

Racial Disparity in Arrests Increased as Crime Rates Declined

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ABSTRACT

Racial disparity in arresting behavior is not only a concern for people of color; it can delegitimize law enforcement, increase tension between police and citizens, and even increase crime. Efforts at police reform stall, in part because racial disparity in policing was previously unmeasurable. The authors present three new measures of racial disparity in arrest, measured across more than 13,000 agencies nationwide, allowing for reliable analysis of disparity across time and geographic space. They demonstrate that, between 1999 and 2015, while crime rates generally declined, racial disparity in arrest increased substantially. Where the average police agency in 1999 arrested 5.48 Blacks for every White, the 2015 average was 9.25 arrests, nearly twice that. The increase derives largely from disparity in juvenile arrests by urban municipal agencies.

Main Text:

Americans commit fewer crimes than they did three decades ago. Since the early 1990's, crime rates have generally been declining (1, 2). It might be tempting to interpret the decline as evidence of more effective policing, except that Americans have become *less* inclined to trust the police.

In a 2001 public opinion poll, 78 percent of respondents said they trusted the police (3), but by 2018, that number declined to 43 percent (4). Recent high-profile examples of racial bias in policing increased public concerns about crime-fighting policies and even sparked a large-scale social movements (5). Race-driven arresting behavior is not only problematic for people of color; it also threatens the legitimacy of law enforcement agencies and endangers fundamental democratic values (6, 7). Policing is often the most visible form of state interaction and the public expects police to be fair, impartial, effective and restrained in the pursuit of justice (6, 8). Increases in fairness and impartiality increase the likelihood police action will be accepted and supported by the public, and may itself decrease crime rates (8).

Police also have significant discretion when deciding to ignore, warn, cite, or ultimately arrest (8). Because arrest is the first step in the criminal justice pipeline, bias or disparity in police actions carries forward through the whole criminal justice process (9, 10).

In 1994, in response to the Rodney King controversy, Congress passed the Violent Crime Control and Law Enforcement Act¹, which gave the Department of Justice (DOJ) Civil Rights Division authority to investigate and litigate against law enforcement agencies with “a pattern or practice of [problematic] conduct” (11, 12). This was the authority used by DOJ officials to investigate police conduct in Ferguson, Missouri. After 100 person-days of on-site investigating, the DOJ concluded:

¹ Originally passed as 42 U.S.C. §14141, recoded as 34 U.S.C. § 12601.

“The harms of Ferguson police and court practices are borne disproportionately by African Americans, and there is evidence that this is due in part to intentional discrimination on the basis of race.” (13)

The massive data collection initiative undertaken by DOJ investigators highlights one of the significant problems facing researchers of race and crime: there is no well-developed measure of racial disparity in arrests. Arrests are the product of two processes: commission of actual crimes; and police behavior and actions. Actual crime is inherently unobservable – at best, we can only measure the number of crimes reported, observed, or designated as solved, and each of these is subject to biases and limitations (14). However, we present below the first comprehensive nationwide measure of racial disparity in African-American arrests.

In this article, we present three measures of racial disparity in adult and juvenile arrests for 13,917 agencies, including 2,908 county and 11,009 municipal police, from 1999 through 2015. Results show the average 2015 police agency arrests 15.6 Black adults for every White adult, and 5.5 Black juveniles for every White juvenile. Across all three metrics, we show levels of racial disparity in arrest nearly doubled over the seventeen-year period, with the largest increases driven by rising disparity in local juvenile arrests. Some communities show drastically higher levels of disparity, with urban areas tending towards the largest disparities. We then use the heightened standard of racial bias investigations, DOJ investigative findings (e.g., the Ferguson report), to validate our results.

MEASURING RACIAL DISPARITY IN ARRESTS

The Federal Bureau of Investigation’s Uniform Crime Reporting (UCR) Program, the primary source of national data on criminal arrests, consists of monthly arrest data for participating state and local law enforcement agencies². UCR reporting is voluntary and an average 77.1 percent of agencies report in any given year.³

From 1999 through 2015, UCR recorded data on 172,319,182 arrests – enough for every American adult in 2015 to have been arrested once. While we necessarily focus on arrests of African Americans, the full dataset contains 118,329,821 White arrests, 49,571,340 Black arrests, 2,075,546 Asian arrests, and 2,342,475 American Indian or Alaskan Native (AIAN) arrests.⁴

Because racial groups are not distributed uniformly across jurisdictions, a simple count of arrests by race is an insufficient measure of racial disparity. For instance, an agency which arrests 10,000 Whites and 30,000 African-Americans may be showing significant disparity if the

² For information on data quality, see (15), section I.

³ Reporting agencies are treated as a non-random subset of all agencies. For information on non-responses, missing data, and imputations, see (15), section II.

⁴ For descriptive statistics on arrests over full period, by agency type, see Table S6 in (15).

arrestable population is 70 percent White, or no disparity at all if the population is 25 percent White. Therefore, we adjust arrest numbers to account for the population at risk of arrest.⁵

Geographic population estimates come from the U.S. Census and American Community Survey (ACS). Using estimates of racial population within an agency's jurisdiction, we first calculate a simple risk ratio as a comparative baseline to assess racial disparities in arrests. The risk ratio is the natural log of the arrest rate for the Black population divided by the arrest rate for the White population.⁶

A risk ratio provides an easily interpreted measure of relative arrests. A risk ratio of 3, for example, means an agency arrests three time more African-Americans than Whites, given the racial distribution of their jurisdiction.

