Driving While Black/Driving While Brown (DWB/DWB)

A Mathematical Investigation of Racial Profiling: Is it Racism??
[Teacher Edition—teacher notes in red]

To start this project, I have shown the first 8 minutes or so of the film, *Hurricane*, starring Denzel Washington. This is a powerful film about the true story of the boxer, Ruben "Hurricane" Carter who was falsely imprisoned for over 20 years on a racist frame-up. I show the film until a white police officer tells Denzel that he's looking for "two Negroes in a white car" (this is 1964) and Denzel responds, "Any two will do?" We stop the film just as Denzel sees a number of police cars slowly pulling up and realizes that this is no ordinary traffic stop (we do tell students *before* hand that they will be quite upset when we pull the plug!) We then give students a writing prompt: "what did Denzel mean?" and give students time to write, before having a group discussion about what they wrote, racial profiling, racism, their experiences, and wherever the conversation goes that you are comfortable with and have time for. We use this as an entry into the project, in which we make clear that we are going to use mathematics to check up on the police, to determine for ourselves *if* racism is a factor and if so, how.

In this project, you will learn how to use mathematics as a weapon in the struggle for social justice and use it to check up on what police have been doing. We will investigate *racial profiling*, sarcastically called *Driving While Black* or *Driving While Brown* (*DWB*). African Americans and Latinas/Latinos *all* over the U.S. have complained, filed suit, and organized against what they call racist police practices—being stopped, searched, harassed, and arrested only because they fit the racial profile of being African American (Black) or Latina/o (Brown). But are they right? How do we know? And can mathematics help answer these questions?

PART I. Learning about *probability simulations*. We start by finding the percentages of African Americans, Latinos, Whites, and Asians/Pacific Islanders/Native Americans in Chicago [I originally used 2000 census data figures.] In the bags are small cubes, of different colors, representing whites, Asians/Pacific Islanders/Native Americans, Latinos, and African Americans. The percent of each cube approximately matches (or *simulates*) the percent of those people in Chicago. For example, if blue cubes represented African Americans, and if Chicago was half African American, then half of the cubes in each bag would be blue. [You could ask students this question before reading this sentence, to get them starting thinking about probability and representation ideas] Your job is to find Chicago's racial percents [or your city's/town's] by repeatedly picking cubes from the bag and analyzing the results. That is, you will *randomly* pick a cube, record its color, and replace it, ***without looking in the bags***. So you will be *conducting an experiment* and *collecting data* (picking, recording, and replacing cubes) and then *analyzing data* (determining, from your picks, how many of each color there are to determine the racial/ethnic percents in Chicago, in 2000). In 2000, the breakdown was approximately .36 African American, .36 white, .24 Latina/o, .04 Asian/PI/NA. I put 25 cubes in the bags, 9, 9, 6, and 1, but just adjust to fit your situation.

Use these two charts (below) to record your picks. Use the **Tally Sheets** for each *ten* picks and then transfer the results of each ten picks to the **Cumulative Table**. The Cumulative Table is for a "running total" of all the picks you've made so far in your group, up to the final 100. When you've recorded all 100 picks by race/ethnicity in the Cumulative Table, then you can figure out the columns for percentage of each race/ethnicity in the table as well. [the purpose of the Cum Table is for students to see how the probabilities change—and coverge—as the number of picks increases.]

Cumulative Table

# of picks	African American #	African American %	Latino/a #	Latino/a %	White #	White %	Asian/ PI/NA #	Asian/ PI/NA %
10								
20								
30								
40								
50								
60								
70								
80								
90								
100								

1a) How many cubes, of each color, do you think are in the bag? Why? Discuss your reasoning in your group, in detail, and explain how you used mathematics. Since students will *not* know how many cubes are in the bag, they may have multiple, reasonable answers. Each group can discuss this and then write their response. But they should do this *before* combining data from all groups (done in step *1b*). The point here is that each group will have 100 trials, but after combining data from all groups and then finding the percentages, they will be much closer to the theoretical probabilities of {.36, .36, .24, .04}.

