The Racial Gap in Wait Times: Why Minority Precincts Are Underserved by Local Election Officials

STEPHEN PETTIGREW

IN THE NOVEMBER 2012 GENERAL ELECTION, 1 in 10 voters waited in line for more than 30 minutes to cast a ballot. About 3.5 million voters waited in excess of an hour, with some standing in line for longer than five hours. Long lines at the polls became such a hot topic in the media that President Barack Obama acknowledged in his victory speech that the issue was one that needed to be fixed. Despite the growing media attention given to the problem of lengthy lines at precincts,[1,2,3] little political science work has investigated the determinants of long waiting times.

In this article, I demonstrate that a voter in a predominantly minority precinct experiences a line that is twice as long, on average, than a voter in a predominantly white precinct. Additionally, minorities are three times as likely to wait longer than 30 minutes and six times as likely to wait more than 60 minutes. While the existence of this "racial gap" has been noted

[1]Bob King, "Confusion Reigns among Fla. Voters," Politico, 6 November 2012, accessed at http://www.politico.com/story/2012/11/confusion-reigns-among-fla-voters-083401, 24 June 2017.
[2]David A. Graham, "Here's Why Black People Have to Wait Twice as Long to Vote as Whites," *The Atlantic,* 8 April 2013, accessed at http://www.theatlantic.com/politics/archive/2013/04/heres-why-black-people-have-to-wait-twice-as-long-to-vote-as-whites/274791, 24 June 2017.
[3]Jeremy W. Peters, "Waiting Times at Ballot Boxes Draw Scrutiny," *New York Times,* 4 February 2013, accessed at http://www.nytimes.com/2013/02/05/us/politics/waiting-times-to-vote-at-polls-draw-scrutiny.html, 24 June 2017.

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elsewhere,[4,5,6] this article is the first to show that for two neighborhoods in the same county or town, the neighborhood that is less white is likely to have a longer line. I show that the majority of the racial gap is explained by this variation within the geographic units that administer elections rather than differences—such as an urban/rural divide—between administrative units. This finding is particularly important because it suggests that local election officials are doing a worse job of serving minority precincts than white ones.

After presenting initial evidence of the racial gap, I discuss how election administration by local county and town officials explains some of the variation in wait times across the country. I then estimate the size of the racial gap that is attributable to both between- and within-jurisdiction factors and compare it with the size of the gap when only within-jurisdiction factors are considered. I find that more than half of the gap in wait times results from within-jurisdiction differences. I then provide a possible explanation for these within-jurisdiction differences by showing that election officials appear to systematically provide more poll workers and voting machines to white precincts than minority ones. I conclude with a discussion of the role played by voter turnout and reflect on whether the findings of the article provide evidence for racial discrimination.

THE RACIAL GAP IN WAIT TIMES

Throughout this article, I rely on survey responses of verified voters in the 2006, 2008, 2012, and 2014 Cooperative Congressional Election Study (CCES).[7,8,9,10,11] Respondents were asked, "Approximately how long did

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[4]Charles Stewart III and Stephen Ansolabehere, "Waiting in Line to Vote" (Working Paper 114, Caltech/MIT Voting Technology Project, 28 July 2013), accessed at http://dspace.mit.edu/bitstream/handle/1721.1/96640/WP%20114.pdf, 24 June 2017.

[5]U.S. Government Accountability Office, *Observations on Wait Times for Voters on Election Day 2012* (Washington, DC: U.S. Government Printing Office, 2014), accessed at http://www.gao.gov/assets/670/666252.pdf, 24 June 2017.

[6]Christopher Famighetti, Amanda Melilli, and Myrna Pérez, *Election Day Long Lines: Resource Allocation* (New York: Brennan Center for Justice, 2014), accessed at https://www.brennancenter.org/sites/default/files/publications/ElectionDayLongLines-ResourceAllocation.pdf, 24 June 2017.

[7]"2006 Cooperative Congressional Election Study," accessed at http://hdl.handle.net/1902.1/14002, 24 June 2017.

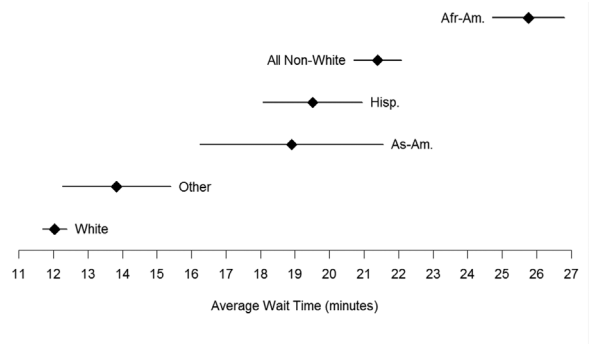
[8]"2008 Cooperative Congressional Election Study," accessed at http://hdl.handle.net/1902.1/14003, 24 June 2017.

[9]"2012 Cooperative Congressional Election Study," accessed at http://hdl.handle.net/1902.1/21447, 24 June 2017.

[10]"2014 Cooperative Congressional Election Study." accessed at https://doi.org/10.7910/DVN/XFXJVY, 24 June 2017.

[11]For a discussion of the validity of survey data to measure lines, see the supplementary appendix in the online version of this article.

