QSS20_Finalpset1_Individual_You-Chi_Liu

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1 0. Load packages and imports

[122]:

```python
## basic functionality
import pandas as pd
import numpy as np
import re
from matplotlib import pyplot as plt


## repeated printouts
from IPython.core.interactiveshell import InteractiveShell
InteractiveShell.ast_node_interactivity = "all"
```

2 Individual portion

Use the same `sentencing_cleaned` data for this portion.

In the group portion, you investigated one form of disparity: probation versus incarceration.

Here, you'll investigate a second type of disparity—the length of a defendant's sentence—and also investigate how variation between different judges in the severity of the sentence relates to disparities.

[123]:

```python
sentencing_cleaned=pd.read_csv("sentencing_cleaned.csv")
```

```
/opt/conda/lib/python3.8/site-packages/IPython/core/interactiveshell.py:3165:
DtypeWarning: Columns (10,11,16,25) have mixed types.Specify dtype option on
import or set low_memory=False.
  has_raised = await self.run_ast_nodes(code_ast.body, cell_name,
```

2.1 3.1 Filter to incarceration and construct a sentence length variable (6 points)

Defendants can be sentenced to different lengths for probation, but for simplicity:

- Filter to sentences that involve incarceration (same Illinois Department of Corrections logic as above)
- Filter out non-numeric sentence lengths (e.g., Term, Pounds, or Dollars)
- Filter to Black or White defendants

Then, follow the instructions in the codebook (combining COMMITMENT_TERM with COMMITMENT_UNIT) to create a standard sentence length in days column (senlength_derived). To simplify, you can assume that:

- 1 hour = 1/24th of a day
- 1 year = 365 days
- 1 month = 30.5 days
- 1 week = 7 days
- Natural life = difference between the age of 100 and the defendant's age at incident (cleaned; if missing, code to age 20); note that this is a simplification since age at incident != age at sentencing

Print the following cols for an example of each type (eg an example of originally hours; an example of natural life): COMMITMENT_TERM, COMMITMENT_UNIT, age_derived and your new standardized sentence length column

Print the summary of that sentence length column using the .describe() command

[124]:

```
#Filter to sentences that involve incarceration (same Illinois Department of␣
 ↪Corrections logic as above)

incar = sentencing_cleaned[sentencing_cleaned['COMMITMENT_TYPE'].str.
 ↪fullmatch("Illinois Department of Corrections", na = False)].copy()


#Filter out non-numeric sentence lengths (e.g., Term, Pounds, or Dollars)
non_num = incar['COMMITMENT_UNIT'].isin(['Term', 'Pounds', 'Dollars'])
incar = incar[~non_num].copy()


# Filter to Black or White defendants
incar = incar[(incar['is_black_derived']== True)| (incar['is_white_derived']==␣
 ↪True)].copy()
```

[125]:

```
#Then, follow the instructions in the codebook (combining COMMITMENT_TERM with␣
 ↪COMMITMENT_UNIT)
#to create a standard sentence length in days column (senlength_derived)
##Natural life = difference between the age of 100 and the defendant's age at␣
 ↪incident
##cleaned; if missing, code to age 20); note that this is a simplification␣
 ↪since age at
##incident != age at sentencing

incar['COMMITMENT_TERM'] = incar['COMMITMENT_TERM'].astype('string').str.
 ↪replace('\.0', '').astype(float)

incar['age_derived'].fillna(value = 20, inplace = True)
```

```
incar["age_new"]=incar['age_derived']*365


incar['commitment_unit_clean'] = incar['COMMITMENT_UNIT'].map({"Year(s)":365,␣
↪"Weeks":7,"Hours":1/24 , "Months":30.5 , "Days":1 }).
↪fillna(incar['COMMITMENT_UNIT'])

incar['commitment_unit_clean']=np.where(incar.COMMITMENT_UNIT=="Natural Life",
                                                     ␣
↪36500-incar['age_new'],incar['commitment_unit_clean'])


incar["senlength_derived"]= incar["commitment_unit_clean"] *␣
↪incar["COMMITMENT_TERM"]
```

```
<ipython-input-125-6a354fae18d6>:7: FutureWarning: The default value of regex
will change from True to False in a future version.
  incar['COMMITMENT_TERM'] =
incar['COMMITMENT_TERM'].astype('string').str.replace('\.0', '').astype(float)
```