After accounting for population size, the average agency arrests 11.6 Black adults for every White adult and 3.6 Black juvenile for every White juvenile over the full period. This risk has increased over time. In 1999, the average agency arrested 5.4 African-Americans for every one White arrest, but by 2015 that number had nearly doubled to 9.25.⁷

Because risk ratios are highly skewed, we utilize the natural log of the risk ratio. However, interpreting logged risk ratios is slightly less straightforward. Logged risk ratios greater than zero mean African-Americans have a higher risk of arrest than Whites, while a risk ratio less than zero would mean Whites have a higher arrest risk.

A non-trivial number of communities have no African-Americans residing in the police jurisdiction. In those cases, even a small number of Black arrests can substantially increase measures of arrest disparity. Logged risk ratios have been weighted by the jurisdiction's African-American population to describe the shared policing experience of the average African-American and to reduce the influence of agencies which police very few Blacks.

As shown in Figure 1, between 1999 and 2015, logged risk ratios increased significantly.⁸ In 1999, the average African-American lived in a community with 1.4 Black arrests for every White arrest. By 2015, that number had increased to 1.8. Most of the increase is driven by arrests at the municipal and local level, where arrests increased from 1.2 in 1999 to 1.5 by 2015.

[Figure 1 - Risk ratio (logged), for local and county agencies, 1999-2015.]

⁵ For more on determining agency's jurisdictional population, see (15), section III.

⁶ Arrest rates include a population adjustment. For details, see (15), section III(C).

⁷ Summary statistics for the risk ratio are in Table S7 in (15).

⁸ To aid in interpretation, all logged risk ratios are presented as exponentiated.

Figure 2 is a map of risk ratios by county. Counties are omitted if more than 40 percent of residents are policed by agencies which failed to report data. The map reveals substantial geographic variation in policing behavior, with larger-population agencies showing higher risk ratios. Rural agencies had an average risk ratio of 1.1, suburban agencies averaged 1.5, and urban agencies averaged 1.9, though there were significant variation within each type.⁹

[Figure 2 - Risk ratio (logged) averaged across both local and county agencies, 2015.]

THE IMPACT OF ACTUAL CRIME RATES

Police arrest behavior results from a combination of two processes: (a) the actual rate at which crimes are committed; and (b) police policies and procedures that result in arrest (16-18). The risk ratio above provides a good baseline measure of relative arrest, but since it does not take into account racial differences in the underlying rate of commission of crime, it fails to disentangle these two processes. To determine where police policies and procedures result in disparity, we need to determine when an agency arrests a specific sub-group at a higher rate than it “should”. This raises the question, at what rate *should* an agency be arresting members of a group? The deceptively simple answer is that an agency should be arresting individuals who commit crimes, but before we can determine whether the agency arrests more than it should, we must first try to estimate the underlying rate of crime commission within that agency’s jurisdiction.

As the actual rate of crime commission is unobservable, there is no actual measure of how many crimes are committed. Thus, it is not possible to control for the actual commission of crime and leave only the second process – policing behavior. However, it is possible to control for factors which have been empirically demonstrated to affect actual rates of criminal offending. Specifically, we control for Black-White median income ratio; Black-White poverty rate ratio; number of female-headed households; rate of between-county geographic mobility; Black-White high school dropout rate ratio; Black-White educational attainment ratio for high school completion; Black-White unemployment rate ratio; population density; population size; overall arrest rate; proportion of the population under age 18; Hispanic population proportion; housing rental rate; and housing vacancy rate.¹⁰ The validity of this model rests on the ability to predict crime. While this is not knowable, we conduct a robustness check of the explanatory power of this model using data on crimes *reported* to Chicago Police from 2002 through 2015. The model explains 76% or more of the variation in reported crimes each year.¹¹

⁹ For definitions and discussion of rural, suburban, and urban, see (15), section II(B).

¹⁰ For discussion of theories of the residual model, see (15), section IV(B).

¹¹ See (15), figure S4 for mean R-squared by year.

By regressing these explanatory variables, we partially explain the variance in arrest rates resulting from the crime rate, leaving the remaining variance attributable to police action unexplained. Unlike the risk ratio, this residual measure of racial disparity does not have a straightforward numeric interpretation. Positive numbers indicate an agency arrests more African-Americans than expected, given the predicted level of crime.¹²

The ability of the model to predict crime declines over time. In 1999, the model explained between 14 and 18 percent of arrests by an agency. By 2015, that number declined to between 7 and 10 percent. This is consistent with other research, finding levels of actual crime became less related to arrest rates over this time period (19).

At the same time, the residual measure increased, indicating an increase in racial differences in arrest which cannot be explained by predicted criminal behavior (see Figure 3). Between 1999 and 2015, racial disparity experienced by the average African-American increased from 0.19 to 0.28 (an increase of 32 percent). Racial disparity in juvenile arrests doubled during this time, from 0.15 to 0.30.

[Figure 3 - Arrest rate residual, for local and county agencies, 1999-2015.]

Figure 4 is a map of racial disparity, summarized by county, as calculated using the residual measure. Most increase in disparity is driven by increases at the local and municipal level. The average African-American lives in a community where racial disparity in municipal policing doubled over the seventeen-year period (from 0.09 to 0.19).

[Figure 4 - Arrest rate residual, averaged across both local and county agencies, 2015.]

The logged risk ratio measure of racial disparity and the residual measure of racial disparity are highly related (corr. = 0.94 for adults; 0.92 for juveniles; and 0.94 for all arrests). The residual measure of disparity displays many of the same geographic trends as the risk ratio.

