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Chairperson Lofgren, Ranking Member Davis, members of the Committee,

I am honored to share with you my expertise in voting systems security, accessibility and usability. Let me begin by speaking about my background as it relates to this important topic. I am the Andrew Banks Family Preeminence Endowed Professor and Chair of the Computer & Information Science & Engineering Department at the University of Florida where I lead the Human Experience Research Lab. I have worked in elections for more than 15 years conducting research, developing innovative technologies and conducting studies with various elections stakeholders. In 2003, I developed an open source voting system called Prime III in response to the 2000 Presidential Election and the Help America Vote Act, or HAVA. To my knowledge, I am the only person to create an open source voting system that has been used in federal, state and local elections. Prime III was the first universally designed voting system, to my knowledge, meaning it was designed for all voters, independent of their ability or disability. The idea was one machine that everyone could use. This has benefits for accessibility, security and usability for voters and election administrators. For example, the margin of victory of the 2016 Presidential Election was smaller than the number of voters with disabilities that voted. If voters with disabilities are the only people voting using a specific type of technology, then adversaries could simply target that single population and impact the outcome of the election, see data from Rutgers' reports below. After HAVA was passed, each voting precinct was required to have at least 1 accessible voting machine. Although this was a good idea making progress towards increasing accessibility of our elections, there was one side effect. It setup a separate but equal experience for voters with disabilities. As such, there were unexpected issues introduced. For example, in some precincts, there were reports of the accessible voting equipment not being setup because the poll workers didn't know how to set it up. Essentially, because few voters used it, it was not something the poll workers gave much attention. Prime III has been used statewide in New Hampshire. New Hampshire adopted Prime III as their accessible voting machine and renamed it, One4All. Butler county, Ohio, which is my birth county, adopted Prime III as their remote accessible, absentee voting system in 2018. ES&S is the nation's largest voting machine manufacturer. ES&S created a machine called the Universal ExpressVote. ExpressVote was designed after Prime III. Dominion has the ImageCast Prime X machine that is very similar to Prime III as well. The research and development of Prime III was supported by the National Science Foundation

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and the U.S. Election Assistance Commission. The U.S. EAC supported this research and development through a 5 year accessible voting technologies grant that created the Research Alliance for Accessible Voting, RAAV. This grant helped setup Prime III research, development and studies that have resulted in improvement in the state of the art in elections technology. It also supported research and training for election administrators. Grants such as the EAC accessible voting technologies project are crucial to achieving the necessary security, accessibility and usability in our elections. Grants from the U.S. EAC have resulted in very good findings that are improving our elections.

I would like to transition now into specific recommendations. In 2018, the National Academies of Science, Engineering and Medicine released a consensus report titled, "Securing the Vote: Protecting American Democracy" The report was the result of a 2 year study conducted by experts from elections administration and policy, cybersecurity, accessibility, and law. I was a member of this committee. Over the course of the study, the committee reviewed extensive background materials. It held five meetings where invited experts spoke to the committee about a range of topics including voter registration, voting accessibility, voting technologies and market impediments to technological innovation, cybersecurity, post-election audits, and the education and training of election workers. The committee did not access classified information but instead relied on information in the public domain, including state and federal government reports, published academic literature, testimony from congressional hearings, and presentations to the committee. Issues related to voting such as voter identification laws, gerrymandering, foreign and domestic disinformation, campaign financing, and other similar topics were outside the charge of the committee and therefore, are not included in the report.

The committee was inspired by dedicated and enlightened election officials from across the nation and all levels of government. Such individuals are working tirelessly to improve accessibility, harness new technologies, and ensure the integrity of the results of elections. Unfortunately, these same officials often lack appropriate staff and resources and are routinely hampered in their work by a patchwork of laws and regulations that make it difficult to upgrade and modernize their election systems. U.S. elections are subject to aging equipment, targeting by external actors, a lack of sustained funding, and growing expectations that voting should be more accessible, convenient, and secure. The present issues and threat environment provide an extraordinary opportunity to marshal science and technology to create more resilient and adaptive election systems that are accessible, reliable, verifiable, and secure.

The Academies' study committee recognized that the federal government has an important role to play in understanding the impact of technological changes on the conduct of elections and in evaluating possible remedies to election threats. It noted that the U.S. EAC has a vital role to play in improving election administration and that NIST and NSF also have important roles to play in advancing the state of the art in US elections. The committee stated that the designation by the U.S. Department of Homeland Security of election systems as a subsector of the existing government facilities critical infrastructure sector is correct and appropriate, and that this designation reflects appropriately the need for sophisticated technical expertise and sharing of intelligence information required to protect the nation's election infrastructure.

