

Chances of a Fair World: Equity Topics for Probability & Statistics

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Let's see who's here today...

Do you teach (or plan to teach) Introductory Statistics or Quantitative Literacy/Math for Liberal Arts?

- Both
- Statistics
- Quantitative Literacy/Math for Liberal Arts
- Neither

Let's see who's here today...

Do you currently use equity or social justice topics in teaching math classes?

- Regularly
- Sometimes
- Rarely
- Never

Let's see who's here today...

How confident and comfortable are you with the idea of using equity and social justice topics in your math classes?

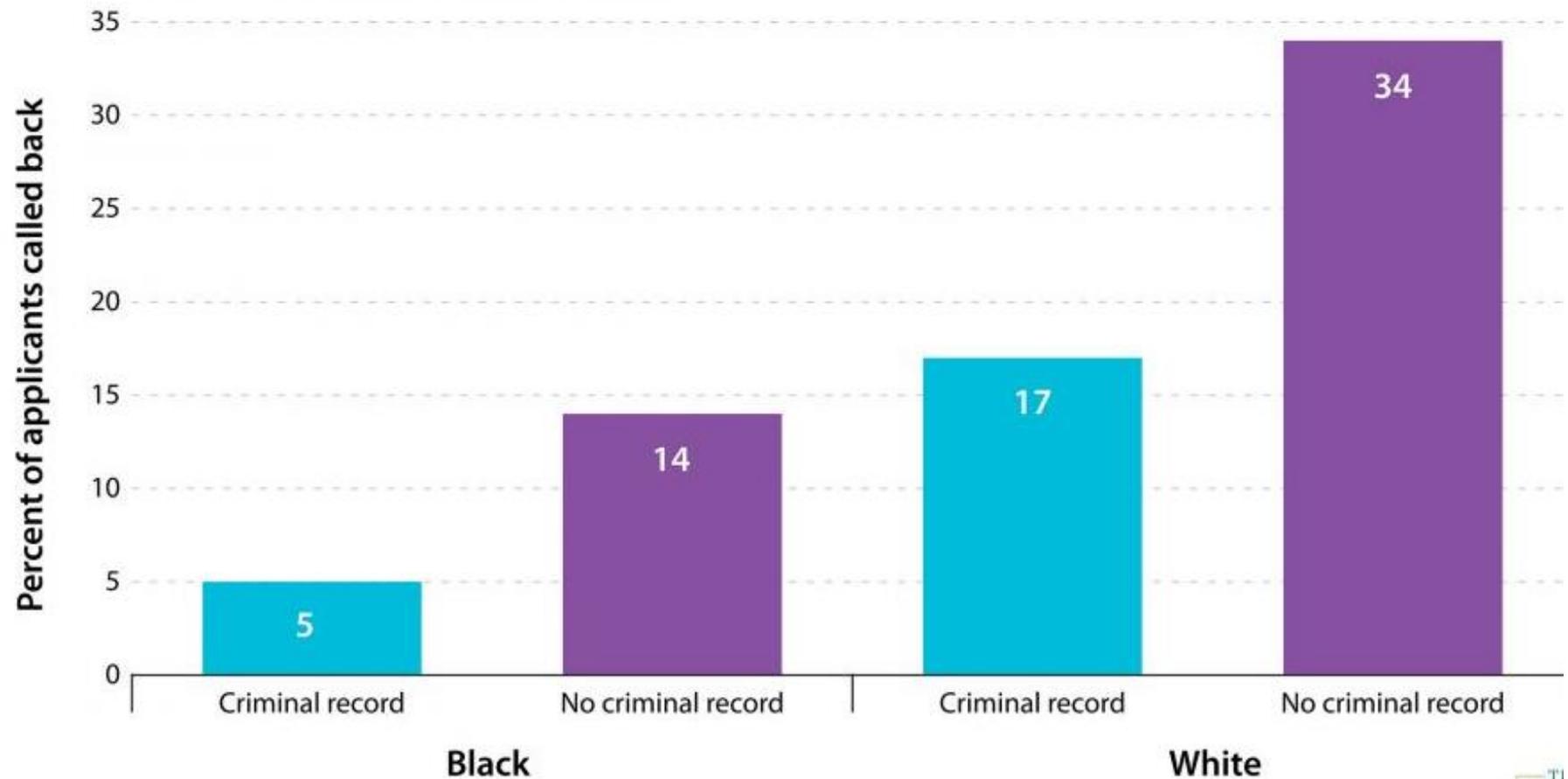
- Very
- Somewhat
- A little bit
- Not at all

Why Use Equity & Social Justice Topics?

- Showing a variety of contexts for probability and statistics helps with student engagement
- Using real data grounds probability and statistics as practical topics
- Topics can be current and relevant to students from diverse backgrounds
- Students have asked for it!

