predicted closure with 57% accuracy.

- Random guessing would result in 50% accuracy, so their influence is modest.

▶ The relative importance of factors:

- **Income: 53%**
  - Average income: 33%
  - Poverty rate: 19%
- **Education** (BA/BS): **28%**
- **Ethnicity** (Non-Hispanic White population): **16%**
- Age had negligible importance, and immigration had none.

Visualizing the relationships: mildly significant factors

Closure decreases as poverty increases.
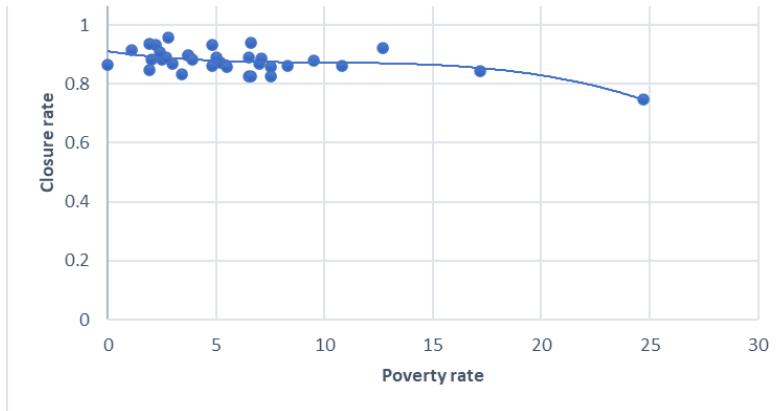
Closure increases with income except at the highest range.

Closure increases with education.
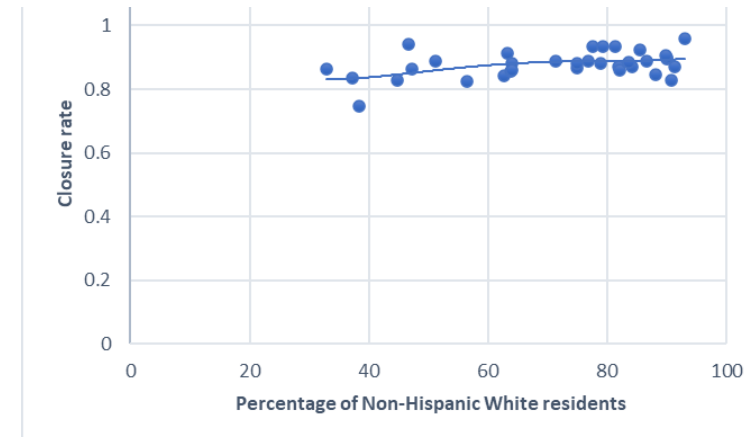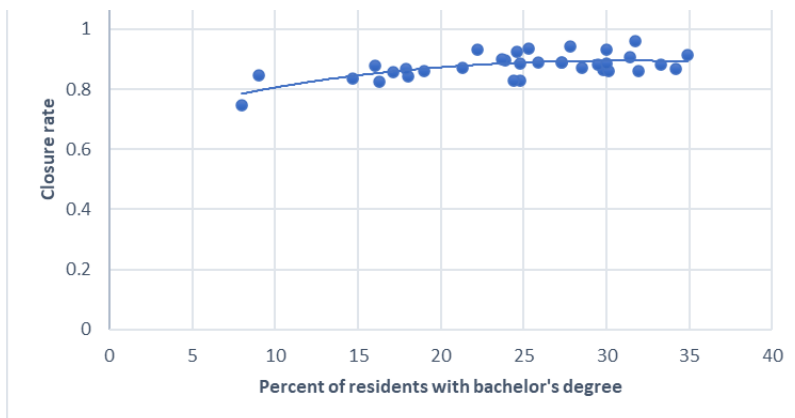
Closure increases with the percentage of White, non-Hispanic residents.