[126]:
```
#Print the following cols for an example of each type (eg an example of␣
↪originally hours; an example of natural life): COMMITMENT_TERM,␣
↪COMMITMENT_UNIT,
#age_derived and your new standardized sentence length column

result = incar.groupby('COMMITMENT_UNIT').apply(lambda x: x.sample(1)).
↪reset_index(drop=True)
result_final = result[["COMMITMENT_UNIT","COMMITMENT_TERM", "age_derived",␣
↪"senlength_derived"]]
result_final
```

[126]:
```
  COMMITMENT_UNIT  COMMITMENT_TERM  age_derived senlength_derived
0            Days            364.0         27.0             364.0
1           Hours              1.0         22.0          0.041667
2          Months             18.0         36.0             549.0
3    Natural Life              1.0         38.0           22630.0
4           Weeks              2.0         23.0              14.0
5         Year(s)              5.0         22.0            1825.0
```

[127]:
```
#Print the summary of that sentence length column using the .describe() command
incar["senlength_derived"].describe()
```

[127]:
```
count     58289.0
unique      235.0
```

```
top         365.0
freq      14456.0
Name: senlength_derived, dtype: float64
```

2.2 3.2 Examine disparities in length within the same judge and offense category: no adjustment (2 points)

- Filter to narcotics offenses
- For each judge with at least 20 Black and at least 20 white defendants, plot the (1) median sentence length for Black defendants and (2) median sentence length for white defendants (factor variable on x axis for each judge_id who qualifies; group by race)
- Write a 1-2 sentence interpretation - if we assume that cases/defendants are randomly assigned to sentencing judges, what might this suggest about the role of judicial discretion in these disparities?

[128]:

```
# Filter to narcotics offenses

incar = incar[incar['simplified_offense_derived']=="Narcotics"]

organized = incar.groupby(["judgeid_derived"])["is_black_derived",␣
 ↪"is_white_derived"].sum().reset_index()

organized =␣
 ↪organized[(organized['is_black_derived']>=20)&(organized['is_white_derived']>=20)]

# print(organized)

judge_list =␣
 ↪["judge_133","judge_166","judge_177","judge_20","judge_21","judge_279","judge_320"
             ,"judge_334","judge_35","judge_36","judge_41"]

incar = incar[incar['judgeid_derived'].isin(judge_list)]

incar['senlength_derived'] = incar['senlength_derived'].astype(float)

organized2= incar.groupby(["judgeid_derived","is_black_derived"]).
 ↪agg({'senlength_derived': 'median'}).reset_index()
final=organized2.pivot(index="judgeid_derived", columns="is_black_derived",␣
 ↪values="senlength_derived").plot(kind="bar")
final.legend(["White", "Black"])
plt.title('Comparison of Median Sentence Length By Race Determined By Selected␣
 ↪Judges')
plt.xlabel('Judges')
plt.ylabel('Median Sentence Length(Days)')
plt.show()
```