Examples

The rate at which applicants receive callbacks for job applications is affected by race and criminal record.



Source: The Hamilton Project

Consider “percent of applicants called back” as the probability of an applicant being called back. For each of the categories of job applicant shown in the table, determine the probability that an applicant would receive at least 1 callback if they submit 5 applications.

White, no criminal record: 87.5%

White, criminal record: 60.6%

Black, no criminal record: 53.0%

Black, criminal record: 22.6%

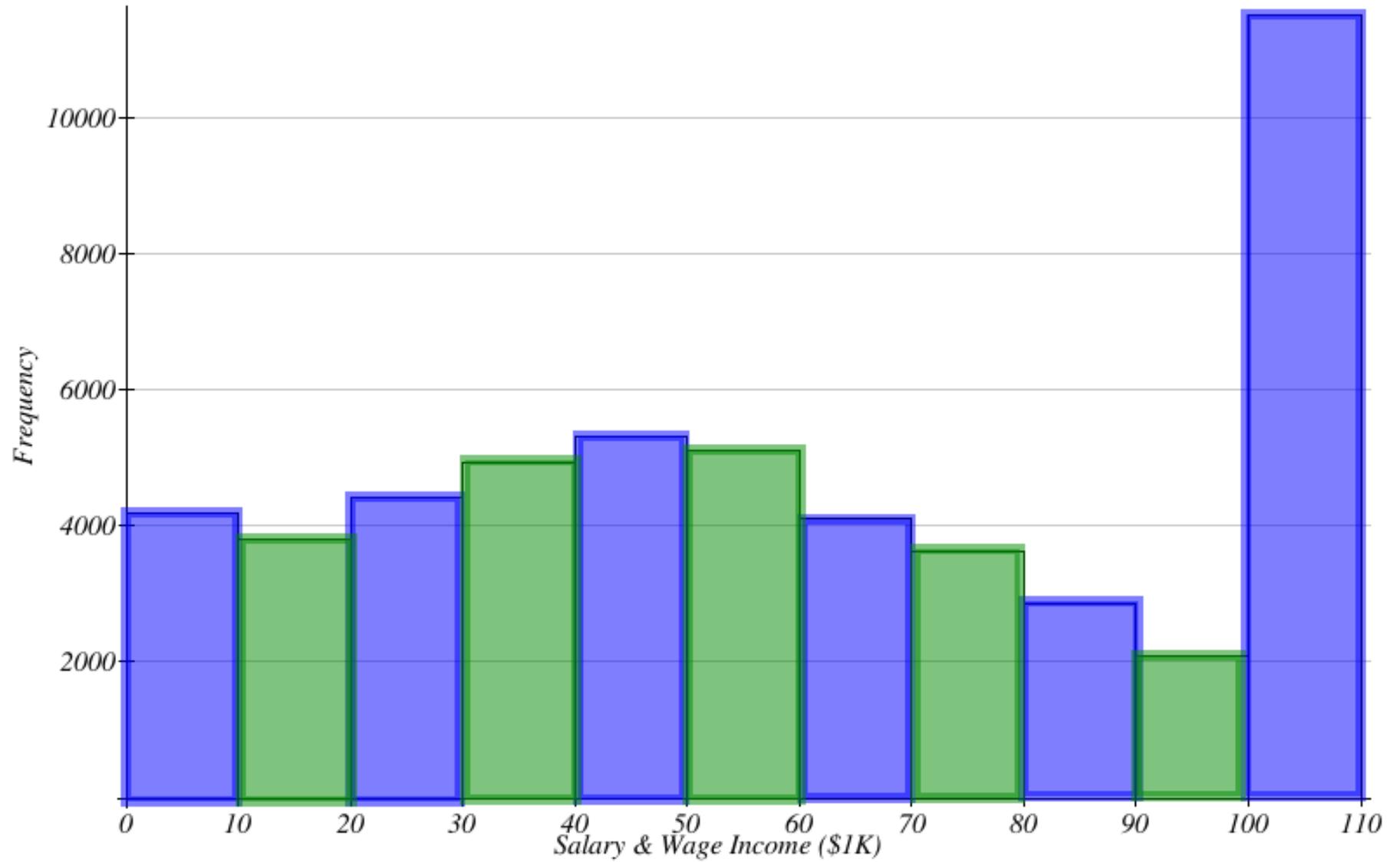
From the Census Bureau's Current Population Survey (CPS), we have the following descriptive statistics for personal annual wage and salary incomes in 2019.

