

# Considering the number of accessible voting systems needed in a voting location

---

The Help America Vote Act of 2002 (HAVA) requires that every polling place have at least one accessible voting system to ensure that voters with disabilities can mark and cast their ballot independently and privately. This was a big step forward for accessible voting. Overall, the frequency and severity of problems voters with disabilities encounter has been reduced, and the difference in voter turnout between people with and without disabilities has been reduced. However, problems still remain with ensuring that voters with disabilities have equal access to independent and private voting.

This document is a summary of approaches to considering how to resource and configure voting options for in-person voting so that an accessible voting system is available to anyone who needs or wants to use it, on an equal basis to any other method of voting.

## **Ballot marking devices are valuable to all voters**

Accessible voting is not the only use for ballot marking devices (BMDs). Entire states (including Georgia, South Carolina, and formerly Maryland), and several large jurisdictions (including Los Angeles County and Philadelphia) have used BMDs as the standard in-person voting system for all voters.

**A ballot marking device is a part of an accessible voting system.** BMDs include an accessible electronic interface for marking choices and reviewing those selections before printing a ballot to be cast as the official voting record. The printed ballot may be in one of two formats:

- A printed facsimile of a ballot where selections are indicated by filling in a bubble next to a candidate or choice
- A summary list of all selections, including undervotes (not voting in a race, or voting for fewer than the maximum number of allowed candidates)

**Ballot marking devices offer benefits to voters beyond a narrow definition of disability.** Benefits cited for BMDs include:

- Error prevention, including overvote protection and correctly printed ballots, including stray marks or ambiguous filling of bubbles that are a significant cause for ballots being rejected

This work is performed as part of NIST Contract #1333ND20FNB770277 - Task 3: Gather technical information to provide guidance on number of accessible ballot marking devices (BMDs) needed in polling places

- Support for voters to easily change their selections, including correcting mistakes during marking without needing to spoil the ballot
- On-screen review followed by verification of the printed, marked ballots is important to this process. Note the printed ballot must be legible and lend itself to being accurately read back by a voter's personal assistive technology or an independent system.
- Visual presentation options are useful for many needs not classified as low vision, including poor lighting in polling places, especially an option for larger fonts. Most people who prefer "large print" materials do not identify as having a disability
- Audio support can assist those with low literacy or augment low reading skills
- Support for Spanish and other languages makes it easier to manage printed ballot supplies, and for voter to use their preferred language

## **Alternative voting methods or locations are not the answer**

This report is focused on in-person voting because all voting methods must be accessible, so that voters with disabilities have the same opportunities for choice and personal preference as other voters.

This report does not include consideration of remote mail-in voting options including blank ballot delivery, remote-accessible ballot marking, or electronic ballot return. All of these can provide an alternative to in-person voting for people with disabilities, but are beyond the scope of this report. Although a growing number of states offer accessible vote by mail options, they are not universal and not required under HAVA.

This report also does not consider curbside or drive-through voting. Unless offered to all voters, it is an accommodation for physical access to the polling place and still required an accessible voting system to be an option for all voters with disabilities.

## **Demographics and the number of people affected**

Any recommendations rely on data about the number of voters affected to calculate the likely number of voters needed accessible voting options.

Because we assume that BMDs are an effective tool for all voters, we have to look beyond the narrow statistics for people with disabilities. Some important demographic statistics include:

Population	Why it is important	Sources
Total voting population	Elections should provide for the total possible turnout	CVAP (citizen voting age population) - <a href="#">Census</a> VEP (voting eligible population) <a href="#">US Elections Project</a>
Registered voters	Used for election administration. Some states have Same Day Registration which adds uncertainty	State and local voter registration statistics. EAC EAVS biannual report
People with disabilities	Legal scope for HAVA and ADA	Census and related sites like <a href="#">DisabilityStatistics.org</a>
People with low literacy	Additional audience	<a href="#">National assessment of adult literacy</a>
People who speak a second language	Language Minority Provisions of the Voting Rights Act (VRA) Statistics on other languages spoken that do not reach VRA thresholds	<a href="#">DOJ Language Minority Provisions</a>
Older adults	Older adults experience reduced function that may not be classified as disability	<a href="#">CDC</a> Disability impacts us all Census American Community Survey

