EXECUTIVE ORDER 12866, REGULATORY PLANNING AND REVIEW; EXECUTIVE ORDER 14094, MODERNIZING REGULATORY REVIEW; EXECUTIVE ORDER 13563, IMPROVED REGULATION AND REGULATORY REVIEW

Executive Order 12866, Regulatory Planning and Review, and Executive Order 13563, Improving Regulation and Regulatory Review, as amended by Executive Order 14094, Modernizing Regulatory Review, require agencies to assess and compare the costs and benefits of regulations. Executive Order 13563 emphasizes the importance of quantifying both costs and benefits, reducing costs, harmonizing rules, and promoting flexibility. Further, if the regulatory action is a "significant regulatory action," then a regulatory impact analysis (RIA) must be conducted demonstrating these costs and benefits. After reviewing the Department's assessment of the likely costs of this proposed regulation, the Office of Management and Budget (OMB) has determined that it is a significant regulatory action within the meaning of Executive Order 12866, as amended.

1 INTRODUCTION

1.1 BACKGROUND AND NEED FOR RULEMAKING

Title II of the Americans with Disabilities Act (ADA) provides that no qualified individual with a disability shall be excluded from participation in or denied the benefits of the services, programs, or activities of a State or local government. The Department of Justice has consistently made clear that this requirement includes all services, programs, and activities of public entities, including those provided online. It also includes those provided via mobile applications (apps). Despite the Department's clearly stated position and the availability of voluntary web and mobile app accessibility standards, many organizations have indicated that voluntary compliance with existing standards has not resulted in equal access for people with

disabilities.[1] Accordingly, they have urged the Department to take regulatory action to ensure web and mobile app accessibility. In addition, the National Council on Disability, an independent Federal agency, has emphasized the need for regulatory action on this issue because competitive market forces have not proven sufficient to provide individuals with disabilities access to telecommunications and information services.[2] In the associated Notice of Proposed Rulemaking (NPRM), the Department proposes technical standards for website and mobile app accessibility to give public entities greater clarity in exactly how to meet their ADA obligations and to help ensure equal access to government services, programs, and activities for people with disabilities.

The Department estimates in this Preliminary Regulatory Impact Analysis (PRIA) that there are roughly 22.8 billion annual visits to State and local government websites (Section 4.3.2), 3.2 billion of which are by individuals with disabilities. Individuals with disabilities access State and local government websites and mobile apps for a variety of government services, programs, and activities. Some examples of the many services, programs, and activities provided on government websites and mobile apps include motor vehicle registration, license applications, vaccination registries, unemployment benefit applications, and family and elder support programs.

Often, however, State and local governments' online services and mobile apps are not equally available to individuals with disabilities who cannot access these websites and mobile

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[1] *See, e.g.*, Letter from American Council of the Blind et al. to U.S. Dep't of Just. (Feb. 28, 2022), available at https://acb.org/accessibility-standards-joint-letter-2-28-22 (citing research showing persistent barriers in digital accessibility); Letter from Consortium for Citizens with Disabilities to U.S. Dep't of Just. (Mar. 23, 2022), available at https://www.c-c-d.org/fichiers/CCD-Web-Accessibility-Letter-to-DOJ-03232022.pdf.

[2] National Council on Disability, The Need for Federal Legislation and Regulation Prohibiting Telecommunications and Information Services Discrimination (Dec. 19, 2006), available at https://www.ncd.gov/publications/2006/Dec282006.

apps because they have not been designed to be accessible. If an individual with a disability is unable to access the website or mobile app that a government uses to offer its services, programs, or activities, they may be denied access to critical benefits and services. For example, a program that requires applicants to fill out an online application for benefits that is incompatible with screen readers, voice dictation, or hands-free devices will likely deny certain individuals with disabilities an equal opportunity to apply for those benefits. Further, the ability to access voting information, find up-to-date health and safety resources, and look up mass transit schedules and fare information may depend on having access to websites and mobile apps. With accessible web content and mobile apps people with disabilities can access government services independently and privately.

Accordingly, the Department is proposing technical requirements to provide concrete standards to public entities on how to fulfill their obligations under title II to provide access to all of their services, programs, and activities that are provided via the web and mobile apps. Specifically, the Department proposes to adopt an internationally recognized accessibility standard for web access, the Web Content Accessibility Guidelines (WCAG) 2.1 Level AA, which was published in June 2018 by the W3C.[3] The Department believes the requirements described in the NPRM are necessary to ensure the "equality of opportunity, full participation, independent living, and economic self-sufficiency" for individuals with disabilities set forth in the ADA. 42 U.S.C. 12101(a).

The NPRM provides more information on the Department's regulatory proposal including, for example, more information about the problems the rulemaking seeks to address, WCAG 2.1, compliance timeframes, and exceptions. Please refer to the NPRM for more specific

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[3] *Web Content Accessibility Guidelines (WCAG) 2.1*, World Wide Web Consortium (June 5, 2018), https://www.w3.org/TR/WCAG21/.

information about the regulatory proposal. This document, the PRIA, is focused on providing information about the costs and benefits associated with that proposal.

1.2 SUMMARY OF BENEFITS AND COSTS

Requiring State and local government websites and mobile apps to comply with WCAG 2.1 Level AA will result in costs for State and local government entities to remediate and maintain their websites and mobile apps to meet the WCAG 2.1 Level AA success criteria. The Department estimates that a total number of 109,893 State and local government websites and 8,805 State and local government mobile apps will be affected by the rule. These websites and mobile apps provide services on behalf of and are managed by 91,489 State and local governments that will incur these costs. These costs include one-time costs for familiarization with the requirements of the rule; testing, remediation, and operating and maintenance (O&M) costs for websites; testing, remediation, and O&M costs for mobile apps; and school course remediation costs. The remediation costs include both time and software components. Initial familiarization, testing, and remediation costs of the proposed rule occur over the first two or three years and are presented in Table 1 (two years for large governments and three years for small governments). Annualized recurring costs after implementation are shown in Table 2. These initial and recurring costs are then combined to show total costs over the 10-year time horizon (Table 3 and Table 4) and annualized costs over the 10-year time horizon (Table 5 and Table 6). Annualized costs over this 10-year period are estimated at $2.8 billion assuming a 3 percent discount rate or $2.9 billion assuming a 7 percent discount rate. This includes $15.8 billion in implementation costs accruing during the first three years (the implementation period), undiscounted, and $1.8 billion in annual O&M costs during the next seven years. All values are presented in 2021 dollars as 2022 data were not yet available.

Benefits will generally accrue to all individuals who access State and local government

websites and mobile apps, and additional benefits will accrue to individuals with certain types of disabilities. The WCAG 2.1 Level AA standards for website and mobile app accessibility primarily benefit individuals with vision, hearing, cognitive, and/or manual dexterity disabilities because accessibility standards are intended to address barriers that often impede access for people with these disability types. Using the U.S. Census Bureau's Survey of Income and Program Participation (SIPP) 2021 data, the Department estimates that 4.8 percent of adults have a vision disability, 7.5 percent have a hearing disability, 10.1 percent have a cognitive disability, and 5.7 percent have a manual dexterity disability. Due to the incidence of multiple disabilities, the total share without any of these disabilities is 80.1 percent.

The Department monetized benefits for both people with these disabilities and people without disabilities.[4] There are many additional benefits that have not been monetized due to data availability. Benefits that cannot be monetized are discussed qualitatively. These non-quantified benefits are central to this proposed rule's potential impact as they include concepts inherent to any civil rights law—such as equality and dignity. Other impacts to individuals include increased independence, increased flexibility, increased privacy, reduced frustration, decreased reliance on companions, and increased program participation. This proposed rule will also benefit governments through increased certainty about what constitutes an accessible website, potential reduction in litigation, and a larger labor market pool (due to increased educational attainment and access to job-training).

Annual and annualized monetized benefits of the proposed rule are presented in Table 7,

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[4] Throughout this proposed rule, the Department uses the phrases "individuals without a relevant disability" or "individuals without disabilities" to refer to individuals without vision, hearing, cognitive, or manual dexterity disabilities. Individuals without these disabilities may have other types of disabilities, or they may be individuals without disabilities, but to simplify the discussion in this proposed rule, "individuals without relevant disabilities" or "individuals without disabilities" will be used to mean individuals without one of these four types of disabilities.

Table 8, and Table 9. Annual benefits, beginning once the rule is fully implemented, total $11.4

billion. Because individuals generally prefer benefits received sooner, future benefits need to be

discounted to reflect the lower value due to the wait to receive them. OMB guidance states that

annualized benefits and costs should be presented using real discount rates of 3 and 7 percent.[5]

Benefits annualized over a 10-year period that includes both three years of implementation and

seven years post-implementation total $9.3 billion per year, assuming a 3 percent discount rate,

and $8.9 billion per year, assuming a 7 percent discount rate.

Comparing annualized costs and benefits, monetized benefits to society outweigh the costs.

Net annualized benefits over the first 10 years post publication of this rule total $6.5 billion per

year using a 3 percent discount rate and $6.0 billion per year using a 7 percent discount rate

(Table 10). Additionally, beyond this 10-year period, benefits are likely to continue to accrue at

a greater rate than costs because many of the costs are upfront costs and benefits tend to have a

delay before beginning to accrue.

To consider the relative magnitude of the estimated costs of this proposed regulation, the

Department compares the costs to revenues for public entities. Because the costs for each

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[5] Office of Management and Budget. September 17, 2003. Circular A-4. Available at
https://www.whitehouse.gov/wp-content/uploads/legacy_drupal_files/omb/circulars/A4/a-4.pdf. Accessed
1/24/2023.

government entity type are estimated to be well below 1 percent of revenues, the Department

does not believe the rule will be unduly burdensome or costly for public entities.[6]

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[6] As a point of reference, the United States Small Business Administration advises agencies that a potential indicator that the impact of a proposed regulation may be "significant" is whether the costs exceed 1 percent of the gross revenues of the entities in a particular sector, although the threshold may vary based on the particular types of entities at issue. The Department estimates that the costs of this rulemaking for each government entity type are far less than 1 percent of revenues. *See* Small Bus. Admin., A Guide for Government Agencies: How to Comply with the Regulatory Flexibility Act, at 19 (Aug. 2017), https://advocacy.sba.gov/wp-content/uploads/2019/07/How-to-Comply-with-the-RFA-WEB.pdf; *see also* EPA's Action Development Process: Final Guidance for EPA Rulewriters: Regulatory Flexibility Act, EPA, at 24 (Nov. 2006), https://www.epa.gov/sites/default/files/2015-06/documents/guidance-regflexact.pdf (providing an illustrative example of a hypothetical analysis under the RFA in which, for certain small entities, economic impact of "[l]ess than 1% for all affected small entities" may be "presumed" to have "no significant economic impact on a substantial number of small entities").

Table 1: Initial Familiarization, Testing, and Remediation Costs (Millions)

Cost	State	County	Municipal	Township	Special District	School District	U.S. Territories	Higher Ed.	Total
Regulatory familiarization	$0.02	$0.90	$5.79	$4.83	$11.44	$3.63	$0.00	$0.56	$27.17
Websites	$228.9	$742.5	$2,363.4	$1,342.9	$374.4	$1,826.1	$6.4	$1,283.0	$8,167.7
Mobile apps	$13.7	$53.1	$93.4	$1.3	$0.0	$379.7	$1.2	$64.4	$606.8
Postsecondary course remediation	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$5,393.8	$5,393.8
Primary and secondary course remediation	N/A	$47.4	$18.5	$40.0	N/A	$1,059.5	N/A	N/A	$1,165.4
Third-party website remediation	$6.6	$35.8	$133.5	$77.6	$18.0	$103.1	$0.0	$84.7	$459.2
Total	$249.2	$879.7	$2,614.6	$1,466.6	$403.9	$3,372.0	$7.6	$6,826.4	$15,819.9

Table 2: Average Annual Cost After Implementation (Millions)

Cost	State	County	Municipal	Township	Special District	School District	U.S. Territories	Higher Ed.	Total
Websites	$19.9	$65.1	$215.1	$124.2	$40.5	$164.7	$0.6	$111.7	$741.9
Mobile apps	$0.01	$0.04	$0.03	$0.00	$0.00	$0.21	$0.00	$0.04	$0.33
Postsecondary course remediation	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$935.7	$935.7
Primary and secondary course remediation	N/A	$4.7	$1.9	$4.0	N/A	$105.9	N/A	N/A	$116.5
Third-party website remediation	$0.6	$3.2	$12.1	$7.2	$1.9	$9.2	$0.0	$7.4	$41.6
Total	$20.5	$73.1	$229.2	$135.4	$42.5	$280.1	$0.6	$1,054.8	$1,836.0

Table 3: Present Value of 10-Year Total Cost, 3 Percent Discount Rate (Millions)

Cost	State	County	Municipal	Township	Special District	School District	U.S. Terri-tories	Higher Ed.	Total
Regulatory familiarization	$0.01	$0.87	$5.62	$4.69	$11.11	$3.52	$0.00	$0.54	$26.38
Websites	$331.5	$1,077.9	$3,456.5	$1,972.4	$583.3	$2,664.8	$9.3	$1,859.1	$11,954.8
Mobile apps	$13.2	$50.6	$89.5	$1.3	$0.0	$360.1	$1.1	$61.8	$577.7
Postsecondary course remediation	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$9,391.1	$9,391.1
Primary and secondary course remediation	N/A	$67.6	$26.4	$56.9	N/A	$1,509.1	N/A	N/A	$1,660.0
Third-party website remediation	$9.5	$52.0	$195.2	$113.9	$28.0	$150.3	$0.0	$122.8	$671.7
Total	$354.2	$1,249.0	$3,773.3	$2,149.2	$622.4	$4,687.9	$10.5	$11,435.3	$24,281.7

Table 4: Present Value of 10-Year Total Cost, 7 Percent Discount Rate (Millions)

Cost	State	County	Municipal	Township	Special District	School District	U.S. Terri-tories	Higher Ed.	Total
Regulatory familiarization	$0.01	$0.84	$5.41	$4.51	$10.70	$3.39	$0.00	$0.52	$25.39
Websites	$292.4	$949.6	$3,017.0	$1,716.9	$504.2	$2,330.4	$8.2	$1,639.8	$10,458.6
Mobile apps	$12.4	$47.4	$84.6	$1.2	$0.0	$335.0	$1.1	$58.4	$540.1
Postsecondary course remediation	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$7,708.4	$7,708.4
Primary and secondary course remediation	N/A	$56.3	$22.0	$47.5	N/A	$1,258.5	N/A	N/A	$1,384.3
Third-party website remediation	$8.4	$45.8	$170.4	$99.2	$24.2	$131.6	$0.0	$108.3	$587.8
Total	$313.2	$1,099.9	$3,299.4	$1,869.3	$539.1	$4,059.0	$9.3	$9,515.4	$20,704.6

Table 5: 10-Year Average Annualized Cost, 3 Percent Discount Rate (Millions)

Cost	State	County	Municipal	Township	Special District	School District	U.S. Terri-tories	Higher Ed.	Total
Regulatory familiarization	$0.00	$0.10	$0.66	$0.55	$1.30	$0.41	$0.00	$0.06	$3.09
Websites	$38.9	$126.4	$405.2	$231.2	$68.4	$312.4	$1.1	$217.9	$1,401.5
Mobile apps	$1.5	$5.9	$10.5	$0.1	$0.0	$42.2	$0.1	$7.2	$67.7
Postsecondary course remediation	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$1,100.9	$1,100.9
Primary and secondary course remediation	N/A	$7.9	$3.1	$6.7	N/A	$176.9	N/A	N/A	$194.6
Third-party website remediation	$1.1	$6.1	$22.9	$13.4	$3.3	$17.6	$0.0	$14.4	$78.7
Total	$41.5	$146.4	$442.3	$251.9	$73.0	$549.6	$1.2	$1,340.6	$2,846.6

Table 6: 10-Year Average Annualized Cost, 7 Percent Discount Rate (Millions)

Cost	State	County	Municipal	Township	Special District	School District	U.S. Terri-tories	Higher Ed.	Total
Regulatory familiarization	$0.00	$0.12	$0.77	$0.64	$1.52	$0.48	$0.00	$0.07	$3.61
Websites	$41.6	$135.2	$429.6	$244.5	$71.8	$331.8	$1.2	$233.5	$1,489.1
Mobile apps	$1.8	$6.7	$12.0	$0.2	$0.0	$47.7	$0.2	$8.3	$76.9
Postsecondary course remediation	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$1,097.5	$1,097.5
Primary and secondary course remediation	N/A	$8.0	$3.1	$6.8	N/A	$179.2	N/A	N/A	$197.1
Third-party website remediation	$1.2	$6.5	$24.3	$14.1	$3.4	$18.7	$0.0	$15.4	$83.7
Total	$44.6	$156.6	$469.8	$266.1	$76.8	$577.9	$1.3	$1,354.8	$2,947.9

Table 7: Annual Benefit After Full Implementation (Millions)

Benefit Type	Visual Disability	Other Relevant Disability [a]	Without Relevant Disabilities	State and Local Gov'ts	Total
Time savings - current users	$549.6	$751.3	$2,858.5	N/A	$4,159.4
Time savings - new users	$222.4	$695.0	N/A	$600.6	$1,518.1
Time savings - mobile apps	$51.5	$70.5	$268.1	N/A	$390.1
Time savings - education	$693.5	$1,205.8	$3,157.8	N/A	$5,057.1
Educational attainment	$7.2	$255.6	N/A	N/A	$262.8
Total benefits	**$1,524.2**	**$2,978.3**	**$6,284.3**	**$600.6**	**$11,387.5**

[a] For purposes of this table, hearing, cognitive, and manual dexterity disabilities are referred to as "other relevant disabilities."

Table 8: 10-Year Average Annualized Benefits, 3 Percent Discount Rate (Millions)

Benefit Type	Visual Disability	Other Relevant Disability [a]	Without Relevant Disabilities	State and Local Gov'ts	Total
Time savings - current users	$463.6	$633.8	$2,411.6	N/A	$3,509.1
Time savings - new users	$187.6	$586.4	N/A	$506.7	$1,280.7
Time savings - mobile apps	$43.5	$59.4	$226.2	N/A	$329.1
Time savings - education	$504.7	$878.8	$2,307.6	N/A	$3,691.1
Educational attainment	$13.8	$492.4	N/A	N/A	$506.2
Total benefits	**$1,213.2**	**$2,650.9**	**$4,945.4**	**$506.7**	**$9,316.3**

[a] For purposes of this table, hearing, cognitive, and manual dexterity disabilities are referred to as "other relevant disabilities."

Table 9: 10-Year Average Annualized Benefits, 7 Percent Discount Rate (Millions)

Benefit Type	Visual Disability	Other Relevant Disability [a]	Without Relevant Disabilities	State and Local Gov'ts	Total
Time savings - current users	$451.4	$617.1	$2,347.7	N/A	$3,416.1
Time savings - new users	$182.7	$570.8	N/A	$493.3	$1,246.8
Time savings - mobile apps	$42.3	$57.9	$220.2	N/A	$320.4
Time savings - education	$478.9	$834.2	$2,191.3	N/A	$3,504.4
Educational attainment	$12.3	$437.2	N/A	N/A	$449.5
Total benefits	**$1,167.6**	**$2,517.1**	**$4,759.1**	**$493.3**	**$8,937.2**

[a] For purposes of this table, hearing, cognitive, and manual dexterity disabilities are referred to as "other relevant disabilities."

Table 10: 10-Year Average Annualized Comparison of Costs and Benefits

Benefit Type	3% Discount Rate	7% Discount Rate
Average annualized costs (millions)	$2,846.6	$2,947.9
Average annualized benefits (millions)	$9,316.3	$8,937.2
Net benefits (millions)	$6,469.7	$5,989.3
Cost-to-benefit ratio	0.3	0.3

2   BASELINE CONDITIONS

To estimate the costs and benefits of the proposed rule, baseline web accessibility of government websites and baseline disability prevalence need to be considered both in the presence and absence of the proposed rule over the 10-year analysis period. For these analyses, the Department assumed that the number of governments would remain constant over the 10-year horizon for which the Department projects costs and benefits. This is in line with the trend of total government units in the United States, which rose by only 19 government units (representing a 0.02 percent increase) between 2012[7] and 2017.[8] The Department assumes that the total number of government websites scales with the number of governments, and that the number of government websites that each government maintains would remain constant for the 10-year period with or without the rule. The Department notes, however, that if the number of government websites increases over time, both costs and benefits would increase accordingly, and because benefits are estimated to be larger than costs, this would only create a larger net benefit for the rule. The Department also assumes constant rates of disability over the 10-year horizon.[9] Finally, the ways in which government websites are used, and the types of websites

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[7] U.S. Census Bureau, *Census of Governments 2012 - Public use Files* (Jan. 2012), https://www.census.gov/data/datasets/2012/econ/gus/public-use-files.html.
[8] U.S. Census Bureau. (2022). *Census of Governments 2017 - Public use Files.* (Jan. 2017), https://www.census.gov/data/datasets/2012/econ/gus/public-use-files.html.
[9] Recent trends in disability prevalence vary across surveys, with some finding an increase in recent years and others finding no change. Due to uncertainty, the Department assumed no change in prevalence rates over the next ten years. U.S. Census Bureau. *2021 SIPP: Estimates of Disability Prevalence* (Aug. 2022),

(*e.g.*, Learning Management Systems and Content Management Systems) are assumed to be constant due to a lack of data.

Costs to test and remediate websites were estimated based on the level of effort needed to reach full compliance with WCAG 2.1 AA from the level of observed compliance during the Department's automated and manual accessibility checking from September 2022 through October 2022. The Department did not feel confident quantifying baseline conformity with proposed requirements.[10] Baseline accessibility of mobile apps and password protected course content was understood through literature, which estimated costs to make those materials WCAG 2.1 Level AA compliant, implicitly defining baseline conditions.

Most literature on current website accessibility has not historically tested websites against the same sets of standards, so comparing results from studies over time to find trends in accessibility is challenging. Additionally, the types of websites tested, and their associated geographies, tend to vary from study to study, compounding the difficulty of extracting longitudinal trends in accessibility. There are, however, some studies that have evaluated the change in accessibility for the same websites in different time periods, such as a 2014 paper that continued a study of Alabama website accessibility from 2002.[11] That study found almost no change in accessibility from the previous 2002 study.[12] Although most accessibility studies do not take this longitudinal approach, their conclusions, regardless of the standards against which

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https://www.census.gov/programs-surveys/sipp/tech-documentation/user-notes/2021-usernotes/estim-disabilty-preval html.

[10] Though SortSite does give what percentile a website falls into as far as accessibility, it does not give a raw "accessibility score."

[11] Potter, P. (2002). "Accessibility of Alabama Government Web Sites," *Journal of Government Information* 2(5), 303–17, https://doi.org/10.1016/S1352-0237(03)00053-4; Youngblood, N. (2014). "Revisiting Alabama State Website Accessibility," *Government Information Quarterly* 31(3), 476–87, https://doi.org/10.1016/j.giq.2014.02.007.

[12] Potter (2002) found that 80 percent of state websites did not pass section 508 standards, and Youngblood (2014) found that 78 percent of those same websites still did not meet section 508 standards 12 years later.

websites are checked, are generally that websites are not fully accessible. For example, a 2006 study found that 98 percent of State home pages did not meet WCAG 1.0 Level AA guidelines.[13] Another 2006 study found that only 18 percent of municipal websites met Section 508 standards.[14] And 14 years later, a 2021 study found that 71 percent of county websites evaluated did not conform to WCAG 2.0, and the remaining 29 percent only partially conformed to the standards.[15] Given the minimal progress in web accessibility over the last twenty years, the Department does not expect that compliance with WCAG 2.1 Level AA would improve significantly in the absence of the rule.

Question 1: The Department requests comment on accessibility trends that would be experienced in the absence of this proposed rule and would be relevant to estimation of regulatory effects.

2.1 NUMBER OF GOVERNMENTS

The proposed regulation will affect all State and local governments by requiring them to comply with WCAG 2.1 Level AA web accessibility standards. The Department used the 2017 Census of Governments to determine the number of affected governments, disaggregated by government entity type as defined by the Census Bureau.[16] The Department estimates the number of government entities affected by the proposed rule in Table 11. To account for differences in government characteristics, the Department stratified the government entities by

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[13] Goette, T., Collier, C. and White, J. (2006). "An Exploratory Study of the Accessibility of State Government Web Sites," *Universal Access in the Information Society* 5(1), 41, https://doi.org/10.1007/s10209-006-0023-2.
[14] Evans-Cowley, J. (2006). "The Accessibility of Municipal Government Websites." *Journal of E-Government* 2(2), 75, https://doi.org/10.1300/J399v02n02_05.
[15] Yang Bai et al. (2021). "Accessibility of Local Government Websites: Influence of Financial Resources, County Characteristics and Local Demographics," *Universal Access in the Information Society* 20(4), 851, https://doi.org/10.1007/s10209-020-00752-5. The Department notes that although these studies discuss State or local government conformance with the Section 508 standards, those standards only apply to the Federal Government, not to State or local governments.
[16] U.S. Census Bureau. (2022). *Census of Governments 2017 - Public use Files.* Retrieved from https://www.census.gov/data/datasets/2017/econ/gus/public-use-files.html.

population size, and analyzed impacts of the rule to each type of government entity within the population bounds. The Department seeks feedback from the public on whether the data from the Census of Governments accurately captures the number of affected governments.

Washington D.C. is included as a State for purposes of this table and the following analysis. Territory-wide governments are included as U.S. territories. Sub-territory-wide governments are included with the relevant government type (*e.g.*, Puerto Rico's municipalities are included with the municipalities category).

School districts included enrollment numbers but not population numbers. To approximate population, the Department multiplied the enrollment numbers by estimated total population to school-age population, by county.[17] As a hypothetical example, if a school district's enrollment is 10,000, and 20 percent of the population in the county is school-aged, then the school district's population was estimated to be 50,000. Independent community colleges were excluded from school district counts and included separately because these are considered separately for costing purposes. Counts of public universities and community colleges are from the National Center for Education Statistics (NCES).

Table 11: Number of Governments by Government Entity Type

Type of Government Entity	Population of less than 50,000	Population of 50,000 or more	Total
State	N/A	51 [a]	51
County	2,105	926	3,031
Municipal	18,729	766	19,495
Township	16,097	156	16,253

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[17] 2017 Census of Government data was used to estimate the universe of school districts and their populations. While the rule uses the most recent Small Area Income and Poverty Estimates (SAIPE) data for designating school districts as large or small entities, the 2017 Census of Governments data was used in calculations here for consistency with the estimation methods of other government entities. 24 percent of the generated population estimates were compared to the 2020 SAIPE data, and every school district was found to be classified correctly as having a population of either less than, or greater than or equal to 50,000.
U.S. Census Bureau. (2021). *County Population by Characteristics: 2010-2019. Annual County Resident Population Estimates by Age, Sex, Race, and Hispanic Origin: April 1, 2010 to July 1, 2019.* Retrieved from https://www.census.gov/data/datasets/time-series/demo/popest/2010s-counties-detail.html.

Type of Government Entity	Population of less than 50,000	Population of 50,000 or more	Total
Special district	38,542 [b]	N/A	38,542
School district	11,443	779	12,222
U.S. territory	2	3	5
Public university	744 [b]	N/A	744
Community college	1,146 [b]	N/A	1,146
Total (no higher education)	86,918	2,681	89,599
Total (with higher education)	88,808	2,681	91,489

Source: 2017 Census of Governments.
[a] Washington D.C. is included as a State for purposes of this table and the following analysis.
[b] Special district, public university, and community college data do not include population. For these tables, they are displayed as small.

2.2 NUMBER OF INDIVIDUALS WITH DISABILITIES

The Department expects the benefits of this proposed regulation will accrue to all individuals using State and local government services, but particularly to those with certain types of disabilities. WCAG 2.1 Level AA primarily benefits individuals with vision, hearing, cognitive, and/or manual dexterity disabilities.[18] Identifying individuals with these disabilities is not straightforward, and different surveys yield different estimates of the number of individuals with these disabilities in the United States. The Department considered three main data sources: (1) the U.S. Census Bureau's American Community Survey (ACS),[19] (2) the Center for Disease Control and Prevention's Behavioral Risk Factor Surveillance Survey (BRFSS),[20] and (3) the U.S. Census Bureau's Survey of Income and Program Participation (SIPP).[21] All three surveys include weights that allow users to calculate nationally representative estimates.

The ACS is an annual nationwide survey that began in 2007 and collects and produces

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[18] *See* Section 4.2.
[19] U.S. Census Bureau. *American Community Survey (ACS)*. Retrieved from https://www.census.gov/programs-surveys/acs.
[20] Centers for Disease Control and Prevention. (2014, May 16). *About BRFSS*. Retrieved from https://www.cdc.gov/brfss/about/index htm.
[21] *See* U.S. Census Bureau. (2022, August 16). *About this Survey*. Retrieved from https://www.census.gov/programs-surveys/sipp/about html.

information on social, economic, housing, and demographic characteristics. For each person in a household, the following questions are asked:[22]

- Is this person deaf or does he/she have serious difficulty hearing?

- Is this person blind or does he/she have serious difficulty seeing even when wearing glasses?

- Because of a physical, mental, or emotional condition, does this person have serious difficulty concentrating, remembering, or making decisions?

These are the three questions that identify if an individual has a hearing, vision, or cognitive disability in the ACS. Data are not available on manual dexterity.

The BRFSS is a cross-sectional telephone survey conducted by State health departments then compiled by the CDC that began in 1984. The primary purpose of the survey is to collect prevalence data to generate State and national estimates regarding risk behaviors and preventative health practices. The disability questions are very similar to those in the ACS:[23]

- Some people who are deaf or have serious difficulty hearing may or may not use equipment to communicate by phone. Are you deaf or do you have serious difficulty hearing?

- Are you blind or do you have serious difficulty seeing, even when wearing glasses?

- Because of a physical, mental, or emotional condition, do you have serious difficulty concentrating, remembering, or making decisions?

The SIPP is a household-based longitudinal survey, meaning it involved repeated

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[22] Some disability questions are only asked of household members aged 15 or older. The 2019 survey questionnaire is available at U.S. Department of Commerce. (2018, August 2). *The American Community Survey.* Retrieved from https://www2.census.gov/programs-surveys/acs/methodology/questionnaires/2019/quest19.pdf.
[23] Centers for Disease Control and Prevention. (2022, May 9). *Disability and Health Data System (DHDS) Data Guide Status and Types.* Retrieved from https://www.cdc.gov/ncbddd/disabilityandhealth/dhds/data-guide/status-and-types html#status.

observations of the same variables over time, created to provide data on income, employment, and government program participation collected since 1983. However, like the other surveys considered, the SIPP also collects other measures including disability. The disability questions are consistent with the standard questions asked in multiple government surveys, including the ACS. In addition to the standard disability questions, the Social Security Administration (SSA) sponsored seven disability questions in SIPP. The relevant questions in the SIPP are:[24]

- Is [respondent/household member] blind or does he/she have serious difficulty seeing even when wearing glasses or contacts?

- Is [respondent/household member] deaf or does he/she have serious difficulty hearing?

- Because of a physical, mental, or emotional problem, does [respondent/household member] experience serious difficulty concentrating, remembering, or making decisions?

- Does [respondent/household member] have any difficulty using his/her hands and fingers to do things such as picking up a glass or grasping a pencil?

The first three questions are similar to questions in the other two surveys meant to measure a vision, hearing, or cognitive disability. However, unlike the other surveys, the SIPP also contains a question related to a manual dexterity disability.[25]

The Department used data for 2019 from each of the three surveys to calculate the prevalence of disabilities, shown in Table 12. Of the three standard disability questions common among all three surveys, the prevalence rates of each disability vary by survey, but the ACS rates

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[24] Questionnaire for the 2021 survey available at U.S. Census Bureau. (2022, August 29). *2021 Survey of Income and Program Participation (SIPP)*. Retrieved from https://www2.census.gov/programs-surveys/sipp/questionnaires/2021/2021_SIPP_PU_Instrument_Specifications_AUG22.pdf.
[25] This question is only asked in select years.

are consistently below the BRFSS and SIPP rates. The SIPP estimated prevalence rate for

hearing disability is higher than the estimates from the other two surveys but is between the ACS

and the BRFSS estimates for vision disabilities and cognitive disabilities.

As the wording of the questions are very similar among these three surveys, definitional

differences do not explain the variation in disability prevalence estimates. Gettens et al. (2015)

assessed possible explanations for the higher BRFSS disability prevalence rates compared to

ACS.[26] The authors suggest that BRFSS sampling and nonresponse bias are the most likely

reasons for the different prevalence rates. BRFSS is vulnerable to sampling bias because of

some non-coverage inherent in random digit dialing sampling, and it is vulnerable to

nonresponse bias due to the relatively low response rates.

Because the SIPP sample is address-based using the Master Address File, the same general

sampling method used for the ACS, the SIPP is less vulnerable than the BRFSS to sampling bias.

Although the SIPP response rate is also lower than for the ACS, the SIPP response rate is

generally higher than the BRFSS response rate. However, Gettens et al. (2015) also notes that

response bias in the form of not reporting a disability because of perceived negative implications

may also be a factor. The authors do not address the SIPP data, which yield disability estimates

that are generally closer to the BRFSS than the ACS. Because the SIPP estimates are less likely

than the BRFSS estimates to suffer from sampling and nonresponse bias, these are unlikely to be

the reasons for the differences in the estimated disability prevalence rates between the SIPP and

the ACS. Therefore, it is unclear whether the ACS or SIPP data are more accurate.

The Department believes the SIPP is appropriate to estimate the number of individuals with

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[26] Gettens, J., Lei, P., & Henry, A. (2015). *Using American Community Survey Disability Data to Improve the Behavioral Risk Factor Surveillance System Accuracy.* DCR Brief Number: 2015-05. Retrieved from https://www.mathematica.org/publications/using-american-community-survey-disability-data-to-improve-the-behavioral-risk-factor-surveillance.

disabilities who will receive the greatest benefits from increased accessibility of State and local government websites and mobile apps. It is a long-standing, large, nationally representative survey with a section of its questionnaire dedicated to disabilities. Additionally, the SIPP is the only survey that includes a variable that can be used as a proxy for a manual dexterity disability. Finally, more recent data are available from SIPP; the Department uses the 2021 SIPP data that refer to the calendar year 2020 in this proposed regulation. The 2020 ACS data are used as a variable to calculate different prevalence levels for sensitivity analysis.

The Department used SIPP data over ACS data for three reasons. First, the most recent SIPP dataset includes a variable that can be used as a proxy for a manual dexterity disability, whereas the ACS does not. Second, literature suggests disabilities are underreported, and so the Department chose the higher prevalence rates in the SIPP data to minimize this underreporting.[27] Finally, only four types of disabilities are included in the analysis: visual, hearing, cognitive, and manual dexterity. People with other types of disabilities, such as speech, may also benefit but are not included in these numbers, so the Department believes that the higher prevalence rates in the SIPP would be more appropriate to account for this gap in data.[28] Similarly, some people with temporary disabilities may not respond to the SIPP questionnaire reporting a disability, so the Department believes the higher SIPP numbers are more appropriate. According to the Pew Research Center, 27 percent of people have a disability relevant to web accessibility standards, which further supports the Department's decision to select the SIPP data over ACS data to account for gaps in data on disability prevalence.[29]

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[27] Gettens, J., Lei, P., & Henry, A. (2015). *Using American Community Survey Disability Data to Improve the Behavioral Risk Factor Surveillance System Accuracy.* DCR Brief Number: 2015-05. Retrieved from https://www.mathematica.org/publications/using-american-community-survey-disability-data-to-improve-the-behavioral-risk-factor-surveillance.

[28] See https://www.w3.org/WAI/fundamentals/accessibility-intro/. Accessed on 11/30/2022.

[29] Fox, S. and Boyles, J.L. (2012). Disability in the Digital Age. Pew Research Center. http://www.pewinternet.org/2012/08/06/disability-in-the-digital-age/.

Table 12: Prevalence of Disabilities in 2019 for Adults Using Different Data Sources

Disability Type	ACS [a]	BRFSS [b]	SIPP [c]
Vision disability, prevalence	2.8%	5.0%	4.9%
Hearing disability, prevalence	4.3%	5.9%	7.2%
Cognitive disability, prevalence	5.2%	12.0%	9.1%
Vision disability, number (millions)	7.0	12.8	12.3
Hearing disability, number (millions)	11.1	16.2	18.2
Cognitive disability, number (millions)	13.5	28.6	22.8

[a] Erickson, W., Lee, C., von Schrader, S. (2022). Disability Statistics from the American Community Survey (ACS). Ithaca, NY: Cornell University Yang-Tan Institute (YTI). Retrieved from Cornell University Disability Statistics website: www.disabilitystatistics.org. Includes Guam and Puerto Rico.
[b] Centers for Disease Control and Prevention, National Center on Birth Defects and Developmental Disabilities, Division of Human Development and Disability. Disability and Health Data System (DHDS) Data [online]. [accessed Nov 6, 2022]. URL: https://dhds.cdc.gov. Includes Puerto Rico.
[c] U.S. Census Bureau. https://www.census.gov/programs-surveys/sipp/data/datasets/2020-data/2020.html

Using SIPP 2021 data, as shown in Table 13, the Department estimates that 4.8 percent of adults have a vision disability, 7.5 percent have a hearing disability, 10.1 percent have a cognitive disability, and 5.7 percent have a manual dexterity disability. Due to the incidence of multiple disabilities, the total share without any of these disabilities is 80.1 percent.[30]

Table 13: Disability Prevalence Counts, SIPP 2021

Disability Type	Prevalence Rate	Number (Millions)	Marginal Prevalence Rate [a]	Marginal Number [a] (Millions)
Vision	4.8%	12.2	4.8%	12.2
Hearing	7.5%	19.0	6.1%	15.3
Cognitive	10.1%	25.5	6.7%	16.9
Manual dexterity	5.7%	14.3	2.3%	5.7
None of the above	80.1%	202.3	80.1%	202.3

Source: U.S. Census Bureau. https://www.census.gov/programs-surveys/sipp/data/datasets/2021-data/2021.html.
[a] Individuals with multiple qualifying disabilities are counted within the first disability category listed (*e.g.*, if someone has a cognitive and vision disability, they are included in the

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[30] These estimates may miss some individuals due to underreporting. Some individuals with temporary disabilities may also not respond in the affirmative and may be missed. We note, however, that people with temporary disabilities may not always qualify as having a disability covered by the ADA.

vision disability prevalence rate).

3 COMPLIANCE COST ANALYSIS

3.1 SUMMARY OF COMPLIANCE COSTS

For governments to comply with the proposed rule, they will have to invest time and resources to make inaccessible website and mobile app content accessible. The Department has found that most government websites and apps will require accessibility testing and remediation because they do not meet the criteria of WCAG 2.1 Level AA web accessibility guidelines. In addition, the proposed rule will generally require public postsecondary educational institutions and primary and secondary schools to provide accessible course content to students with disabilities at the time that the schools knew or should have known that a student with a disability is enrolled in classes and would be unable to access the content available on the password-protected website (the rule provides a similar requirement for parents in the primary and secondary school context).[31] The Department performed analyses to estimate the costs to test and remediate inaccessible websites, mobile apps, and education course content. Estimated total costs of the rule can be found in Table 14.

The cost section is organized as follows:

- Section 3.2: Regulatory Familiarization Costs

- Section 3.3: Website Testing and Remediation Costs

- Section 3.4: Mobile App Testing, Remediation, and O&M Costs

- Section 3.5: Postsecondary Education Course Remediation Costs

- Section 3.6: Elementary and Secondary Course Content Remediation

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[31] The Department notes that the term "parent" as used throughout this analysis is intended to include biological, adoptive, step-, or foster parents; legal guardians; or other individuals recognized under Federal or State law as having parental rights.

- Section 3.7: Costs for Third-Party Websites and Mobile Apps

- Section 3.8: Sensitivity and Uncertainty Analyses of Costs

- Section 3.9: Cost to Revenue Comparison

Table 14: Initial Familiarization, Testing, and Remediation Costs (Millions)

Cost	State	County	Municipal	Township	Special District	School District	U.S. Terri- tories	Higher Ed.	Total
Regulatory familiarization	$0.02	$0.90	$5.79	$4.83	$11.44	$3.63	$0.00	$0.56	$27.17
Websites	$228.9	$742.5	$2,363.4	$1,342.9	$374.4	$1,826.1	$6.4	$1,283.0	$8,167.7
Mobile apps	$13.7	$53.1	$93.4	$1.3	$0.0	$379.7	$1.2	$64.4	$606.8
Postsecondary course remediation	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$5,393.8	$5,393.8
Primary and secondary course remediation	N/A	$47.4	$18.5	$40.0	N/A	$1,059.5	N/A	N/A	$1,165.4
Third-party website remediation	$6.6	$35.8	$133.5	$77.6	$18.0	$103.1	$0.0	$84.7	$459.2
Total	$249.2	$879.7	$2,614.6	$1,466.6	$403.9	$3,372.0	$7.6	$6,826.4	$15,819.9

Table 15: Average Annual Cost After Implementation (Millions)

Cost	State	County	Municipal	Township	Special District	School District	U.S. Terri- tories	Higher Ed.	Total
Websites	$19.9	$65.1	$215.1	$124.2	$40.5	$164.7	$0.6	$111.7	$741.9
Mobile apps	$0.01	$0.04	$0.03	$0.00	$0.00	$0.21	$0.00	$0.04	$0.33
Postsecondary course remediation	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$935.7	$935.7
Primary and secondary course remediation	N/A	$4.7	$1.9	$4.0	N/A	$105.9	N/A	N/A	$116.5
Third-party website remediation	$0.6	$3.2	$12.1	$7.2	$1.9	$9.2	$0.0	$7.4	$41.6
Total	$20.5	$73.1	$229.2	$135.4	$42.5	$280.1	$0.6	$1,054.8	$1,836.0

Table 16: 10-Year Average Annualized Cost, 3 Percent Discount Rate (Millions)

Cost	State	County	Municipal	Township	Special District	School District	U.S. Terri-tories	Higher Ed.	Total
Regulatory familiarization	$0.00	$0.10	$0.66	$0.55	$1.30	$0.41	$0.00	$0.06	$3.09
Websites	$38.9	$126.4	$405.2	$231.2	$68.4	$312.4	$1.1	$217.9	$1,401.5
Mobile apps	$1.5	$5.9	$10.5	$0.1	$0.0	$42.2	$0.1	$7.2	$67.7
Postsecondary course remediation	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$1,100.9	$1,100.9
Primary and secondary course remediation	N/A	$7.9	$3.1	$6.7	N/A	$176.9	N/A	N/A	$194.6
Third-party website remediation	$1.1	$6.1	$22.9	$13.4	$3.3	$17.6	$0.0	$14.4	$78.7
Total	$41.5	$146.4	$442.3	$251.9	$73.0	$549.6	$1.2	$1,340.6	$2,846.6

Table 17: 10-Year Average Annualized Cost, 7 Percent Discount Rate (Millions)

Cost	State	County	Municipal	Township	Special District	School District	U.S. Terri-tories	Higher Ed.	Total
Regulatory familiarization	$0.00	$0.12	$0.77	$0.64	$1.52	$0.48	$0.00	$0.07	$3.61
Websites	$41.6	$135.2	$429.6	$244.5	$71.8	$331.8	$1.2	$233.5	$1,489.1
Mobile apps	$1.8	$6.7	$12.0	$0.2	$0.0	$47.7	$0.2	$8.3	$76.9
Postsecondary course remediation	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$1,097.5	$1,097.5
Primary and secondary course remediation	N/A	$8.0	$3.1	$6.8	N/A	$179.2	N/A	N/A	$197.1
Third-party website remediation	$1.2	$6.5	$24.3	$14.1	$3.4	$18.7	$0.0	$15.4	$83.7
Total	$44.6	$156.6	$469.8	$266.1	$76.8	$577.9	$1.3	$1,354.8	$2,947.9

3.2 REGULATORY FAMILIARIZATION COSTS

Regulatory familiarization refers to the time needed for professional staff members to become familiar with the requirements of new regulations. This may include time spent reading the rule itself, but more commonly refers to time spent reviewing guidance documents provided by the Department, advocacy groups, or professional organizations. It does not include time spent identifying current compliance levels or implementing changes. It also does not include training time to learn the nuances of WCAG 2.1 Level AA.

It is unclear how long State and local governments will spend familiarizing themselves with this rule. The Department estimates, based on its best professional judgment, that on average it will take a government entity three hours to familiarize itself with the rule. This estimate assumes that it takes approximately one hour to gain a general understanding of the rule, and an additional 20 minutes for each exception, rounding out to three hours. This may include time spread across several employees. This does not include time for training, identifying current compliance levels, or implementing changes, which is generally calculated later in implementation costs. Additionally, the Department believes many governments will also use overviews and guidance documents to familiarize themselves with the rule. The Department believes this time estimate for familiarization is in line with some other rules of similar complexity and requests comment on this estimate.

The time spent will also differ by government entity type. Small governments with little online presence will likely spend less time familiarizing themselves with the rule. Larger governments or educational institutions may spend more time because they have a larger online web presence and may need to better understand the exemptions. The Department is interested in feedback about its estimation for the time it takes a government entity to familiarize itself with the proposed rule.

The cost of this time is valued at the median loaded wage for "Software and Web Developers, Programmers, and Testers." According to the 2021 Occupational Employment and Wage Survey (OEWS), the median hourly wage rate is $49.49.[32] Time may also be spent by employees in other occupations, with higher or lower wage rates, but the Department believes the wage rate for software and web developers, programmers, and testers is an appropriate proxy for these other employees' wage rates.[33] The selected wage rate was multiplied by two to account for benefits and overhead.[34] Therefore, the Department has estimated regulatory familiarization costs to be $27.2 million ($98.98 per hour × 3 hours × 91,489 governments) (Table 18).

The Department included all regulatory familiarization costs in Year 1. New governments may incur regulatory familiarization costs, but the rate of new government formation is low, and so the Department did not calculate the number of new governments over this 10-year horizon. Additionally, these new governments would have had some familiarization costs to understand the current requirement to make websites and mobile apps accessible even in the absence of this rule. Therefore, the additional time for new governments to familiarize themselves with the proposed standards, above and beyond the current general requirement, would be small. Average annualized regulatory familiarization costs over 10 years, using a 7 percent discount rate, are $3.6 million.

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[32] OEWS data available at: U.S. Bureau of Labor Statistics. (2022, March 31). *May 2021 National Occupational Employment and Wage Estimates United States*. Retrieved from https://www.bls.gov/oes/current/oes_nat htm#15-0000. 2022 OEWS data were released after this analysis was conducted.

[33] Wage rates for other occupations of workers who may be reviewing the rule are similar. For example, the median hourly wage for all computer occupations is $46.84, and for management occupations it is $49.25.

[34] Department of Justice guidance on selection of this figure was unavailable, so the Department used guidance in selecting this number from a different agency that frequently engages in rulemakings. Department of Health and Human Services. (2016). *Guidelines for Regulatory Impact Analyses.* Retrieved from https://aspe hhs.gov/reports/guidelines-regulatory-impact-analysis.

Table 18: Regulatory Familiarization Costs

Variable	Value
Potentially affected governments	91,489
Average hours per entity	3
Loaded wage rate	$98.98
Base wage [a]	*$49.49*
Adjustment factor	*2.00*
Cost year 1 (thousands)	$27,167
Annual cost years 2-10 (thousands)	$0
Average annualized cost, 3% discount rate (thousands)	$3,092
Average annualized cost, 7% discount rate (thousands)	$3,615

[a] 2021 OEWS median wage for software and web developers, programmers, and testers (SOC 15-1250).