FIGURE 1
Average Wait Time (with 95% Confidence Intervals) in November 2012 Election, by Voter Race



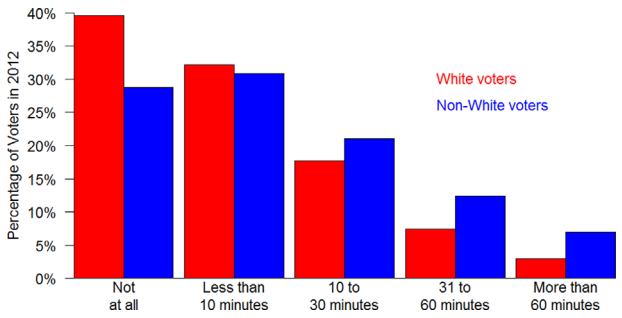
you wait in line to vote?" and then were presented with five possible responses: "not at all," "less than 10 minutes," "10 to 30 minutes," "31 minutes to an hour," and "more than an hour." Those who waited longer than one hour specified their wait time in an open-ended follow-up. Following the convention used in the literature on wait times,[12,13] the responses were coded into minutes. Respondents who fell into the first four categories were recoded to be the midpoint of their response category (that is, 0, 5, 20, and 45 minutes). I used the open-ended responses for those who waited longer than an hour.[14]

Based on these data, the average voter in the 2012 presidential election waited 14 minutes and 2 seconds to vote. Out of 129 million voters, roughly 11 million (8.8 percent) spent longer than a half hour in line. Three and a half million (2.7 percent) reported waiting more than an hour to cast their ballot. While these numbers are large, if all voters are equally likely to experience a long line, then the problem might be viewed as an inconvenience, but one that lacks broader consequences. On the other hand, if long lines systematically afflict certain groups of voters, then there may be political ramifications to consider.

Figure 1 provides evidence supporting the latter scenario. While white voters waited an average of 12:02, the average nonwhite voter waited

[12]Charles Stewart III, "Waiting to Vote in 2012," *Journal of Law & Politics* 28 (Summer 2013): 439–463.
[13]Pew Charitable Trusts, "Elections Performance Index: Methodology," April 2014, accessed at http://www.pewtrusts.org/~/media/Assets/2014/04/07/EPI_methodology.pdf, 24 June 2017.
[14]Using an ordered logit to model response categories directly yields the same substantive results. I chose this approach for ease of interpretation. Additionally, recent work suggests that midpoint imputation will tend to attenuate differences in means between subgroups suggesting that the results in this paper may underestimate the size of the racial gap. Indeed, implementing the method laid out in that article provides slightly larger estimates of the racial gap.

FIGURE 2
Distribution of Wait Times for White and Nonwhite Voters in November 2012 Election



almost twice as long, 21:24. The difference is even more pronounced when considering only African American voters, whose average wait was 25:46. This racial gap in wait times was not unique to 2012. In 2008, the average wait time for white voters was 13:40, while that of nonwhites was 23:47.[15] Even in the 2006 and 2014 midterm elections, when low participation decreased the nationwide average wait time, the racial gap persists.

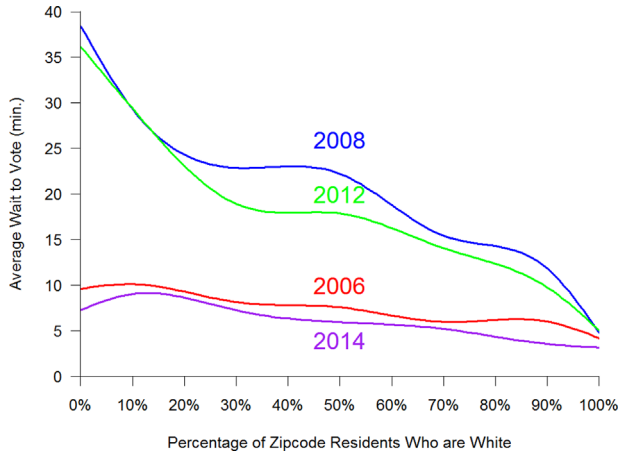
There are also dramatic differences in the distribution of wait times between white and nonwhite voters. Figure 2 shows that in 2012, the percentage of white voters who did not wait to vote (39.6 percent) was significantly larger than for nonwhite voters (28.8 percent). Perhaps even more dramatic, 19.3 percent of minority voters reported a wait of longer than 30 minutes, compared with only 10.5 percent of white voters. And while only 3.0 percent of white voters waited longer than one hour, 7.0 percent of minorities waited at least that long.

A similar story holds in the 2006, 2008, and 2014 elections.[16] In 2008, for example, 41.5 percent of white voters experienced no line, but 4.5 percent waited for longer than one hour. In matching the pattern from 2012, nonwhite voters were less likely to experience no line (29.9 percent) and much more likely to wait more than an hour (10.2 percent). Even in low-turnout midterm elections, nonwhite voters are at a disadvantage. In 2014, they were more than twice as likely to wait longer than 30 minutes to vote (4.6 percent) than white voters (1.9 percent).

Although the existing research on lines has dealt with them as an individual-level phenomenon, it is virtually impossible for an individual

[15]The appendix includes replications of Figure 1 using data from the 2006, 2008, and 2014 elections.
[16]The appendix includes graphs of these distributions in these years.

FIGURE 3
Average Wait Time, Conditional on Election Year and Neighborhood Racial Demographics



voter to experience a long wait without other voters at the same precinct having a similar experience. Thus, voter precincts are the ideal unit of analysis to study lines. Unfortunately, precinct-level data on lines are virtually nonexistent; the most precise level of geographic identification in the CCES data is the respondent's five-digit zip code. Therefore, I consider how neighborhood racial diversity, based on zip code–level census data, correlates with line length. Figure 3 smooths the average wait time across levels of racial diversity and shows that the racial gap persists in the aggregated data. In both presidential and midterm elections, the average wait in 100 percent white neighborhoods is lower than in 100 percent minority neighborhoods.

This evidence demonstrates a persistent pattern of white voters having less of a time burden placed on them at the polls. The question remains whether the racial gap results from predominantly white counties having attributes that decrease wait times compared with more minority-heavy counties, or whether within-county variation suggests that county officials are treating white and nonwhite precincts differently—deliberately or otherwise. After detailing how local election administration can influence lines, I provide evidence to support the latter explanation.

HOW ELECTION ADMINISTRATION CAN AFFECT LINES

Unlike many other countries, the authority to administer elections in the United States is vested in state legislatures. Much of that responsibility is

further devolved to bureaucrats and elected officials at the local level.[17,18,19] Most states leave responsibilities such as training poll workers or allocating voting machines to their individual counties, although a handful of states[20] have city or town officials run their elections. The result is that there are more than 8,000 local election officials throughout the country making these administrative decisions.

