

BRENNAN CENTER  
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TWENTY YEARS

*at New York University School of Law*

## Long Voting Lines: Explained

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In just days, millions of voters will cast ballots in [tens of thousands](#) of polling places. For the most part, they will have a brief and pleasant experience. But if past elections are any indication, at least some voters will wait hours in line to cast their ballot.

There have already been scattered reports of long lines during early voting in [North Carolina](#) and [Texas](#). During the primary season, many waited hours to vote in Wisconsin and Arizona. And in 2012, voters in Florida waited up to seven hours, leading President Obama to declare in his victory speech, “We have to fix that.”

So what causes long lines on Election Day — and how can officials prevent them?

There are several contributing factors. In [Wisconsin’s April primary](#), voters faced a new photo ID requirement, for example. In [North Carolina](#) this fall, some counties eliminated early voting locations. In [Florida](#) in 2012, state officials drastically reduced the number of early voting days. Less than two weeks ago, in Texas, there were reports of [vote-flipping](#) and [other machine](#) malfunctions. These issues can certainly cause backups on Election Day.

But how resources — such as voting machines, poll workers, and poll books — are allocated to each polling location can also make a big difference.

Brennan Center [research](#) from three states with some of the longest lines in 2012 (Florida, Maryland, and South Carolina) showed precincts with the longest lines had fewer machines, poll workers, or both. Areas with higher percentages of minority voters tended to have fewer machines, we found, and voters in precincts with more minorities experienced longer waits. [Other research](#) backed up our results, finding those who waited the longest tended to live in urban areas and were disproportionately African American and Latino.

Preliminary data from the 2016 presidential primary election shows similar trends. When Arizona held its primary in March, there were [reports](#) that some voters waited as long as five hours to cast a ballot. At the time, the lengthy wait times sparked outrage from state [officials](#) and made national [headlines](#).

The long waits were concentrated in Maricopa County, which contains Phoenix. With a population of about 4 million, Maricopa is not only the most populous county in Arizona, it is the fourth-most populous county in the United States. Press accounts at the time suggested that a dramatic reduction in polling places was the culprit. In the 2012 primary, for example, there were more than 200 polling locations. In 2016, there were 60 vote centers. Voters could cast a ballot at any vote center in the county — regardless of address. The drastic reduction in voting locations followed [cuts](#) to state election funding. Nonetheless, contemporary accounts suggested that the fewer places to vote may

have [disproportionately affected](#) Latinos. (Last month, the county [instituted](#) a planning process to avoid long lines in future elections.)

In an effort to understand what happened in Maricopa County more deeply — and compare it to line problems from 2012 — the Brennan Center analyzed the 2016 primary election data.<sup>1</sup> Among the key findings are:

- On average, vote centers across the county closed more than two hours late. Vote centers in Phoenix closed, on average, more than four hours late.
- Latino voters faced disproportionately long wait times. Across heavily Latino census tracts, the average wait time at the closest voting center was more than four hours.
- Vote centers with longer wait times tended to have fewer resources, such as poll workers and electronic poll books, per voter.

With just days left before the 2016 election, polling place resources — such as poll workers, machines, and poll books — have likely already been allocated. Going forward, election officials should ensure these resources are distributed equitably and there are contingency plans should long lines occur. Furthermore, we recommend officials pay special attention to voters living in racially diverse neighborhoods and urban areas.

### MARICOPA COUNTY CASE STUDY

#### Magnitude of Delays

Long lines were widespread. The Maricopa County vote centers were [scheduled to close at 7:00 p.m.](#) But about 70 percent of them closed more than an hour late. Five centers were coping with voter lines past midnight. The table below summarizes the wait times across the 60 vote centers:

Distribution of Vote Center Wait Times	
Wait Time	Vote Centers
0-1 Hour	19
1-2 Hours	9
2-3 Hours	12
3-4 Hours	10
4-5 Hours	5
5+ Hours	5
<b>Average</b>	<b>137 Minutes (2 Hr. 17 Min.)</b>

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<sup>1</sup> Analysis based on data provided to the Brennan Center by the Maricopa County Board of Elections.