1b) Look at your *cumulative table*—what happened as you picked more times? How close was your first row to your final answer to #1a above? That is, if you had to answer #1a after just 10 picks, would your answer be the same or different as after 100 picks, and why? Make a chart on the board where each group can write their total for each race, then have students add the class totals and find the percentage for each race. The point is for students to see what happens with more data. You can have students look at how each group varies (or not) from the final percentages as well.

2) (*After combining the data of all groups on the board, and then finding the percentage for each race.*) What happened when we combined everyone's data together? Why? What do you think would happen if your group picked 1,000,000 times? Explain your reasoning, in detail, in your own words, and explain, as best as you can, the mathematics behind your reasoning. This is getting at the *law of large numbers,* which essentially says that as one repeats the number of trials of an experiment, the results approach the theoretical probabilities. You could have students write the response, or discuss as a class. But this is a big, central idea, don't skip it!

2a) *Whole group activity*: We will learn how to *simulate*, with graphing calculators and *random number generators*, the probability simulation that we just did. That is, we will use the calculator to *simulate* the cube picking. First, we have to change the *seed* for the random number generator. Type in your birthday

as day-month-year (e.g., June 18, 1983 would be 6181983). Then press the *STO* key, then *MATH left-arrow ENTER ENTER*. Then set the output of the calculator to 2 digits, instructions in the box below: [NOTE: All calculator instructions are for the TI-83/84. Changing the random seed is only necessary if the calculator's random number generator has never been used, because otherwise, in a class set, all calculators may generate the identical sequence—which we don't want!]

Press the **MODE** button (immediately to the right of the **2ⁿᵈ** button).
Press the *down-arrow cursor key* once (top right of keyboard), so that **Float** is blinking.
Press the *right-arrow cursor key* three times until the **2** is blinking.
Press **ENTER** (bottom right of the keyboard).
Press **CLEAR** twice (just underneath cursor keys).

The key idea here is this: picking the cubes from the bag is supposed to establish the "power" of mathematics (i.e., simulations) to "look" inside the bag and, through analyzing data, to have a good guess of its contents. That's necessary. But at this point, students need to have an experience that translates that power to the calculator (because real data are hard to simulate w/ the bag and colored cubes, and because the calculator is more general). So they next simulate the physical randomness of picking a cube with the calculator's random number generator (in preparation for analyzing data on traffic stops).

We can do this as follow. Show students how to set the calculators to two decimal places (instructions in the box above) and have them press the RAND function. They will get a two-digit number between .00 and .99 (actually, they can also get 1.00, which is an interesting discussion in itself!, or, they can get exponential notion, also interesting). I've then had students "cast" the outcomes to match the racial percentages of Chicago's 2000 population {.36, .36, .24, .04} as follows. Outcomes in [.00 … .35] are African Americans, outcomes in [..36 … .71] are whites, those between [.72 … .95] are Latinas/os, and numbers in [.96 … .99] are Asians/PIs/NAs. Have them simulate the 100 "picks" with the calculators and repeat the process of *1a* and *1b* above, including combining the groups' data. They will see that the calculators too allow you to "see" into the bag. This establishes the equivalent power of the calculator and prepares students to do the rest of the activity, which is essential!

As a side point, combining all the outcomes from picking, *with* all those from the calculators should be even closer yet to the theoretical probabilities, so don't miss that opportunity if time allows (or assign as homework).

PART II. INVESTIGATING DWB/DWB

We learned in Part I how to do *probability simulations*. Now we can simulate the data for traffic stops to decide whether we think racial profiling occurred. Here are some Illinois data based on actual police reports. The *American Civil Liberties Union* has collected data about traffic stops in Illinois. We have actual statewide data for 2009: [I contacted my local ACLU chapter to get the data. You can too!]

	Caucasian	African American	American Indian	Hispanic	Asian
Stops	1672913	436368	4011	279061	77051

Have students set calculators to 4 decimal points before proceeding.