Given this, an important question is how much of the racial gap in line length can be attributed to differences between these 8,000 counties and towns—which I refer to as *electoral jurisdictions*—and how much can be attributed to decision making within jurisdictions. It could be that rural areas, which have higher concentrations of white voters, have fewer logistical obstacles in administering elections than densely populated urban areas, where black voters tend to live. In this scenario, the racial gap would be a result of differences between counties or towns that administer elections. If, on the other hand, a sizable portion of the racial gap is explained by differences within counties or towns, then we must conclude that minority and nonminority precincts are being handled by election officials in different ways.

In the context of solving the problem of long lines, a substantial amount of between-jurisdiction variance would suggest that more heavily minority counties or towns require an influx of resources or a better regime in training poll workers. Evidence of a racial gap within jurisdictions would suggest that election officials must do a better job of fairly distributing the resources they have.

In my analysis, I regress wait time on neighborhood racial demographics[21] to establish a baseline for the size of the racial gap that results from both the between- and within-jurisdiction variation. I then include jurisdiction fixed effects in the model to assess the extent to which the racial gap is attributable to differences in racial demographics within a

[17]Heather K. Gerken, *The Democracy Index: Why Our Election System Is Failing and How to Fix It* (Princeton, NJ: Princeton University Press, 2009).
[18]Daniel P. Tokaji, "The Future of Election Reform: From Rules to Institutions," *Yale Law & Policy Review* 28 (Fall 2009): 125–154.
[19]Richard L. Hasen, *The Voting Wars: From Florida 2000 to the Next Election Meltdown* (New Haven, CT: Yale University Press, 2012).
[20]Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont, and Wisconsin.
[21]I use aggregate racial demographics as the covariate of interest rather than individual race because long lines are afflict entire precincts, not individual voters. In the absence of blatant expressions of racial discrimination, such as having separate lines for different races, there is not a coherent story to tell about how an individual African American voter could be forced to wait in line longer than white voters at the same precinct. Therefore, I am more concerned with neighborhood demographics than individual racial characteristics, although the two will be correlated.

jurisdiction.[22] If the coefficient from the fixed-effects regression is reduced but still substantively large compared with the baseline coefficient, this suggests that a sizable part of the racial gap results from election officials handling white and minority precincts within their jurisdiction differently.

The literature provides several explanations for between-jurisdiction variation in wait times. One is that jurisdictions in which voters cast ballots on computerized direct-recording electronic (DRE) machines tend to have longer average wait times than those with optical scan systems, which use a paper ballot and optical scanning system.[23] In 2012, the average wait time in jurisdictions that used DREs was 17:34 (SE = < 1 second), while the average wait time for a voter in an optical scan jurisdiction was 11:23 (SE = < 1 second). The main reason for the discrepancy is that DRE systems, which require expensive computer stations, are much less scalable than optical scan systems, which require an extra table and privacy dividers.[24] Jurisdiction fixed effects will account for this variability because voting technology is almost entirely constant within a jurisdiction. In 2012, 64.9 percent of jurisdictions used optical scan systems, while 30.7 percent used DREs.[25]

Another factor that can impact wait times and is mostly constant within a jurisdiction is the length of the ballot. Ballot length has a strong positive correlation with lines,[26] and queueing theory tells us that when a system includes multiple points of service—that is, a check-in station and a ballot casting station—a backlog anywhere in the system will create backlogs at all previous points of service.[27] Therefore, when a long ballot causes all vote-casting stations to fill, lines will develop for those waiting to check in.

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[22]The approach is akin to a differences-in-differences estimator. Rather than leveraging variation in the treatment over time however, I am taking advantage of differences in the "treatment" (racial demographics) within an election administrative unit to estimate the impact on line length.

[23]William A. Edelstein and Arthur D. Edelstein, "Queueing and Elections: Long Lines, DREs and Paper Ballots" (paper presented at the Electronic Voting Technology Workshop, Washington, DC, 9–10 August 2010), accessed at http://static.usenix.org/event/evt/tech/full_papers/Edelstein.pdf, 12 June 2017.

[24]Optical scan systems still require ballot scanners, but scanning the ballot takes much less time than it takes to vote on a DRE. In November 2014 in Boston (an optical scan jurisdiction), it took, on average, 19 seconds between completing the ballot and completing the scanning process. In contrast, voters in Orange County, Florida took an average of 8 minutes to fill out their ballots on the DRE machines. See Charles Stewart III, "Managing Polling Places Resources" (report, Caltech/MIT Voting Technology Project, November 2015), accessed at https://shass.mit.edu/files/shass/cimg/news/2015/Poli%20Sci%20FINAL%20print.pdf, 12 June 2017.

[25]Most of the remaining jurisdictions use a mixture of the two systems. A handful of tiny jurisdictions use paper ballots. As of 2012, no jurisdictions used lever voting machines, and only four small Idaho counties used punch card systems.

[26]Edelstein and Edelstein, "Queueing and Elections."

[27]Donald Gross, John F. Shortle, James M. Thompson, and Carl M. Harris, *Fundamentals of Queueing Theory* (Hoboken, NJ: Wiley, 2008).

TABLE 1
How Did Neighborhood Demographics Impact Average Wait?

	(1)	(2)	(3)	(4)
White Pct	−14.177***	−17.386***	−7.930***	−12.139***
	(0.286)	(0.561)	(0.430)	(0.743)
Juris. fixed effects			✓	✓
Additional controls		✓		✓
Observations	91,907	78,102	91,907	78,102
R^2	0.066	0.083	0.196	0.227

Note: *p < 0.05; **p < 0.01; ***p < 0.001
Ordinary least squares regression coefficients with standard errors clustered by jurisdiction. Standard errors are in parentheses.