## Drivers of Delay

The study of lines, including those during elections, is known as queuing theory. [Queuing theory](#) suggests that wait times are caused by a [combination of factors](#), including the arrival rate of voters, the amount of available resources to process them, and the time it takes to vote.

Based on our analysis of Maricopa County’s primary, important but predictable themes emerged. The vote centers with the highest amount of traffic tended to close later.<sup>2</sup> Vote centers processed varying numbers of ballots. While some vote centers tabulated just 100 or 200 ballots, others tabulated more than 3,000.

Maricopa County uses optical scan voting machines. The voting process consists of three phases: (1) arriving at the polling place and checking in at a registration table, (2) marking a paper ballot in a voting booth, and (3) feeding the ballot into an optical scan machine.

Election officials allocate resources, such as voting machines and poll workers, to various locations based on turnout estimates. And that’s the method Maricopa County followed in the primary when it came to allocating poll workers and electronic poll books.<sup>3</sup> Yet when it came to voting machines and privacy booths (where a voter marks a ballot), each voting center got the same amount: eight booths<sup>4</sup> and just one optical scan machine. Queuing theory suggests that voters would back up while waiting for scarce resources, such as voting booths or voting machines, after checking in.

Not surprisingly, the data shows that vote centers that tabulated more ballots — and that had more voters per electronic poll book (EPB) and poll worker — had longer wait times.

Wait Time	Ballots	Ballots per EPB	Ballots per Poll Worker	Vote Centers
0-30 Minutes	221	87	29	8
30-60 Minutes	1,601	353	115	11
60+ minutes	2,165	394	161	41

At one center, the Church of Beatitudes in Phoenix, voters stood in line for hours only to learn that poll workers had temporarily [run out of ballots](#). Election officials allocated just 979 ballots<sup>5</sup> to the vote center. By the end of Election Day, the location processed 3,102 ballots — more than three times the number originally allocated. Voting ended at 12:48 a.m., almost 6 hours late — the second latest closing time in the entire county.<sup>6</sup>

<sup>2</sup> Based on the bivariate regression (Dep.: Minutes Late ~ Ind.: Ballots Cast) the  $R^2 = 0.3647$  ( $p = .000$ )

<sup>3</sup> We assume Maricopa officials considered turnout or voter registration data when allocating certain resources because there was variation in the quantity of (1) **poll workers** and (2) **electronic poll books** provided to vote centers. Charles Stewart, in *Managing Policy Place Resources*, refers to several jurisdictions that take a systematic approach to polling place management including: Travis County, Texas; Orange County, California; Denver, Colorado; and Bernalillo County, New Mexico. Stewart also highlights efforts in 2014 by the Washington, D.C. Board of Elections to efficiently allocate resources and reduce wait times. See <http://web.mit.edu/vtp/Managing%20Polling%20Place%20Resources.pdf>

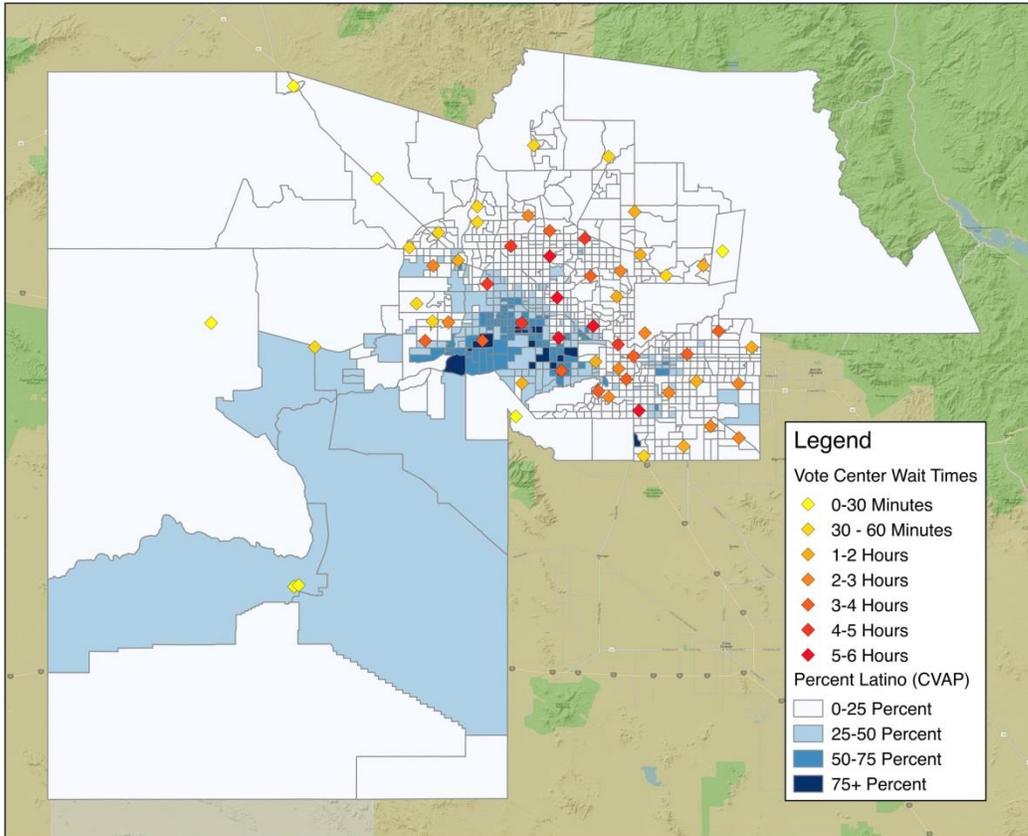
<sup>4</sup> Each vote center was provided 7 standard privacy booths and 1 accessible privacy booth. Vote centers were also allocated one accessibility device each.