According to the broad demographics about disability from the CDC *Disability Impacts us all*, **26% of adults** in the United States have some type of disability

- 13.7% mobility - serious disability walking or climbing stairs
- 10.8% cognition – remembering, concentrating or making decisions
- 6.8% independent living and 3.7% difficulty dressing or bathing
- 5.9% hearing – deafness or serious difficulty hearing
- 4.6% vision – blindness or serious difficulty seeing

These numbers collected by the CDC do **not** include dexterity impairments! Statistics are not available for the number of people with difficulty or inability to use their hands for fine-motor tasks like marking a ballot.

The Census report Older Americans Month, 2017 says that

- 11 Million (M) or 22% adults over 65 may have mobility, dexterity, vision or hearing disability

Other sources, such as The Brennan Center's 2006 *The Machinery of Democracy: Accessibility, Usability, and Cost* assembled data from several sources to focus on eligible voters and the demographics that were the most relevant for voting in-person (not counting transportation to the polling place):

- 19.1 M have trouble seeing
- 28.3 M have physical difficulty, including grasping and handling small objects
- 30.8 M have trouble hearing
- 17.8 M speak English "less than well"
- 9.2 M live in linguistically isolated households

Additional relevant demographic numbers on literacy from the National Assessment of Adult Literacy (US Dept of Education, 2003) suggest that 43% of literate adults may not read well enough to understand all of the information written on a ballot:

- 30 M or 13% literate adults read at a below basic level
- 63 M or 29% literate adults read at a basic level

Finally, a 2016 report from NonProfit Vote, *Engaging New Citizens* points out the large number of who may need extra help understanding how to vote:

- 45 M or 35% of voters are low propensity or infrequent voters

It would be useful to normalize the data across these (and similarly authoritative) sources to provide a strong quantitative picture of the large number of voters affected to have a broader picture of who might benefit from using a BMD if it was made available to them as a routine and normal voting option,

# Ways of looking at the numbers

---

The goal of this report is not to make recommendations, but to gather technical information and possible ways of calculating the number of accessible voting systems that can be input to guidance. It draws on existing resources including:

- Access Board requirements for architectural accessibility features
- Tools that calculate the resources required to avoid lines in polling places, including the number of voting stations to manage peak demand
- Data on overall turnout and the number of people who currently choose a BMD or paper ballot
- Data on laws or procedures about how the accessible voting options are offered.

## Reframing the questions to consider

Although coming up with a number of ballot marking devices seems like a relatively simple question, breaking down the assumptions and information needed shows that it's not a simple question at all. <sup>1</sup>

We broke the question into several smaller questions to be considered in turn below.

1. How do existing accessibility standards for buildings and facilities, such as those issued under the Architectural Barriers Act, specify the number of elements or spaces that must be accessible?
2. How many BMDs are required at each voting location to meet the letter and intent of HAVA?
3. How many BMDs are needed to guarantee that a voter with a disability does not have to wait any longer than any other voter?
4. How many BMDs are needed to ensure that everyone who wants to vote on a BMD is able to, with wait times no longer than other voters?

---

<sup>1</sup> Of note, in California, counties using polling places must have the usual 1 accessible voting system per polling place. Counties using vote centers must have at least three per vote center. So there is one state-wide rule that adjusts the numbers to accommodate a larger number of voters.

The discussions below assume a well-run voting location with good line management, places to sit for people who cannot stand for a long time, well-trained poll workers, and where there are no legal or procedural restrictions on who can use the accessible voting system. It is important that voters can make a choice based on their own needs and preferences.

## **Architectural Barriers Act standards**

We reviewed the [Architectural Barriers Act \(ABA\)](#) Accessibility Standards which specify the minimum number of various building elements and spaces that must be accessible. Elements and spaces covered include parking spaces, dining surfaces, toilet rooms, assembly seating, among others.