Visualizing the relationships: not significant
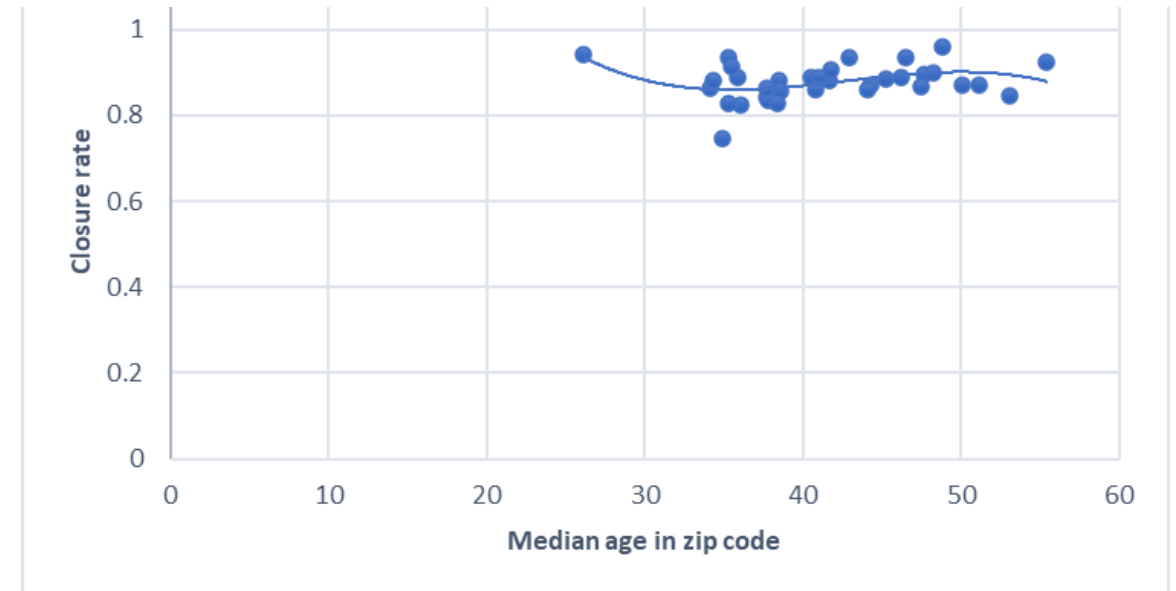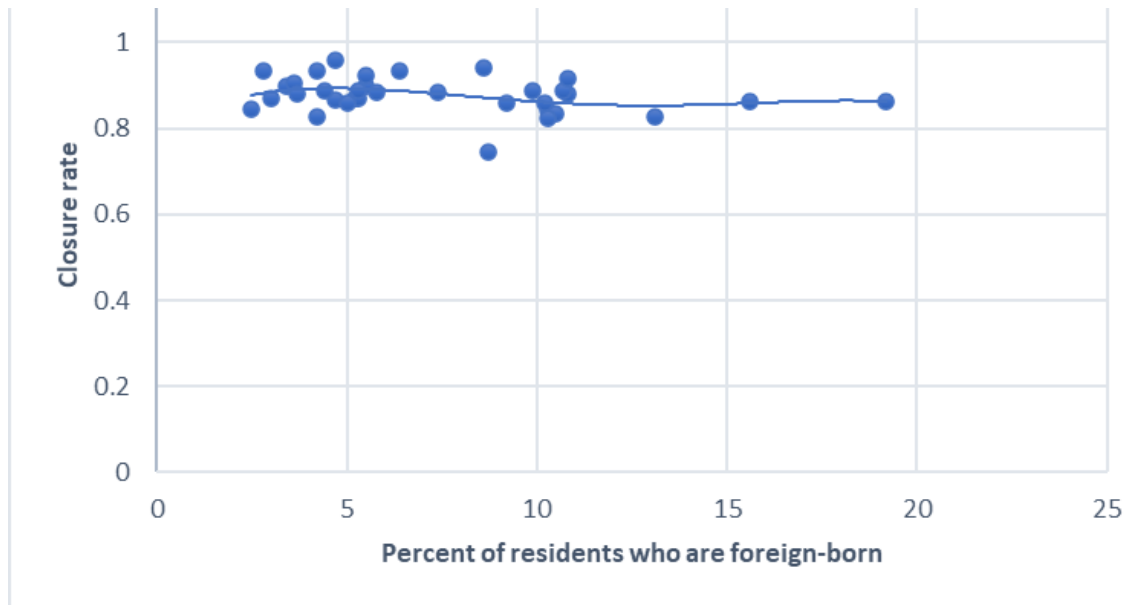
However, age and immigration *are* important for specific issues, as seen in later slides.

Random forests: Closure rates by issue

▶ 53 issue types were reported via SeeClick Fix.

▶ 21 issues could not be analyzed using random forests, mostly due to an extremely high closure rate and/or high equity.

- In these cases, any inequity in closure rates must be small.

▶ 31 of the remaining 32 issues were closed less equitably than the average.

- For these 32 issues, this set of socioeconomic indicators is significant in predicting which reports don't get closed.

No apparent inequity

Issue	Dept	Div	Count	Closure rate
Report Missed Curbside Collection	DPW	Waste Management	3520	98%
Road Maintenance	DPW	Highways	569	98
Comment On Trash Service	DPW	Waste Management	503	94
Traffic Signs	DPW	Traffic Engineering	424	97
Drainage Maintenance	DPW	Highways	251	98
Sidewalk Maintenance	DPW	Highways	239	98
Street Light Outage	DPW		219	98
Curb/Gutter/Driveway Apron	DPW	Highways	118	97
Road Construction	I&P	Permits	39	90
Water/Sewer Billing Question	DPW	Utilities	38	89
Overcrowding	Health Department		27	81
No Heat	Health Department		9	89
Repair a Recycling Cart	DPW	Waste Management	7	100
Request for Curbside Ramp	DPW	Hwys/Waste Mgmt	2	100