<sup>5</sup> Data provided by the Maricopa Board of Elections shows that the Church of the Beatitudes was allocated 979 regular ballots and 1,000 provisional ballot envelopes.

<sup>6</sup> Closing time data for vote centers provided to the Brennan Center by the Maricopa County Board of Elections.

## Affected Communities

Voters in densely populated areas tended to wait longer. In Phoenix, where roughly 35 percent of the county’s eligible voters reside, the average wait time was over four hours. Comparably, across the entire county, the average wait time was roughly two hours. In the map below, we see that Phoenix and the surrounding areas had the longest lines.



Race and geography are intertwined in Maricopa County. Latinos account for a larger portion of the citizen voting age population (CVAP) in Phoenix (25 percent) when compared to the entire county (19 percent).<sup>7</sup>

Arizona’s list of registered voters does not include race data.<sup>8</sup> Instead, we looked at the demographics from census tracts to make estimates about the race of the CVAP near each vote center.<sup>9</sup> We refer to these clusters of census tracts as “catchment areas.” While it was true that

<sup>7</sup> Whites account for roughly 70 percent of the CVAP in Maricopa County, where as Latinos account for 19 percent of the CVAP. Black or African Americans account significantly smaller portion, or 5 percent, of the CVAP. Based on 2014 CVAP Estimates ACS [https://www.census.gov/rdo/data/voting\\_age\\_population\\_by\\_citizenship\\_and\\_race\\_cvap.html](https://www.census.gov/rdo/data/voting_age_population_by_citizenship_and_race_cvap.html)

<sup>8</sup> Voter data provided to the Brennan Center by the Maricopa County Board of Elections did not include race data.

<sup>9</sup> To calculate demographic data for each vote center, the Brennan Center measured the distance between the center of all census tracts within Maricopa County and the closest vote center. Based on this analysis, each census tract was assigned a vote center – creating a “catchment area” for each vote center. By aggregating demographic data for the CVAP across the catchment area, the Brennan Center was able to estimate the characteristics of the voters surrounding each vote center. **Notes:** [1] One vote center – the San Lucy District Administrative Building – was dropped from the analysis. Based on our geographic analysis of census tracts, this vote center was not closest to any particular tract. Furthermore, the San Lucy Administrative Building processed just 36 voters; [2] The Kaka Village Vote Center did not have a precise street address, thus it was geo-located in the center of Kaka

voters could cast a ballot anywhere in the county, it is likely that the majority of voters cast their ballots at the voting center nearest to their home.<sup>10</sup> While these estimates will not perfectly represent the actual voters processed at each center, it is the best estimate available for understanding the broader trends.