The residual is a valid measure of racial disparity, but only to the extent it successfully nets out the actual commission of crime. Since actual crime rates are unknowable, the measure is sensitive to omitted variable bias. One of the benefits of the ratio structure is that it reduces (but does not fully eliminate) the influence of omitted variables. By comparing factors that relate to underlying propensity between two groups (the group of interest versus Whites), we reduce the burden on the model to completely predict differential propensity. Instead, the model is biased only to the extent these factors correlate to crime differently across race. While this method still

¹² Summary statistics for the residual measure are in Table S8 in (15).

clearly incorporates a strong assumption of racial invariance, it substantially improves upon a basic control model.

One of the most significant sources of omitted variable bias is the definitions of crimes, which differ across states and over time. The elements of a crime – even basic, seemingly-universal crimes, such as murder – are subject to legislative idiosyncrasies. Additionally, agencies at different jurisdictional levels often police or prioritize different types of crime.

However, instead of being a barrier to analysis, this geographic and temporal variation provide a rich opportunity to assess the impact of omitted variable bias on residual estimates of racial disparity. To do this, we standardize the residual by state and year. All cells are standardized to a mean of zero (0) and a standard deviation of one (1). Essentially, the standardized residual compares each agency to a set of other agencies which perform similar tasks and exist the same legal scheme. To the extent an omitted variable exhibits racial variance, this invariance is likely similar for agencies that are in close geographic proximity.¹³ Thus, nearby agencies act as a form of control on the residual, helping remove the remaining influence of omitted variables.

Figure 5 displays the standardized residual, a more conservative measure of disparity, summarized by county. Because it has been standardized, the residual does not increase over time. However, distinguishing by agency type, urban agencies tended to have higher levels of standardized disparity than their rural neighbors.¹⁴ This disparity between rural and urban agencies increased substantially over time. As a check on omitted variable bias, the standardized residual suggests the residual method of measuring disparity preforms well, as the standardized and unstandardized residuals are highly correlated (corr. = 0.93 for adults; 0.96 for juveniles; and 0.93 for all arrests).

[Figure 5 - Black-White Arrest Rate Residual (Standardized), Averaged Across Both Local and County Agencies, 2015.]

VALIDATING MEASURES USING DOJ INVESTIGATION DATA

One of the only available standards for assessing racial bias is the Department of Justice law enforcement misconduct investigation. After congress allocated the authority, the DOJ instigated 68 investigations of 54 police agencies between 1999 and 2015.¹⁵ These investigations are one of the primary mechanisms for oversight and correction of “institutional failures that cause systemic police misconduct” (11). As these investigations arguably provide the only U.S. data on verified

¹³ For a discussion of the spatial relationship of crime see (20).

¹⁴ For discussion of standardization, see (15), section V(A).

¹⁵ For discussion of the coding and analysis of investigations, see (15), section V(B).

racial bias to date, we use the Department’s findings as an external validation of the measures presented here.¹⁶

Because investigations frequently take months or years to complete, the DOJ does not have the resources to investigate all complaints of misconduct, so the department prioritizes cases where “reform can have broad ranging effects or represent an emerging issue where federal action may help set a standard for reform” (11).

The result of this selection process is that agencies investigated are in no way a representative sample of agencies. Rather, they are representative of unusual circumstances. Thus, it is uninformative to compare measures of racial bias on the handful of agencies investigated by the DOJ to our dataset of all agencies. Instead, we compare ten instances where the Department investigated allegations of racial bias but made *no finding* of bias to five instances where allegations of racial bias were substantiated by investigation.

Figure 6a compares the measures presented here, by reference to these highly specific sample sets. Across the risk ratio, the residual, and the standardized residual of racial disparity, agencies with substantiated allegations have higher levels of measured disparity than both the average agency and agencies with unsubstantiated allegations. This suggests these measures are picking up on a valid source of racial disparity and perhaps even racial bias.

[Figure 6 - Mean percentile and Difference-in-Difference changes for measures of Black-White racial disparity.]

Past case studies demonstrate agency improvement after implementation of a consent decree (an agreement between the DOJ and the agency to engage in specific policy changes and reforms), though the sustainability improvements varies across agencies (21-24). We examine changes in these measures, following DOJ investigation, utilizing a Difference-in-Difference (DID) estimator.¹⁷ For each measure of racial disparity presented here, the DID estimator measures the difference in an agency’s arresting behavior before and after the investigation, averaged across all agencies where the DOJ found evidence of racial bias. Since all agencies scrutinized (not just those with supported racial bias allegations) likely make changes after an extensive DOJ investigation, this method also controls for changes experienced by agencies with unsupported bias allegations during the same time period following investigation. In this way, the DID

¹⁶ Bias has an underlying motivational component which it is difficult to measure without individual officer-level data. Therefore, we are comparing this measure of racial disparity to the DOJ measure of bias, which must meet a higher standard than disparity. That the measure correlates well suggests it is able to predict, at least to some extent, a more strict measure of bias.

¹⁷ For discussion of Difference-in-Difference estimator and analysis, see (15), section V(B).

estimator measures changes in racial bias caused by a consent decree, while simultaneously removing other influences caused by DOJ investigation.

Figure 6b depicts the trends in the DID estimator for the years surrounding the start of an investigation. For all three measures of disparity (risk ratio, residual, and standardized residual), the DID estimator is mostly stable in the four years prior to an investigation, declines slightly in the year the investigation begins, increases the following year, and then declines markedly. The decline in years following investigation is consistent with past research (21-24), though we have insufficient data to follow the trend for more than four years and assess sustainability.