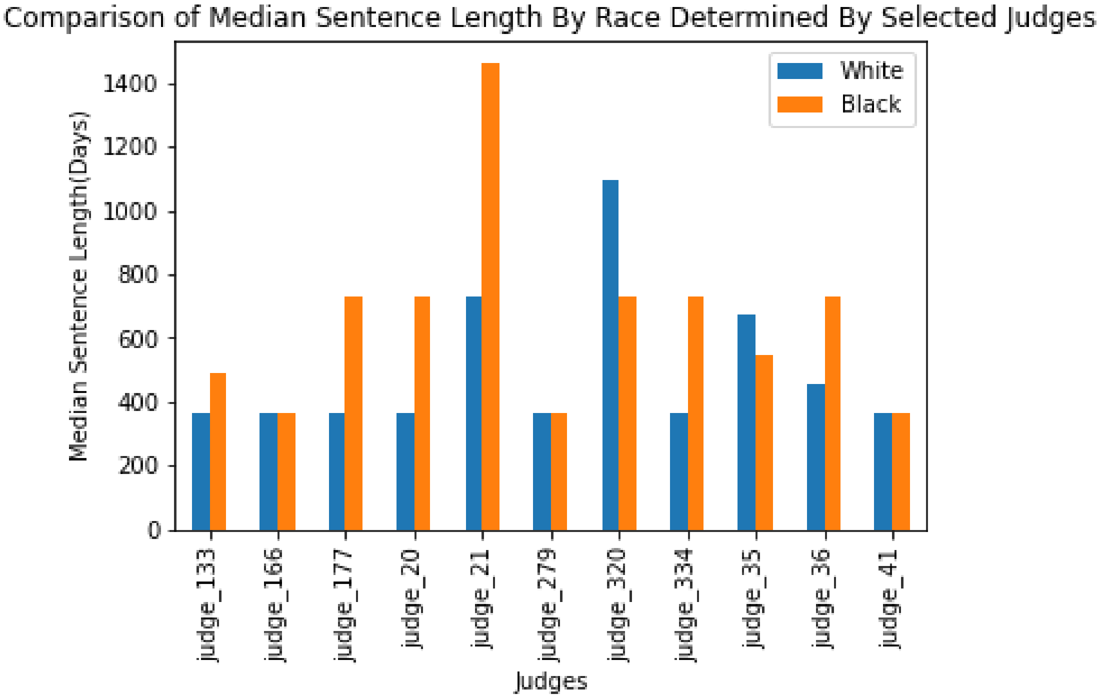
```
<ipython-input-128-d58177cf93ad>:5: FutureWarning: Indexing with multiple keys
(implicitly converted to a tuple of keys) will be deprecated, use a list
instead.
  organized = incar.groupby(["judgeid_derived"])["is_black_derived",
"is_white_derived"].sum().reset_index()
```

[128]:
```
<matplotlib.legend.Legend at 0x7fdd70235f40>
```

[128]:
```
Text(0.5, 1.0, 'Comparison of Median Sentence Length By Race Determined By
Selected Judges')
```

[128]:
```
Text(0.5, 0, 'Judges')
```

[128]:
```
Text(0, 0.5, 'Median Sentence Length(Days)')
```



[129]:
```
# Write a 1-2 sentence interpretation - if we assume that cases/defendants are␣
 ↪randomly
# assigned to sentencing judges, what might this suggest about the role of␣
 ↪judicial discretion in these disparities?

## From the plot "Comparison of Median Sentence Length By Race Determined By␣
 ↪Selected Judges," we can notice quite
## clearly that Black has disproportionately higher median sentence legths as␣
 ↪among the eleven
```

```
## judges, 5 judges gave a higher sentence length for Black with 3 judges giving equal sentence length. This contrast
## and interesting result from the plot can possible suggest the bias and racism underlined and influenced the judical
## discretion that then widen the racial disparities and challenge the idea of "fairness" in law. However, it is
## important to note that although median is statistically more representative, the sentence length can still be skewed
## to a extent of outliers who commit more severe crime and have a long sentence length.
```

2.3 3.3 Examine disparities in length within the same judge and offense category: constructing matched pairs (6 points)

Focus on `judgeid_derived` = `judge_21` and the same narcotics offenses. For each defendant, you want to construct "matched groups" of defendants who:

- Are the same exact age
- Are the same gender
- Differ in race from the focal defendant

Use code to find any/all matched defendants for each focal defendant. Print a table that compares the sentence length for focal compared to others and comment on what other things you'd like to match on if we had a larger dataset

