Color and Collateral:

Examining Individual and Neighborhood Effects of Race on Housing Valuation and Mortgage Lending

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Executive Summary

Anecdotal accounts of racial bias in residential appraisals have proliferated in the media. Illinois REALTORS® undertook to quantify the relationship between a borrower's race and how likely it is they will receive a residential appraisal lower than the contract price. National Home Mortgage Disclosure Act (HMDA) data was analyzed and demonstrates a significant statistical relationship. Notable findings include:

- **Data available between 2007 to 2020 show a substantial disparity in the denial rates of African American and White applicants.** This finding is robust during healthy economic conditions and recessions, and across different reporting systems. The average disparity is between one to two percentage points. Using 2019 as illustrative, the 1.05 percentage point difference represents an additional 8150 mortgage loans denied to Black borrowers.

- **Disparities between White and minority borrowers vary substantially at the state, county, and neighborhood levels.** While some areas favor minority borrowers, favor for White applicants is common and widespread across the United States.

- **African American applicants in Illinois are twice as likely (8.7% versus 3.5%) to have mortgages denied due to lack of collateral.** The Illinois averages are based on nearly half a million White applications and over one hundred thousand Black and Hispanic applications.

- **Neighborhood homogeneity appears to be rewarded by appraisers.** Black and Hispanic/Latino borrowers, living in a census tract with a greater proportion of minority residents *decreased* the odds of loan denial. White borrowers living in a census tract with a greater proportion of Black or Hispanic residents are more likely to be denied a mortgage due to lack of collateral.

While our analysis demonstrates a significant relationship between a borrower's race and their home's appraised value, further research is warranted, including but not limited to analysis of the vast stores of appraisal data housed by Government Sponsored Enterprises (GSEs) such as Fannie Mae and Freddie Mac.

Introduction

> **"It sinks in, that what was devaluing my home was me."**
>
> - **Carlette Duffy,** Black Homeowner Who Experienced Suspected Racial Bias

In 2020 the topic of racial bias in residential appraisals made national headlines when the New York Times published Kamin's article, *Black Homeowners Face Discrimination in Appraisals.* The article was the first in what would become a regular drip of news coverage about Black Americans facing eerily similar circumstances. A Black homeowner, seeking to sell her home or refinance her residential mortgage, would have the home appraised. When the appraised value seems suspiciously low to the homeowner, a subsequent appraisal is ordered. But before the second appraisal, the homeowner removes evidence of her race. Items such as family photos, books by Black authors, artwork or other objects that might indicate the home is owned by a Black person are stowed out of sight. In some instances, the homeowner asks a White friend or family member to meet the second appraiser. The result: higher appraised values, with sometimes staggeringly high increases in value. As Carlette Duffy, a Black homeowner in Indianapolis who experienced suspected racial bias notes, "It sinks in, that what was devaluing my home was me." (Sheridan, 2021)

Illinois REALTORS® fielded multiple similar anecdotes from members throughout 2020 and established the Discriminatory Appraisals Task Force to begin to understand and address racial bias in appraisals. The mission of the Task Force is to conduct research, educate consumers and identify solutions. The research contained in this report is part of the Task Force's mission to create compelling, quantitative analysis of the relationship between race and appraisal outcomes. While there has been a large amount of research conducted, both quantitative and qualitative, on racist public housing policies such as redlining, scholarship specific to residential appraisals is lacking. Perry (2018) and Howell and Korver-Glenn (2018) produced commonly cited recent studies pertaining to the impact of race on home values and problems with bias in the appraisal industry. The need remains, however, for additional quantitative analysis specific to race and appraised value.

Our research seeks to measure the significance of the relationship between race and low appraisal values. Illinois REALTORS® contracted with Dr. Marshall Jean, an Assistant Instructional Professor of Sociology at the University of Chicago who specializes in large-scale quantitative analysis, to conduct an independent study of federal Home Mortgage Disclosure Act (HMDA) data. The research includes descriptive, longitudinal, regression and hierarchical regression analysis and demonstrates a high level of correlation between race and loan denials based on low appraisals. One challenge to conducting this study was identifying an appropriate large-scale data set. While the HMDA data is large, publically-available, and includes critical inputs, there are some limitations which we outline in our report. Further research in this subject area is warranted and encouraged due to the potential scope and real financial burdens that result from devaluing assets based on race.

Literature Review

The topic of bias in appraisals is underpinned by the knowledge that residential properties in majority Black areas are worth less money than properties in majority White areas (Perry, 2018). While multiple racist housing policies contributed to the structural deprivation of property wealth in Black communities (Rothstein, 2018), racial bias in residential appraisals has received relatively minor attention from researchers. There are a handful of quantitative and qualitative research studies examining the relationship between race and home appraisals.

Perry, Rothwell and Harshbarger's (2018) research thrust the topic of racial bias in appraisals into the mainstream with their finding that homes in Black neighborhoods are undervalued at a national average of $48,000. The research compared structurally similar homes and included a devaluation adjustment for both structural characteristics of the home and neighborhood amenities (Perry, Rothwell, Harsbarger, 2018). Dr. Perry put the appraisal industry squarely on the policy agenda in his testimony to a 2019 Congressional Hearing of the House of Representatives, Financial Services Subcommittee on Housing, Community Development and Insurance titled, "What's Your Home Worth? A Review of the Appraisal Industry."