	White Men	White Women	Black Men	Black Women
Median Income	\$55,470	\$40,138	\$37,028	\$32,052
Mean Income	\$75,078	\$51,106	\$49,300	\$42,571

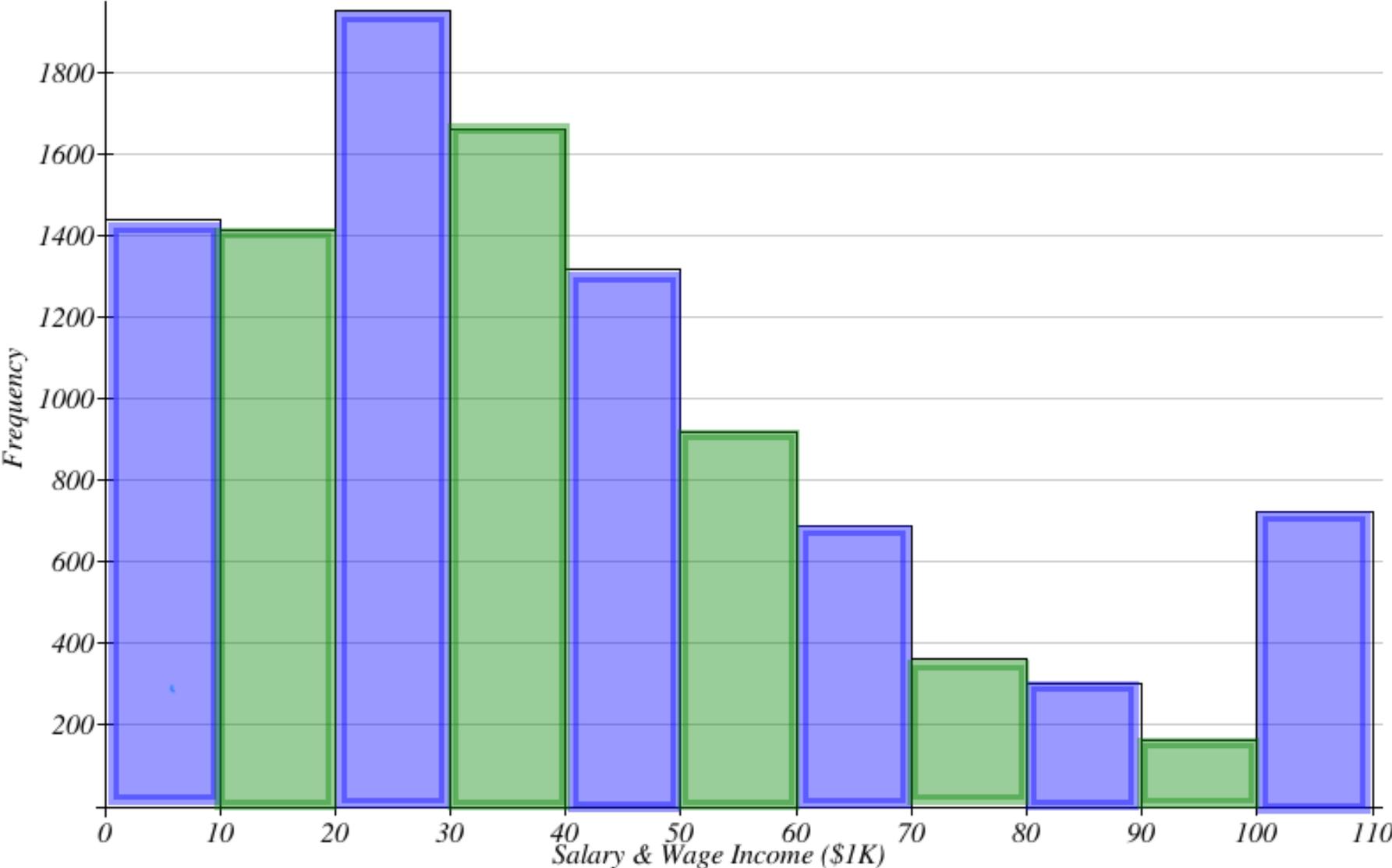
Some ideas for using these statistics:

- Discussions what kind of distribution has a larger mean than median
- Construction of possible histograms or box plots, with discussion of choices that are made
- Research into the fuller CPS reports
- What's going on in this table? What do you notice? What do you wonder?

White Men, Annual Salary & Wage Income, 2019, U.S.

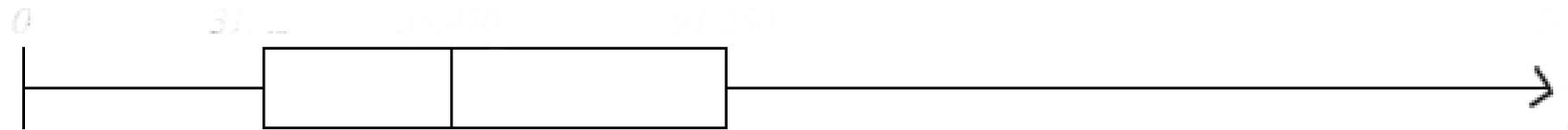


Black Women, Annual Salary & Wage Income, 2019, U.S.