[131]:
```
judges_example = incar.loc[incar['judgeid_derived'] == "judge_21"]

def proximate_defendent(data,i):
    defendant_lookfor = data.iloc[i]
    other_defendants = data.loc[data['CASE_ID'] != defendant_lookfor['CASE_ID']]
    same_stuff = other_defendants.loc[other_defendants["age_derived"] == defendant_lookfor["age_derived"]]
    same_stuff = same_stuff.loc[same_stuff["is_male_derived"] == defendant_lookfor["is_male_derived"]]
    same_stuff = same_stuff.loc[same_stuff["is_white_derived"] != defendant_lookfor["is_white_derived"]]
    table = pd.DataFrame()
    table["match_CASE_ID"] = same_stuff.CASE_ID
    table["match_is_male"] = same_stuff.is_male_derived
    table["match_is_white"] = same_stuff.is_white_derived
    table["match_age"] = same_stuff.age_derived
    table["match_senlength"] = same_stuff.senlength_derived
    table["focal_CASE_ID"] = defendant_lookfor.CASE_ID
    table["focal_is_male"] = defendant_lookfor.is_male_derived
    table["focal_is_white"] = defendant_lookfor.is_white_derived
    table["focal_age"] = defendant_lookfor.age_derived
    table["focal_senlength"] = defendant_lookfor.senlength_derived
    return(table)

original = pd.DataFrame()


for i in range(0, judges_example.shape[0]):
    if proximate_defendent(judges_example, i).shape[0] > 0:
        individuals = proximate_defendent(judges_example, i)
        original = pd.concat([original,individuals])

original.sample(n=20)
```

```
[131]:        match_CASE_ID  match_is_male  match_is_white  match_age  \
       53700   404580508998           True            True       24.0
       44766   401172012065           True            True       21.0
       49418   402981555331           True            True       24.0
       81801   415127464675           True           False       24.0
       47992   402439955301           True            True       24.0
       49418   402981555331           True            True       24.0
       61940   407703520450           True           False       32.0
       412     213700128228           True            True       21.0
       81801   415127464675           True           False       24.0
       32302   396456361697           True            True       32.0
       66907   409543756342           True           False       28.0
       81892   415163150361           True           False       24.0
       67872   409877997576           True            True       29.0
       47992   402439955301           True            True       24.0
       32289   396452543476           True            True       32.0
       61941   407703814159           True           False       32.0
       51346   403724052552           True           False       23.0
       32289   396452543476           True            True       32.0
       74782   412483493163           True            True       25.0
       48546   402664055531           True           False       25.0

              match_senlength  focal_CASE_ID  focal_is_male  focal_is_white  \
       53700            365.0   424062396620           True           False
       44766           2555.0   406322205406           True           False
       49418            730.0   415163150361           True           False
       81801           2190.0   402981555331           True            True
       47992            730.0   415163150361           True           False
       49418            730.0   424062396620           True           False
       61940           1460.0   396456361697           True            True
       412             1095.0   406322205406           True           False
       81801           2190.0   404580508998           True            True
       32302           2190.0   407704401578           True           False
       66907           1825.0   403026639715           True            True
       81892           2190.0   404580508998           True            True
```

```
67872          365.0   414327840987          True           False
47992          730.0   424062396620          True           False
32289         2190.0   407703520450          True           False
61941         1460.0   396452543476          True            True
51346          365.0   408156860822          True            True
32289         2190.0   407703373595          True           False
74782          365.0   402664055531          True           False
48546         1460.0   412483493163          True            True

       focal_age  focal_senlength
53700       24.0            365.0
44766       21.0           1460.0
49418       24.0           2190.0
81801       24.0            730.0
47992       24.0           2190.0
49418       24.0            365.0
61940       32.0           2190.0
412         21.0           1460.0
81801       24.0            365.0
32302       32.0           1460.0
66907       28.0            365.0
81892       24.0            365.0
67872       29.0           1460.0
47992       24.0            365.0
32289       32.0           1460.0
61941       32.0           2190.0
51346       23.0            365.0
32289       32.0           1460.0
74782       25.0           1460.0
48546       25.0            365.0
```

[132]:

```
# Comment on what other things you'd like to match on if we had a larger dataset
## If we had a larger dataset, I would like to match the education level and income of each focal and the matches.
## I think it would be interesting to analyze how education and income level can correlate with the sentence length.
```

3 4. Optional challenge: looking at judge characteristics

The previous exercises showed large differences in sentences between judges/differences in disparities. You become interested in how the judge's own demographic attributes are correlated with sentencing. Going back to the judge's name (`SENTENCE JUDGE`), parse their first name and try to probabilistically infer his or her gender. Then, investigate whether disparities differ between "likely female" and "likely male" judges.

[ ]: