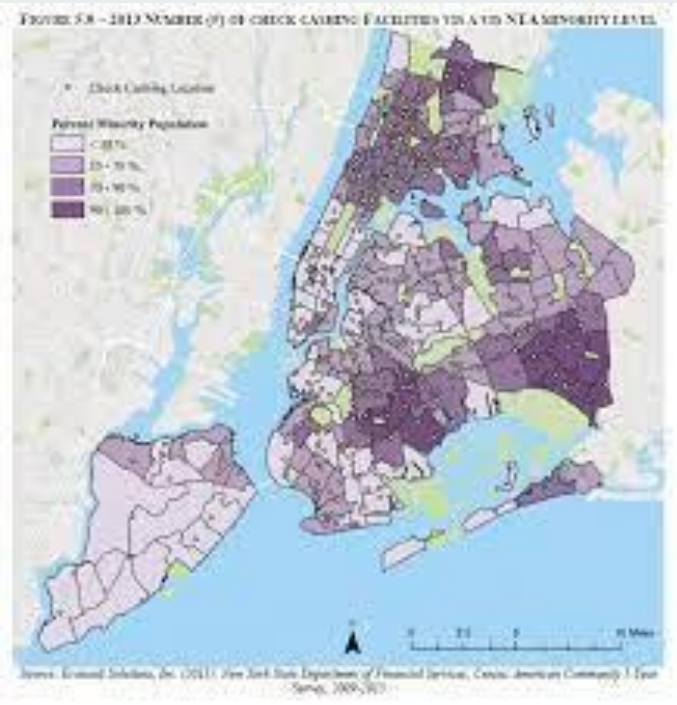# Digital Redlining in Banking

Presented by Alana Robinson & Stephen Sabaugh
CSCI 77800 Fall 2022

Part I

HISTORY OF REDLINING

The Problem: Background on Redlining

What is Redlining? ◀◀
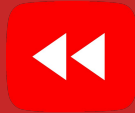
The Legacy of Redlining ◀◀

Redlining is a way that lenders identified and referenced neighborhoods with a greater share of people deemed more likely to default on mortgage. The term is based on the fact that these lenders would use red ink to outline on paper maps the parts of a city that were considered at high risk of default, as well as more desirable neighborhoods for approving a loan. Riskier neighborhoods were predominantly black and Latino.

Physical copies of such maps are stored in the National Archives. The University of Richmond has digital versions of about 200 maps once used for redlining, including the ones on the next 5 slides (Bronx, Brooklyn, Queens, Manhattan, Staten Island) .

Nelson, Robert K, Ayers, Edward L. Robert K. Mapping inequality. American Panorama ed. Retrieved November 25, 2022 from https://dsl.richmond.edu/panorama/redlining].

Brooks, Khristopher. (2020, June 12). What is redlining and is it still happening across the U.S. *CBS News*. Retrieved November 25, 2022 from www.cbsnews.com/news/redlining-what-is-history-mike-bloomberg-comments.

The Problem: Background on Redlining

Digital redlining shares many things in common with traditional redlining, which is the deliberate withholding of loans and other key resources from residents of certain neighborhoods, largely along racial divides.
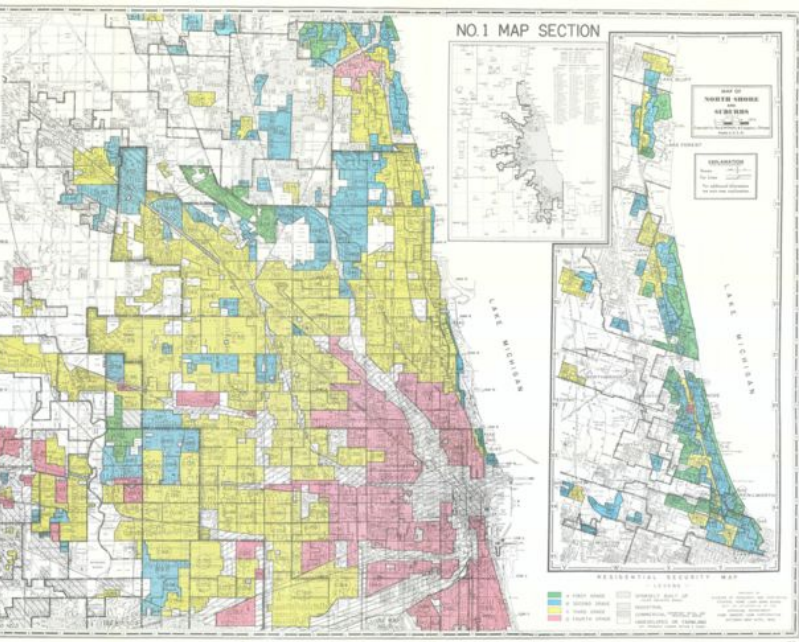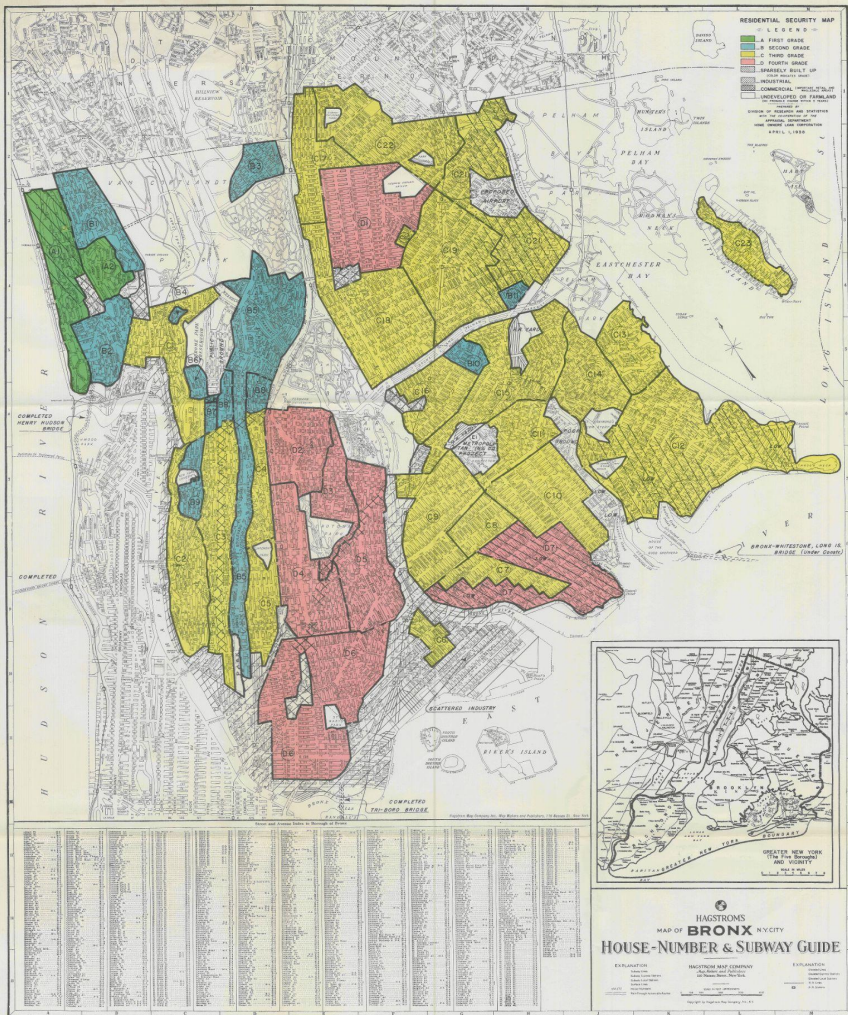
Quaintance, Zack. (2022, March 28). What is digital redlining? Experts explain the nuances. Government Technology. Retrieved November 25, 2022, from
https://www.govtech.com/network/what-is-digital-redlining-experts-explain-the-nuances

Home Owner's Loan Corporation (HOLC) Neighborhood Redlining Grade

Here's an interactive Redlining Map that features the grade for major cities and neighborhood in USA. Type in your address and you will see your neighborhood's physical redlining grade and why.

"The Home Owners' Loan Corporation (HOLC) was created in the New Deal Era and trained many home appraisers in the 1930s. The HOLC created a neighborhood ranking system infamously known today as redlining. Local real estate developers and appraisers in over 200 cities assigned grades to residential neighborhoods. These maps and neighborhood ratings set the rules for decades of real estate practices. The grades ranged from A to D. A was traditionally colored in green, B was traditionally colored in blue, C was traditionally colored in yellow, and D was traditionally colored in red."

Home Owners' Loan Corporation (HOLC) Neighborhood Redlining Grade - Overview

Bronx, Redlined Map - 1938

Interactive Map
https://dsl.richmond.edu/panorama/redlining/#loc=11/40.869/-74.096&city=bronx-ny

Nelson, Robert K, Ayers, Edward L. Robert K. Mapping inequality. American Panorama ed. Retrieved November 25, 2022 from https://dsl.richmond.edu/panorama/redlining.

Brooklyn, Redlined Map - 1938

Interactive Map
https://dsl.richmond.edu/panorama/redlining/#loc=10/40.654/-74.301&city=brooklyn-ny

Nelson, Robert K, Ayers, Edward L. Robert K. Mapping inequality. American Panorama ed. Retrieved November 25, 2022 from https://dsl.richmond.edu/panorama/redlining.

Queens, Redlined Map - 1938

Interactive Map

https://dsl.richmond.edu/panorama/redlining/#loc=10/40.683/-74.239&city=queens-ny

Nelson, Robert K, Ayers, Edward L. Robert K. Mapping inequality. American Panorama ed. Retrieved November 25, 2022 from https://dsl.richmond.edu/panorama/redlining.

Manhattan, Redlined Map - 1938

Interactive Map
https://dsl.richmond.edu/panorama/redlining/#loc=11/40.794/-74.124&city=manhattan-ny

Nelson, Robert K, Ayers, Edward L. Robert K. Mapping inequality. American Panorama ed. Retrieved November 25, 2022 from https://dsl.richmond.edu/panorama/redlining.

Staten Island, Redlined Map - 1938

Interactive Map
https://dsl.richmond.edu/panorama/redlining/#loc=11/40.574/-74.323&city=staten-island-ny

Nelson, Robert K, Ayers, Edward L. Robert K. Mapping inequality. American Panorama ed. Retrieved November 25, 2022 from https://dsl.richmond.edu/panorama/redlining.

The History

Data Visualization of Redlining in NYC

Here is an informative and interactive website that gives historical data visualization of Redlining in NYC using some open source data.

Inequality in NYC - Redlining

Inequality in NYC. https://rayortigas.github.io/cs171-inequality-in-ny.
rayortigas.github.io/cs171-inequality-in-nyc.

Part 2

REDLINING EVOLVES INTO DIGITAL REDLINING

FROM PHYSICAL REDLINING TO DIGITAL REDLINING

Digital redlining, is similar to redlining, a discriminatory practice where resources like housing loans are withheld from certain neighborhoods that institutions have deemed hazardous, generally because they are predominantly home to communities of color or low-income residents.

According to research, the rise of digital banking now have regulators and community advocates concerned about a new form of discrimination, digital redlining. We now understand that digital redlining is a form of discrimination where lenders restrict access to credit, or offer credit on unequal terms, because of the applicants' digital footprint. This type of redlining occurs when products or pricing offered to the consumer or presented in display ads or social media marketing differ by digital channel, so that channels with greater minority usage are offered adverse conditions and higher rates. It can also occur when lenders curate online loan advertising or set loan terms and conditions based on internet tracking or big data.

**Most of these redlined communities are now the same communities that are experiencing digital redlining.

Pazornik, Melissa. (2020, January 30). Digital Banking Raises the Specter of Digital Redlining. *Treliant*, Retrieved November 25, 2022 from www.treliant.com/knowledge-center/digital-banking-raises-the-specter-of-digital-redlining.

Home Owner's Loan Corporation (HOLC),

a federal agency that is now defunct worked with local real estate agencies to create the redlined maps during the Great Depression in the 1930s. HOLC's mission was to assist homeowners with their mortgage.

HOLC's Neighborhood Redlining Grade in 1930s

Here's an interactive map featuring HOLC's Redlining with the grade breakdown for major cities in the USA. Type in your address or city and see your neighborhood's physical redlining grade and why.

"The Home Owners' Loan Corporation (HOLC) was created in the New Deal Era and trained many home appraisers in the 1930s. The HOLC created a neighborhood ranking system infamously known today as redlining. Local real estate developers and appraisers in over 200 cities assigned grades to residential neighborhoods. These maps and neighborhood ratings set the rules for decades of real estate practices. The grades ranged from A to D. A was traditionally colored in green, B was traditionally colored in blue, C was traditionally colored in yellow, and D was traditionally colored in red."

Home Owners' Loan Corporation (HOLC) Neighborhood Redlining Grade - Overview

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a federal agency that is now defunct worked with local real estate agencies to create the redlined maps during the Great Depression in the 1930s. HOLC's mission was to assist homeowners with their mortgage.

HOLC's Neighborhood Redlining Grade in 1930s

The grades ranged from A to D. A was traditionally colored in green, B was traditionally colored in blue, C was traditionally colored in yellow, and D was traditionally colored in red.

A (Best): Always upper- or upper-middle-class White neighborhoods that HOLC defined as posing minimal risk for banks and other mortgage lenders, as they were "ethnically homogeneous" and had room to be further developed.

B (Still Desirable): Generally nearly or completely White, U.S.-born neighborhoods that HOLC defined as "still desirable" and sound investments for mortgage lenders.

C (Declining): Areas where the residents were often working-class and/or first or second generation immigrants from Europe. These areas often lacked utilities and were characterized by older building stock.

D (Hazardous): Areas here often received this grade *because* they were "infiltrated" with "undesirable populations" such as Jewish, Asian, Mexican, and Black families. These areas were more likely to be close to industrial areas and to have older housing.

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Home Owner's Loan Corporation (HOLC),

a federal agency that is now defunct worked with local real estate agencies to create the redlined maps during the Great Depression in the 1930s. HOLC's mission was to assist homeowners with their mortgage.

HOLC's Neighborhood Redlining Grade in 1930s

Banks received federal backing to lend money for mortgages based on these grades. Many banks simply refused to lend to areas with the lowest grade, making it impossible for people in many areas to become homeowners. While this type of neighborhood classification is no longer legal thanks to the Fair Housing Act of 1968 (which was passed in large part due to the activism and work of the NAACP and other groups), the effects of disinvestment due to redlining are still observable today.

Part 3

———

DIGITAL REDLINING

DIGITAL REDLINING

"Digital redlining is the practice of creating and perpetuating inequities between already marginalized groups specifically through the use of digital technologies, digital content, and the internet. The concept of digital redlining is an extension of the practice of redlining in housing discrimination,a historical legal practice in the United States and Canada dating back to the 1930s where red lines were drawn on maps to indicate poor and primarily black neighborhoods that were deemed unsuitable for loans or further development, which created great economic disparities between neighborhoods. The term was popularized by Dr. Chris Gilliard, a privacy scholar, who defines digital redlining as "the creation and maintenance of tech practices, policies, pedagogies, and investment decisions that enforce class boundaries and discriminate against specific groups".

Wikipedia contributors. (2022, July 4). "Digital Redlining. Wikipedia. Retrieved on November 25, 2022 from en.wikipedia.org/wiki/Digital_redlining.

Part 4

DIGITAL REDLINING IN BANKING

Digital Banking increases likelihood of Digital Redlining

According to Pazornik, community activists and regulators fear that with so many people using in digital banking this may increase digital redlining. Generally, digital redlining is a type of discrimination where lenders restrict access to credit, or offer credit on unequal terms, because of the applicants' digital footprint and their neighborhood. This type of redlining occurs when products or pricing offered to the consumer or presented in display ads or social media marketing differ by channel, so that channels with greater minority usage are offered adverse conditions. It can also occur when lenders curate online loan advertising or set loan terms and conditions based on internet tracking or big.

Pazornik, Melissa. (2020, January 30). "Digital Banking Raises the Specter of Digital Redlining." *Treliant*, Retrieved on November 25, 2022 from ,www.treliant.com/knowledge-center/digital-banking-raises-the-specter-of-digital-redlining.

DIGITAL REDLINING in BANKING

"Everyone in the financial services industry is aware of redlining risk, which is a key regulatory priority. Physical redlining is a form of illegal disparate treatment that occurs when residents of majority-minority neighborhoods receive unequal access to credit, or unequal terms of credit, because of the demographics of either the neighborhood in which the credit seeker resides or the residential property to be mortgaged is located. Redlining may violate both the Fair Housing Act and the Equal Credit Opportunity Act, and cause related issues under the Community Reinvestment Act (CRA). Key factors in physical redlining are locations of branches and loan production offices; marketing practices; product availability, terms, and conditions; geographic distribution of applications and approvals; and neighborhood demographics."

Pazornik, Melissa. (2020, January 30). "Digital Banking Raises the Specter of Digital Redlining." *Treliant*, Retrieved on November 25, 2022 from
,www.treliant.com/knowledge-center/digital-banking-raises-the-specter-of-digital-redlining.

[Digital Redlining in Lending](#) (Video Explainer)

"The Department of Justice (DOJ) recently announced that it is spearheading its most aggressive and coordinated enforcement effort to address redlining: its new Combatting Redlining Initiative.

Redlining is when financial institutions and lenders illegally avoid providing services to certain communities that have concentrations of minorities and other protected classes. Digital redlining often relates to disparate impact where banks are setting hard policies or using computer systems that appear to be fair, but the result, and it's not always intended and the result is that discrimination occurs.

