

Background:

Older adults racialized as Black in the United States (US) are two times more likely to experience Alzheimer's disease related dementias than their counterparts racialized as White (Data shows racial disparities in Alzheimer's disease diagnosis between Black and white research study participants). Research suggests that interpersonal and structural racism are contributors to racial and ethnic disparities in cognitive aging (Experiences of Racism Associated with Poor Memory, Increased Cognitive Decline).

Structural racism refers to “a system in which public policies, institutional practices, cultural representations, and other norms work [in tandem] to perpetuate racial group inequity” (The Aspen Institute). It is deeply woven into the fabric of American culture and society and can manifest itself via legislation, residential zoning, healthcare, etc. Racial/ethnic segregation reflects a long history of policies, such as redlining, that has kept access to resources restricted for minoritized groups. It is a fundamental and structural determinant of health because of its role in mediating exposure to key social determinants of health (Residential Segregation And Health: History, Harms, And Next Steps). Segregation is strongly associated with health disparities between Black and white populations. In 2021, Pohl et al. examined if the associations between residential segregation and later-life cognition and dementia differed based on segregation measure and by participant race/ethnicity (Relationship between Residential Segregation, Later-Life Cognition, and Incident Dementia across Race/Ethnicity). It was found that non-Hispanic Black adults were most likely to experience negative effects of neighborhood segregation on cognition (language and memory) and dementia (Relationship between Residential Segregation, Later-Life Cognition, and Incident Dementia across Race/Ethnicity). Experiences of structural, interpersonal and institutional racism are also associated with lower memory scores and worse cognition in midlife and old age, especially among Black individuals (Alzheimer's Association). Additionally, ecosocial factors, such as socially inflicted trauma (i.e racism) and economic and social deprivation can influence health (Theories for Social Epidemiology in the 21st Century: An Ecosocial Perspective). Post Traumatic Slavery Syndrome (PTSS), coined by Dr. Joy Degruy, explains the multigenerational trauma the African diaspora faces due to centuries of chattel slavery and oppression. Trauma from racism has developed over time exacerbating brain health for older adults racialized as Black.

The Multifaceted Life Course Structural Racism (MLCSR) measure is a compilation of publicly available datasets that capture aspects of structural racism. It looks at structural racism through two pathways (structural violence and limited and restricted access), ten domains (residential segregation and gentrification, property ownership, government representation, policing and incarceration, income and poverty, occupational segregation and employment, healthcare and healthy food access, environmental pollution, and media and marketing) and three historic periods: before the Civil Rights Act of 1968, Desegregation/Integration (1969-1999) and

Modern Times (2000-present). For this task, we will examine how government representation and environmental pollution interact with structural racism to affect dementia in older adults racialized as Black. Thus, this raises the question: **Does structural racism have an influence on dementia?**

We hypothesize that greater exposure to life course structural racism increases the risk of incident dementia and cognitive decline in late life. The nature of this project lends itself to multiple phases and we are solely contributing to the first. In this data collection phase, we hope to tune our variables of interest and collect data that begins to capture something as inherently abstract as structural racism. The following phases, which will not take place until well after this course is over, mainly involve analyzing the impact of structural racism on dementia for people racialized as Black.

Analytic Approach/Statistical Model:

Participants were a community-dwelling sample of older adults racialized as Black over 50 years, in the study. We linked participant data by county at birth, at adolescence (ages 10-18), adulthood (ages 19-50), and midlife (ages 51 and older) to the aforementioned datasets.

Due to the nature of our project, we first need to develop our own binary criteria (0-1) for structural violence in each item under different domains and pathways, and then we collect or scrape data from public sources in order to actually label it. Instead of working with direct data due to a lack of sources, most of the time we have to work with proxy data. For example, we may not be able to get the data on where Black residents lived before the Civil Rights Movement, so data on redlined areas may help determine where they lived because redlined areas are highly correlated with people of color.

Regarding statistical models, time series analysis is the key component of our research, since our project spans across three different time periods. Time analysis enables us to, for example, explore how structural violence has evolved and impacted the targeted population over time.

Literature Review:

For the Environmental Pollution domain, some previous studies (Christopher, et al., 2021) have been conducted to reveal the fact that regions where people of color live were facing more severe fine particulate matter (PM2.5) pollution, which can cause lung or heart problems. However, few studies have focused on the impact of Hazardous Air Pollutants, or HAP, on these regions. HAPs, such as Benzene, are air pollutants emitted by industries or facilities that can cause cancer or other health effects. PM2.5 can sometimes be the carrier of HAPs, but often these two things are discussed separately. Therefore, I decided to work with the county-level HAP data of industries and facilities to determine if counties with a higher proportion of people

racialized as black than national average are facing more HAP emissions from local facilities. Regarding Superfund Sites, on the other hand, some research suggested that people of color live disproportionately close to superfund sites (Johnson, 2020), which, distinct from conventional landfills, are locations that are polluted by hazardous wastes. The research first shows that most superfund sites are located in the proximity of government-assisted housing, and then states the fact that a considerable portion of residents living in this kind of housing are people of color, thus proving the point that people of color are facing environmental racism. My approach, in comparison, is to find if counties with a greater proportion of black residents than the national average in the desegregation period are more likely to have superfund sites.

The Voting Act of 1965 was a milestone marking a major shift for Black people in politics. The important piece of legislation prohibited racial discrimination in voting practices. Upon its ratification, the Black community was finally able to *legally* participate in the nation's system of democracy. In fact, this amendment did not just allow for a significant increase in the number of registered Black voters; it opened the door for more Black legislators across all levels of government. Within the following decade, from 1970 to 1980, "the total number of Black elected officials in the United States tripled, from just 1,469 to 4,912." Ideally, this act would have allowed Black voters the right "to elect representatives of their choice"; however, implicit bias and racist policies mitigated the potential for diverse representation throughout the branches of government. This was especially true for the judicial branch.

The United States has two court systems—the federal court system and the state court system. Federal courts consist of three main types: District Courts, Courts of Appeals, and the Supreme Court. District Courts (i.e., "small case courts") hold trials for cases, in which the district judge applies legal principles to make a decision for or against the defendant. The Court of Appeals hears appeals and challenges to decisions made in trials from the District Courts. The Supreme Court is the highest court in the United States. Supreme Court judges defend the Constitution by holding the final decision on constitutional questions and other appeals regarding constitutionality. Unlike in state courts, decisions made in the federal court system do not just affect the plaintiff and defendant; they hold the power to affect the entire nation. A prime example is *Plessy v. Ferguson*—whose ruling not only required Black train passengers to ride in partitioned cars, but also legally upheld racial segregation across the nation for almost seven decades. Court rulings, such as this, highlighted the dire need for such an influential and authoritative system to have better Black representation.

From 1970 to 2000, there have been over 1500 federal judges appointed; only 125 of them were Black. In an era of civil and political unrest amongst the Black community, researchers have questioned if the lack of Black judges within the federal court system has had an impact on significant trials. In 1988, a study by Welch et al. demonstrated that while it is difficult to definitively state what impact Black judges have on cases, "in the crucial decision to incarcerate, having more black judges increases equality of treatment." In fact, a more recent

Harvard study conducted by Dr. Sen demonstrated patterns amongst the evaluation of rulings made by Black federal judges versus that of their white counterparts. The study indicated that case decisions made by Black federal district judges were more likely to be overruled than that of white judges, by up to ten percentage points. It also clarified that this increased likelihood “cannot be explained away by factors such as qualification disparities or types of cases.” The presence of Black judges within the federal court system has created—and continues to create—a significant impact; however, the potential of this impact is diminished because of their disproportionately low representation and systemic biases of the environment around them.