3.3 WEBSITE TESTING, REMEDIATION, AND O&M COSTS

3.3.1 Overview

Under the proposed rule, State and local government websites must adhere to WCAG 2.1 Level AA guidelines for web accessibility. To assess costs to governments, the Department employed multistage stratified cluster sampling to randomly select government entities and government entity websites. Mobile app costs were analyzed separately in Section 3.4. Each identified website within the second stage sample was tested for accessibility using a two-pronged approach of automated and manual testing to estimate the number of accessibility errors present in each site. The Department estimated remediation costs for government websites based on these manual and automated accessibility reports. Costs associated with the remediation of Portable Document Format files (PDFs) and the captioning of audio and visual media hosted on government websites were estimated separately. In addition, the Department estimated testing costs by evaluating the pricing of several commercial web accessibility checkers that could be used in tandem with manual testing. The Department then derived an average cost to test and remediate all websites of a given government entity for each government type and size. Initial website testing and remediation costs, which represent one-time costs incurred by entities to comply with the rule within the implementation period, are shown in Table 19. These costs are

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shown on a per-entity basis in Table 20.

Table 19: Total Initial Website Testing and Remediation Costs (Millions)

Type of Government Entity	Testing Costs	Website Remediation Costs	PDF Remediation Costs	Video and Audio Captioning Costs	Total Initial Costs
State	$28.3	$141.1	$22.9	$6.7	$199.0
County (small)	$9.1	$35.4	$15.9	$1.7	$62.2
County (large)	$87.7	$433.2	$44.4	$20.6	$585.9
Municipality (small)	$268.8	$1,260.1	$112.7	$60.0	$1,701.5
Municipality (large)	$61.8	$304.2	$45.0	$14.5	$425.5
Township (small)	$185.5	$876.1	$89.5	$41.7	$1,192.8
Township (large)	$3.8	$18.0	$2.1	$0.9	$24.7
Special district	$61.4	$247.0	$13.8	$11.8	$333.9
U.S. territory (small)	$0.1	$0.6	$0.4	$0.0	$1.2
U.S. territory (large)	$0.6	$3.0	$0.7	$0.1	$4.5
School district (small)	$175.1	$813.5	$55.7	$38.7	$1,083.0
School district (large)	$85.2	$421.4	$24.1	$20.1	$550.8
Public university	$73.4	$362.7	$26.7	$17.3	$480.1
Community college	$98.0	$483.4	$30.9	$23.0	$635.3
Total	$1,138.8	$5,399.6	$484.9	$257.1	$7,280.3

Table 20: Initial Website Testing and Remediation Costs per Entity

Type of Government Entity	Number of Entities	Testing Costs per Entity	Website Remediation Costs per Entity	PDF Remediation Costs per Entity	Video and Audio Captioning Costs per Entity	Total Initial Costs per Entity
State	51	$554,485	$2,766,514	$449,520	$131,717	$3,902,235
County (small)	2,105	$4,327	$16,836	$7,576	$802	$29,541
County (large)	926	$94,738	$467,780	$47,903	$22,272	$632,693
Municipality (small)	18,729	$14,349	$67,280	$6,015	$3,203	$90,847
Municipality (large)	766	$80,619	$397,187	$58,739	$18,911	$555,456
Township (small)	16,097	$11,525	$54,426	$5,558	$2,591	$74,100
Township (large)	156	$24,199	$115,085	$13,372	$5,479	$158,136
Special district	38,542	$1,593	$6,408	$357	$305	$8,664
U.S. territory (small)	2	$64,019	$314,185	$184,704	$14,959	$577,867
U.S. territory (large)	3	$200,917	$998,675	$244,257	$47,548	$1,491,397
School district (small)	11,443	$15,302	$71,088	$4,870	$3,385	$94,644
School district (large)	779	$109,370	$540,940	$30,996	$25,755	$707,061
Public University	744	$98,671	$487,445	$35,950	$23,208	$645,275

Type of Government Entity	Number of Entities	Testing Costs per Entity	Website Remediation Costs per Entity	PDF Remediation Costs per Entity	Video and Audio Captioning Costs per Entity	Total Initial Costs per Entity
Community College	1,146	$85,540	$421,788	$26,976	$20,082	$554,385
Total	91,489	N/A	N/A	N/A	N/A	N/A

3.3.2 Government and website sampling

To account for variability in website complexity and baseline compliance with WCAG 2.1 guidelines between government types, the Department began by dividing State and local government entities into 14 categories based on government entity type and government size (Table 21).[35] The Department used the United States Census of Governments[36] to aggregate a complete list of government entities within each government type and divided these into "Small" (representing fewer than 50,000 people), and "Large" (representing at least 50,000 people).[37] Additionally, the Department tabulated the nation's public universities and community colleges.[38] While these postsecondary educational institutions are not independent local governments themselves, all costs associated with public postsecondary educational institutions were estimated separately from those of State and local governments. More information about the categorization of these entities can be found in Section 2.1.

Table 21: Counts of Government Entities

Type of Government Entity [a]	Population of less than 50,000	Population of 50,000 or more	Total
State	N/A	51	51

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[35] Because there are not population data for special districts, and there are no states with a population less than 50,000, our sample effectively only has 12 categories.
[36] U.S. Census Bureau. (2022). *Census of Governments 2017 - Public use Files.* Retrieved from https://www.census.gov/data/datasets/2017/econ/gus/public-use-files.html.
[37] Small Business Administration. (2017). *A Guide for Government Agencies: How to Comply with the Regulatory Flexibility Act.* Retrieved from https://cdn.advocacy.sba.gov/wp-content/uploads/2019/06/21110349/How-to-Comply-with-the-RFA.pdf. Independent school districts designated as "Post-Secondary" or "Special or Vocational Education" were excluded from this round of calculations to be analyzed together with public institutions of higher education.
[38] National Center for Education Statistics. (n.d.). *Summary Tables.* Retrieved from https://nces.ed.gov/ipeds/SummaryTables/.

Type of Government Entity [a]	Population of less than 50,000	Population of 50,000 or more	Total
County	2,105	926	3,031
Municipal	18,729	766	19,495
Township	16,097	156	16,253
Special district	38,542 [b]	[b]	38,542
School district	11,443 [c][d]	779 [c][d]	12,222
U.S. territory	2	3	5
Public university	744 [b][e]	[b]	744
Community college	1,146 [b][e]	[b]	1,146
Total (no higher education)	86,918	2,681	89,599
Total (with higher education)	88,808	2,681	91,489

[a] Data for government entities from U.S. Census Bureau. (2022). Census of Governments 2017 – Public use Files. https://www.census.gov/data/datasets/2017/econ/gus/public-use-files.html
[b] Special district, public university, and community college data do not include population.
[c] Counts of independent school districts exclude "Post-Secondary" and "Special or Vocational" school districts.
[d] Population data for school districts estimated from U.S. Census Bureau. (2021). County Population by Characteristics: 2010-2019. Annual County Resident Population Estimates by Age, Sex, Race, and Hispanic Origin: April 1, 2010 to July 1, 2019. https://www.census.gov/data/datasets/time-series/demo/popest/2010s-counties-detail.html.
[e] Counts of public universities and community colleges from the National Center for Education Statistics (NCES). https://nces.ed.gov/ipeds/SummaryTables/.

From those lists, the Department generated a random sample of governments within each category. The Department sampled 207 government entities which were distributed proportionally across entity types while ensuring that no entity type had a sample of fewer than 15 government entities.[39] As there are fewer than 15 U.S. territories in each size class, all covered U.S. territories were sampled.[40] The Department separately drew unstratified random

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[39] The Department evaluated sampling capacity and determined 200 entities would be feasible based on the expected burden of manually generating website lists. Proportional allocation was used between entity types but a minimum of 15 entities was selected for each entity type to ensure a sufficient sample size for estimates specific to each entity type.

[40] Additionally, the Department stratified the governments within each survey cell by population prior to sampling. Government entity types for which fewer than 20 entities were chosen for the sample were partitioned into two equally sized strata, while government entity types for which more than 20 entities were chosen for the sample were partitioned into four equally sized strata. Samples were drawn proportionately from these strata. Large and small U.S. territories, all of which were sampled, and special districts, for which population data are not available, were not stratified.

samples of 10 public universities and 10 community colleges for use in its analyses of those

entities.[41] (See Section 3.5.1 for more detail.)

Table 22: Government Entities Sample Sizes

Type of Government Entity	Population of less than 50,000	Population of 50,000 or more	Total
State	N/A	16	16
County	16	16	32
Municipal	25	15	40
Township	25	15	40
Special district	38 [a]	[a]	38
School district	21	15	36
U.S. territory	2	3	5
Public university	10 [a]	[a]	10
Community college	10 [a]	[a]	10
Total (no higher education)	127	80	207
Total (with higher education)	147	80	227

[a] Special district, public university, and community college data do not include population. These are counted as small entities for the purposes of this analysis.

To generate cost estimates to remediate websites, the Department developed a

methodology to count all the websites within the sample frame. Once samples of government

entities were drawn, the Department identified the main website for each government entity (if

there was one) and scanned that website with the automated accessibility checker SortSite. [42, 43]

The Department was interested in two elements of SortSite's output: the issue report, which lists

accessibility issues found on each page, and the inventory report, which lists the links found on

the website. By viewing SortSite's inventory report, the Department was able to effectively see

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[41] Technical colleges were included with community colleges.

[42] For the purposes of this analysis, a "main website" is the main domain used by a government entity as the home for its public-facing web content and services. Main websites often host information about the government entity's history, contact information for government offices, and links to relevant resources, though they can offer other services as well. All subdomains of a main website are considered part of the main website for the purposes of tabulating government website counts and estimating compliance costs.

[43] SortSite is an automated accessibility checker that can be used to scan entire websites to identify and diagnose potential errors in accessibility, browser compatibility, usability, and more areas against a variety of standards. The Department used SortSite Professional to count links and identify PDFs, audio and video files, and instances of possible noncompliance with WCAG 2.1 Level AA guidelines across government websites. It is available here: https://www.powermapper.com/buy/all/sortsite/.

all external websites that were linked from a government's main website. Using the list of external links generated from SortSite's inventory report, the Department identified additional websites (referred to herein as "secondary" websites) associated with the government entity.[44] This methodology may result in a slight undercount of government websites, since some governments may maintain websites that are not linked directly from the entity's main website; however, the Department believes this is uncommon.

All websites deemed to be covered by the proposed rule and under the purview of its associated entity were recorded to estimate the average number of websites managed by different government entity types (Table 23). Only websites which the government created or manages directly were counted.[45] Third-party websites that offer government services were excluded from this part of the analysis and analyzed separately (Section 3.7).

Social media sites other than the major video-hosting platforms YouTube and Vimeo were excluded from the analysis for the following reasons. Concerning existing content, the Department is considering an exemption for preexisting social media content. If this exemption

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[44] For the purposes of this analysis, a "secondary website" is a domain other than an entity's main website that the entity uses to offer public-facing web content and services. For example, a hypothetical small municipality might use town.gov as its main website. The local library in that municipality might use its own website, townlibrary.org. Since in this example the library is a service provided by the municipality, townlibrary.org would be considered a secondary website of the municipality. Alternatively, the library's web presence could be hosted at library.town.gov or town.gov/library; in these cases, the library's web presence would not be counted as a secondary website because it would exist as a subdomain or directory, respectively, of the municipality's main website, not its own domain. This distinction was made in part because SortSite can crawl through an entire domain, including subdomains and directories, at once. Distinguishing between websites at the domain level allows for convenient tabulation and analysis of accessibility issues.

[45] The Department assessed the content and presentation of each website to determine whether the government entity would likely incur the burden of remediating the content hosted therein. In some cases, a third-party content manager was easy to identify. For example, websites that host the municipal codes of several local governments maintain the shared templates they use to present those documents. Despite using the website to provide a service, individual governments have no access to the web architecture that powers those templates, and therefore are not anticipated to remediate them themselves. In less clear-cut cases, the Department used its best professional judgment to determine whether a third party likely controls the content on a government site, relying on contextual evidence such as whether the government entity was referenced in the site's domain name or whether a third-party content provider was cited on the site. Web content hosted or managed by a third party often cites that third party's name in the publishing information in the footer of a webpage.

is included in the final rule, then there would be no costs associated with preexisting content. If it is not included, then there would be some costs associated with preexisting content. However, it is possible that many old, inaccessible posts would be removed rather than remediated.

Regarding public entities' future social media content (*i.e.*, the content that they post themselves), which is covered under the proposed rule, the exclusion of social media pages from this analysis may lead to an underestimate in costs. However, the Department believes the O&M estimates are sufficient to capture these additional unquantified costs, which would likely be small considering that accessibility is far less expensive when performed at the creation stage and non-video/audio content is generally substantially less expensive than video/audio content (which was quantified in this analysis). Furthermore, the Department believes that any potential undercount due to the exclusion of non-video and non-audio social media content is likely offset by the overestimate in costs resulting from assuming all content on websites (with the exception of PDFs, as further described in Section 3.3.5) will be remediated rather than archived or removed. It was further assumed that the costs of making text or image posts accessible on social media would be de minimis because this will largely involve adding alt text to images and avoiding text contrast issues, which are generally incorporated in social media website functionality. Section 3.3.6 estimates the costs associated with making video and audio content accessible.

In total, the Department identified 1,060 websites for the 207 sample entities, with the number of websites identified scaling positively with size of government. On average, states had the most websites and special districts had the fewest, with some not having any covered websites.

A secondary sample consisting of about one third of all secondary websites for each

government selected in the primary sample was then drawn to estimate additional testing and

remediation costs, alongside the primary sample of websites.[46]

Table 23: Average Number of Websites per Entity and Entity Type

Type of Government Entity	Total Main Sites	Total Secondary Sites	Number of Entities	Main Sites per Entity	Secondary Sites per Entity	Average Websites per Entity
State	51	1,438	51	1.0	28.2	29.2
County (small)	1,710	1,842	2,105	0.8	0.9	1.7
County (large)	926	5,267	926	1.0	5.7	6.7
Municipality (small)	14,158	11,149	18,729	0.8	0.6	1.4
Municipality (large)	766	3,297	766	1.0	4.3	5.3
Township (small)	8,711	2,681	16,097	0.5	0.2	0.7
Township (large)	156	290	156	1.0	1.9	2.9
Special district	10,143	0	38,542	0.3	0.0	0.3
U.S. territory (small)	2	35	2	1.0	17.5	18.5
U.S. territory (large)	3	42	3	1.0	14.0	15.0
School district (small)	10,497	14,012	11,443	0.9	1.2	2.1
School district (large)	779	6,740	779	1.0	8.7	9.7
Public university	744	5,239 [a]	744	1.0	7.0 [a]	8.0 [a]
Community college	1,146	8,070 [a]	1,146	1.0	7.0 [a]	8.0 [a]
Total	49,792	60,100	91,489	0.5	0.7	1.2

[a] The Department did not identify secondary websites for public universities or community colleges. A discussion of the number of websites and costs for those entities can be found in Section 3.5.1.

Question 2: The Department requests comments and data pertaining to the costs of

removing or archiving web content.

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[46] From each entity's list of secondary websites, the larger of (a) one website or (b) one-third of the list was selected. The Department evaluated sampling capacity and determined that one third of websites per entity would be feasible based on the expected burden of scanning many websites with SortSite.

3.3.3 Website remediation costs

Remediation and testing costs were separated into two categories (discussed in Sections 3.3.3–3.3.6 and Section 3.3.7, respectively) in order to capture nuances in each estimate. The cost of remediating a website to comply with WCAG 2.1 Level AA standards was calculated by estimating the amount of time it would take to fix each accessibility error identified on that website and multiplying that time by the 2021 OEWS median wage for software and web developers, programmers, and testers (SOC 15-1250) and by a factor of two to account for benefits and overhead.[47] Table 24 shows the number of websites identified and tested by SortSite from the government entities in the sample.

Table 24: Number of Main and Secondary Websites Identified and Tested in Sample

Type of Government Entity	Main Websites	Main Websites Tested	Secondary Websites	Secondary Websites Tested
State	16	16	446	117
County (small)	13	13	14	7
County (large)	16	16	91	35
Municipality (small)	19	19	15	11
Municipality (large)	15	15	63	26
Township (small)	13	13	4	4
Township (large)	15	15	28	13
Special district	10	10	0	0
U.S. territory (small)	2	2	35	13
U.S. territory (large)	3	3	42	16
School district (small)	19	19	25	14
School district (large)	15	15	131	50
Public university	10	10	0 [a]	0 [a]
Community college	10	10	0 [a]	0 [a]
Total	176	176	894	306

[a] The Department did not sample secondary websites for public universities or community colleges. A discussion of the number of websites and costs for those entities can be found in Section 3.5.1.

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[47] OEWS data available at: U.S. Bureau of Labor Statistics. (2022, March 31). *May 2021 National Occupational Employment and Wage Estimates United States.* Retrieved from https://www.bls.gov/oes/current/oes_nat htm#15-0000.

Each government website in the second stage sample was scanned by SortSite to check for possible errors against WCAG 2.1 Level AA criteria. SortSite divides WCAG 2.1 Level AA success criteria into 350 distinct error descriptions and scans entire websites to identify instances of those potential errors.[48] It then produces an issue report, which lists the errors found by error description, WCAG 2.1 guideline, page or file on which the error was found, file or document type for that page or file, and line of code within the webpage's HTML in which the error was identified. The Department's accessibility experts estimated the amount of time that it takes on average for a web accessibility professional to fix one instance of each of the 350 error types and applied those values to the issue reports generated by SortSite.[49] Error types ranged in severity from requiring on average one minute to fix to requiring 120 minutes to fix. Sample error descriptions can be found in Table 25. A full list of error descriptions and their associated time estimates can be found in Appendix C: SortSite Error Descriptions and Remediation Time Estimates.

Table 25: Sample SortSite Error Descriptions

WCAG 2.1 Success Criterion	SortSite Error Description	Average Minutes to Fix One Instance	Is This Error Type "Fix Once, Fix All?"
1.3.1	Use semantic markup like strong instead of using the CSS font-weight property.	5	No

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[48] Some WCAG 2.1 success criteria have no associated SortSite error descriptions, while some have several. SortSite assesses success criteria corresponding to all four disability types discussed in Section 2.2. A full listing of SortSite's error descriptions, along with their corresponding WCAG 2.1 success criteria, can be found in Appendix C: SortSite Error Descriptions and Remediation Time Estimates.

[49] The experts relied on their own prior experience addressing instances of these accessibility errors to form their estimates. The time estimates were determined with the assumption that the individuals fixing accessibility errors may need additional time to locate and fully understand the impacts of the errors. The estimates for most errors were initially set lower, but were ultimately raised to five minutes per instance, which, while likely an overestimate for web developers with extensive accessibility backgrounds, accounts for the fact that some individuals responsible for remediation may not have as much experience in fixing accessibility errors. Some simple error types retained an estimate of requiring fewer than five minutes to address.

WCAG 2.1 Success Criterion	SortSite Error Description	Average Minutes to Fix One Instance	Is This Error Type "Fix Once, Fix All?"
1.3.1, 2.1.1, 4.1.2	This element uses JavaScript to behave like a link. Links like this cannot be tabbed to from the keyboard and are not read out when screen readers list the links on a page.	30	No
1.4.1	Removing the underline from links makes it hard for color-blind users to see them.	5	Yes
4.1.1	Duplicate id – the same ID is used on more than one element.	5	No
1.4.3	Ensure that text and background colors have enough contrast.	10	Yes

The Department determined that there are some instances in which the construction of a website means that not all accessibility errors need to be fixed individually. Some errors, which may appear on multiple web pages, may be addressable by a single change to a website's content management system (CMS).[50] The Department introduced several criteria into the cost algorithm to reflect this nuance. The time to fix each instance of an error type was tallied individually unless:

- The error type was on the predetermined list of error types that the Department deemed could always be fixed once to address every instance across a website;[51]

- The error appeared on a JSON or XML file type, suggesting it was more likely produced from a content management system[52]; or

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[50] Most websites today employ some manner of CMS. These systems allow for easier management and updating of websites. For example, a CMS may store all images that appear on a website in a single media library. If a piece of alt text for an image needs to be updated, that change is made in one location in that media library and can be pushed out to all the pages that use that image.

[51] These errors, which include those that can be resolved by a single change in a CMS, also include several other website-wide errors. For example, if a color contrast problem is found across multiple locations on a website, the web developer can often make a single update in the website's stylesheet to fix the error everywhere.

[52] Content on webpages with these file types is often generated automatically from formatting conventions in a central database. Changes to the formatting or appearance of these pages can be made once and propagated throughout all similar pages on a website.

- The error appeared on the same line of code on at least 10 different webpages.[53]

If an error satisfied one of the above conditions, the Department assumed that fixing a single instance of the error could serve to address all similar instances of that error. The Department recognizes that these rules may not comprehensively capture the cases in which accessibility errors could be fixed only once, but believes that, on average, these rules will accurately capture website remediation costs. The Department invites comment on the process used to estimate the cost of remediating a website.

3.3.4 Manual evaluation

The literature overwhelmingly finds that automated accessibility checkers are not sufficient to find all accessibility errors on a website, recommending instead that manual testing be used in conjunction with automated assessments to ensure a thorough evaluation.[54, 55] In recognition of this fact, the Department developed a methodology to incorporate the results of manual testing into its remediation cost estimates. To evaluate the extent to which SortSite identifies errors, the Department manually assessed 14 government web pages for accessibility errors. The resulting manual error list was compared against SortSite's issue report for the same 14 web pages.

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[53] The presence of the same type of error in the same line number of code on multiple web pages was taken as an indication that content with a particular accessibility error may have been replicated across those pages. Examples include links that are vaguely labeled "Click here" in the sidebar of multiple pages on a site; a site logo in every page's header that lacks alt text; and incorrectly formatted headings in the same place on each press release on a website. In these cases, and others, one change in the website's CMS could be pushed out to many pages, thereby addressing many accessibility issues with only the effort required to fix a single one. The threshold of 10 pages was chosen to acknowledge that error types may occur on the same line across different pages as a coincidence, but that this is unlikely to happen across many pages independently. This approach has several limitations. The heuristic could still inappropriately flag some coincidences, leading to an underestimate of costs, or it could miss instances when an error is replicated on fewer than 10 pages, overestimating costs. Additionally, this methodology fails to account for accessibility errors that are replicated across many pages if the code in which that error occurs is not on the exact same line of code on each page. Replicated content is often generated on adjacent, rather than exactly equal, lines on different pages, so the strict application of this rule has likely led to an overestimate of costs.

[54] Vigo, M., Brown, J., & Conway, V. (2013). Benchmarking web accessibility evaluation tools: Measuring the harm of sole reliance on automated tests. *W4A 2013 - International Cross-Disciplinary Conference on Web Accessibility.* 10.1145/2461121.2461124.

[55] Abduganiev, S. G. (2017). Towards Automated Web Accessibility Evaluation: A Comparative Study. *I.J. Information Technology and Computer Science, 9*, 18-44. doi:10.5815/ijitcs.2017.09.03.

Specifically, the Department considered discrepancies between the two lists' error types, error frequencies, and total estimated time to remediate. This section describes these findings and the corresponding adjustments that the Department used to account for shortcomings in SortSite's automated scanning.

The sample of 14 web pages was drawn randomly in two stages. For each of the 14 types of government entities, one was selected at random. The Department then used SortSite to scan the main websites, thereby generating a list of unique, valid web pages per entity.[56] This list included pages on which SortSite found no accessibility issues as well as PDF files hosted on the website. From each entity type's resulting list of unique web pages, one page was drawn at random for manual evaluation. In this way, a sample of 14 web pages was generated (one per type of government entity) for manual evaluation.

The manual evaluation was conducted by a web accessibility expert. Experts perform such manual evaluations using a variety of assistive tools, which facilitate the manual inspection and help identify areas requiring closer follow-up. Several automated assistive tools were used to flag initial errors to be examined. As accessibility testing is inherently a manual process, the expert proceeded from the starting point provided by those assistive tools by visually inspecting code, functionality, and layout to ensure that accessibility functions and standards were being met. The following tools were employed in the first stage of this assessment: the WAVE browser extension,[57] NVDA Screen Reader,[58] and SortSite. The page was inspected manually, including reading the text and inspecting source code, and any identified issues were recorded.

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[56] The list of valid web pages did not include web pages that were not accessible due to HTML status errors (*e.g.*, HTML status error 400). Specifically, only web pages with HTML status codes 200 and 1002 were included for sampling.
[57] WAVE. (2022). *WAVE Web Accessibility Evaluation Tools*. Retrieved from https://wave.webaim.org/.
[58] NV Access. (2022). *Download NVDA*. Retrieved from https://www.nvaccess.org/download/.

The results of the WAVE and SortSite scans were reviewed manually to validate that true errors were identified and to assist in highlighting potentially problematic areas requiring closer inspection of the source code. The NVDA screen reader was applied to the page, and the web accessibility expert listened to the outputs to evaluate compliance and logical ordering. Keyboard accessibility was assessed by tabbing through the page.

Using these methods, a comprehensive listing of errors was generated. The web accessibility expert also estimated the time to remediate the identified errors. Table 26 presents sample output from the manual evaluation procedure. It also compares estimated remediation times based on the manual evaluation and based on the automated SortSite scan.

Table 26: Illustrative Example of Issues Identified by Manual Evaluation vs. SortSite

WCAG 2.1 Success Criterion	Error Description	Remediation Details	Minutes to Remediate	Identification Source
1.4.3	Insufficient color contrast where white text is on yellow background	Fix in CSS	10	Manual
1.1.1	Repeated text label in footer relies on visual differentiation only (A-Z)	Update text label or add ARIA label to differentiate	5	Manual
2.1.1	Left hand navigation is not keyboard accessible	Update HTML or CSS to incorporate navigation properly	60	Manual
2.5.3	Visible label name needs to be included in ARIA label	Add label to ARIA label attribute	5	SortSite
1.1.1	Page has Unicode characters from a different language which a screen reader may not pronounce correctly	Add language attribute to these elements	15	SortSite

The 14 web pages were aggregated to assess the overall accuracy of the automated estimates of remediation time. Specifically, the manually-estimated remediation times and the Sortsite-based estimates of remediation times were each aggregated across the 14 web pages, and then the two estimates were compared. The manual evaluation yielded a total remediation time of 1,204 minutes. For those same 14 web pages, the automated estimate of total remediation time was 609 minutes, based on the SortSite scan and the pre-assigned error remediation times. Comparing these two values, the Department determined that the automated remediation assessment procedure identifies 609 / 1,204 = 50.6 percent of the true remediation time. To account for this, all of the automated remediation times (estimated with Sortsite) were increased by an adjustment factor of 1.98 (1,204 / 609). In effect, this manual adjustment approximately doubles each government's estimated website costs to account for the fact that Sortsite may not

catch every accessibility error. Initial website remediation costs can be found in Table 27.

Table 27: Initial Website Remediation Costs

Type of Government Entity	Number of Entities	Initial Website Remediation Costs per Entity	Total Initial Website Remediation Cost for all Entities (Millions)
State	51	$2,766,514	$141.1
County (small)	2,105	$16,836	$35.4
County (large)	926	$467,780	$433.2
Municipality (small)	18,729	$67,280	$1,260.1
Municipality (large)	766	$397,187	$304.2
Township (small)	16,097	$54,426	$876.1
Township (large)	156	$115,085	$18.0
Special district	38,542	$6,408	$247.0
U.S. territory (small)	2	$314,185	$0.6
U.S. territory (large)	3	$998,675	$3.0
School district (small)	11,443	$71,088	$813.5
School district (large)	779	$540,940	$421.4
Public University	744	$487,445	$362.7
Community College	1,146	$421,788	$483.4
Total	91,489	$59,019	$5,399.6

3.3.5 PDF remediation costs

PDFs often have accessibility errors that are difficult for automated checkers such as SortSite to identify, so the cost of remediating PDFs hosted on government websites was calculated using a separate methodology. The costs to remediate PDFs were divided into two categories: software costs and remediation time.

The Department determined that access to PDF editing software equipped with accessibility functionality is necessary to ensure PDFs are accessible. There are several PDF editing software options that entities can use, including CommonLook PDF,[59] FOXIT,[60] and

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[59] Available at: CommonLook. (2022). *CommonLook PDF.* Retrieved from https://commonlook.com/accessibility-software/pdf/.

[60] Available at: FOXIT. (2022) *Foxit PDF Editor.* Retrieved from https://www.foxit.com/pdf-editor/.

Adobe Acrobat Professional.[61] One license of Adobe Acrobat Professional costs $239.88 per

year. This price is fairly standard for PDF editing software, and Adobe Acrobat is seen by some

accessibility organizations as the standard software to use for this work,[62] so this price was

retained as the estimated price for one license of PDF editing software for the duration of the

analysis. It was assumed that each entity would maintain one license each year to support the

continued remediation of PDFs. This assumption may result in an underestimate of costs, as

multiple licenses may be required to cover the full burden of PDF remediation for some entities.

However, it may overestimate costs because some governments have already purchased PDF

editing software.

The Department estimated the amount of time needed to remediate existing PDFs

covered by the proposed rule by determining an average amount of time needed to make a pre-

existing PDF compliant with WCAG 2.1 Level AA guidelines and estimating the number of

covered PDFs hosted on State and local government websites requiring remediation.

The Department sampled 28 main websites from the government sample drawn in

Section 3.3.2 (two for each of the 14 government categories) and used the SortSite inventory

report, which comprehensively lists the links and pages found on a website, to count the number

of PDFs hosted on each. The Department used R[63] to determine the page count and date of last

modification for each PDF found. The 43,502 PDFs on the 28 sampled government websites

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[61] Available at: Adobe. (2022). *Adobe Acrobat Plans & Pricing.* Retrieved from
https://www.adobe.com/acrobat/pricing.html.
[62] *See* WebAIM. (2019). *PDF Accessibility.* Retrieved from https://webaim.org/techniques/acrobat/.
[63] R is an open-source programming environment and language designed to make accessible an expansive suite of
statistical computing capabilities. It was used extensively in the data organization and manipulation in this analysis.
The package 'pdftools' was used to isolate the page counts and modification dates for the PDFs in this sample. R
can be found here: https://www.r-project.org/. Documentation for 'pdftools' can be found here: https://cran.r-
project.org/web/packages/pdftools/pdftools.pdf.

had a median page count of three pages.[64] This number was extrapolated as the average page count for PDFs on State and local government websites.

The inventory report which was used to tabulate the total number of PDFs and page counts does not list accessibility errors. Therefore, the Department also looked at the issue reports for each of these 28 government websites to count the number of PDFs with errors. Combining these counts, the Department estimates that 95.2 percent of PDFs hosted on government websites will require some degree of remediation to reach full compliance with the proposed rule.

The Department assumed that PDFs that had neither been created nor modified in the prior 10 years are likely to be outdated and would therefore be removed or archived rather than remediated. We request comment on this assumption. This assumption may result in an underestimate of costs in the case that some PDFs from before 2012 may still be in use and would need to be remediated. Conversely, in assuming that all PDFs modified since 2012 would be remediated rather than archived, the Department may overestimate costs. Of the 43,502 PDF documents hosted on the 28 sampled websites, 6,518, or 15.0 percent, were last modified before 2012.

There are numerous challenges in estimating the time needed to make PDFs and other conventional electronic documents accessible, not least of which are the differences in length and large variation in complexity of content between different documents.[65] These difficulties are compounded by the wide ranges in file origins, types and density of errors, and methods of

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[64] The Department considered using the mean number of pages per PDF instead of the median, but a small number of outliers imposed a significant right skew on the mean PDF page count; the mean of the lowest 95 percent of page counts in the sample was 5 pages, while the mean of the total sample was 14 pages. The Department believes that in this case, the median provided a more representative point estimate to apply across PDFs than the mean.
[65] Kasdorf, B. (2018). Why accessibility is hard and how to make it easier: Lessons from publishers. *The Association of Learned & Professional Society Publishers*. doi:10.1002/leap.1146
https://onlinelibrary.wiley.com/doi/pdf/10.1002/leap.1146.

remediation undertaken by the developer. As such, the Department recognizes the hazards in

creating a unified time estimate averaged across all PDFs that require some degree of

remediation. Nevertheless, using its best professional judgment, the Department estimated that,

on average, it takes six minutes to remediate one page of an inaccessible PDF. To test this

estimation, the Department consulted with an analyst not involved in the development of this

figure, who developed a range of estimates and concurred in the reasonableness of this estimate.

The Department invites comments on the time needed to remediate PDFs to conform to WCAG

2.1 Level AA.

The time taken to remediate one PDF detected by the SortSite issue report was calculated

as: 3 (median pages per PDF) times 6 (minutes to remediate per page) times 0.85 (probability the

PDF was modified in the last 10 years) = 15.3 minutes per PDF.[66] The number of covered PDFs

requiring remediation currently hosted on government websites was estimated by counting the

unique PDFs listed in the issue reports of each government website included in the second-stage

sample drawn in section, and extrapolating to all State and local governments. The 2021 OEWS

median wage for software and web developers, programmers, and testers (SOC 15-1250) was

used to convert the time needed to remediate PDFs into costs, with a factor of two applied to

account for benefits and overhead.[67] This assumption may lead to an overestimate in costs in the

case that less specialized training than that typically possessed by those in SOC 15-1250 is

required for PDF remediation; the Department invites comment on the appropriateness of this

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[66] Since PDFs are only detected by the SortSite issue report if they have accessibility errors, the estimate of the percentage of government PDFs that have errors was not needed for the rest of this analysis. All PDFs discovered through the issue report could be counted as inaccessible. The 95.2 percent of PDFs on government websites that have some barriers to accessibility may be of interest to readers as they estimate the costs they may incur to become compliant with the proposed rule.

[67] OEWS data available at: U.S. Bureau of Labor Statistics. (2022, March 31). *May 2021 National Occupational Employment and Wage Estimates United States*. Retrieved from https://www.bls.gov/oes/current/oes_nat htm#15-0000.

choice of wage rate for this task. Table 28 displays total PDF remediation costs and the average

number of PDFs requiring remediation per entity. Table 29 displays the average PDF

remediation costs per entity.

Table 28: Total PDF Costs and Average Number of PDFs Requiring Remediation per Entity

Type of Government Entity	PDF Software Cost (Thousands)	PDF Remediation Time Cost (Thousands)	Total PDF Remediation Cost (Thousands)	Average Number of PDFs per Entity [b]
State	$12.2	$22,913.3	$22,925.5	17,797
County (small)	$504.9	$15,443.5	$15,948.5	291
County (large)	$222.1	$44,136.0	$44,358.1	1,888
Municipality (small)	$4,492.7	$108,160.4	$112,653.1	229
Municipality (large)	$183.7	$44,810.3	$44,994.0	2,317
Township (small)	$3,861.3	$85,607.8	$89,469.2	211
Township (large)	$37.4	$2,048.6	$2,086.0	520
Special district	$9,245.5	$4,532.1	$13,777.5	5
U.S. territory (small)	$0.5	$368.9	$369.4	7,307
U.S. territory (large)	$0.7	$732.1	$732.8	9,666
School district (small)	$2,744.9	$52,986.0	$55,731.0	183
School district (large)	$186.9	$23,958.7	$24,145.6	1,218
Public university [a]	$178.5	$26,568.6	$26,747.1	1,415
Community college [a]	$274.9	$30,639.5	$30,914.4	1,059
Total	$21,946.4	$462,905.8	$484,852.1	200

[a] A secondary sample of postsecondary institution websites was not taken. The total number of PDFs for these institutions was estimated using a scaling factor derived from the number of PDFs of large school districts and large counties, which the Department determined to be the governments most similar to postsecondary institutions.
[b] This column presents the number of PDFs averaged across all governments, including those that do not have a website.

Table 29: Average PDF Remediation Costs per Entity

Type of Government Entity	Number of Entities	PDF Software Cost per Entity	PDF Remediation Time Cost per Entity [b]	Total PDF Remediation Cost per Entity [b]
State	51	$240	$449,280	$449,520
County (small)	2,105	$240	$7,337	$7,576
County (large)	926	$240	$47,663	$47,903
Municipality (small)	18,729	$240	$5,775	$6,015

Type of Government Entity	Number of Entities	PDF Software Cost per Entity	PDF Remediation Time Cost per Entity [b]	Total PDF Remediation Cost per Entity [b]
Municipality (large)	766	$240	$58,499	$58,739
Township (small)	16,097	$240	$5,318	$5,558
Township (large)	156	$240	$13,132	$13,372
Special district	38,542	$240	$118	$357
U.S. territory (small)	2	$240	$184,464	$184,704
U.S. territory (large)	3	$240	$244,017	$244,257
School district (small)	11,443	$240	$4,630	$4,870
School district (large)	779	$240	$30,756	$30,996
Public University [a]	744	$240	$35,710	$35,950
Community College [a]	1,146	$240	$26,736	$26,976
Total	91,489	$240	$5,060	$5,300

[a] A secondary sample of postsecondary institution websites was not taken. The total number of PDFs for these institutions was estimated using a scaling factor derived from the number of PDFs of large school districts and large counties, which the Department determined to be the governments most similar to postsecondary institutions.
[b] This column presents PDF costs averaged across all governments, including those that do not have a website.

Question 3: The Department estimated that it takes six minutes on average to remediate one page of a PDF to WCAG 2.1 Level AA standards. The Department requests comments on the appropriateness of this assumption. The Department also seeks feedback on the compliance estimates in this PDF section for public entities and small public entities.

Question 4: The Department used the 2021 OEWS median wage for software and web developers, programmers, and testers (SOC 15-1250) to estimate labor costs associated with remediating PDFs to WCAG 2.1 Level AA standards. The Department requests comments on the appropriateness of ascribing this task to this occupation group.

3.3.6 Video and audio captioning costs

To estimate costs associated with remediating video and audio content, the Department compared the website remediation costs (discussed in Sections 3.3.3 and 3.3.4) and the costs of captioning covered video and audio content for a limited subsample of websites. The ratio of

these costs was then applied as an adjustment factor to the remediation costs of all the websites in the sample to arrive at estimates of video and audio captioning costs for all websites.

To do this, two governments were randomly selected from each government type, without additional stratification. Using the outputs of the SortSite scans for these 28 governments' main websites, the Department compiled a list of all videos associated with each website. The associated videos included videos hosted on the main website, external videos that were linked from the main website, and YouTube or Vimeo videos that were embedded in or linked externally from the main website. Each video file identified by SortSite that was hosted on or externally linked from the main website was opened, its duration was recorded, and a determination was made about whether the video required captions.[68] A video was deemed as not requiring captions if it was already captioned or if it contained no audio content. Videos likely to be archived, such as a re-broadcasting of an earlier synchronous meeting (*e.g.*, a recording of a Teams video call), were noted as such and included only in one portion of the analysis, as discussed below. Videos that were duplicates or inaccessible (*e.g.*, showed an HTTP status error or broken link message) were excluded from all the analysis.

In a similar fashion, the Department opened all audio files that were on or linked from a government's main website and recorded all file durations. The Department thus generated a listing of all video and audio files hosted on or linked from each of the 28 sampled governments' main websites. Across all 28 governments' main websites, non-YouTube and non-Vimeo videos in need of captions were found to have a total duration of 1,640 minutes. Audio files in need of captions were found to have a total duration of 378 minutes.

The durations of YouTube and Vimeo videos were imputed from the mean duration of

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[68] YouTube and Vimeo pages linked from the main website were not identified by SortSite as video files. The duration of videos hosted on those sites was estimated using a separate procedure, described below.

non-YouTube and non-Vimeo videos, computed across all 28 governments. To best represent

the types of videos typically found on platforms such as YouTube or Vimeo, this mean

calculation excluded duplicate videos, videos that could not be accessed, videos requiring no

captions, and videos that were likely to be archived. From this method, the Department imputed

a mean duration of 11 minutes for YouTube and Vimeo videos. The SortSite output for these 28

websites indicated that 2,141 linked or embedded URLs contained the text "YouTube" or

"Vimeo." All 2,141 pages were assumed to contain un-captioned videos created by these

governments, yielding a total time of 23,794 minutes of YouTube and Vimeo videos requiring

captions (across the 28 governments).

In summary, the Department estimated that, for those 28 entities, captioning is needed

for:

- 1,640 minutes of non-YouTube and non-Vimeo videos,

- 378 minutes of audio files, and

- 23,794 minutes of YouTube and Vimeo videos.

This leads to a total captioning time of 25,811 minutes for the 28 governments. A scan of

consumer prices suggests that an upper bound for captioning costs is $15 per minute of video

requiring captions.[69, 70] This rate was applied to the total captioning time, yielding an estimated

cost of $387,200 across the 28 governments. For these same governments, the total website

remediation costs are $8.1 million. The ratio of these costs to website remediation costs is 4.8

percent. This ratio represents the estimated mean percentage increase in website costs when

[69] Klein, Rebecca. (2022, July 25). *What's the True Price of Closed Captioning Services?* Retrieved from 3PLAYMEDIA: https://www.3playmedia.com/blog/how-much-does-closed-captioning-service-cost/; Morgan, A. (n.d.). Closed Captioning Cost. *AST*. Retrieved from https://www.automaticsync.com/closed-captioning-cost/.
[70] Audio files were assumed to incur the same cost of $15 per minute. While captioning an audio file may require additional tasks (such as creating an accompanying video with synchronized captions), any additional cost is assumed to be negligible given that audio files contribute a very small fraction of total captioning needs.

accounting for video and audio content requiring captions—including content posted to external sites and platforms such as YouTube and Vimeo. This mean percentage was applied uniformly to all government types to scale up the website costs to account for video and audio content. Total captioning costs for each government entity type can be found in Table 30.

The preceding method only identifies video and audio files on or linked from the main website, which may tend to underestimate the total cost burden associated with captioning. However, the methodology also tends to overestimate the total cost burden, as it assumes that governments are responsible for every identified video—which they may not be— (including all videos linked from the main website to YouTube or Vimeo). These two biases may cancel each other.

Table 30: Total Video and Audio Captioning Costs

Type of Government Entity	Captioning Costs per Entity	Total Captioning Costs (Thousands)
State	$131,717	$6,717.6
County (small)	$802	$1,687.3
County (large)	$22,272	$20,623.5
Municipality (small)	$3,203	$59,994.0
Municipality (large)	$18,911	$14,485.5
Township (small)	$2,591	$41,712.0
Township (large)	$5,479	$854.8
Special district	$305	$11,759.7
U.S. territory (small)	$14,959	$29.9
U.S. territory (large)	$47,548	$142.6
School district (small)	$3,385	$38,729.7
School district (large)	$25,755	$20,063.0
Public university	$23,208	$17,266.7
Community college	$20,082	$23,013.8
Total	$2,810	$257,080.1

3.3.7 Website testing costs

The Department estimated initial costs associated with testing websites for accessibility errors. It was assumed that initial testing costs were a one-time burden that would be incurred

over the course of the proposed rule's implementation period. Testing costs incurred after the proposed rule's implementation period are accounted for in Section 3.3.8. Website testing costs were estimated as arising from two factors: software costs and testing time.

3.3.7.1 Software costs

There are several commercially available automated accessibility checkers government entities can use to assist in identifying the accessibility errors present on their websites, paired with manually checking. These range in price according to the capabilities of the software. The Department identified the prices of several popular accessibility tools that allow for full-site scans (Table 31):[71]

Table 31: Automated Accessibility Checker Pricing

Accessibility Checker	Cost	Pricing Model
SortSite Professional [a]	$349	per license
WAVE AIM [b]	$500	per 20,000 pages
Total Validator Pro [c]	$49	per year
Achecker [d]	$3,830	per 12,000 pages per year
Average cost per entity with at least one website	$1,182	N/A

[a] Available at https://www.powermapper.com/buy/all/sortsite/
[b] Available at https://wave.webaim.org/aim/
[c] Available at https://www.totalvalidator.com/validator/PurchaseForm
[d] Available at https://www.accessibilitychecker.org/pricing/

Achecker offers their services as an annual subscription. Achecker allows scans of 1,000 webpages per month, while Total Validator Pro and SortSite require a one-time purchase and can be used to scan unlimited webpages or websites. WAVE AIM charges based on pages. The Department assumed that an entity would need to check less than 20,000 pages, which has a fee of $500. The Department invites comment on the number of webpages maintained across a State or local government's websites. It was assumed that each entity with at least one website would

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[71] Versions of each of these checkers have been examined in the literature; see Vigo, Brown, and Conway (2013) and Abduganiev (2017).

buy one license, for one year, of one of these checkers to assist in accessibility testing. Each can capture the accessibility errors of a full website in under a few hours, so only one license per entity will likely be necessary.

The average software cost per entity in each cell was taken as the mean cost per entity of each of these checkers over one year. The total cost of automated accessibility testing software was found by multiplying the average price of one license for each of these software solutions ($1,182) by the number of entities in each cell with at least one website. Software costs are shown in Table 32.

Question 5: The Department estimated that each entity would need to check fewer than 20,000 webpages during its initial compliance assessment. The Department invites comments on the appropriateness of this assumption.

3.3.7.2 Testing time

In addition to using an automated accessibility checker, the Department assumed that entities would take time to perform manual accessibility checks because research shows that automated testing cannot adequately capture all accessibility errors, as discussed in Section 3.3.4. Relying on its best professional judgment, the Department estimated that entities would spend 20 percent of the time needed for website remediation on testing activities (remediation cost time is calculated in Sections 3.3.3 and 3.3.4). Testing costs per entity can be found in Table 32. The Department invites comment on the time needed to comprehensively evaluate websites for accessibility errors.

Table 32: Total and Average Testing Costs per Entity (Thousands)

Type of Government Entity	Aggregate Software Cost	Aggregate Testing Time Cost	Total Aggregate Testing Cost	Average Testing Cost per Entity [a]
State	$60.3	$28,218.4	$28,278.7	$554.5
County (small)	$2,021.5	$7,087.8	$9,109.3	$4.3

Type of Government Entity	Aggregate Software Cost	Aggregate Testing Time Cost	Total Aggregate Testing Cost	Average Testing Cost per Entity [a]
County (large)	$1,094.5	$86,632.9	$87,727.5	$94.7
Municipality (small)	$16,734.8	$252,015.9	$268,750.6	$14.3
Municipality (large)	$905.4	$60,849.0	$61,754.4	$80.6
Township (small)	$10,296.2	$175,219.0	$185,515.2	$11.5
Township (large)	$184.4	$3,590.7	$3,775.1	$24.2
Special district	$11,989.0	$49,398.8	$61,387.9	$1.6
U.S. territory (small)	$2.4	$125.7	$128.0	$64.0
U.S. territory (large)	$3.5	$599.2	$602.8	$200.9
School district (small)	$12,407.5	$162,691.3	$175,098.7	$15.3
School district (large)	$920.8	$84,278.5	$85,199.3	$109.4
Public university	$879.4	$72,531.9	$73,411.3	$98.7
Community college	$1,354.6	$96,673.8	$98,028.4	$85.5
Total	$58,854.2	$1,079,912.8	$1,138,767.0	$12.4

[a] This column presents the mean initial testing cost across all governments, including those that do not have a website.

Question 6: The Department estimated that testing time is equal to 20 percent of the time it takes to remediate websites. The Department invites comments on the appropriateness of this assumption.

3.3.8 Operating and Maintenance (O&M) costs

In addition to initial testing and remediation costs associated with making existing web content web accessible, the Department also estimated O&M costs, which governments would incur after the initial implementation phase. These O&M costs cover ongoing activities required under the rule to ensure that new web content meets WCAG 2.1 Level AA such as websites and new social media posts.

The Department estimates O&M costs will be composed of (1) a fixed cost for technology to assist with creating accessible content, as well as (2) a variable cost that scales according to the size and type of content on the website. In general, websites with higher remediation costs are likely to have a higher O&M burden in general, as remediation cost is one

useful measure of a website's amount of content affected by WCAG 2.1 Level AA standards. As such, the Department believes that the initial remediation costs serve as a reasonable basis for scaling future O&M costs. However, regardless of their initial remediation burden, governments may be able to mitigate their ongoing costs by developing systems early in the implementation period to ensure that accessibility considerations are incorporated at every stage of future content creation.