Apparently inequitable

Issue	Dept	Div	Count	Closure	Accuracy	Age	White	Poor	Income	Education	Immigrant
Request a new Recycling Container	DPW	Waste management	3868	89%	71%	10%	24%	12%	40%	2%	12%
Schedule Bulk Metal Pickup	DPW	Waste management	1904	98	71	15	7	25	25	16	12
Abandoned Vehicle on the Street	Police	Police Non-Emergency	1105	55	59	17	18	17	14	13	21
Tree Trimming	DPW	Highways	927	98	82	14	24	14	14	12	22
Weeded Lot	DPW	Highways	795	97	77	33	15	14	16	11	12
Building Violation	I&P	Code compliance	755	75	56	17	16	16	18	18	15
Unregistered or Inoperable Vehicle on Private Property	Police	Police Non-Emergency	601	64	62	12	15	15	14	15	30
Water/Wastewater Concern	DPW	Utilities	488	96	82	23	19	11	13	23	11
Drainage Complaint	I&P	Code compliance	310	92	70	17	15	15	22	18	13
Junk Violation	P&Z	Code compliance	265	60	66	13	14	18	20	17	18
Grading Violation	I&P	Code compliance	257	85	63	19	12	21	13	18	17
Regional/Community Parks	R&P		237	52	68	17	18	20	18	13	15
Trash, Garbage or Refuse	Health Dept		236	67	62	15	19	15	17	17	17
Illegal Signs	P&Z	Code compliance	198	53	66	15	19	14	16	13	22
Cable Service	OIT	Cable TV	177	59	65	15	19	18	17	14	16
Carcass Removal	Animal Control		164	80	70	15	19	22	15	14	15
Rodents (Mice/Rats)	Health Dept		162	67	71	17	16	16	18	19	14
Chickens/Roosters/Fowl	P&Z	Code compliance	111	75	74	21	14	15	22	14	14
COVID-19			86	87	80	12	20	27	14	13	13
Vacant Structure Open to Casual Entry	I&P	Code compliance	52	71	75	8	8	15	30	30	8
Facilities	R&P		45	56	80	14	14	18	20	19	15
Plumbing problems / Sewage back-ups	Health Dept		44	84	86	13	14	13	21	26	13
Active Road Construction	DPW	Highways	40	95	100	20	8	42	12	10	8

Example:
'Request a new recycling container'

Issue	Dept	Div	Count	Closure	Accuracy	Age	White	Poor	Income	Education	Immigrant
Request a new Recycling Container	DPW	Waste management	3868	89%	71%	10%	24%	12%	40%	2%	12%

► Handled by Waste Management in Public Works

► 3868 requests – the most common issue

► 89% of requests were closed. We're interested in explaining the 11% that remained open.

► Socioeconomic differences alone can predict which reports were closed with 71% accuracy.
In order, the major factors were:
- 52%: income inequality
  - 40%: average income
  - 12%: poverty rate
- 24%: percentage of non-Hispanic White residents
- 12%: percentage of foreign-born residents
- 10%: median age

Example:
'Junk violation'

Issue	Dept	Div	Count	Closure	Accuracy	Age	White	Poor	Income	Education	Immigrant
Junk Violation	P&Z	Code compliance	265	60%	66%	13%	14%	18%	20%	17%	18%

► Handled by Code Compliance in Planning and Zoning

► 265 reports

► 60% were closed. We're interested in explaining the 40% that remained open.

► Socioeconomic differences alone can predict which reports were closed with 66% accuracy.

In order, the major factors were:

- 38%: income inequality
  - 20%: average income
  - 18%: poverty rate
- 18%: percentage of foreign-born residents
- 17%: percentage of residents with bachelor's degree
- 14%: percentage of non-Hispanic White residents
- 13%: average age

Apparently inequitable, but few reports

Issue	Dept	Div	Count	Closure	Accuracy	Age	White	Poor	Income	Education	Immigrant
Interior Sanitation or Maintenance	Health Department		27	**52%**	**74%**	16%	**35%**	19%	12%	7%	11%
Stagnant Swimming Pool	DPW	Utilities	25	56	72	12	25	13	16	15	19
Open Burning	Health Department		23	83	87	13	21	18	17	18	14
Stagnant Water	Health Department		20	75	85	16	17	11	18	18	20
Septic System - Sewage overflow	Health Department		20	50	75	12	11	33	13	18	12
Mold	Health Department		11	64	91	11	25	9	18	21	16
Other Concerns	Constituent Services		7	57	86	14	17	19	19	18	13

Results become less reliable as cases decrease.

The Best Place – For All

Summary of Part 2

► For some issues, socioeconomic differences led to moderate differences in the County's response.

► That is, the County is more likely to close some types of issues based on who lives in the area.

Conclusion

▶ Socioeconomic differences do not significantly affect the adoption of SeeClickFix. But they do affect the County's response.

▶ This could be monitored on a regular basis.
  - Optimally, the data would also include issues reported through other means – such as by phone and email.
  - A better level of analysis would be the census tract.

▶ Questions? Comments? exduva22@aacounty.org