We must foster an environment that promotes innovation in election systems technology, provides election administrators with human resource tools to increase the professionalization of the election workforce, allocates appropriate resources for the operation of elections, and better secures elections by developing auditing tools that provide assurances that ballots cast are counted and tabulated correctly and that the results of elections are accurate.

I would like to share some key recommendations from the report with you.

Elections should be conducted with human-readable paper ballots. These may be marked by hand or by machine, using a ballot-marking device; they may be counted by hand or by machine, using an optical scanner. Recounts and audits should be conducted by human inspection of the human-readable portion of the paper ballots. Voting machines that do not provide the capacity for independent auditing, for example, machines that do not produce a voter-verifiable paper audit trail, should be removed from service as soon as possible. Currently, there's no known way to secure a digital ballot. At this time, any election that is paperless is not secure. Therefore, Internet voting, specifically, the return of ballots should not be used at this time.

Vendors and election officials should be required to report any detected efforts to probe, tamper with, or interfere with any election systems, including, voter registration systems.

Each state should require a comprehensive system of post-election audits of processes and outcomes.

A detailed set of cybersecurity best practices for state and local election officials should be continuously developed and maintained.

Congress should provide funding to help state and local governments modernize their election systems and improve their cybersecurity capabilities. Congress should also authorize and provide funding for a major research initiative on voting. In the report, recommendation 7.3 says,

"Congress should authorize and fund immediately a major initiative on voting that supports basic, applied, and translational research relevant to the administration, conduct, and performance of elections. This initiative should include academic centers to foster collaboration both across disciplines and with state and local election officials and industry."

This recommendation calls for a bold initiative to foster research and development towards the mitigation of the issues outlined in the report. Such an initiative would be managed by the relevant existing government agencies. These agencies are the U.S. EAC, NIST, U.S. Department of Homeland Security, National Science Foundation, and U.S. Department of Defense (DoD). This initiative would call for a minimum of $25 million in funding over a 5-year period to establish a national center that has the primary focus of research and development as it relates to making all aspects of elections secure, accessible, usable and trustworthy. The center would work across universities, election officials, and elections technologies companies. The proposed research center is critical to protecting our elections and advancing the state of the art in elections to mitigate all domestic and foreign threats.

I would like to speak to a recent debate in the academic research community with respect to hand-marked paper ballots and ballot marking devices (BMD). As previously mentioned, in "Securing the Vote: Protecting American Democracy," the committee was clear in their recommendation that "Elections should be conducted with human-readable paper ballots. These may be marked by hand or by machine, such as a ballot marking device (BMD)." Following the release of the report, many States are moving away from paperless voting machines to hand-marked paper ballots or BMD. At the onset, it is important for voters to understand the difference in voting processes and how their votes are cast and counted.

In most BMD implementations, the voter makes selections using the BMD and a paper ballot is produced with a QR code or some other barcode and the voters' selections. The barcode(s) represent the voters' selections and are read by a separate scanner. In this case, some are concerned that the barcode may not match the human-readable portion of the ballot. To ensure a match, the national academies report recommends that all elections should undergo an audit, for example a risk-limiting audit (RLA). This recommendation

also applies to hand-marked paper ballots as well because they are fed through a scanner for tallying. The audit would ensure that the election results are accurate and would neutralize any barcode mismatches. Furthermore, if the barcodes don't match, this provides a forensic trail to investigate the mismatch.

Hand-marked paper ballots, unlike BMD voting, are susceptible to overvoting and undervoting hacks. The undervote hack occurs when a voter decides not to make a selection in a contest, in other words, they leave the contest blank. This is a natural response when a voter doesn't want to vote for any candidates in a particular contest. An insider could then make a selection on that ballot. This will take two-to-five seconds and it's impossible to detect if the insider is not caught in the act. The overvote hack occurs when the voter makes a selection, but the insider makes an additional selection causing an overvote, which would lead to a nullified ballot. Like the undervote hack, this is undetectable unless the insider is caught in the act. These hacks require very little expertise and time.

There have been claims that voters do not review their ballots that have been produced by a BMD. Therefore, it's possible to flip votes so that what is printed on the ballot isn't what the voter selected and if the voter doesn't verify the ballot, the hack is successful. Dr. Michael Byrne at Rice University has just completed a study and his findings differ. Dr. Byrne and his colleagues have recently completed two separate studies on BMD ballot verification. One was a proper experiment and one was a field study in Los Angeles, California. For the experiment, they found that giving voters explicit reminders to verify their ballots resulted in a significant increase in verification rate. They also found a higher verification rate for a shorter ballot (5 races) than a longer one (40 races). Their results suggest that it is likely possible to improve verification rates with a little bit of instruction.