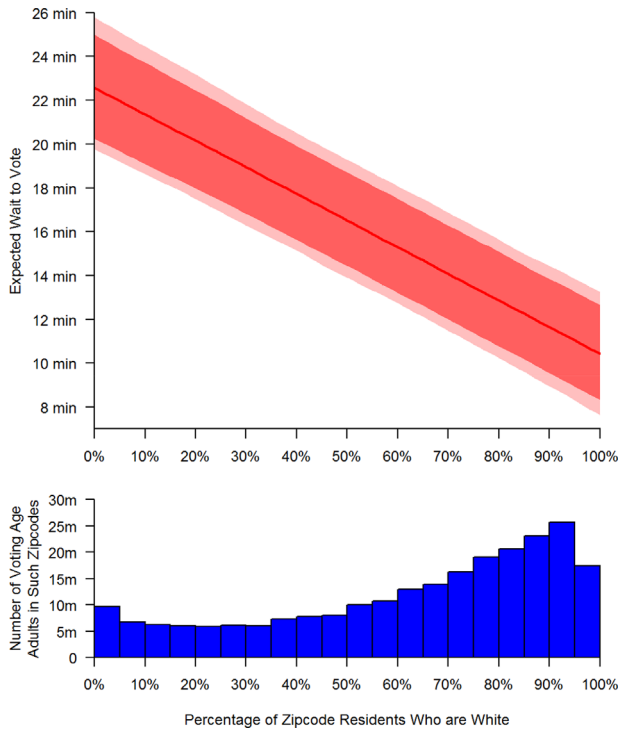
The fixed-effects approach, which is equivalent to including a dummy variable for each jurisdiction in the regression, accounts for ballot length and also controls for other known or unknown factors that may vary between but not within jurisdictions. These factors include the type of training that poll workers receive, the professionalism of the election administration process, and the total number voting machines and poll workers available. Jurisdiction fixed effects also control for state laws or regulations that may impact line length, most notably, voter identification laws, as well as jurisdiction demographics and other aggregate voter characteristics that do not vary within a county or town.[28]

ESTIMATING THE RELATIONSHIP BETWEEN RACIAL DEMOGRAPHICS AND AVERAGE LINE LENGTH

Table 1 displays the results of several linear regression models of line length on the percentage of people in a zip code who are white.[29] All models include year fixed effects; Models 3 and 4 include jurisdiction fixed effects as well. Models 2 and 4 account for additional demographic control variables.[30] The models control for population density, percentage of residents over 65 years old, median income, and percentage of English speakers at the zip code level using census data and race, age, party, and early voting at the individual voter level. Table 1 shows that the total size of the racial gap in wait times—including both between- and

[28]David C. Kimball, "Why Are Voting Lines Longer for Urban Voters?" (paper presented at the Southwestern Social Science Association Annual Conference, New Orleans, LA, 27–30 March 2013), accessed at http://www.umsl.edu/~kimballd/SSSA13-Kimball.pdf, 12 June 2017.
[29]The conclusions presented here do not change when an ordered logit model is used to estimate the effects. Similarly, the results are robust to allowing for nonlinearities in the covariate of interest. I chose to present the ordinary least squares estimates with a linear specification for ease of interpretation. For the full version of this table, including the covariate parameter estimates, see Appendix A.
[30]The full results are available in the appendix online.

FIGURE 4
Marginal effect of Neighborhood Racial Demographics on Expected Wait Time



within-jurisdiction variation—is 14.18 minutes (without controls; SE = 0.29) or 17.39 minutes (with controls; SE = 0.56). In other words, the difference in wait time between an area that is 0 percent white and one that is 100 percent white is about a quarter of an hour.

Including jurisdiction fixed effects, as in Models 3 and 4, does not cause the racial gap to disappear; in fact, more than half of it remains. In the model without control variables, the average racial gap is 7.93 minutes (SE = 0.43), which represents 55.9 percent of the overall gap from Model 1. When demographic controls are included, the impact of within-county variation is even more pronounced. The racial gap estimate of 12.14 (SE = 0.74) from Model 4 is 69.8 percent the size of that from Model 2. These findings suggest that a substantial amount, or perhaps majority, of the difference in wait times between whites and nonwhites results from differences within an election administrator's jurisdiction.

To further illustrate the magnitude of the within-jurisdiction impact of neighborhood demographics, Figure 4 presents the expected wait time (with 95 percent and 99 percent confidence intervals) at different levels of

neighborhood racial composition.[31] The top of the figure shows that for an entirely nonwhite zip code, the average wait time was 22.55 minutes (SE = 1:18), while for an entirely white zip code, the wait was just 10.43 minutes (SE = 1.08). The bottom of the figure highlights that although most Americans live in mostly white zip codes, there are tens of millions of voters in neighborhoods with high expected wait times.

While the relationship between race and average wait time is striking, the racial gap is even clearer when we consider the probability of experiencing an unacceptably long wait. Survey evidence suggests that the typical American places the threshold of acceptable wait time to vote somewhere between 30 and 60 minutes,[32] so I collapsed the data into two dummy variables based on whether the respondent waited longer than 30 minutes or longer than 60 minutes.[33]

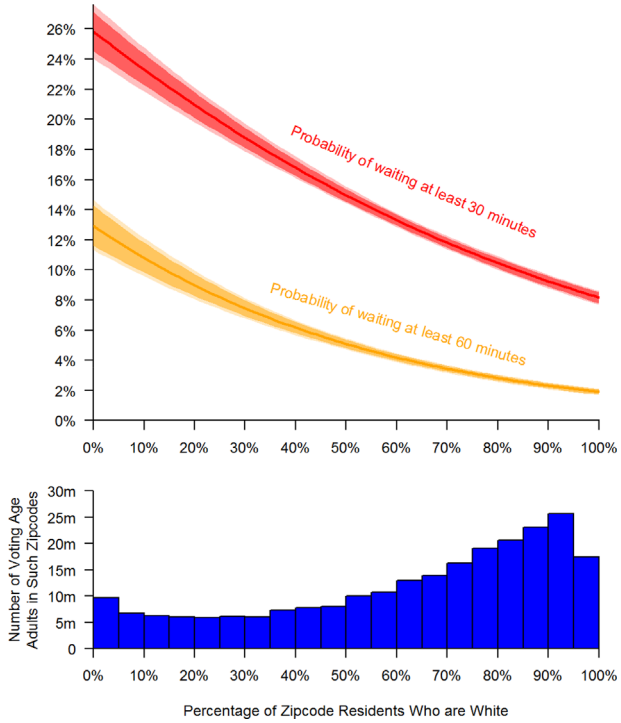
Using covariate specifications identical to those in Table 1, I estimated two sets of logistic regression models in which the outcome is whether the voter waited in a long line (more than 30 minutes or more than 60 minutes). The full results of these regressions, which are provided in Appendix A, are entirely consistent with the story that white neighborhoods are much less likely to experience long lines at their precinct. The results provide further evidence that at least half of the racial gap in wait times is attributable to within-county variation in how elections are run.