Redlining is prohibited by the Fair Housing Act as well as the Equal Credit Opportunity Act. Since more and more financial institutions are trying to become efficient through technology. CFPB director Rohit Chopra discussed digital redlining and the concerns regulators have with digital and algorithmic redlining, which can result from automated underwriting systems. Specifically, Mr. Chopra warned of "*digital and algorithmic redlining*"

Witmer, Adam. (2022, February 4). "What Is Digital Redlining in Lending?" *Compliance Cohort*, 4, Retrieved November 25, 2022 from www.compliancecohort.com/blog/what-is-digital-redlining-in-lending.

<u>Digital Redlining in Lending</u> (Video Explainer)

Now, traditionally, regulators have focused on redlining as it applies to branch locations, advertising methods, and geographic concerns of avoiding certain communities of color. But there is a new element to redlining that the regulators are starting to talk about: digital redlining.

Digital redlining often relates to disparate impact where banks are setting hard policies or using computer systems that appear to be fair, but the result, and it's not always intended, but the result is that discrimination occurs. This is a real concern because more and more financial institutions are trying to become efficient through technology. When that occurs, sometimes we're using tools that could potentially get us in a problem.

Witmer, Adam. (2022, February 4). "What Is Digital Redlining in Lending?" *Compliance Cohort*, 4, Retrieved November 25, 2022 from www.compliancecohort.com/blog/what-is-digital-redlining-in-lending.

Part 5

PERSONAL & ANECDOTAL CONNECTION

This project was inspired by a conversation between the presenters. One presenter talked about the experience of getting the home security system, ADT. In the conversation the presenter who sought the home security system made an observation that her brother, who lives on Long Island, also had the same home security system but was charged at least 80% less for the same security system and with more services. When the presenter inquired with the company about the difference they said they charge base on zip code. Your zip code, the representative said to her, carries a higher charge and service fees.

Both presenters live in Brooklyn. One presenter lives in Cypress Hills, East New York (11208) and the other presenter lives in Greenpoint(11222). The East New York presenter's area is loosely considered a Redlined/Declining area. When you look at the zip code data you will notice a higher percentage of unbanked and underbanked for that zip code and many similar geographic areas in NYC that were formerly redlined.

Part 6

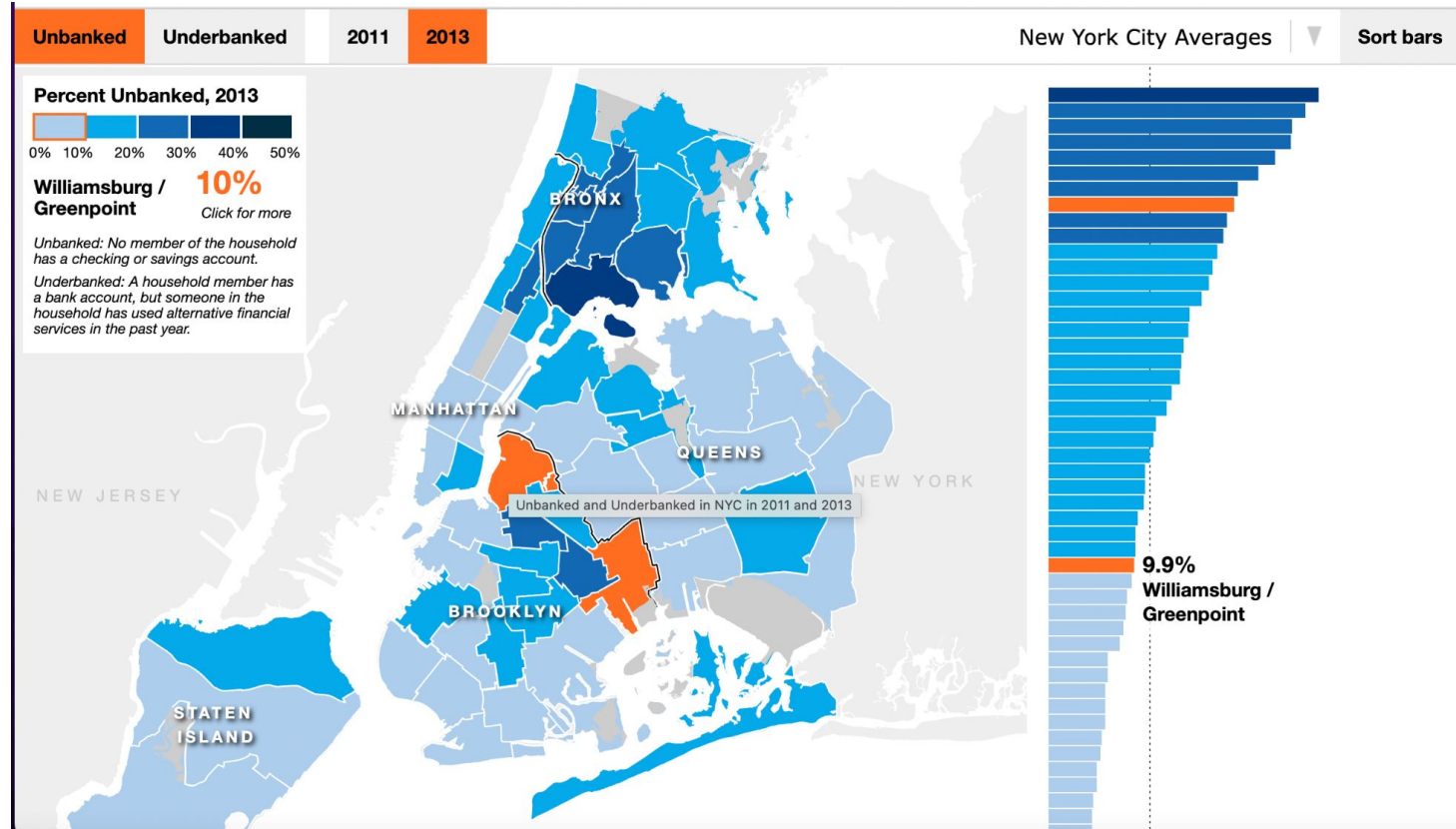## THE DATA: *OPEN SOURCE DATA FROM "NYC OPEN DATA" ON WHERE ARE THE UNBANKED AND UNDERBANKED IN NYC*

RAW DATA SETS USED TO CREATE THE JAVA BANK PROGRAM and the Redlining Algorithm visualization in AWK.