The slight drop during the investigation year suggests agencies might behave slightly better when DOJ is on site. However, the slight uptick following investigation start is interesting and might indicate one of several processes. First, DOJ investigations take time – it is not unusual for one to take more than a year before a court order or consent decree, creating a period of time after investigation but before structural changes begin to address bias. Second, the uptick to slightly above original levels may indicate some backlash following investigation. However, we caution against over-interpretation given the sample size.

CONCLUSION

Even as crime rates went down, racial disparity in arrests went up. Where the average police agency in 1999 arrested 5.48 Blacks (adult and juvenile) for every White, the 2015 average was 9.25 arrests, nearly twice that. By itself, this is a startling conclusion, but the details tell a compelling story. The increase is driven primarily by local agencies and is particularly influenced by arrests of African-American juveniles in urban areas. Disparity in arresting behavior has the potential to infiltrate the entire institution, delegitimizing the police, and increasing crime. Of particular concern, police contact has been shown to increase the likelihood of later offending among young boys who reported no criminal behavior prior to contact (25).

The larger narrative here is one of a widening disconnect, along racial lines, between law enforcement activities and actual criminal offending. This aligns with prior research on mass incarceration, showing that black involvement in crime has declined since the 1980's, but racial disparities in imprisonment have increased (26). Similarly, self-reported participation in criminal conduct has become virtually independent of police arresting behavior. In 1979, juveniles not reporting unlawful behavior were unlikely to be arrested (19). Yet, in 1999, just one generation later, the relationship between crime and arrest had changed, with fully 70 percent of people arrested reporting no involvement in criminal activity.

The biggest barrier to analysis of the divergence between crime rates and racial disparity was the absence of a reliable measure of racial disparity. To address this, we developed three measures of racial disparity in police arresting behavior: (1) a risk ratio estimating population-controlled racial disparity; (2) a residual estimator of disparity after controlling for commission of crime; and

(3) a standardized residual that adjusts for geographic and temporal variations in the definition of crime.

This is perhaps the more valuable contribution here. Without a valid measurement of racial disparity, policy initiatives to reform police practices easily stall (27, 28). Policy makers have difficulty mandating change without an understanding of the policies or procedures that reduce or exacerbate disparity (29). Yet, we can now report three methods of assessing disparity which have been assessed for validity by comparison to the rigorous investigative work of the DOJ's Civil Rights Division.

The last two decades saw sweeping changes to police practices as Americans lived through the height of the war on drugs, privatization of prisons, increased militarization of police, refinement of community-oriented policing, and the expansion of social movements reactive to police behaviors. The little we know about the impact of these large structural changes on racial disparity or bias comes primarily from single-agency case studies. The development of a valid nationwide measure of racial disparity provides a critical tool for determining the consequences of large structural trends.

As police and policymakers continue to innovate solutions to problems in policing and communities struggle to respond to violence both by and against police, measurement of racial disparity in arresting behaviors has the potential to unlock causes and solutions for police, policy makers, and community advocates.

REFERENCES AND NOTES

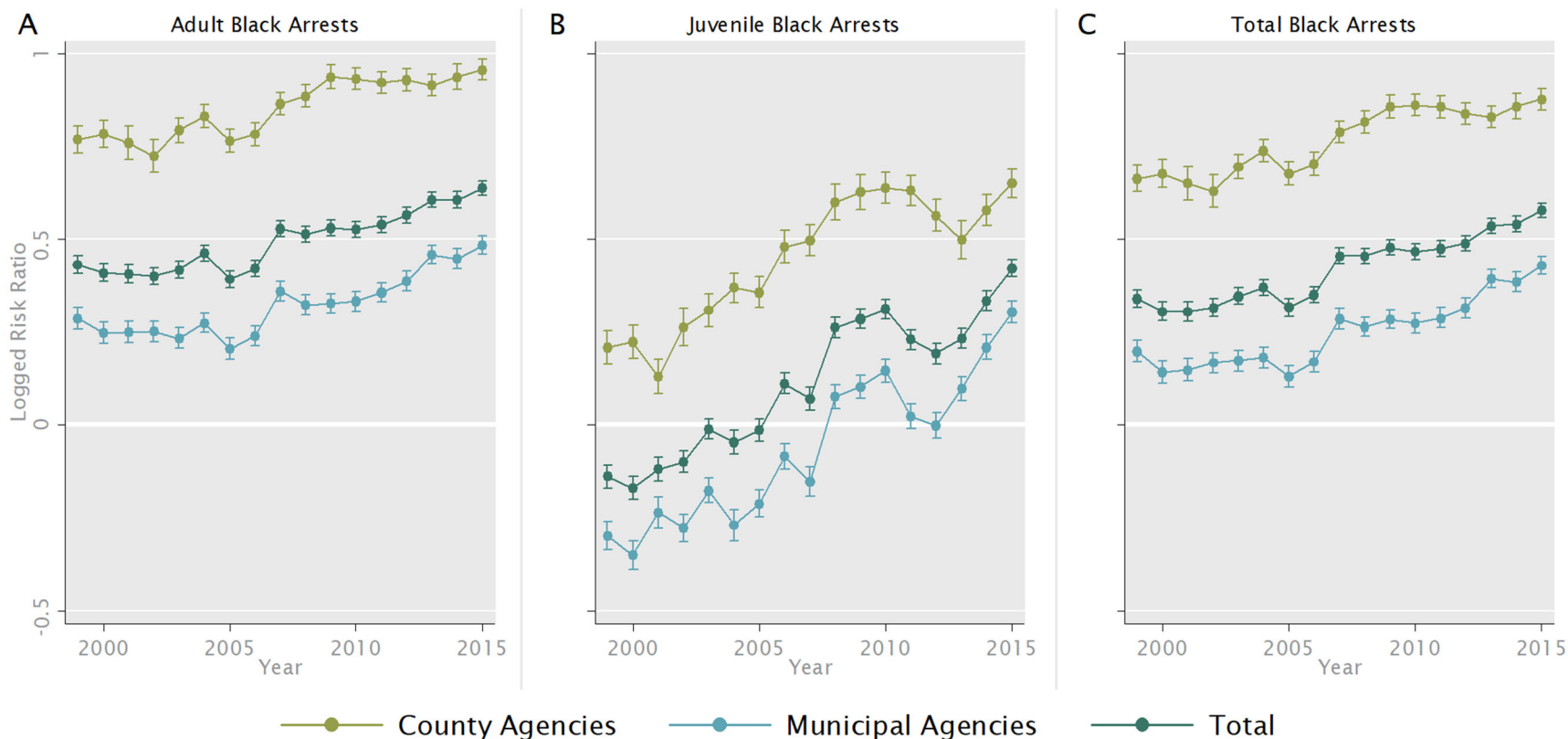
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FIG. 1 – BLACK-WHITE RISK RATIO (LOGGED), FOR LOCAL AND COUNTY AGENCIES, 1999-2015.

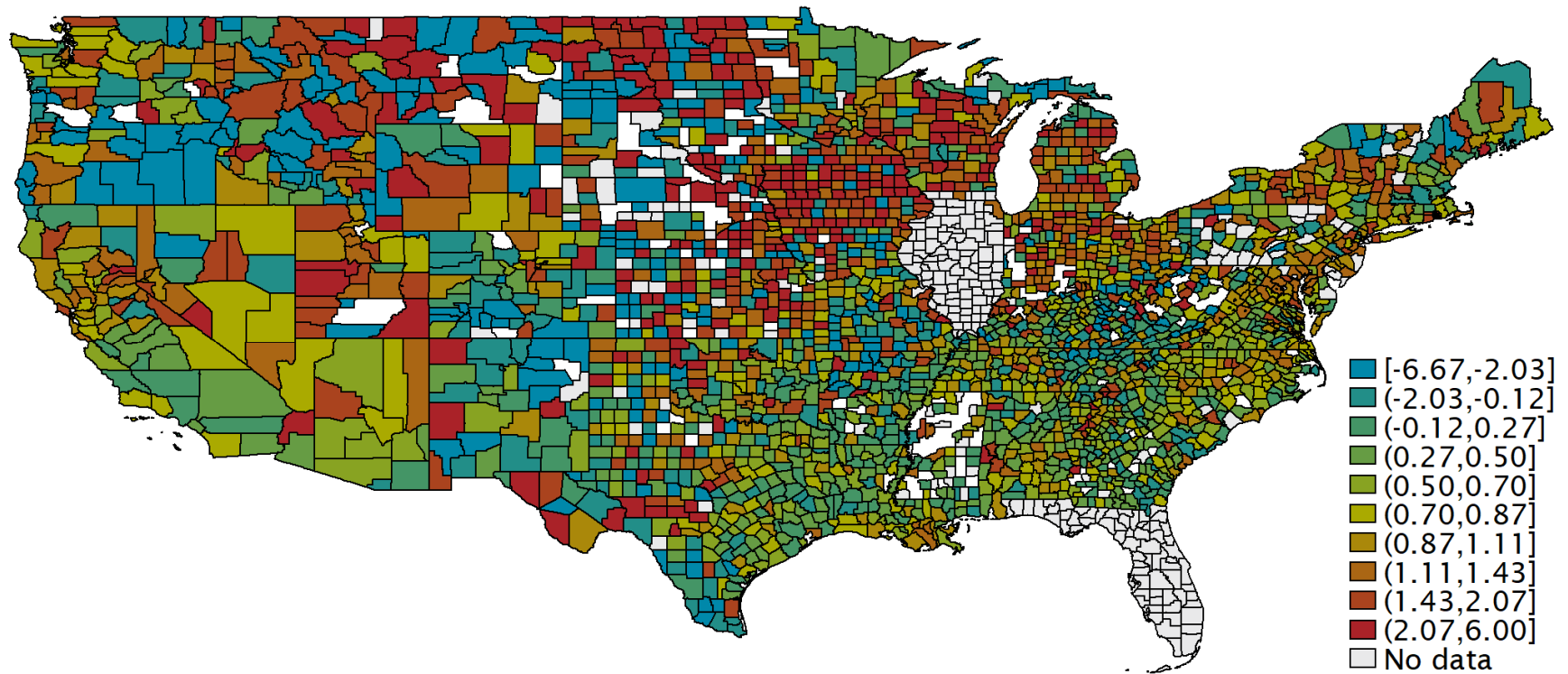
(A, B, and C) Black-White risk ratio (logged) between 1999 and 2015 for county, municipal and all agencies, displayed by (A) adult Black arrests; (B) juvenile Black arrests; and, (C) all Black arrests.



Notes. – Bars represent 95% confidence interval. Estimates weighted for non-response and by African-American population living in agency’s jurisdiction. For more information on weighting, see (15), section II(B), available on the Science website.

FIG. 2 – BLACK-WHITE RISK RATIO (LOGGED) AVERAGED ACROSS BOTH LOCAL AND COUNTY AGENCIES, 2015.

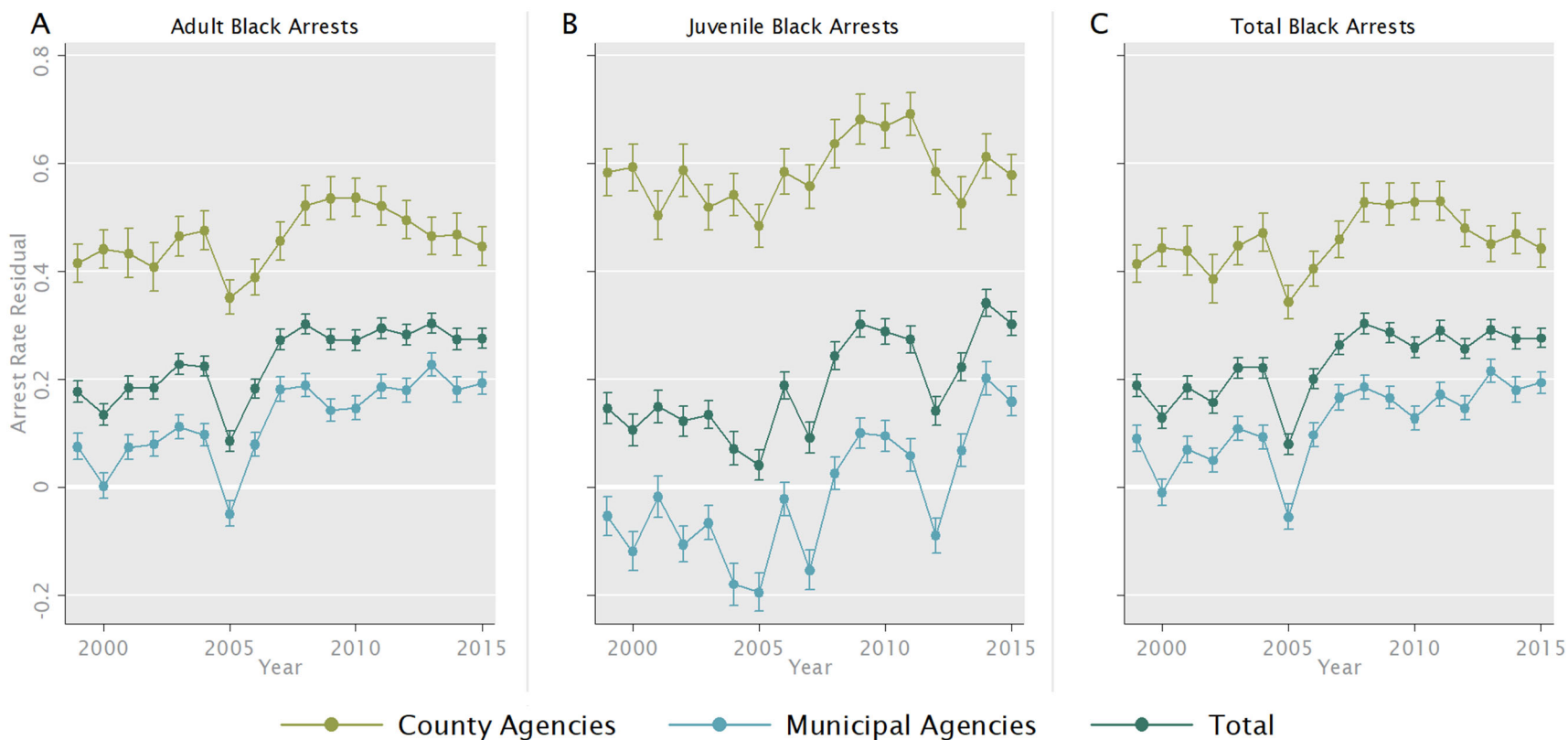
Map of Black-White risk ratio (logged), averaged by county, for all U.S. counties in 2015. Red indicates areas of higher racial disparity.



Notes. – Category breaks represent quintiles. Counties missing arrest data on 40 percent or more of residential population have been omitted.

FIG. 3 – BLACK-WHITE ARREST RATE RESIDUAL, FOR LOCAL AND COUNTY AGENCIES, 1999-2015.

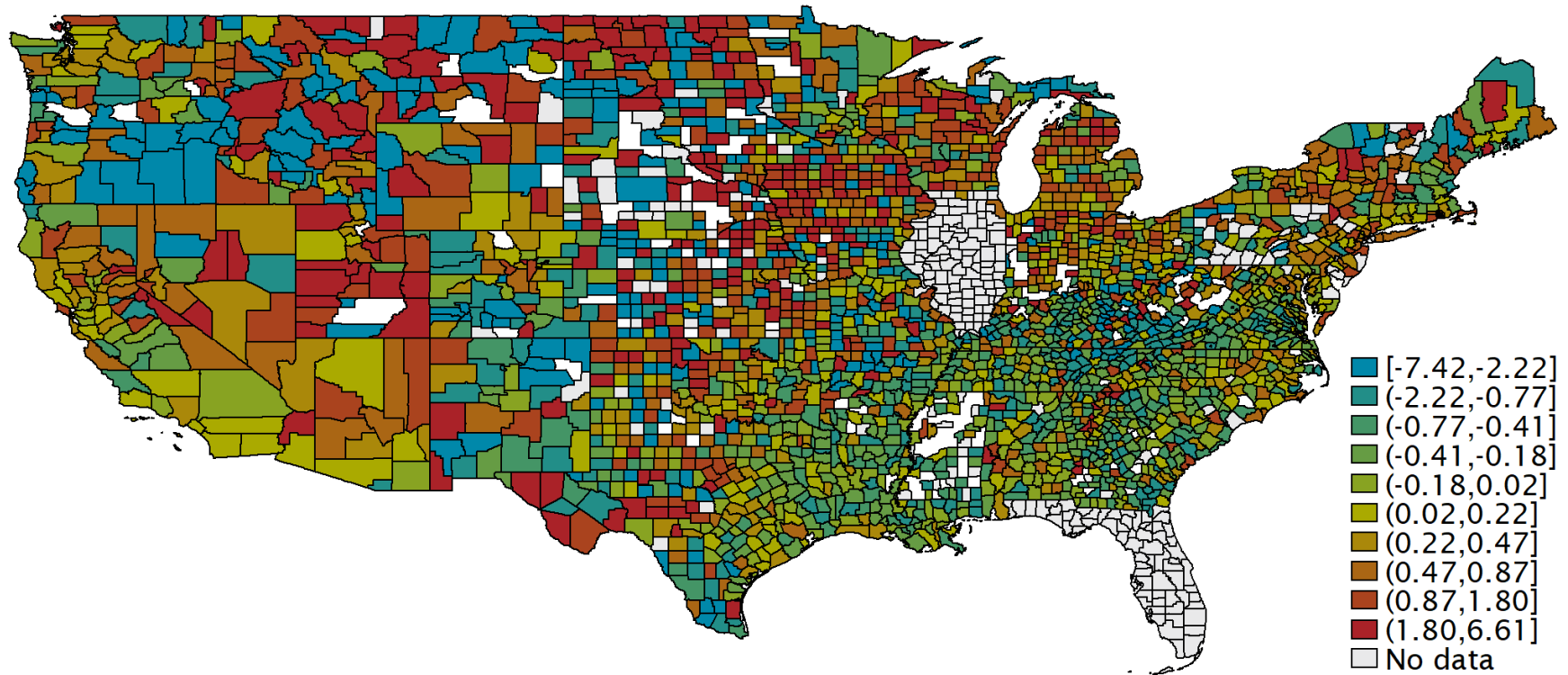
(A, B, and C) Black-White residual measure of racial disparity between 1999 and 2015 for county, municipal and all agencies, displayed by (A) adult Black arrests; (B) juvenile Black arrests; and, (C) all Black arrests.



Notes. – Bars represent 95% confidence interval. Estimates weighted for non-response and by African-American population living in agency’s jurisdiction. For more information on weighting see (15), section II(B). Control variables listed in text.

FIG. 4 – BLACK-WHITE ARREST RATE RESIDUAL, AVERAGED ACROSS BOTH LOCAL AND COUNTY AGENCIES, 2015.

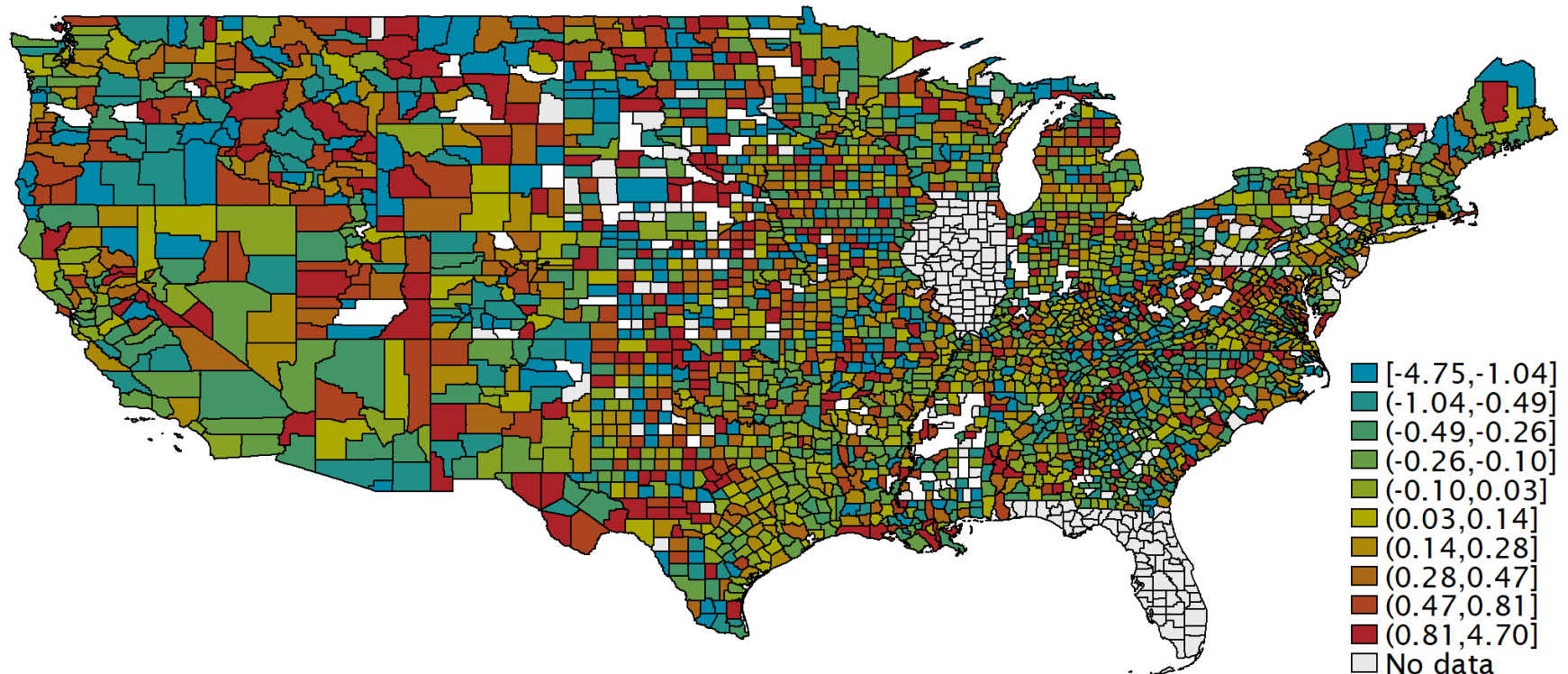
Map of Black-White residual measure of racial disparity, averaged by county, for all U.S. counties in 2015. Red indicates areas of higher racial disparity.