Our work also focuses on the lack of Black representation in our state government. In order to understand why this is an issue, one must be familiar with the structure of our state government. State government is modeled after the Federal government and follows the same three branch structure. The executive branch is headed by the state governor, with six other positions that are held in all fifty states; attorney general, superintendent of schools, insurance commissioner, agriculture commissioner, labor commissioner and public service commissioner. Beyond this, the structure varies after this from state to state because of the freedom that individual states are given in designing their government. In every state except Nebraska, the legislative branch, Congress, consists of the Senate and the House of Representatives. The Senate is the smaller upper chamber where officials serve longer four year terms and the larger lower chamber where officials typically serve two year terms is the House of Representatives. Finally, the judicial branch is led by the State supreme court. The court’s structure and judicial appointments are determined by legislation or the State constitution (“State and Local Government.” *The White House*).

Next, it is crucial to think about the power that the state government has. State governments play an important role in our daily lives because they have specific responsibilities that are *solely* theirs. These include but are not limited to; education, running welfare and social benefits programs/general distribution of aid, regulation of industry, maintaining state highways and local roads, and protecting people from local threats and maintaining a justice system. This is a wide range of responsibilities that might seem intangible at first, however we quickly start to see how race intersects with the state’s powers when we start to get more specific. For example, house members heavily contribute to the policy work for things like criminal justice reform and voting rights, two issues which have historically impacted Black folks disproportionately (Maloy, and Trust. “Functions of State and National Government.”).

Many proponents of equal Black representation in government are well aware of the fact that more Black politicians does not necessarily mean an emphasis on Black rights and centering Black issues—yet it is still an indicator of a healthy and equitable democracy. Descriptive representation is a measure of how well an elected representative resembles their constituents. Descriptive representation is necessary for many reasons beyond the push for equal representation in government as a benchmark of equality. For example, there is research

supporting the claim that Black politicians do a better job attending to the needs/interests of Black Americans than any other demographic (*Black Politicians Are More Intrinsically ... - Wiley Online Library*). Furthermore, Black state representatives are necessary because their election can inspire more Black folks to participate in politics and they are more likely to initiate policies that the mass Black public supports, among many other things (*When and Why Minority Legislators Matter - Annual Reviews*).

Now that we have established the need for Black representation at the state level, it proposes the following question: How well are Black folks currently represented in the state government? There is a plethora of research available to support the claim that it is not good enough as is. For starters, 89% of officeholders nationwide are white. That leaves only 11% of these seats for various minority groups with many differing interests. Representation is severely disappointing in the US Senate and state governor's offices, and even local government positions and the US presidency when you look beyond the state level. Building on the history of Black participation in politics outlined above, voter suppression efforts and gerrymandering are two of the biggest modern restraints on the political power of Black voters. Despite these glaring issues, state legislatures are the sole branch of state government that accurately mirror the Black population in the US. For example, more than half of state legislatures had either nearly proportional or overrepresentation of Black folks in 2020. On the surface this seems like a step in the right direction until you break it down to the house and senate levels. There are currently only three Black senators— this is even more disheartening when you recognize the authority that the Senate has relative to members of the house. At the conclusion of our literature review, one thing is clear above all else: Black folks are underrepresented in our government at the state level, which compels us to dig deeper and analyze this statistically (Noe-Payne, Mallory. "Black Representation in Politics Is Poor Nationwide, except in State Houses.", "The State of Black Representation in the US Today." *Public Wise*).

Items:

For EP.SV3 (Environmental Pollution domain, Structural Violence path, Modern time period), the labeling criteria are as follows. A county is coded as 1 if a county has a greater or equal proportion of people racialized as black than the national average in 2020 and its annual HAP emission is greater or equal to the mean annual HAP of counties with lower proportion of black residents than the national average. This item is completed by Longyuan.

For EP.LRA2 (Environmental Pollution domain, Limited or Restricted Access path, Desegregation time period), a county is labeled as 1 if it is a county with a greater or equal proportion of people racialized as black than the national average in 1990 and has a Superfund Site that is in the National Priority List (NPL) list within its range before 1990, according to the EPA. Longyuan is still working on this item.