NYC OPEN DATA: RAW DATA SETS USED TO CREATE THE JAVA BANK PROGRAM and the Redlining Algorithm visualization in AWK.

Where Are the Unbanked and Underbanked in New York City | NYC Open Data

Unbanked in Greenpoint

NYC OPEN DATA: RAW DATA SETS USED TO CREATE THE JAVA BANK PROGRAM and the Redlining Algorithm visualization in AWK.

Where Are the Unbanked and Underbanked in New York City | NYC Open Data
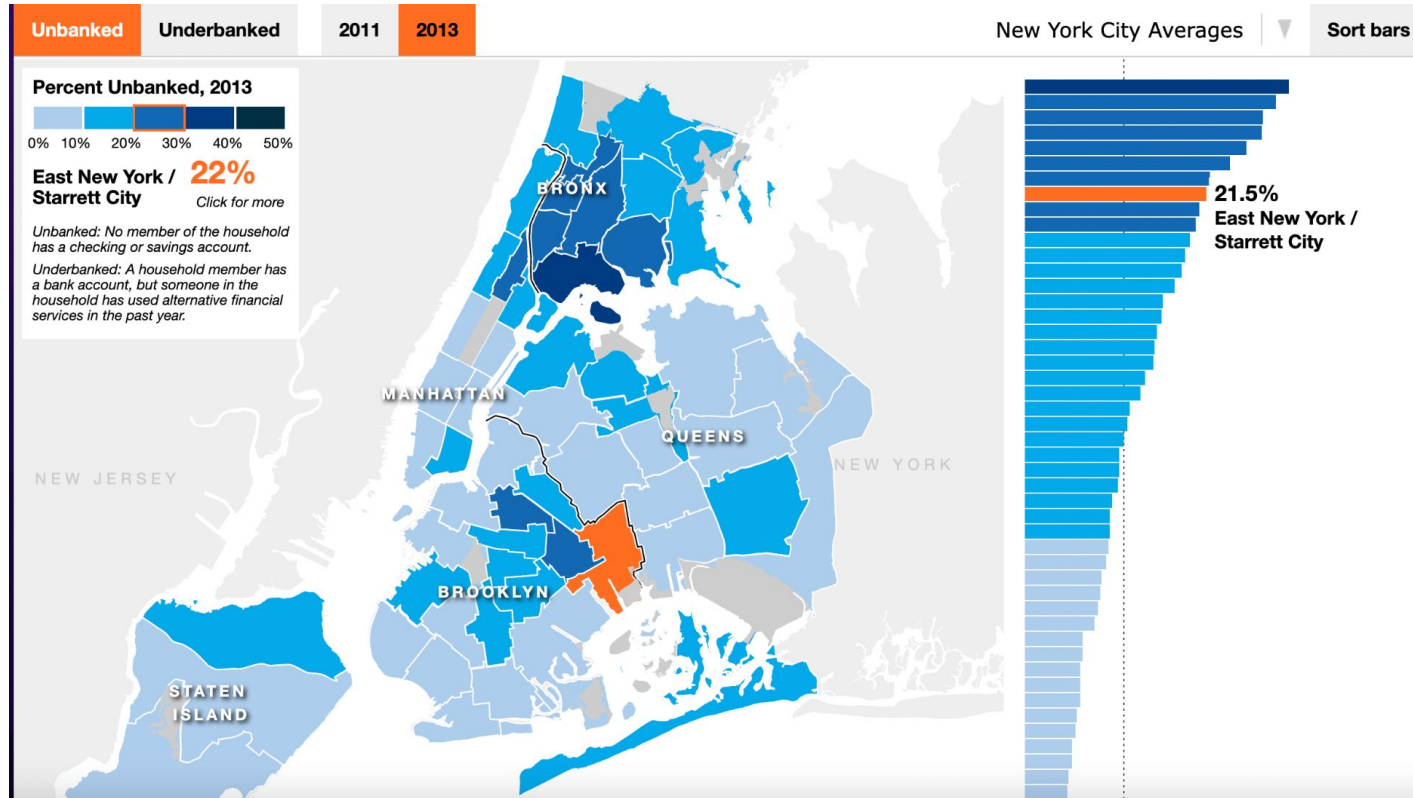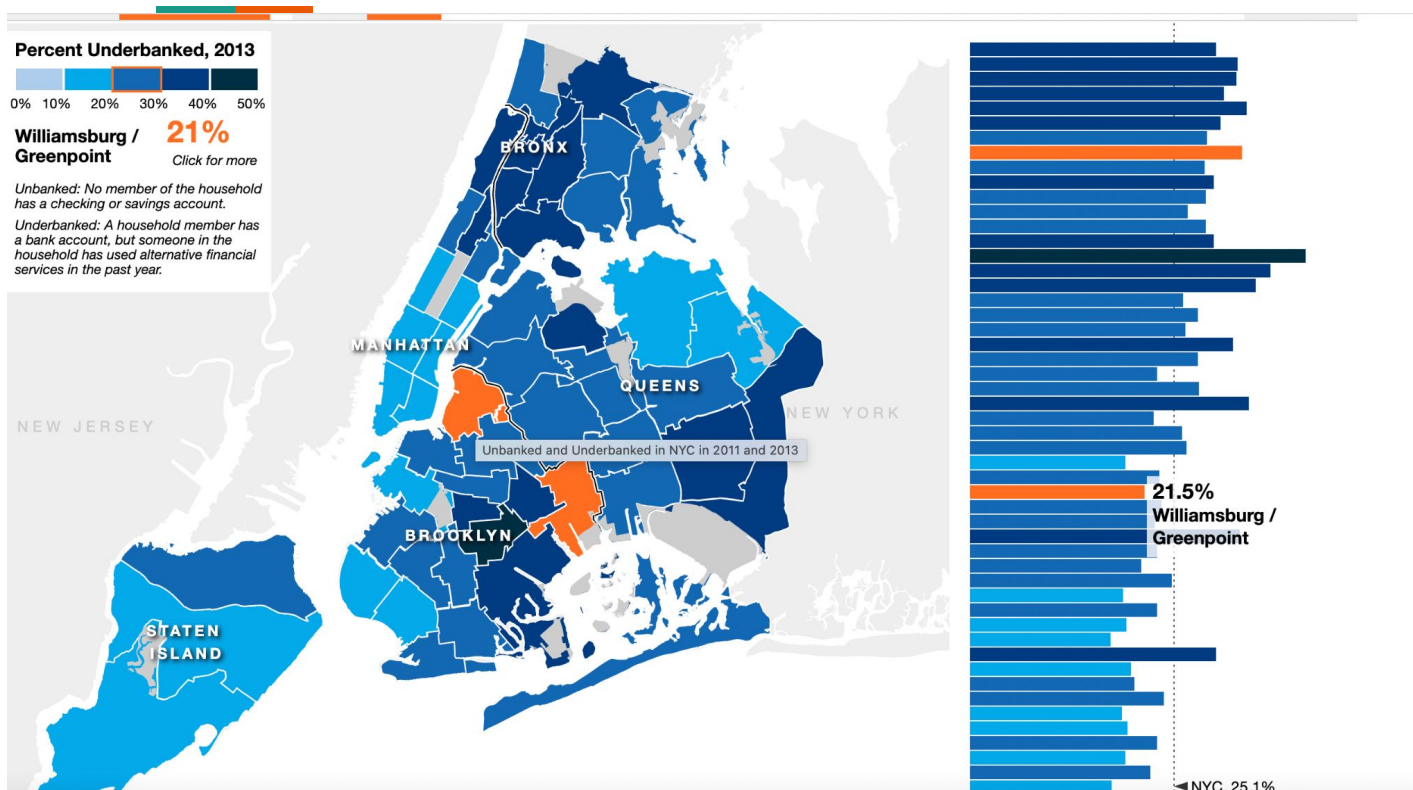