For many standard the ABA, uses 5% as the scoping level for the number of accessible resources a facility must provide. For example, it is specified for portable toilet and bathing facilities, dining and work surfaces, dressing and fitting rooms, lockers, mailboxes, and other elements.

Other standards provide minimum numbers for accessible elements through a table that starts at approximately 4%, but goes down as the total count increases. Examples include parking spaces, seating in assembly areas, and transient lodging guest rooms.

The highest requirements—20%—are used for facilities expected to have more visitors with disabilities such as rehabilitation facilities and outpatient physical therapy parking spaces.

In reviewing the ABA standards, we looked for facilities whose usage is similar to a voting location:

- Large numbers of people
- With a short stay at the facility
- Visiting the facility over the course of many hours

One way to use this guidance is to mimic the ABA and use 5% of the total number of voting booths. This accommodates both small polling places and large vote centers. The table below compares the number of BMDS that would be required at two different scoping levels.

### Number of BMDs needed at 5% and 20% of total booths

Total voting booths provided	BMDs needed 5% of total	BMDs needed 20% of total
1-10	1	2
10 - 15	1	3
15-20	1	4
21 - 40	2	8
41 - 60	3	12

This approach could be used in a model, such as the [Polling Place Resource Planner](#), adding a recommended number of accessible voting systems based on the overall number of voting booths it recommends.

For example, for an expected 1000 voters, it takes 8 voting stations to keep lines under 30 minutes with the default voting time of 5 minutes per voter. However, if we raise the voting time to 10 minutes to include slower voting times using audio or assistive technology, 15 total stations are needed. From the recommendation for total voting stations, we can calculate the number of accessible BMDs.

## Visualizations of the wait times for 8 and 15 stations for 1000 voters

Data	Visualizaion
<p><b>Data shown in the graph</b></p> <p>Voters: 1000                      Check-in: 4  <b>Stations: 8</b>                      Hours: 13</p> <p>Check in time: 2 min  <b>Vote time: 5 min</b>                      Pattern: composite                      Longest wait: 25 min</p>	
<p><b>Data shown in the graph</b></p> <p>Voters: 1000                      Check-in: 4  <b>Stations: 15</b>                      Hours: 13</p> <p>Check in time: 2 min  <b>Vote time: 10 min</b>                      Pattern: composite                      Longest wait: 25 min</p>	

### How many BMDs are required at each voting location to meet the letter of the law?

The Help America Vote Act (HAVA) requires 1 accessible voting system in each location in a Federal election.

One of most frequent problems reported, however, is that the accessible machine is *present* but not *set up and ready for use*. When this experience is repeated year after year, or when the accessible voting system is difficult to use, that experience becomes a barrier in itself. For example, a county official in a rural-suburban county with a very old DRE system anecdotally reported that only 1 blind voter in the entire county still attempted to use the system.

In small jurisdictions, accessible voting systems may only be deployed in Federal elections, leaving voters relying on accommodations during municipal, school, or special elections, further depressing use of the systems.

## **How many BMDs are needed to guarantee that a voter with a disability does not have to wait any longer than any other voter?**

If we assume that only people with disabilities or voters who will have problems using a hand-marked paper ballot, even if not officially classified with a disability, will use the accessible system, the time to mark the ballot is likely to be longer on average because they are more likely to use the inherently slower audio ballot, take longer reading, or need more time for physical actions.

If we also make the assumption that the arrivals pace for voters to use the BMD matches that of voters overall, we can use the polling place calculator to see how many BMDs are needed with no wait times beyond 30 minutes, by adjusting the input to the calculator.

Using the same 13 hour day, enough check-in stations that they are not a bottleneck, and the default composite arrivals pattern, we can recalculate scenarios for 250 voters and the number of BMDs needed.