Within the domain of government representation, we chose to focus on the structural violence and limited resource access of Black people after the ratification of the Civil Rights Act of 1968, before the start of the new millennium (i.e., GR.SV2, GR.LRA2). To quantify this, we are exploring the two following variables: 1) for every state, the counties that had decreasing or no Black representation in federal offices from 1970-2000 and 2) for every state, the counties that saw no increase in Black representation in federal offices from 1970-2000.

Additionally, we chose to focus on government representation as it relates to structural violence in the modern time period (GR.SV3). A similar approach to Sances and Wu's 2017 research will be used. For this we will explore government funding, as it relates to Black populations. A question we can investigate is: How does government funding vary based on a county's racial demographic?

The final variable of interest that we focused on in government representation is limited resource access in the modern times (GR.LRA3). We chose to quantify this by investigating the ratio of Black representation in state offices to the Black population in that state, for any decade between 2000-2020.

Data Sources:

Environmental Pollution domain — EP.SV3 and EP.LRA2

	format	Available features	Scraping Approach	Data Quality
2020 Census National Demographics data	csv	Percentage of Black or African American alone or in combination with one or more other races in 2020	Downloaded from https://data.census.gov/table/DECENNIALDP2020.DP1	No missing data on key features
2020 Census County Level Demographics data	csv	-County GEO ID (FIPS) -County name -Percentage of people racialized as black -Total population	Downloaded from https://data.census.gov/table/DECENNIALDP2020.DP1?g=010XX00US\$0500000&d=DEC+Demographic+Profile	No missing data on key features

2020 County-Level Facility HAP Emission data	xlsx	-State and county name -County FIPS code -Annual HAP emission amount	Downloaded from https://awsedap.epa.gov	No missing data on key features
All National Priority List (NPL) Superfund Sites data	xlsx	-State and city name - Site epa id - Action start and end time	Downloaded from https://semspub.epa.gov/work/HQ/100000013.pdf	No missing data on key features
1990 5% (1-in-20) census data	csv	-Public Use Microdata Area(PUMA) code -Ethnicity	Extracted from https://usa.ipums.org/	No missing data on key features

Government Representation domain — GR.SV2 and GR.LRA2

	Format	Variables of interest	Scraping Approach	Data quality	Purpose
“List of African American federal judges”	Csv	Judge, Circuit, State, District, Began Active Service	Scrape from https://en.wikipedia.org/wiki/List_of_African_American_federal_judges	No missing values in variables of interest	Finding the number of Black federal judges from 1970-2000, and the states their district served

Government Representation domain — GR.LRA3

	Format	Variables of interest	Scraping Approach	Data quality	Purpose
“CCEST2020 -ALLDATA6”	Csv	“BA_MALE, “BA_FEMA LE”, “HBA_MAL	Downloaded from the official Census	No missing values in variables of interest	Finding the percentage of Black population by

		E”, “HBA_FEM ALE”, “TOT_POP”	website; https://www2.census.gov/programs-surveys/popest/datasets/2010-2020/counties/asrh/		state between the years 2010 and 2020
“List of minority governors and lieutenant governors in the United States”	Tabular	“Minority ethnicity”, “State”, “Term start”, “Term end”	Downloaded the table from Wikipedia; https://www2.census.gov/programs-surveys/popest/technical-documentation/file-layouts/2010-2020/cc-est2020-alldata6.pdf	No missing values in variables of interest	Finding the total number of Black state governors
“Black-American Members by State and Territory”	Tabular	“State or Territory”, “First Took Office”	Scrape from the website https://history.house.gov/	No missing values in variables of interest	Finding the total number of Black house members (Senate & congress)
“African American State Supreme Justices since 1870”	Text/Tabular	Term	Scrape from the website https://www.blackpast.org/special-features/african-american-state-supreme-court-justices-since-1870/	No missing values in variables of interest	Finding the total number of Black State supreme court judges