Previous quantitative research on valuation bias sought to understand the downstream impacts of mortgage redlining. Lang and Nakamura's (1993) quantitative analysis found that homes in redlined neighborhoods receive less accurate appraisals because there are fewer comparable properties which leads to less favorable lending terms. Though they do not name it, their findings suggest the concept of unconscious or systemic bias. In their 1996 paper, Cho and Megbolugbe use a sample of Fannie Mae mortgages to argue appraisal behavior is not influenced by external factors such as redlining. Rather they cast light on possible moral hazard problems with appraisal, finding that in 80 percent of cases, the appraisal was between 0 and 5 percent above purchase price (Cho and Megbolugbe, 1996). With the luxury of hindsight, their initial findings

indicate the structural problems with appraisal that contributed to the eventual housing/mortgage collapse in the early 2000s. The researchers propose an econometric model for empirically testing for systemic appraisal bias across communities with multiple characteristics, including racial composition, but unfortunately the fully developed model was never published (Cho and Megbolugbe, 1996). Both the 1993 and 1996 research do not directly address the relationship between race and appraisal outcomes, instead focusing on "economically rational terms rather than on the basis of racial or ethnic prejudice" (Cho and Megbolugbe, 1996). Apgar and Calder (2005) demonstrate the predilection for appraisers (and others in the homebuying process) to inflate home values for minority borrowers which contributed to the Housing Crash of 2007. As a result, the knowledge base about appraisal fair housing complaints has been built largely on overvaluing (Rice, 2021). The evidence seems to suggest that race plays a role in appraisal to the disadvantage of minority borrowers regardless of whether the values are too high or too low. Federal legislation, post housing crash, shaped the current appraisal regulatory framework which is exacerbating problems in the appraisal industry due to more hours, less pay and a risk averse lending environment (Blake and Kromrei, 2021).

Howell and Korver-Glenn (2018), recognizing a lack of research explicitly examining racial bias in the appraisal industry, undertook to document its presence and how it happens. Their study, which is one of the most cited in media coverage on the topic, identifies racial inequality in home values independent of home characteristics and quality; neighborhood housing stock, socioeconomic status, and amenities; and consumer housing demand (Howell and Korver-Glenn, 2018). They use a quantitative model to look at neighborhood racial composition's impact on tax assessment values. Ethnographic and interview data from residential appraisers illustrates how appraisals are conducted and their susceptibility to racial bias. One of the most striking findings relates to the lack of uniformity in how appraisers select comparable properties, leaving the process open to racial bias (Howell and Korver-Glenn, 2018). One of the appraisers interviewed explicitly signaled that the racial composition of an area meant low housing quality and crime and subsequently chose comparable properties from a racially similar area 30 miles away, overlooking multiple comparable properties that were closer, but in neighborhoods with different racial composition (Howell and Korver-Glenn, 2018). Howell and Korver-Glenn (2018) assert that standardizing the comparable property selection process would aid in reducing the influence of racial bias.

Increased interest from media, policymakers, and real estate industry trade groups has led to calls for the federal government and specifically the FHFA and GSE's to make their appraisal data more easily accessible to the public so that large-scale, quantitative analysis may be performed. In response, Freddie Mac published an analysis of appraisal data that showed a major gap between White, Latino and Black census tracts receiving appraisals that were lower than contract price (Narragon et al, 2021). Their findings indicated borrowers in Latino census tracts were more than twice as likely to receive a low appraisal and borrowers in Black census tracts received low appraisals at a rate 5 points higher than in White census tracts (Narragon et al, 2021). In the absence of a large, public dataset that is appraisal specific, we have identified national Home Mortgage Disclosure Act (HMDA) data as a resource to examine the relationship between race and appraisals.

Data and Methods

The HMDA data requires many financial institutions to report information on mortgage applications they process. Annual datasets from 2007 to 2020 maintained by the Consumer Finance Protection Bureau (CFPB) were available at the time of this publication. Reporting requirements, including which institutions are required to submit data and the nature of the data required, have evolved over the years. As of 2021, any financial institution originating more than 25 closed-end mortgage loans annually must collect, record, and report HMDA data on their mortgage lending. This means that a majority of mortgage applications filed each year are represented in the data set, with between five and ten million records available in most years. Required data include information on borrower demographics (such as race, gender, and age), characteristics of the loan (such as amount, interest rates, originating agency), and characteristics of the property (such as single- or multi-family dwelling and construction type). It includes an indicator of whether the loan was approved, and if not, a set of codes for potential reasons why the loan was denied. Code 4 is "value or type of collateral not sufficient" (FFEIC, 2013). In most cases this denial code indicates that the appraised value of the underlying property was lower than the application loan amount. In limited cases it could also indicate that the applicant refused to make repairs required by certain loan conditions to bring the property up to value. This indicator for denial of the mortgage loan due to lack of collateral is our primary outcome of interest.

The HMDA datasets also provide a select set of information from the US Census based on property location, such as the average age of housing stock in the area, the percent minority residents, and information on the median family income of the census tract. We merged in additional data

from the 2019 US Census American Community Survey (5-year estimates) including the percentage of residents of different racial groups and the percentage of owner-occupied homes at the census-tract level. Census tracts represent useful proxies for local neighborhood areas in large-scale analysis.

One critical issue with the data is that information is reported on mortgage applicants. In the case of home purchase transactions, the applicant is generally not the current resident in the home. Because we are interested in the influence of race on mortgage appraisals, we are missing key information for home purchase transactions. Therefore, we restrict our analyses to applications that list the loan purpose as refinancing or home improvement of properties that are owner-occupied. This eliminates between fifty and sixty percent of the data in any given year. While the remaining sample still represents millions of applications each year, the limitation of analyzing only these types of loans imposes important limits on the generalizability our results. Additionally, because refinance and home improvement loans are often sought by homeowners that have already built equity in their homes, they may be less likely to be rejected due to lack of collateral than new home buyers.