For the field study, they went out to Los Angeles to observe their mock election using their new VSAP (voting solution for all people) BMD, and found that 51% of voters verified (or appeared to verify) their printed ballots, and those that did took over 2 minutes longer to vote, which is presumably the verification time. This is a much higher verification rate than has been seen in some other studies, which is particularly surprising given that it was a mock election with nothing on the line for the voters.

My research lab has been working on a new voting machine interface that will further advance voter verification of paper ballots produced by BMD. We will begin to run studies of this new technology in February 2020. I would be happy to report our findings to you in the spring.

In my opinion, the gold standard for securing elections should be the audit. If necessary, a full manual recount should be possible. With this in mind, the BMD has an advantage over hand-marked paper ballots. Hand-marked paper ballots will suffer from ambiguous marks that are left to the auditors to interpret. This doesn't happen with the BMD. Some may say that the number of ballots that have this issue are small, but we have seen margins of victory very small, even down to one vote. Most importantly, every vote should count and every ballot should be auditable.

Lastly, I would like to emphasize the fact that there is no current technology to secure a digital ballot. Some have suggested that ballot encryption is a safe method to secure the ballot. This is not true. An encrypted ballot protects against modification, which is a common threat model in voting system security. In other words, the common threat has been that a bad actor would change votes in favor of their preferred candidate. An additional threat that is often ignored is chaos. Instead of tipping the election in favor of a specific candidate, the goal is chaos. In this scenario, encrypted ballots are extremely vulnerable. The hack would be to simply delete all the encrypted ballots. Essentially, this would nullify the election because all ballots would be lost. Another hack would be to hold the encrypted ballots for ransom with ransomware. In either case, the result is chaos and will cause doubt in the election results. Therefore, it is important to understand that no electronic ballot, including encrypted ballots, are secure at this time.

As a nation, we have the capacity to build an elections system for the future, but doing so requires focused attention from citizens, federal, state, and local governments, election administrators, and innovators in academia and industry. It also requires a commitment of appropriate resources. Representative democracy only works if all eligible citizens can participate in elections, have their ballots accurately cast, counted, and tabulated, and be confident that their ballots have been accurately cast, counted, and tabulated.

Sincerely,

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SECURING THE VOTE
Protecting American Democracy

The 2016 presidential election made clear the vulnerability of America's election infrastructure to foreign cyberattacks. Such attacks represent a new threat to the nation's system of representative democracy. A new report from the National Academies of Sciences, Engineering, and Medicine recommends concerted action by Congress, federal agencies, and state and local governments to protect the security and integrity of U.S. elections.

Securing the Vote: Protecting American Democracy recommends that focused attention be directed at strengthening cybersecurity for election systems. In addition, the report recommends that all U.S. elections be conducted with human-readable paper ballots by the 2020 presidential election. Risk-limiting audits should be implemented for all federal and state elections within a decade. And election systems should continue to be considered as U.S. Department of Homeland Security (DHS)-designated critical infrastructure. In addition, the report states that Internet voting should not be used for the return of marked ballots at the present time, as no known technology guarantees the secrecy, security, and verifiability of a marked ballot transmitted over the Internet.
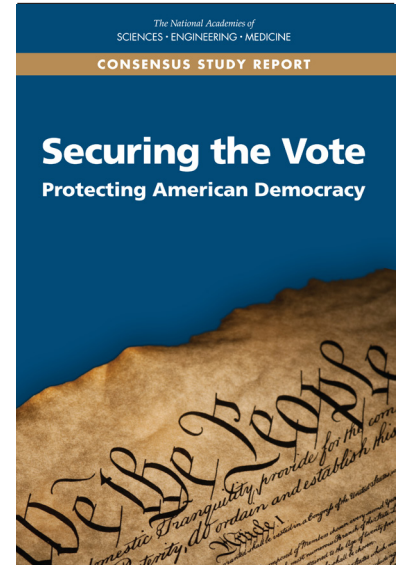
STEPS FEDERAL POLICYMAKERS SHOULD TAKE TO SECURE U.S. ELECTIONS

The report recommends that Congress:

- provide funding for state and local governments to improve their cybersecurity capabilities on an ongoing basis;

- create incentive programs for public-private partnerships to develop modern election technology; and

- authorize and fund immediately a major initiative on voting that supports research relevant to the administration, conduct, and performance of elections. This initiative should include academic centers to foster collaboration both across disciplines and with state and local election officials and industry.