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Government Representation domain — GR.SV3

	Format	Variables of interest	Scraping Approach	Data quality	Purpose
2017 State Government Tax Tables	XLSX; tabular	“State government and local government amount”, “Description”, “States”	Downloaded from https://www.census.gov/programs-surveys/cog/data/tables/2017/List_1924968137.html#list-tab-List_1924968137	No missing values	To determine how funding differs based by race for 2017
2022 Census of Governments - Organization	XLSX; tabular	GEO_TTL, YEAR, AMOUNT	Downloaded from https://www.census.gov/programs-surveys/cog/data/tables/2017/List_1924968137.html#list-tab-List_1924968137	No missing values, but need to find the variable descriptions	To determine how funding differs based by race for 2022

Process:

For the environmental pollution domain, there is no missing data. However, one difficult point when working with these datasets is that the FIPS code and GEO ID need to be somehow converted to merge the demographics data with HAP emission data. Sometimes the FIPS and GEO ID need to be converted manually due to irregularities in GEO ID. This process took a lot of time since different data sources have different ways of labeling places.

Another difficulty here is in converting PUMA codes to county names and FIPS codes. Also, since the NPL Superfund sites only included city and state names and no FIPS codes, we need to somehow convert the city name, combined with the state name, to the county's FIPS

codes. What we are planning to do is to feed the city name and the state name into Google's Geocoding API, which will return to us the county name. After that, we may need some manual corrections.

Also, there may be some change in county names or county boundaries between the 1990s and now, so we may need to take that into consideration when deciding which county to which the cities belong. Longyuan is currently working on this item and may need to add datasets if necessary.

Initially, the variable for government representation in period 2 (i.e., 1970-2000) looked slightly different. The original variables were supposed to identify counties with Black representation in local offices. However, dealing with local offices in this time period presented several challenges. The main challenge stemmed from the fact that local governments are heavily saturated. There is no end of offices, agencies, and positions in local government. This, in turn, makes it hard to confirm that all Black people who have ever worked in local government are properly accounted for across 50 states over the course of 30 years. This problem, coupled with the fact that there is already a scarce amount of data for this time period, caused us to reassess the definitions of our variables. As to not compromise the thoroughness and accuracy of the variables, we decided to explore other levels of government to quantify this metric.

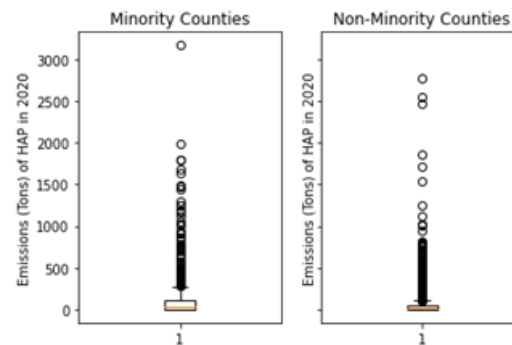
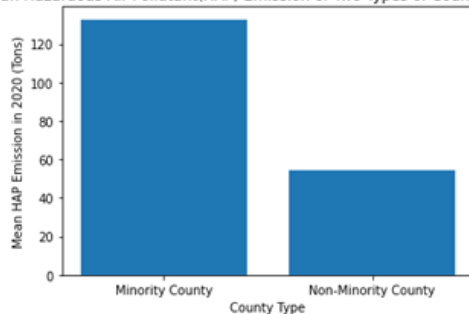
When looking into the data available on state government positions for this time period, we ran into the same issues that we had with the local government. As a result, we decided that national offices were the best direction for these variables, since there are ample verified records about positions held on the national level. The only issue is that we are only interested in state-level or county-level data, and most national offices pertain to serving the nation as a whole. The only viable options were to look into representation in the House of Congress or the federal court system (specifically the District Courts and the Courts of Appeal). Upon reading the 1988 paper "Do Black Judges Make a Difference?", we realized that there was an already-proven relationship between Black representation of federal judges and the livelihood of the Black community. As a result, we redefined our variables to focus on representation of federal judges in the District Courts and the Courts of Appeal. Following the redevelopment of these variables, we found an all-encompassing dataset detailing every Black judge who has been appointed to serve on a federal court. Since, we have been working on cleaning and analyzing this data.