Figure 5 reports the predicted probabilities of waiting in a 30- or 60-minute line given the racial makeup of a neighborhood.[34] For the millions of voters who live in predominantly nonwhite neighborhoods, their chances of waiting at least 30 minutes are roughly one in four (25.8 percent). That is more than triple the probability for voters in white neighborhoods, where the probability is 8.2 percent. The gap is even more profound when it comes to lines that exceed an hour. There is a 12.9 percent probability of a voter from a nonwhite neighborhood waiting more than an hour, compared with just 1.9 percent at the other end of the demographic spectrum.

These results support the conclusion that a substantial proportion—and perhaps most—of the racial gap in wait times results from how white and nonwhite precincts within the same administrative jurisdiction are

[31]This figure is based on the results of Table 1, Model 4, with all ancillary covariates were set to their means.
[32]"2013 Cooperative Congressional Election Study-MIT Module."
[33]An added benefit of this approach is that it does not require imputing continuous time values for the categorical survey responses.
[34]These figures are based on the results of Model 4 from Tables 3 and 4.

FIGURE 5
Marginal Effect Of Neighborhood Racial Demographics on the Probability a Voter Experiences a Long Line



handled. In the following section, I provide a potential explanation why there is such tremendous variation in wait times within jurisdictions.

MINORITY PRECINCTS RECEIVE FEWER RESOURCES THAN WHITE PRECINCTS

Perhaps the most important factor in determining how long a line to expect on Election Day is the number of resources—particularly voting machines and poll workers—that are provided to a precinct. If every precinct had a huge number of voting machines and poll workers, then every voter who arrived would be able to immediately check in and fill out their ballot without a delay. As resource allocation decreases, the strain on the system —and thus the length of the line—will increase. Once a precinct reaches its full operational capacity, the length of the line will increase exponentially, not linearly.[35] Given that local governments are constrained by the

[35]Gross et al., *Fundamentals of Queueing Theory.*

TABLE 2
How Do Precinct Racial Demographics Correlate with Allocation of Resources to Precincts?

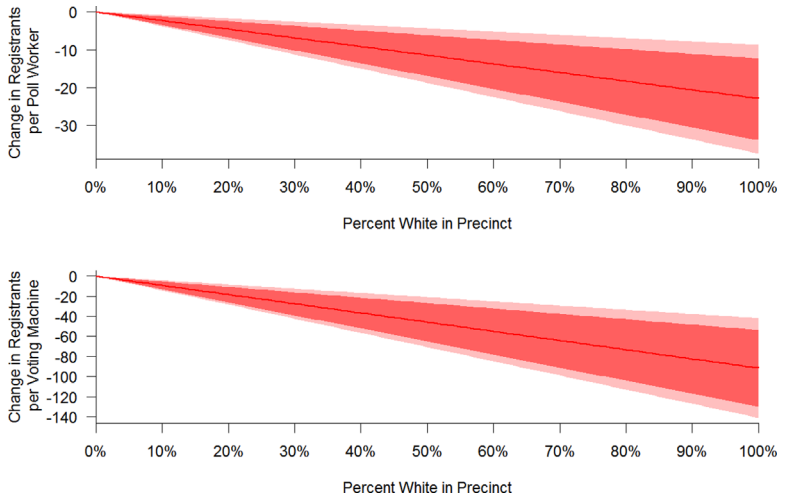
	Registrants per Poll Worker (1)	*Registrants per Voting Machine* (2)
Intercept	196.948***	336.571***
	(10.482)	(41.065)
Pct. White in Precinct	−0.228***	−0.915***
	(0.055)	(0.192)
Observations	5,228	6,601
R^2	0.352	0.609

Note: *p < 0.05; **p < 0.01; ***p < 0.001
Ordinary least squares regression coefficients with standard errors clustered by county. Country fixed effects included. Standard errors are in parentheses.

availability of resources, a major responsibility of a county or town election administrator is to decide how many resources to place in each precinct. In this section, I demonstrate that precincts that have higher concentrations of white voters tend to receive larger numbers of poll workers and voting machines than precincts with more minority voters.

While there is no comprehensive precinct-level database about Election Day resources, Famighetti, Melilli, and Pérez collected precinct-level voting machine and poll worker allocation data from 6,600 precincts in Florida, Maryland, and South Carolina during the November 2012 election. Table 2 shows that the percentage of white voters in a precinct is a significant predictor of resource allocation. In the case of both poll workers and voting machines, precincts that have a higher proportion of white

FIGURE 6
How Does Poll Worker and Voting Machine Allocation Change as a Precinct Becomes More White?



voters have fewer registered voters per resource. Figure 6 uses these results to illustrate that as the size of the white population in a precinct increases, the allocation of resources per registered voter becomes increasingly generous. On average, a mostly white precinct has about 20 fewer registered voters per poll worker than an primarily minority precinct. Likewise, white precincts have 90 fewer registrants per voting machine compared with minority precincts.

These differences are substantial and consequential. In an average-sized minority precinct that is open for 12 hours on Election Day, voting machines must serve an additional 7.5 registered voters per hour—an additional voter every 12 minutes. During a high-turnout presidential election, most precincts are stretched thin as a result of lack of resources.[36] Figure 6 shows why the problem is even worse in minority precincts, where there are fewer machines and poll workers to begin with.