The U.S. Election Assistance Commission (EAC) has a vital role to play in improving election administration, the report says. It urges the president to nominate and Congress to confirm a full commission and to ensure that the commission has sufficient members to sustain a quorum.

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The report also recommends steps Congress should take to support the EAC's work, including:

- appropriating funds for distribution by the EAC for the ongoing modernization of election systems;

- authorizing and funding the EAC to develop voluntary certification standards for voter registration databases, electronic pollbooks, chain-of-custody procedures, and auditing;

- providing the funding necessary to sustain the EAC's Voluntary Funding System Guidelines standard-setting process and certification program;

- requiring state and local election officials to provide the EAC with data on voting system failures and information on other difficulties arising during elections (for example, long lines, fraudulent voting, intrusions into voter registration databases); this information should be made publicly available; and

- fully funding the EAC to carry out its existing functions, as well as additional ones articulated in the report. For example, the report recommends that the EAC and DHS continue to develop and maintain a detailed set of cybersecurity best practices for state and local election officials. And it urges the EAC to closely monitor the expenditure of federal funds made available to states for the purposes of enhancing election security.

The report also recommends that Congress take steps to support work by the National Institutes of Standards and Technology (NIST) around election systems, including:

- authorizing and appropriating funds to NIST to establish Common Data Formats for auditing, voter registration, and other election systems;

- authorizing and providing appropriate funding to NIST to carry out its current elections-related functions and to perform the additional functions articulated in the report; and

- authorizing and funding NIST, in consultation with the EAC, to develop security standards and verification and validation protocols for electronic pollbooks, in addition to those standards and protocols developed for voting systems.

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RECOMMENDATIONS FOR
SECURING THE VOTE

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Today, U.S. elections are subject to aging equipment, targeting by external actors, and a lack of sustained funding. These issues highlight the need to create more resilient, adaptive, and secure election systems. Representative democracy only works if all eligible citizens can participate in elections and have their ballots accurately cast, counted, and tabulated. We have the capacity to build an elections system for the future by taking the following steps.

✓ Elections should be conducted with human-readable paper ballots.

✓ The Internet (or any network connected to the Internet) should not be used for the return of marked ballots at the present time.

✓ Vendors and election officials should be required to report any detected efforts to probe, tamper with, or interfere with voter registration systems.

✓ Each state should require a comprehensive system of post-election audits of processes and outcomes.

✓ A detailed set of cybersecurity best practices for state and local election officials should be continuously developed and maintained.

✓ Congress should provide funding to help state and local governments modernize their election systems and improve their cybersecurity capabilities. Congress should also authorize and provide funding for a major research initiative on voting and for the development of security standards and verification and validation protocols for electronic pollbooks, chain-of-custody procedures, and auditing.

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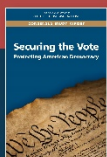
Fact sheet: Disability and Voter Turnout in the 2016 Elections
Lisa Schur and Douglas Kruse[1]

Key points:

- 16.0 million people with disabilities reported voting in the November 2016 elections.

- The voter turnout rate of people with disabilities was 6 percentage points lower than that of people without disabilities.

- Employed people with disabilities, however, were just as likely as employed people without disabilities to vote, suggesting that employment helps bring people with disabilities into mainstream political life.

- The voter registration rate of people with disabilities was 2 percentage points lower than that of people without disabilities. The lower voter turnout was due both to a lower registration rate among people with disabilities, and to lower turnout among those who are registered.

- If people with disabilities voted at the same rate as people without disabilities who have the same demographic characteristics, there would be about 2.2 million more voters.

These figures are based on analysis of data from the federal government's Current Population Survey Voting Supplement for November 2016. The computations were made using six disability questions introduced on the Current Population Survey in 2008.

Voter turnout among voting eligible population

		Millions who reported:	
	Percent voting	Voting	Not voting
Overall	61.4%	137.5	86.5
People without disabilities	62.2%	121.5	73.9
People with disabilities	55.9%	16.0	12.6
Hearing impairment	62.7%	5.1	3.0
Visual impairment	53.7%	2.1	1.8
Mental or cognitive impairment	43.5%	4.0	5.2
Difficulty walking or climbing stairs	55.9%	9.7	7.7
Difficulty dressing or bathing	44.6%	2.3	2.8
Difficulty going outside alone	44.7%	4.5	5.6

[1] Professors at the School of Management and Labor Relations, Rutgers University, 50 Labor Center Way, New Brunswick, NJ, 08901, Lschur@smlr.rutgers.edu and Dkruse@smlr.rutgers.edu.