The Department estimates that all governments will be required to purchase at least one additional PDF editing software license (beyond any they already possess) to assist with creating web accessible PDF files. The Department retained its estimate from Section 3.3.5 of one PDF editing software license imposing an annual cost per government of $239.88. The Department believes that many larger governments already possess such licenses for other routine activities, and these licenses are likely already available to IT professionals who would assist with making PDFs web accessible. Smaller governments, on the other hand, may be less likely to have already purchased PDF editing software licenses. However, given their smaller size, lower rate of PDF creation, and smaller staff performing such work, it is estimated that a single license would be sufficient to make PDFs accessible.[72]

The Department also estimates that each government will incur an annual cost equal to 10 percent of the cost it incurred for initial website testing, website remediation, PDF remediation, and video and audio captioning. The exact nature of O&M activities relating to web accessibility could vary dramatically across governments. However, for reasons described further below, the Department believes the budgeted amount of 10 percent of initial testing and remediation costs is

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[72] As shown in Table 28, large entities on average host a greater number of PDFs on their websites than small entities of the same government type. The Department assumes that entities with fewer PDFs hosted on their website have a lower rate of PDF creation than entities with more PDFs hosted on their website. See Section 3.3.5 for further discussion on the number of PDFs hosted on State and local government websites.

sufficient to cover items such as: time spent making future web content accessible, time spent on web accessibility training, and additional software licenses governments may decide to purchase at their discretion.

Annual O&M costs are significantly smaller than remediation costs because (1) the amount of new material added each year will generally be less than the current amount of content and (2) the cost to remediate new content is significantly smaller than to remediate existing content. One vendor estimates that applying accessibility during the development phase is 3–10 times faster than retrofitting a fully launched site for web accessibility.[73] Given the estimate that new web content is 3–10 times faster to make accessible than existing content, the Department concluded that allocating 10 percent of the time originally used to test and remediate sites to upkeep each year would be more than sufficient to ensure future content is accessible.

The Department does not attribute any cost for training employees on the WCAG 2.1 Level AA success criteria as the Department assumed IT professionals will generally be experienced in WCAG 2.1 Level AA. However, to the extent that some unaccounted cost may be incurred to train IT professionals on WCAG 2.1 Level AA standards, free training materials are available online. The time spent by these IT professionals on training may be offset by unaccounted benefits, as accessible websites can reduce ongoing website maintenance costs.[74]

Table 33 displays the undiscounted annual O&M costs for each government type. The total annual cost across all governments is estimated to be $741.9 million. O&M costs are

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[73] Level Access. (2022). The Road to Digital Accessibility. Retrieved from https://www.levelaccess.com/the-road-to-digital-accessibility/.

[74] Bureau of Internet Accessibility. (2021, August 12). *Web Accessibility Isn't Always Expensive or Time Consuming*. Retrieved from https://www.boia.org/blog/web-accessibility-isnt-always-expensive-or-time-consuming; Parks, S., and Sedov V., Forrester Research, Inc. (June 2016). *Assessing the Value of Accessible Technologies for Organizations*. Retrieved from https://web.archive.org/web/20170710171528/https://mscorpmedia.azureedge.net/mscorpmedia/2016/07/Microsoft-TEI-Accessibility-Study_Edited_FINAL-v2.pdf.

estimated to accrue over the implementation period following the same schedule described for initial costs in Section 3.3.9. Large governments will incur 100 percent of annual O&M costs starting in Year 3 following promulgation of the proposed rule, and small governments would incur these full O&M costs beginning in Year 4.

Table 33: Annual O&M Costs, by Government Type

Type of Government Entity	Number of Entities	Undiscounted Annual O&M Costs, per Entity (Thousands) [a]	Total Undiscounted Annual O&M Costs for All Entities (Thousands)
State	51	$390.3	$19,906.4
County (small)	2,105	$3.1	$6,470.7
County (large)	926	$63.4	$58,677.8
Municipality (small)	18,729	$9.2	$172,517.7
Municipality (large)	766	$55.6	$42,622.7
Township (small)	16,097	$7.6	$121,724.7
Township (large)	156	$15.9	$2,482.2
Special district	38,542	$1.1	$40,513.9
U.S. territory (small)	2	$57.9	$115.8
U.S. territory (large)	3	$149.2	$447.7
School district (small)	11,443	$9.6	$109,531.3
School district (large)	779	$70.8	$55,156.1
Public University	744	$64.6	$48,081.1
Community College	1,146	$55.5	$63,644.5
Total	91,489	$8.1	$741,892.6

[a] This column presents the mean annual O&M cost across all governments, including those that do not have a website.

3.3.9 Total costs for website testing and remediation

The Department assumes that initial testing and remediation costs would be uniformly distributed across the number of implementation years for each entity type. To arrive at an estimate of how many software licenses each entity would need to complete their initial remediation, it was further assumed that each entity would complete their implementation over the course of one year, with the same fraction of entities selecting each of the available years during which to complete their remediation. In aggregate, it was assumed that large entities

would incur 50 percent of their initial testing and remediation costs during each of Year 1 and Year 2 following the promulgation of the rule, and that small entities would incur 33 percent of their initial testing and remediation costs during each of the first three years following the promulgation of the rule. Projected website costs over 10 years are displayed by entity type in Table 34 and Table 35, and in total in Table 36. Present value (PV) and average annualized costs are displayed using both a 3 percent and 7 percent discount rate.

Table 34: Projected 10-Year Website Costs by Entity Type, Part 1 (Millions)

Time Period	State	County (large)	Municipality (large)	Township (large)	U.S. Territory (large)	School district (large)	Public University
Year 1	$99.5	$292.9	$212.7	$12.3	$2.2	$275.4	$240.0
Year 2	$109.5	$322.3	$234.1	$13.6	$2.5	$303.0	$264.1
Year 3	$19.9	$58.7	$42.6	$2.5	$0.4	$55.2	$48.1
Year 4	$19.9	$58.7	$42.6	$2.5	$0.4	$55.2	$48.1
Year 5	$19.9	$58.7	$42.6	$2.5	$0.4	$55.2	$48.1
Year 6	$19.9	$58.7	$42.6	$2.5	$0.4	$55.2	$48.1
Year 7	$19.9	$58.7	$42.6	$2.5	$0.4	$55.2	$48.1
Year 8	$19.9	$58.7	$42.6	$2.5	$0.4	$55.2	$48.1
Year 9	$19.9	$58.7	$42.6	$2.5	$0.4	$55.2	$48.1
Year 10	$19.9	$58.7	$42.6	$2.5	$0.4	$55.2	$48.1
PV of 10-year costs, 3% discount rate	$331.5	$976.4	$709.2	$41.2	$7.5	$917.9	$800.1
Average annualized costs, 3% rate	$38.9	$114.5	$83.1	$4.8	$0.9	$107.6	$93.8
Total costs per entity, 3% discount rate	$6.5	$1.1	$0.9	$0.3	$2.5	$1.2	$1.1
Annualized costs per entity, 3% rate	$0.8	$0.1	$0.1	$0.0	$0.3	$0.1	$0.1
PV of 10-year costs, 7% discount rate	$292.4	$861.3	$625.6	$36.3	$6.6	$809.7	$705.8
Average annualized costs, 7% rate	$41.6	$122.6	$89.1	$5.2	$0.9	$115.3	$100.5
Total costs per entity, 7% discount rate	$5.7	$0.9	$0.8	$0.2	$2.2	$1.0	$0.9
Annualized costs per entity, 7% rate	$0.8	$0.1	$0.1	$0.0	$0.3	$0.1	$0.1

Table 35: Projected 10-Year Website Costs by Entity Type, Part 2 (Millions)

Time Period	Special district	County (small)	Municipality (small)	Township (small)	U.S. Territory (small)	School district (small)	Community College
Year 1	$111.3	$20.7	$567.2	$397.6	$0.4	$361.0	$317.7
Year 2	$124.8	$22.9	$624.7	$438.2	$0.4	$397.5	$349.5
Year 3	$138.3	$25.0	$682.2	$478.7	$0.5	$434.0	$63.6
Year 4	$40.5	$6.5	$172.5	$121.7	$0.1	$109.5	$63.6
Year 5	$40.5	$6.5	$172.5	$121.7	$0.1	$109.5	$63.6
Year 6	$40.5	$6.5	$172.5	$121.7	$0.1	$109.5	$63.6
Year 7	$40.5	$6.5	$172.5	$121.7	$0.1	$109.5	$63.6
Year 8	$40.5	$6.5	$172.5	$121.7	$0.1	$109.5	$63.6
Year 9	$40.5	$6.5	$172.5	$121.7	$0.1	$109.5	$63.6
Year 10	$40.5	$6.5	$172.5	$121.7	$0.1	$109.5	$63.6
PV of 10-year costs, 3% discount rate	$583.3	$101.5	$2,747.4	$1,931.2	$1.9	$1,746.9	$1,059.0
Average annualized costs, 3% rate	$68.4	$11.9	$322.1	$226.4	$0.2	$204.8	$124.1
Total costs per entity, 3% discount rate	$0.0	$0.0	$0.1	$0.1	$0.9	$0.2	$0.9
Annualized costs per entity, 3% rate	$0.0	$0.0	$0.0	$0.0	$0.1	$0.0	$0.1
PV of 10-year costs, 7% discount rate	$504.2	$88.3	$2,391.5	$1,680.6	$1.6	$1,520.7	$934.1
Average annualized costs, 7% rate	$71.8	$12.6	$340.5	$239.3	$0.2	$216.5	$133.0
Total costs per entity, 7% discount rate	$0.0	$0.0	$0.1	$0.1	$0.8	$0.1	$0.8
Annualized costs per entity, 7% rate	$0.0	$0.0	$0.0	$0.0	$0.1	$0.0	$0.1

Table 36: Total Projected 10-Year Website Costs (Millions)

Time Period	Cost
Year 1	$2,911.0
Year 2	$3,206.8
Year 3	$2,049.8
Year 4	$741.9
Year 5	$741.9
Year 6	$741.9
Year 7	$741.9
Year 8	$741.9
Year 9	$741.9
Year 10	$741.9
PV of 10-year costs, 3% discount rate	$11,954.8
Average annualized costs, 3% discount rate	$1,401.5
PV of 10-year costs, 7% discount rate	$10,458.6
Average annualized costs, 7% discount rate	$1,489.1

3.4 MOBILE APP TESTING, REMEDIATION, AND O&M COSTS

3.4.1 Mobile app testing and remediation costs

Mobile apps offer convenient access to State and local government services, programs, and activities. According to a U.S. Census Bureau report released in 2021, smartphones and tablet devices were present in 84 percent and 63 percent of U.S. households in 2018, respectively.[75] Mobile apps are relatively new compared to websites, and a different technology. Existing tools to evaluate website accessibility cannot reasonably be applied to mobile apps and cannot be easily altered for mobile app evaluation. The tools that do exist to evaluate mobile app accessibility are largely geared towards app developers and often require access to and knowledge of mobile app coding.[76] Literature related to accessibility for mobile software is also sparse, which may be attributed to the relative lack of tools available to assess mobile app

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[75] Michael Martin, *Computer and Internet Use in the United States: 2018,* American Community Survey Reports (April, 2021), https://www.census.gov/content/dam/Census/library/publications/2021/acs/acs-49.pdf.

[76] Acosta-Vargas, P. et al. (2020). Accessibility Assessment in Mobile Applications for Android. In I. Nunes (Ed.), *Advances in Human Factors and Systems Interaction.* AHFE 2019. Advances in Intelligent Systems and Computing (Vol. 959). Springer, Cham. Retrieved from https://doi.org/10.1007/978-3-030-20040-4_25.

accessibility compared with the tools available to assess website accessibility.[77] The Department

expects that these resources will grow as a result of this rulemaking and a resulting greater

demand for mobile app accessibility resources.

3.4.1.1 Mobile App Estimation

Under the proposed rule, State and local government mobile apps used to offer services,

programs, and activities to members of the public must adhere to WCAG 2.1 Level AA. Mobile

apps are less common compared to websites, web applications, and mobile websites.[78] Mobile

apps are generally more costly to build and maintain than mobile websites.[79] To evaluate costs

associated with mobile app compliance, a simple random sample of five entities was selected for

each type of government. As described in Section 3.3.2, governments were stratified by size

when sampled. Here, the small number of apps sampled prevented the Department from

stratifying by size as it did when sampling websites.

The Department identified mobile apps created specifically for sampled government

entities using a manual search process. State and local government entities are obligated to

ensure that mobile apps they use to offer services, programs, and activities to members of the

public are accessible. However, as with websites, the Department only identified mobile apps

created directly for a government. The Department did not include mobile apps developed and

managed by a third-party and used by the sampled government entities ("external mobile apps")

because the Department was unable to find existing data or literature on the cost to remediate

these apps, which may differ substantially from internal mobile apps. Additionally, many of

these external mobile apps are used by multiple government clients, so our sample would

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[77] *See id.*

[78] Ganapati, S. (2015). *Using Mobile Apps in Government.* Retrieved from
https://www.businessofgovernment.org/sites/default/files/Using%20Mobile%20Apps%20in%20Government.pdf.
[79] *Id.*

overcount those apps. However, unlike websites, the Department has not included costs for

third-party mobile apps as a separate cost, because the necessary data are unavailable. Exclusion

of third-party developed mobile apps from this analysis will underestimate costs. The

Department believes this undercount is offset elsewhere, for example, for State and local

government mobile apps used to offer services, programs, and activities to members of the

public, the Department assumed all non-compliant material would be remediated, but in reality,

some material will be archived or removed.

The Department identified mobile apps that are managed solely by a single government

entity as well as mobile apps that are shared between a few different governments. The

Department searched four sources for mobile apps: Google, the Google Play Store, Apple's App

Store, and the SortSite inventory report output. Generally, sources were manually searched

using a "Find" or "Search" function and results were manually assessed by the Department to

identify government-controlled mobile apps.

When conducting web searches using Google, the Department included the name of the

selected government entity as one keyword searched in combination with the terms "mobile app"

and "app." The Department searched for apps in the Google Play[80] and Apple App[81] stores by

searching the name of the selected government entity. The Apple app store can only be fully

accessed through the Apple App Store app, which comes pre-downloaded on most Apple

devices. The Apple App Store app cannot be downloaded on Windows PCs. To search the

Apple App Store when using a non-Apple device, such as a Windows PC, the Department used

an online database of mobile apps available in the Apple App Store.[82] If a SortSite inventory

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[80] Google Play App Store: https://play.google.com/store/apps?hl=en_US&gl=US.
[81] Apple App Store: https://www.apple.com/app-store/.
[82] Online database of Apple Apps: https://theappstore.org/.

report was available for a sampled government entity, the department used the "Find" tool in Microsoft Excel to search for external links containing the phrase "mobile app."[83]

Once a mobile app was identified as providing a service, program, or activity, the Department recorded key data points related to mobile apps including the name of the mobile app, the government entity the mobile app is affiliated with, the link to the mobile app's download point(s) as well as key metrics used to evaluate the cost to modify the mobile app for accessibility including file size (MB), whether multiple versions of the mobile app were identified (*i.e.*, the mobile app was available for download from the Apple app store and Google Play), and key functions of the mobile app. In total, 65 unique mobile apps were identified across the 65 government entities sampled.

To estimate the number of mobile apps controlled by government entities, the Department calculated the average number of identified apps per government entity in the sample, by entity type. The results of these calculations, the average number of identified apps by government entity, are presented below in Table 37. This was multiplied by the number of government entities for each respective government type (see Table 11) to estimate the number of mobile apps controlled by each government type. Estimates of the total number of apps controlled by each government type are presented below, in Table 38.

Table 37: Average Number of Mobile Apps by Government Type

Type of Government Entity	Population Less than 50,000	Population More than 50,000	Total
State	N/A	4.40	4.40
County	0.20	0.60	0.32
Municipal	0.00	1.00	0.04
Township	0.00	0.20	0.00
Special district	0.00	[a]	0.00

[83] Searching for the terms "app" or "application" alone generated a plethora of irrelevant entries due to the large number of web apps and online portals/PDFs related to applications for permits (*e.g.*, digging permits, alarm permits, construction permits, events permits) therefore the terms were not included in the SortSite search process.

Type of Government Entity	Population Less than 50,000	Population More than 50,000	Total
School district	0.40	1.40	0.46
U.S. territory	0.50	5.33	3.40
Public university	1.20	[a]	1.20
Community college	0.20	[a]	0.20
Total (special districts and higher education)	[a]	[a]	0.03
Total (all else)	0.10	1.00	0.15

[a] Special district, public university, and community college data do not include population. For tables in Section 3.4 of this PRIA, they are displayed as entities with populations less than 50,000.

Table 38: Total Estimated Number of Mobile Apps by Government Type

Type of Government Entity	Population Less than 50,000	Population More than 50,000	Total
State	N/A	224	224
County	421	556	977
Municipal	0	766	766
Township	0	31	31
Special district	0	[a]	0
School district	4,577	1,091	5,668
U.S. territory	1	16	17
Public university	893	[a]	893
Community college	229	[a]	229
Total (special districts and higher education)	1,122	[a]	1,122
Total (all else)	4,999	2,684	7,683

[a] Special district, public university, and community college data do not include population. For tables in Section 3.4 of this PRIA, they are displayed as entities with populations less than 50,000.

3.4.1.2 Testing and Remediation Cost Estimation

As previously discussed, very little data are available on the level of accessibility on mobile apps or the cost to remediate them. Yan & Ramachandran (2019)[84] include a qualitative discussion of costs associated with mobile app testing and modification for accessibility and suggest that the cost to modify an inaccessible mobile app to be accessible may be significant.

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[84] Yan, S., & Ramachandran, P. G. (2019). The Current Status of Accessibility in Mobile Apps. *ACM Transactions on Accessible Computing (TACCESS),* 12, 1-31.

The authors state that "It can be expensive to fix accessibility issues in a mobile app after the mobile app has been developed. It often requires redesigning the layout or look and feel of the GUIs (Graphical User Interfaces) to fix some issues." Yan & Ramachandran also present evidence indicating that mobile apps are generally inaccessible. Of the apps they tested for accessibility, 94.8 percent were in violation of criteria listed in WCAG 1.0, WCAG 2.0, or WABScore, three sources they relied on to test accessibility.[85]

Given the lack of literature related to accessibility testing guidelines, tools, and costs for mobile apps, the Department assumed that costs to test and modify a mobile app for compliance with WCAG 2.1 Level AA criteria would be a percentage of the cost to develop an "average" mobile app. Using best professional judgment, the Department assumed that costs to test and modify an existing mobile app for accessibility will be greater than half of the cost to develop a mobile app from scratch, but less than the total cost of developing a new mobile app. Specifically, the Department applied best professional judgment and assumed that the cost to test and modify a mobile app for accessibility will be 65 percent of the cost to develop a new mobile app. The Department seeks the public's input on this assumption. The Department used mobile app development cost data made public by the mobile app developer SPD Load in 2022[86] to estimate an average mobile app development cost of $105,000. This results in an average mobile app accessibility testing and modification cost of $68,250 (65 percent of $105,000). The Department acknowledges that building a mobile app is often comparably more expensive than building a mobile web page and that mobile app development costs can vary widely depending

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[85] Yan & Ramachandran (2019) used a self-designed checklist of accessibility pulling from all three sources (WCAG 1.0, WCAG 2.0, and WABScore).
[86] SPD Load. (2022). *How Much Does It Cost to Develop an App in 2022? Cost Breakdown*. Retrieved from https://spdload.com/blog/app-development-cost/.

on desired app functions.[87] A sensitivity analysis based on total mobile app development costs is included in Section 3.8 to help readers understand how cost assumptions impact total estimated costs.

Some apps may be more complex than others, and therefore more expensive to test and modify for accessibility.[88] The Department used file size as a proxy for mobile app complexity. An average file size was calculated from our sample of identified apps. A weight associated with file size was applied to the cost of modifying apps to adjust for complexity across government entity types. Weights were applied by multiplying the estimated average cost of modifying a mobile app ($68,250) by one plus or minus the percent above or below the average file size of the mobile app. For example, if a mobile app's file size is 10 percent below our sample's average file size, we would multiply $68,250 by 90 percent for an estimated cost of $61,425. If file size data was not available for a given mobile app, the file size was assumed to be equal to the average file size in our sample. The methodology used to adjust mobile app testing and modification costs for mobile app complexity is outlined below in Equation 1.

$$\text{Modification costs} = (\text{avg cost to modify a mobile app}) * \left(1 \pm \left(\frac{\text{file size}}{\text{avg sampled file size}}\right)\right) (1)$$

Table 39 shows the average costs associated with testing and modifying an existing mobile app to meet accessibility criteria in the proposed rule. Generally, the estimated costs differ due to variability in the file size. The average cost of mobile app testing and modification was then multiplied by the total estimated number of apps for each respective government type (see Table 38) to generate an estimated cost to all government entities in each respective

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[87] Ganapati, S. (2015). *Using Mobile Apps in Government.* Retrieved from https://www.businessofgovernment.org/sites/default/files/Using%20Mobile%20Apps%20in%20Government.pdf.
[88] Srivastava, S. (2022, May 6). *What Differentiates a $10,000 Mobile App From a $100,000 Mobile App?* Retrieved from appinventiv: https://appinventiv.com/blog/mobile-app-development-costs-difference/.

category. Total undiscounted cost estimates for initial costs (costs during implementation) are
presented in Table 40. No State has a population below 50,000 so this cell is marked with an
"N/A" indicating that there are no results to present. No mobile apps were identified for small
municipalities, small townships, or special districts in the sample, so average costs are reported
as "N/A" and total costs are reported as zero.

Table 39: Average Cost to Modify a Mobile App by Government Type

Type of Government Entity	Population Less than 50,000	Population More than 50,000
State	N/A	$61,045
County	$59,356	$50,478
Municipal	N/A	$121,922
Township	N/A	$41,624
Special district	N/A [a]	[a]
School district	$68,250	$61,670
U.S. territory	$134,991	$65,971
Public university	$52,185 [a]	[a]
Community college	$77,478 [a]	[a]
Total (special districts and higher education)	$64,832	[a]
Total (all else)	$87,532	$67,118

[a] Special district, public university, and community college data do not include population.
For tables in Section 3.4 of this PRIA, they are displayed as entities with populations less than
50,000.

Table 40: Initial Mobile App Costs (Millions)

Type of Government Entity	Population Less than 50,000	Population More than 50,000	Total
State	N/A	$13.7	$13.7
County	$25.0	$28.0	$53.0
Municipal	$0.0	$93.4	$93.4
Township	$0.0	$1.3	$1.3
Special district	$0.0 [a]	[a]	$0.0
School district	$312.4	$67.3	$379.7
U.S. territory	$0.1	$1.1	$1.2
Public university	$46.6 [a]	[a]	$46.6
Community college	$17.8 [a]	[a]	$17.8

Type of Government Entity	Population Less than 50,000	Population More than 50,000	Total
Total (special districts and higher education)	$64.3	[a]	$64.3
Total (all else)	$337.5	$204.7	$542.3

[a] Special district, public university, and community college data do not include population. For tables in Section 3.4 of this PRIA, they are displayed as entities with populations less than 50,000.

Costs for the proposed rule are expected to be incurred at different times for each type of government entity because of differences in proposed implementation timelines. Government entities serving populations over 50,000 will have two years to implement the proposed rule, and costs are assumed to be distributed evenly across the two implementation years. Government entities serving populations of less than 50,000 and special districts will have three years to implement the proposed rule and costs are expected to be distributed evenly among the three implementation period years. Public postsecondary institutions are generally associated with large governments, and consequently, for purposes of this analysis, the Department assumes that postsecondary institutions will have two years to implement the rule.

Question 7: Is data available on the cost of testing and remediating mobile apps for accessibility?

Question 8: Are there additional complexity metrics or proxies that we can reasonably incorporate into our model?

3.4.2 O&M costs

Additionally, the Department assumed that government entities will incur O&M costs associated with accessibility upkeep starting after the proposed rule's implementation period. Yan & Ramachandran (2019) indicate that the cost to develop an accessible mobile app is likely similar to the cost to build an inaccessible mobile app. Building on that line of logic, the

Department assumed that O&M costs associated with accessible mobile apps would be similar to but somewhat lower than O&M costs associated with inaccessible mobile apps due to a reduced need to modify GUIs (Graphical User Interfaces).[89] The Department, using best professional judgment due to the absence of applicable data, assumed that added O&M costs associated with accessible mobile apps are equal to 10 percent of O&M costs associated with an average mobile app. The Department used a publicly available data range to calculate average annual mobile app operation and maintenance costs[90] and estimate the annual cost of O&M for an average mobile app. The estimated average annual cost of O&M per mobile app ($375) was multiplied by 10 percent to calculate expected additional O&M costs incurred as a result of compliance with the proposed rule ($37.50). The Department then multiplied expected additional O&M costs per app by the total estimated number of mobile apps. Undiscounted costs of compliance with the proposed rule over a 10-year period, PV of costs, and average annualized costs are presented in Table 41.

Table 41: Timing of Mobile App Costs (Millions)

Time Period	Costs
Year 1	$247.1
Year 2	$247.1
Year 3	$112.6
Year 4	$0.3
Year 5	$0.3
Year 6	$0.3
Year 7	$0.3
Year 8	$0.3
Year 9	$0.3
Year 10	$0.3
PV of 10-year costs, 3% discount rate	$577.7
Average annualized costs, 3% discount rate	$67.7

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[89] Yan, S., & Ramachandran, P. G. (2019). The Current Status of Accessibility in Mobile Apps. *ACM Transactions on Accessible Computing (TACCESS), 12*, 1-31.

[90] Georgiou, M. (2022, June 30). *Cost of Mobile App Maintenance in 2022 and Why It's Needed*. Retrieved from Imaginovation Insider: https://imaginovation.net/blog/importance-mobile-app-maintenance-cost/.

Time Period	Costs
PV of 10-year costs, 7% discount rate	$540.1
Average annualized costs, 7% discount rate	$76.9

Question 9: Is better data available related to mobile app O&M costs?

Question 10: Is data available related to O&M costs specifically for accessible mobile apps?

3.5 POSTSECONDARY EDUCATION

3.5.1 Overview

The proposed rule distinguishes between public postsecondary institutions' public-facing websites, mobile apps, and password-protected course material. Costs were estimated separately for these three categories—Section 3.3 estimates websites and Section 3.4 estimates mobile apps. Public-facing websites were assessed for current levels of compliance using SortSite in the manner described in Section 3.3. For this cost component, unstratified random samples were drawn consisting of 10 public four-year universities and 10 public community colleges[91], and are presented in Section 3.3. Whereas the Department searched for and scanned other governments' secondary websites, only the main site was scanned for postsecondary institutions. Instead, the Department estimated that postsecondary institutions' secondary sites would incur testing and remediation costs equal to 1.1 times the testing and remediation costs of their main websites. Postsecondary institutions were found to have main website costs that were most similar to those of large school districts and large counties, and for those two types of government entities, secondary sites incur 1.1 times the cost of the main sites, on average. For those two entity types, entities have 5.7 times as many secondary sites as main sites and secondary sites have 0.25 times the number of PDFs as main sites. Those ratios were used in estimating numbers of higher

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[91] Technical colleges were included with community colleges.

education secondary sites and secondary site PDF costs in Sections 3.3.2 and 3.3.5, respectively. For an estimate of postsecondary institutions' mobile application costs, please see Section 3.4.

Given that website accessibility scanning software is not compatible with password-protected sites, costs to remediate online course content were estimated with a different method. As an overview, the Department used a probabilistic model to estimate the proportion of courses that would require remediation during the first year of remediating course content (the first year after implementation). As discussed in more detail later, in the second year of remediating course content, the Department assumed virtually all remaining courses would be remediated. O&M costs were estimated at a higher annual rate than for websites to account for new courses that may be introduced, additional captioning associated with video lectures, and the like.

3.5.2 Postsecondary Education Cost to Remediate Course Content

Under the proposed rule, postsecondary course content (*e.g.*, provided through third-party learning management systems) must be made accessible when an institution is on notice that a student with a relevant disability is enrolling in a particular class. Using data from the 2021 SIPP, the Department estimated the prevalence of students with either a hearing, vision, manual dexterity, or cognitive disability, as those are the primary disabilities which the WCAG 2.1 Level AA guidelines impact. The Department estimated prevalence values for individuals aged 18–22 to account for the conventional school age population that attends 4 year and higher institutions and used an age range of 17–29 for community college students.[92] The Department recognizes that these age ranges do not represent the entire postsecondary population, and that they may create biased estimates for disability prevalence by excluding older populations who may be more prone to disabilities. However, given the need to define the population's age in order to

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[92] 17–29 was calculated from NCES data and includes 80 percent of the community college population.

estimate disability prevalence, the Department feels that these are appropriate ranges for this cost estimation.

The Department understands that only a portion of students with disabilities will require course remediation. Data in the High School Longitudinal Study ("HSLS") of 2009, conducted by the National Center for Education Statistics ("NCES"), suggests that 37 percent of students with disabilities report their disability to their college or university.[93] Applying this proportion to the disability prevalence rates for students with a vision, hearing, dexterity, or cognitive disability, yields the percent of individuals aged 18–22 and 17–29 who will report a relevant disability to their college or university. However, because the HSLS reports the fraction of students with any disability who report their disability to the school, and not the fraction of students with either a vision, hearing, dexterity, or cognitive disability who report their disability to the school, this number may be an over or underestimate depending on the variability in the likelihood that students with specific disabilities report their disability to the school. To estimate average class sizes, The Department used Common Data Set ("CDS") reports from 21 public universities and 10 community colleges, resulting in an average of 29.8 students per class in public universities and 20.4 students per class in community colleges.

3.5.2.1 Overview of Methods and Findings

When estimating the percent of courses that will be remediated in each year, the Department found that, within two years following implementation, virtually all postsecondary courses would have been remediated. Specifically, the probability function discussed below shows that by the end of year four (two years after schools begin to remediate course content) 96 percent of courses offered by public four-year and above institutions and 90 percent of courses

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[93] Adam, T., & Warner-Griffin, C. (2022, April). Use of Supports Among Students with Disabilities and Special Needs in College. *National Center for Education Statistics at the Institute of Education Sciences*, 2.

offered by community colleges will have been remediated. The Department assumes that despite having some courses for which remediation has not been requested by year five, postsecondary institutions will finish remediation on their own to preempt requests in the following year. For institutions that wait to remediate outstanding courses, the costs will be negligible.

3.5.2.2 Probabilistically Calculating the Rate of Course Remediation

In this section, the Department provides its estimates for the rate at which courses will be remediated based on how widely dispersed students with disabilities are throughout a postsecondary institution's available courses. This computation utilizes a probabilistic model that accounts for average class size, disability prevalence, average student course load, and postsecondary enrollment data.

The Department assumes all postsecondary institutions are part of the "large government" category, as public four year and above institutions are State governed. The Department was not able to find comprehensive data on which entity types govern community colleges, but believes it is roughly 45 percent State governed.[94]

Over the two-year period when remediation is occurring, the Department used the following methodology to determine how quickly institutions ramp up to 100 percent of courses being made accessible. If a college offers n_c courses, and its students take four courses per semester on average, then the probability that a student with a reported disability chooses not to take a particular course is:

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[94] Though the Department does not have a fully disaggregated list of community colleges based on government entity type, the Department did examine funding source as a proxy for government type, and with that methodology found that 44 percent of community colleges would be attributed to states, and the remaining 56 percent would be split between other local government entities. The Department does not have the data to further estimate how the remaining 56 percent would be broken up, though the presence of a community college might suggest that they are more likely to be "large" than "small."

$$P\left(\begin{array}{c}\text{one student with a disability chooses}\\\text{not to take a given course}\end{array}\right) = 1 - \frac{4}{n_c} \qquad (1)$$

If there are n_d students with reported disabilities, then the probability that all such students choose not to take a given course is:

$$P\left(\begin{array}{c}\text{all students with a disability choose}\\\text{not to take a given course}\end{array}\right) = \left(1 - \frac{4}{n_c}\right)^{n_d} \qquad (2)$$

The complement of this probability, shown in Eq. 3, represents the probability that a course will contain at least one student with a reported disability. As this probability applies to every course, this expression also equals the expected proportion of courses that will contain at least one student with a disability:

$$\hat{p}_{\substack{\text{courses with at least}\\\text{one student with a disability}}} = 1 - P\left(\begin{array}{c}\text{all students with a disability choose}\\\text{not to take a given course}\end{array}\right) = 1 - \left(1 - \frac{4}{n_c}\right)^{n_d} \qquad (3)$$

The number of courses in a semester that a university offers n_c was estimated from total enrollment E, average class size $\bar{s}_c$, and the average number of courses taken per semester:

$$n_c = \frac{E \cdot 4}{\bar{s}_c} \qquad (4)$$

The number of students with a reported disability n_d was estimated by applying the percent of students with a reported disability p_d (given in Table 42) to the total enrollment E:

$$n_d = E \cdot p_d \qquad (5)$$

Combining the expressions in Eq. 4 and Eq. 5 with Eq. 3 yields:

$$\hat{p}_{\substack{\text{courses with at least}\\\text{onestudent with a disability}}} = 1 - \left(1 - \frac{\bar{s}_c}{E}\right)^{E \cdot p_d} \qquad (6)$$

The total enrollment E of each public four-year university and each public community

college in the U.S. was acquired from NCES databases, using values collected for the Fall 2020 semester.[95, 96] The Department estimates the average class size $\overline{S_c}$ to be 20.4 for community colleges and 29.8 for public four-year and above universities. These class-size estimates are based on data reported to the Common Data Set (CDS) by 21 four-year universities and 10 community colleges.[97] Institutions report the number of classes in seven size categories[98] Depending on the institution, data are from one of three academic years: 2015–16, 2016–17, and 2017–18.

Eq. 6 contains simplifying assumptions, including that students select courses at random. While the foregoing methodology may not capture heterogeneities in student course preference, such heterogeneities would likely cluster similar groups of students together, which may reduce the variety of courses taken by students with reported disabilities. As such, the Department's method may slightly overestimate the true proportion of courses requiring remediation during the first year. For this reason, the costs provided here may slightly overestimate the true costs.

3.5.2.3 Course Remediation Estimates

The probability formula derived in the preceding section provides a way to estimate the proportion of courses requiring remediation. This section justifies assumptions used with this equation and applies the formula to the first year following implementation. In the second year, the Department assumes virtually all remaining courses are remediated.

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[95] National Center for Education Statistics. (n.d.). *Summary Tables*. Retrieved from https://nces.ed.gov/ipeds/SummaryTables/.
[96] Enrollment trends over time were reviewed to ensure the COVID-19 pandemic did not significantly impact this number and the number is applicable to non-pandemic years.
[97] Common Data Set Initiative. (n.d.). Retrieved from https://commondataset.org/.
[98] The seven size categories are: 1–9 students, 10–19 students, 20–29 students, 40–49 students, 50–99 students, and 100+ students. Each size category was assumed to have a mean class equal to the midpoint of the range. For the 100+ size category, the average class size was assumed to be 125.

Table 42 shows the assumptions, data, and methodology used to estimate course costs. A

more thorough discussion of the Department's findings can be found in the subsequent text.

Table 42: Course Remediation Costs

Description	Public University	Community College	Source
Age range	18-22	17-29	NCES
Average class size	29.8	20.4	CDS Data
Prevalence of disabilities	0.13	0.12	SIPP Data
Share of students with a disability who notify school	0.37	0.37	HSLS
Share of students who have a relevant disability and notify school	0.05	0.04	Calculation
Total number of courses offered	1,803,277	965,097	Calculation
Number of courses remediated first semester	900,406	383,766	Calculation
Cost per course	$1,690	$1,690	Farr et al. (2009)[99], NCDAE[100]
First semester cost for all institutions (millions)	$1,521.6	$648.5	Calculation
First semester mean cost per institution (millions)	$2.0	$0.6	Calculation
Number of courses remediated second semester	563,214	269,294	Calculation
Second semester course remediation costs (millions)	$951.8	$455.1	Calculation
First year cost (millions)	$2,473.4	$1,103.6	Calculation
Courses remediated in Year 2	339,656	312,037	Calculation
Year 2 course remediation cost (millions)	$574.0	$527.3	Calculation
Total costs to remediate all courses (millions)	$3,047.4	$1,630.9	Calculation
Mean cost per institution to remediate all courses (millions)	$4.1	$1.4	Calculation
Mean cost per student to remediate all courses	$340.7	$341.4	Calculation
Yearly O&M cost per course	$253	$253	Calculation
Total yearly O&M cost (millions)	$609.5	$326.2	Calculation
Mean O&M cost per institution	$819,198	$285,380	Calculation

[99] Beverly Farr et al., *A Needs Assessment of the Accessibility of Distance Education in the California Community College System Part II: Costs and Promising Practices Associated with Making Distance Education Courses Accessible*, MPR Associates, Inc. (May 2009), https://files.eric.ed.gov/fulltext/ED537862.pdf.
[100] Cyndi Rowland et al., *GOALS Cost Case Study: Cost of Web Accessibility in Higher Education*, Gaining Online Accessible Learning through Self-Study (Dec. 2014), https://www.ncdae.org/documents/GOALS_Cost_Case_Study.pdf.

Total courses offered per institution was calculated using an assumption that half the classes offered in a semester are not offered in the following semester (in other words, half of the classes offered in the school are only offered *either* first or second semester); therefore, the Department multiplied the number of classes estimated in a semester (Eq. 4) by 1.5 to estimate total classes offered. The Department calculated the proportion of classes requiring remediation on a per school basis and with that number calculated the total number of classes offered by a school requiring remediation. The Department developed a per-course cost estimate because it believes that password protected course content is unique in its combination of level of complexity, volume of material, and distribution of content compared to other government websites. These qualities distinguish it from other government entities' websites, which necessitate a separate estimation approach. Though literature on course content remediation cost to WCAG 2.1 Level AA is sparse, the Department used findings from Farr et al. (2009) and the National Center on Disability and Access to Education ("NCDAE") GOALS Course Cost Case Study (2014)[101, 102], to estimate the cost to remediate a course to be $1,690. Each of these studies presented ranges of cost estimates for "simple" and "complex" courses.[103] To generate an average class cost, the Department first adjusted the cost estimates to 2021 dollars. The Department then took the midpoint of the given ranges and generated a weighted average from the two studies' "simple" and "complex" course cost estimates using survey data from Farr et al. (2009) that estimated 40 percent of classes to be complex, and 60 percent of classes to be

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[101] Farr, B., et al. (2009, May). A Needs Assessment of the Accessibility of Distance Education in the California Community College SystemPart II: Costs and Promising Practices Associated with Making Distance Education Courses Accessible. *MPR Associates, Inc*. Retrieved from https://eric.ed.gov/?id=ED537862.

[102] Rowland, C., et al. (2014, December). *GOALS Cost Case Study: Cost of Web Accessibility in Higher Education*. 86.

[103] "Simple" courses are loosely defined as courses that mostly house images and documents.

simple.[104]

To calculate the number of courses remediated in the first semester, the Department applied Eq. 6 to a given institution and calculated the number of expected courses requiring remediation in the first semester the rule is in effect. The Department then multiplied the sum of the number of all institutions' first semester courses requiring remediation by the cost per course to estimate a total first semester cost to remediate courses. The Department expects the first semester to be the most expensive as it will be the semester with the smallest amount of existing compliance, and therefore the greatest number of classes that are out of compliance with WCAG 2.1 Level AA. In subsequent semesters, those courses that have been previously remediated will already be accessible, meaning the total pool of classes needing remediation will decrease over time. The Department estimates that 46 percent of all classes offered between community colleges and four-year and above institutions will be remediated in the first semester, costing a total of $2.2 billion. On a per-student basis, this is $170 and $136 for four-year and above institutions and community colleges, respectively.

To calculate second semester classes requiring remediation, the Department used the same proportion of classes needing remediation but calculated a new number of classes that are eligible for remediation. The Department estimates that there is a 50 percent overlap in classes offered between semester one and semester two. Using that estimate, the Department calculated the number of second semester classes eligible for remediation as half the number of classes in the first semester plus the courses which are offered both semesters but were not remediated in semester one. The Department estimates that 563,214 public four-year and above courses and

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[104] *See* Farr et al., at 5. As part of this study, experts were interviewed on online learning to estimate the proportion of classes which are simple or complex. These estimates are discussed throughout the paper, and are first referenced on page 5.

269,294 community college courses will need to be remediated in semester two, which will cost

a total of $1.4 billion. Because the Department's estimated rate of remediation is relatively high

(the modeling above yields a 75 percent remediation rate in semester one for four-year

institutions and a 60 percent remediation rate in semester one for community colleges), the

Department assumed that by the end of the second year of remediation, all postsecondary

institutions will have remediated all currently offered courses.

Whereas the Department estimates general O&M costs to be 10 percent of total

remediation costs (see Section 3.3.8), the Department estimates educational institutions to have a

higher annual O&M costs of 15 percent of the initial remediation costs, amounting to $253 per

class. Given that course content often contains video-based lectures requiring closed captioning,

and content that is updated more frequently than general web content, the Department assumes a

50 percent higher cost in the operation and management of course content than for general web

content. Additionally, this 50 percent higher estimate accounts for developing new accessible

courses. The full 10-year costs of the rule, including course remediation and O&M costs, are

presented in Table 43, along with PV and annualized costs.

Table 43: Projected 10-Year Costs for Course Remediation (Millions)

Institution Type	Public University	Community College	Total
Year 1	$0	$0	$0
Year 2	$0	$0	$0
Year 3	$2,473	$1,104	$3,577
Year 4	$1,069	$748	$1,817
Year 5	$609	$326	$936
Year 6	$609	$326	$936
Year 7	$609	$326	$936
Year 8	$609	$326	$936
Year 9	$609	$326	$936
Year 10	$609	$326	$936
PV, 3% discount rate	$6,147	$3,245	$9,391

Institution Type	Public University	Community College	Total
PV, 7% discount rate	$5,051	$2,658	$7,708
Annualized cost, 3% discount rate	$721	$380	$1,101
Annualized cost, 7% discount rate	$719	$378	$1,097

Question 11: The Department invites public comment on literature or resources which estimate the average cost to make postsecondary education course content comply with WCAG 2.1 Level AA.

3.6 ELEMENTARY AND SECONDARY COURSE CONTENT REMEDIATION

Under the proposed rule, password protected course content (*e.g.*, content provided through third-party learning management systems) in a public elementary or secondary school generally must be made accessible when a student with a disability is enrolled in the course or when the dependent of a parent with a disability enrolls in the course. This section estimates the costs for elementary and secondary education institutions to make this content accessible. Much of the methodology here is similar to that for course remediation costs for postsecondary education (Section 3.5). The Department estimates that annualized costs with a 3 percent discount rate for elementary and secondary education institutions are $195 million. Additionally, these institutions will incur some O&M costs after implementation.

NCES publishes a list of all public schools in the United States. With enrollment counts by grade level for kindergarten (grade K) through 12th grade.[105] Best available estimates suggest 66 percent of all schools (public and private) have an LMS and the Department assumed that this number will not change significantly in the next 10 years in the presence or absence of this

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[105] National Center for Education Statistics. (2021). *ELSI - Elementary and Secondary Information System*. Retrieved from https://nces.ed.gov/ccd/elsi/default.aspx.

rule.[106,107] The Department made this assumption due to a lack of available data, and the Department notes that even if there were an increase in the percent of schools with an LMS, this would increase both costs and benefits, likely resulting in a nominal impact to the net benefits of the rule. Using these data, the number of public schools with an LMS was computed, by grade level. The Department estimated the number of unique courses offered per school and per grade level, and then used this value to calculate the total number of LMS courses that must be remediated in each school. Table 44 presents the assumptions for the number of unique LMS courses offered per grade level, based on the Department's best professional judgment. The number of unique courses is lower for earlier grade levels[108] and increases in higher grade levels as that education becomes more departmentalized (*i.e.*, students move from teacher to teacher for their education in different subjects) and schools generally introduce more elective offerings as students progress toward grade 12.[109]

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[106] To the extent that the percentage of public schools with an LMS is lower than the percentage of private schools, the analysis presented here overestimates the true elementary and secondary course remediation costs.

[107] Catalano, F. (2021, January 26). *Pandemic Spurs Changes in the Edtech Schools Use, From the Classroom to the Admin Office*. (EdSurge) Retrieved December 1, 2022, from https://www.edsurge.com/news/2021-01-26-pandemic-spurs-changes-in-the-edtech-schools-use-from-the-classroom-to-the-admin-office.

[108] Standardized curricula and relatively lower mean enrollments in earlier grade levels tend to decrease the number of unique course offerings per grade level, which would reduce the number of LMS courses that must be remediated.

[109] According to NCES, in the 2016–2017 school year, 24 percent of elementary school classes were departmentalized, compared to 93 percent of middle schools and 96 percent of high schools. *National Teacher and Principal Survey,* NCES, https://nces.ed.gov/surveys/ntps/tables/ntps1718_fltable06_t1s.asp.

Table 44: Calculation of Elementary and Secondary Course Remediation Costs, by Grade Level

Grade Level	Number of Schools [a]	Number of Schools with an LMS [b]	Number of LMS Courses per Grade Level	Number of Courses to Remediate	Cost to Remediate a Yearlong Course	Total Cost (Millions)
K	52,155	34,422	1	34,422	$182	$6.3
1	52,662	34,757	1	34,757	$182	$6.3
2	52,730	34,802	1	34,802	$182	$6.3
3	52,661	34,756	1	34,756	$182	$6.3
4	52,363	34,560	1	34,560	$182	$6.3
5	50,903	33,596	7	235,172	$364	$85.7
6	35,032	23,121	7	161,848	$364	$59.0
7	29,962	19,775	7	138,424	$364	$50.5
8	30,161	19,906	7	139,344	$364	$50.8
9	23,843	15,736	14	220,309	$994	$219.0
10	24,200	15,972	14	223,608	$994	$222.3
11	24,322	16,053	14	224,735	$994	$223.4
12	24,304	16,041	14	224,569	$994	$223.2
Total	N/A	N/A	N/A	N/A	N/A	$1,165.4

[a] This represents the number of schools with nonzero enrollment in the listed grade level. As such, a single school can be represented on multiple rows.
[b] This represents the number of schools with an LMS and nonzero enrollment in the listed grade level.

As discussed in Section 3.5, the Department estimated costs to remediate a single postsecondary course using two estimates from Farr et al. (2009) and the NCDAE GOALS Course Case Study.[110, 111] Those two papers also estimate the cost to remediate an average "simple" college course (loosely defined as a course that mostly houses images and documents). The Department assumes that a high school course is equivalent in its complexity to a simple college course, and therefore averaged the two simple course cost estimates from the two studies to estimate a course cost of $497 dollars per semester. Research suggests that 8- to 12-year-olds

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[110] Farr, B., et al. (2009, May). A Needs Assessment of the Accessibility of Distance Education in the California Community College SystemPart II: Costs and Promising Practices Associated with Making Distance Education Courses Accessible. *MPR Associates, Inc*. Retrieved from https://eric.ed.gov/?id=ED537862.
[111] Rowland, C., et al., (2014, December). *GOALS Cost Case Study: Cost of Web Accessibility in Higher Education*. 86.

spend 22 minutes on course work outside of class for every hour that teenagers spend.[112]

Accordingly, the Department estimates that a 5th through 8th grade semester-long course would cost $364 to remediate (22 divided by 60, multiplied by $497). Kindergarten through 4th grade courses were assumed to have half as much content requiring remediation as 5th through 8th grade courses, leading to an estimated cost of $182 per semester-long course (half of $364). These figures are shown above in Table 44. The semester-long course costs were doubled to acquire yearlong course remediation costs. To estimate the total remediation costs for a given grade level, the Department multiplied the number of distinct LMS courses in a year by the yearlong course remediation cost. Summing across all grade levels yields the total costs of $1.2 billion.