DISCUSSION: IS THIS RACIAL DISCRIMINATION?

In this article, I have shown that a majority of the racial gap in wait times can be attributed to factors that vary within election administration jurisdictions. I have also provided evidence that one of these factors is that white precincts tend to get a larger allocation of voting machines and poll workers than nonwhite precincts. The important remaining question, then, is whether these facts should be taken as evidence of racial discrimination.

Perhaps the most obvious argument to counter the claim of discrimination is that recently there have been big changes in voter turnout patterns by race. The fixed-effects models eliminate any variation in turnout between counties, but there is still variation in turnout within a county or town. The lack of data makes it challenging to empirically test the impact of turnout. Precinct-level turnout data are available for recent elections, but I cannot match CCES respondents to specific precincts.[37]

Even without the ideal data, it is still possible to consider how turnout impacts the results of this article. One might argue that the racial gap is a phenomenon unique to the 2008 and 2012 elections, resulting from an "Obama effect." Historically, turnout tends to be higher in areas with a

[36]Lawrence Norden and Christopher Famighetti, *America's Voting Machines at Risk* (New York: Brennan Center for Justice, 2015), accessed at https://www.brennancenter.org/sites/default/files/publications/Americas_Voting_Machines_At_Risk.pdf, 12 June 2017.

[37]Nor is it possible to identify the zip code of precincts in a systematic way, particularly going back in time. One county in Texas, for example, lists "American Legion" as the location of one of its precincts. There are several American Legions in the county, and it is it not possible to determine which one is the precinct because no additional identifying information is provided.

higher concentration of white voters.[38,39,40] Election officials may use this as a reasonable justification for allocating additional resources to white precincts, where demand is typically highest. In 2008 and 2012, there was a surge in minority voting across the country, surpassing white turnout in many areas.[41] An election official could argue that this surge in 2008 created unpredictable swings in turnout, making it difficult to allocate resources. In 2012, however, election officials cannot make the same argument since they had four years to adjust their allocation strategy. The fact that the gap was nearly the same size in 2012 as 2008 suggests that election administrators are even less responsive to anticipated shocks to turnout than is required to make election run smoothly in all precincts.

Perhaps the best reason to think that much of the racial gap is not a result of the Obama effect is that the gap exists in the 2006 and 2014 midterm elections, when Obama was not on the ballot. White turnout in 2014, especially among conservatives, was particularly high compared with minority turnout, which should have put more strain on white precincts. Yet in that year, African American voters waited more than twice as long, on average, than white voters. Additionally we know that voting is habit forming,[42,43] so even if the racial gap in 2008 and 2012 came from first-time minority voters, we should expect a large proportion of them to continue voting in future elections. Sticking to the old rules of resource allocation will cause the gap in wait times for different racial groups to persist.

The more important point is that even if the racial gap is explained by shifts in voter turnout, election officials could be doing a better job of anticipating these shifts. It is difficult to imagine an election official would intentionally decide to provide fewer poll workers or voting infrastructure to a minority precinct, simply because of its racial composition. But prior research has shown that low socioeconomic status individuals are less likely to file complaints with the government, so officials might anticipate

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[38]Sidney Verba, Kay Lehman Schlozman, and Henry E. Brady, *Voice and Equality: Civic Voluntarism in American Politics* (Cambridge, MA: Harvard University Press, 1995).
[39]Steve J. Rosenstone and John Mark Hansen, *Mobilization, Participation, and Democracy in America* (New York: Macmillan, 1993).
[40]Raymond E. Wolfinger and Steven J. Rosenstone, *Who Votes?* (New Haven, CT: Yale University Press, 1980).
[41]Michael Tesler and David O. Sears, *Obama's Race: The 2008 Election and the Dream of a Post-Racial America* (Chicago: University of Chicago Press, 2010).
[42]Markus Prior, "You've Either Got It or You Don't? The Stability of Political Interest over the Life Cycle," *Journal of Politics* 72 (July 2010): 747–766.
[43]Alan S. Gerber, Donald P. Green, and Ron Shachar, "Voting May Be Habit-Forming: Evidence from a Randomized Field Experiment," *American Journal of Political Science* 47 (July 2003): 540–550.

more complaints if they underallocate resources to white precincts, where income levels tend to be higher.[44,45,46]

Additionally, resources such as poll workers and voting machines are scarce and indivisible. If one precinct has 75 voters and another has 100 voters, and there are three voting machines to allocate, the optimal solution is to give one machine to the smaller precinct and two machines to the larger precinct. This will create longer lines in the smaller precinct. Better data on precinct resource allocation rules could assess the extent to which this dynamic may explain the racial gap.

I have shown in this article that the racial composition of a voter's neighborhood is strongly tied to how long he or she will wait in line to vote. A substantial amount of the gap between white and nonwhite wait times is a result of local factors, which provides policymakers a way forward in addressing the problem. Future research could apply the solutions of discrete optimization problems to the topic of resource provision in elections.

[44]H. George Frederickson, *Social Equity and Public Administration: Origins, Developments, and Applications* (Armonk, NY: M.E. Sharpe, 2010).

[45]Bryan D. Jones, Saadia R Greenberg, Clifford Kaufman, and Joseph Drew, "Service Delivery Rules and the Distribution of Local Government Services: Three Detroit Bureaucracies," *Journal of Politics* 40 (May 1978): 332–368.

[46]Kenneth R. Mladenka, "The Urban Bureaucracy and the Chicago Political Machine: Who Gets What and the Limits to Political Control," *American Political Science Review* 74 (December 1980): 991–998.

APPENDIX A

TABLE A1
How Did Neighborhood Demographics Impact Average Wait?