Race and ethnicity are complex social constructs, but it is necessary to reduce this complexity and categorize individuals to make meaningful statistical comparisons across groups. Race and ethnicity are defined separately in the HMDA data, and each application may have one or two borrowers that may have different racial backgrounds. Each applicant may report up to five racial backgrounds. Our unit of analysis is the application, so we operationalize racial groups in the following way:

- If a sole applicant or both co-applicants reported that they are White only and not Latino or Hispanic, the application was coded as White.
- Likewise if the sole applicant or both co-applicants reported that they are Black, Asian, or Native (Native American, Native Hawaiian, or other Pacific Islander) only, and not Latino or Hispanic.
- If a sole applicant or both co-applicants reported that they are White and Latino or Hispanic, or they did not report a race but did indicate Latino or Hispanic ethnicity, the application was coded as Hispanic/Latino.
- If one or more applicants reported a non-White race and Latino or Hispanic ethnicity, or two or more races, or if co-applicants reported different races according to the above scheme, the application was coded as Multiracial.
- If the applicant did not report either race or ethnicity information, the application was coded as "Race Missing".

If ethnicity information was omitted, it was assumed that the applicant(s) were not Hispanic or Latino. Also, it should be noted a small portion of the data include indicators that race and ethnicity information was based on observation or surname, not applicant reports. We analyzed the outcomes of multiracial applications, Native Americans and Pacific Islanders, and those missing racial information to preserve the integrity of the dataset. However, in this report we focus primary on Black/African American, Hispanic/Latino, and Asian applicants.

We conducted a series of analyses to examine the relationship between the racial background of applicants and the rates at which their applications were denied due to lack of collateral. In this report, when referring to denials, we specifically mean applications denied for this reason, not denials generally. We do include applications where other denial reasons are listed in addition to denial for collateral. We are interested in the phenomenon of disparities in home valuation, and this may exist even if there are other important differences among borrowers such as creditworthiness. We omit applications that did not receive an approval decision, such as those withdrawn before a decision or closed due to incomplete filing information.

Our analyses include a description of how denial rates in the data have changed over time, an analysis of geographic variation in disparities in denial rates, and a multi-level, cross-sectional regression analysis that examines the relationship between applicant race, neighborhood racial makeup, and denial rates while controlling for key socioeconomic factors.

Robust Black-White Disparities over Time

We calculated the percentage of applications that were denied due to lack of collateral in available year HMDA data were available for each major racial group. We hoped to find descriptive evidence of change in disparities over time that would suggest whether the phenomenon of discrimination in housing appraisals has decreased or remained constant over time. However, our findings are sensitive to both changes in market conditions and changes in the dataset. For example, the first few years our data were marked by the financial crisis, and a time when these data collection procedures were still relatively new. Therefore, it is likely that the relatively chaotic trends in denial rates during this time reflect these conditions rather than meaningful shifts in appraisal behavior.

As previously mentioned, there were changes in reporting requirements under the HMDA over time. In particular, there was a meaningful overhaul of data reporting in 2018. This coincides with a dramatic increase in the denial rates calculated in this analysis. But due to the timing of the data change, we believe that the spike seen in this year is likely artificial. The decline in 2019 and 2020 may also be attributable to changes in the analytic sample. Mortgage rates declined substantially beginning in 2019, resulting in more people refinancing their homes with lower monthly payments.[1] Together with appreciation in home values, this would lower the general likelihood of denial due to lack of collateral and compress disparities in approvals.

[1] In 2018, refinance and home improvement loans represented 39% of the HMDA data. By 2020, historically low interest rates resulted in a tremendous growth in the overall number of applications, and they represented 62% of the HMDA data.

In all years, a substantial disparity exists in the denial rates of African American and White applicants. This finding is robust during healthy economic conditions and recessions, and across different reporting systems.

Despite these concerns, one trend in the data remains clear. In all years, a substantial disparity exists in the denial rates of African American and White applicants. This finding is robust during healthy economic conditions and recessions, and across different reporting systems. The average disparity is around one to two percentage points. This may seem like a small amount, but across the United States and time it represents a substantial issue. If one takes 2019 as illustrative, the 1.05 percentage point difference in that year represents an additional 8150 mortgage loans denied to Black borrowers.

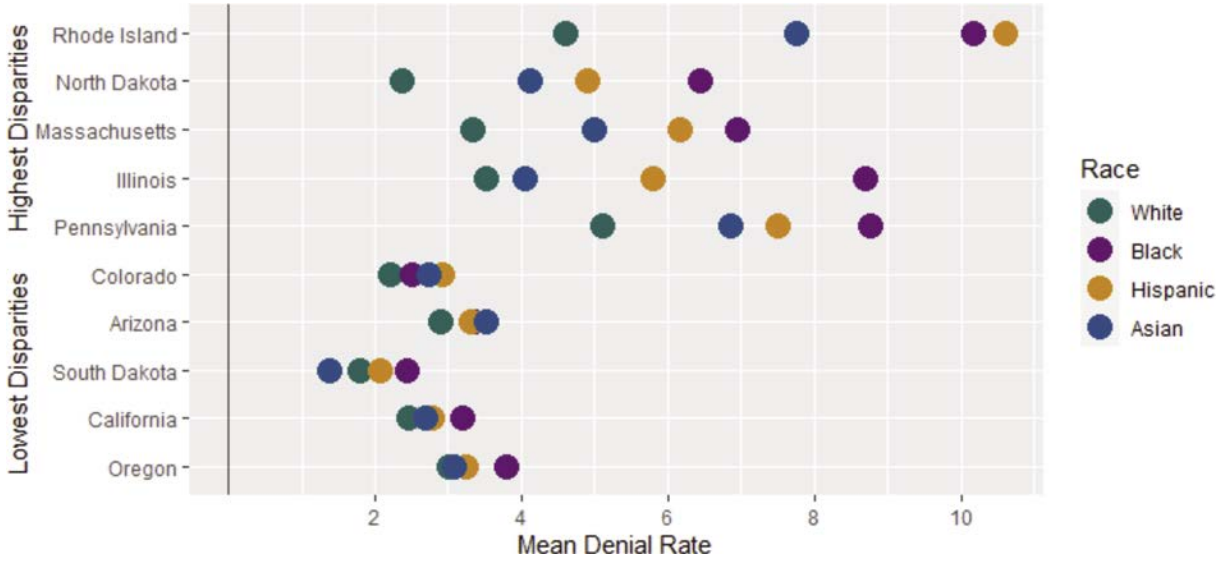
Evidence from these trends is inconsistent regarding the disparities between other racial groups. Asian borrowers generally had slightly lower denial rates than Whites, but not in all years. Hispanic/Latino borrowers appear to have had higher denial rates up until about a decade ago, but the convergence may be due to increased reporting consistency as well as changes in appraisal values. Although not depicted above, the denial rates of Native borrowers were typically similar to those of African Americans, and trends for mixed-race borrowers were general similar to those of Whites.

Rhode Island and Illinois had the greatest disparities in this regard, with African American applicants twice as likely to have mortgages denied due to lack of collateral.

A Widespread Phenomenon

Appraisal discrimination may vary from place to place depending on market conditions or local culture. We examined the three most recent years of data (2018-2020) that have been collected since the last major revision in reporting requirements. We calculated the average denial rates for White, Black, and Hispanic/Latino borrowers in each year and the three-year average at the census tract, county, and state level. We found substantial variation at each level.

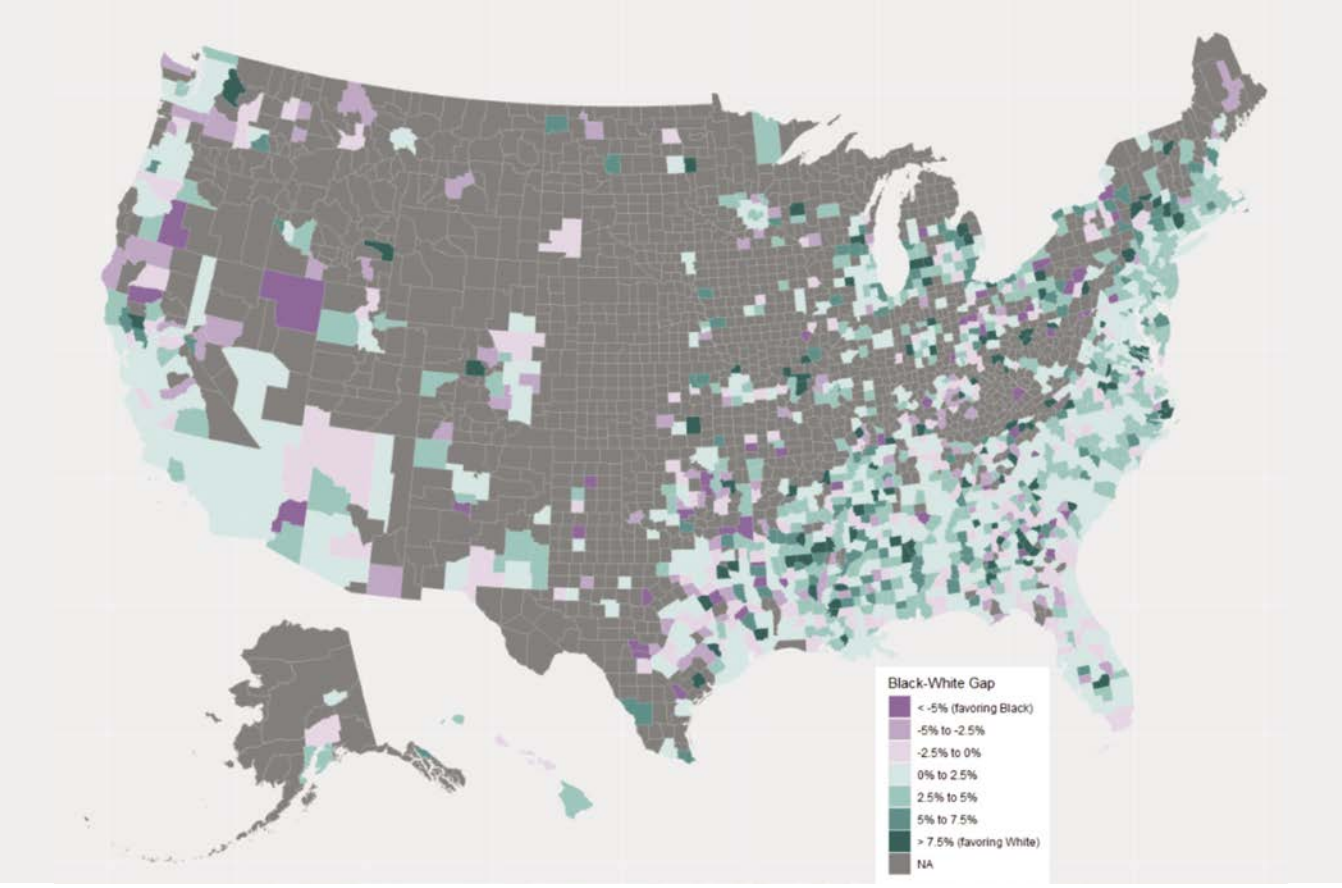
At the state level, Western states tended to have lower racial gaps in denial rates, and disparities were generally higher in the Midwest and Northeast, but exceptions to these general patterns are present in each region. The graph below highlights the states with the highest and lowest advantage of White applicants versus Black. Rhode Island and Illinois had the greatest disparities in this regard, with African American applicants twice as likely to have mortgages denied due to lack of collateral. While Rhode Island is a small state with relatively few minority residents, Illinois is large and diverse. The Illinois averages are based on nearly half a million White applications and over one hundred thousand Black and Hispanic applications. Other states with high gaps included large urban centers with substantial segregation, suggesting a possible relationship that could be explored in future research. The most equitable states included Oregon, California, South Dakota, and Colorado. Hawaii is interesting and unique in that during the most recent three years, all three racial minority groups had lower mortgage denial rates than Whites, including a Black denial rate more than two percentage points lower than the White rate.[2]



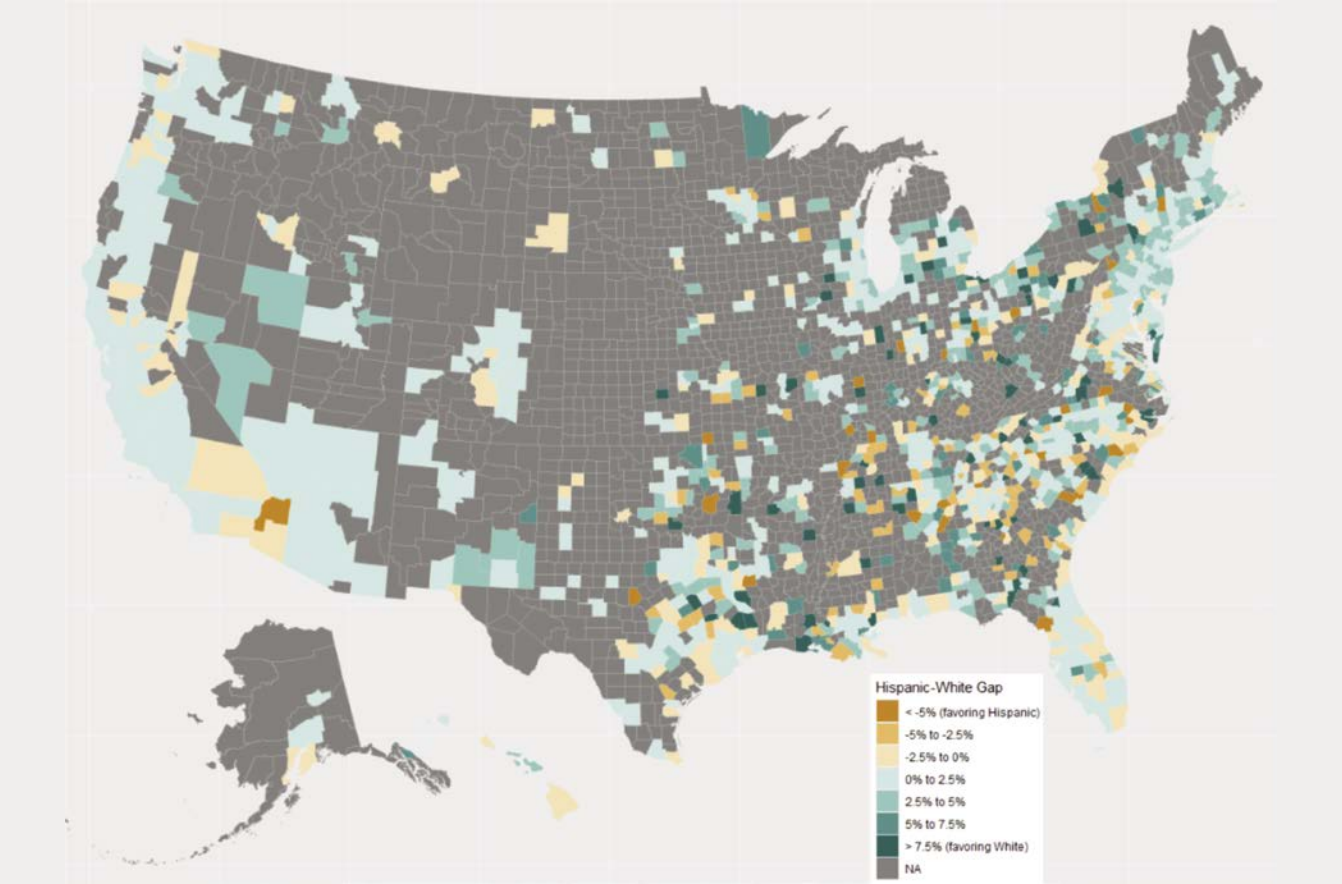
[2] The sample sizes for Hawaii were on the small side, relatively speaking, but sufficient to calculate reliable averages. It included 19669 White, 1093 Black, 1637 Hispanic/Latino, and 8125 Asian applications.

Three-year average Black-White gaps in denial rates at the county level were about 0.6%, with a 25th percentile of -3.6% and a 75th percentile of 3.4%. The Hispanic-White county-level disparity had a median of 0.26%, with 25th and 75th percentiles of -3.9% and 3.4% respectively. Race-specific denial rates and gaps between the rates were positively correlated over time, but not strongly. Among counties with at least 20 Black applicants in 2018, Black denial rates from one year to the next were correlated at slightly more than .25. For Hispanic/Latinos, the correlation was about .30. Correlations in disparities over time were positive and modest, at about .15 for Black-White gaps and .08 for Hispanic-White gaps. In laymen's terms, this means there was slight tendency for counties with higher disparities one year to have higher disparities the next, but there is much more apparently random variation. It is not the case that appraisal discrimination is a persistent, highly-local problem, at least as evidenced by mortgage denials. Rather it is a diffuse issue geographically.

The map below provides a visual of the mean Black-White disparities in mortgage denial rates in counties with at least ten White and ten Black applications during the last three years. The gray areas are those without sufficient racial diversity in HMDA application data to calculate reliable averages for each group. The pattern of approval rates favoring White is widespread, in areas as diverse as the South, Southern California, the Milwaukee/Chicago/Detroit area of the Midwest, and the East Coast. However, there are a smaller number of counties were the disparities are reversed, and Black applicants were more likely to have their loans approved.



The next map examines Hispanic-White gaps with the same criteria. The Hispanic/Latino population is more widespread throughout the US. Again overall approval rates tend to favor whites, but the advantage is less clear. Areas where Hispanic borrowers held small advantages are more widespread. However, it is clear from both maps that the sometimes large disparities seen at the state level are not necessarily consistent through the entirety of the states. Our next analysis confirms and quantifies this more local geographical variation.



The Interaction of Race and Racial Neighborhood Context

Both real estate professionals and social scientists know how important neighborhood context is to the way people act, make judgments, and perceive their surroundings. We believed that it is likely that both the race of the owner and the racial makeup of the neighborhood it is located in can affect the valuations of appraisers. We therefore took a multi-level approach to our analysis. Hierarchical linear modeling (HLM) is similar to linear regression, but rather than assuming the units of analysis are independent of each other, it notes which units are clustered together and assumes that their characteristics may be correlated with each other. These models can be complex and computationally intensive, therefore we focused on a specific year to focus on. The results below are from 2019 , the middle year of the recent data-collection regime, when denial rates were near their historical averages and before the aberrations in the market caused by the coronavirus pandemic.

We utilized a four-level HLM, with 6,212,741 mortgage applications clustered within 71,332 census tracts, which are clustered within 3,306 counties, which are clustered within all 50 states. Some models included control variables. At the application level, control variables included the amount of the loan, applicants' income, debt-to-income ratio, sex, age, and the automated underwriting system(s) used by the financial institution to evaluate the application. At the census tract level, available control variables included median age of housing in the tract, the owner occupancy rate, median family income, and the percent Black, Hispanic, and Asian of the census tract. Models were estimated using the HLM 8 Software (Raudenbush, Bryk, and Congdon, 2019)

We began with an unrestricted model with no covariates to determine the proportion of variance in denial rates at each level. We found that 38% of the variance lies at the census tract level, 40% at the county level, and 22% at the state level.

As we began to explore the effects of borrower race and the racial context of the neighborhood, familiar patterns emerged. Minority borrowers, including Asians, were more likely to be denied mortgages due to lack of collateral. Additionally, applications to refinance or improve homes in neighborhoods with a higher percentage of minority residents were more likely to be denied. Analysis of variance confirmed that there is significant variation among counties and states in the White-minorities achievement gaps. Variation at the census-tract level is also substantial, but many tracts had too few minority applicants to reliably estimate tract-specific gaps.

[3] We compared the results of selected models using data from 2018 or 2020 as well. While estimates naturally varied slightly from year to year, the findings were substantively consistent with those detailed here.

[4] Some variables in the HMDA data are binned to protected privacy. We used midpoint coding for these, and controlled for their linear effects. Some variables had missing data. Mean imputation was used and missing data flags were included in the models.

[5] We found that the percent Asian of the tract was the weakest contextual variable in terms of its relationship to denial outcomes. Additionally, it is mathematically problematic to include multiple measures that are mechanically related to each other (such as percent Black, Hispanic, and Asian) in a regression model. Therefore we did not include the percent Asian in our final models.

For White borrowers, living in a census tract with a greater proportion of Black or Hispanic residents was associated with higher odds of being denied a mortgage due to lack of collateral. But for Black and Hispanic/Latino borrowers, living in a census tract with a greater proportion of minority residents *decreased* the odds of denial.

But the most interesting finding was the interaction between applicants' racial backgrounds and the makeup of the neighborhood in which they lived. Consider the following model:

Level-1 Model

$$\text{Prob}(DENIEDV_{ijkl}=1|\pi_{jkl}) = \phi_{ijkl}$$
$$\log[\phi_{ijkl}/(1 - \phi_{ijkl})] = \eta_{ijkl}$$
$$\eta_{ijkl} = \pi_{0jkl} + \pi_{1jkl}*(BLACK_{ijkl}) + \pi_{2jkl}*(HISPANIC_{ijkl}) + \pi_{3jkl}*(ASIAN_{ijkl}) + \pi_{4jkl}*(NATIVE_{ijkl}) + \pi_{5jkl}*(RACE\_MIXED_{ijkl}) + \pi_{6jkl}*(RACE\_MISSING_{ijkl})$$

Level-2 Model

$$\pi_{0jkl} = \beta_{00kl} + \beta_{01kl}*(PERCENT\_BLACK_{jkl}) + \beta_{02kl}*(PERCENT\_HISPANIC_{jkl}) + r_{0jkl}$$
$$\pi_{1jkl} = \beta_{10kl} + \beta_{11kl}*(PERCENT\_BLACK_{jkl}) + \beta_{12kl}*(PERCENT\_HISPANIC_{jkl}) + r_{1jkl}$$
$$\pi_{2jkl} = \beta_{20kl} + \beta_{21kl}*(PERCENT\_BLACK_{jkl}) + \beta_{22kl}*(PERCENT\_HISPANIC_{jkl}) + r_{2jkl}$$
$$\pi_{3jkl} = \beta_{30kl} + \beta_{31kl}*(PERCENT\_BLACK_{jkl}) + \beta_{32kl}*(PERCENT\_HISPANIC_{jkl}) + r_{3jkl}$$
$$\pi_{4jkl} = \beta_{40kl}$$
$$\pi_{5jkl} = \beta_{50kl}$$
$$\pi_{6jkl} = \beta_{60kl}$$

The level-3 and level-4 models add no covariates, but do contain random effects for each level corresponding to the level-2 random effects *r* above. Each covariate is centered around its group mean. White borrowers are the reference group.

The key feature of this model is the interaction between applicants' race and the racial makeup of the census tract. β_{00} represents the average log-odds of denial for a borrower in a neighborhood with the average racial makeup in its county (in terms of the percentage of Black and Hispanic residents). β_{01} represents the average change in the log-odds of denial for a one-percentage-point increase in the proportion of Black residents in the neighborhood, and β_{02} represents the average change for a one-percentage-point increase in the proportion of Hispanic/Latino residents. β_{10} represents the mean difference in the log-odds of denial between White and Black borrowers (i.e. the "Black-White gap"). Therefore β_{11} and β_{12} represent how changes in the Black and Hispanic makeup of the neighborhood change the Black-White disparity at the individual level.

We found that the effect of applicants' race was different depending on the racial makeup of the neighborhood in which he, she, or they lived. For White borrowers, living in a census tract with a greater proportion of Black or Hispanic residents was associated with higher odds of being denied a mortgage due to lack of collateral. But for Black and Hispanic/Latino borrowers, living in a census tract with a greater proportion of minority residents *decreased* the odds of denial. That is to say, Black and Hispanic borrowers appear to be penalized somewhat less if they are living in a neighborhood with other people of color.[6]

[6] In other models, we found that the percent Asian in a tract was associated with slightly lower odds of denial for White and Asian borrowers, but generally not for Black or Hispanic.

The output of hierarchical logistic regression models are difficult to interpret for non-statisticians, so we include a table below that summarizes an example of this key finding. In the first row, the model-estimated mean denial rates for a White applicant living in a census tract with the average racial makeup for its county. The second row displays the estimated average change in the denial rate if the applicant lives in a census tract that has a 20-percentage-point higher population of African American residents than the county average. The third row provides estimates for an applicant living in a census tract with a 20-percentage-point higher population of Latino/Hispanic residents than the county average. We present results from two models, a base model (described above) that examines unadjusted racial disparities, and an expanded model that controls for application- and neighborhood-level covariates described in the second paragraph of this section.

	Estimated without controls		Controlling for covariates	
	Denial Rate	Contextual Change in Rate	Denial Rate	Contextual Change in Rate
White Applicant	5.29*		4.54*	
+20% Black	6.21*	0.92*	5.06*	0.52*
+20% Hispanic	5.72*	0.44*	4.51	-0.03
Black Applicant	6.63*		5.22*	
+20% Black	6.07*	-0.55*	5.00*	-0.22*
+20% Hispanic	6.30*	-0.33*	5.15	-0.06
Hispanic Applicant	6.59*		5.02*	
+20% Black	6.23*	-0.36*	4.96	-0.07
+20% Hispanic	6.29*	-0.30	4.93	-0.09
Asian Applicant	7.27*		5.45*	
+20% Black	7.24	0.02	5.54	0.09
+20% Hispanic	7.51	0.27	5.63	0.18
Native Applicant	8.80*		6.34*	
Mixed-Race Applicant	6.28*		5.58*	
Application Missing Race	4.83*		5.17*	

* Indicates a statistically- significant relationship at conventional levels of significance (p<.05)

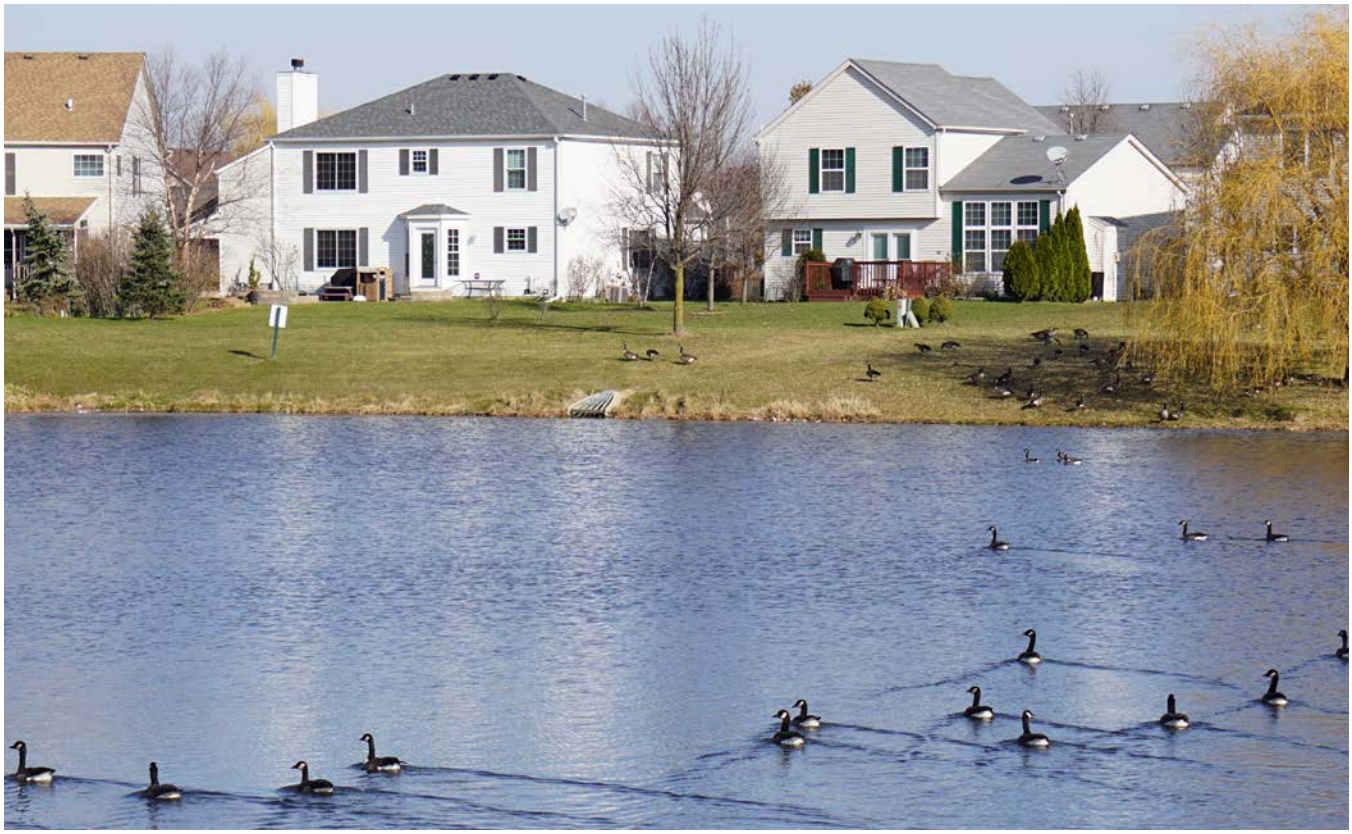
According to the model-based estimates, White applicants have an average denial rate of 5.29 within a neighborhood (census tract) of average racial makeup in its county. But if a White borrower applies for a new mortgage on their home in a neighborhood with twenty-percentage-points more Black residents, the probability of denial increases to 6.21 percent. A similar, weaker phenomenon is observed for neighborhoods that are more predominantly Hispanic/Latino, although the effect is still statistically significant. The inclusion of application and neighborhood-level controls reduces effect of neighborhood racial makeup, although the effect of Black representation in neighborhoods remains substantially negative.