Table 45 presents the costs incurred in the first 10 years following promulgation of the rule, by entity type. For each year after completing course remediation, the Department assumed elementary and secondary school districts would incur an O&M cost equal to 10 percent of the initial remediation cost.[113] The Department assumes costs will not be incurred until the year required by the rule (Year 4 for small entities and Year 3 for large entities) because courses would not be remediated until necessary. The Department expects that elementary and secondary courses will be remediated at a faster rate than postsecondary courses, given that the proposed rule generally requires elementary and secondary educational web content to be accessible if requested by *either* the child or their parent(s), whereas postsecondary course provisions in the rule do not provide for a child's parent(s) to request accessible web content. As

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[112] Rideout, V., & Robb, M. B. (2019). *The Common Sense Census: Media Use by Tweens and Teens.* San Francisco: Common Sense Media.

[113] This O&M cost estimate is lower than the 15 percent of initial remediation costs assumed for postsecondary course remediation O&M in Section 3.5. This reflects differences in the content taught at each level. The Department believes that course materials in postsecondary education may change frequently as instructors develop new courses and higher-level theory evolves. In primary and secondary educational contexts, the Department believes that course content is more likely to remain relevant from one year to the next, allowing instructors to reuse materials, rather than make new content accessible each year.

such, the Department expects that virtually all course content will be remediated by elementary and secondary educational institutions in the first year required under the rule.

The NCES public school data does not indicate whether the school is part of a school district that is a small or large entity. Therefore, to allocate the total costs to small and large school districts, the Department calculated the proportion of small and large entities among independent school districts (ISDs), which represent a large majority of all public-school students and all public-school districts in the U.S.[114] Within ISDs, the Department determined that 52.7 percent of students attend small school districts, and 47.3 percent of students attend large school districts, based on the 2017 Census of Governments. These percentages were applied to the total cost in Table 44 to allocate costs to small and large school districts.

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[114] The 2017 Census of Governments shows that students enrolled in independent school districts make up over 80 percent of all elementary and secondary public-school enrollees, and the number of independent school districts accounts for over 90 percent of all public-school districts.

Table 45: Projected 10-Year Course Remediation Costs (Millions)

Time Period	Cost for Small School Districts	Cost for Large School Districts	Total Costs
Year 1	$0	$0	$0
Year 2	$0	$0	$0
Year 3	$0	$551	$551
Year 4	$614	$55	$670
Year 5	$61	$55	$117
Year 6	$61	$55	$117
Year 7	$61	$55	$117
Year 8	$61	$55	$117
Year 9	$61	$55	$117
Year 10	$61	$55	$117
PV, 3% discount rate	$842	$818	$1,660
PV, 7% discount rate	$692	$692	$1,384
Annualized cost, 3% discount rate	$99	$96	$195
Annualized cost, 7% discount rate	$99	$99	$197

In general, four types of government are responsible for providing public elementary and secondary education: counties, municipalities, townships, and ISDs. The Department allocated costs across these entity types in proportion to the relative number of entities of each type in the 2017 Census of Governments. Table 46 shows the total counts of school districts, by government type. The Department applied these percentages to the costs to estimate the cost per type of government entity in Table 45.

Table 46: Count of Districts by Government Type in the 2017 Census of Governments

Type of District	Number of Districts	Percent of Total
Independent school district	12,754	90.7%
County dependent school district	571	4.1%
Municipal dependent school district	223	1.6%
State dependent school district	32	0.2%
Township dependent school district	481	3.4%

3.7 COSTS FOR THIRD-PARTY WEBSITES AND MOBILE APPS

Some government entities use third-party websites and mobile apps to provide government services, programs, and activities. Under the proposed rule, such third-party websites and mobile apps must generally be made accessible in accordance with WCAG 2.1 Level AA. This

section presents numbers to provide a sense of the size of the costs to modify existing third-party websites that are used to provide government services. Third-party costs related to mobile apps are unquantified in this analysis because the Department was unable to find existing data or literature on the subject.

These numbers should be interpreted with caution because they include significant uncertainty. Limited information exists regarding the number of third-party websites and mobile apps employed by government entities. Additionally, little research has been conducted assessing how government entities use third-party website and mobile app services.

It is unclear whether the third-party provider of State and local government websites would incur the cost of testing and remediating these websites and mobile apps. Costs may be passed on to public entities by way of increased charges from third-party websites. Alternatively, the website and mobile app providers may choose to absorb the costs themselves. For simplicity within this analysis, the Department assumed that all costs would be passed on to public entities.

To estimate costs incurred from third-party website and mobile app compliance, the Department used a convenience sub-sample of our sample of government entities discussed in Section 3.3. This sub-sample includes 106 government entities and was not stratified to ascertain representativeness among various government entities. For this sub-sample, the Department used pre-existing SortSite inventory reports that were generated to estimate government website compliance costs (as discussed in Section 3.3) to identify third-party websites that provide government services on behalf of sampled government entities. The result of this count of third-party websites that provide government services on behalf of government entities is that the sample would treat each third-party website as uniquely serving only one particular government entity. In reality, this approach would overrepresent true costs, because a third-party website is

likely to serve many government entities. For example, a bill payment website might contract with several cities, allowing each of those cities to provide the same website to individuals who need to pay city fines. In this example, although our count of third-party websites in our sample would treat a given city as the sole user of a third-party website, in reality several cities could in fact use that same third-party website, and that website would only incur costs once to be made accessible.

To address this, the Department sought information regarding the number of governments served by a single third-party website but was not able to find estimates in literature. In lieu of such estimates, the Department assumed, using its best professional judgment, that each third-party website serves an average of 25 government entities. The estimated number of third-party websites was then divided by 25 to reflect that costs associated with third-party website compliance will be distributed across 25 government entities. This allowed the Department to provide a more accurate picture of the third-party website costs that would actually be incurred.

For each government entity type, the Department then calculated the ratio of third-party websites in the sample, as calculated above, to total government websites in the sample. Across all entity types, the average ratio is 0.042, or 4.2 percent. The Department reviewed the literature for reputable estimates of the average cost of modifying a third-party website that provides government services to the public for WCAG 2.1 AA compliance. In the absence of existing reputable estimates, the Department opted to use average government website testing and remediation costs generated in this study as an approximate estimate of WCAG 2.1 AA compliance costs for third-party websites that provide government services. Government website testing and remediation cost estimates for each government entity type were multiplied

by the third-party to government website ratios to estimate costs from third-party website compliance with WCAG 2.1 AA (shown in Table 47 and Table 48).

In aggregate, there are estimated to be 0.04 third-party websites for every government website. If all costs were passed along to governments, governments would incur additional costs for remediating third-party websites equivalent to about 4 percent of the costs to test and remediate their own websites. The present value of total 10-year costs incurred from third-party website compliance is estimated to be $671.7 million at a discount rate of 3 percent and $587.8 at a discount rate of 7 percent. Total costs from third-party website compliance are presented in Table 49.

Question 12: The Department requests input on third-party cost estimation, including as regards: (a) how many governments use the same third-party website, as well as on the associated costs to remediate websites offered by third-party providers, (b) whether other aspects of the above analysis could be refined, and (c) how to estimate third-party costs associated with mobile apps.

Question 13: The Department requests input on whether there are societal costs that have not been quantified or that would be difficult to quantify—for example, impacts on public entities' decisions to use virtual platforms, the continued public availability of archived government material, transition costs for users getting accustomed to newly reformatted websites, and the costs (mentioned briefly in section 4.4.5) of increased public program participation.

Table 47: Third-Party Website Compliance Costs, Large Government Entities (Millions)

Year	State	County (large)	Municipality (large)	Township (large)	U.S. territory (large)	School District (large)	Public University
Year 1	$2.9	$12.3	$12.9	$0.5	$0.0	$21.3	$15.9
Year 2	$3.1	$13.5	$14.2	$0.5	$0.0	$23.4	$17.4
Year 3	$0.6	$2.5	$2.6	$0.1	$0.0	$4.3	$3.2
Year 4	$0.6	$2.5	$2.6	$0.1	$0.0	$4.3	$3.2
Year 5	$0.6	$2.5	$2.6	$0.1	$0.0	$4.3	$3.2
Year 6	$0.6	$2.5	$2.6	$0.1	$0.0	$4.3	$3.2
Year 7	$0.6	$2.5	$2.6	$0.1	$0.0	$4.3	$3.2
Year 8	$0.6	$2.5	$2.6	$0.1	$0.0	$4.3	$3.2
Year 9	$0.6	$2.5	$2.6	$0.1	$0.0	$4.3	$3.2
Year 10	$0.6	$2.5	$2.6	$0.1	$0.0	$4.3	$3.2
PV of ten-year costs, 3% discount rate	$9.50	$41.01	$43.01	$1.57	$0.01	$70.87	$52.83
Annualized costs, 3% discount rate	$1.11	$4.81	$5.04	$0.18	$0.00	$8.31	$6.19
Total costs per entity, 3% discount rate	$0.19	$0.04	$0.06	$0.01	$0.00	$0.09	$0.07
Annualized costs per entity, 3% discount rate	$0.02	$0.01	$0.01	$0.00	$0.00	$0.01	$0.01
PV of ten-year costs, 7% discount rate	$8.38	$36.17	$37.94	$1.38	$0.01	$62.52	$46.60
Annualized costs, 7% discount rate	$1.19	$5.15	$5.40	$0.20	$0.00	$8.90	$6.64
Total costs per entity, 7% discount rate	$0.16	$0.04	$0.05	$0.01	$0.00	$0.08	$0.06
Annualized costs per entity, 7% discount rate	$0.02	$0.01	$0.01	$0.00	$0.00	$0.01	$0.01

Table 48: Third-Party Website Compliance Costs, Small Government Entities (Millions)

Year	Special District	County (small)	Municipality (small)	Township (small)	U.S. territory (small)	School district (small)	Community College
Year 1	$5.3	$2.3	$31.4	$23.1	$0.0	$16.4	$21.0
Year 2	$6.0	$2.5	$34.6	$25.5	$0.0	$18.1	$23.1
Year 3	$6.6	$2.7	$37.8	$27.9	$0.0	$19.7	$4.2
Year 4	$1.9	$0.7	$9.6	$7.1	$0.0	$5.0	$4.2
Year 5	$1.9	$0.7	$9.6	$7.1	$0.0	$5.0	$4.2
Year 6	$1.9	$0.7	$9.6	$7.1	$0.0	$5.0	$4.2
Year 7	$1.9	$0.7	$9.6	$7.1	$0.0	$5.0	$4.2
Year 8	$1.9	$0.7	$9.6	$7.1	$0.0	$5.0	$4.2
Year 9	$1.9	$0.7	$9.6	$7.1	$0.0	$5.0	$4.2
Year 10	$1.9	$0.7	$9.6	$7.1	$0.0	$5.0	$4.2
PV of 10-year costs, 3% discount rate	$28.00	$11.02	$152.16	$112.36	$0.01	$79.40	$69.92
Annualized costs per entity, 3% discount rate	$3.28	$1.29	$17.84	$13.17	$0.00	$9.31	$8.20
Total costs per entity, 3% discount rate	$0.00	$0.01	$0.01	$0.01	$0.01	$0.01	$0.06
Annualized costs per entity, 3% discount rate	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.01
PV of 10-year costs, 7% discount rate	$24.20	$9.58	$132.45	$97.78	$0.01	$69.12	$61.68
Annualized costs per entity, 7% discount rate	$3.45	$1.36	$18.86	$13.92	$0.00	$9.84	$8.78
Total costs per entity, 7% discount rate	$0.00	$0.00	$0.01	$0.01	$0.00	$0.01	$0.05
Annualized costs per entity, 7% discount rate	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.01

Table 49: Projected Total Costs of Remediating Third-Party Websites (Millions)

Year	Total Costs (All Entities)
Year 1	$165.2
Year 2	$181.9
Year 3	$112.1
Year 4	$41.6
Year 5	$41.6
Year 6	$41.6
Year 7	$41.6
Year 8	$41.6
Year 9	$41.6
Year 10	$41.6
PV of 10-year costs, 3% discount rate	$671.7
Annualized costs, 3% discount rate	$78.7
PV of 10-year costs, 7% discount rate	$587.8
Annualized costs, 7% discount rate	$83.7

3.8 SENSITIVITY AND UNCERTAINTY ANALYSES OF COSTS

The Department's cost estimates rely on a variety of assumptions from literature and elsewhere that, if changed, could impact the cost burden to different government entities. To better understand the uncertainty behind its cost estimates, the Department performed several sensitivity analyses on key assumptions in its cost model. A full summary of the Department's high and low estimate costs is in Table 51. Other assumptions not altered here also involve a degree of uncertainty and so these low and high estimates should not be considered absolute bounds.

For website testing and remediation costs, the Department adjusted its estimate of the effectiveness of automated accessibility checkers such as SortSite at identifying accessibility errors. In its primary analysis, the Department relied on its own manual assessment of several webpages to estimate the fraction of remediation time that the errors SortSite caught accounted for among all errors present. This approach found that SortSite caught errors corresponding to 50.6 percent of the time needed to remediate a website, leading to a manual adjustment factor of 1.98. This manual adjustment factor was multiplied by the remediation time estimated using the SortSite output for each website in the sample. Vigo, Brown, and Conway (2013), by contrast, find that SortSite correctly identifies 30 percent of the accessibility errors on a given website.[115] This finding is not necessarily inconsistent with the results of the Department's analysis, however, since the paper's authors merely count instances of errors, without considering the relative severity of errors. Nevertheless, the Department replicated its analysis using the 30 percent estimate for SortSite's comprehensiveness, which amounts to an adjustment factor of

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[115] Vigo, M., Brown, J., & Conway, V. (2013). Benchmarking web accessibility evaluation tools: Measuring the harm of sole reliance on automated tests. *W4A 2013 - International Cross-Disciplinary Conference on Web Accessibility.*

3.33. This altered assumption resulted in a 10-year total website testing and remediation cost of

$19.2 billion at a 3 percent discount rate. This is $7.2 billion more than the primary estimate of

$12.0 billion. The analysis for estimating costs of remediating third-party websites (described in

Section 3.7 was replicated using the same altered assumption of SortSite's comprehensiveness,

resulting in a 10-year total third-party website testing and remediation present value cost of $1.1

billion. This is $400 million more than the primary estimate of $672 million.

The Department also reexamined its assumptions concerning PDFs that government

entities would choose to remediate. In the primary analysis, it was assumed that only those PDFs

that had last been modified prior to 2012 would be removed or archived rather than remediated.

This assumption resulted in an estimate that 15 percent of PDFs currently hosted on government

websites would be taken down or archived. Government entities post PDFs that serve a variety

of purposes; city council meeting minutes, State agency research reports, summaries of new

county policies, municipal permit applications, and flyers for school events are all frequently

stored in this format. Some inaccessible documents that are more than 10-years old may remain

crucial to providing government services and may therefore be remediated rather than removed.

Many of these documents, however, may no longer be relevant even if they are less than 10-

years old. Government entities may choose to archive these outdated files rather than incur the

cost to remediate them to WCAG 2.1 Level AA standards. To approximate an upper bound on

the number of PDFs government entities would choose to archive, the Department reconducted

its website cost analysis with the assumption that 50 percent of PDFs on State and local

government websites would be archived or removed rather than remediated. This calculation

resulted in website costs of $11.6 billion discounted at 3 percent over 10 years; $311 million less

than the primary estimate of $12.0 billion. Once again, the analysis for estimating costs of

remediating third-party websites (described in Section 3.7) was replicated using this altered PDF archival rate, resulting in a 10-year total third-party website testing and remediation present value cost of $654 million. This is $17 million less than the primary estimate of $672 million.

For postsecondary course remediation cost, the Department calculated costs over an increased timeline to generate a low-cost estimate. In its initial calculations, the Department estimated disability prevalence using SIPP data, calculated that the majority of classes will be remediated in the first year following the implementation of the rule, and determined that any outstanding classes will be remediated in the second year. However, the prevalence rates used from SIPP data are higher estimates than estimates from the ACS. If the true disability prevalence of the college population is lower than was estimated for these analyses, then fewer courses will need remediation per year. This is the underlying logic for changes in this assumption. The Department found that in a scenario where one third of courses are remediated per year, the annualized cost at a 3 percent discount rate is $992 million: $109 million less than its primary estimate.[116]

To generate a high-cost estimate for higher education, the Department evaluated a higher per-course remediation cost. In its primary estimates, the Department used data from two studies that estimated costs to make a course web accessible. These studies were conducted in 2009 and 2014 respectively, and the online landscape of postsecondary education has changed since then. The Department believes that COVID-19 and the subsequent distance learning at higher education institutions may have increased the amount of course content that is offered through online portals. If this is the case, it's possible that there is fundamentally more content eligible for remediation than there was at the time of the studies on which the Department is using to

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[116] The Department chose 1/3 to create a scenario with a more flexible remediation timeline, which implies that all courses get remediated within three years instead of two.

base its course cost estimates, and that because of that there is less compliance in web accessible course content.[117] To account for this, the Department used the higher estimates for complex course remediation given in Farr et al. (2009) and the GOALS Cost Case Study from the NCDAE to estimate a cost of $1,894 per course (compared with $1,690 in the primary estimate), and an operation and management cost of $284 per course (compared with $253 in the primary estimate). Under these conditions, the Department found the annualized cost of the rule for course content remediation to be $1.21 billion: $112 million more than its primary estimates.

To estimate course remediation costs for elementary and secondary institutions, the Department made assumptions about the number of LMSs that students interface with at each grade level. In addition, the Department had to estimate the average cost to remediate each of those LMS's content to be compliant with WCAG 2.1 Level AA. The Department performed a sensitivity analysis on these assumptions to create upper and lower bounds on cost.

For the upper bound, the Department increased the number of LMSs that students interact with in each semester. For students in grades K–4, the Department raised the assumption from one LMS to two, from seven LMSs to ten in grades 5–8, and from 14 LMSs to 20 in grades 9–12. In addition, the Department created a continuum of costs between its low estimate of $182 and its high estimate of $994, allocating costs that increase linearly with each subsequent grade level, and effectively raising the average cost to remediate course content. These changes raised the annualized cost with a 3 percent discount rate from $195 million to $312 million.

For the lower bound, the Department adjusted the same parameters downwards. The Department kept the same estimate of one LMS for grades K–4, decreased the number of LMSs for grades 5–6 from seven to five, and decreased the number of LMSs for grades 9–12 from 14

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[117] Conversely, it is also possible that a shift to online learning has made the higher education community more aware of web accessibility issues, and therefore increased the rate of WCAG 2.1 compliance.

to 10. For course remediation costs, the Department halved the estimated costs to remediate a class for all grades. When applying these changes, the annualized cost with a 3 percent discount rate decreased from $195 million dollars to $75 million dollars.

The Department conducted sensitivity analyses to assess the mobile apps cost model by varying the assumption that the cost to test and modify an existing mobile app for accessibility is equal to 65 percent of the cost to build an "average" mobile app. In the sensitivity analysis the Department assumed that State and local government entities mostly control either "simple" or "complex" mobile apps, rather than "average" mobile apps. Simple mobile apps are less costly to build than the average mobile app. The expected cost of building a simple mobile app is estimated to be $50,000, compared with $105,000 for an average mobile app. [118] The cost of testing and modifying a simple mobile app for accessibility is assumed to be 65 percent of the cost to build a simple mobile app, equal to $32,500. Using this assumption based on simple mobile apps, PV of total mobile app testing and remediation costs decreases from $597.8 million to $285.7 million. Conversely, complex apps are costlier to build than both simple apps and the "average" mobile app. The expected cost of building a complex mobile app is $300,000.[119] The cost to test and modify a complex mobile app for accessibility is assumed to be 65 percent of the cost to build a complex mobile app, equal to $195,000. Using this assumption, total mobile app testing and remediation costs increase from $597.8 million to $1.1 billion.

The parameters changed for each analysis can be found In Table 50, and the total aggregated lower and higher estimates can be found in Table 51. Based on the Department's analysis, total 10-year costs discounted at 7 percent will likely be between $18.4 and $29.5

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[118] SPD Load. (2022). *How Much Does It Cost to Develop an App in 2022? Cost Breakdown*. Retrieved from https://spdload.com/blog/app-development-cost/.
[119] *Id.*

billion.

Table 50: Sensitivity Analysis Parameters

Cost	Bound	Variations
Higher education course remediation	Lower estimate	Increased remediation timeline
Higher education course remediation	Higher estimate	Higher course cost
Website costs	Lower estimate	Increased rate of PDF archival
Website costs	Higher estimate	Lower effectiveness of automated accessibility checkers
Mobile app costs	Lower estimate	Assume government apps are "simple"
Mobile app costs	Higher estimate	Assume government apps are "complex"
Elementary and secondary course remediation costs	Lower estimate	Assume fewer LMS classes, lower class cost
Elementary and secondary course remediation costs	Higher estimate	Assume more LMS classes, higher class cost

Table 51: Sensitivity Analyses of Total Costs (Millions)

Time Period	Primary	High Estimate	Low Estimate
Year 1	$3,361	$5,462	$3,145
Year 2	$3,646	$5,935	$3,422
Year 3	$6,402	$8,986	$4,030
Year 4	$3,270	$3,756	$2,716
Year 5	$1,836	$2,485	$2,835
Year 6	$1,836	$2,485	$1,743
Year 7	$1,836	$2,485	$1,743
Year 8	$1,836	$2,485	$1,743
Year 9	$1,836	$2,485	$1,743
Year 10	$1,836	$2,485	$1,743
PV of 10-year costs, 3% discount rate	$24,302	$34,420	$21,712
Average annualized costs, 3% discount rate	$2,849	$4,035	$2,545
PV of 10-year costs, 7% discount rate	$20,724	$29,527	$18,407
Average annualized costs, 7% discount rate	$2,951	$4,204	$2,621

3.9   COST TO REVENUE COMPARISON

To consider the relative magnitude of the estimated costs of this proposed regulation, the

Department compares the costs to revenues for these entities. Because the costs for each

government entity type are estimated to be well below 1 percent of revenues, the Department

does not believe the rule will be unduly burdensome or costly for public entities.[120] Costs for

each government entity type are estimated to be well below this 1 percent threshold.

The Department estimated the proportion of total local government revenue in each local

government entity type and size using the 2012 U.S. Census Bureau's database on individual

local government finances.[121] To evaluate which government entities continue to be small, the

Department applied the U.S. Census's Bureau's population growth rates by State to the

population numbers in the individual local government finances data to estimate 2020 population

levels.[122]

For independent school districts, the local government finances data only include

enrollment numbers, not population numbers. However, the population provisions in the

proposed rule's regulatory text are based on the population in the relevant area. Therefore, for

school districts, the Department estimated population by multiplying the enrollment numbers by

estimated population to school-age population ratios by county, then multiplying these

population numbers by applying population growth by State.[123]

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[120] As noted above and as a point of reference, the United States Small Business Administration advises agencies
that a potential indicator that the impact of a proposed regulation may be "significant" is whether the costs exceed 1
percent of the gross revenues of the entities in a particular sector, although the threshold may vary based on the
particular types of entities at issue. The Department estimates that the costs of this rulemaking for each government
entity type are far less than 1 percent of revenues. *See* Small Bus. Admin., A Guide for Government Agencies: How
to Comply with the Regulatory Flexibility Act, at 19 (Aug. 2017), https://advocacy.sba.gov/wp-
content/uploads/2019/07/How-to-Comply-with-the-RFA-WEB.pdf.
[121] Available at U.S. Census Bureau. (2021, October 8). *Historical Data*. Retrieved from
https://www.census.gov/programs-surveys/cog/data/historical-data.html. The Department was unable to find more
recent data with this level of detail.
[122] Population growth rates at U.S. Census Bureau. (2022, August 5). *Historical Population Change Data (1910-
2020)*. Retrieved from https://www.census.gov/data/tables/time-series/dec/popchange-data-text.html. Population
numbers in the 2012 data are from different years, so the Department applied a growth rate based on the specified
date for each entity.
[123] U.S. Census Bureau. (2021). *County Population by Characteristics: 2010-2019. Annual County Resident
Population Estimates by Age, Sex, Race, and Hispanic Origin: April 1, 2010 to July 1, 2019.* Retrieved from
https://www.census.gov/data/datasets/time-series/demo/popest/2010s-counties-detail.html. 2017 Census of
Government data was used to estimate the universe of school districts and their populations. While the rule relies on
the most recent SAIPE data for designating school districts as large or small entities, the 2017 Census of
Governments data was used (a) for consistency with the estimation methods of other government entities, and (b) to

The Department applied these proportions of governments in each entity type to the total local government revenue estimate from the U.S. Census Bureau's State and Local Government Finances by Level of Government and by State: 2020, updated to 2021 dollars using the GDP deflator.[124] Table 52 contains the average annualized cost using a 3 percent and 7 percent discount rate,[125] 2020 annual revenue estimates, and the cost-to-revenue ratios for each entity type and size. The costs are less than 1 percent of revenues in every entity type and size combination, so the Department believes that the costs of this proposed regulation would not be overly burdensome for the regulated entities.

Costs for postsecondary institutions were analyzed separately from other government entities. Except for community college independent districts, it is unclear where these costs should be included for this analysis and some postsecondary institutions have additional sources of revenue that may not be included in the government revenue estimates, most notably tuition and endowments. For public universities, which tend to be State dependent, the Department has included costs with State governments to ensure the ratio of costs to revenues is not underestimated. It is unclear where non-independent school district community colleges should be included so these costs were excluded from this analysis. For community college independent districts, the Department has revenue data. By applying the proportion of the total number of

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determine which school districts were dependent vs. independent. 24 percent of the generated population estimates were compared to the 2020 SAIPE data, and every school district was found to be classified correctly as having a population of either less than, or greater than or equal to 50,000.

[124] Available at U.S. Census Bureau. (2022, September 20). *2020 State & Local Government Finance Historical Datasets and Tables*. Retrieved from https://www.census.gov/data/datasets/2020/econ/local/public-use-datasets html.

[125] The estimated costs for dependent community colleges are not included in this table because the Department is unable to determine how to distribute these entities' costs across the other types of State and local entities. Additionally, it is unclear if all public college and university revenue (*e.g.*, tuition and fees) are included in the revenue recorded for the state or local entities on which the school is dependent. Finally, the low cost-to-revenue ratio for the independent community colleges indicate that these would not increase the cost-to-revenue ratio above 1 percent for any entity type and size.

community colleges that are independent to total community college costs, the Department could

compare costs to revenues for these independent community colleges.

Table 52: Cost-to-Revenue Ratios by Entity Type and Size

Type of Government Entity	Size	Average Annualized Cost (Millions) 3% Discount Rate	Average Annualized Cost (Millions) 7% Discount Rate	Annual Revenue (Millions) [a]	Cost-to-Revenue 3% Discount Rate	Cost-to-Revenue 7% Discount Rate
State	Small	N/A	N/A	N/A	N/A	N/A
State	Large	$867	$877	$2,846,972	0.03%	0.03%
County	Small	$20	$21	$65,044	0.03%	0.03%
County	Large	$126	$135	$448,212	0.03%	0.03%
Municipality	Small	$342	$362	$184,539	0.19%	0.20%
Municipality	Large	$100	$108	$524,589	0.02%	0.02%
Township	Small	$244	$257	$55,819	0.46%	0.48%
Township	Large	$8	$9	$12,649	0.07%	0.07%
Special district	N/A	$73	$77	$278,465	0.03%	0.03%
School district [b]	Small	$366	$384	$330,746	0.12%	0.12%
School district [b]	Large	$208	$218	$311,614	0.07%	0.07%
Territory	Small	$0	$0	$1,243	0.02%	0.02%
Territory	Large	$1	$1	$38,871	0.00%	0.00%
Public university [c]	N/A	N/A	N/A	N/A	N/A	N/A
Community college [d]	N/A	$163	$166	$38,445	0.44%	0.45%

[a] U.S. Census Bureau, *2020 State & Local Government Finance Historical Datasets and Tables* (Sept. 2022), https://www.census.gov/data/datasets/2020/econ/local/public-use-datasets.html. Inflated to 2021 dollars using GDP deflator.
[b] Excludes colleges and universities.
[c] Almost all public universities are State-dependent; costs included in the State entity type.
[d] Census of Governments data include revenue numbers only for independent community colleges. The costs included correspond to the proportion of the total number of community colleges that are independent.

4 BENEFITS ANALYSIS

4.1 SUMMARY OF BENEFITS FOR PERSONS WITH AND WITHOUT RELEVANT DISABILITIES

Websites and mobile apps are common resources to access government programs and

services. For example, during a 90-day period in the summer of 2022, there were nearly 5.0

billion visits to Federal Government websites.[126] Aggregate data are unavailable for State and

local government, but based on the analysis in Section 3.3.2, the Department estimates there are

roughly 109,900 State and local government websites, and as shown later in this section, these

websites have 22.8 billion annual visits. Unfortunately, services, programs, and activities that

State and local governments provide online are not always fully accessible to individuals with

disabilities. Compliance with WCAG 2.1 Level AA would increase availability of these

resources to individuals with disabilities and would also result in benefits to individuals without

disabilities because accessible websites incorporate features that benefit all users.

This section considers the benefits of compliance with WCAG 2.1 Level AA to both

individuals with and without disabilities. This section is organized as follows:

- Section 4.2 describes the primary types of disabilities impacted by WCAG 2.1 Level
  AA and provides prevalence rates for each disability type. It also considers how
  individuals without disabilities may benefit.

- Section 4.3 monetizes benefits where applicable. These are predominantly
  associated with time savings. The Department estimates that average annualized
  benefits will total $8.9 billion, using a 7 percent discount rate, and $9.3 billion using
  a 3 percent discount rate.

- Section 4.4 describes additional benefits that could not be quantified.

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[126] analytics.usa.gov. (2022). Retrieved October 13, 2022, from https://analytics.usa.gov/. While this rule will not apply to the Federal Government, this statistic is provided for analogy to show the proliferation of government services offered online.

Table 53: Annual Benefit Once Full Implementation (Millions)

Benefit Type	Visual Disability	Other Relevant Disability [a]	Without Relevant Disabilities	State and Local Gov'ts	Total
Time savings - current users	$549.6	$751.3	$2,858.5	N/A	$4,159.4
Time savings - new users	$222.4	$695.0	N/A	$600.6	$1,518.1
Time savings - mobile apps	$51.5	$70.5	$268.1	N/A	$390.1
Time savings - education	$693.5	$1,205.8	$3,157.8	N/A	$5,057.1
Educational attainment	$7.2	$255.6	N/A	N/A	$262.8
Total benefits	**$1,524.2**	**$2,978.3**	**$6,284.3**	**$600.6**	**$11,387.5**

[a] For purposes of this table, hearing, cognitive, and manual dexterity disabilities are referred to as "other relevant disabilities."

Table 54: 10-Year Average Annualized Benefits, 3 Percent Discount Rate (Millions)

Benefit Type	Visual Disability	Other Relevant Disability [a]	Without Relevant Disabilities	State and Local Gov'ts	Total
Time savings - current users	$463.6	$633.8	$2,411.6	N/A	$3,509.1
Time savings - new users	$187.6	$586.4	N/A	$506.7	$1,280.7
Time savings - mobile apps	$43.5	$59.4	$226.2	N/A	$329.1
Time savings - education	$504.7	$878.8	$2,307.6	N/A	$3,691.1
Educational attainment	$13.8	$492.4	N/A	N/A	$506.2
Total benefits	**$1,213.2**	**$2,650.9**	**$4,945.4**	**$506.7**	**$9,316.3**

[a] For purposes of this table, hearing, cognitive, and manual dexterity disabilities are referred to as "other relevant disabilities."

Table 55: 10-Year Average Annualized Benefits, 7 Percent Discount Rate (Millions)

Benefit Type	Visual Disability	Other Relevant Disability [a]	Without Relevant Disabilities	State and Local Gov'ts	Total
Time savings - current users	$451.4	$617.1	$2,347.7	N/A	$3,416.1
Time savings - new users	$182.7	$570.8	N/A	$493.3	$1,246.8
Time savings - mobile apps	$42.3	$57.9	$220.2	N/A	$320.4
Time savings - education	$478.9	$834.2	$2,191.3	N/A	$3,504.4
Educational attainment	$12.3	$437.2	N/A	N/A	$449.5
Total benefits	**$1,167.6**	**$2,517.1**	**$4,759.1**	**$493.3**	**$8,937.2**

[a] For purposes of this table, hearing, cognitive, and manual dexterity disabilities are referred to as "other relevant disabilities."

Question 14: The Department requests comments, data, and information that could assist in refining the estimated benefits and discussing the unquantified benefits.

4.2 Types of Disabilities Affected by Accessibility Standards

Accessibility standards can benefit individuals with a wide range of disabilities, including vision, hearing, cognitive, speech, and physical disabilities. This section focuses on those with vision, hearing, cognitive, and manual dexterity disabilities because WCAG 2.1 Level AA success criteria more directly benefit people with these disability types.[127] However, the Department would like to emphasize that benefits for other disability types are also important and that excluding those may underestimate benefits. Additionally, disability prevalence rates may underestimate the number of people with a relevant disability due to underreporting. As shown in Section 2.2, the Department estimates that 19.9 percent of adults have a relevant disability for purposes of this analysis.

Table 56 presents prevalence rates for each type of disability. To avoid double counting impacted individuals, the Department also includes cumulative numbers where individuals with multiple qualifying disabilities are counted within the first disability category listed (*e.g.*, if someone has a cognitive and a vision disability, they are included in the vision disability prevalence rate).

The number of individuals with disabilities impacted by this rule may be smaller or larger than the numbers shown here. According to the Pew Research Center, 27 percent of people have a disability.[128] Individuals with temporary disabilities may also be less likely to report a disability than those with permanent disabilities. Conversely, not all of the individuals with

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[127] For example, see https://www.w3.org/WAI/fundamentals/accessibility-intro/. Accessed on 11/30/2022.
[128] Fox, S., & Boyles, J. L. (2012). *Disability in the Digital Age.* Pew Research Center. Retrieved from http://www.pewinternet.org/2012/08/06/disability-in-the-digital-age/.

vision, hearing, cognitive, or manual dexterity disabilities may be impacted by the proposed

rulemaking. For example, "cognitive disabilities" is a broad category and some people with

cognitive disabilities may not experience the same benefits from web accessibility that others do.

Table 57 shows how each of the WCAG 2.1 success criterion relates to these disability

types.[129]

Table 56: Disability Prevalence Counts, SIPP 2021

Disability Type	Prevalence Rate	Number (Millions)	Marginal Prevalence Rate [a]	Marginal Number [a] (Millions)
Vision	4.8%	12.2	4.8%	12.2
Hearing	7.5%	19.0	6.1%	15.3
Cognitive	10.1%	25.5	6.7%	16.9
Manual dexterity	5.7%	14.3	2.3%	5.7
None of the above	80.1%	202.3	80.1%	202.3

Source: U.S. Census Bureau. https://www.census.gov/programs-surveys/sipp/data/datasets/2021-data/2021.html; *see* U.S. Census Bureau, Survey of Income and Program Participation – About this Survey (Aug. 2022), https://www.census.gov/programs-surveys/sipp/about.html.
[a] Individuals with multiple qualifying disabilities are counted within the first disability category listed (*e.g.*, if someone has a cognitive and vision disability, they are included in the vision disability prevalence rate

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[129] The Department uses the SIPP variable "EGRASPD" with the description "Does … have any difficulty using his/her hands and fingers to do things such as picking up a glass or grasping a pencil?" as the best available measure of manual dexterity in the data.

Table 57: WCAG 2.1 Success Criteria and Relevant Disability Types and Populations

Success Criterion	Level	Disability Types [a]	Population (Millions)
1.1.1 Non-text Content	A	V, H	31.1
1.2.1 Prerecorded Audio-only and Video-only	A	V, H	31.1
1.2.2 Captions (Prerecorded)	A	H	19.0
1.2.3 Audio Description or Media Alternative (Prerecorded)	A	V	12.2
1.2.4 Captions (Live)	AA	H	19.0
1.2.5 Audio Description (Prerecorded)	AA	V, C	37.7
1.3.1 Info and Relationships	A	V, H	31.1
1.3.2 Meaningful Sequence	A	V	12.2
1.3.3 Sensory Characteristics	A	V, H	31.1
1.3.4 Orientation	AA	M	14.3
1.3.5 Identify Input Purpose	AA	C	25.5
1.4.1 Use of Color	A	V	12.2
1.4.2 Audio Control	A	V, H	31.1
1.4.3 Contrast (Minimum)	AA	V	12.2
1.4.4 Resize text	AA	V	12.2
1.4.5 Images of Text	AA	V, C	37.7
1.4.10 Reflow	AA	V	12.2
1.4.11 Non-Text Contrast	AA	V	12.2
1.4.12 Text Spacing	AA	V	12.2
1.4.13 Content on Hover or Focus	AA	V	12.2
2.1.1 Keyboard	A	V, M	26.5
2.1.2 No Keyboard Trap	A	V, M	26.5
2.1.4 Character Key Shortcuts	A	V, M	26.5

Success Criterion	Level	Disability Types [a]	Population (Millions)
2.2.1 Timing Adjustable	A	V, H, C, M	71.0
2.2.2 Pause, Stop, Hide	A	C	25.5
2.3.1 Three Flashes or Below Threshold	A	C	25.5
2.4.1 Bypass Blocks	A	V, C, M	52.0
2.4.2 Page Titled	A	V, H, C, M	71.0
2.4.3 Focus Order	A	V, M	26.5
2.4.4 Link Purpose (In Context)	A	V, C, M	52.0
2.4.5 Multiple Ways	AA	V, C	37.7
2.4.6 Headings and Labels	AA	V, C	37.7
2.4.7 Focus Visible	AA	V, C	37.7
2.5.1 Pointer gestures	A	M	14.3
2.5.2 Pointer Cancellation	A	M	14.3
2.5.3 Label in Name	A	V, M	26.5
2.5.4 Motion Actuation	A	M	14.3
3.1.1 Language of Page	A	V, C	37.7
3.1.2 Language of Parts	AA	V, C	37.7
3.2.1 On Focus	A	V, C, M	52.0
3.2.2 On Input	A	V, C	37.7
3.2.3 Consistent Navigation	AA	V, C	37.7
3.2.4 Consistent Identification	AA	V, C	37.7
3.3.1 Error Identification	A	V, C	37.7
3.3.2 Labels or Instructions	A	V, H, C, M	71.0
3.3.3 Error Suggestion	AA	V, C, M	52.0
3.3.4 Error Prevention	AA	V, H, C, M	71.0

Success Criterion	Level	Disability Types [a]	Population (Millions)
4.1.1 Parsing	A	V, H, C, M	71.0
4.1.2 Name, Role, Value	A	V, H	31.1
4.1.3 Status Messages	AA	V	12.2

Source: Web Content Accessibility Guidelines (https://www.w3.org/TR/WCAG21/); AAA excluded from this table.

[a] V= Vision, H= Hearing, C= Cognitive, M= Manual dexterity

4.2.1 Vision disabilities

Individuals who have vision disabilities often confront significant barriers because many websites and apps provide information visually without features that enable screen readers or other assistive technology to retrieve information. Individuals with vision disabilities often rely on changing the presentation of web content into forms that are more usable for their particular needs, such as by enlarging text size and images; customizing settings for fonts, colors, and spacing; listening to text-to-speech synthesis of the content (including audio output provided by screen reader software); listening to audio description of multimedia; or reading text using refreshable Braille. A common barrier to website accessibility is an image or photograph without corresponding text describing the image. A screen reader or similar assistive technology cannot "read" an image, leaving individuals who are blind or have low vision with no way of independently knowing what information the image conveys (*e.g.*, a simple graphic or a complex diagram). Similarly, websites often lack navigational headings or links that would facilitate navigation using a screen reader. Websites may also contain tables with header and row identifiers that display data, but fail to provide associated cells for each header and row so that the table information can be interpreted by a screen reader. Websites and apps that conform to the requirements of WCAG 2.1 address these barriers (see Table 57).

4.2.2 Hearing disabilities

Websites and mobile apps can pose challenges when audio content is not accessible to people with hearing disabilities. People with hearing disabilities often need transcripts and captions of audio content (*e.g.*, podcasts, videos with audio tracks); media players that display captions and provide options to adjust the text size and colors of the captions; options to stop, pause, or adjust the volume of audio content (independently of the system volume); or high-

quality foreground audio that is clearly distinguishable from background noise. The WCAG 2.1 success criteria associated with hearing disabilities are shown in Table 57.

4.2.3 Cognitive disabilities

Individuals with cognitive disabilities could experience difficulties in accessing web content due to difficulties with orientation, attention, memory, abstraction, organizing and planning, experience and management of time, problem solving, language (reading and writing), and calculation.[130] Individuals with cognitive disabilities may use different types of web browsing methods depending on their particular needs. For instance, some individuals, especially those with dyslexia and other print disabilities, use text-to-speech software (*e.g.*, screen readers) to hear information while reading it visually, or use captions to read the information while hearing it. Some individuals may use tools that resize text and increase spacing or customize colors and fonts to assist with reading, or use grammar and spelling tools to assist with writing—these tools are especially helpful to individuals with dyslexia.

4.2.4 Manual dexterity disabilities

Individuals with manual dexterity disabilities may use specialized hardware or software to navigate web content, such as ergonomic or customized keyboards and mouse devices; head pointers, mouth sticks, and other aids to help with typing; on-screen keyboards with trackballs, joysticks, and switches to operate them; or voice recognition, eye tracking, and other approaches for hands-free interaction. Individuals with manual dexterity disabilities may need more time to type, click, or carry out other interactions, and they might type single keystrokes in sequence rather than typing simultaneous keystrokes to activate commands. This includes commands for

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[130] Borg, J., Lantz, A., & Gulliksen, J. (2014, April 19). Accessibility to Electronic Communication for People with Cognitive Disabilities: A Systematic Search and Review of Empirical Evidence. *Universal Access in the Information Society, 14*, 547–562.

special characters, shortcut keys, or to activate menu items. Other key design aspects include providing visible indicators of where the keyboard is currently focused, and mechanisms to skip over blocks of text or other content, such as over page headers or navigation bars.

4.2.5 Persons without disabilities

Accessibility can also produce significant benefits for individuals without disabilities. For instance, many individuals without disabilities enjoy the benefits of physical accessibility features currently required under the ADA. For example, curb cuts, ramps, and doors with accessible features can be helpful when pushing strollers or dollies. In the web context, experts have recognized that accessible websites are generally better organized and easier to use even for persons without disabilities.[131] In addition, there are other benefits in the web context, such as the availability of live-captioning, which can improve access for persons with limited English proficiency and individuals in loud environments. This can result in benefits to the general public. At this time, the Department does not have any evidence that indicates that accessibility features negatively affect some users resulting in disbenefits.

Companions[132] may also benefit from this proposed rulemaking because they will not need to spend as much time assisting with activities that an individual with a disability can now perform on their own. Companions can then spend this time assisting with other tasks or engaging in other activities. Estimates on the number of companions vary based on definitions, but according to the AARP, there are 53 million "unpaid caregivers" in the United States.[133]

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[131] *See*, for example, W3C Web Accessibility Initiative. (2018, November 9). *Developing a Web Accessibility Business Case for Your Organization*. (S. Rush, Editor) Retrieved from http://www.w3.org/WAI/bcase/Overview.
[132] A companion may refer to a family member, friend, caregiver, or anyone else providing assistance.

[133] AARP. (2020), Caregiving in the U.S. https://www.aarp.org/ppi/info-2020/caregiving-in-the-united-states html. The term "unpaid caregiver" as used in the AARP report is comparable to this analysis' use of the term companion to refer to family members, friends, caregivers, or anyone else providing assistance.

This number includes companions to those with disabilities other than disabilities applicable to web accessibility. There are also 4.7 million direct care workers in the United States.[134] Benefits to companions are not quantified, but they are discussed further in section 4.4.

The population of persons without disabilities is derived as the remainder of the population once individuals with the four disabilities discussed above are removed. The Department estimates that there are 202.3 million Americans without one of the four disabilities considered above.

4.3 MONETIZED BENEFITS

The Department monetized five benefits of accessible public entity websites and mobile apps (Figure 1). The values presented in Sections 0 through 4.3.8 are annual benefits once the rule is fully implemented and benefits fully accrue. The timing of these benefits is discussed in Section 4.3.9. The five benefits include:

- Time savings for current users of State and local government websites ($4.2 billion per year),
- Time savings for those who switch modes of access (*i.e.*, switch from other modes such as phone or mail to web) or begin to participate (did not previously partake in the government's service, program, or activity) ($917.4 million per year),
- Time savings for current mobile app users ($390.1 million per year),
- Time savings for students and parents ($5.1 billion per year), and
- Earnings from additional educational attainment ($262.8 million per year).[135]

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[134] PHI. (2023). Key Facts & FAQ: Understanding the Direct Care Workforce. https://www.phinational.org/policy-research/key-facts-faq/.
[135] Even after the implementation period, the size of the annual benefit increases over time as more cohorts graduate with additional educational attainment. $262.8 million represents the annual benefit to one graduating class.

All five types of benefits are applicable for those with a disability. For individuals without a relevant disability, benefits are limited to time savings for current users of State and local government websites, current users of mobile apps, and educational time savings. For State and local governments, monetized benefits include time savings from reduced contacts (*i.e.*, fewer interactions assisting residents). This section is organized by benefit type. After calculating current benefit levels for each benefit type, the Department projects benefits over a 10-year period and takes into consideration the implementation period. The Department then presents sensitivity analyses and benefits for regulatory alternatives.

There are many additional benefits of accessible websites and mobile apps, but data were not available to monetize these additional benefits. Therefore, they are addressed qualitatively in Section 4.4.

In total, the Department estimated benefits of $8.9 billion per year on an average annualized basis, using a 7 percent discount rate. On a per capita basis, this equates to $35 per adult in the United States.[136]

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[136] Census Bureau estimates 257.9 million adults in the United States in 2020. U.S. Census Bureau. (2022, March 10). *National Demographic Analysis Tables: 2020*. Retrieved from
https://www.census.gov/data/tables/2020/demo/popest/2020-demographic-analysis-tables.html.

Figure 1: Flow Diagram Summarizing Beneficiaries and Benefit Components

Time savings for current website users	Time savings for switched modes of access	Time savings for mobile app users	Time savings for students and parents	Increased earnings from greater educational attainment
Vision disability	Vision disability	Vision disability	Vision disability	Vision disability
Hearing, cognitive, or manual dexterity disabilities	Hearing, cognitive, or manual dexterity disabilities	Hearing, cognitive, or manual dexterity disabilities	Hearing, cognitive, or manual dexterity disabilities	Hearing, cognitive, or manual dexterity disabilities
Without disabilities or other disabilities	State and local government	Without disabilities or other disabilities	Without disabilities or other disabilities	

4.3.1 Benefits literature review

The Department conducted a literature review on the benefits of website accessibility in developing a methodology. The primary quantitative outcomes considered in the literature are changes in task completion rates and task completion time. Other outcomes include usability, satisfaction, mood, emotional state, number of user problems, subjective aesthetics rating, and user experience. The benefits estimates in this proposed rulemaking rely on time savings estimates from Schmutz et al. (2017).[137] The Department believes this is the most applicable and reliable paper and that time savings is the outcome most easily monetized.

The Department identified nine papers that quantify changes in task completion time based on varying the level of website accessibility. These papers are summarized in Table 58.

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[137] Schmutz, S., Sonderegger, A., & Sauer, J. (2017). Implementing Recommendations from Web Accessibility Guidelines: A Comparative Study of Nondisabled Users and Users with Visual Impairments. *Human Factors*, *59*(6), 956–972. https://doi.org/10.1177/0018720817708397.