It is extremely difficult (likely impossible) to find an all encompassing dataset of state elected officials from 2010-2020 that includes demographic information. There are many roles at the state level that only exist in certain states, within the executive branch alone. The lack of uniform offices and centralized data can be attributed to the freedom that states are given in governing themselves. As a result, I chose to look at three specific offices and use them as a case study of the remaining positions at the state level. These positions are Congress (both the house

and the senate), state governor, and state supreme court justice. For all three, it was more feasible to look for an exhaustive list of every Black person to hold each office ever. Then, essentially working backwards, I used the details of their terms to narrow it down to those that served between 2010 and 2020. Finally, to find the percentage of Black state representatives for each role, I can divide by the total number of people who served during that same time period. It will also be useful to aggregate the data by summing across positions and finding the percentage of all state representatives who are Black, regardless of the office they held. I have not completed these last two steps because I very recently finished finding the information on the Black state supreme court judges. This process was more difficult than expected and I had to be creative about the way I searched for the data that was relevant to our analyses. Once I settled on this “backwards” approach, it made things much easier.

EDA

Mean Hazardous Air Pollutant(HAP) Emission of Two Types of Counties in 2020



For EP.SV3, Longyuan plotted these two graphs. The first one is the Mean HAP emission of two types of counties, the first one being minority counties, defined by Longyuan as the counties with greater proportion of black residents in 2020, and the second one is non-minority counties. We can see a huge difference here, as the mean HAP emission for minority counties is about 130 tons, while that for non-minority counties is only about 50 tons.

The second graph shows a boxplot of HAP emissions between two counties. Again we can see that the median HAP emission of non-minority counties is lower than that of minority counties, and the distribution of HAP emission for minority counties is centered higher than that of non-minority counties.

Future Works:

Longyuan is expecting to work on EP.SV2 and EP.LRA1 when he finishes his work on EP.SV2. Future datasets may come from similar sources, EPA and IPUMS, for example, because these authorities have the most accurate data of the issue he is working with.

In the future, we plan to run some analyses on the data regarding the Black judges who have been appointed to serve on a federal court from 1970 to 2000. We also plan on looking into the breakdown of federal judicial districts throughout those years. We know what they are in current times, but we are unsure if they have changed in the past; thus, we are proactively taking the necessary measures to confirm the accuracy of each state's count. When all the data has been gathered and processed, we plan to visualize our findings through a temporal map—a map with user controls to explore data over time. Ideally, this will allow viewers to see how Black representation in the federal courts changed throughout the 30 years of this period.

We will finish collecting and merging all of the state representation data so the result is one clean dataset that we can aggregate to find the answer to the original question: What is the ratio of Black representation in state offices to the Black population in that state, for any decade between 2000-2020? From there, we hope to analyze our results across time periods and domains to investigate how these things interact with one another under the large umbrella of structural racism and violence against people racialized as Black.

Contributions:

1. Background
 - a. Research question, problem statement, motivation - Woomy
 - b. Hypothesis - Imani & Dillon
2. Analytic Approach/Statistical Model - Longyuan
3. Literature review
 - a. Pertaining to environmental pollution - Longyuan
 - b. Pertaining to government representation in Period 2 & federal court system - Imani
 - c. Pertaining to government representation in modern times & state offices - Dillon
4. Items, Data Sources, Process
 - a. EP.SV3 & EP.LRA2 - Longyuan
 - b. GR.LRA3 - Dillon
 - c. GR.SV2 & GR.LRA2 - Imani
 - d. GR.SV3 - Woomy
5. EDA - Longyuan
6. Future Works - Longyuan, Imani, Dillon

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