Black applicants are about 25% more likely (1.34 percentage points in absolute terms) to have their applications denied due to lack of collateral. However, this disparity *diminishes* by more than a third if the mortgage is for a home in a neighborhood with a twenty-percentage-point higher representation of Black residents than average in that county. The effect of surrounding Hispanic/Latino population on Black-White disparities is smaller, and no longer significant after controlling for covariates.

Hispanic/Latino applicants also see decreased disparities with White borrowers if they live in higher-minority neighborhoods. The effects of Black and Hispanic neighborhood representation are moderate and similar in the base model. They are also mostly explained by the socioeconomic control variables introduced in the expanded model.

The effects of neighborhood representation on Asian borrowers are less consistent. In the base model above, the effect of Hispanic representation is marginally significant (p=.052), but the size and direction of the interaction effects differed in other years. Asian-White disparities are more difficult to calculate due to the low number of census tracts with significant numbers of Asian borrowers. We therefore interpret these effects with caution. Native applicants had significantly higher denial rates than Whites, and those with mixed-race applications had slightly higher denial rates. Evidence for the interactive relationship between these racial groups and neighborhood context was inconsistent as well.

We can only speculate regarding the causes behind this phenomenon. It may be that appraisers unconsciously interpret a match between the race of homeowners and the surrounding neighborhood as a more natural living situation. Some appraisers interviewed by Howell and Korver-Glenn (2018) indicated that they privilege racial composition of neighborhoods over other criteria when selecting comparable homes during the appraisal process. Some models did suggest evidence that the match between particular racial groups (e.g. Hispanics borrowers in Hispanic neighborhoods, or Asian borrowers in Asian neighborhoods), but this pattern was not consistent. But the general pattern of White homeowners experiencing higher denial rates in higher minority areas, and Black and Hispanic/Latino homeowners experiencing (relatively) lower denial rates in higher-minority areas was robust across model specifications, as well as 2018 and 2020 data. Across most models, the proportion of Black residents appeared to be the most salient characteristic, predicting a larger penalty for White borrowers and a larger (relative) benefit for minority borrowers.



Discussion and Future Research

While the HMDA data are not ideally suited for examining issues related to the appraisal process, they do provide insight into an important downstream outcome – the success or failure of the mortgage application process. We have found evidence of persistent disparities in mortgage approval outcomes, primarily attributable to property valuations, between White applicants and all major racial minority groups in the United States. These disparities persist even after controlling for key socioeconomic factors at both the individual and neighborhood levels. Although it is somewhat concentrated in some states and counties more than others, the phenomenon is widespread through the country. These disparities result in the denial of many thousands of mortgage loans each year.

Our findings are generally convergent with the recent research note prepared by analysts with Freddie Mac (Narragon et al, 2021). Their analysis benefited from actual appraisal data, and they found robust evidence of racial disparities in valuation. However, our findings on the interaction between applicants' race and the racial makeup of the neighborhood contrast with the Freddie Mac study. They found that Black and Latino borrowers experienced lower property appraisals in higher-minority census tracts, comparing those in tracts with 50-80% (matched) minority versus 80-100% minority. We operationalized minority concentration as continuous and considered both the percent Black and Latino makeup of tracts simultaneously. It may be that the interactive relationships between individual and neighborhood race are non-linear. That is to say, they may operate differently in neighborhoods with a small or moderate number of minority residents than they do in more segregated neighborhoods. This will be an important question for future research.[7]

This provokes another key issue for future research, the need for additional data. In particular, greater transparency and availability of housing appraisal data will be needed to address equity concerns in this critical part of the home buying process. Congress and the CFPB could require appropriate collection and publication of appraisal data in a manner that protects individual privacy, much as what has been done with mortgage data via the HMDA. The additional transparency gained by this, and the potential for additional attention on this issue, may in itself have a positive effect on the behavior of home appraisers.

[7] An alternative explanation for the divergent findings is technical. Narragon et al. faced the same issue in their data concerning racial identification of homeowners as we did with the HMDA data. Application data is based on borrowers, but appraisals are conducted on sellers' homes. We decided to limit our analyses to only those applications where the race of the homeowner was provided (owner-occupied refinance and home improvement loans). The Freddie Mac researchers acknowledge this limitation, and elected to analyze their complete data set.

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