The table below uses different average voting times on the BMDs to adjust for both slower voting times with audio or other assistive technology and the length of the ballot (especially the number of contests and length of any ballot questions)

### **Number of BMDs needed for average voting times for 250 voters**

Estimated average vote time	Number of voting stations (BMDs) provided	Average waiting time
5 minutes	1	+120 minutes
5 minutes	2	< 30 minutes

Estimated average vote time	Number of voting stations (BMDs) provided	Average waiting time
10 minutes	1-2	+120 minutes
10 minutes	3	< 30 for most of day > 90 minutes at peak
10 minutes	4	< 30 minutes
15 minutes	1-3	+120 minutes
15 minutes	4	< 30 for most of day +120 minutes at peak
15 minutes	5	< 30 for most of day +60 minutes at peak
15 minutes	6	< 30 minutes

## How many BMDs are needed to ensure that everyone who wants to vote on a BMD is able to, with no extra wait?

Anecdotal reports from poll workers in early voting in Maryland, say that even with more than one BMD, there was not a line to use a paper-marking voting booth, but there was sometimes a short wait to use a BMD.

This question asks how many voting stations would be needed for hand-marked paper ballots and BMDs if voters were allowed to choose which type of ballot to use, given an equal choice. For these calculations, we use the default 5 minutes of voting time, because the diversity in voters will reduce the average time.

Other evidence for this assumption comes from a study of voter verification in the fall of 2019. Voters were asked to vote a ballot using both a hand-marked paper ballot and a BMD. Careful timings of each stage of voting showed that the overall time to vote was the same on each ballot for an individual voter, though there was

significant variation between voters. The results were similar across three different ballot marking systems.

We are gathering data on how many voters choose each method of voting in jurisdictions where they are offered a choice at check-in, for some empirical evidence of what the ratio is.

### **Number of BMDs needed for a variety of ratios**

Assuming: 1000 voters, 5 minute wait time for 8 and 15 stations

<b>Ratio HMPB   BMD</b>	<b>8 stations total</b>	<b>15 stations total</b>
50%   50%	4   4	8   7
60%   40%	5   3	9   6
70%   30%	6   2	10   5

## **Other ideas for measuring the number of BMDs needed**

### **Ideas for the calculation model**

We have also brainstormed other data or approaches to setting a metric for the number of BMDs needed:

- Ensure that there are enough BMDs for 100% use in a low-turnout election.
- Calculate using the average number of voters in all elections during the past 8 years. However, it's important to remember that past turnout is not always a good predictor of turnout in any election.
- Consider non-federal elections, which often have lower turnout.

### **Ideas and research needed about the population**

The number of people to include is also an area for quantitative research. The total number of people with disabilities may not be a good metric for the number who need a BMD (rather than using it by preferences)

- Use Census data by county to adjust the % of people with disabilities.

Consider which voters need, and can benefit from, using a BMD

- Calculate only people with vision, mobility, or dexterity disabilities. Deaf voters already vote at higher rates than the overall turnout, and people with disabilities affecting independent living or self-care may be less likely to vote in person
- Include literacy, which affects the ability to read the ballot, but is not included in disability statistics
- Include language access, both because some people may speak English, but not read it, and because some are not literate in either language.

### **Calculations in all- or most- vote by mail states**

In the all vote-by-mail states, Colorado led the way in re-conceptualizing “vote centers” into voter service centers. California followed with strong requirements for vote center placements in counties adopting the Voter’s Choice Act.

These states and others with over 50% use of vote by mail have historical data on use of polling places that can be a model for estimating the number of people who will vote in person.

### **Further research**

The [Polling Place Research Planner](#) is an example of an election administration tools that uses evidence-based models (in this case based on queuing theory) to create simulations that help election officials make decisions about polling place voting options. There is a need to expand these models to include scenarios for providing accessible voting that takes into consideration different voting systems, number of voters expected to vote in person, and other characteristics of the jurisdiction.

In addition, although this paper does not cover the use of remote accessible vote by mail (RAVBM) systems, that is another area for gathering quantitative data that could feed these models. We don’t know, for example, whether RAVBM changes the percentage of people voting in person or by mail, or whether it increases overall turnout.

Tools based on models that include not only provision of BMDS, but the availability and use of options like drive-through or curbside voting, voting by mail, provision for alternative languages, could be an opportunity to ensure that every election official has the information they need to best meet legal requirements *and* the needs of all their voters.