Vote centers in Latino areas tended to have longer wait times. When census tracts where more than 75 percent of the voting population is Latino are examined, we find that the average wait time (at the closest vote center) was 244 minutes.<sup>11</sup> Comparably, if we isolate the census tracts where more than 75 percent of the voting population is white, we find the average wait time was 167 minutes, a difference of 46 percent.<sup>12</sup>

Aggregating census tracts across catchment areas, we find the relationship between race and wait times to be consistent.

Percent Latino (CVAP)*	Average Wait Time	Vote Centers <sup>13</sup>
0-10% Latino	89 Minutes (1 Hr. 29 Min.)	20
10-20% Latino	159 Minutes (2 Hr. 39 Min.)	23
20% + Latino	175 Minutes (2 Hr. 55 Min.)	16

*\* Since catchment areas combine census tracts, the table indicates a lower concentration of Latino voters than at the more granular census tract level.*

### Finding Solutions: Untangling Multiple Causes

So far, we have considered several individual factors associated with long lines, such as resource allocation, race, and geography. To better understand the cause of wait times in Maricopa County, we will now use a statistical tool called a regression model, which measures how several factors simultaneously affect an outcome. In this case, the outcome is the number of minutes a vote center stayed open past the scheduled closing time.

We find statistically significant relationships between: (1) long lines and vote centers that served higher percentages of Latino voters and (2) long lines and vote centers located within the city of Phoenix. We also find statistically significant relationships between longer wait times and the allocation of poll workers and electronic poll books.<sup>14</sup>

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*in south east Maricopa County.* 2014 ACS CVAP Estimates

[https://www.census.gov/rdo/data/voting\\_age\\_population\\_by\\_citizenship\\_and\\_race\\_cvap.html](https://www.census.gov/rdo/data/voting_age_population_by_citizenship_and_race_cvap.html)

<sup>10</sup> One study, by Bowen Center for Public Affairs at Ball State University, estimated that majority of voters in three Indiana Counties [Cass, Tippecanoe and Wayne] voted at the vote center closest to their home. In one of the three Indiana Counties [Cass], approximately 87 percent of voters voted at the center closest to their home. <http://bowencenterforpublicaffairs.org/wp-content/uploads/2012/09/Assessing-and-Evaluating-Indiana-Vote-Centers.pdf>

<sup>11</sup> Based on an analysis of 19 tracts where Latinos accounted for >= 75 percent of the CVAP Note: This sample of census tracts reflects a geographic concentration of Latinos.

<sup>12</sup> Based on an analysis of 431 tracts where Whites accounted for >= 75 percent of the CVAP

<sup>13</sup> Vote center counts based on analysis of “catchment areas” for 59 vote centers. For more information, see methodology described in footnote 9.

<sup>14</sup> Our regression findings suggest that the allocation of poll workers has a stronger relationship with wait times than the allocation of electronic poll books. We find in models 1-3 a statistically significant relationship. Based on findings from models 4-6 we see that the predictive power of the resource allocation measures are overwhelmed by our volume and population measures (1) “Ballots Cast” and (2) “CVAP Served.”

But the strongest predictor of delays is the number of eligible voters each center serves. When included in our regression model, this factor swamps other variables such as the number of voters per poll worker and the number of electronic poll books per voter. The table below illustrates this relationship:

Wait Time	CVAP	CVAP per Square Mile	Vote Centers <sup>15</sup>
0-30 Minutes	6,414	11 <sup>16</sup>	7
30-60 Minutes	24,967	87	11
60+ minutes	55,527	2,075	41

### Conclusion

We are already reading reports of delays at the polls – even in [Phoenix](#) – but long lines are not a wildly unpredictable phenomenon. As the case study of Maricopa County shows, long lines can result from poor planning at the local level. Careful study and preparation by election officials are the first line of defense. Election officials should make sure that resources — such as poll workers and machines — are allocated equitably and competently. Racially diverse urban areas should receive special attention and election officials should make sure that contingency plans are in place when long lines occur.

View regression tables [here](#).

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<sup>15</sup> Vote center counts based on analysis of “catchment areas” for 59 vote centers. For more information, see methodology described in footnote 9.

<sup>16</sup> As a general matter, this extremely low population density figure applies to geographically large census tracts in west and southwest Maricopa County. See map of Maricopa County included with this analysis.