As shown above, among the voting eligible population (citizens age 18 or older), 55.9% of people with disabilities reported voting, compared to 62.2% of people without disabilities. Within the disability population, the voting rate among people with hearing impairments (62.7%) was higher than the overall voting rate for people without disabilities, and the lowest rate was among those with a mental or cognitive impairment (43.5%). For each disability group except those with hearing impairments, the difference in turnout from those without disabilities is strong enough to be outside the survey's margin of error.[2]

The total of 137.5 million people who reported voting estimated from this survey is close to the total of 138.8 million ballots counted.[3] Any misreporting is unlikely to differ between the disability and non-disability populations, so the estimate of the turnout gap should be unbiased.

Some of the gap may be due to other demographic differences between people with and without disabilities. When adjusted for gender, race, age, education, and state of residence, the estimated gap expands slightly from 6.3 points to 7.8 points. This implies that if people with disabilities voted at the same rate as otherwise-similar people without disabilities, there would be an additional 2.2 million voters.

The estimated total of 16.0 million voters with disabilities compares with an estimated 17.1 million African-Americans and 12.7 million Hispanics/Latinos who voted in November 2016, based on analysis of this voting supplement. It should be noted that the disability total may be understated because these disability measures may not capture several types of disability.[4]

Some of the lower turnout of people with disabilities can be tied to difficulties getting to or using polling places.[5] A variety of states and localities have made efforts to reduce barriers and increase turnout among people with disabilities.[6] In addition, prior research has found the lower turnout is partly explained by lower levels of income, lower levels of political recruitment, and lower feelings of political efficacy.[7]

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[2] The margins of error are based on a 95% level of confidence.

[3] http://www.electproject.org/2016g, accessed 5-22-17

[4] The disability questions measure the major sensory, mobility, and mental impairments, but may miss some learning disabilities and physical conditions that do not necessarily limit mobility, such as epilepsy and cancer.

[5] The Government Accountability Office released a report on June 10, 2009 finding that only 27% of polling places in 2008 had no potential impediments to access by people with disabilities, which was an improvement over 2000 when only 16% had no potential impediments (GAO-09-685). A 2012 household survey found that 30% of citizens with disabilities who had voted at a polling place in 2012 said they encountered difficulties in doing so, compared to only 8% of citizens without disabilities (Lisa Schur, Meera Adya, and Douglas Kruse, "Disability, Voter Turnout, and Voting Difficulties in the 2012 Elections," July 2013, http://smlr.rutgers.edu/sites/smlr.rutgers.edu/files/images/Disability%20and%20voting%20survey%20report%20for%202012%20elections.pdf).

[6] Lisa Schur, Meera Adya, and Mason Ameri. "Accessible Democracy: Reducing Voting Obstacles for People with Disabilities." Election Law Journal Vol. 14, No. 1, 2015, pp. 60-65.

[7] The prior findings are summarized in Lisa Schur, Todd Shields, and Kay Schriner, "Voting," in Gary Albrecht, ed., Encyclopedia of Disability (Thousand Oaks, CA: Sage Publications, 2005), and Lisa

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Disability and voter turnout in 2008, 2012, and 2016

	2008	2012	2016
People without disabilities	64.5%	62.5%	62.2%
People with disabilities	57.3%	56.8%	55.9%
Disability turnout gap	-7.2%	-5.7%	-6.3%
Hearing impairment	63.1%	63.2%	62.7%
Visual impairment	56.8%	57.3%	53.7%
Mental or cognitive impairment	46.1%	44.8%	43.5%
Difficulty walking or climbing stairs	56.8%	56.3%	55.8%
Difficulty dressing or bathing	46.4%	46.7%	44.5%
Difficulty going outside alone	45.7%	47.3%	44.7%

These results can be directly compared to the general elections in November 2008 and 2012. As can be seen above, overall turnout dropped slightly from 2008 to 2012 and 2016. The drop was slightly greater for people without disabilities from 2008 to 2012, leading to a narrowing of the disability gap from 7.2 to 5.7 points, but the disability gap widened slightly to 6.3 points in 2016. It is important to note, however, that these estimated changes in the disability gap are small enough that they are within the survey's margin of error, so we cannot be confident of a true change in the disability gap over this period.

These results cannot be directly compared to elections before 2008 because they are based on a measure of disability introduced by the Census Bureau in 2008. A national survey conducted by the Eagleton Institute of Rutgers University following the November 2000 elections is comparable because it had similar questions and estimated prevalence of disability. Based on that survey, there was a 12 percentage point gap in voter turnout between people with and without disabilities in 2000, indicating that the relative voter turnout of people with disabilities in general elections may have improved from 2000 to 2016 (perhaps due in part to increased accessibility of polling places).[8]

Schur and Meera Adya, "Sidelined or Mainstreamed? Political Participation and Attitudes of People with Disabilities in the United States, Social Science Quarterly, Vol. 94, No. 3, 2013, pp. 811-839.