All papers the Department identified are based on experiments and tend to have small sample sizes. Schmutz et al. (2017) has one of the larger sample sizes of 110 participants (55 with a vision impairment and 55 without a vision impairment).

Out of the nine studies the Department reviewed, eight studies generally found that accessible websites led to time reductions. Schmutz et al. (2017) found that accessible websites led to time reductions of 24 percent for individuals with vision disabilities and 21 percent for individuals without vision disabilities. Schmutz et al. (2017) is the Department's preferred paper of the studies the Department reviewed, because Schmutz et al. (2017) is peer-reviewed, the results are consistent with nearly all of the other studies reviewed in identifying significant time savings from increased accessibility, the sample size is on the larger side, it utilizes government websites, the results are generally consistent with the rest of the literature but bounded by results in other papers (ensuring the results are not outliers), it provides findings for both those with and without vision disabilities, and the experiment was conducted in person with a moderator. Griffith et al. (2023) is another recent study that showed a statistically significant time reduction of 52 percent for users with vision disabilities.[138] That study also used WCAG 2.1, which is the standard used in this proposed rule. However, because a 52 percent time reduction was in the upper bound of studies the Department reviewed, the Department believes it is prudent to use Schmutz et al. (2017), which falls within the middle of the range of studies' findings. The other studies that found time reductions with accessible websites reported reductions of 6 percent, 10 percent, 12 percent, 15 percent, 31 percent, 34 percent (twice), and 57 percent, as shown with more detail in Table 58. Across all studies, when users with vison disabilities interacted with

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[138] Griffith, M., Wentz, B., and Lazar, J. (2023). *Quantifying the Cost of Web Accessibility Barriers for Blind Users*. Interacting with Computers, 34(6), 137–149. https://doi.org/10.1093/iwc/iwad004.

accessible websites, their change in task completion time ranged from an increase of 27 percent (but not statistically significant, so it cannot be distinguished from zero) to a decrease of 57 percent. Schmutz et al.'s finding of a decrease of 24 percent is near the middle of this range.

The Department believes the Vollenwyder et al. (2023)[139] study, which is the only study of the nine studies reviewed that found an increase in time associated with accessible websites, albeit not a statistically significant estimate, is an outlier. The Department believes reliance on this study is inappropriate, not only because the study's findings are an outlier, but also because of methodology concerns. The Department noted that the authors of Vollenwyder et al. (2023) excluded unsuccessful tasks from the time completed calculation. Participants who submit the wrong answer may tend to spend longer than participants who submit the correct answer. Removing these participants negatively biases the mean completion time. Given that there are lower completion rates for the low-conformance site, the bias would be larger for the low-conformance site. This would explain why less time is spent on low-conformance sites, which contradicts theory, anecdotal evidence, and the rest of empirical literature. Furthermore, the Vollenwyder et al. (2023) study describes a data cleaning procedure that removed 36 participants (21.6 percent of the sample) due to detectable noncompliance. The authors describe one participant who "declared that they did not answer the study seriously and that their data should not be used for the main analysis." The high rate of detectable noncompliance suggests poorly controlled experimental conditions compared to other studies that incorporated participant monitoring into the experimental design. Undetected instances of noncompliance, which may be substantial in the Vollenwyder et al. study considering the lack of monitoring, would reduce the

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[139] Vollenwyder, B., Petralito, S., Iten, G., Brühlmann, F., Opwis, K., and Mekler, E. (2023). How Compliance with Web Accessibility Standards Shapes the Experiences of Users with and without Disabilities. International Journal of Human-Computer Studies, 170.
https://www.sciencedirect.com/science/article/pii/S1071581922001756?via%3Dihub.

study's external validity. In addition, as a separate matter, poorer compliance rates are associated with greater risk of compliance bias, which arises when compliant participants differ substantially from non-compliant participants. Considering these reasons, the Department chose not to rely on the Vollenwyder et al. (2023) study.

Finally, for users without a disability or without a vision impairment (depending on the paper), time savings range from 0 percent to 31 percent. Schmutz et al.'s finding of a decrease of 21 percent is within this range, although on the upper end and is not statistically significant. The Department used this 21 percent reduction for users with non-vision disabilities. However, because of concerns about the precision of this estimate, the Department reduced this to a 10 percent reduction in time for those without disabilities, which is on the lower end of the range. Additionally, this smaller effect is more consistent with the Schmutz et al. (2016)'s statistically significant finding of a 14.5 percent time savings for non-visually impaired users.[140]

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[140] Schmutz, S., Sonderegger, A., & Sauer, J. (2016). Implementing Recommendations from Web Accessibility Guidelines: Would They Also Provide Benefits to Nondisabled Users. Human Factors, 58, 611–629. https://pubmed.ncbi nlm nih.gov/27044605/.

Table 58: Literature on Website Accessibility Time Savings

Short Citation	Disability Type	Sample Size	Web Standards	Country	Time Reduction (With Impairment)	Time Reduction (Without Impairment)
DRC (2004) [a]	Vision	Not Reported	Not Reported	UK	34%	31%
Griffith et al. (2023) [b]	Vision	40 (all impaired)	WCAG 2.1	US	52%***	N/A
Pascual et al. (2014) [c]	Vision	13 (9 impaired)	WCAG 2.0: NA, A	Spain	57% (low vision) 10% (blind)	6%
Pascual et al. (2015a) [d]	Hearing	14 (all impaired)	None	Spain	Varies by barrier and experience	N/A
Pascual et al. (2015b) [e]	Motor and Dexterity	8 (all impaired)	WCAG 2.0: NA, A	Spain	34%	N/A
Schmutz et al. (2016) [f]	None	61	WCAG 2.0: NA, A, AA	Switzerland	N/A	15%** (from NA to AA)
Schmutz et al. (2017) [g]	Vision	110 (55 impaired)	WCAG 2.0: NA, A, AA	Switzerland, Germany, Austria	24%*** (from NA to AA)	21% (from NA to AA)
Schmutz et al. (2018) [h]	None	110	WCAG 2.0: NA, AA	Switzerland	N/A	12%**
Vollenwyder et al. (2023) [i]	Vision	131 (66 impaired)	WCAG 2.0: NA, AA	Switzerland	-27%	0%

Note: Asterisks indicate level of statistical significance: *** = 99 percent, ** = 95 percent, * = 90 percent. No indication means not significant or not reported. Although the Department used the term "impairment" in this table and in several places in this analysis because this is the term generally used in the studies, the Department typically uses the term "people with disabilities" or "individuals with disabilities" in our rulemaking.

[a] Disability Rights Commission. (2004). The Web: Access and Inclusion for Disabled People. https://www.city.ac.uk/__data/assets/pdf_file/0004/72670/DRC_Report.pdf.

[b] Griffith, M., Wentz, B., and Lazar, J. (2023). *Quantifying the Cost of Web Accessibility Barriers for Blind Users*. Interacting with Computers, 34(6), 137–149. https://doi.org/10.1093/iwc/iwad004.

[c] Pascual, A., Ribera, M., Granollers, T., and Coiduras, J. (2014). *Impact of Accessibility Barriers on the Mood of Blind, Low-Vision and Sighted Users,* Procedia Computer Science, 27, 431–440. https://www.sciencedirect.com/science/article/pii/S1877050914000490.

[d] Pascual, A., Ribera, M., Granollers, T. (2015a). Impact of web accessibility barriers on users with hearing impairment. In: Interacción 2014: Proceedings of the XV International Conference on Human Computer Interaction. pp. 1–2. http://dx.doi.org/10.1145/2662253.2662261.

[e] Pascual, A., Ribera, M., Granollers, T. (2015b). Impact of Accessibility Barriers on the Mood of Users with Motor and Dexterity Impairments. J. Access. Des. All 1–27. http://dx.doi.org/10.17411/jacces.v5i1.93.

[f] Schmutz, S., Sonderegger, A., & Sauer, J. (2016). Implementing Recommendations from Web Accessibility Guidelines: Would They Also Provide Benefits to Nondisabled Users. Human Factors, 58, 611–629. https://pubmed.ncbi.nlm.nih.gov/27044605/.

[g] Schmutz, S., Sonderegger, A., & Sauer, J. (2017). Implementing Recommendations from Web Accessibility Guidelines: A Comparative Study of Nondisabled Users and Users with Visual Impairments, Human Factors, 59, 956–972. https://pubmed.ncbi.nlm.nih.gov/28467134/.

[h] Schmutz, S., Sonderegger, A., & Sauer, J. (2018). Effects of Accessible Website Design on Nondisabled Users: Age and Device as Moderating Factors, Ergonomics, 61(5), 697–709. https://www.tandfonline.com/doi/abs/10.1080/00140139.2017.1405080?journalCode=terg20.

[i] Vollenwyder, B., Petralito, S., Iten, G., Brühlmann, F., Opwis, K., and Mekler, E. (2023). How Compliance with Web Accessibility Standards Shapes the Experiences of Users with and without Disabilities. International Journal of Human-Computer Studies, 170. https://www.sciencedirect.com/science/article/pii/S1071581922001756?via%3Dihub.

4.3.2 Time savings for current users of State and local government websites

As discussed above, Schmutz et al. (2017) found that the task completion time for individuals with impaired eyesight decreased by about 24 percent when using a "high conformance to WCAG 2.0" website compared with a "very low conformance to WCAG 2.0." They also estimate a 21 percent decrease in time to complete tasks for individuals with unimpaired eyesight. These two estimates are the basis for the Department's time savings estimates.

To monetize these benefits, the Department used the following five-step process:

1. Gather website traffic data on the number of visits to and the average time spent on State and local government websites.

2. Determine the share of government website visits conducted by individuals with vision disabilities; with hearing, cognitive, or manual dexterity disabilities; and without disabilities.

3. Determine the amount of time spent on a website for each group of individuals.

4. Determine the amount of time saved by applying findings from Schmutz et al. (2017) for persons with vision disabilities and without vision disabilities.

5. Monetize the time savings using an hourly wage rate.

Step 1: Gather website traffic data

The Department gathered website traffic data on the number of visits to and the average time spent on public entities' websites using SEMRUSH[141] and a sample of 452 State and local government websites (see section 3.3.2 for how this sample was derived).[142] Across all entity

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[141] For information on this application see https://www.semrush.com/features/.
[142] SEMRUSH does not provide data for some websites, primarily less visited websites. These are assigned visit and time estimates of zero. This will underestimate benefits. A sensitivity analysis excludes these from the averages to provide a high estimate of benefits.

types, the average website had 37,000 views in September 2022 (the most recent data available), and the average time spent on the website was 4.3 minutes. The number of website visits was adjusted by multiplying by 0.577 to remove potential visits by bots.[143] The Department did not adjust the average amount of time spent on a website to reflect traffic from bots, but because these tend to spend less time than a human, the average time estimate used in this analysis is likely an underestimate. Extrapolating to the Department's estimate of the total number of State and local government websites (96,584), the Department found that there were 22.8 billion annual visits (Table 60).[144] This excludes the 13,309 secondary websites for postsecondary schools because these websites were not included in the sampling methodology (see Section 3.5.1).

Step 2: Determine the share of government website visits conducted by each group of individuals

The Department determined the share of government website visits conducted by each of the three relevant groups as follows. As shown in Section 4.2, 4.8 percent of adults have a vision disability, 15 percent have a hearing, cognitive, or manual dexterity disability (but not a vision disability), and 80.1 percent have none of these disabilities. However, the Department cannot directly apply these proportions because individuals with disabilities are less likely to use the internet.[145] Therefore, the Department adjusted the website visitation proportions by incorporating the internet usage rates. A 2011 Pew Report,[146, 147] found that 54 percent of persons with disabilities use the internet, as opposed to 81 percent of the public at large (Table

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[143] Statista. (2022). *Distribution of bot and human web traffic worldwide from 2014 to 2021.* Retrieved from https://www.statista.com/statistics/1264226/human-and-bot-web-traffic-share/.

[144] Data for September may not be representative of all months, but this is the only data readily available.

[145] Fox, S. (2011). *Americans Living with Disability and Their Technology Profile.* Pew Research Center. Retrieved from http://www.pewinternet.org/2011/01/21/americans-living-with-disability-and-their-technology-profile/.

[146] *Id.*

[147] This reference is dated but more recent estimates are not available.

59). From this and disability prevalence rates, the Department calculated the population of

individuals using the internet, broken down by individuals with vision disabilities, individuals

with other disabilities, and individuals with none of these disabilities. The Department applied

these proportions to the total number of annual visits to State and local websites to estimate the

number of website visits by persons with each disability status.

Table 59: Disaggregating Total Website Visits Among Beneficiary Types

Variable	Vision Disability	Hearing, Cognitive, or Manual Dexterity Disability [a]	Without Disability
Internet usage rate (PEW 2011)	54%	54%	81%
Disability prevalence rate (SIPP 2021)	5%	15%	80%
Share of visits	3%	11%	86%
Total annual visits (millions)	784	2,450	19,579

[a] If the individual also has a vision disability, they are included there.

Step 3: Determine the amount of time spent on a website for each group of individuals

The Department assumed that the average time spent on a website (4.3 minutes), as

estimated by SEMRUSH, is applicable to the group of individuals without disabilities. Schmutz

et al. (2017) found that individuals with disabilities spend on average twice as long to complete a

task on a website as individuals without a disability. Therefore, the Department assumes that

individuals with disabilities spend on average 8.6 minutes of time on an applicable website.

Step 4: Determine the amount of time saved by applying findings from Schmutz et al. (2017)

Schmutz et al. (2017) found that the task completion time for individuals with impaired

eyesight decreased by about 24 percent when using a "high conformance to WCAG 2.0" website

compared with a "very low conformance to WCAG 2.0." They also estimate a 21 percent

decrease in time to complete tasks for individuals with unimpaired eyesight. Schmutz et al.

(2017) only considered time savings for those with and without impaired eyesight and no other estimates of time savings are available for other disabilities in the peer-reviewed literature. Therefore, the Department used the time savings for individuals with unimpaired eyesight (21 percent) to quantify benefits for individuals with hearing, cognitive, or manual dexterity disabilities. The Department used a lower 10 percent time savings for individuals without disabilities, rather than the full 21 percent.

Schmutz et al. (2017) assessed time savings associated with WCAG 2.0. No literature was identified assessing time savings for the additional success criteria in WCAG 2.1. Therefore, the Department has used the findings for WCAG 2.0. Time savings associated with WCAG 2.1 should be larger than the time savings under 2.0 because WCAG 2.1 includes all of the WCAG 2.0 success criteria, in addition to success criteria that were developed under WCAG 2.1. Therefore, Schmutz et al. (2017) is still relevant, and the use of these estimates may result in an underestimate of benefits.

Conversely, benefits may be overestimated in some respects because the websites of some State and local governments may be more accessible than the baseline of "very low" used in Schmutz et al. (2017). However, the Department believes this is likely not a significant overestimate, if at all, given the numerous accessibility errors found on State and local government websites through the compliance assessment discussed in Section 3.3. Additionally, the literature has found government websites to have accessibility issues.[148] However, to the degree that some websites are more accessible than the baseline in the Schmutz et al. (2017) estimates, the benefit estimation could be biased upwards.

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[148] Johnson, A., & Castro, D. (2021, June 3). *Improving Accessibility of Federal Government Websites*. Retrieved from Information Technology & Innovation Foundation: https://itif.org/publications/2021/06/03/improving-accessibility-federal-government-websites/.

Step 5: Monetize the time savings using an hourly rate

To monetize the value of these time savings, the Department needed to place a monetary value on non-work time, and therefore the Department assumed the value of leisure time is equivalent to the post-tax value of compensation.[149] Using data from the Bureau of Labor Statistics' (BLS') Occupational Employment and Wage Survey (OEWS), median hourly wage rates in May 2021 were $22.[150] According to the Census Bureau, the tax rate for the median household is 8 percent.[151, 152] Therefore, post-tax hourly earnings are $20.34. Table 60 presents the calculations performed. The Department estimates that benefits to current website users, post implementation, total $4.2 billion per year.

Table 60: Time Savings Calculation for Current Website Users

Variable	Vision Disability	Hearing, Cognitive, or Manual Dexterity Disability [a]	Without Disability
Average minutes spent on a website [b]	8.6	4.3	4.3
Percent reduction in time spent	24%	21%	10%
Total annual visits (millions)	784	2,450	19,579
Hours saved annually (millions)	27	37	141
Value of an hour of non-labor time	$20.34	$20.34	$20.34
Benefits (millions)	$549.6	$751.3	$2,858.5

[a] If the individual also has a vision disability, they are included there.
[b] Based on the SEMRUSH data, the average website visit length of 4.3 minutes. For simplicity, the Department assumed the average time spent by persons without a vision disability is the same as the total average (*i.e.*, 4.3 minutes). For persons with vision disabilities, the time was double to 8.6 minutes per Schmutz et al. (2017) findings.

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[149] Department of Justice guidance was unavailable, so the Department used guidance from a different agency that frequently engages in rulemakings. Department of Health and Human Services. (2016). *Guidelines for Regulatory Impact Analyses.* Retrieved from https://aspe.hhs.gov/reports/guidelines-regulatory-impact-analysis.
[150] U.S. Bureau of Labor Statistics. (2022, March 31). *May 2021 National Occupational Employment and Wage Estimates United States.* Retrieved from https://www.bls.gov/oes/current/oes_nat htm#00-0000.
[151] Shrider, E. A., Kollar, M., Chen, F., & Semega, J. (2021, September). Income and Poverty in the United States: 2020. *U.S. Census Bureau, Current Population Reports*, 60-273. Washington, D.C.: U.S. Government Publishing Office. Retrieved from https://www.census.gov/library/publications/2021/demo/p60-273.html.
[152] "Post-tax income is defined as money income net of federal and state income taxes and credits, payroll taxes (FICA), and economic impact payments (EIP)."

*Question 15: The Department requests comment on refinement of this analysis, including whether the time savings estimate is appropriate for all time spent on government websites (*e.g.*, how is time on government websites spent, and is it primarily to complete tasks?).*

4.3.3 Time savings for new users of State and local government websites

As web accessibility increases, some individuals with disabilities who previously did not access government services, programs, or activities will benefit. This includes:

- Mode switchers who accessed government services, programs, and activities via a method other than the web (*e.g.*, the phone, mail, in person, or with assistance from a companion[153]) and will now complete these tasks independently on government websites. These users will experience time savings because completing an action online is generally less time-consuming than alternative methods.[154]

- Those who previously abstained from using government services, programs, or activities due to difficulties with accessibility and will now partake in these services, programs, and activities via websites. These users will benefit from increased participation.

The Department assumed that once a website is accessible, individuals with disabilities would access the website at the same rate as individuals without disabilities. Earlier in this analysis (Section 0), when estimating benefits to current website users, the Department incorporated literature finding that 54 percent of persons with disabilities use the web, compared to 81 percent of the public at large.[155] Consequently, website visits were adjusted to reflect

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[153] A companion may refer to a family member, friend, caregiver, or anyone else providing assistance.
[154] Time savings for companions who helped individuals with disabilities to use inaccessible State or local government websites is discussed in Section 4.4.4.
[155] Fox, S. (2011). *Americans Living with Disability and Their Technology Profile.* Pew Research Center. Retrieved from http://www.pewinternet.org/2011/01/21/americans-living-with-disability-and-their-technology-profile/.

lower visitation rates by individuals with disabilities. Here, the Department considers the

differential of 27 percentage points (81 percent minus 54 percent) to estimate the number of

individuals with disabilities who switch from another mode to accessing government services,

programs, and activities online. This equates to 3.3 million new web users with vision

disabilities and 10.3 million new web users with hearing, cognitive, or manual dexterity

disabilities.

The Department could not identify data to disaggregate these new users between mode

switchers and those who previously abstained from using government services, programs, or

activities abstainers. Therefore, the Department has treated all 13.5 million new users as mode

switchers. The Department believes these individuals are probably more common than

abstainers because many government services, programs, and activities are hard to abstain from,

such as paying taxes. Additionally, the Department believes the benefit to new participants

should be as large or greater than mode switchers and consequently modeling all benefits as

stemming from switching modes would underestimate benefits.

The Department estimated the difference in time spent between completing these tasks on

government websites and alternative methods (*e.g.*, phone, mail, in person, or help from a

companion), and then monetized that time. Little data were identified to estimate time savings

per transaction, the distribution of these alternative methods, or the number of transactions

performed per year. Therefore, the Department had to make assumptions based on its best

professional judgment. The Department welcomes the public's input on these assumptions, and

in particular any applicable supporting data.

The Department uniformly distributed new website users across four previous modes:

phone, mail, in person, and assistance from a companion. In other words, 25 percent of new

users were assigned to each method (Table 61). The Department assumed using an accessible

website would save 10 minutes on average compared to phone, and five minutes on average

compared to mail or companion assistance. Time savings for in-person visits were estimated to

be 80 minutes. This results in an average time savings of 25 minutes per transaction. One

survey from the European Union found that the average time savings was 69 minutes for each

online transaction, compared to more traditional media.[156] However, this survey focused on only

a few types of transactions, which may be more time intensive than average.[157]

Table 61: Time Savings per Contact Method

Prior Method	Distribution	Time Savings (Minutes per Transaction)
Phone	25%	10
Mail	25%	5
In-person	25%	80
Assistance from companion [a]	25%	5
Average	100%	25

[a] Only time savings for the individual with disabilities is considered here. Potential time to travel to the companion is not included. Companions include caregivers, family, and friends.

Time savings for phone calls generally stem from wait time. Although it may be possible

to multitask while waiting on hold, this is not always possible, or the secondary task cannot

always be completed as productively. Phone calls also may take more time because it often

takes extra time to relay information verbally than to enter it on a website, and the government

official may need to spend time accessing applicable information. Mailing information also

takes more time than via the web because most persons can type faster than they can write by

hand, and because you need to assemble and mail the letter. Additionally, sometimes, one may

[156] Ramboll Management. (2004). *User Satisfaction and Usage Survey of e-Government Services*. Retrieved from http://www.cisco.at/pdfs/publicsector/egov_service-survey_02-05.pdf.
[157] These include reporting personal income tax returns; reporting business VAT returns; registering a new business; submitting a proposal for a public procurement; searching a public library catalogue; and enrollment in higher education.

need to call first to request the form be sent to them via mail. Replacing mail with website usage also results in a benefit to users from removing the wait time for the letter to be received and processed.

In-person visits are likely the largest source of time savings for mode switchers. In-person visits require travel time and wait times. Depending on where the individual lives and the type of service the individual is seeking, travel times can vary and potentially be substantial. In addition to time savings, those who no longer visit an office in person will save on travel costs such as gas and parking, not quantified here. The Department has assumed an average of 80 minutes per in-person transaction. As a conceptual example, this could equate to 25 minutes to travel to the location; 20 minutes to park, walk to/from the office, and wait for the appointment, 10 additional minutes of appointment duration time (*i.e.*, the additional time it takes for an in-person appointment compared to conducting the activity on a website), and 25 minutes to travel home. Individuals with certain types of disabilities may also require someone else to drive them, and that other time is not considered here.[158]

Lastly, some individuals may have companions assist them with completing the activity online. This requires additional time to meet with the person providing assistance and explain the required task. The Department has only included five minutes here for the participant with a disability's time. This does not include the assistant's time, or time for one party to travel to the other, which could be substantial.

The Department assumed 8 transactions per year based on its best professional judgment, for a time savings of 3.3 hours per person per year (8 transactions multiplied by 25 minutes per

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[158] For example, individuals with vision disabilities may be less likely to visit offices in person than individuals with other disabilities due to driving restrictions. However, if they visit in person, their time savings may be larger due to greater use of public transportation and more time to find the office.

transaction, from Table 61). To test the assumption on the number of transactions per year, the

Department asked an analyst not involved with this estimation to provide a separate assessment,

and the analyst concurred with this assumption, noting that although it is reasonable, it may

underestimate transactions. Multiplying this time savings by the 13.5 million new website users

results in 45.1 hours saved per year.[159] As was done for current website users, the value of an

hour of time was estimated to be $20.34. Therefore, total benefits equal $222.4 million for

individuals with vision disabilities, $695.0 for individuals with hearing, cognitive, or manual

dexterity disabilities, or $917.4 million in total (Table 62). The Department assumes benefits

would remain constant over time but, as noted elsewhere in this RIA, requests comments on

trends that may facilitate refinement of year-by-year estimates.

Table 62: Time Savings Calculation for New Website Users

Variable	Vision Disability	Hearing, Cognitive, or Manual Dexterity Disability [a]
Adult population (millions)	12.2	38.0
Increased share using websites (PEW 2011)	27%	27%
New users (millions)	3.3	10.3
Transactions per person per year	8.0	8.0
Average hours saved per person	3.3	3.3
Hours saved annually (millions)	10.9	34.2
Value of an hour of non-labor time	$20.34	$20.34
Benefits (millions)	$222.4	$695.0

[a] If the individual also has a vision disability, they are included there.

Question 16: To estimate benefits to mode switchers, the Department estimated the

difference in time spent between completing these tasks on government websites and alternative

methods (phone, mail, in person, or help from companions). The Department had to make

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[159] Because 3.3 hours and 13.5 million are rounded, multiplying these two values does not equal the 45.1 million calculated when the calculation is performed with unrounded values.

assumptions based on its best professional judgment. The Department requests comments and data on the appropriateness of these assumptions.

4.3.4 Cost savings to governments from reduced contacts

As discussed in Section 4.3.3, improved website accessibility will lead some individuals who accessed government services via the phone, mail, or in person to begin using the public entity's website to complete the task. This will generate time savings for government employees who would have assisted those individuals. As explained above, there are an estimated 13.5 million new users. Also explained above, the Department assumed that 75 percent of transactions by new website users were previously conducted via the phone, mail, or in person visits (Table 61); this excludes the 25 percent who have a companion assist them to use the website. Therefore, the Department assumes for each new user, there are 6 fewer transactions that require government personnel's time (8 total annual transactions multiplied by 75 percent) (Table 63).

Table 63: Time Savings Calculation for Government Entities

Variable	Number
Increased share using websites (PEW 2011)	27%
Persons with disabilities (millions)	50.1
New website users (millions)	13.5
Transactions per person per year	8.0
Share of transactions via phone, mail, or in-person	75%
Relevant transactions per person per year	6.0
Minutes saved per transaction	10.0
Hours saved per person with disabilities	1.0
Hours saved (millions)	13.5
Value of an hour of labor time	$44.38
Benefits (millions)	$600.6

The time savings from the government's perspective are different than from the individual's perspective. The Department assumed using an accessible website would save the government 10 minutes on average across all modes. This estimation takes into account various time savings

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for different modes. For phone calls, this reflects the average length of a call.[160] For mailings,

this reflects time to open the letter and key in the pertinent information to the computer program.

For in-person visits, it reflects the average length of an appointment. These numbers are based

on best professional judgment only and are hence imprecise.

This time was valued at $44.38 per hour, which reflects the loaded median hourly wage rate

for government employees in Office and Administrative Support Occupations (base wage rate

multiplied by two to account for benefits and overhead).[161] Multiplying these time estimates by

the number of avoided transactions, and the loaded hourly wage rate, the Department calculated

that time savings to governments would total $600.6 million.

Question 17: The Department assumed using an accessible website would save 10 minutes

on average, across all users and all modes. The Department requests data to assist in

quantifying this time estimate.

4.3.5 Time savings to mobile app users

Very little data is available on the benefits of accessible mobile apps. The Department

assumed that a major benefit is time savings, but the amount of time spent on government mobile

apps and the time savings from greater accessibility are unknown. The Department made some

assumptions to try to understand the potential magnitude of these benefits. First, the Department

assumed time savings from greater mobile app accessibility is the same as for websites: 24

percent for individuals with vision disabilities and 21 percent for individuals with other

disabilities, and 10 percent for individuals without disabilities. Time savings could be smaller or

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[160] A study published by Cornell University found that average call-handling time per customer ranged between 4.7 and 8.8 minutes depending on the industry. Public entities were included in the sample, but average handling time was not reported specifically for public entities. Batt, R., Doellgast, V., & Kwon, H. (2005-2006). *U.S. Call Center Industry Report 2004 National Benchmarking Report Strategy, HR Practices & Performance.* Cornell University, School of Industrial and Labor Relations. Working Paper 05 – 06.

[161] U.S. Bureau of Labor Statistics. (2022, March 31). *May 2021 National Industry-Specific Occupational Employment and Wage Estimates*. Retrieved from https://www.bls.gov/oes/current/naics2_99 htm#43-0000.

larger, but without additional data, the Department believes this is the most appropriate assumption.

Second, the Department needed an estimate of the amount of time spent on State and local government mobile apps. These data are not available, so the Department assumed the amount of time spent on State and local government mobile apps is on average the same as the amount of time spent on State and local government websites. For the compliance cost assessment, the Department estimated the number of State and local government websites and mobile apps and found a ratio of 0.09 apps per website. Therefore, benefits for current users of mobile apps are 9 percent of benefits for current users of government websites, or $390.1 million.

Similar to its approach in assessing costs of mobile app accessibility, the Department did not calculate the benefits accruing from external mobile apps. These third-party apps were excluded from the cost analysis because the Department was unable to find existing data or literature on the subject. However, as noted above, State or local governments that rely on external mobile apps to provide services, programs, and activities to the public will nonetheless need to ensure these apps are accessible, such as through procurement procedures. Thus, this benefits estimation could result in an underestimate of the benefits accruing from external mobile apps becoming accessible to the public, or otherwise being provided to the public in an accessible manner.

Question 18: Very little data is available on the benefits of accessible mobile apps. The Department made some assumptions to try to understand the potential magnitude of these benefits. The Department requests comments on these assumptions and data that could help guide this calculation. For example, how many people use State and local government mobile apps? How much time is spent on these apps?

4.3.6 Time savings for higher-education students

As a result of the rule, there will be a time savings benefit for higher-education students accessing remediated course content. Schmutz et al. (2017) estimated that high compliance with WCAG 2.0 standards is associated with a 24 percent time savings for users with vision disabilities and 21 percent time savings for other users when compared to low compliance with WCAG 2.0 standards. The Department used these estimates as a basis to calculate time savings for students benefiting from increased conformance to WCAG 2.1 Level AA. The Department used 24 percent for individuals with vision disabilities, 21 percent for individuals with hearing, cognitive, or manual dexterity disabilities, and 10 percent for individuals without disabilities. As discussed above, literature specific to WCAG 2.1 is not available, but because WCAG 2.1 incorporates the standards in WCAG 2.0, this should result in an underestimate of benefits.

The Department began by estimating the number of postsecondary students (both undergraduate and graduate) with disabilities. The Department used SIPP data to estimate disability prevalence rates for college-age individuals,[162] and data from the National Center of Education Statistics (NCES) for information on student populations at public universities and community colleges.[163] There are an estimated 13.7 million higher-education students in the U.S, roughly 12 percent of whom have a vision, hearing, cognitive, or manual dexterity disabilities (Table 64).

Table 64: Number of Higher-Education Students with Disabilities

Variable	Public Universities	Community Colleges	Total
Number of students (NCES) (1,000s)	8,945.4	4,777.9	13,723
Age range (NCES)	18-22	17-29	N/A

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[162] In public four-year institutions the age range used to determine prevalence rates was 18-22 to reflect the norm for undergraduates; however, graduate students are also included in four-year institution data and their disability prevalence rate is assumed to be the same as 18-22-year-olds. For community colleges, 17-29 was used as an age range, which accounts for 80 percent of students.
[163] Technical colleges and other degree granting institutions are included as community colleges.

Variable	Public Universities	Community Colleges	Total
Vision disability prevalence rate (SIPP)	1.8%	2.0%	1.9%
Other disability prevalence rate [a] (SIPP)	10.8%	10.0%	10.5%
Total students with a vision disability (1,000s)	162.2	97.6	260
Total students with other disabilities (1,000s)	967.0	477.5	1,445
Total students with no disability (1,000s)	7,816.1	4,202.9	12,019

[a] In this table, hearing, cognitive, and manual dexterity disabilities are referred to as "other disabilities." If the individual also has a vision disability, they are included there.

Next, the Department calculated the expected hours that students with vision disabilities, other disabilities,[164] and no relevant disabilities, will interface with course content in a year. The Department used the finding from Fosnacht et al. (2018) that undergraduate students at four-year institutions spend 13.8 hours on schoolwork outside of class per week.[165] To account for the fact that many community college students are part time, the Department calculated an adjusted weekly average hours interfacing with course content for community college students (9.5 hours) based on the proportion of students that are part time.[166] The Department multiplied these total schoolwork hours by 0.25 to reflect only the time spent interfacing with online content. The appropriate adjustment factor is unclear. For those with vision disabilities, the Department also incorporated an adjustment factor of two to reflect the additional time spent accessing course content.[167] With these parameters, the Department calculated the total number of weekly hours different student disability populations spent outside of class interfacing with online course content.

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[164] For the purposes of this analysis, "other" disabilities include cognitive, hearing, and manual dexterity disabilities.
[165] Fosnacht, K., McCormick, A. C., & Lerma, R. (2018). First-Year Students' Time Use in College: A Latent Profile Analysis. *Research in Higher Education, 59*(7). Retrieved from https://doi.org/10.1007/s11162-018-9497-z.
[166] The Department assumes that full time community college students spend the same amount of time on schoolwork as those in four-year institutions, and that part time students spend half of that time. The Department calculated a weighted average of hours spent on schoolwork per week based on these assumptions and the proportion of students who are part time.
[167] The adjustment factor comes from Schmutz et al. (2017) who demonstrate that it takes twice as long for someone with a vision disability to complete online tasks as someone with no disability. We are assuming the same adjustment factor is appropriate for accessing school content.

Applying the percent time savings by population, the Department estimates a total time savings of 3.7 million hours per week for students at public universities, and 1.3 million hours per week for students at community colleges. The Department assumed two 16-week semesters per year, and that schools using quarters or trimesters have an equivalent number of weeks per year. The Department used wage data from the U.S. Census Bureau's 2021 Current Population Survey (CPS) to value an hour of time for the relevant age ranges and calculate monetary benefits from time saved. Using the median tax rate of 7.6 percent,[168,169] this amounts to $13.64 for four-year university students and $16.31 for community college students. The Department estimates total annual time savings of $2.3 billion.[170]

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[168] U.S. Bureau of Labor Statistics. (2022, March 31). *May 2021 National Occupational Employment and Wage Estimates United States*. Retrieved from https://www.bls.gov/oes/current/oes_nat htm#00-0000.

[169] Shrider, E. A., Kollar, M., Chen, F., & Semega, J. (2021, September). Income and Poverty in the United States: 2020. *U.S. Census Bureau, Current Population Reports*, 60-273. Washington, D.C.: U.S. Government Publishing Office. Retrieved from https://www.census.gov/library/publications/2021/demo/p60-273.html.

[170] The annual savings calculated as a result of this rule are only fully realized once all courses have been made accessible, which the Department estimates will be in Year 4. For a full breakdown of yearly benefits for time savings for students, see Table 70.

Table 65: Time Savings Benefit for Postsecondary Education

Variable	Public Universities	Community Colleges	Total
Average hours per week spent on schoolwork outside of class	13.8	9.5	Fosnacht et al. 2018
Adjustment for schoolwork spent interfacing with online content	0.25	0.25	Best professional judgment
Adjustment for individuals with vision disabilities to access content	2	2	Schmutz et al. 2017
Hours spent on course content - vision disability (1,000s)	1,119.2	463.2	Calculation
Hours spent on course content - other disabilities (1,000s)	3,336.3	1,133.5	Calculation
Hours spent on course content - no disabilities (1,000s)	26,965.6	9,977.3	Calculation
Percent time saved - vision disability	24%	24%	Schmutz et al. 2017
Percent time saved - other disabilities	21%	21%	Schmutz et al. 2017
Percent time saved - no disabilities	10%	10%	Schmutz et al. 2017
Total hours saved per week - vision disability (1,000s)	268.6	111.2	Calculation
Total hours saved per week- other disabilities [a] (1,000s)	700.6	238.0	Calculation
Total hours saved per week- no disabilities (1,000s)	2,696.6	997.7	Calculation
Total hours saved per week - all groups (1,000s)	3,665.8	1,346.9	Calculation
Weeks per semester	16	16	Best professional judgment
Value of an hour of non-labor time	$13.64	$16.31	CPS 2021
Monetary savings (millions per year)	$1,600	$703	Calculation

[a] In this table, hearing, cognitive, and manual dexterity disabilities are referred to as "other disabilities." If the individual also has a vision disability, they are included there.

4.3.7 Time savings for elementary and secondary students and parents

Similar to postsecondary students, elementary and secondary students will have time savings benefit associated with accessing remediated course content. The calculations here mirror those for postsecondary education. The Department began by estimating the prevalence of disabilities among elementary and secondary school students. For vision disabilities, the Department estimated prevalence rates for 6–12-year-olds for elementary school and 13–18-year-olds for secondary school. For certain disabilities, SIPP disability data is only available for 15-year-olds and older. Therefore, for hearing, cognitive, and manual dexterity disabilities, the Department used data for 15–18-year-olds only.

Additionally, the Department estimated the number of parents with disabilities because coursework will also need to be made accessible for them. The Department assumed most parents are between 25 and 65-years-old. There are an estimated 29.0 million elementary school students and 19.2 million secondary students according to the NCES (Table 66).[171] Assuming each student has two parents who may access their coursework, this results in 96.4 million parents.[172]

Table 66: Number of Elementary and Secondary School Students and Parents with Disabilities

Variable	Elementary School Students	Secondary School Students	Parents
Number of individuals (NCES) (1,000s) [a]	28,976	19,231	96,416
Age range [b]	6-12	13-18	25-65
Vision disability prevalence rate (SIPP)	1.5%	1.6%	3.8%
Other disability prevalence rate (SIPP) [c]	8.8%	8.8%	11.7%
Total with a vision disability (1,000s)	420.5	308.5	3,670.2

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[171] NCES. The Elementary/Secondary Information System (ElSi). Retrieved from: http://nces.ed.gov/ccd/elsi/.
[172] Parents may be double counted here if they have multiple children, but this is necessary for the cost calculation because the Department assumes the time estimate is per child.

Variable	Elementary School Students	Secondary School Students	Parents
Total with other disabilities (1,000s)	2,559.9	1,699.0	11,242.8
Total with no disabilities (1,000s)	25,996.0	17,223.9	81,502.5

[a] The Department assumed two parents per student. Parents may be double counted here if they have multiple children, but this is necessary for the cost calculation because the Department assumes the time estimate is per child.

[b] For certain disabilities, SIPP disability data is only available for 15-year-olds and older. Therefore, for other disabilities, the Department used data for 15-18-year-olds. The Department assumed most parents are between 25 and 65-years-old.

[c] In this table, hearing, cognitive, and manual dexterity disabilities are referred to as "other disabilities." If the individual also has a vision disability, they are included there.

The Department assumes time savings of 24 percent for individuals with vision disabilities, 21 percent for individuals with hearing, cognitive, or manual dexterity disabilities, and 5 percent for individuals without disabilities. The rate for individuals without disabilities is lower than in the postsecondary analysis because the Department believes the types of activities performed via the web are less complex for elementary and secondary schools.

Next, the Department calculated the expected hours that students with vision disabilities, other disabilities,[173] and no relevant disabilities, will interface with course content in a year. The Department used the finding from Common Sense Census that 8–12-year-olds spend 22 minutes per day on average on homework. Teens spend one hour per day.[174] The Department multiplied these total schoolwork hours by 0.25 to reflect only the time spent interfacing with online content. The appropriate adjustment factor is unclear. For those with vision disabilities, the Department also incorporated an adjustment factor of two to reflect the additional time spent

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[173] For the purposes of this analysis, "other" disabilities include cognitive, hearing, and manual dexterity disabilities.

[174] Rideout, V., & Robb, M. (2019). The Common Sense Census: Media Use By Tweens And Teens. Retrieved from https://www.commonsensemedia.org/sites/default/files/research/report/2019-census-8-to-18-full-report-updated.pdf.

accessing course content.[175] With these parameters, the Department calculated the total number of weekly hours different student disability populations spent outside of class interfacing with online course content. Based on its best professional judgment, the Department assumed parents spend on average 0.5 hours accessing online course content per week.

Applying the percent-time savings by population, the Department estimates total time savings. The Department assumed students are in school 25 weeks per year. The Department used OEWS data to value an hour of time for parents. Using the median tax rate of 7.6 percent,[176] the post-tax wage rate is $20.34 per hour. The Department estimates total annual time savings for parents of $2.1 billion per year.[177] Wage rates for students younger than working age are not available and little literature is available on the appropriate monetary value to use for children. Therefore, the Department used a wage rate of $7.25 to reflect the minimum wage and estimates total annual time savings for elementary and secondary students of $670.5 million per year.

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[175] The adjustment factor comes from Schmutz et al. (2017) who demonstrate that it takes twice as long for someone with a vision disability to complete online tasks as someone with no disability. The Department is assuming the same adjustment factor is appropriate for accessing school content.

[176] U.S. Bureau of Labor Statistics. (2022, March 31). *May 2021 National Occupational Employment and Wage Estimates United States*. Retrieved from https://www.bls.gov/oes/current/oes_nat htm#00-0000; Shrider, E. A., Kollar, M., Chen, F., & Semega, J. (2021, September). Income and Poverty in the United States: 2020. *U.S. Census Bureau, Current Population Reports*, 60-273. Washington, D.C.: U.S. Government Publishing Office. Retrieved from https://www.census.gov/library/publications/2021/demo/p60-273.html.

[177] The annual savings calculated as a result of this rule are only fully realized once all courses have been made accessible, which the Department estimates will be in Year 4. For a full breakdown of yearly benefits for time savings for students, see Table 70.

Table 67: Time Savings for Elementary and Secondary School Students and Parents with Disabilities

Variable	Elementary School Students	Secondary School Students	Parents	Source
Average hours doing schoolwork online per day	0.4	1.0	N/A	Common Sense Census
Share of hours spent on online schoolwork	0.25	0.25	N/A	Best judgment
Hours spent interfacing with course content per week	0.64	1.75	0.50	Calculation/Assumption
Adjustment for persons with vision disabilities to access content	2	2	2	Schmutz et al. 2017
Hours spent on course content - vision disability (1,000s)	539.6	1,079.7	3,670.2	Calculation
Hours spent on course content - other disabilities (1,000s)	1,642.6	2,973.2	5,621.4	Calculation
Hours spent on course content - no disabilities (1,000s)	16,680.8	30,141.8	40,751.3	Calculation
Percent time saved - vision disability	24%	24%	24%	Schmutz et al. 2017
Percent time saved - other disabilities	21%	21%	21%	Schmutz et al. 2017
Percent time saved - no disabilities	5%	5%	5%	Schmutz et al. 2017
Total hours saved per week - vision disability (1,000s)	129.5	259.1	880.9	Calculation
Total hours saved per week- other disabilities (1,000s)	344.9	624.4	1,180.5	Calculation
Total hours saved per week- no disabilities (1,000s)	834.0	1,507.1	2,037.6	Calculation
Total hours saved per week - all groups (1,000s)	1,308.5	2,390.6	4,098.9	Calculation
Weeks per school year	25	25	25	Best judgment
Value of an hour of non-labor time	$7.25	$7.25	$20.34	CPS 2021 & judgment
Monetary savings (millions per year)	$237	$433	$2,084	Calculation

4.3.8 Benefits of greater educational attainment

Improved web accessibility can generate benefits to students by reducing obstacles and facilitating participation. It may encourage additional educational participation, help enrolled students to succeed, and reduce time costs. For example, Flowers, et al. (2001) reviewed community college websites and found that 77 percent were inaccessible to individuals with disabilities.[178] The National Center for Education Statistics (NCES) report that students with a disability are less likely to graduate high school, enroll in postsecondary education, and complete a higher education degree.[179]

- 92.3 percent of students without a disability graduated high school compared with 77.1 percent for students with a hearing, cognitive, or manual dexterity disability.[180]

- 16.5 percent of students without a disability diagnosis had not enrolled in postsecondary education the year after high school compared with 44.9 percent for students with a disability (later number imputed by the Department).

- Of students enrolled for the first time in a postsecondary institution, after 6 years, 43.0 percent of those with a disability had not graduated and were no longer enrolled, compared with 34.6 percent among students without a disability.

Time savings for students associated with public-facing websites and course remediation were quantified in Section 4.3.2 and Sections 4.3.6 and 4.3.7, respectively. Here, the Department considers benefits associated with higher educational attainment. This could derive

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[178] Flowers, C., Bray, M., & Algozzine, R. (2001). Content Accessibility of Community College Web Sites. *Community College Journal of Research and Practice, 25*(7), 475. Retrieved from https://www.tandfonline.com/doi/abs/10.1080/10668920152407874. This paper may be out of date, but more recent numbers were not identified.

[179] U.S. Department of Education. (2017). *Characteristics and Outcomes of Undergraduates with Disabilities.* Retrieved from https://nces.ed.gov/pubs2018/2018432.pdf.

[180] Graduation rate for students with a disability was imputed by the Department based on the graduation rate for all students, the graduation rate for students without a disability, and the share of students with a disability.

from accessibility of both public-facing websites and password-protected course content.

Figure 2 and Table 68 show SIPP data on educational attainment by disability status. Those without a disability tend to have higher educational attainment. This rule could decrease the educational attainment gap, but it is unclear to what degree this rule will increase educational attainment for individuals with disabilities. There are reasons beyond web accessibility that may influence this gap. Additionally, some websites are already at least partially accessible. However, for calculation purposes, the Department has assumed based on best professional judgment that the rule would close the gap 10 percent. Also shown in Table 60, individuals with more education earn more. Young workers with a bachelor's degree or higher earn more than twice what a peer without a high school degree or diploma earns.[181]

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[181] National Center for Education Statistics. (2022). *Annual Earnings by Educational Attainment. Condition of Education.* U.S. Department of Education, Institute of Education Sciences. Retrieved from https://nces.ed.gov/programs/coe/indicator/cba/annual-earnings. Inflated from 2020 to 2022 dollars using the GDP implicit price deflator. Bureau of Economic Analysis. Table 1.1.9. Implicit Price Deflators for Gross Domestic Product. BEA. (2022, October 18). *What is the Interactive Data Application?* Retrieved from https://apps.bea.gov/iTable/index_nipa.cfm.

Figure 2: Educational Attainment by Disability Status, 25–34-Year-Olds
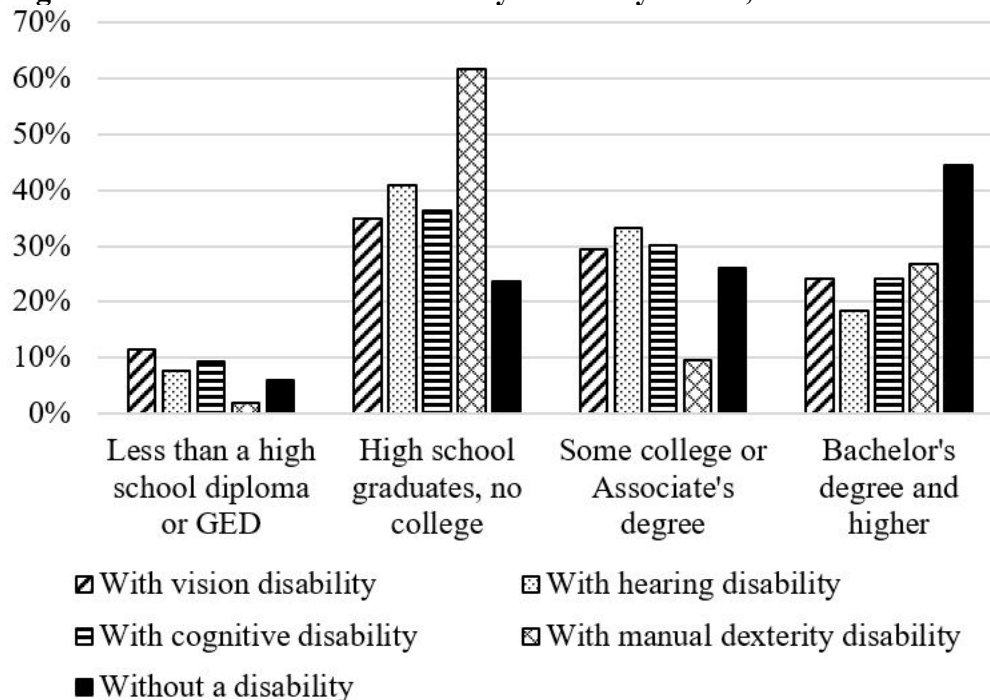
Table 68: Educational Attainment Distribution and Earnings for Young Workers

Type of Disability	Less than a High School Diploma or GED	High School Graduates, no College	Some College or Associate's Degree	Bachelor's Degree and Higher
None	6%	24%	26%	44%
Vision [a]	11%	35%	29%	24%
Hearing	8%	41%	33%	18%
Cognitive	9%	36%	30%	24%
Manual dexterity	2%	62%	10%	27%
Median annual earnings	$31,180	$38,202	$43,571	$63,876

Sources: SIPP 2021, educational attainment for 25- to 34-year-olds; NCES Median annual earnings of full-time year-round workers 25- to 34-years-old, inflated to 2021 dollars using the GDP deflator.