	(1)	(2)	(3)	(4)
Intercept	16.504***	6.671***		
	(0.259)	(0.945)		
White Pct	−14.177***	−17.386***	−7.930***	−12.139***
	(0.286)	(0.561)	(0.430)	(0.743)
Population Dens.		0.0001***		0.0002***
		(0.00001)		(0.00002)
Pct. over 65		5.305**		−1.400
		(1.640)		(2.051)
Median Income		0.066***		0.048***
		(0.004)		(0.006)
Pct. Speak Eng.		10.929***		12.906***
		(0.777)		(1.030)
Afr.-Amer.		5.480***		3.593***
		(0.333)		(0.323)
Hispanic		0.773*		−0.131
		(0.368)		(0.357)
Asian-Amer.		0.706		2.712***
		(0.801)		(0.764)
Other race		−0.614		−0.110
		(0.419)		(0.405)
Age		−0.027		−0.014
		(0.031)		(0.030)
Age^2		−0.0005		−0.001
		(0.0003)		(0.0003)
Party: Indep.		0.402		0.190
		(0.287)		(0.277)
Party: Repub.		−0.627**		−0.905***
		(0.199)		(0.194)
Early Voter		5.537***		5.556***
		(0.230)		(0.254)
2008	9.385***	8.125***	9.836***	8.725***
	(0.239)	(0.260)	(0.231)	(0.250)
2012	7.271***	6.321***	7.553***	6.728***
	(0.206)	(0.226)	(0.200)	(0.219)
2014	−1.784***	−1.441***	−1.563***	−1.027***
	(0.210)	(0.274)	(0.204)	(0.265)
Juris. fixed effects			✓	✓
Observations	91,907	78,102	91,907	78,102
R^2	0.066	0.083	0.196	0.227
Adjusted R^2	0.066	0.083	0.171	0.199

Note: *p < 0.05; **p < 0.01; ***p < 0.001
Ordinary least squares regression coefficients with standard errors clustered by jurisdiction. Intercept not calculated with fixed effects models. Standard errors are in parentheses.

TABLE A2
How Did Neighborhood Demographics Impact the Probability of Waiting More Than 30 Minutes?

	(1)	(2)	(3)	(4)
Intercept	−2.112***	−2.112***	−3.662***	−4.392***
	(0.046)	(0.046)	(0.648)	(0.675)
White Pct	−1.670***	−1.670***	−0.940***	−1.231***
	(0.044)	(0.044)	(0.074)	(0.115)
Population Dens.				0.00002***
				(0.00000)
Pct. over 65				−1.043**
				(0.368)
Median Income				0.008***
				(0.001)
Pct. Speak Eng.				0.973***
				(0.162)
Afr.-Amer				0.203***
				(0.048)
Hispanic				−0.065
				(0.062)
Asian-Amer.				0.266*
				(0.119)
Other race				0.118
				(0.072)
Age				0.001
				(0.005)
Age^2				−0.0001
				(0.0001)
Party: Indep.				0.059
				(0.050)
Party: Repub.				−0.135***
				(0.034)
Early Voter				0.485***
				(0.040)
2008	1.487***	1.487***	1.716***	1.629***
	(0.045)	(0.045)	(0.048)	(0.050)
2012	1.232***	1.232***	1.375***	1.312***
	(0.042)	(0.042)	(0.045)	(0.048)
2014	−0.530***	−0.530***	−0.525***	−0.538***
	(0.055)	(0.055)	(0.057)	(0.074)
Juris. fixed effects			✓	✓
Observations	91,907	91,907	91,907	78,102
Log Likelihood	−24,786.620	−24,786.620	1,395.000	−20,190.980
Akaike Inf. Crit.	49,583.250	49,583.250	2,790.000	45,961.960

Note: *p < 0.05; **p < 0.01; ***p < 0.001
Linear probability model with standard errors clustered by jurisdiction. Standard errors are in parentheses.

TABLE A3
How Did Neighborhood Demographics Impact the Probability of Waiting More Than 60 Minutes?

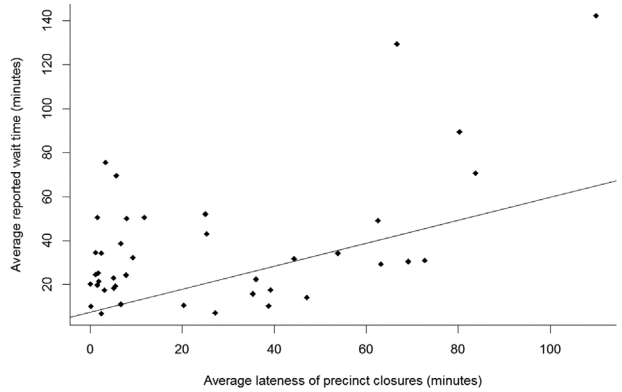
	(1)	(2)	(3)	(4)
Intercept	−3.312***	−3.312***	−5.253***	−6.873***
	(0.088)	(0.088)	(1.280)	(1.317)
White Pct	−2.253***	−2.253***	−1.264***	−1.899***
	(0.073)	(0.073)	(0.123)	(0.184)
Population Dens.				0.00003***
				(0.00001)
Pct. over 65				−0.224
				(0.576)
Median Income				0.010***
				(0.002)
Pct. Speak Eng.				1.732***
				(0.265)
Afr.-Amer				0.053
				0.076
Hispanic				−0.122
				(0.104)
Asian-Amer.				0.097
				(0.213)
Other race				−0.166
				(0.132)
Age				0.016
				(0.009)
Age^2				−0.0003**
				(0.0001)
Party: Indep.				0.021
				(0.089)
Party: Repub.				−0.052
				(0.059)
Early Voter				0.865***
				(0.063)
2008	1.929***	1.929***	2.264***	2.062***
	(0.087)	(0.087)	(0.093)	(0.096)
2012	1.469***	1.469***	1.705***	1.531***
	(0.085)	(0.085)	(0.090)	(0.094)
2014	−1.196***	−1.196***	−1.089***	−1.124***
	(0.138)	(0.138)	(0.142)	(0.185)
Juris. fixed effects			✓	✓
Observations	91,907	91,907	91,907	78,102
Log Likelihood	−9,948.267	−9,948.267	1,395.000	−7,370.696
Akaike Inf. Crit.	19,906.530	19,906.530	2,790.000	20,321.390

Note: *p < 0.05; **p < 0.01; ***p < 0.001
Linear probability model with standard errors clustered by jurisdiction. Standard errors are in parentheses.