[8] Based on data used in Lisa Schur, Todd Shields, and Kay Schriner, "Generational Cohorts, Group Membership, and Political Participation by People with Disabilities," Political Research Quarterly, Vol. 58, No. 3, September 2005. Surveys conducted by Louis Harris and Associates for the National Organization on Disability show disability turnout gaps of 0% to 17% over the 1992-2008 period, but the disability prevalence is not reported so it is unclear if the disability measure used in those surveys can be readily compared (*The ADA, 20 Years Later: KesslerFoundation/NOD Survey of Americans with Disabilities*, Harris Interactive, New York, NY, 2010).

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Breakdown by employment status and demographics

There was no gap in voter turnout between employed people with and without disabilities, indicating that employment helps provide resources and social contact that encourage voting.[9] The disability voting gap was concentrated among the non-employed, as shown in the numbers below. The disability gap was also:

- larger among women than among men, reflecting especially high voter turnout among women without disabilities;
- larger among white non-Hispanics than among other race and ethnicity groups
- larger among those age 18-34 and 35-49 than among other age groups
- largest in the Northeast and smallest in the West

Except for the comparisons among the employed and other race/ethnicity, each of these disability gaps is strong enough to be outside the survey's margin of error.

	Disability		No Disability		Disability Gap	
	2012	2016	2012	2016	2012	2016
Overall	56.8%	55.9%	62.5%	62.2%	-5.7%	-6.3%
Employed	64.6%	64.7%	64.2%	63.6%	0.4%	1.1%
Not employed	55.0%	54.0%	59.2%	59.2%	-4.2%	-5.2%
Women	56.5%	56.4%	64.8%	64.3%	-8.3%	-7.9%
Men	57.2%	55.4%	60.1%	59.9%	-2.9%	-4.5%
White non-Hispanic	57.5%	58.2%	65.2%	66.4%	-7.7%	-8.2%
African-American	62.8%	54.5%	67.2%	60.4%	-4.4%	-5.9%
Hispanic	46.8%	42.7%	48.1%	48.0%	-1.3%	-5.3%
Other race/ethnicity	47.5%	49.4%	50.2%	49.3%	-2.7%	-0.1%
Age 18-34	32.6%	33.1%	48.8%	49.7%	-16.2%	-16.5%
Age 35-49	45.4%	46.9%	63.5%	62.9%	-18.1%	-16.0%
Age 50-64	58.1%	54.5%	71.0%	69.2%	-12.9%	-14.7%
Age 65+	64.4%	63.9%	75.4%	73.8%	-11.0%	-9.9%
Northeast	54.5%	54.7%	63.3%	62.5%	-8.8%	-7.8%
Midwest	60.1%	58.7%	65.8%	65.2%	-5.7%	-6.5%
South	56.4%	54.1%	61.3%	60.9%	-4.9%	-6.8%
West	55.6%	57.3%	60.7%	61.1%	-5.1%	-3.8%

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[9] This is consistent with other research on the role of employment summarized in Lisa Schur, Todd Shields, and Kay Schriner, "Voting," in Gary Albrecht, ed., Encyclopedia of Disability (Thousand Oaks, CA: Sage Publications, 2005)

Whether voted by mail and on election day

Among voters with disabilities in 2016, only 53% voted at the polling place on election day, compared to 61% of voters without disabilities. They were instead more likely to vote by mail before election day (28% compared to 19%), reflecting the mobility problems faced by some people with disabilities. All of these disability gaps are strong enough to be outside the survey's margin of error.

	Disability	No Disability	Disability Gap
How voted in 2016:			
At polling place on election day	52.6%	60.9%	-8.3%
At polling place before election day	18.1%	19.2%	-1.1%
By mail before election day	28.4%	18.6%	9.8%
By mail on election day	0.9%	1.4%	0.5%

State Breakdowns in Voter Turnout

The voter turnout gap between people with and without disabilities varied by state, as shown in the breakdown below. It should be cautioned that the sample size is low in many states, which increases the margin of error and decreases the likelihood of finding a disability gap that exceeds the margin of error. The disability gap in 2016 was large enough to be outside the margin of error (indicated by an "*") in 24 states and the District of Columbia, and was within the margin of error in the remaining 26 states.