[a] Individuals with multiple qualifying disabilities are counted within the first disability category listed (*e.g.*, if someone has a cognitive and vision disability, they are included in the vision disability prevalence rate).

The Department has limited the estimation of benefits to individuals moving from one educational attainment category to the next each year. The size of this population is unclear, but the Department approximates it by using the number of 18-year-olds with a disability. This is

referred to as one "cohort." Each year a different cohort will move between education categories and begin accruing benefits. There are 4.3 million 18-year-olds in the U.S,[182] of which, 0.3 percent have a vision disability, 1.3 percent have a hearing disability, 8.3 percent have a cognitive disability, and 1.5 percent have a manual dexterity disability (individuals with multiple qualifying disabilities are counted with the first disability in the list to avoid double counting).[183] To determine how earnings could change for individuals with disabilities, the Department:

1. Calculated total earnings for 18-year-olds with each disability type by multiplying the relevant population by the educational attainment distribution by the median annual earnings for each educational attainment category.

2. Calculated the counterfactual earnings assuming individuals with disabilities had the same educational attainment as those without disabilities. The Department multiplied the relevant population of individuals with disabilities by the educational attainment distribution for individuals without a disability by the median annual earnings for each education category.

3. Took the difference between these earnings totals and multiplied by 10 percent.

As shown in Table 69, benefits for one cohort, for one year, will total $262.8 million once the adjustment is complete. However, this will not occur until after a period of educational enrollment. For a discussion of the timing of these benefits, see Section 4.3.9. Additionally, this benefit will compound over time as additional cohorts of students graduate.

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[182] U.S. Census Bureau. (2022, March 10). *National Demographic Analysis Tables: 2020. Table 1. Total U.S. Resident Population by Age, Sex, and Series: April 1, 2020.* Retrieved from https://www.census.gov/data/tables/2020/demo/popest/2020-demographic-analysis-tables.html.
[183] Based on SIPP disability rates for 15 to 21-year-olds, calculated by the Department. The Department used data for 15- to 21-year-olds as a proxy for 18-year-olds because data specific to 18-year-olds was not available.

Table 69: Total Annual Earnings for One-Year Cohort

Type of Disability	Prevalence Rate (15-21-Year-Olds) [a]	1-Year Cohort Population [b]	Current Total Earnings (million)	Counter-Factual Total Earnings (million)	Total Earnings Difference (million)	Benefit (million) [c]
Vision	0.3%	13,340	$603	$675	$72	$7
Hearing	1.3%	56,580	$2,499	$2,862	$363	$36
Cognitive	8.3%	359,020	$16,283	$18,159	$1,874	$187
Manual dexterity	1.5%	62,473	$2,840	$3,160	$320	$32
Total	11.4%	491,413	$22,227	$24,855	$2,628	$263

[a] Individuals with multiple qualifying disabilities are counted within the first disability category listed (*e.g.*, if someone has a cognitive and vision disability, they are included in the vision disability prevalence rate).
[b] Prevalence rates multiplied by Census Bureau's estimate of 4.3 million 18-year-olds in 2020 (https://www.census.gov/data/tables/2020/demo/popest/2020-demographic-analysis-tables.html).
[c] Total earnings difference multiplied by 10 percent.

Improved accessibility of State and local government websites, including public secondary and postsecondary school websites, may expand the pool of qualified job applicants and potentially lead to a better employer-employee match. When individuals with disabilities are able to complete more education, they will become qualified applicants for jobs that they would not have been qualified for otherwise. People with disabilities will also be able to access services, programs, and activities offered on State and local government websites that may make them more competitive job applicants, such as skills training, resume and interviewing workshops, or additional certifications. The wage-related effects quantified above are indeed benefits of the rulemaking if associated with the types of outcomes just discussed (such as better overall skills across labor pools and better employer-employee matching).[184] Benefits for both employers and prospective employees with disabilities—some of which are likely to be captured in the quantitative approach above—may include increased productivity, better self-esteem, more

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[184] By contrast, if the phenomena discussed in the opening of this paragraph are not realized, then increased earnings (if any) should be categorized as transfers, rather than benefits.

job satisfaction, increased employee retention, reduced dependence on public benefits, and lower recruiting and hiring costs, among other partially unquantified effects (including both benefits and transfers). The Department expects that there may also be unquantified benefits associated with current State and local government employees with disabilities being better able to navigate their employers' websites and mobile apps.

Question 19: The Department requests evidence that would facilitate refinement of this analysis, including as regards: (a) whether wage effects would be a societal benefit, rather than a shift of relatively high-paying jobs from some individuals to others, and (b) whether 10 percent is a reasonable approximation of the potential rule-induced narrowing of the earnings gap between individuals with and without relevant disabilities.

4.3.9 Projected 10-year benefits

Benefits after implementation were calculated in the preceding sections. However, during the implementation period, benefits will be lower. The proposed rule allows either two or three years for implementation, depending on the covered entity's population. With the exclusion of educational benefits, the Department believes benefits will fully accrue beginning in Year 4 but that some benefits will exist during the three implementation years as websites and mobile apps become more accessible. The Department assumes that in Year 1 benefits are 27 percent of the level once compliance is complete; in Year 2 it increases to 53 percent; and in Year 3 it increases to 80 percent (Table 70).[185]

For course-remediation time savings, the Department assumed no benefits would accrue

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[185] The Department assumed benefits accrue at a steady rate over the implementation period. For example, for large entities, benefits increase from 33 percent in Year 1, to 66 percent in Year 2, and 100 percent in Year 3. For small entities, benefits increase from 25 percent in Year 1, to 50 percent in Year 2, to 75 percent in Year 3, and 100 percent in Year 4. These accrual rates are weighted by the number of government websites for small versus large governments. Eighty percent of websites are for small entities, despite websites being less common among small entities, because the number of small governments is much larger than the number of large governments.

until the implementation period is complete because courses would not be remediated until necessary, and it is unknown in advance which courses will need to be remediated. Therefore, in Year 3, once small entities are affected, 63 percent of potential benefits for postsecondary students will accrue and 53 percent of potential benefits for elementary and secondary students will accrue. In Year 4, full benefits are reached.[186]

For educational attainment, benefits do not accrue until after the additional education is obtained. For simplicity, benefits are assumed to begin in Year 5, after two years of implementation followed by two years of additional attainment. The amount of time to obtain additional education varies based on the degree, but the Department believes two years is an appropriate average. For example, to move from a high school degree to some college or an associate's degree, would take approximately two years. Similarly, to move from some college or an associate's degree to a bachelor's degree would also take approximately two years. The Department only incorporated two years of implementation because most public colleges are under the purview of large governments with a two-year implementation period. Average annualized educational attainment benefits only include additional earnings over this 10-year period, not over the course of a lifetime.

The Department estimates that 10-year average annualized benefits for additional educational attainment, using a 7 percent discount rate, are $449 million. These benefits will continue to grow after this 10-year period as more workers gain additional education and the size of the population benefiting increases.

Annual benefits, after implementation, were calculated based on current data. There are a

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[186] The Department does not know which institutions are associated with small or large governments. Therefore, the Department assumed that four-year institutions are large entities and community colleges are small entities. For elementary and secondary schools, the Department used the share of students in independent school districts who are in small versus large districts.

variety of reasons why annual benefits could be higher or lower in later years than the numbers estimated here. For example, annual benefits could grow over time because the population is likely to grow and age over time, resulting in a larger number of people with disabilities who would benefit from the rule. To demonstrate, if the number of people with disabilities increases by 1 percent a year, then benefits would increase by roughly 1 percent a year. However, because of the many reasons benefits could increase or decrease, and the related uncertainties, the Department has not projected how benefits would change over time. For example, web and mobile app usage will likely become more common over time, increasing the number of users benefiting, but the Department does not know the growth rate in web usage. Conversely, benefits in later years could be lower because the baseline level of compliance, against which benefits are measured, may change over time. There has been a trend towards greater accessibility in recent years, and that trend may have continued in the absence of this proposed rule.

Table 70: Timing of Benefits (Millions)

Year	Total Benefit (Million)	Non-Education Accrual Rate	Non-Education Benefits (Millions)	Postsec. Accrual Rate	Postsec. Benefits[a] (Million)	Elementary/ Secondary Accrual Rate	Elementary/ Secondary Benefits[a] (Million)	Educational Attainment Accrual	Education Attainment Benefits (Million)
Year 1	$1,619	27%	$1,619	0%	$0	0%	$0	0%	$0.0
Year 2	$3,239	53%	$3,239	0%	$0	0%	$0	0%	$0.0
Year 3	$7,756	80%	$4,858	63%	$1,447	53%	$1,452	0%	$0.0
Year 4	$11,125	100%	$6,068	100%	$2,303	100%	$2,754	0%	$0.0
Year 5	$11,387	100%	$6,068	100%	$2,303	100%	$2,754	1 cohort	$263
Year 6	$11,650	100%	$6,068	100%	$2,303	100%	$2,754	2 cohorts	$526
Year 7	$11,913	100%	$6,068	100%	$2,303	100%	$2,754	3 cohorts	$788
Year 8	$12,176	100%	$6,068	100%	$2,303	100%	$2,754	4 cohorts	$1,051
Year 9	$12,439	100%	$6,068	100%	$2,303	100%	$2,754	5 cohorts	$1,314
Year 10	$12,702	100%	$6,068	100%	$2,303	100%	$2,754	6 cohorts	$1,577

[a] Benefits may begin accruing during the implementation period, but for simplicity, the Department excluded benefits here for these years. The Department only incorporated two years of implementation because most public colleges are under the purview of large governments with a two-year implementation period.

4.3.10 Sensitivity Analysis of Benefits

The benefits calculations incorporate some assumptions and sources of uncertainty. Therefore, the Department has conducted sensitivity analyses on select assumptions to demonstrate the degree of uncertainty in the estimates. Other assumptions not altered here also involve a degree of uncertainty and so these low and high estimates should not be considered absolute bounds.

Average annualized benefits, using a 7 percent discount rate, are estimated to be $8.9 billion under the primary conditions. Using the low estimate assumptions, they are $6.4 billion and under the high estimate assumptions they are $14.7 billion (Table 71). The variations used for each benefit type are shown in Table 72.

Table 71: Average Annualized Benefits Sensitivity Analysis (Millions) [a]

Beneficiary	Low Estimate	Primary	High Estimate
Time savings - current users	$2,688.7	$3,416.1	$7,284.1
Time savings - new users	$170.3	$753.5	$1,177.3
Time savings - governments	$83.6	$493.3	$578.1
Time savings - mobile apps	$252.1	$320.4	$683.1
Time savings - education	$3,043.7	$3,504.4	$3,803.5
Educational attainment	$141.2	$449.5	$1,167.5
Total	$6,379.7	$8,937.2	$14,693.6

[a] 10-Year average annualized benefits, 7 percent discount rate.

Table 72: Assumptions and Data Sources Varied for Sensitivity Analysis

Beneficiary	Estimate Type	Variations
Time savings - current users	Low	ACS data for prevalence rates, instead of SIPP
Time savings - current users	High	Same time reduction (24%) for all disabilities
Time savings - current users	High	Exclude "n/a" from SEMRUSH output
Time savings - new users	Low	ACS data for prevalence rates, instead of SIPP
Time savings - new users	Low	Usage gap only closes by 75%
Time savings - new users	Low	Lower transaction time (19 minutes instead of 25)
Time savings - new users	Low	Fewer transactions (6 instead of 8)
Time savings - new users	High	Higher transaction time (31 minutes instead of 25)
Time savings - new users	High	More transactions (10 instead of 8)

Beneficiary	Estimate Type	Variations
Time savings - governments	Low	ACS data for prevalence rates, instead of SIPP
Time savings - governments	Low	Usage gap only closes by 75%
Time savings - governments	Low	Lower transaction time (7.5 minutes instead of 10)
Time savings - governments	Low	Fewer transactions (7.5 instead of 6)
Time savings - governments	High	Higher transaction time (12.5 minutes instead of 10)
Time savings - governments	High	More transactions (4.5 instead of 6)
Time savings - mobile apps	Low	ACS data for prevalence rates, instead of SIPP
Time savings - mobile apps	High	Same time reduction (24%) for all disabilities
Time savings - mobile apps	High	Exclude "n/a" from SEMRUSH output
Time savings - education	Low	ACS data for prevalence rates, instead of SIPP
Time savings - education	High	Same time reduction (24%) for all disabilities
Educational attainment	Low	ACS data for prevalence rates, instead of SIPP
Educational attainment	Low	Smaller share of achievement gap closed
Educational attainment	High	Benefits begin in Year 3, instead of Year 5
Educational attainment	High	Larger share of achievement gap closed

For current website users, the Department altered three assumptions—one for the low estimate and two for the high estimate. First, disability prevalence rates are much lower using ACS data than SIPP data. As explained in Section 2.2, the Department believes the SIPP estimates are more appropriate, but ACS numbers are used here for sensitivity. Using ACS data reduces the average annual benefits from $3.4 to $2.7 billion. For the high estimate, rather than assuming the time reduction for individuals with hearing, cognitive, or manual dexterity is equivalent to individuals without a hearing disability, the Department assumes the reduction is equivalent to individuals with vision disabilities. The Department also excluded websites for which SEMRUSH did not provide data, rather than assuming values of zero. These two variations increase benefits from $3.4 billion to $7.3 billion.

For new website users and cost savings to governments, the Department altered four assumptions. First, once again, ACS prevalence rates were used in lieu of SIPP estimates. Second, rather than assuming website usage becomes equivalent for individuals with and without

disabilities, the Department assumed this gap only closes by 75 percent. Third, the average time spent per transaction was reduced or increased by 25 percent for the low estimate and high estimate, respectively. Fourth, the average number of transactions per year was reduced or increased by 25 percent for the low estimate and high estimate, respectively. Incorporating these alternative assumptions reduces the benefits for new users to $170.3 million or increases the benefits to $1.2 billion, from $753.5 million. For cost savings to governments, benefits decrease to $83.6 million or increase to $578.1 million from $493.3 million.

For mobile app users, the Department altered three assumptions. These are the same as for current website users (ACS prevalence data, time reduction for individuals with other disabilities, and exclusion of websites not analyzed by SEMRUSH). Benefits either decrease to $252.1 million or increase to $683.1 million from $320.4 million.

For time savings for students and parents, the Department altered two assumptions. The low estimate uses ACS data for prevalence rates instead of SIPP. The high estimate uses a 24 percent time savings for those with hearing, cognitive, and manual dexterity disabilities instead of 21 percent. Benefits decrease to $3.0 billion or increase to $3.8 billion from $3.5 billion.

For benefits of additional educational attainment, the Department altered three assumptions. First, ACS prevalence rates were used instead of SIPP. Second, benefits begin to accrue in Year 3 rather than Year 5. Third, the Department changed the share of the educational achievement gap that would be closed from 10 percent to 5 and 15 percent. Benefits decrease to $141.2 million or increase to $1.2 billion from $449.5 million.

4.4 Unquantified Benefits

This rulemaking is being promulgated under the ADA—a Federal civil rights law. Congress stated that a purpose of the ADA is "to provide a clear and comprehensive national mandate for the elimination of discrimination against individuals with disabilities." 42 U.S.C. 12101(b)(1). This proposed rule is intended to further the ADA's broad purpose by helping to eliminate discrimination against people with disabilities in public entities' services, programs, and activities offered via the web and mobile apps. Access to such services, programs, and activities is critical to furthering the Nation's goal, as articulated in the ADA, to ensure "equality of opportunity, full participation, independent living, and economic self-sufficiency" for people with disabilities. *Id.* 12101(a)(7). This access is also critical to promoting the exercise of fundamental constitutional rights, such as the rights to freedom of speech, assembly, association, petitioning, and due process of law. This rulemaking, therefore, implicates benefits like dignity, independence, and advancement of civil and constitutional rights for people with disabilities. Such benefits can be difficult or impossible to quantify yet provide tremendous benefit to society. The January 20, 2021 Presidential Memorandum titled "Modernizing Regulatory Review"[187] states that the regulatory review process should fully account for regulatory benefits that are difficult or impossible to quantify. Many of the benefits in this rulemaking are exactly the type of benefits contemplated by the January 20, 2021 Presidential Memorandum on "Modernizing Regulatory Review."

These benefits are central to this proposed rule's potential impact as they include concepts inherent to any civil rights law—like equality—that will be felt throughout society and personally by individuals with disabilities. Consider, for example, how even a routine example

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[187] 86 FR 7223 (Jan. 20, 2021).

of access to a web-based form could impact a person with a disability. When the online form is accessible, the person with a disability can complete the form: 1) at any time they please, even after normal business hours; 2) on their own; 3) without needing to share potentially private information with someone else; and 4) quickly, because they would not need to coordinate a time to complete the form with a companion. Importantly, this is the experience people without disabilities have when accessing online government services. This proposed rule is intended to ensure that people with disabilities have the same opportunity to participate in and receive the benefits of the services, programs, or activities that State and local governments make available to members of the public online.

There are many benefits of this proposed rule—like equality and dignity—that have not been monetized in this PRIA due to limited data availability and inherent difficulty to quantify. Those benefits are discussed here qualitatively. The Department requests comments and data that could assist in quantifying these important benefits so that the Department can also represent them in a way consistent with this proposed rule's costs. The Department recognizes the significant benefits of this rule and the impact the rule will have on the everyday lives of people with disabilities. Thus, the Department seeks the public's assistance in better quantifying the benefits that are discussed qualitatively in this section.

This section's description of the proposed rule's unquantified benefits first discusses benefits to individuals followed by benefits to State and local governments.

Benefits to individuals include, among others:

- o Increased independence, flexibility, and dignity;
- o Increased privacy;
- o Reduced frustration;
- o Decreased assistance by companions;

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- o Increased program participation; and

- o Increased civic engagement and inclusion.

Benefits to governments include, among others:

- o Increased certainty about the applicable technical standard and potential reduction in litigation; and

- o Potential reduction in litigation.

4.4.1 Increased independence, flexibility, and dignity

Among the most impactful benefits of this rulemaking are greater independence, flexibility, and dignity for people with disabilities. These unquantified benefits will extend beyond just people with disabilities—all Americans will benefit from more accessible websites, as described in this PRIA. These benefits are also among the most difficult to quantify, given that they will be felt uniquely by each person and are often experienced in many intangible aspects of a person's life. Because of this, the Department was unable to quantify the monetary benefits of increased independence, flexibility, and dignity that will result from this rulemaking. These benefits are thus briefly described here.

Accessible public entity websites and mobile apps will enable more people with disabilities to independently access State or local government services, programs, and activities. People with disabilities will be able to directly access websites providing essential governmental information and services, without needing to rely on a companion to obtain information and interact with websites and mobile apps. For example, people with disabilities will be able to independently submit forms and complete transactions, request critical public services, communicate more easily with their local public officials, and apply for governmental benefits. The ability to do each of these tasks independently, without paying an assistant or asking for a companion's assistance, creates a substantial benefit. Additionally, online processing with status

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updates, automated notifications, and automated reminders generates time savings (estimated above) and convenience that those with disabilities will be better able to access when they can independently enroll in government services through websites as a result of this rule. This rulemaking will thus enable people with disabilities to be more independent and exercise greater control over their interactions with State or local governments, which are unquantified benefits that will accrue from this rulemaking.

Further, this rulemaking will provide increased flexibility for people with disabilities. This is another benefit that is difficult to quantify, so the Department describes it here. Because of this rulemaking, people with disabilities will be better able to access State or local government services, programs, or activities on their own time and at their convenience, without needing to wait for assistance from a companion or a State or local government employee. The ability to conduct certain transactions on a public entity's website, such as paying a utility bill, renewing a business license, or requesting a special trash pick-up, gives individuals the ability to conduct these transactions at a time most convenient to them. This greater flexibility should lead to overall improved use of a person's time, as measured by their preferences (thereby enhancing what economists refer to as utility). This greater flexibility could also result in cost savings to individuals with disabilities who might have previously paid an assistant or sought the help of a companion to conduct these transactions. Additionally, when websites are inaccessible, people with disabilities might have to make separate arrangements to conduct a transaction by taking time off work or arranging transportation. Because of greater website accessibility, people with disabilities can schedule these transactions or search for information at a time and place most convenient for them, which results in increased benefits.

Finally, individuals with disabilities will benefit from the dignity that is associated with

greater independence and flexibility. This is another benefit that is difficult to quantify, so the

Department has included it as an unquantified benefit that will result from this rulemaking.

When individuals with disabilities do not need to rely on others to conduct transactions and

access services, programs, and activities, they are able to act with the independence and

flexibility that individuals without disabilities enjoy, which results in greater feelings of dignity.

The knowledge that websites and mobile apps are designed to be inclusive of individuals with

disabilities can give people with disabilities a greater sense of dignity rooted in the knowledge

that their lives are valued and respected, and that they too are entitled to receive the benefits of

State or local government services, programs, or activities, without needing to rely on others.

The Department was unable to quantify the monetary value of this benefit, but the Department

expects individuals with disabilities to benefit from greater dignity as a result of this rulemaking.

This benefit is also associated with a greater sense of confidence, self-worth, empowerment, and

fairness, which are also benefits which will accrue as a result of this rulemaking.

4.4.2 Increased privacy

Accessible websites and mobile apps allow individuals with disabilities to conduct

activities independently, without unnecessarily disclosing potentially private information such as

banking details, social security numbers, and health information to other people. This is because

when individuals with disabilities are able to use an accessible website or mobile app, they can

rely on security features to convey information online, rather than potentially sharing

information with others such as companions or State or local government employees. Without

accessible websites, people with disabilities may need to share this sensitive information with

others unnecessarily, which could result in identity theft or misuse of their personal information.

Additionally, privacy protects individual autonomy and has inherent value. Even the prospect of

identity theft may result in people with disabilities sharing less information or needing to take

additional measures to protect themselves from having their information stolen. Because of this, there is a benefit that is difficult to quantify in people with disabilities being able to safely and privately conduct important transactions on the web, such as for taxes, health transactions, and benefits applications. The increased privacy and assurances that information will be kept safe online will benefit people with disabilities, though the Department was unable to quantitatively calculate this benefit.

Further, another qualitative privacy benefit of this rulemaking is that people with disabilities will have greater access to community resources that require sharing and receiving private information. Sometimes sensitive information may need to be discussed such as information about physical health, mental health, sexual history, substance use, domestic violence, or sexual assault. When websites are more accessible, people with disabilities will be able to share this information using things like online forms and messaging systems, which reduces the likelihood that an individual with a disability will need to disclose this personal information unnecessarily with a companion or on the phone in the presence of others. Additionally, if people with disabilities can access websites independently, they may be able to seek out community resources without needing to involve a companion or a State or local government employee unnecessarily, which enhances people with disabilities' ability to privately locate information. For example, if a person with a disability is seeking to privately locate State or local government resources that would enable them to leave an abusive relationship safely, accessible websites will allow them to search for information with greater privacy than seeking out resources in person, on the phone, or by mail, which they may not be able to do without seeking assistance from, or risking being detected by, their abuser. These benefits were not calculated quantitatively due to the difficulty of placing a value on added privacy, but the

Department anticipates people with disabilities would nonetheless greatly benefit from the privacy benefits of this rule.

4.4.3 Reduced frustration

Potentially in addition to the significant unquantified benefits discussed above, another impactful benefit of this rulemaking that may be difficult to quantify is reduced frustration for people with disabilities. Inaccessible websites and mobile apps create significant frustration for individuals with disabilities who are unable to access information or complete certain tasks. In addition to the inconvenience of not being able to complete a task, this frustration can lead to a lower quality user experience. For example, Pascual et al. (2014) assessed the moods of sighted, low-vision, and blind users while using accessible and inaccessible websites and found greater satisfaction with accessible websites.[188] This frustration appears to be particularly common for individuals with disabilities. Lazar et al. (2007) documented the frustrations users who are blind experience when using screen readers, finding, for example, that on average users reported losing 30.4 percent of time due to inaccessible content.[189] Furthermore, some people with vision disabilities may be unable to complete a required task altogether. For example, if an individual with a vision disability is filling out an online form but the color contrast between the foreground and background on the "submit" button is not sufficient, they may be unable to submit their completed form. The inability to complete a task independently or without any barriers can be extremely frustrating and significantly reduce the overall quality of the user experience. The frustration that individuals with disabilities experience while accessing services, programs, and

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[188] Afra Pascual et al., *Impact of Accessibility Barriers on the Mood of Blind, Low-Vision and Sighted Users*, 27 Procedia Computer Science. 431, 440 (2014), *available at* https://repositori.udl.cat/bitstream/handle/10459.1/47973/020714.pdf?sequence=1.

[189] Jonathan Lazar et al., *What Frustrates Screen Reader Users on the Web: A Study of 100 Blind Users*, 22(3) International Journal of Human–Computer Interaction. 247-269 (2007), *available at* https://web.archive.org/web/20100612034800id_/http://triton.towson.edu/~jlazar/IJHCI_blind_user_frustration.pdf.

activities that public entities offer on their websites and mobile apps would be significantly reduced if the content was made accessible.

It is difficult to quantify this reduction in frustration in monetary costs, but it may already partially be captured in the quantitative estimates framed above as time savings. The Department believes the ability to complete tasks and engage with the services, programs, and activities offered by public entities on websites and mobile apps can make a significant improvement in the quality of the lives of people with disabilities by reducing the frustration they experience.

4.4.4 Decreased assistance by companions

In addition to the significant benefits discussed above, when individuals with disabilities are able to access websites and mobile apps independently instead of relying on a companion for assistance, both individuals with disabilities and their companions will benefit in other ways that are difficult to quantify.

If people with disabilities previously relied on supports such as family members or friends to perform these tasks, the quality of these relationships may be improved. If a person with a disability no longer needs to request assistance, they can spend that time together with their loved ones socializing or doing activities that they prefer, instead of more mundane tasks like filling out tax forms. People with disabilities will have an increased opportunity to relate to their companions as equals, rather than needing to assume a dependent role in their relationships when they need help from others to complete tasks online. Requests for assistance, and the manner in which those requests are fulfilled by others, can sometimes cause stress or friction in interpersonal relationships; when individuals can complete tasks independently, those strains on relationships may be reduced.

If people with relevant disabilities previously paid companions to assist them with online

tasks, they will be able to save or spend this money as they choose. They will also be able to

save the time and effort associated with finding paid companions who are willing and able to

assist with intermittent, often low-paid work.

If State agencies were providing a personal care assistant or home health aide to assist an

individual with a disability, it is possible that some of that companion's time could be reallocated

to assist a different person with a disability, because the same amount of assistance would not be

needed to complete tasks online. This could reduce government spending for home- and

community-based services. It may also increase the number of direct care workers who are

available to assist people with disabilities.

Companions will also benefit when they do not need to provide assistance. Family

members or friends will be able to do other things with the time that they would have spent

helping someone with a disability. These may be activities that they enjoy more, that earn

income, or that benefit society in other ways. Paid companions will be able to spend their time

on other tasks such as assisting with bathing, toileting, or eating. All of these benefits are

difficult to quantitatively calculate, but they are nonetheless benefits that would accrue from the

rule.

4.4.5 Increased program participation

Section 4.3.3 indirectly quantified the benefits of increased access to services, programs,

and activities by calculating the benefit from people changing how they access those services to

using websites and mobile apps, which the Department referred to as switching modes.

However, the Department believes that there are unquantified benefits associated with increased

program participation that are difficult to quantify, which are described briefly here.

Inaccessible websites may prevent persons with disabilities from accessing information

or using State or local government services, programs, and activities that others without

disabilities have access to online. While people with disabilities may nonetheless access government services, programs, and activities despite barriers due to inaccessible websites, there will be other times when people with disabilities are too discouraged by these barriers and thus do not participate in services, programs, and activities. This rulemaking will reduce those barriers to access, which will result in fewer individuals with disabilities being deterred from participating in State or local government services, programs, or activities. Further, there may be some State or local government services, programs, or activities that individuals with disabilities would simply not have been aware of due to an inaccessible website, that they may now choose to participate in since they have access to the website or mobile app providing those services. This will result in a benefit of increased program participation, which will allow people with disabilities to take advantage of services, programs, or activities that could improve their lives. This could also result in an increase in revenue for State or local governments offering programs, services, and activities online, because people with disabilities will have greater access to online programs that have corresponding fees or charges, which could lead to additional revenue for State or local governments. The Department believes there is great intangible benefit to people with disabilities being able to connect to services, which will result in greater feelings of engagement and belonging in the community. The Department recognizes that there may be associated costs with increased program participation as more resources may be necessary to meet the resulting demand for services, programs, and activities, and requests comment that would facilitate quantification of such effects.

4.4.6 Increased civic engagement and inclusion

Increased program participation in many civic activities will result in an unquantified benefit of greater community involvement, which will allow people with disabilities to advocate for themselves and others and participate more actively in the direction of their communities.

For example, if more people with disabilities can independently access information about proposed legislative and policy changes and contact local civic leadership about their views, they might be more likely to become actively involved in civic activities within their communities. Further, they may be able to access information to inform their democratic participation, such as by locating election resources and procedures for accessible voting. By facilitating this kind of civic engagement, this rule will promote the exercise of fundamental constitutional rights, such as the rights to freedom of speech, assembly, association, and petitioning. Aside from these benefits, governments also provide opportunities for social engagement, recreation, and entertainment, which will further enable people with disabilities to feel more engaged and connected with their communities. This engagement is a benefit both to people with disabilities, as well as to people without disabilities who will be able to connect with others in their community more easily. All of these benefits are difficult to quantify monetarily, but the Department nonetheless believes they will result in significant benefits for people with disabilities and for American communities.

4.4.7 Increased certainty about what constitutes an accessible website under the ADA and potential reduction in litigation

Although the ADA applies to the services, programs, and activities that State and local governments offer via the web, the ADA's implementing regulations currently do not include specific technical standards. The Department has consistently heard from covered entities that that they desire guidance on how to specifically comply with the ADA in this context. Adopting WCAG 2.1 Level AA as the technical standard for web and mobile app accessibility will reduce confusion and uncertainty by providing clear rules to public entities regarding how to make the services, programs, and activities they offer to the public via their websites and mobile apps accessible. Although the resulting increased certainty from adopting a technical standard is

difficult to quantify, the Department believes it is an important benefit that will make covered entities more confident in understanding and complying with their ADA obligations.

Further, increased certainty regarding how to make websites and mobile apps accessible may reduce litigation costs for public entities. Similar to how specific standards in the physical environment enable businesses to identify and resolve accessibility issues, the adoption of WCAG 2.1 Level AA as a technical standard will enable covered entities to determine if their websites or mobile apps are out of compliance with the ADA and resolve any instances of noncompliance, resulting in greater accessibility without litigation. The Department recognizes that more specific technical standards could lead to an increase in litigation, as there will be a clearer way to demonstrate that public entities are not in compliance. However, the ability to more easily determine noncompliance will allow the covered entity to proactively resolve any compliance issues. Thus, although it is difficult to know the exact impact that a clear technical standard will have on total litigation costs, the Department believes that the potential for reduced litigation costs is a significant benefit for particular entities that should be accounted for in this analysis.

Question 20: Many benefits have not been monetized due to data availability and are discussed here qualitatively. The Department requests comments and data that could assist in quantifying these benefits.

5   COSTS AND BENEFITS OF REGULATORY ALTERNATIVES

The Department estimated costs and benefits for several possible alternatives to the proposed rule. These alternatives are described in Table 73.

Table 73: Regulatory Alternatives Considered

Stringency	Alternative
Less stringent	3 years for implementation for large entities; 4 years for implementation for small entities
Less stringent	Conformance with WCAG 2.1 Level A required
Less stringent	Conformance with WCAG 2.0 Level AA required
Rule as proposed	Conformance with WCAG 2.1 Level AA required
More stringent	1 year for implementation for all entities
More stringent	1 year implementation for large entities; 3 years implementation for small entities
More stringent	Conformance with WCAG 2.1 Level AAA required

5.1 COSTS OF REGULATORY ALTERNATIVES

To estimate the impact to website, mobile apps, and course remediation costs, of lengthening the required implementation timeline, the Department adjusted its assumptions as to the pace at which entities would incur initial testing and remediation costs. In this analysis, the Department projected 10-year costs assuming large entities would incur 33 percent of their initial costs in each of the first three years and small entities would incur 25 percent of their initial costs in each of the first four years after the promulgation of the rule.

For a web page to conform to WCAG 2.1, the web page must satisfy the success criteria under three levels of conformance: A, AA, or AAA. The three levels of conformance indicate a measure of accessibility and feasibility. Level A, which is the minimum level of accessibility, contains criteria that provide basic web accessibility and are the least difficult to achieve for web developers. Level AA, which is the intermediate level of accessibility, includes all of the Level A criteria and contains enhanced criteria that provide more comprehensive web accessibility, and yet are still achievable for most web developers. Level AAA, which is the highest level of conformance, includes all of the Level A and Level AA criteria, but it also contains additional criteria that can provide a more enriched user experience, though these additional criteria are the most difficult to achieve for web developers.

To estimate the costs of requiring conformance only with WCAG 2.1 Level A standards, the Department duplicated its website cost methodology discussed in Sections 3.3.3–3.3.9 while omitting from consideration any errors that violate WCAG 2.1 Level AA guidelines only. Accessibility errors that violated both WCAG 2.1 Level A and WCAG 2.1 Level AA standards were retained.

WCAG 2.1 introduced 12 new success criteria for WCAG 2.1 Levels A and AA.[190] To estimate the costs of requiring WCAG 2.0 Level AA rather than WCAG 2.1 Level AA standards, the Department replicated its website cost methodology from Sections 3.3.3–3.3.9 while omitting any errors classified under one or more of these new success criteria.

To estimate the costs of shortening the implementation timeline for the proposed rule to one year for all entities, the Department retained its primary calculations but assumed that the full burden of the initial costs would be borne in Year 1. The Department then generated a second alternative timeline with a one-year implementation timeline for large entities, and a three-year implementation timeline for small entities. For these alternatives, the costs remain the same, but the year that they begin to accrue is changed.

The Department believes that requiring compliance with WCAG 2.1 Level AAA would prove infeasible, or at least unduly onerous, for some entities. Level AAA, which is the maximum level of accessibility, includes all of the Level A and Level AA criteria and contains additional criteria that can provide a more enriched user experience, but are the most difficult to achieve for web developers. The W3C® does not recommend that Level AAA conformance be required as a general policy for entire websites because it is not possible to satisfy all Level AAA

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[190] These are WCAG Success Criteria 1.3.4, 1.3.5, 1.4.10, 1.4.11, 1.4.12, 1.4.13, 2.1.4, 2.5.1, 2.5.2, 2.5.3, 2.5.4, and 4.1.3. More information is available at: W3C Web Accessibility Initiative. (2020, August 13). *What's New in WCAG 2.1*. (S. L. Henry, Editor) Retrieved from https://www.w3.org/WAI/standards-guidelines/wcag/new-in-21/.

criteria for some content.[191] For those reasons, the Department did not quantify costs of requiring WCAG 2.1 Level AAA. Table 74 shows the projected 10-year costs of these alternatives. Table 75 shows the total incremental costs of these alternatives over 10 years with a 7 percent discount rate.

Table 74: Projected Total 10-Year Costs for Regulatory Alternatives (Millions)

Time Period	Longer Time Frame	WCAG 2.1 A	WCAG 2.0 AA	Rule As Proposed	Shorter Time Frame Opt. 1 [a]	Shorter Time Frame Opt. 2 [a]
Year 1	$2,387	$3,095	$3,082	$3,361	$8,344	$5,046
Year 2	$2,582	$3,380	$3,365	$3,646	$5,526	$6,402
Year 3	$2,803	$6,275	$5,402	$6,402	$2,717	$4,304
Year 4	$6,030	$3,262	$2,817	$3,270	$1,836	$2,389
Year 5	$3,270	$1,831	$1,600	$1,836	$1,836	$1,836
Year 6	$1,836	$1,831	$1,600	$1,836	$1,836	$1,836
Year 7	$1,836	$1,831	$1,600	$1,836	$1,836	$1,836
Year 8	$1,836	$1,831	$1,600	$1,836	$1,836	$1,836
Year 9	$1,836	$1,831	$1,600	$1,836	$1,836	$1,836
Year 10	$1,836	$1,831	$1,600	$1,836	$1,836	$1,836
PV of 10-year costs, 3% rate	$22,721	$23,620	$21,286	$24,275	$26,238	$25,806
Average annualized costs, 3% rate	$3,162	$2,795	$2,522	$2,872	$3,102	$3,052
PV of 10-year costs, 7% rate	$18,579	$20,093	$18,174	$20,701	$22,898	$22,298
Average annualized costs, 7% rate	$2,712	$2,860	$2,587	$2,947	$3,260	$3,174

[a] Option 1 is a compliance timeframe of one year for all entities. Option 2 is a compliance timeframe of one year for large entities and three years for small entities.

Table 75: Incremental Costs of Regulatory Alternatives (Millions) [a]

Alternative	Total	Incremental From Rule as Proposed
Longer Timeframe	$18,579	-$2,122
WCAG 2.1 A	$20,093	-$608

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[191] *See* W3C®, *Understanding Conformance, Understanding Requirement 1* (last updated Aug. 19, 2022), *available at* https://www.w3.org/WAI/WCAG21/Understanding/conformance.

Alternative	Total	Incremental From Rule as Proposed
WCAG 2.0 AA	$18,174	-$2,527
Rule as Proposed	$20,701	N/A
Shorter Timeframe Opt. 1 [b]	$22,898	$2,197
Shorter Timeframe Opt. 2 [b]	$22,298	$1,597

[a] 10-year total costs, 7 percent discount rate.
[b] Option 1 is a compliance timeframe of one year for all entities. Option 2 is a compliance timeframe of one year for large entities and three years for small entities.

Question 21: The Department requests comment on refining the quantitative analysis of regulatory alternatives.

5.2 BENEFITS OF REGULATORY ALTERNATIVES

The Department has considered several regulatory alternatives. These include changes in the compliance implementation period and the WCAG compliance level. The less stringent alternatives include a longer compliance period (four years for small public entities and special district governments and three years for large public entities) and compliance with WCAG 2.1 Level A or WCAG 2.0 Level AA. The more stringent alternatives are two different shorter compliance periods. One alternative allows one year for all entities to comply, and the other alternative allows one year for large entities and three years for small entities. As noted previously, the Department also considered analyzing Level AAA conformance as an alternative but decided not to do so. The W3C® does not recommend that Level AAA conformance be required as a general policy for entire websites because it is not possible to satisfy all Level AAA criteria for some content.[192]

A variety of assumptions were used to estimate benefits for these regulatory alternatives. For the alternative compliance timeframes, the Department adjusted only the benefit accrual

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[192] *See* W3C®, *Understanding Conformance, Understanding Requirement 1* (last updated Aug. 19, 2022), *available at* https://www.w3.org/WAI/WCAG21/Understanding/conformance.

rates to reflect the alternative timeframes. Table 76 shows the 10-year average annualized

benefits decrease to $7.7 billion from $8.9 billion with the longer timeframe and increase to

either $10.7 billion or $9.7 billion with the shorter timeframes (using a 7 percent discount rate).

Table 76: Average Annualized Benefits, Regulatory Alternatives (Millions) [a]

Beneficiary	Longer Time Frame	WCAG 2.1 A	WCAG 2.0 AA	Rule As Proposed	Shorter Time Frame Opt. 1 [b]	Shorter Time Frame Opt. 2 [b]
Time savings - current users	$3,171.6	$2,696.9	$3,416.1	$3,416.1	$3,882.6	$3,469.8
Time savings - new users	$699.6	$170.3	$170.3	$753.5	$856.4	$765.3
Time savings - governments	$458.0	$83.6	$83.6	$493.3	$560.7	$501.1
Time savings - mobile apps	$297.4	$252.9	$320.4	$320.4	$364.1	$325.4
Time savings - education	$2,775.4	$2,766.6	$3,504.4	$3,504.4	$4,384.2	$4,070.8
Educational attainment	$313.4	$224.7	$224.7	$449.5	$614.1	$597.6
Total	$7,715.4	$6,195.1	$7,719.5	$8,937.2	$10,662.1	$9,730.0

[a] 10-Year average annualized benefits, 7 percent discount rate.
[b] Option 1 is a compliance timeframe of one year for all entities. Option 2 is a compliance timeframe of one year for large entities and three years for small entities.

For the WCAG compliance level, the alternative assumptions were less straightforward.

For time savings for current website users, current mobile app users, and higher-education

students, the Department used the ratio of the number of success criteria under the difference

standards to adjust benefit levels. The literature used to assess benefits of compliance with

WCAG 2.1 Level AA was based on compliance with WCAG 2.0 Level AA. Therefore, the

Department set benefits for WCAG 2.0 Level AA equal to the benefits estimated for the rule as

proposed. For WCAG 2.1 Level A, the Department multiplied primary benefits estimates by

0.79 (based on the ratio of the number of success criteria of WCAG 2.1 Level A to WCAG 2.0

Level AA, or 30/38).[193]

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[193] WCAG 2.0 Level AA has 38 success criteria, and WCAG 2.1 Level A has 30. WGAG 2.0 Level AA is used as the baseline because that is the standard used by Schmutz et al. (2017).

For time savings to new users and State and local governments, the Department used the low and high estimates for the less stringent and more stringent compliance level alternatives, respectively. For benefits of higher educational attainment, the Department simply multiplied by 0.5 and 1.5 respectively for the less stringent and more stringent alternatives. The basis for this is the gap in educational achievement closing by 5 percent or 15 percent, rather than 10 percent (the same alternative assumptions as used in the sensitivity analysis).

Table 76 shows the 10-year average annualized benefits for the alternative compliance levels, using a 7 percent discount rate. Benefits decrease to $6.2 billion and $7.7 billion from $8.9 billion for WCAG 2.1 Level A and WCAG 2.0 Level AA, respectively. Table 77 presents the incremental benefits of the alternatives relative to the primary estimate.

Table 77: Incremental Benefits of Regulatory Alternatives (Millions) [a]

Alternative	Total	Incremental From Rule as Proposed
Longer Timeframe	$7,715.4	-$1,221.7
WCAG 2.1 Level A	$6,195.1	-$2,742.0
WCAG 2.0 Level AA	$7,719.5	-$1,217.7
Rule as Proposed	$8,937.2	N/A
Shorter Timeframe Opt. 1 [b]	$10,662.1	$1,725.0
Shorter Timeframe Opt. 2 [b]	$9,730.0	$792.8

[a] 10-Year average annualized benefits, 7 percent discount rate.
[b] Option 1 is a compliance timeframe of one year for all entities. Option 2 is a compliance timeframe of one year for large entities and three years for small entities.

PRELIMINARY REGULATORY FLEXIBILITY ACT (PRFA) ANALYSIS

1   WHY THE DEPARTMENT IS CONSIDERING ACTION

Title II of the ADA provides that no qualified individual with a disability shall be excluded from participation in or denied the benefits of the services, programs, or activities of a State or local government. The Department has consistently made clear that this requirement includes *all* services, programs, and activities of public entities, including those provided via the

web. In this NPRM, the Department proposes technical standards for website and mobile app

accessibility to give public entities greater clarity in exactly how to meet their ADA obligations

and to help ensure equal access to government services, programs, and activities for people with

disabilities.

Just as steps exclude people who use wheelchairs, inaccessible websites can exclude

people with a range of disabilities from accessing government services. For example, the ability

to access voting information, find up-to-date health and safety resources, and look up mass

transit schedules and fare information may depend on having access to websites and mobile

apps. With accessible web content and mobile apps people with disabilities can access

government services independently and privately.

2 OBJECTIVES OF AND LEGAL BASIS FOR THE PROPOSED RULE

On July 26, 1990, President George H.W. Bush signed into law the ADA, a

comprehensive civil rights law prohibiting discrimination on the basis of disability. 42 U.S.C.

12101-12213. Section 204(a) of the ADA directs the Attorney General to issue regulations

implementing part A of title II, but exempts matters within the scope of the authority of the

Secretary of Transportation under section 223, 229, or 244. 42 U.S.C. 12134(a).[194] Title II,

which this rule addresses, applies to State and local government entities, and, in part A, protects

qualified individuals with disabilities from discrimination on the basis of disability in services,

programs, and activities provided by State and local government entities.

Accordingly, the Department is proposing technical requirements to enable public entities

to fulfill their obligations under title II to provide access to all of their services, programs, and

activities that are provided via the web and mobile apps. The Department believes the

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[194] Section 229(a) and section 244 of the ADA direct the Secretary of Transportation to issue regulations
implementing part B of title II, except for section 223. *See* 42 U.S.C 12149; 42 U.S.C. 12164.

requirements described in the NPRM are necessary to ensure the "equality of opportunity, full participation, independent living, and economic self-sufficiency" for individuals with disabilities set forth in the ADA. 42 U.S.C. 12101(a)(7).

3   NUMBER OF SMALL GOVERNMENTS AFFECTED BY THE RULEMAKING

The Department has examined the impact of the proposed rule on small entities as required by the RFA. For the purposes of this analysis, impacted small public entities are independent State and local governmental units in the United States that serve a population less than 50,000.[195] Based on this definition, the Department estimates a total of 88,000 small entities. This estimate includes the governments of counties, municipalities, townships, school districts, and territories with populations below 50,000 in the 2020 Census of Governments.[196] No State governments qualify as small. All special district governments[197] are included in this analysis because total population for these public entities could not be determined and the Department wants to ensure small governments are not undercounted. Table 78 contains information about the distribution of population sizes of small entities by government type.

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[195] 5 U.S.C. 601(5) and Small Business Administration. (2017). *A Guide for Government Agencies: How to Comply with the Regulatory Flexibility Act.* Retrieved from https://www.sba.gov/sites/default/files/advocacy/How-to-Comply-with-the-RFA-WEB.pdf.

[196] U.S. Census Bureau. (2022, September 20). *2020 State & Local Government Finance Historical Datasets and Tables*. Retrieved from https://www.census.gov/data/datasets/2020/econ/local/public-use-datasets.html.

[197] The proposed rule defines "special district government" as "a public entity—other than a county, municipality, or township, or independent school district—authorized by State law to provide one function or a limited number of designated functions with sufficient administrative and fiscal autonomy to qualify as a separate government and whose population is not calculated by the United States Census Bureau in the most recent decennial Census or Small Area Income and Poverty Estimates." A special district government may include, for example, a mosquito abatement district, utility district, transit authority, water and sewer board, zoning district, or other similar governmental entities that operate with administrative and fiscal independence.