Unbanked in East New York

NYC OPEN DATA: RAW DATA SETS USED TO CREATE THE JAVA BANK PROGRAM and the Redlining Algorithm visualization in AWK.

Where Are the Unbanked and Underbanked in New York City | NYC Open Data

Percent Underbanked, 2013

0% 10% 20% 30% 40% 50%

Williamsburg / Greenpoint   **21%**   *Click for more*

Unbanked: No member of the household has a checking or savings account.

Underbanked: A household member has a bank account, but someone in the household has used alternative financial services in the past year.

BRONX

MANHATTAN

QUEENS

NEW YORK

Unbanked and Underbanked in NYC in 2011 and 2013

BROOKLYN

STATEN ISLAND

NEW JERSEY

21.5% Williamsburg / Greenpoint

◄ NYC. 25.1%

The *underbanked* is a general label describing individuals with little to no bank relationships. The underbanked includes individuals with:
- no bank accounts.
- bank accounts and who regularly use
- nontraditional financial institutions such as check cashers and payday lenders.
credit profiles that limit their ability to obtain bank credit.

Underbanked in Greenpoint

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NYC OPEN DATA: RAW DATA SETS USED TO CREATE THE JAVA BANK PROGRAM and the Redlining Algorithm visualization in AWK.

Where Are the Unbanked and Underbanked in New York City | NYC Open Data

| Unbanked | **Underbanked** | 2011 | **2013** | New York City Averages ▼ | Sort bars |

Percent Underbanked, 2013

0% 10% 20% 30% 40% 50%

East New York / Starrett City **33%** *Click for more*

Unbanked: No member of the household has a checking or savings account.

Underbanked: A household member has a bank account, but someone in the household has used alternative financial services in the past year.