	Disability		No Disability		Disability Gap		
	2012	2016	2012	2016	2012	2016	
U.S.	56.8%	55.9%	62.5%	62.2%	-5.7%	-6.3%	
Alabama	57.8%	47.4%	62.7%	59.4%	-4.9%	-12.0%	*
Alaska	59.1%	60.1%	58.3%	61.5%	0.9%	-1.5%	
Arizona	48.1%	66.2%	56.9%	59.6%	-8.9%	6.6%	
Arkansas	46.2%	51.2%	54.7%	60.1%	-8.4% *	-8.9%	*
California	50.4%	52.3%	58.4%	58.6%	-8.0% *	-6.3%	*
Colorado	65.6%	69.0%	71.1%	69.5%	-5.5%	-0.6%	
Connecticut	52.7%	65.0%	63.8%	63.8%	-11.1% *	1.3%	
Delaware	71.1%	53.0%	66.8%	63.5%	4.3%	-10.5%	*
Florida	62.0%	58.9%	60.7%	59.5%	1.3%	-0.7%	
Georgia	54.9%	57.8%	62.9%	60.6%	-8.0% *	-2.7%	
Hawaii	51.4%	54.1%	51.7%	46.3%	-0.2%	7.7%	
Idaho	56.6%	65.1%	64.9%	61.6%	-8.3%	3.5%	
Illinois	60.4%	65.8%	61.6%	63.5%	-1.2%	2.3%	
Indiana	54.8%	49.4%	59.9%	59.7%	-5.2%	-10.3%	*

Iowa	63.9%	56.1%	70.2%	64.7%	-6.3%		-8.6%	*
Kansas	63.0%	53.0%	63.3%	62.9%	-0.3%		-9.9%	*
Kentucky	48.5%	42.5%	61.4%	60.2%	-12.9%	*	-17.6%	*
Louisiana	58.7%	48.2%	67.6%	64.0%	-8.9%	*	-15.7%	*
Maine	55.9%	68.2%	71.0%	73.5%	-15.1%	*	-5.3%	
Maryland	58.3%	60.4%	66.0%	66.4%	-7.7%	*	-6.0%	
Massachusetts	59.7%	59.6%	72.3%	67.6%	-12.6%	*	-8.1%	*
Michigan	60.7%	63.7%	68.0%	64.4%	-7.3%	*	-0.7%	
Minnesota	65.7%	58.7%	74.2%	69.9%	-8.4%	*	-11.2%	*
Mississippi	67.9%	63.2%	75.9%	68.6%	-8.0%	*	-5.3%	
Missouri	53.5%	55.9%	65.8%	66.2%	-12.2%	*	-10.3%	*
Montana	64.9%	67.0%	65.8%	65.7%	-0.9%		1.3%	
Nebraska	62.2%	70.4%	61.5%	66.2%	0.7%		4.2%	
Nevada	58.5%	58.2%	57.9%	60.8%	0.7%		-2.6%	
New Hampshire	59.0%	66.0%	70.8%	69.4%	-11.9%	*	-3.4%	
New Jersey	56.8%	58.6%	62.5%	61.8%	-5.7%		-3.2%	
New Mexico	57.7%	54.4%	62.1%	54.9%	-4.5%		-0.4%	
New York	50.2%	48.8%	59.7%	58.4%	-9.5%	*	-9.6%	*
North Carolina	62.5%	64.5%	69.8%	68.0%	-7.3%	*	-3.5%	
North Dakota	57.2%	60.1%	64.7%	64.7%	-7.6%		-4.6%	
Ohio	58.3%	53.2%	63.9%	65.5%	-5.6%	*	-12.3%	*
Oklahoma	49.4%	51.7%	53.0%	57.6%	-3.6%		-5.9%	
Oregon	66.6%	53.9%	67.8%	68.8%	-1.1%		-14.9%	*
Pennsylvania	54.9%	54.1%	62.6%	64.0%	-7.7%	*	-9.9%	*
Rhode Island	61.0%	50.0%	62.7%	62.1%	-1.7%		-12.1%	*
South Carolina	59.8%	50.4%	65.5%	64.0%	-5.7%		-13.5%	*
South Dakota	64.7%	51.9%	60.4%	60.1%	4.2%		-8.1%	
Tennessee	47.9%	47.1%	57.4%	55.1%	-9.5%	*	-8.0%	*
Texas	55.8%	51.5%	53.5%	55.9%	2.3%		-4.4%	*
Utah	59.8%	63.3%	56.7%	62.6%	3.1%		0.7%	
Vermont	62.1%	57.6%	63.4%	63.2%	-1.3%		-5.6%	
Virginia	57.1%	57.4%	68.2%	69.5%	-11.1%	*	-12.0%	*
Washington	63.6%	62.5%	66.0%	66.8%	-2.4%		-4.4%	
Washington, D.C.	63.8%	60.0%	77.6%	76.1%	-13.8%	*	-16.1%	*
West Virginia	42.9%	45.9%	48.8%	52.0%	-5.8%		-6.1%	*
Wisconsin	66.5%	63.9%	74.7%	71.6%	-8.2%	*	-7.7%	*
Wyoming	59.7%	54.5%	58.7%	66.1%	1.0%		-11.6%	*