Table 78: Distribution of the Population of Small Government Entities

Government Type	Mean Population Size	10th Percentile Population Size	Median Population Size	90th Percentile Population Size
County	18,520	3,688	15,665	39,072
Municipality	4,220	142	1,042	12,311
Township	2,846	61	898	6,977
Special district	[a]	[a]	[a]	[a]
School district [b]	48,520	47,567	48,520	49,472
U.S. territory	8,806	792	5,095	22,728
CCs [c]	22,704	8,299	21,689	41,183

[a] Population is not reported for special districts in the Census of Governments data.
[b]Excludes community colleges which are costed separately. Population estimated based on the enrollment numbers multiplied by the ratio of the total population to the school-age population for the county.
[c] Population estimated based on the enrollment numbers multiplied by the ratio of the total population to the school-age population for the county.

The Census of Governments includes enrollment numbers for school districts, but not population counts. To approximate population, the Department multiplied the enrollment numbers by the ratio of the estimated total population to school age population, by county.[198] Postsecondary educational institutions are considered as separate institutions because their funding sources are different from those of traditional State and local governments. While public postsecondary educational institutions receive funding from State and local tax revenue, they also receive funding from tuition and fees from students and sometimes from endowments. Public universities are excluded from this analysis because these tend to be State-dependent institutions and all States have populations greater than 50,000. Independent community colleges were removed from school district counts and included separately. These were combined with counts of dependent community colleges from the National Center for Education

[198] U.S. Census Bureau. (2021). *County Population by Characteristics: 2010-2019. Annual County Resident Population Estimates by Age, Sex, Race, and Hispanic Origin: April 1, 2010 to July 1, 2019.* Retrieved from https://www.census.gov/data/datasets/time-series/demo/popest/2010s-counties-detail.html.

Statistics (NCES).[199]

Question 22: The Department is seeking data and feedback to assist in tabulating the number of small entities affected by this rule.

4   IMPACT OF THE PROPOSED RULE ON SMALL GOVERNMENTS

The Department calculated costs and benefits to small governments. The Department also compared costs to revenues for small governments to evaluate the economic impact to these governments (see Section 3.9 for details). The costs are less than 1 percent of revenues for every entity type, so the Department believes that the costs of this proposed regulation would not be overly burdensome for the regulated small governments.[200] These costs include one-time costs for familiarization with the requirements of the rule, the purchase of software to assist with remediation of the website or mobile app, the time spent testing and remediating websites and apps to comply with WCAG 2.1 Level AA, and elementary, secondary, and postsecondary education course content remediation. Annual costs include recurring costs for software licenses and remediation of future content.

The Department performed analyses to estimate the costs to test and remediate inaccessible websites, mobile apps, and elementary, secondary, and postsecondary education course content. As described in Section 3.3.2, these analyses involved multistage stratified cluster sampling to randomly select government entities, government entity websites, and

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[199] National Center for Education Statistics. (n.d.). *Summary Tables*. Retrieved from https://nces.ed.gov/ipeds/SummaryTables/.

[200] As noted above and as a point of reference, the United States Small Business Administration advises agencies that a potential indicator that the impact of a proposed regulation may be "significant" is whether the costs exceed 1 percent of the gross revenues of the entities in a particular sector, although the threshold may vary based on the particular types of entities at issue. The Department estimates that the costs of this rulemaking for each government entity type are far less than 1 percent of revenues. *See* Small Bus. Admin., A Guide for Government Agencies: How to Comply with the Regulatory Flexibility Act, at 19 (Aug. 2017), https://advocacy.sba.gov/wp-content/uploads/2019/07/How-to-Comply-with-the-RFA-WEB.pdf.

government entity apps. The Department selected samples from each cell of the matrix of types of government entities and size (small or large) (Table 11), estimated each type of remediation cost, and then extrapolated the costs to the population of government entities in each government type and size combination. Annualized total costs for small governments over a 10-year period are estimated at $1.5 billion assuming either a 3 percent or 7 percent discount rate (Table 82). Additional details on how these costs were estimated are provided in Section 3.

The most recent revenue data available are from U.S. Census Bureau's State and Local Government Finances by Level of Government and by State: 2020.[201] However, these data do not disaggregate revenue by entity type or size. Therefore, the Department first estimated the proportion of total local government revenue in each local government entity type and size using the 2012 U.S. Census Bureau's database on individual local government finances.[202] The Department then multiplied these proportions of the total local government revenues in each entity type by the 2020 total local government revenue to calculate the 2020 revenue for the small entities in each government type (Table 79). Revenue data for the small territories are from the United States Government Accountability Office.[203] The Department then multiplied these 2020 revenue numbers by the ratio of the 2021 GDP deflator to the 2020 GDP deflator to express these revenues in 2021 dollars.[204] See Section VI.3.9 for additional details on how these revenue numbers were derived.

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[201] U.S. Census Bureau. (2022, September 20). *2020 State & Local Government Finance Historical Datasets and Tables*. Retrieved from https://www.census.gov/data/datasets/2020/econ/local/public-use-datasets html.

[202] Available at U.S. Census Bureau. (2021, October 8). *Historical Data*. Retrieved from https://www.census.gov/programs-surveys/cog/data/historical-data.html. The Department was unable to find more recent data with this level of detail. Population counts were adjusted for estimated population growth over the applicable period.

[203] GAO. (June 2021). *U.S. TERRITORIES: Public Debt Outlook-2021 Update*. Retrieved from https://www.gao.gov/assets/gao-21-508.pdf.

[204] Bureau of Economic Analysis. Table 1.1.9. Implicit Price Deflators for Gross Domestic Product. Available at https://apps.bea.gov/iTable/?reqid=19&step=3&isuri=1&1910=x&0=-99&1921=survey&1903=13&1904=2015&1905=2021&1906=a&1911=0. Accessed November, 2022.

Table 79: Distribution of Local Government Revenue to Small Government Entities

Government Type	Percentage of Total Local Government Revenue 2012	Total Annual Revenue for Small Governments 2020 (Millions)
County	2.89%	$62,248
Municipality	8.20%	$176,606
Township	2.48%	$53,419
Special district	12.38%	$266,495
School district [a]	14.70%	$316,528
CCs - independent [b]	0.50%	$36,793

[a] Excludes community colleges which are costed separately.
[b] Data are not available for dependent community colleges to attribute what portion of the larger entity's revenue is available to dependent community colleges.

Costs to small entities, as calculated in Section 3, are displayed in Table 80 and Table 81. Table 82 contains the costs and revenues per government type, and cost-to-revenue ratios using a 3 percent and 7 percent discount rate. The costs are less than 1 percent of revenues for every entity type, so the Department believes that the costs of this proposed regulation would not have a significant economic impact on small entities affected by the proposed rule.[205]

Because the Department's cost estimates take into account different government types and sizes, the Department believes the estimates in this analysis are generally representative of what smaller entities of each type should expect to pay. This is because the Department's

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[205] As noted above and as a point of reference, the United States Small Business Administration advises agencies that a potential indicator that the impact of a proposed regulation may be "significant" is whether the costs exceed 1 percent of the gross revenues of the entities in a particular sector, although the threshold may vary based on the particular types of entities at issue. The Department estimates that the costs of this rulemaking for each government entity type are far less than 1 percent of revenues. *See* Small Bus. Admin., A Guide for Government Agencies: How to Comply with the Regulatory Flexibility Act, at 19 (Aug. 2017), https://advocacy.sba.gov/wp-content/uploads/2019/07/How-to-Comply-with-the-RFA-WEB.pdf. Dependent community college costs (community colleges that are operated by a government entity rather than being an independent school district) are not compared to revenues. Revenues are not available directly for these community colleges. And the Department is unable to determine how to distribute these entities' costs across the State and local government entity types. Additionally, it is unclear if all public college and university revenue (*e.g.*, tuition, fees) are included in the revenue recorded for the State or local entities on which the school is dependent.

methodology generally estimated costs based on the sampled baseline accessibility to full accessibility in accordance with this rule, which provides a precise estimate of the costs within each government type and size. While the Department recognizes that there may be variation in costs for differently sized "small" entity types, we believe the Department's estimates are generally representative given the precision in our methodology within each stratified group. However, the Department is interested in feedback on how it can further refine this analysis to better represent costs for small government entities.

Table 80: Present Value of Total 10-Year Costs per Entity, 3% Discount Rate

Type of Government Entity	Number of Entities	Regulatory Familiarization	Website Testing and Remediation	Mobile App Testing and Remediation	Postsecondary Course Remediation	Primary and Secondary Course Remediation	Third-Party Website Remediation	Total
Special district	38,542	$288	$15,134	$0	N/A	N/A	$726	$16,148
County (small)	2,105	$288	$48,221	$11,236	N/A	$16,923	$5,235	$81,904
Municipality (small)	18,729	$288	$146,690	$0	N/A	$743	$8,124	$155,846
Township (small)	16,097	$288	$119,972	$0	N/A	$1,865	$6,980	$129,104
School district (small)	11,443	$288	$152,660	$25,826	N/A	$69,538	$6,939	$255,251
U.S. Territory (small)	2	$288	$928,388	$63,746	N/A	N/A	$5,570	$997,993
Community College	1,146	$288	$924,042	$14,875	$2,831,231	N/A	$61,016	$3,831,453

Table 81: Present Value of Total 10-Year Costs per Entity, 7% Discount Rate

Type of Government Entity	Number of Entities	Regulatory Familiarization	Website Testing and Remediation	Mobile App Testing and Remediation	Postsecondary Course Remediation	Primary and Secondary Course Remediation	Third-Party Website Remediation	Total
Special district	38,542	$278	$13,081	$0	N/A	N/A	$628	$13,987
County (small)	2,105	$278	$41,933	$10,418	N/A	$14,113	$4,553	$71,293
Municipality (small)	18,729	$278	$127,688	$0	N/A	$620	$7,072	$135,657
Township (small)	16,097	$278	$104,405	$0	N/A	$1,555	$6,074	$112,311
School district (small)	11,443	$278	$132,897	$23,947	N/A	$57,990	$6,041	$221,153
U.S. Territory (small)	2	$278	$808,504	$59,126	N/A	N/A	$4,851	$872,758
Community College	1,146	$278	$815,076	$14,047	$2,319,125	N/A	$53,821	$3,202,346

Table 82: Number of Small Entities and Ratio of Costs to Government Revenues

Government Type	Number of Small Entities	Average Annual Cost per Entity (3%) [a] [c]	Average Annual Cost per Entity (7%) [a] [c]	Total 10-Year Average Annual Costs (3%) (Millions)	Total 10-Year Average Annual Costs (7%) (Millions)	Annual Revenue (Millions)	Ratio of Costs to Revenue (3%)	Ratio of Costs to Revenue (7%)
County	2,105	$9,601.6	$10,150.5	$20.2	$21.4	$65,044.3	0.03%	0.03%
Municipality	18,729	$18,269.9	$19,314.5	$342.2	$361.7	$184,538.9	0.19%	0.20%
Township	16,097	$15,135.0	$15,990.6	$243.6	$257.4	$55,818.9	0.44%	0.46%
Special district	38,542	$1,893.1	$1,991.4	$73.0	$76.8	$278,465.3	0.03%	0.03%
School district [a]	11,443	$31,964.3	$33,559.1	$365.8	$384.0	$330,746.4	0.11%	0.12%
U.S. territory	2	$116,995.3	$124,261.1	$0.2	$0.2	$1,242.5	0.02%	0.02%
CCs [b]	960	$449,163.1	$455,942.1	$431.2	$437.7	N/A	N/A	N/A
CCs - independent	231	$449,163.1	$455,942.1	$103.8	$105.3	$11,340.2	0.91%	0.93%
Total (includes all CCs)	87,878	$16,798.0	$17,515.5	$1,476.2	$1,539.2	N/A	N/A	N/A
Total (only independent CCs)	87,149	$13,181.3	$13,848.1	$1,148.7	$1,206.8	$927,196.7	0.12%	0.13%

[a] Excludes community colleges, which are costed separately.

[b] Includes all dependent community college districts and the small independent community college districts. Revenue data are not available for the dependent community college districts.

[c] This cost consists of regulatory familiarization costs (discussed in Section 3.2), government website testing and remediation costs (Section 3.3), mobile app testing and remediation costs (Section 3.4), postsecondary education course remediation costs (Section 3.5), elementary and secondary education course remediation costs (Section 3.6), and costs for third-party websites (Section 3.7) averaged over ten years.

The Department quantified six types of benefits in the preliminary regulatory impact analysis. These include:

- Time savings for current users of State and local government websites;

- Time savings for those who switch modes of access (*i.e.*, switch from other modes such as phone or mail to web) or begin to participate (did not previously partake in the government's service, program, or activity);

- Time savings for current mobile app users;

- Time savings for students and parents;

- Earnings from additional educational attainment; and

- Time savings for State and local governments from reduced contacts (*i.e.*, fewer interactions assisting residents).

However, only the last of these types of benefits directly impacts State and local government budgets. Improved website accessibility will lead some individuals who accessed government services via the phone, mail, or in person to begin using the public entity's website to complete the task. This will generate time savings for government employees. As explained in Section 4.3.4, the Department assumed that for each of the 13.5 million new users of State and local government websites, there will be six fewer transactions that require government personnel's time, and each of these will save the government about 10 minutes of labor time. This results in 13.5 million hours saved. To determine the share associated with small governments, the Department multiplied by 80 percent, which is the share of websites associated with small governments.

The cost of this time is valued at the median loaded wage for "Office and Administrative Support Occupations" within Federal, State, and local governments. According to the 2021

OEWS, the median hourly wage rate is $22.19.[206] This was multiplied by two to account for

benefits and overhead.[207] This results in a loaded hourly wage rate of $44.38 per hour.

Multiplying 13.5 million hours by 80 percent and $44.38 per hour results in time savings to

governments of $478.9 million. Assuming lower benefits during the implementation period (see

Section VI.4.3.8) results in average annualized benefits of $404.0 million and $393.3 million

using a 3 percent and 7 percent discount rate, respectively.

The parameters used here are the same as those used in the PRIA for all governments.

Benefits for small governments may be a smaller share of all benefits than estimated here if

fewer transactions are conducted by small governments. The Department assumed six

transactions for all governments regardless of size. If small governments conduct fewer

transactions, then benefits would be smaller. Similarly, the benefits for very small governments

may be smaller than for larger small governments. Benefits may also vary across small and large

governments if employee wage rates differ. However, the Department does not have precise data

at this time to indicate how the number of transactions or wage rates may vary by government

size.

5 RELEVANT FEDERAL RULES DUPLICATING, OVERLAPPING, OR CONFLICTING WITH THE PROPOSED RULE

The Department has determined that there are no other Federal rules that are either in

conflict with this proposed rule, or are duplicative of it. The Department recognizes that there is

a potential for overlap with other Federal nondiscrimination laws because entities subject to title

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[206] OEWS data available at: U.S. Bureau of Labor Statistics. (2022, March 31). *May 2021 National Industry-Specific Occupational Employment and Wage Estimates*. Retrieved from https://www.bls.gov/oes/current/naics2_99 htm#43-0000.
[207] Department of Justice guidance was unavailable, so the Department used guidance from a different agency that frequently engages in rulemakings. Department of Health and Human Services. (2016). *Guidelines for Regulatory Impact Analyses*. Retrieved from https://aspe.hhs.gov/reports/guidelines-regulatory-impact-analysis.

II of the ADA may also be subject to title I of the ADA, which prohibits discrimination on the basis of disability in employment, or section 504 of the Rehabilitation Act, which prohibits discrimination on the basis of disability in programs and activities that receive Federal financial assistance. The regulation implementing title II of the ADA does not, however, invalidate or limit the remedies, rights, and procedures available under any other Federal, State, or local laws that provide greater or equal protection for the rights of individuals with disabilities (or individuals associated with them). Compliance with the Department's title II regulation, therefore, does not ensure compliance with other Federal laws.

6   ALTERNATIVES TO THE PROPOSED RULE

Under the Regulatory Flexibility Act, agencies must consider any significant alternatives to the proposed rule that accomplish the stated objectives of applicable statutes and that minimize the rule's economic impact on small entities. Section 603(c) of the RFA gives agencies some alternatives that they must consider at a minimum: (1) establishment of different compliance or reporting requirements for small entities or timetables that take into account the resources available to small entities; (2) clarification, consolidation, or simplification of compliance and reporting requirements for small entities; (3) use of performance rather than design standards; and (4) exemption for certain or all small entities from coverage of the rule, in whole or in part. The Department considered several alternatives to the proposed rule to meet these requirements, presented in Table 83 below.

Table 83: Regulatory Alternatives Considered

Stringency	Alternative
Less stringent	3 years for implementation for large entities; 4 years for implementation for small entities
Less stringent	Conformance with WCAG 2.1 Level A required
Less stringent	Conformance with WCAG 2.0 Level AA required
Rule as proposed	Conformance with WCAG 2.1 Level AA required
More stringent	1 year for implementation for all entities
More stringent	1 year implementation for large entities; 3 years implementation for small entities
More stringent	Conformance with WCAG 2.1 Level AAA required

The Department has considered three less-restrictive compliance alternatives for small governments. The first is a longer compliance period of four years for small public entities and special district governments, for which the Department adjusted its assumptions as to the pace at which entities would incur initial testing and remediation costs. Additionally, two less restrictive compliance levels were considered: WCAG 2.1 Level A and WCAG 2.0 Level AA. To estimate the costs of requiring conformance only with WCAG 2.1 Level A standards, the Department duplicated its website cost methodology discussed in Sections 3.3.3–3.3.9 while omitting from consideration any errors that violate WCAG 2.1 Level AA guidelines only. Accessibility errors that violated both WCAG 2.1 Level A and WCAG 2.1 Level AA standards were retained. WCAG 2.1 introduced 12 new success criteria for Levels A and AA.[208] To estimate the costs of requiring WCAG 2.0 Level AA rather than WCAG 2.1 Level AA standards, the Department replicated its website cost methodology from Sections VI.3.3.3–VI.3.3.9 while omitting any errors classified under one or more of these new success criteria. Costs and benefits of these regulatory alternatives for all governments are presented in Sections 5.1 and 5.2, respectively.

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[208] These are Success Criteria 1.3.4, 1.3.5, 1.4.10, 1.4.11, 1.4.12, 1.4.13, 2.1.4, 2.5.1, 2.5.2, 2.5.3, 2.5.4, and 4.1.3. Success Criteria 1.3.6, 2.2.6, 2.3.3, 2.5.5, and 2.5.6 were newly introduced as Level AAA success criteria. More information is available at: W3C Web Accessibility Initiative. (2020, August 13). *What's New in WCAG 2.1*. (S. L. Henry, Editor) Retrieved from https://www.w3.org/WAI/standards-guidelines/wcag/new-in-21/.

Here, the Department summarizes the costs and benefits of these regulatory alternatives for small entities.

Costs differ for the regulatory alternatives as explained in Section 5.1. The results are summarized in Table 84 and Table 85

Table 84: Average Annualized Costs for Small Entities of Regulatory Alternatives, 7 Percent Discount Rate (Millions)

Government Type	Rule As Proposed	WCAG 2.1 Level A	WCAG 2.0 Level AA	Longer Implementation Period
County	$21.4	$21.2	$21.8	$20.6
Municipality	$361.7	$360.8	$366.5	$348.9
Township	$257.4	$256.5	$261.5	$248.8
Special district	$76.8	$76.7	$86.7	$82.9
School district [a]	$384.0	$383.1	$382.5	$362.2
U.S. territory	$0.2	$0.2	$0.2	$0.2
CCs [b]	$437.7	$436.5	$357.5	$392.8
CCs - independent	$105.3	$105.0	$86.0	$94.5
Total (includes all CCs)	$1,539.2	$1,535.1	$1,476.8	$1,456.4
Total (only independent CCs)	$1,206.8	$1,203.6	$1,205.3	$1,158.1

[a] Excludes community colleges, which are costed separately.
[b] Includes all dependent community college districts and the small independent community college districts.

Table 85: Average Annualized Costs Per Small Entity of Regulatory Alternatives, 7 Percent Discount Rate

Government Type	Rule as Proposed	WCAG 2.1 A	WCAG 2.0 AA	Longer Implementation Period
County	$10,151	$10,074	$10,360	$9,774
Municipality	$19,315	$19,264	$19,569	$18,628
Township	$15,991	$15,933	$16,247	$15,457
Special district	$1,991	$1,990	$2,249	$2,150
School district [a]	$33,559	$33,482	$33,428	$31,652
U.S. territory	$124,261	$122,836	$123,629	$118,003
CCs [b]	$455,942	$454,702	$372,373	$409,159
CCs - independent	$455,942	$454,702	$372,373	$409,159
Total (includes all CCs)	$17,516	$17,468	$16,805	$16,573
Total (only independent CCs)	$13,848	$13,811	$13,830	$13,289

[a] Excludes community colleges which are costed separately.
[b] Includes all dependent community college districts and the small independent community college districts.

Benefit methodology for regulatory alternatives is explained in Section 5.2. Here, the

Department applies that same methodology to small entities. Using a longer compliance period,

the Department estimates average annualized benefits would be slightly lower because benefits would not accrue as quickly. The Department estimates average annualized benefits of $378.2 million and $365.2 million using a 3 percent and 7 percent discount rate, respectively (compared with $404.0 million and $393.3 million associated with the rule as proposed).

The Department altered four assumptions to estimate the benefits associated with WCAG 2.1 Level A and WCAG 2.0 Level AA. These are the same assumptions altered for the sensitivity analysis in Section 4.3.9. First, ACS prevalence rates were used in lieu of SIPP estimates. Second, rather than assuming website usage becomes equivalent for individuals with and without disabilities, the Department assumed this gap only closes by 75 percent. Third, the average time spent per transaction was reduced by 25 percent. Fourth, the average number of transactions per year was reduced by 25 percent. Incorporating these alternative assumptions reduces the cost savings for small governments to $68.5 million and $66.7 million using a 3 percent and 7 percent discount rate, respectively (from $404.0 million and $393.3 million associated with the rule as proposed). The Department seeks the public's feedback on other alternatives that may minimize the costs to small governments while achieving the benefits of the rulemaking that are not already discussed in this proposed rule.

APPENDIX A: COST ANALYSIS STATISTICAL METHODOLOGY

Several elements of the Department's website testing and remediation costs are based on a sample of websites of State and local government entities that were collected and assessed as described in Section 3.3. Further details about the sampling process are given below. Table A86 shows the counts for the universe of State and local governments affected by the proposed rule, disaggregated by entity type and population size. The Department drew a sample from each of these cells and estimated costs for each entity type and size.

Table A86: Government Entity Type Sample Frame Counts

Type of Government Entity [a]	Population of less than 50,000	Population of 50,000 or more	Total
State	-	51	51
County	2,105	926	3,031
Municipal	18,729	766	19,495
Township	16,097	156	16,253
Special district	38,542 [b]	[b]	38,542
School district	11,443 [c][d]	779 [c][d]	12,222
U.S. territory	2	3	5
Public university	744 [b][e]	[b]	744
Community college	1,146 [b][e]	[b]	1,146
Total (no higher education)	86,918	2,681	89,599
Total (with higher education)	88,808	2,681	91,489

[a] Data for government entities from U.S. Census Bureau. (2022). Census of Governments 2017 - Public use Files. https://www.census.gov/data/datasets/2017/econ/gus/public-use-files.html.
[b] The available data sources (U.S. Census Bureau and NCES) do not report the population of the region associated with special districts, public universities, and community colleges. These entity types are displayed as small here.
[c] Counts of independent school districts exclude "Post-Secondary" and "Special or Vocational" school districts.
[d] Population data for school districts estimated from U.S. Census Bureau. (2021). County Population by Characteristics: 2010-2019. Annual County Resident Population Estimates by Age, Sex, Race, and Hispanic Origin: April 1, 2010 to July 1, 2019. https://www.census.gov/data/datasets/time-series/demo/popest/2010s-counties-detail.html.
[e] Counts of public universities and community colleges from the National Center for Education Statistics (NCES). https://nces.ed.gov/ipeds/SummaryTables/.

Because exhaustive lists of all 91,497 governments' websites are not available (and manually generating such a sample frame was not feasible), the Department drew a two-stage

cluster sample. The primary sampling units (PSUs) are the government entities shown in Table A86, and the secondary sampling units (SSUs) are the websites associated with each government. After randomly selecting PSUs, the Department used a variety of search techniques to generate a list of websites for each sampled government entity. Then, a random sample was drawn from each list of websites (SSUs).

A.1 SAMPLE ALLOCATION

The total number of governments sampled was informed by the projected feasibility of generating a list of websites for each sampled entity and assessing the accessibility of the sampled websites (*i.e.*, based on resources available and timeline). The Department set a target sample size of 200 entities to be allocated, as shown in Table A87 below, among the entity types in Table A86 (excluding institutions of higher education).[209] The Department also set a minimum sample size of 15 for each entity type. In the case of U.S. territories, all five were sampled. The remaining sample slots were allocated among the entity types proportionally to the number of entities of each type.

Due to the complexity of attributing costs borne by institutions of higher education to their various funding sources and the State and local governments that operate them (see Section 3), public universities and community colleges were not included within the other government entity types. Given that postsecondary educational institutions have two separate website cost components requiring estimation (public-facing websites and online course content), a smaller random sample of 10 universities and 10 community colleges was drawn for institutions of higher education. This results in a total of 227 government entities in the final sample.

The number of entities to sample from a given entity type c_g was determined using the

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[209] The sample size grew to 207 entities, as minor corrections were made to capacity estimates.

following formula:

$$c_g = \min\left(c_{\min} + \left(\hat{F} - \left(c_{\min} \times |G^{c_{\min}}| + \sum_{g \notin G^{c_{\min}}} C_g \right) \right) \times \frac{C_g}{\sum_{g \in G^{c_{\min}}} C_g}, C_g \right)$$

where C_g is the population total for entity type g (excluding postsecondary institutions), $\hat{F}$ is the

estimated total allowable sample size across all government types (in this case, 200), $c_{\min}$ is the

established minimum acceptable sample size per entity type (in this case, 15), $G = \{g\}$ is the set

of government entity types, $G^{c_{\min}} = \{g \in G \mid C_g \geq c_{\min}\}$ is the set of government entity types

that contain at least $c_{\min}$ government entities, and $|G^{c_{\min}}|$ is the number of government entity

types with at least $c_{\min}$ members in the population. For example, the number of small school

districts sampled was calculated as[210]:

$$c_{\text{School district (small)}} = \min\left(15 + \left(200 - (15 \times 10 + (2 + 3)) \right) \times \frac{11{,}443}{89{,}594}, 11{,}443 \right) = 21.$$

Table A87 displays the number of entities in the final sample of each entity type.

Table A87: Government Entity Type Sample Counts

Type of Government Entity	Population of less than 50,000	Population of 50,000 or more	Total
State	N/A	16	16
County	16	16	32
Municipal	25	15	40
Township	25	15	40
Special district	38 [a]	[a]	38
School district	21	15	36
U.S. territory	2	3	5
Public university	10 [a]	[a]	10

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[210] Sample size calculations were rounded to the nearest whole number.

Type of Government Entity	Population of less than 50,000	Population of 50,000 or more	Total
Community college	10 [a]	[a]	10
Total (no higher education)	127	80	207
Total (with higher education)	147	80	227

[a] Special district, public university, and community college data do not include population. For these tables, they are displayed as small.

A.2 STRATIFICATION

Prior to sampling, the sample frame of each entity type for which population data were available was stratified by population. This was done with the intent of drawing samples from strata that were more homogeneous in their website remediation costs, thereby improving the precision of the estimates and reducing their associated uncertainty. Entity types were partitioned into either two or four equally sized strata. Entity types divided into two strata were split by the median population, while entity types with four strata were divided by quartile. The number of strata used for each survey cell was determined by the total number of entities allocated to the sample of each entity type; no stratum was permitted to have fewer than five entities sampled, while seven to eight entities sampled per stratum were preferred. Consequently, entity types with fewer than 20 entities sampled were partitioned into two strata while those with 20 or more entities sampled were partitioned into four. Entities were proportionally sampled from the strata, so the proportion of entities in the sample from each stratum would equal the proportion of entities in the population in each stratum. Since the strata were of equal size, this resulted in equally sized samples from each stratum.

The following tables show the definition, population size, sample size, and sampling proportion for each stratum from which PSUs were sampled.

Table A88: Sample Frames and Sample Sizes for States

Variable	Stratum 1	Stratum 2
Definition	≤4,505,836 in population	>4,505,836 in population
Pop. size	26	25

Variable	Stratum 1	Stratum 2
Sample counts	9	7
Sampling rate	34.6%	28.0%

Table A89: Sample Frames and Sample Sizes for Small Counties

Variable	Stratum 1	Stratum 2
Definition	≤15,617 in population	>15,617 in population
Pop. size	1053	1052
Sample counts	8	8
Sampling rate	0.76%	0.76%

Table A90: Sample Frames and Sample Sizes for Large Counties

Variable	Stratum 1	Stratum 2
Definition	≤128,987 in population	>128,987 in population
Pop. size	463	463
Sample counts	8	8
Sampling rate	1.7%	1.7%

Table A91: Sample Frames and Sample Sizes for Small Municipalities

Variable	Stratum 1	Stratum 2	Stratum 3	Stratum 4
Definition	≤308 in population	>308 and ≤932 in population	>932 and ≤3,484 in population	>3,484 in population
Pop. size	4682	4686	4679	4682
Sample counts	6	7	6	6
Sampling rate	0.13%	0.15%	0.13%	0.13%

Table A92: Sample Frames and Sample Sizes for Large Municipalities

Variable	Stratum 1	Stratum 2
Definition	≤86,141 in population	>86,141 in population
Pop. size	383	383
Sample counts	8	7
Sampling rate	2.1%	1.8%

Table A93: Sample Frames and Sample Sizes for Small Townships

	Stratum 1	Stratum 2	Stratum 3	Stratum 4
Definition	≤221 in population	>221 and ≤880 in population	>880 and ≤2,472 in population	>2,472 in population
Pop. size	4038	4015	4022	4022

	Stratum 1	Stratum 2	Stratum 3	Stratum 4
Sample counts	7	6	6	6
Sampling rate	0.17%	0.15%	0.15%	0.15%

Table A94: Sample Frames and Sample Sizes for Large Townships

Variable	Stratum 1	Stratum 2
Definition	≤73,604 in population	>73,604 in population
Pop. size	78	78
Sample counts	8	7
Sampling rate	10.3%	9.0%

Table A95: Sample Frames and Sample Sizes for Special Districts

Variable	Stratum 1
Definition	All special districts
Pop. size	38,542
Sample counts	38
Sampling rate	0.10%

Table A96: Sample Frames and Sample Sizes for Small School Districts

Variable	Stratum 1	Stratum 2	Stratum 3	Stratum 4
Definition	≤1,944 in population	>1,944 and ≤5,095 in population	>5,095 and ≤11,774 in population	>11,774 in population
Pop. size	2963	2962	2962	2962
Sample counts	6	5	5	5
Sampling rate	0.20%	0.17%	0.17%	0.17%

Table A97: Sample Frames and Sample Sizes for Large School Districts

Variable	Stratum 1	Stratum 2
Definition	≤87,948 in population	>87,948 in population
Pop. size	392	387
Sample counts	8	7
Sampling rate	2.0%	1.8%

Table A98: Sample Frames and Sample Sizes for Small Territories

Variable	Stratum 1
Definition	All small U.S. territories
Pop. size	2
Sample counts	2
Sampling rate	100%

Table A99: Sample Frames and Sample Sizes for Large Territories

Variable	Stratum 1
Definition	All large U.S. territories
Pop. size	3
Sample counts	3
Sampling rate	100%

Table A100: Sample Frames and Sample Sizes for Public Universities

Variable	Stratum 1
Definition	All public universities
Pop. size	744
Sample counts	10
Sampling rate	1.3%

Table A101: Sample Frames and Sample Sizes for Community Colleges

	Stratum 1
Definition	All community and technical colleges
Pop. size	1146
Sample counts	10
Sampling rate	0.87%

As stated previously, State and local government websites were selected in a two-stage stratified cluster sample. In the first stage, government entities were drawn without replacement from each stratum. Each entity in each stratum was assigned a random number drawn uniformly from the range [0,1], and each stratum was arranged in ascending order by this random number. The entities assigned the first n_h smallest random numbers were selected from stratum *h* for the sample. For each entity selected in the first stage, the main website was identified (if one existed), and it was used to identify any secondary websites, following the procedure detailed in Section 3.3.

In the second stage, each entity selected in the first stage with at least one secondary

website was treated as a cluster of secondary websites.[211] Each secondary website found within

each cluster was assigned a random number drawn uniformly from the range [0,1], and the

secondary sites in each cluster were arranged in ascending order by the random number. The

websites assigned the first m_i smallest random numbers were selected from entity *i* for the

second stage. The number of secondary websites sampled per entity was calculated using the

ceiling function, as:

$$m_i = \left\lceil \frac{1}{3} \times M_i \right\rceil$$

where M_i is the number of secondary sites belonging to entity *i*. For example, one secondary

site was sampled from each entity with one, two, or three secondary sites, while two were

sampled from entities with four, five, or six secondary sites.

The Department calculated the following quantities (for each government type listed in

Table A86): total number of main websites, total number of secondary websites, total time to

remediate the main websites, total time to remediate the secondary websites, total number of

PDFs hosted on the main websites, and total number of PDFs hosted on secondary websites.

Main websites were analyzed separately from secondary websites because main websites were

expected to be larger, potentially having higher remediation costs. Importantly, only secondary

websites (and their associated PDFs) were sampled in the second stage of clustering. All other

variables were collected in the first stage of sampling, with no clusters or SSUs.[212] Therefore,

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[211] Unlike the other entity types, secondary websites for public universities and community colleges were not
tabulated or sampled. Instead, costs for remediating secondary websites of those entity types were estimated using
the costs to fix their main websites and an adjustment factor relating the costs to fix secondary and main websites for
large school districts and large counties. More information on this methodology can be found in Section 3.5.1.
[212] For example, each State government only has one main website. Therefore, the 16 sampled PSUs (*i.e.*, the 16
sampled State government main websites) form a complete sample, which was drawn from the population of 50
main State websites.

the government entity was treated as the unit of analysis when calculating mean number of websites per government, mean and total time to remediate the main website, and mean and total number of PDFs hosted on the main website. When calculating mean and total time to remediate secondary websites, the government entity was treated as the PSU, and the secondary websites were treated as the SSUs.

A.3 SURVEY WEIGHTS

Survey weights were calculated separately for variables associated with the first and second stages of sampling. Weights associated with variables collected in the first stage sample (number of main websites, number of secondary websites, time to fix main websites, and number of PDFs on main websites) were calculated as the reciprocal of the probability of selection for each entity:

$$W_h = \frac{1}{P_h} = \frac{N_h}{n_h}$$

where N_h is the number of entities in stratum h and n_h is the number of entities sampled from stratum h.

Weights associated with variables collected in the second stage sample (time to fix secondary websites and number of PDFs hosted on secondary websites) were calculated as the reciprocal of the probability of selection of an entity from a given stratum multiplied by the reciprocal of the probability of selection of any given secondary website from a cluster:

$$W_{hi} = \frac{1}{P_h \times P_i} = \frac{N_h}{n_h} \times \frac{M_i}{m_i}$$

where N_h is the total number governments in stratum h, n_h is the number of governments sampled from stratum h, M_i is the number of covered secondary websites belonging to

government i, and m_i is the number of secondary websites sampled from government i.

For example, the sample weight associated with variables collected in the first stage for Pentwater, Michigan, a small municipality sampled from the second population stratum, would be calculated as:

$$W_2 = \frac{1}{P_2} = \frac{N_2}{n_2} = \frac{4,686}{7} = 669.43$$

The sample weight associated with variables collected in the second stage for Pentwater, Michigan, would be calculated as:

$$W_{2,\text{Pentwater}} = \frac{1}{P_2 \times P_{\text{Pentwater}}} = \frac{N_2}{n_2} \times \frac{M_{\text{Pentwater}}}{m_{\text{Pentwater}}} = \frac{4,686}{7} \times \frac{3}{1} = 2008.29$$

A full presentation of the survey weights for all entities in the sample can be found in Appendix B.

A.4 NONRESPONSE

There were several instances in which SortSite could not successfully scan a selected website for accessibility errors. These websites were considered nonrespondents since they were selected as respondents but did not yield data. As SortSite was able to scan both highly accessible and largely inaccessible sites, it was assumed that these nonrespondents did not significantly differ in level of accessibility from those websites that were successfully scanned. Nonresponding websites were therefore replaced in the sample in the following way:

- If a main website failed to scan, preventing an inventory report from being generated for the search for secondary websites, the entire entity was deemed a nonresponding cluster and was replaced in the primary sample by another entity of the same entity type and stratum.

- If a secondary website failed to scan, then that website was deemed a nonrespondent and

was replaced in the secondary sample by another secondary website from the same entity.

- In the rare case that a secondary website that failed to scan could not be replaced in the secondary sample, the entity was deemed a nonresponding cluster and replaced in the primary sample.

A.5   STATISTICAL SOFTWARE

The PROC SURVEYMEANS procedure in SAS Version 9.4[213] was used to calculate the following quantities separately for each entity type described in Table A86:[214]

- total number of main websites

- total number of secondary websites

- total time required to remediate main websites

- total time required to remediate secondary websites

- total number of PDFs on main websites

- total number of PDFs on secondary websites

The purpose of the survey was separate estimation of these quantities for each of the entity types in Table A86. For this reason, survey calculations were performed separately for each entity type in SAS.

Main websites and secondary websites were considered separately because their associated data were collected at different stages of sampling and reflect different sampling approaches; the number of main and secondary websites, the time required to fix main websites, and the number of PDFs on main websites were all collected in the first stage of the sample,

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[213] SAS is a powerful statistical computing platform used by researchers and statistical professionals for a broad range of analytical tasks. Available at: SAS. (2022). *Analytics Software & Solutions.* Retrieved from https://www.sas.com/en_us/home.html

[214] More information on the determination of the time needed to remediate websites and the number of PDFs on main and secondary websites can be found in Sections 3.3.3.-3.3.5.

while the time required to fix secondary websites and the number of PDFs on secondary websites were collected in the second stage of sampling. As a result, different survey weights were applied in the analysis of these different variables.

A.6 UNCERTAINTY ANALYSIS

A full uncertainty analysis of the final website cost estimates was conducted with Monte Carlo simulation using @RISK software.[215] Using @RISK, each value output by SAS, as described in Section A.5 Statistical Software, was recast as a normal distribution centered around the calculated value from SAS, with the standard error calculated by SAS as the distribution's standard deviation. Since entity types cannot have negative numbers of websites, take negative time to remediate websites, or host negative numbers of PDFs on their websites, each distribution was truncated with a lower bound of 0.[216]

In each simulated trial, each of these distributions was randomly sampled and the resulting values were propagated through the website cost calculations. The simulation was run for 10,000 iterations to generate an empirical distribution of final website costs. Table A102 and Table A103 show the resulting 90 percent confidence intervals (CIs) for the final website costs derived in Section 3.3.

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[215] @Risk is a computing system that performs Monte Carlo simulations for uncertainty analysis and risk assessment in Microsoft Excel. Available at: Palisade. (2022). *@RISK.* Retrieved from https://www.palisade.com/risk/
[216] Due to truncation, some confidence intervals may not be centered around the calculated value.

Table A102: Total Projected 10-Year Website Costs with Confidence Intervals (Millions)

Time Period	Cost	90% CI Lower Limit for Cost	90% CI Upper Limit for Cost
Year 1	$2,911.0	$2,474.2	$3,538.9
Year 2	$3,206.8	$2,726.3	$3,897.6
Year 3	$2,049.8	$1,691.2	$2,488.9
Year 4	$741.9	$632.2	$891.6
Year 5	$741.9	$632.2	$891.6
Year 6	$741.9	$632.2	$891.6
Year 7	$741.9	$632.2	$891.6
Year 8	$741.9	$632.2	$891.6
Year 9	$741.9	$632.2	$891.6
Year 10	$741.9	$632.2	$891.6
PV of 10-year costs, 3% discount rate	$11,954.8	$10,166.7	$14,406.0
Average annualized costs, 3% discount rate	$1,401.5	$1,191.9	$1,688.8
PV of 10-year costs, 7% discount rate	$10,458.6	$8,899.7	$12,606.3
Average annualized costs, 7% discount rate	$1,489.1	$1,267.1	$1,794.9

Table A103: Total Website Costs by Entity Type with Confidence Intervals (Millions)

Entity Type	PV of 10-Year Costs, 3% Discount Rate	90% CI Lower Limit for Cost, 3% Discount Rate	90% CI Upper Limit for Cost, 3% Discount Rate	PV of 10-Year Costs, 7% Discount Rate	90% CI Lower Limit for Cost, 7% Discount Rate	90% CI Upper Limit for Cost, 7% Discount Rate
State	$331.5	$229.5	$432.3	$292.4	$202.5	$381.3
County (small)	$101.5	$65.3	$143.3	$88.3	$56.8	$124.7
County (large)	$976.4	$576.8	$1,399.0	$861.3	$508.8	$1,234.1
Municipality (small)	$2,747.4	$1,600.9	$3,942.6	$2,391.5	$1,393.0	$3,432.5
Municipality (large)	$709.2	$434.7	$1,012.1	$625.6	$383.4	$892.8
Township (small)	$1,931.2	$1,395.0	$2,506.9	$1,680.6	$1,213.7	$2,182.0
Township (large)	$41.2	$21.2	$71.5	$36.3	$18.7	$63.0
Special district	$583.3	$184.8	$1,133.5	$504.2	$157.2	$983.5
U.S. territory (small)	$1.9	$1.9	$1.9	$1.6	$1.6	$1.6
U.S. territory (large)	$7.5	$7.5	$7.5	$6.6	$6.6	$6.6
School district (small)	$1,746.9	$1,054.7	$2,537.3	$1,520.7	$917.9	$2,209.1
School district (large)	$917.9	$457.5	$1,465.3	$809.7	$403.5	$1,292.5
Public university	$800.1	$438.6	$1,403.8	$705.8	$386.8	$1,238.3
Community college	$1,059.0	$378.2	$2,128.2	$934.1	$333.6	$1,877.3
Total	$11,954.8	$10,166.7	$14,406.0	$10,458.6	$8,899.7	$12,606.3

APPENDIX B: GOVERNMENT ENTITIES SAMPLED

The following tables show the government entities sampled in the determination of baseline compliance with WCAG 2.1 Level AA and the estimation of compliance costs for the proposed rule. The population stratum from which each entity was sampled and the survey weights associated with variables collected in the first and second stages of sampling are included. An entity's second stage survey weight is given as "N/A" when that entity had no covered secondary websites. More information on sampling, including the definitions of strata for each entity type and the definitions and calculations of survey weights, can be found in Appendix A.