APPENDIX B: VALIDITY OF SURVEY-BASED MEASURES OF WAIT TIMES

One potential concern with using survey data to estimate wait times is that respondents who wait in long lines might be more likely to recall how long they waited than those who only waited a few minutes. Psychology research has shown that the relationship between an individual's perception of time

FIGURE 7
How Much Do Objective and Survey-Based Measures of Wait Times Correlate?



and actual time is linear.[47] This implies that people who reported waiting longer in line did actually wait longer in line.

In the context of this article, for recall bias to impact the results, it must be the case that the bias is operating differently for white and nonwhite voters. There is no clear reason to believe that nonwhite voters who wait in a long line are more (or less) likely to report doing so than white voters who wait in a long line.

Another potential source of bias is from media reports about long lines at minority precincts predisposing minority voters to report longer lines. I subset the data to only include respondents with a verified record of voting, so for media effects to drive my conclusions, they would have to trump the impact that a voter's actual voting experience has on their survey response. The racial gap so large that even a modest amount of bias is unlikely to account for the entirety of the gap.

Although most counties and towns do not collect "objective" measures of line length in their precincts, there are a handful that do in the form of closing times of precincts. Because anybody in line at the end of the designated closing time is allowed to cast a ballot, the delay between the designated and true closing times provides a proxy for the line length at the precinct. Using Famighetti, Melilli, and Pérez's data from 41 counties in three states in 2012, I regressed the county average wait time—from the CCES responses—on the average delay in precinct closing time. I find a positive and statistically significant relationship ($\beta = 0.524$ (0.1328); $p < .001$; $R^2 = 0.284$). Figure 7 shows a scatterplot of this relationship.

[47]Lorraine G. Allan, "The Perception of Time," *Perception and Psychophysics* 26 (September 1979): 340–354.

In the absence of nationwide objective measures of line length, survey responses provide a reliable measure.

APPENDIX C: AVERAGE WAIT TIME BY RACE IN VARIOUS ELECTIONS

FIGURE C1
Average Wait Time in November 2006 Election

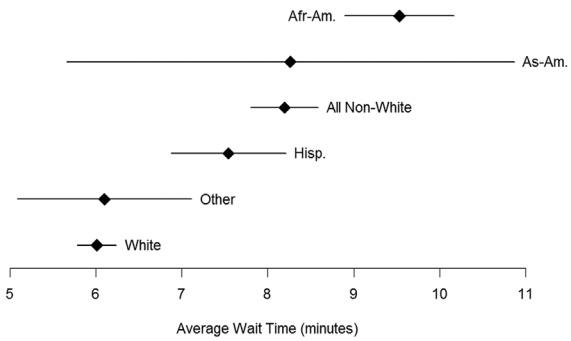


FIGURE C2
Average Wait Time in November 2008 Election

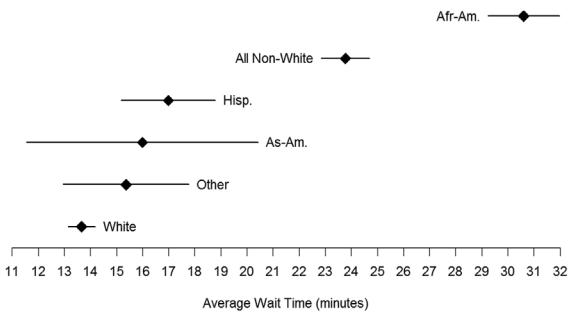
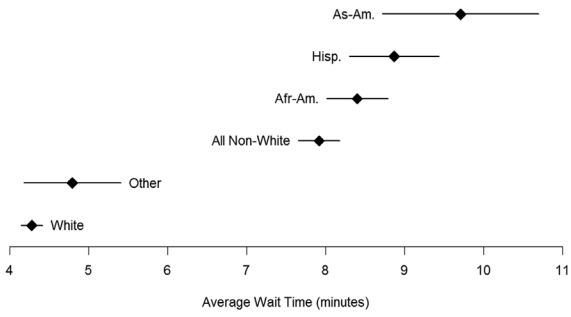


FIGURE C3
Average Wait Time in November 2014 Election



APPENDIX D: DISTRIBUTION OF WAIT TIMES BY RACE IN VARIOUS ELECTIONS

FIGURE D1

Distribution of Wait Times for White and African Americans in November 2006 Election

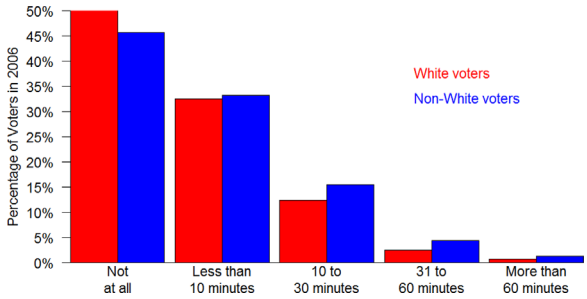


FIGURE D2

Distribution of Wait Times for White and African Americans in November 2008 Election

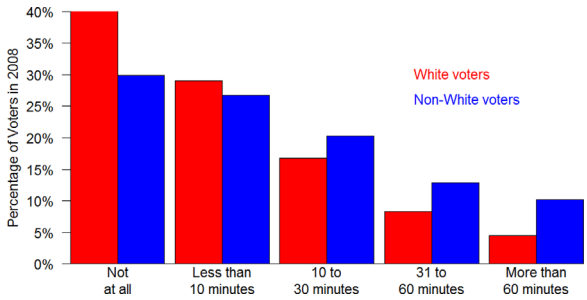


FIGURE D3

Distribution of Wait Times for White and African Americans in November 2014 Election