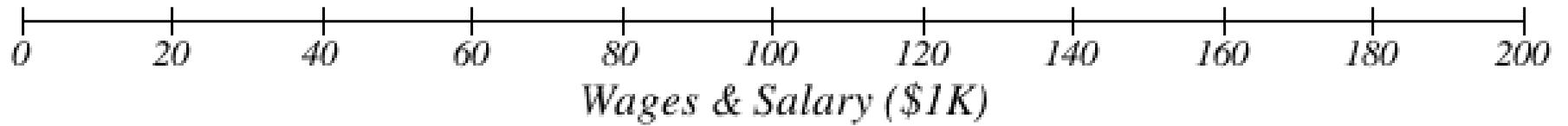
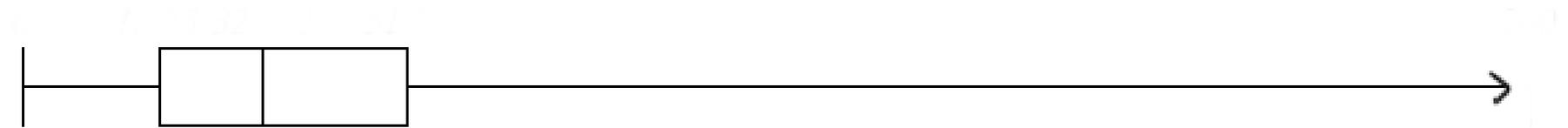


	White Men	White Women	Black Men	Black Women
Median Income	\$55,470	\$40,138	\$37,028	\$32,052
Mean Income	\$75,078	\$51,106	\$49,300	\$42,571
Sample Size	51,988	47,406	9,328	10,954

White Men



Black Women



General concepts for social justice and equity work can be introduced through fictional or silly settings.

From a candy-themed day on probability...

A test detects the presence of Smarties residue on hands. The test has a 2.5% false positive rate and a 10% false negative rate. In the general population, 0.8% of people have Smarties residue on their hands.

- a. What percent of the population would test positive for Smarties residue? (3.2%)
- b. If someone tests positive, what is the probability they really *don't* have residue on their hands? (77.5%)

Table 1 – Immunoassay Error Rates for Various Drugs and Three Immunoassays

Drug/ Drug Class	EMIT		TDx		RIA	
	False Pos Rate	False Neg Rate	False Pos Rate	False Neg Rate	False Pos Rate	False Neg Rate
Cocaine	2.5%	22.8%	2.1%	25.5%	4.1%	17.5%
Opiates	2.2	17.9	1.7	17.5	1.8	14.7
Marijuana	2.1	29.0	0.9	40.8	1.2	37.1
PCP	0.2	21.4	1.6	6.8	1.3	5.8
Amphetamines	0.8	2.4	0.8	4.7	0.1	12.9

Source: “Mandatory Drug Testing in the Canadian Workplace: A Note on the Recent Supreme Court Decision and Its Effect on the Misclassification Rate of Non-Drug Users”

General concepts for social justice and equity work can also be introduced through historic settings.

The table below lists the passenger status of people sailing on the maiden voyage of the RMS Titanic, and whether or not they survived.

	Survived	Did Not Survive	Total
Passenger - 1st Class	202	122	324
Passenger - Not 1st Class	298	695	993
Crew	212	679	891
Total	712	1496	2208

- a. Which group had the best chance of surviving the sinking of the Titanic: first class passengers, other passengers, or crew? Which group had the worst chance of surviving? (first class; crew)

- b. If a survivor was rescued, which group was it most likely they belonged to: first class passengers, other passengers, or crew? Which group was it least likely they belonged to? (non-first class; first class)

Other context ideas from two recent PRIMUS issues on Mathematics for Social Justice...

- New York City's stop-and-frisk policy
- Childhood poverty rates
- Proximity of residences to major highways
- "Broken windows" policing
- High-risk employment
- Jury selection

Sources

“Callback Rate by Race and Criminal Record”

www.hamiltonproject.org

Census Bureau CPS, Wage & Salary Workers Report

<https://www.census.gov/data/tables/time-series/demo/income-poverty/cps-pinc/pinc-10.html>

What’s Going On in This Graph?

<https://www.nytimes.com/column/whats-going-on-in-this-graph>

“Mandatory Drug Testing in the Canadian Workplace: A Note on the Recent Supreme Court Decision and Its Effect on the Misclassification Rate of Non-Drug Users” by W.J. Hurley (2015), in CHANCE, 28:1, 21-26.

DOI: 10.1080/09332480.2015.1016845

Titanic Information

www.encyclopedia-titanica.org

PRIMUS, Volume 29, Issues 3-4 (2019): Mathematics for Social Justice

<https://maa.tandfonline.com/toc/upri20/29/3-4>

Questions?

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