3) When police stop a driver, they have the right to *request* a search of the driver and vehicle (police record only the race of the driver). Do they racially profiling when they do this? We shall see for ourselves what the data tell us. With whites, police requested 13,625 searches. What percent is that

number of the total number of stops of whites in 2009? That number is the "rate of requests for whites." Note that this is a *rate* or a *ratio*—comparing the number of *requests* for a search to the number of *stops*. *13,625 ÷ 1,672,913 = .0081 or .81%*

4) We can do some simulations now, using the random number generator again, and the *rate of requests for whites* from **#3** above.

      a) We could simulate all 1,672,913 stops of whites and of others, but that would take a long time!, so we'll do 1/1000 of these, or 1,673 (rounding up), split between the groups. We want to use a random 4-digit number (between .0000 and .9999) which, depending on how we set it up, will tell us whether the person stopped is "asked" by police to consent to a search. How should we do this? At this point, depending on time, etc., you can have the discussion w/ students about setting this up. "Requests" could be outcomes in [.0000 … .0080], that is, 81 of the 1,000 possible 4-digit outcomes.

      b) After simulating 1,673 "stops," how many whites did police request to search? How close is that to the *rate of requests for whites*? .81% of 1,673 is ~13.55 , so we should have around 14, ± 3. If further off, bad data! It can be tricky to carefully watch the calculator outputs, so emphasize the care on this.

5) We will now simulate the number of African Americans that *should* have had requests to be searched if the *rate of requests for African Americans* was the same as the *rate of requests for whites*. Got that?

      a) This time, use 1/250 of the number of stops for African Americans, or 1,745, and simulate that many stops. How many of those stops are "requested" to be searched? You have to judge students' temperament here, to see how fast and how tolerant they are on this…*1745*.0081 = ~14* again. If you have enough time, people, and engagement, use more than 1,745, maybe twice that.

      b) Do the same for Latinas/os, and use 1/100 [or 1/200, depending…] of the actual stops. How many are requested to be searched?

      2791 * .0081 = ~22.6, so between 20 and 25 or so.

Give students actual data. Police requested 7,705 searches for African Americans (a request rate of .0177) and 4,600 searches of Latinas/os (request rate of .0165). Students should figure out these rates and disparities. Have them develop the idea and compute the *disparity ratio*, which is the ratio of *rate of request for African Americans ÷ rate of requests for whites*, and the same for Latinas/Latinos. They should understand that these disparity ratios mean that in Illinois in 2009, both African Americans and Latinas/os are more than *twice* as "likely" as whites to be "requested" by police officers to submit to a search *after* being pulled over.
For African Americans: *(7705 ÷ 436,368) ÷ (13,625 ÷ 1,672,913) = 2.168.*
For Latinas/Latinos: *(4,600 ÷ 279,061) ÷ (13,625 ÷ 1,672,913) =2.024.*
Note: There are other ways to compute these the *disparity ratios*, **this is just one way**!

Have them discuss the meaning of these data, make sure people understand the idea of *disparity ratio*. [from my experience, the concept of a *disparity ratio* is tricky because it is a ratio of rates. Confusing!]

6) Now that you know the actual data, do the results from your simulation support the claim of racial profiling? Why or why not?

7) Individual writing, to be followed by a group discussion. Please use *another* sheet of paper. [these are questions I've used, of course, use whatever questions you want that seem appropriate]

    a) What did you learn from this activity (give concrete examples)?

b) How did mathematics help you do this (give concrete examples)?

c) Do you think racial profiling is a problem, and if you do, what do you think should be done about it?

d) What questions does this project raise in your mind, and what more do you want to know?

e) Is this a good use of mathematics, and should students be learning mathematics to "read the world" like this in school? Why or why not?

 f) Would you like doing mathematics projects like this in school, and would you want to do more projects like this? Why or why not?

g) If someone said to you, "Hey, you're crazy, mathematics has *nothing* to do with racial profiling, you're just wasting my time!" how would you answer him or her? If you think mathematics *does* have something to do with racial profiling, then write a response as convincingly, powerfully, and clearly as possible. Be as specific and as detailed as you can be, and remember, the person you are convincing will *not* have done this project!

[Please contact me at gutstein@uic.edu with questions, critiques, suggestions, and *especially—*what you and your students learned after doing this activity. Thanx!]