Notes. – Category breaks represent quintiles. Counties missing arrest data on 40 percent or more of the residential population have been omitted. Control variables listed in text.

FIG. 5 – BLACK-WHITE ARREST RATE RESIDUAL (STANDARDIZED), AVERAGED ACROSS BOTH LOCAL AND COUNTY AGENCIES, 2015.

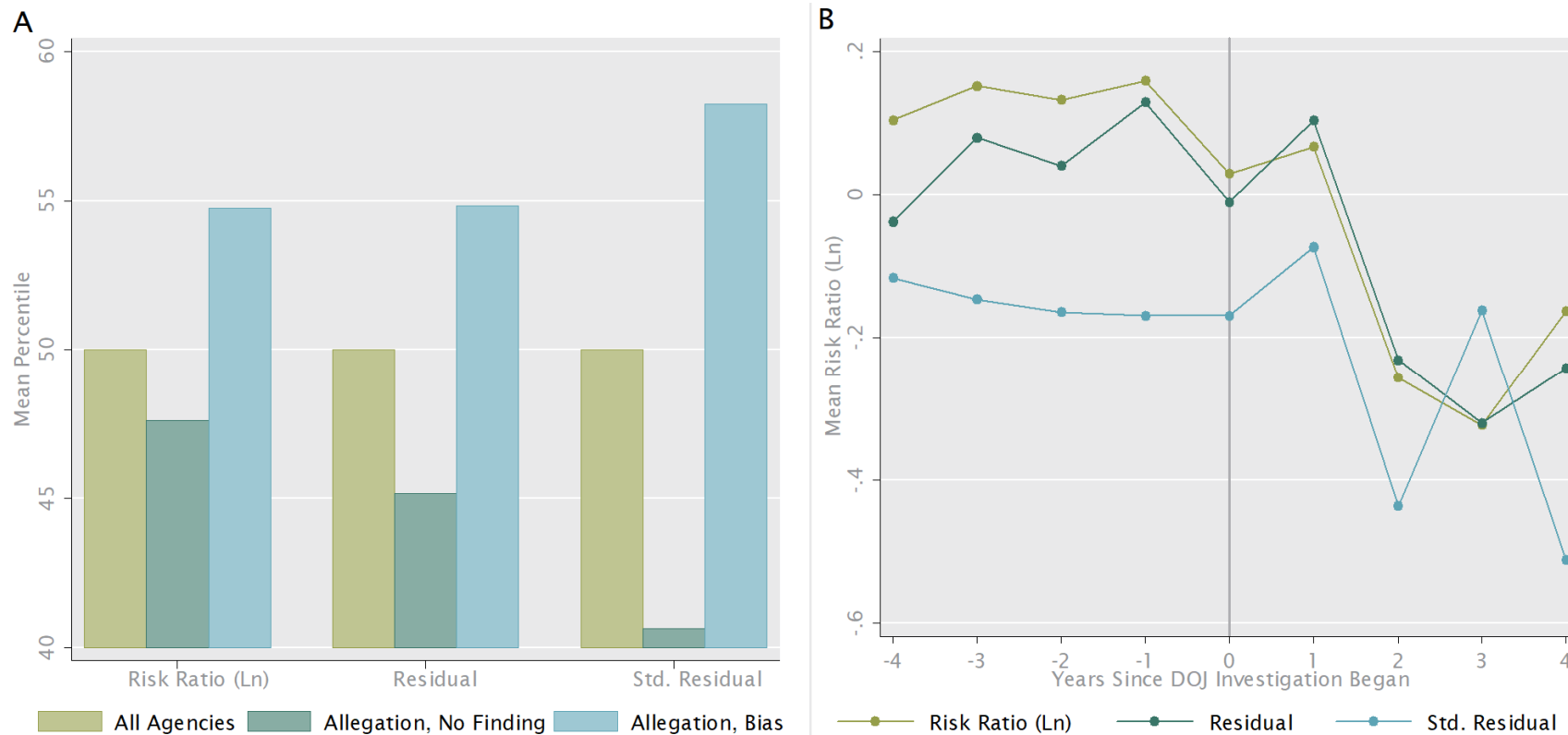
Map of Black-White residual measure of racial disparity, standardized within state and year, averaged by county, for all U.S. counties in 2015. Red indicates areas of higher racial disparity compared to geographically proximate agencies.



Notes. – Category breaks represent quintiles. Counties missing arrest data on 40 percent or more of the residential population have been omitted. Control variables listed in text. Residuals are standardized by year and state.

FIG. 6 – MEAN PERCENTILE AND DIFFERENCE-IN-DIFFERENCE CHANGES FOR MEASURES OF BLACK-WHITE RACIAL DISPARITY.

(A and B) Validation of measures of racial disparity using DOJ investigations. (A) Mean percentile for three measures of racial disparity, by outcome finding of DOJ investigation. (B) Difference-in-Difference estimate of three measures of racial disparity, displayed four years prior to and after the conclusion of DOJ investigation.



Notes. – (A) ‘All Agencies’ category includes agencies with no investigations and investigations with no racial bias allegation. ‘Allegation, No Finding’ includes 10 agencies. ‘Allegation, Bias’ limited to 5 investigations with findings of Black racial bias. (B) DOJ begins investigation in year 0.