33.5%
East New York / Starrett City

BRONX

MANHATTAN

QUEENS

NEW JERSEY

NEW YORK

BROOKLYN

STATEN ISLAND

Unbanked and Underbanked in NYC in 2011 and 2013

The *underbanked* is a general label describing individuals with little to no bank relationships. The underbanked includes individuals with:
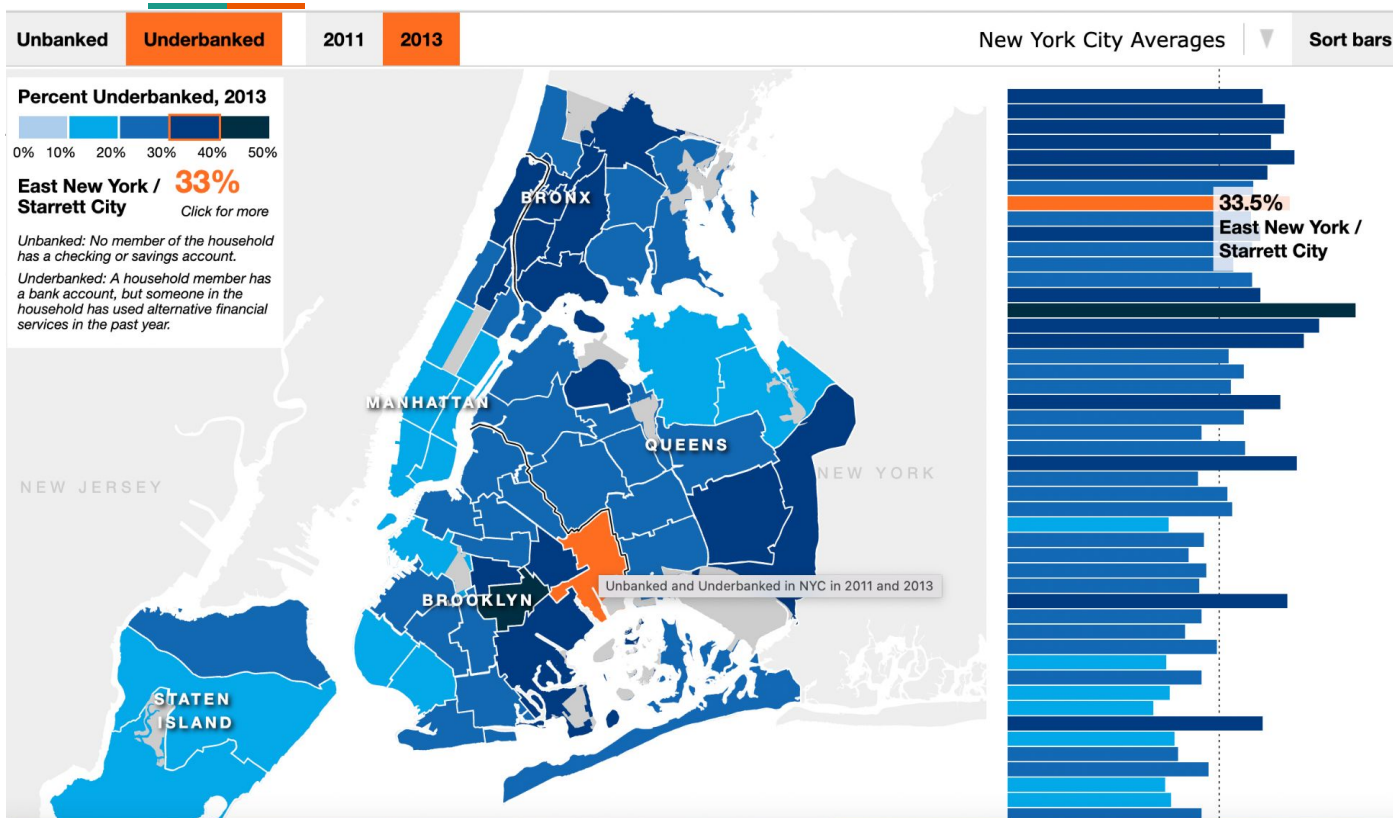- no bank accounts.
- bank accounts and who regularly use
- nontraditional financial institutions such as check cashers and payday lenders.
credit profiles that limit their ability to obtain bank credit.

Underbanked in East New York

29

FDIC DATA: New York State Unbanked

https://household-survey.fdic.gov/place-data?type=state&area=New_York

FDIC Survey Results of Unbanked in New York: 5.9%

Part 7: THE CODE

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THE CODE: PART A
THE JAVA BANKING PROGRAM

THE CODE: PART B
THE REDLINING ALGORITHM in AWK

Code: Java Bank Program using AWK

We implemented our redlining algorithm in our Java Bank Program using data manipulation in AWK.

The program opens up and is run when the customer enters their name and zip code. Based on the customer's zip code they will either be charged a fee or not.


```
AccountUI [Java Application] /Library/Java/JavaVirtualMachines/jdk-17.0.1.jdk/Conten
|Select option number and press enter:|

|Option 1: Add New Account           |
|Option 2: See Balance               |
|Option 3: Transaction               |
|Option 0: Exit                      |

1

Enter First Name:
Alana
Enter Last Name:
Robinson
Enter Zip Code:
11208
Enter Starting Balance:

250
Your Account has a $5.00 monthly fee.
Your first payment is due at the time of opening your account
 Initial Depost: $ 250.00
           Fee: $-  5.00
Current Balance: $ 245.00
|                   Main Menu                   |

|Select option number and press enter:|

|Option 1: Add New Account           |
|Option 2: See Balance               |
|Option 3: Transaction               |
|Option 0: Exit                      |

3

|              Transaction Menu                 |

|Select option number and press enter:|

|Option 1: Deposit                   |
|Option 2: Withdrawal                |
|Option 0: Exit to Main Menu         |
```

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Code: Java Bank Program using AWK

We implemented our redlining algorithm in our Java Bank Program using data manipulation in AWK.

The program runs using the data sets of Unbanked based on zip code and neighborhoods in the 5 boroughs captured from NYC Open Data.

```
Williamsbridge / Baychester              10466 0.160000
Williamsbridge / Baychester              10467 0.160000
Pelham Parkway                           10461 0.150000
Morrisania / East Tremont                10457 0.280000
Morrisania / East Tremont                10456 0.280000
Morrisania / East Tremont                10459 0.280000
Kingsbridge Heights / Mosholu            10463 0.240000
University Heights / Fordham             10453 0.300000
University Heights / Fordham             10468 0.300000
Highbridge / S. Concourse                10452 0.260000
Soundview / Parkchester                  10472 0.220000
Soundview / Parkchester                  10462 0.220000
Soundview / Parkchester                  10460 0.220000
Mott Haven / Hunts Point                 10451 0.310000
Mott Haven / Hunts Point                 10454 0.310000
Mott Haven / Hunts Point                 10455 0.310000
Washington Heights / Inwood              10032 0.180000
Washington Heights / Inwood              10033 0.180000
Washington Heights / Inwood              10040 0.180000
Washington Heights / Inwood              10034 0.180000
Morningside Heights / Hamilton Heights   10025 0.150000
Morningside Heights / Hamilton Heights   10027 0.150000
Morningside Heights / Hamilton Heights   10031 0.150000
Morningside Heights / Hamilton Heights   10032 0.150000
Morningside Heights / Hamilton Heights   10039 0.150000
Central Harlem                           10037 0.200000
Central Harlem                           10026 0.200000
Central Harlem                           10030 0.200000
Central Harlem                           10035 0.200000
East Harlem                              10029 0.190000
East Harlem                              10028 0.190000
North Shore                              10302 0.110000
North Shore                              10303 0.110000
North Shore                              10310 0.110000
Bushwick                                 11206 0.200000
Bushwick                                 11207 0.200000
Bushwick                                 11221 0.200000
Bushwick                                 11237 0.200000
Bedford Stuyvesant                       11205 0.210000
Bedford Stuyvesant                       11216 0.210000
Bedford Stuyvesant                       11221 0.210000
Bedford Stuyvesant                       11233 0.210000
North Crown Heights / Prospect Heights   11216 0.190000
North Crown Heights / Prospect Heights   11213 0.190000
North Crown Heights / Prospect Heights   11217 0.190000
```

Code: Java Bank Program using AWK

We implemented our redlining algorithm in our Java Bank Program using data manipulation in AWK.