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Voter Registration

The disability voting gap is due in part to lower voter registration, but is due more to a lower likelihood of voting if registered. Among people with disabilities, 68% were registered to vote, only 2 points lower than the rate for people without disabilities. Among those who were registered, 82% voted, which was 6 points lower than for registered people without disabilities. People with disabilities were more likely than those without disabilities to have registered at a town hall or registration office, public assistance agency, or registration drive, and less likely to have registered at a department of motor vehicles or using the Internet.

Each of these disability gaps is strong enough to be outside the survey's margin of error, except for the gaps in registering by mail or at a polling place.

	Disability	No Disability	Disability Gap
Registered to vote	68.3%	70.6%	-2.3%
Voted if registered	82.0%	88.0%	-6.0%
How registered to vote:			
Went to a town hall or county/ government registration office	28.5%	20.1%	8.4%
At a department of motor vehicles	24.8%	32.5%	-7.7%
At a public assistance agency	2.2%	1.2%	1.0%
Registered by mail	15.4%	15.1%	0.3%
Registered at polling place	7.6%	7.2%	0.5%
Filled out form at a registration drive	6.0%	4.7%	1.3%
At a school, hospital, or on campus	5.2%	6.4%	-1.2%
Registered using the Internet or online	4.0%	8.3%	-4.4%
Other	6.4%	4.5%	1.8%

Why people were not registered

The most common expressed reason for not registering to vote, among people both with and without disabilities, was a lack of interest in the election or politics. Almost one-fourth of people with disabilities (23%) gave "permanent illness or disability" as their reason for not being registered.

The disability gaps below are strong enough to be outside the survey's margin of error, except for the small disability gaps in "Not eligible to vote," "Did not know where or how to register," "Difficulty with English," and "Other reason."

If not registered to vote, why not:	Disability	No Disability	Disability Gap
Not interested in the election or not involved in politics	36.1%	45.3%	-9.3%
Permanent illness or disability	22.6%	1.6%	20.9%
Did not meet registration deadlines	6.7%	14.0%	-7.3%
Not eligible to vote	7.6%	7.8%	-0.3%
My vote would not make a difference	3.5%	5.4%	-1.9%
Did not know where or how to register	3.1%	3.5%	-0.4%
Did not meet residency requirements/did not live here long enough	1.3%	3.1%	-1.7%
Difficulty with English	2.4%	2.0%	0.5%
Other reason	16.8%	17.3%	-0.5%

Why people did not vote if registered

Among those who were registered to vote but did not do so in November 2016, about one-third (36%) of people with disabilities gave "illness or disability" as the reason for not voting, compared to 7% of people without disabilities. People with disabilities were also more likely to cite transportation problems as a reason for not voting (7% compared to 2%), consistent with their higher rate of voting by mail. They were less likely than people without disabilities to say that they were not interested, too busy, out of town, or didn't like the candidates.

The disability gaps below are strong enough to be outside the survey's margin of error, except for the small disability gaps in "Forgot to vote," "Bad weather conditions," "Registration problems," and "Other."

Why didn't vote	Disability	No Disability	Disability Gap
Illness or disability (own or family's)	35.7%	6.6%	29.0%
Not interested, felt my vote wouldn't make a difference	9.6%	17.3%	-7.6%
Didn't like candidates or campaign issues	20.6%	26.5%	-6.0%
Too busy, conflicting work or school schedule	4.4%	17.0%	-12.6%
Forgot to vote (or send in absentee ballot)	3.2%	3.1%	0.1%
Transportation problems	6.8%	1.8%	5.0%
Out of town or away from home	4.0%	9.1%	-5.1%
Registration problems (i.e. didn't receive absentee ballot, not registered in current location)	3.6%	4.7%	-1.1%
Inconvenient hours, polling place or hours or lines too long	1.4%	2.4%	-1.0%
Bad weather conditions	0.1%	0.0%	0.0%
Other	10.8%	11.6%	-0.8%