The program displays the percentage of unbanked based on the geographic neighborhoods and zips in NYC from the NYC Open Data.

```
Williamsbridge / Baychester              10466 0.160000
Williamsbridge / Baychester              10467 0.160000
Pelham Parkway                           10461 0.150000
Morrisania / East Tremont                10457 0.280000
Morrisania / East Tremont                10456 0.280000
Morrisania / East Tremont                10459 0.280000
Kingsbridge Heights / Mosholu            10463 0.240000
University Heights / Fordham             10453 0.300000
University Heights / Fordham             10468 0.300000
Highbridge / S. Concourse                10452 0.260000
Soundview / Parkchester                  10472 0.220000
Soundview / Parkchester                  10462 0.220000
Soundview / Parkchester                  10460 0.220000
Mott Haven / Hunts Point                 10451 0.310000
Mott Haven / Hunts Point                 10454 0.310000
Mott Haven / Hunts Point                 10455 0.310000
Washington Heights / Inwood              10032 0.180000
Washington Heights / Inwood              10033 0.180000
Washington Heights / Inwood              10040 0.180000
Washington Heights / Inwood              10034 0.180000
Morningside Heights / Hamilton Heights   10025 0.150000
Morningside Heights / Hamilton Heights   10027 0.150000
Morningside Heights / Hamilton Heights   10031 0.150000
Morningside Heights / Hamilton Heights   10032 0.150000
Morningside Heights / Hamilton Heights   10039 0.150000
Central Harlem                           10037 0.200000
Central Harlem                           10026 0.200000
Central Harlem                           10030 0.200000
Central Harlem                           10035 0.200000
East Harlem                              10029 0.190000
East Harlem                              10028 0.190000
North Shore                              10302 0.110000
North Shore                              10303 0.110000
North Shore                              10310 0.110000
Bushwick                                 11206 0.200000
Bushwick                                 11207 0.200000
Bushwick                                 11221 0.200000
Bushwick                                 11237 0.200000
Bedford Stuyvesant                       11205 0.210000
Bedford Stuyvesant                       11216 0.210000
Bedford Stuyvesant                       11221 0.210000
Bedford Stuyvesant                       11233 0.210000
North Crown Heights / Prospect Heights   11216 0.190000
North Crown Heights / Prospect Heights   11213 0.190000
North Crown Heights / Prospect Heights   11217 0.190000
```

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Part 8: Conclusion & Next Steps

- **Teach about Digital Redlining and it's Algorithms**

- **The FCC & States Must Ban Digital Redlining**

  The FCC and States Must Ban Digital Redlining | Electronic Frontier Foundation

Conclusion: Next Steps

"Technological redlining" is the perpetuation of racial, cultural, and economic inequities in technologies. The concept of "redlining" stems from a history of housing discrimination since the 1930s where red lines were (literally) drawn on maps to segregate the poor and dominantly black neighborhoods.
Today, redlining appears virtually in our devices and is regulating the decisions we make. Banks offer high-cost mortgages to people living in minority zip codes; internet service providers don't provide high-speed services to low-income communities; advertisers target ads for housing and employment based on race, gender, and geography."

Nguyen, Anh. (2019, November 20). "Technological Redlining: How Algorithms Are Tearing Communities Apart." *Medium*, 12 Dec. 2021, Retrieved on November 25, 2022 from atnd.medium.com/technological-redlining-how-algorithms-are-dividing-the-country-6939dcc88659

Conclusion: Next Steps

Proposed Solutions:

1. **Teach the ethics of redlining and it's legacy of digital redlining:**
2. **Teach about digital redlining and it's algorithms.**

"Digital Redlining, Access, and Privacy." (2019, November 6). *Common Sense Education*, Retrieved on November 25, 2022 from www.commonsense.org/education/articles/digital-redlining-access-and-privacy.

References: Works Cited

Brooks, Khristopher. "What Is Redlining and Is It Still Happening Across the U.S." *CBS News*, 12 June 2020,
 www.cbsnews.com/news/redlining-what-is-history-mike-bloomberg-comments.

"Digital Redlining, Access, and Privacy." *Common Sense Education*, 6 Nov. 2019,
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 https://atnd.medium.com/technological-redlining-how-algorithms-are-dividing-the-country-6939dcc88659

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Quaintance, Zack. "What Is Digital Redlining? Experts Explain the Nuances." *GovTech*, 18 July 2022,
 www.govtech.com/network/what-is-digital-redlining-experts-explain-the-nuances.

Wikipedia contributors. "Digital Redlining." *Wikipedia*, 4 July 2022, https://en.wikipedia.org/wiki/Digital_redlining.

Witmer, Adam. "What Is Digital Redlining in Lending?" *Compliance Cohort*, 4 Feb. 2022, www.compliancecohort.com/blog/what-is-digital-redlining-in-lending.

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https://dsl.richmond.edu/panorama/redlining
.
Brooks, Khristopher. (2020, June 12). What is redlining and is it still happening across the U.S. *CBS News*. Retrieved November 25, 2022 from
www.cbsnews.com/news/redlining-what-is-history-mike-bloomberg-comments.

Home Owners' Loan Corporation (HOLC) Neighborhood Redlining Grade - Overview

Interactive Map Mapping Inequality

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