Table B104: Sampled States

Name	Stratum	First Stage Survey Weight, W_h	Second Stage Survey Weight, W_{hi}
Arkansas	1	2.89	10.40
Kansas	1	2.89	9.63
Nebraska	1	2.89	10.11
New Hampshire	1	2.89	5.78
Oregon	1	2.89	11.35
Rhode Island	1	2.89	11.56
South Dakota	1	2.89	10.98
Vermont	1	2.89	7.22
West Virginia	1	2.89	11.01
Alabama	2	3.57	14.29
Minnesota	2	3.57	15.48
Missouri	2	3.57	10.71
New York	2	3.57	14.29
North Carolina	2	3.57	13.71
South Carolina	2	3.57	13.78
Virginia	2	3.57	14.29

Table B105: Sampled Counties (<50,000 in Population)

Name	State	Stratum	First Stage Survey Weight, W_h	Second Stage Survey Weight, W_{hi}
Burke County	North Dakota	1	131.63	N/A
Douglas County	Missouri	1	131.63	263.25
Kiowa County	Oklahoma	1	131.63	N/A
Livingston County	Kentucky	1	131.63	131.63
Madison County	Texas	1	131.63	131.63
Mahnomen County	Minnesota	1	131.63	N/A
Nowata County	Oklahoma	1	131.63	N/A
Platte County	Wyoming	1	131.63	394.88
Adams County	Washington	2	131.50	N/A
Aitkin County	Minnesota	2	131.50	N/A
Chattooga County	Georgia	2	131.50	394.50
Christian County	Illinois	2	131.50	N/A
Davison County	South Dakota	2	131.50	N/A
Luquillo Municipio	Puerto Rico	2	131.50	N/A
McIntosh County	Oklahoma	2	131.50	N/A
Polk County	Missouri	2	131.50	263.00

Table B106: Sampled Counties (≥50,000 in Population)

Name	State	Stratum	First Stage Survey Weight, W_h	Second Stage Survey Weight, W_{hi}
Carroll County	Georgia	1	57.88	135.04
Cheshire County	New Hampshire	1	57.88	57.88
Hamblen County	Tennessee	1	57.88	115.75
Lee County	North Carolina	1	57.88	57.88
Liberty County	Georgia	1	57.88	173.63
Otsego County	New York	1	57.88	173.63
San Juan County	New Mexico	1	57.88	173.63
Woodbury County	Iowa	1	57.88	115.75
Bay County	Florida	2	57.88	173.63
Bergen County	New Jersey	2	57.88	173.63

Name	State	Stratum	First Stage Survey Weight, W_h	Second Stage Survey Weight, W_{hi}
Berkeley County	South Carolina	2	57.88	115.75
Cass County	North Dakota	2	57.88	N/A
Douglas County	Georgia	2	57.88	173.63
Jackson County	Michigan	2	57.88	115.75
Jefferson County	Missouri	2	57.88	154.33
Marin County	California	2	57.88	173.63

Table B107: Sampled Municipalities (<50,000 in Population)

Name	State	Stratum	First Stage Survey Weight, W_h	Second Stage Survey Weight, W_{hi}
Crows Nest	Indiana	1	780.33	N/A
Edgefield	Louisiana	1	780.33	N/A
Gumbranch	Georgia	1	780.33	N/A
Summitville	Ohio	1	780.33	N/A
Tenstrike	Minnesota	1	780.33	N/A
Wynnedale	Indiana	1	780.33	N/A
East Tawakoni	Texas	2	669.43	N/A
Iberia	Missouri	2	669.43	N/A
Linwood	Kansas	2	669.43	669.43
Pentwater	Michigan	2	669.43	2008.29
Saxton	Pennsylvania	2	669.43	669.43
Shelby	Nebraska	2	669.43	N/A
Zavalla	Texas	2	669.43	N/A
Edgeworth	Pennsylvania	3	779.83	779.83
Hanceville	Alabama	3	779.83	N/A
Hemphill	Texas	3	779.83	N/A
Horse Cave	Kentucky	3	779.83	N/A
Taylorsville	North Carolina	3	779.83	779.83
Yamhill	Oregon	3	779.83	N/A
Ellensburg	Washington	4	780.33	1560.67

Name	State	Stratum	First Stage Survey Weight, W_h	Second Stage Survey Weight, W_{hi}
Fayetteville	Tennessee	4	780.33	780.33
Jenks	Oklahoma	4	780.33	1170.50
Jersey Village	Texas	4	780.33	780.33
New Freedom	Pennsylvania	4	780.33	780.33
Silverton	Ohio	4	780.33	N/A

Table B108: Sampled Municipalities (≥50,000 in Population)

Name	State	Stratum	First Stage Survey Weight, W_h	Second Stage Survey Weight, W_{hi}
Lake Elsinore	California	1	47.88	47.88
Lakewood	Washington	1	47.88	95.75
Madera	California	1	47.88	95.75
Margate	Florida	1	47.88	95.75
Owensboro	Kentucky	1	47.88	127.67
Plainfield	New Jersey	1	47.88	47.88
Smyrna	Georgia	1	47.88	95.75
West Allis	Wisconsin	1	47.88	95.75
Anchorage	Alaska	2	54.71	145.90
Dearborn	Michigan	2	54.71	164.14
Hesperia	California	2	54.71	164.14
Phoenix	Arizona	2	54.71	109.43
Rialto	California	2	54.71	164.14
Sugar Land	Texas	2	54.71	136.79
Waco	Texas	2	54.71	164.14

Table B109: Sampled Townships (<50,000 in Population)

Name	State	County	Stratum	First Stage Survey Weight, W_h	Second Stage Survey Weight, W_{hi}
Elkhorn Grove Township	Illinois	Carroll	1	576.85	N/A
Gardner Township	North Dakota	Cass	1	576.85	N/A
Johnsonville Township	Minnesota	Redwood	1	576.85	N/A
Nelson Township	Kansas	Cloud	1	576.85	N/A
Pleasant Valley Township	South Dakota	Tripp	1	576.85	N/A
Union Township	South Dakota	Moody	1	576.85	N/A
Union Township	Kansas	Butler	1	576.85	N/A
Beaver Township	Ohio	Noble	2	576.85	N/A
Day	New York	Saratoga	2	669.17	N/A
New Haven	Wisconsin	Dunn	2	669.17	N/A
Ohio Township	Ohio	Monroe	2	669.17	N/A
Rockbridge	Wisconsin	Richland	2	669.17	N/A
Sibley Township	Minnesota	Sibley	2	669.17	N/A
Cannon Falls Township	Minnesota	Goodhue	3	670.33	N/A
Clarendon	Vermont	Rutland	3	670.33	670.33
Ellicottville	New York	Cattaraugus	3	670.33	670.33
Hemlock Township	Pennsylvania	Columbia	3	670.33	N/A
Jackson Township	Pennsylvania	Dauphin	3	670.33	N/A
Monroe Township	Ohio	Pickaway	3	670.33	N/A
Guilford Township	Indiana	Hendricks	4	670.33	N/A
Hampton Township	New Jersey	Sussex	4	670.33	N/A
Homer Township	Michigan	Midland	4	670.33	N/A
Howard Township	Michigan	Cass	4	670.33	N/A
Montgomery Township	Pennsylvania	Franklin	4	670.33	670.33
New Lebanon	New York	Columbia	4	670.33	670.33

Table B110: Sampled Townships (≥50,000 in Population)

Name	State	County	Stratum	First Stage Survey Weight, W_h	Second Stage Survey Weight, W_{hi}
Avon Township	Illinois	Lake	1	9.75	N/A

Name	State	County	Stratum	First Stage Survey Weight, W_h	Second Stage Survey Weight, W_{hi}
Bloomfield Township	New Jersey	Essex	1	9.75	19.5
Brick Township	New Jersey	Ocean	1	9.75	29.25
Clay	New York	Onondaga	1	9.75	24.38
Gloucester Township	New Jersey	Camden	1	9.75	29.25
Jeffersonville Township	Indiana	Clark	1	9.75	N/A
Wabash Township	Indiana	Tippecanoe	1	9.75	N/A
White River Township	Indiana	Johnson	1	9.75	9.75
Cheektowaga	New York	Erie	2	11.14	22.29
Hempstead	New York	Nassau	2	11.14	27.86
Lisle Township	Illinois	Dupage	2	11.14	11.14
Pike Township	Indiana	Marion	2	11.14	N/A
Plainfield Township	Illinois	Will	2	11.14	11.14
Ramapo	New York	Rockland	2	11.14	33.43
Wheeling Township	Illinois	Cook	2	11.14	N/A

Table B111: Sampled Special Districts

Name	State	County	Locality	First Stage Survey Weight, W_h	Second Stage Survey Weight, W_{hi}
Appleton City Public Library District	Missouri	St Clair	Appleton City	1014.26	N/A
Barney Reservoir Joint Ownership Commission	Oregon	Washington	Hillsboro	1014.26	N/A
Bramming Farm Metropolitan District #1	Colorado	Adams	Denver	1014.26	N/A
Broward County Water Control District 4	Florida	Broward	Pompano Beach	1014.26	N/A
Butler Rural Water District 4	Kansas	Butler	El Dorado	1014.26	N/A
Center Park District	North Dakota	Oliver	Center	1014.26	N/A

Name	State	County	Locality	First Stage Survey Weight, W_h	Second Stage Survey Weight, W_{hi}
Cherry Creek South Metropolitan District 1	Colorado	Douglas	Centennial	1014.26	N/A
Clearwater Cemetery Maintenance District	Idaho	Idaho	Kendrick	1014.26	N/A
Cowlitz County Cemetery District 2	Washington	Cowlitz	Woodland	1014.26	N/A
Cuyamaca Water District	California	San Diego	Julian	1014.26	N/A
Douglas County Sid 573	Nebraska	Douglas	Omaha	1014.26	N/A
East Putnam Fire District 2	Connecticut	Windham	Putnam	1014.26	N/A
Ebenezer Cemetery District 10	Kansas	Clay	Clay Center	1014.26	N/A
Edwards County Soil and Water Conservation District	Illinois	Edwards	Albion	1014.26	N/A
Fairview Water District	Idaho	Franklin	Preston	1014.26	N/A
Green Branch Public Drainage Association	Maryland	Wicomico	Salisbury	1014.26	N/A
Gustine Drainage District	California	Merced	Gustine	1014.26	N/A
Laurel Fire District 5	Montana	Yellowstone	Laurel	1014.26	N/A
Leacock Township Sewer Authority	Pennsylvania	Lancaster	Intercourse	1014.26	N/A
Lee County Ambulance Service District	Kentucky	Lee	Beattyville	1014.26	N/A
Little Sandy Fire District	Kentucky	Greenup	Greenup	1014.26	N/A
Lockney Housing Authority	Texas	Floyd	Lubbock	1014.26	N/A
Lumberton Airport Commission	North Carolina	Robeson	Lumberton	1014.26	N/A
Marissa Area Public Library District	Illinois	Randolph	Marissa	1014.26	N/A

Name	State	County	Locality	First Stage Survey Weight, W_h	Second Stage Survey Weight, W_{hi}
Miller Cemetery District	Nebraska	Gosper	Holbrook	1014.26	N/A
Newmanstown Water Authority	Pennsylvania	Lebanon	Newmanstown	1014.26	N/A
Nolan County Fresh Water Supply District 1	Texas	Nolan	Blackwell	1014.26	N/A
Pickens County Natural Gas District	Alabama	Pickens	Aliceville	1014.26	N/A
Piscataway Township Fire District 3	New Jersey	Middlesex	Piscataway	1014.26	N/A
Plymouth Housing Authority	Connecticut	Litchfield	Terryville	1014.26	N/A
Providence Water Authority	Alabama	Walker	Oakman	1014.26	N/A
Rainsville Water and Sanitation District	New Mexico	Mora	Rainsville	1014.26	N/A
Reclamation District 2027 Delta Farms	California	San Joaquin	Holt	1014.26	N/A
South Georgia Regional Information Technology Authority	Georgia	Calhoun	Arlington	1014.26	N/A
Sunnyside-Overlook Municipal Authority	Pennsylvania	Northumberland	Elysburg	1014.26	N/A
Swan Lane Road District	South Dakota	Lawrence	Spearfish	1014.26	N/A
Wallace Fire District 1	New York	Steuben	Avoca	1014.26	N/A
Worland-Washakie Community Center Joint Powers Board	Wyoming	Washakie	Worland	1014.26	N/A

Table B112: Sampled Independent School Districts (<50,000 in Population)

Name	State	County	Locality	Stratum	First Stage Survey Weight, W_h	Second Stage Survey Weight, W_{hi}
Benton Town School District	New Hampshire	Grafton	North Haverhill	1	670.33	N/A
Carter Elementary District 56	Montana	Chouteau	Carter	1	670.33	670.33
Crow-Apple Gate-Lorane School District 66	Oregon	Lane	Eugene	1	473.17	N/A
Greenview Community Unit School District 200	Illinois	Menard	Greenview	1	473.17	473.17
Lake Benton School District 404	Minnesota	Lincoln	Lake Benton	1	473.17	N/A
South Barber County Unified School District 255	Kansas	Barber	Kiowa	1	473.17	N/A
Delhi Central School District	New York	Delaware	Delhi	2	588.00	N/A
Littlefork-Big Falls Independent School District 362	Minnesota	Koochiching	Littlefork	2	588.00	588.00
Randolph School District 195	Minnesota	Dakota	Randolph	2	588.00	N/A
Strother School District 14	Oklahoma	Seminole	Seminole	2	588.00	N/A
Tonkawa School District 87	Oklahoma	Kay	Tonkawa	2	588.00	588.00
Canton Central School District	New York	St Lawrence	Canton	3	578.60	1735.80
Cary Community Consolidated School District 26	Illinois	McHenry	Cary	3	578.60	1157.20
Coal City Community Unit School District 1	Illinois	Grundy	Coal City	3	578.60	N/A
Conecuh County School District	Alabama	Conecuh	Evergreen	3	578.60	578.60
Lonoke School District	Arkansas	Lonoke	Lonoke	3	578.60	578.60

Name	State	County	Locality	Stratum	First Stage Survey Weight, W_h	Second Stage Survey Weight, W_{hi}
Dover School District	Pennsylvania	York	Dover	4	554.20	1385.50
Haddonfield Borough School District	New Jersey	Camden	Haddonfield	4	554.20	1108.40
Port Neches Independent School District 908	Texas	Jefferson	Port Neches	4	554.20	1108.40
Urbandale Community School District	Iowa	Polk	Urbandale	4	554.20	1108.40
Webster Central School District	New York	Monroe	Webster	4	554.20	N/A

Table B113: Sampled Independent School Districts (≥50,000 in Population)

Name	State	County	Locality	Stratum	First Stage Survey Weight, W_h	Second Stage Survey Weight, W_{hi}
Hamilton Township School District	New Jersey	Mercer	Hamilton Square	1	49.00	49.00
Oshkosh Area School District	Wisconsin	Winnebago	Oshkosh	1	49.00	127.40
Schertz-Cibolo-Universal City Independent School District 902	Texas	Guadalupe	Schertz	1	49.00	134.75
Sunnyside School District 12	Arizona	Pima	Tucson	1	49.00	N/A
Tuscaloosa City School District	Alabama	Tuscaloosa	Tuscaloosa	1	49.00	N/A
Ventura Unified School District	California	Ventura	Ventura	1	49.00	141.56
Warren Township Metropolitan School District	Indiana	Marion	Indianapolis	1	49.00	98.00
Waterford School District	Michigan	Oakland	Waterford	1	49.00	49.00

Name	State	County	Locality	Stratum	First Stage Survey Weight, W_h	Second Stage Survey Weight, W_{hi}
Amarillo Independent School District	Texas	Potter	Amarillo	2	55.29	N/A
Anaheim Union High School District	California	Orange	Anaheim	2	55.29	138.21
Jordan School District	Utah	Salt Lake	West Jordan	2	55.29	150.06
Lincoln Pub School District 1	Nebraska	Lancaster	Lincoln	2	55.29	55.29
Sacramento City Unified School District	California	Sacramento	Sacramento	2	55.29	165.86
South Bend Community School Corporation	Indiana	St Joseph	South Bend	2	55.29	55.29
Twin Rivers Unified School District	California	Sacramento	Sacramento	2	55.29	55.29

Table B114: U.S. Territories (<50,000 in Population)

Territory	First Stage Survey Weight, W_h	Second Stage Survey Weight, W_{hi}
American Samoa	1.00	2.67
Commonwealth of the Northern Mariana Islands	1.00	2.71

Table B115: U.S. Territories (≥50,000 in Population)

Territory	First Stage Survey Weight, W_h	Second Stage Survey Weight, W_{hi}
Guam	1.00	2.80
Puerto Rico	1.00	1.00
U.S. Virgin Islands	1.00	2.89

Table B116: Sampled Public Universities

Name	State	First Stage Survey Weight, W_h	Second Stage Survey Weight, W_{hi}
California State University-Dominguez Hills	California	74.4	N/A
Dalton State College	Georgia	74.4	N/A
East Stroudsburg University of Pennsylvania	Pennsylvania	74.4	N/A
Marshall University	West Virginia	74.4	N/A
New Mexico Highlands University	New Mexico	74.4	N/A
Ohio State University-Newark Campus	Ohio	74.4	N/A
The University of Texas at Austin	Texas	74.4	N/A
Lewis-Clark State College	Idaho	74.4	N/A
University of California-Hastings College of Law	California	74.4	N/A
University of Wisconsin-Platteville	Wisconsin	74.4	N/A

Table B117: Sampled Community and Technical Colleges

Name	State	First Stage Survey Weight, W_h	Second Stage Survey Weight, W_{hi}
Butler County Community College	Pennsylvania	114.6	N/A
Clearfield County Career and Technology Center	Pennsylvania	114.6	N/A
Hennepin Technical College	Minnesota	114.6	N/A
Iowa Western Community College	Iowa	114.6	N/A
Klamath Community College	Oregon	114.6	N/A
Lake Region State College	North Dakota	114.6	N/A
Manchester Community College	New Hampshire	114.6	N/A
Rowan College of South Jersey Gloucester Campus	New Jersey	114.6	N/A
Southeast Community College Area	New Mexico	114.6	N/A
Washburn Institute of Technology	Kansas	114.6	N/A

APPENDIX C: SORTSITE ERROR DESCRIPTIONS AND REMEDIATION TIME ESTIMATES

The Department's accessibility experts estimated an average time to fix one instance of each type of accessibility error that can appear on a SortSite issue report. The time estimates reflect the time needed to assess and execute the change needed in the website's code. They do not include the time needed to identify and locate the error; this time was considered "testing" and is described in Section 3.3.7. The process of choosing a single time estimate to represent millions of unique errors across thousands of websites necessarily elides some nuance, including the complexity of the website's code and the skill of the web developer making the changes. The Department therefore made several simplifying assumptions in assigning time estimates.

There may be multiple ways a piece of content can fail to meet a WCAG 2.1 success criterion, but significant context for accessibility errors cannot be inferred from the issue report. Estimates were therefore chosen to represent the average across all possible situations. The Department recognizes that these single estimates for each error type may not perfectly align with every situation.

The Department's experts based their estimates on their own past experience remediating websites for accessibility issues. It was assumed that those addressing the accessibility errors may not have as extensive experience in web accessibility. Estimates were therefore assigned generously, assuming that amateur or inexperienced web developers may take longer to remediate a given accessibility issue than a seasoned expert might.

Some error types were deemed "fix once, fix everywhere" errors. These were errors that may appear several times in a website's issue report, but for which all instances could be addressed by a single change to the website's construction or code. When estimating the time needed to fix accessibility issues on sampled websites, the time needed to fix a "fix once, fix

everywhere" error was only counted once, even if that error type appeared many times. More

information about the process used to assign time estimates to accessibility error types or the

algorithm used to estimate the time needed to fix websites is available in Section 3.3. Ranges of

time estimates for error types can be found in Table C118.

Table C118: Number of Errors by Estimated Time to Remediate

Minutes to Fix One Instance	Fix Once, Fix Everywhere Errors	All Other Errors	Total
≤5	27	339	366
>5 and ≤20	2	8	10
>20	0	5	5
Total	29	352	381

Each SortSite error corresponds to at least one WCAG success criterion. The following

list of error descriptions, along with their associated success criteria, is based on the rules

detailed for WCAG 2.1 Level A and WCAG 2.1 Level AA in SortSite's documentation.[217],[218]

Table C119: SortSite Error Descriptions

Success Criterion	Description	Fix Once, Fix Everywhere
WCAG 2.1 A 1.1.1	alt text should not be an image file name.	No
WCAG 2.1 A 1.1.1	An image with a null alt attribute should not have title, aria-label or aria-labelledby attributes.	No
WCAG 2.1 A 1.1.1	button elements containing only an img must have an alt attribute on the img.	No
WCAG 2.1 A 1.1.1	Decorative and spacer images must have a null alt attribute.	No
WCAG 2.1 A 1.1.1	Decorative and spacer images must not use descriptive alt attributes.	No

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[217] PowerMapper Software. (2022). *Accessibility Standard: WCAG 2.1.* Retrieved from
https://www.powermapper.com/products/sortsite/rules/accwcag2.1/.
[218] There are 350 rules associated with WCAG 2.1 Level A and Level AA success criteria listed on the
PowerMapper website. The remaining 31 rules listed in Table C119 were drawn from a random unstratified
subsample of issue reports of main websites in the website sample. Upon manual inspection, this subsample of issue
reports contained 31 unique errors whose descriptions did not appear verbatim on PowerMapper's list. For the most
part, these additions consist of duplicates of rules from the PowerMapper list, altered to include object names from
the particular instance of the error. These instances were rare, and in no case did the amount of time estimated as
needed to remediate one of the duplicated error types differ from the time needed to remediate the corresponding
original error type. Nevertheless, the errors gleaned from the subsample of issue reports are included in Table C119
for completeness.

Success Criterion	Description	Fix Once, Fix Everywhere
WCAG 2.1 A 1.1.1	Elements with role=img must have an accessible name.	No
WCAG 2.1 A 1.1.1	Figures and images in PDF documents should have non blank ALT text, except for decorative images which should be marked as artifacts.	No
WCAG 2.1 A 1.1.1	img alt text must not use ASCII art (which includes smileys).	No
WCAG 2.1 A 1.1.1	img elements must have an accessible name.	No
WCAG 2.1 A 1.1.1	object elements must have an accessible name.	No
WCAG 2.1 A 1.1.1	Using the same alt text on adjacent images results in screen readers stuttering as the same text is read out twice.	No
WCAG 2.1 A 1.1.1	Inserting images and non-text content directly into frames via the src attribute makes the image inaccessible.	No
WCAG 2.1 A 1.1.1	SVG elements with graphic role attributes must have an accessible name.	No
WCAG 2.1 A 1.1.1	Word document contains a graphic without Alt Text.	No
WCAG 2.1 A 1.1.1	applet elements must contain fallback content.	No
WCAG 2.1 A 1.1.1	object elements should contain fallback content.	No
WCAG 2.1 A 1.1.1	This page has words made of Unicode characters that look like English characters but are from another alphabet. This means screen readers are unable to pronounce these words correctly.	No
WCAG 2.1 A 1.1.1, WCAG 2.1 A 1.2.1	alt text should not contain placeholders like 'picture' or 'spacer'.	No
WCAG 2.1 A 1.1.1, WCAG 2.1 A 1.2.1	Do not use filenames, placeholders or empty text as text alternatives for timed media.	No
WCAG 2.1 A 1.1.1, WCAG 2.1 A 1.4.1	The alt text of this image mentions a color, which isn't useful for blind users.	No
WCAG 2.1 A 1.1.1, WCAG 2.1 A 2.1.1	Use client-side image maps instead of server-side image maps, except where the regions cannot be defined with an available geometric shape.	No
WCAG 2.1 A 1.1.1, WCAG 2.1 A 2.4.4., WCAG 2.1 AAA 2.4.9, WCAG 2.1 A 4.1.2	area elements must have an accessible name.	No
WCAG 2.1 A 1.1.1, WCAG 2.1 A 4.1.2	input type=image elements must have an alt attribute or accessible name.	No
WCAG 2.1 A 1.1.1, WCAG 2.1 A 4.1.2	This image has been updated without updating the alt attribute on the page.	No
WCAG 2.1 A 1.3.1	An element with role=columnheader must be contained in, or owned by, an element with role=row	No

Success Criterion	Description	Fix Once, Fix Everywhere
WCAG 2.1 A 1.3.1	An element with role=gridcell must be contained in, or owned by, an element with role=row	No
WCAG 2.1 A 1.3.1	An element with role=listitem must be contained in, or owned by, an element with role=list or role=group	No
WCAG 2.1 A 1.3.1	An element with role=menuitem must be contained in, or owned by, an element with role=menu or role=menubar	No
WCAG 2.1 A 1.3.1	An element with role=menuitemcheckbox must be contained in, or owned by, an element with role=menu or role=menubar	No
WCAG 2.1 A 1.3.1	An element with role=menuitemradio must be contained in, or owned by, an element with role=menu or role=menubar or role=group	No
WCAG 2.1 A 1.3.1	An element with role=option must be contained in, or owned by, an element with role=listbox	No
WCAG 2.1 A 1.3.1	An element with role=row must be contained in, or owned by, an element with role=grid or role=rowgroup or role=treegrid or role=table	No
WCAG 2.1 A 1.3.1	An element with role=rowgroup must be contained in, or owned by, an element with role=grid or role=treegrid or role=table	No
WCAG 2.1 A 1.3.1	An element with role=rowheader must be contained in, or owned by, an element with role=row	No
WCAG 2.1 A 1.3.1	An element with role=tab must be contained in, or owned by, an element with role=tablist	No
WCAG 2.1 A 1.3.1	An element with role=treeitem must be contained in, or owned by, an element with role=tree or role=group	No
WCAG 2.1 A 1.3.1	An image of text has been used as a heading instead of using the appropriate semantic markup (h1, h2, etc.)	No
WCAG 2.1 A 1.3.1	Bad value for attribute role.	No
WCAG 2.1 A 1.3.1	Do not provide a summary attribute or caption for layout tables.	No
WCAG 2.1 A 1.3.1	Each ID in headers must reference a th cell in the same table.	No
WCAG 2.1 A 1.3.1	Heading should not contain other headings.	No
WCAG 2.1 A 1.3.1	Headings should not be empty.	No
WCAG 2.1 A 1.3.1	Identify row and column headers in Word tables.	No
WCAG 2.1 A 1.3.1	Mark up lists and list items properly. Avoid using images as bullets in lists created with dl, dt and dd.	Yes
WCAG 2.1 A 1.3.1	The aria-controls attribute must point to IDs of elements in the same document.	No
WCAG 2.1 A 1.3.1	The aria-describedby attribute must point to IDs of elements in the same document.	No

Success Criterion	Description	Fix Once, Fix Everywhere
WCAG 2.1 A 1.3.1	The aria-flowto attribute must point to IDs of elements in the same document.	No
WCAG 2.1 A 1.3.1	The aria-labelledby attribute must point to IDs of elements in the same document.	No
WCAG 2.1 A 1.3.1	The aria-owns attribute must point to IDs of elements in the same document.	No
WCAG 2.1 A 1.3.1	The value of aria-activedescendant must either refer to a descendant element, or be accompanied by an aria-owns attribute.	No
WCAG 2.1 A 1.3.1	Use HTML headings instead of applying CSS heading styles to non-headings.	No
WCAG 2.1 A 1.3.1	Use semantic markup like strong instead of using the CSS font-weight property.	No
WCAG 2.1 A 1.3.1	A fieldset element has been used to give a border to text.	No
WCAG 2.1 A 1.3.1	An element with role=cell must be contained in, or owned by, an element with role=row	No
WCAG 2.1 A 1.3.1	Identify row and column headers in data tables using th elements, and mark layout tables with role=presentation.	No
WCAG 2.1 A 1.3.1	Important content has been hidden from screen readers using role=presentation.	No
WCAG 2.1 A 1.3.1	Some ARIA table header cells have no corresponding data cells.	No
WCAG 2.1 A 1.3.1	Some table header cells have no corresponding data cells.	No
WCAG 2.1 A 1.3.1	If a table is used for layout, do not use structural markup like th, headers and scope for the purpose of visual formatting.	No
WCAG 2.1 A 1.3.1	Content inserted with CSS is not available to people who turn off style sheets, or use custom styles.	No
WCAG 2.1 A 1.3.1	Elements with role=feed must contain or own an element with role=article.	No
WCAG 2.1 A 1.3.1	Elements with role=grid must contain or own an element with role=row or role=rowgroup.	No
WCAG 2.1 A 1.3.1	Elements with role=list must contain or own an element with role=listitem.	No
WCAG 2.1 A 1.3.1	Elements with role=listbox must contain or own an element with role=option.	No
WCAG 2.1 A 1.3.1	Elements with role=menu must contain or own an element with role=menuitem or role=menuitemcheckbox or role=menuitemradio.	No
WCAG 2.1 A 1.3.1	Elements with role=radiogroup must contain or own an element with role=radio.	No

Success Criterion	Description	Fix Once, Fix Everywhere
WCAG 2.1 A 1.3.1	Elements with role=row must contain or own an element with role=cell or role=columnheader or role=gridcell or role=rowheader.	No
WCAG 2.1 A 1.3.1	Elements with role=rowgroup must contain or own an element with role=row.	No
WCAG 2.1 A 1.3.1	Elements with role=table must contain or own an element with role=row or role=rowgroup.	No
WCAG 2.1 A 1.3.1	Elements with role=tablist must contain or own an element with role=tab.	No
WCAG 2.1 A 1.3.1	Elements with role=tree must contain or own an element with role=treeitem.	No
WCAG 2.1 A 1.3.1	Elements with role=treegrid must contain or own an element with role=row or role=rowgroup.	No
WCAG 2.1 A 1.3.1	For data tables that have two or more logical levels of row or column headers, use markup to associate data cells and header cells.	No
WCAG 2.1 A 1.3.1	PDF security on the document prevents screen readers accessing document text.	No
WCAG 2.1 A 1.3.1	PDFs must be tagged to be accessible by screen readers.	No
WCAG 2.1 A 1.3.1	Attribute aria-activedescendant value should either refer to a descendant element, or should be accompanied by attribute aria-owns.	No
WCAG 2.1 A 1.3.1, WCAG 2.1 A 1.3.2	Using spaces to create multiple columns results in screen readers reading columns in the wrong order.	No
WCAG 2.1 A 1.3.1, WCAG 2.1 A 2.1.1, WCAG 2.1 A 4.1.2	This element uses JavaScript to behave like a link. Links like this cannot be tabbed to from the keyboard and are not read out when screen readers list the links on a page.	No
WCAG 2.1 A 1.3.1, WCAG 2.1 A 3.3.2	All fieldset elements should be labeled with legend elements.	No
WCAG 2.1 A 1.3.1, WCAG 2.1 AA 2.4.6, WCAG 2.1 A 4.1.2	The label element is blank.	No
WCAG 2.1 A 1.3.2	Inserting spaces between letters in a word means screen readers cannot pronounce the words correctly.	No
WCAG 2.1 A 1.3.2	The dir attribute does not match the writing direction of the lang attribute.	No
WCAG 2.1 A 1.3.2	The lang attribute specifies a language written right-to-left, so dir=rtl is needed to change the text layout direction.	No
WCAG 2.1 A 1.3.2	Word document contains a non-inline graphic or object.	No

Success Criterion	Description	Fix Once, Fix Everywhere
WCAG 2.1 A 1.3.2	CSS positioning can make pages unreadable when style sheets are turned off.	No
WCAG 2.1 A 1.3.2	This page uses nested tables, which do not make sense when read in a screen reader.	No
WCAG 2.1 A 1.3.3	frame title must describe function rather than visual relationship to make sense in a screen reader.	No
WCAG 2.1 AA 1.3.4	Don't lock the screen orientation on mobile devices.	Yes
WCAG 2.1 AA 1.3.5	For input type=password elements, set the autocomplete attribute to new-password or current-password in order to identify input purpose.	No
WCAG 2.1 AA 1.3.5	Invalid value for attribute autocomplete.	No
WCAG 2.1 A 1.4.1	Removing the underline from links makes it hard for color-blind users to see them.	Yes
WCAG 2.1 AA 1.4.2	A media element automatically plays sound for more than 3 seconds, without a way to pause it.	No
WCAG 2.1 AA 1.4.2	A sound plays longer than 3 seconds, without a way to turn it off.	No
WCAG 2.1 AA 1.4.3	If you set any of the colors on the body or a elements you must set all of them.	Yes
WCAG 2.1 AA 1.4.3	Ensure that text and background colors have enough contrast.	Yes
WCAG 2.1 AA 1.4.4	Do not use the meta viewport tag to disable zoom.	No
WCAG 2.1 AA 1.4.4	Use relative units in CSS property values when zoom is disabled by meta viewport.	No
WCAG 2.1 AA 1.4.11	User interface controls must have a contrast ratio of at least 3:1 against adjacent colors.	No
WCAG 2.1 AA 1.4.11, WCAG 2.1 AA 2.4.7	The CSS outline or border style on this element makes it difficult or impossible to see the dotted link focus outline	Yes
WCAG 2.1 AA 1.4.12	A style attribute with letter-spacing: !important cannot be resized by assistive technology.	Yes
WCAG 2.1 AA 1.4.12	A style attribute with line-height: !important cannot be resized by assistive technology.	Yes
WCAG 2.1 AA 1.4.12	A style attribute with word-spacing: !important cannot be resized by assistive technology.	Yes
WCAG 2.1 A 2.1.1	Clickable controls should have an ARIA role.	No
WCAG 2.1 A 2.1.1	All onclick handlers should have an equivalent onkeyup or onkeydown handler.	Yes
WCAG 2.1 A 2.1.1	All ondblclick handlers should have an equivalent onkey handler.	Yes

Success Criterion	Description	Fix Once, Fix Everywhere
WCAG 2.1 A 2.1.1	All onmousedown handlers should have an equivalent onkeydown or onclick handler.	Yes
WCAG 2.1 A 2.1.1	All onmouseout handlers should have an equivalent onblur handler.	Yes
WCAG 2.1 A 2.1.1	All onmouseover handlers should have an equivalent onfocus handler.	Yes
WCAG 2.1 A 2.1.1	All onmouseup handlers should have an equivalent onkeyup or onclick handler.	Yes
WCAG 2.1 A 2.1.1, WCAG 2.1 A 2.1.3	Hidden scrollable content cannot be scrolled using the keyboard.	No
WCAG 2.1 A 2.1.1, WCAG 2.1 A 2.1.3	For script and applet elements, ensure that event handlers are input device-independent. Do not write event handlers that rely on mouse coordinates since this prevents device-independent input.	Yes
WCAG 2.1 A 2.1.1, WCAG 2.1 A 2.1.3	onkey handlers on static elements like div and span cannot be triggered unless tabindex is set.	No
WCAG 2.1 A 2.1.1, WCAG 2.1 AA 2.4.7, WCAG 2.1 A 3.2.1	This field removes focus when tabbed to making it impossible for disabled users to navigate this form via the keyboard.	Yes
WCAG 2.1 A 2.2.1	Do not use the meta refresh tag to automatically refresh pages because this confuses users.	Yes
WCAG 2.1 A 2.2.1	Do not use the meta refresh tag to redirect pages after a pause because this confuses users.	Yes
WCAG 2.1 A 2.2.1	Do not use the Refresh HTTP header to automatically refresh pages because this confuses users.	Yes
WCAG 2.1 A 2.2.1	Do not use the Refresh HTTP header to redirect pages after a pause because this confuses users.	Yes
WCAG 2.1 A 2.2.2	A video plays longer than 5 seconds, without a way to pause it.	No
WCAG 2.1 A 2.2.2	Scrolling marquee text is very hard to read for low vision users.	No
WCAG 2.1 A 2.2.2	The blink element can trigger epileptic seizures and cause problems for people with attention deficit disorders.	No
WCAG 2.1 A 2.2.2	CSS text-decoration: blink has been used to make an element blink, and there's no way the user can turn this off. This causes severe problems for people with attention deficit disorders.	No
WCAG 2.1 A 2.2.2	This page uses script to create a blinking effect.	Yes
WCAG 2.1 A 2.2.2	Don't use CSS animations that run for more than 5 seconds without giving the user a way to turn them off.	Yes

Success Criterion	Description	Fix Once, Fix Everywhere
WCAG 2.1 A 2.2.2	Avoid animated images over 5 seconds long that can't be paused or stopped.	No
WCAG 2.1 A 2.3.1	Web pages must not contain large images that flash more than three times in any one second period.	No
WCAG 2.1 A 2.4.1	This skip link is broken. The target anchor does not exist or is commented out.	No
WCAG 2.1 A 2.4.1, WCAG 2.1 A 4.1.2	Frame title must not be the same as the frame src file name.	No
WCAG 2.1 A 2.4.2	Document must have a title.	No
WCAG 2.1 A 2.4.2	Document title must not be blank.	No
WCAG 2.1 A 2.4.2	Document title must not contain placeholder text like 'Untitled' or the page filename.	No
WCAG 2.1 A 2.4.2	Some pages have the same title, so the title cannot be used to distinguish pages.	No
WCAG 2.1 A 2.4.3	The tab order does not follow logical sequences on the page.	No
WCAG 2.1 A 2.4.4	Link uses general text like 'Click Here' with no surrounding text explaining link purpose.	No
WCAG 2.1 A 2.4.4	Several links on a page share the same link text and surrounding context, but go to different destinations.	No
WCAG 2.1 A 2.4.4, WCAG 2.1 A 4.1.2	Each a element must contain text or an img with an alt attribute.	No
WCAG 2.1 AA 2.4.5	Provide two or more ways to reach each page: via links, search, a site map or table of contents.	No
WCAG 2.1 AA 2.4.6	Radio buttons with very generic labels need to be enclosed in a fieldset with a legend explaining the label.	No
WCAG 2.1 A 2.5.3	The visual label must appear in the accessible name of links and controls.	No
WCAG 2.1 A 3.1.1	lang and xml:lang should match if both are specified.	Yes
WCAG 2.1 A 3.1.1	Page lang attribute contains an invalid language.	Yes
WCAG 2.1 A 3.1.1	Use the lang attribute to identify the language of the page.	Yes
WCAG 2.1 AA 3.1.2	Element lang attribute contains an invalid language.	No
WCAG 2.1 AA 3.1.2	Phrases in a different language should be in a span or div with a lang attribute.	No
WCAG 2.1 A 3.2.1	The page shows a popup when the page is loaded.	No
WCAG 2.1 A 3.2.2	Select lists cannot be operated from the keyboard if they have an onchange handler that performs navigation, because the handler fires as the user moves the selection up and down using the keyboard.	Yes

Success Criterion	Description	Fix Once, Fix Everywhere
WCAG 2.1 A 3.2.2	This element uses JavaScript to open a new window without warning as the user tabs through the controls.	Yes
WCAG 2.1 A 3.2.2	This form automatically submits when focus changes making it nearly impossible for disabled users to navigate via the keyboard.	Yes
WCAG 2.1 A 3.3.2	A group of phone number fields need a visible label or instructions to help users with visual or cognitive disabilities.	No
WCAG 2.1 A 4.1.1	An element with role=button must not appear as a descendant of an element with role=button	No
WCAG 2.1 A 4.1.1	An element with role=button must not appear as a descendant of an element with role=link	No
WCAG 2.1 A 4.1.1	An element with role=checkbox must not appear as a descendant of an element with role=button	No
WCAG 2.1 A 4.1.1	An element with role=checkbox must not appear as a descendant of an element with role=link	No
WCAG 2.1 A 4.1.1	An element with role=combobox must not appear as a descendant of an element with role=button	No
WCAG 2.1 A 4.1.1	An element with role=combobox must not appear as a descendant of an element with role=link	No
WCAG 2.1 A 4.1.1	An element with role=grid must not appear as a descendant of an element with role=button	No
WCAG 2.1 A 4.1.1	An element with role=grid must not appear as a descendant of an element with role=link	No
WCAG 2.1 A 4.1.1	An element with role=gridcell must not appear as a descendant of an element with role=button	No
WCAG 2.1 A 4.1.1	An element with role=gridcell must not appear as a descendant of an element with role=link	No
WCAG 2.1 A 4.1.1	An element with role=listbox must not appear as a descendant of an element with role=button	No
WCAG 2.1 A 4.1.1	An element with role=listbox must not appear as a descendant of an element with role=link	No
WCAG 2.1 A 4.1.1	An element with role=menu must not appear as a descendant of an element with role=button	No
WCAG 2.1 A 4.1.1	An element with role=menu must not appear as a descendant of an element with role=link	No
WCAG 2.1 A 4.1.1	An element with role=menubar must not appear as a descendant of an element with role=button	No
WCAG 2.1 A 4.1.1	An element with role=menubar must not appear as a descendant of an element with role=link	No
WCAG 2.1 A 4.1.1	An element with role=menuitem must not appear as a descendant of an element with role=button	No

Success Criterion	Description	Fix Once, Fix Everywhere
WCAG 2.1 A 4.1.1	An element with role=menuitem must not appear as a descendant of an element with role=link	No
WCAG 2.1 A 4.1.1	An element with role=menuitemcheckbox must not appear as a descendant of an element with role=button	No
WCAG 2.1 A 4.1.1	An element with role=menuitemcheckbox must not appear as a descendant of an element with role=link	No
WCAG 2.1 A 4.1.1	An element with role=menuitemradio must not appear as a descendant of an element with role=button	No
WCAG 2.1 A 4.1.1	An element with role=menuitemradio must not appear as a descendant of an element with role=link	No
WCAG 2.1 A 4.1.1	An element with role=option must not appear as a descendant of an element with role=button	No
WCAG 2.1 A 4.1.1	An element with role=option must not appear as a descendant of an element with role=link	No
WCAG 2.1 A 4.1.1	An element with role=radio must not appear as a descendant of an element with role=button	No
WCAG 2.1 A 4.1.1	An element with role=radio must not appear as a descendant of an element with role=link	No
WCAG 2.1 A 4.1.1	An element with role=scrollbar must not appear as a descendant of an element with role=button	No
WCAG 2.1 A 4.1.1	An element with role=scrollbar must not appear as a descendant of an element with role=link	No
WCAG 2.1 A 4.1.1	An element with role=searchbox must not appear as a descendant of an element with role=button	No
WCAG 2.1 A 4.1.1	An element with role=searchbox must not appear as a descendant of an element with role=link	No
WCAG 2.1 A 4.1.1	An element with role=slider must not appear as a descendant of an element with role=button	No
WCAG 2.1 A 4.1.1	An element with role=slider must not appear as a descendant of an element with role=link	No
WCAG 2.1 A 4.1.1	An element with role=spinbutton must not appear as a descendant of an element with role=button	No
WCAG 2.1 A 4.1.1	An element with role=spinbutton must not appear as a descendant of an element with role=link	No
WCAG 2.1 A 4.1.1	An element with role=switch must not appear as a descendant of an element with role=button	No
WCAG 2.1 A 4.1.1	An element with role=switch must not appear as a descendant of an element with role=link	No
WCAG 2.1 A 4.1.1	An element with role=tab must not appear as a descendant of an element with role=button	No
WCAG 2.1 A 4.1.1	An element with role=tab must not appear as a descendant of an element with role=link	No

Success Criterion	Description	Fix Once, Fix Everywhere
WCAG 2.1 A 4.1.1	An element with role=textbox must not appear as a descendant of an element with role=button	No
WCAG 2.1 A 4.1.1	An element with role=textbox must not appear as a descendant of an element with role=link	No
WCAG 2.1 A 4.1.1	An element with role=treeitem must not appear as a descendant of an element with role=button	No
WCAG 2.1 A 4.1.1	An element with role=treeitem must not appear as a descendant of an element with role=link	No
WCAG 2.1 A 4.1.1	An element with the attribute tabindex must not appear as a descendant of an element with role=button	No
WCAG 2.1 A 4.1.1	An element with the attribute tabindex must not appear as a descendant of an element with role=link	No
WCAG 2.1 A 4.1.1	The a element must not appear as a descendant of an element with role=button	No
WCAG 2.1 A 4.1.1	The a element must not appear as a descendant of an element with role=link	No
WCAG 2.1 A 4.1.1	The audio element with the attribute controls must not appear as a descendant of an element with role=button	No
WCAG 2.1 A 4.1.1	The audio element with the attribute controls must not appear as a descendant of an element with role=link	No
WCAG 2.1 A 4.1.1	The button element must not appear as a descendant of an element with role=button	No
WCAG 2.1 A 4.1.1	The button element must not appear as a descendant of an element with role=link	No
WCAG 2.1 A 4.1.1	The details element must not appear as a descendant of an element with role=button	No
WCAG 2.1 A 4.1.1	The details element must not appear as a descendant of an element with role=link	No
WCAG 2.1 A 4.1.1	The dialog element must not appear as a descendant of an element with role=button	No
WCAG 2.1 A 4.1.1	The dialog element must not appear as a descendant of an element with role=link	No
WCAG 2.1 A 4.1.1	The element a must not appear as a descendant of the a element.	No
WCAG 2.1 A 4.1.1	The element a must not appear as a descendant of the button element.	No
WCAG 2.1 A 4.1.1	The element address must not appear as a descendant of the address element.	No
WCAG 2.1 A 4.1.1	The element article must not appear as a descendant of the address element.	No
WCAG 2.1 A 4.1.1	The element article must not appear as a descendant of the dt element.	No

Success Criterion	Description	Fix Once, Fix Everywhere
WCAG 2.1 A 4.1.1	The element article must not appear as a descendant of the th element.	No
WCAG 2.1 A 4.1.1	The element button must not appear as a descendant of the a element.	No
WCAG 2.1 A 4.1.1	The element button must not appear as a descendant of the button element.	No
WCAG 2.1 A 4.1.1	The element details must not appear as a descendant of the a element.	No
WCAG 2.1 A 4.1.1	The element details must not appear as a descendant of the button element.	No
WCAG 2.1 A 4.1.1	The element dfn must not appear as a descendant of the dfn element.	No
WCAG 2.1 A 4.1.1	The element dialog must not appear as a descendant of the a element.	No
WCAG 2.1 A 4.1.1	The element dialog must not appear as a descendant of the button element.	No
WCAG 2.1 A 4.1.1	The element embed must not appear as a descendant of the a element.	No
WCAG 2.1 A 4.1.1	The element embed must not appear as a descendant of the button element.	No
WCAG 2.1 A 4.1.1	The element footer must not appear as a descendant of the address element.	No
WCAG 2.1 A 4.1.1	The element footer must not appear as a descendant of the dt element.	No
WCAG 2.1 A 4.1.1	The element footer must not appear as a descendant of the footer element.	No
WCAG 2.1 A 4.1.1	The element footer must not appear as a descendant of the header element.	No
WCAG 2.1 A 4.1.1	The element footer must not appear as a descendant of the th element.	No
WCAG 2.1 A 4.1.1	The element h1 must not appear as a descendant of the address element.	No
WCAG 2.1 A 4.1.1	The element h1 must not appear as a descendant of the dt element.	No
WCAG 2.1 A 4.1.1	The element h1 must not appear as a descendant of the th element.	No
WCAG 2.1 A 4.1.1	The element h2 must not appear as a descendant of the address element.	No
WCAG 2.1 A 4.1.1	The element h2 must not appear as a descendant of the dt element.	No
WCAG 2.1 A 4.1.1	The element h2 must not appear as a descendant of the th element.	No
WCAG 2.1 A 4.1.1	The element h3 must not appear as a descendant of the address element.	No

Success Criterion	Description	Fix Once, Fix Everywhere
WCAG 2.1 A 4.1.1	The element h3 must not appear as a descendant of the dt element.	No
WCAG 2.1 A 4.1.1	The element h3 must not appear as a descendant of the th element.	No
WCAG 2.1 A 4.1.1	The element h4 must not appear as a descendant of the address element.	No
WCAG 2.1 A 4.1.1	The element h4 must not appear as a descendant of the dt element.	No
WCAG 2.1 A 4.1.1	The element h4 must not appear as a descendant of the th element.	No
WCAG 2.1 A 4.1.1	The element h5 must not appear as a descendant of the address element.	No
WCAG 2.1 A 4.1.1	The element h5 must not appear as a descendant of the dt element.	No
WCAG 2.1 A 4.1.1	The element h5 must not appear as a descendant of the th element.	No
WCAG 2.1 A 4.1.1	The element h6 must not appear as a descendant of the address element.	No
WCAG 2.1 A 4.1.1	The element h6 must not appear as a descendant of the dt element.	No
WCAG 2.1 A 4.1.1	The element h6 must not appear as a descendant of the th element.	No
WCAG 2.1 A 4.1.1	The element header must not appear as a descendant of the address element.	No
WCAG 2.1 A 4.1.1	The element header must not appear as a descendant of the dt element.	No
WCAG 2.1 A 4.1.1	The element header must not appear as a descendant of the footer element.	No
WCAG 2.1 A 4.1.1	The element header must not appear as a descendant of the header element.	No
WCAG 2.1 A 4.1.1	The element header must not appear as a descendant of the th element.	No
WCAG 2.1 A 4.1.1	The element hgroup must not appear as a descendant of the dt element.	No
WCAG 2.1 A 4.1.1	The element hgroup must not appear as a descendant of the th element.	No
WCAG 2.1 A 4.1.1	The element iframe must not appear as a descendant of the a element.	No
WCAG 2.1 A 4.1.1	The element iframe must not appear as a descendant of the button element.	No
WCAG 2.1 A 4.1.1	The element label must not appear as a descendant of the a element.	No

Success Criterion	Description	Fix Once, Fix Everywhere
WCAG 2.1 A 4.1.1	The element label must not appear as a descendant of the button element.	No
WCAG 2.1 A 4.1.1	The element label must not appear as a descendant of the label element.	No
WCAG 2.1 A 4.1.1	The element main must not appear as a descendant of the a element.	No
WCAG 2.1 A 4.1.1	The element main must not appear as a descendant of the address element.	No
WCAG 2.1 A 4.1.1	The element main must not appear as a descendant of the article element.	No
WCAG 2.1 A 4.1.1	The element main must not appear as a descendant of the aside element.	No
WCAG 2.1 A 4.1.1	The element main must not appear as a descendant of the audio element.	No
WCAG 2.1 A 4.1.1	The element main must not appear as a descendant of the blockquote element.	No
WCAG 2.1 A 4.1.1	The element main must not appear as a descendant of the canvas element.	No
WCAG 2.1 A 4.1.1	The element main must not appear as a descendant of the caption element.	No
WCAG 2.1 A 4.1.1	The element main must not appear as a descendant of the dd element.	No
WCAG 2.1 A 4.1.1	The element main must not appear as a descendant of the del element.	No
WCAG 2.1 A 4.1.1	The element main must not appear as a descendant of the details element.	No
WCAG 2.1 A 4.1.1	The element main must not appear as a descendant of the dialog element.	No
WCAG 2.1 A 4.1.1	The element main must not appear as a descendant of the dt element.	No
WCAG 2.1 A 4.1.1	The element main must not appear as a descendant of the fieldset element.	No
WCAG 2.1 A 4.1.1	The element main must not appear as a descendant of the figure element.	No
WCAG 2.1 A 4.1.1	The element main must not appear as a descendant of the footer element.	No
WCAG 2.1 A 4.1.1	The element main must not appear as a descendant of the header element.	No
WCAG 2.1 A 4.1.1	The element main must not appear as a descendant of the ins element.	No
WCAG 2.1 A 4.1.1	The element main must not appear as a descendant of the li element.	No
WCAG 2.1 A 4.1.1	The element main must not appear as a descendant of the main element.	No

Success Criterion	Description	Fix Once, Fix Everywhere
WCAG 2.1 A 4.1.1	The element main must not appear as a descendant of the map element.	No
WCAG 2.1 A 4.1.1	The element main must not appear as a descendant of the nav element.	No
WCAG 2.1 A 4.1.1	The element main must not appear as a descendant of the noscript element.	No
WCAG 2.1 A 4.1.1	The element main must not appear as a descendant of the object element.	No
WCAG 2.1 A 4.1.1	The element main must not appear as a descendant of the section element.	No
WCAG 2.1 A 4.1.1	The element main must not appear as a descendant of the slot element.	No
WCAG 2.1 A 4.1.1	The element main must not appear as a descendant of the td element.	No
WCAG 2.1 A 4.1.1	The element main must not appear as a descendant of the th element.	No
WCAG 2.1 A 4.1.1	The element main must not appear as a descendant of the video element.	No
WCAG 2.1 A 4.1.1	The element meter must not appear as a descendant of the meter element.	No
WCAG 2.1 A 4.1.1	The element nav must not appear as a descendant of the address element.	No
WCAG 2.1 A 4.1.1	The element nav must not appear as a descendant of the dt element.	No
WCAG 2.1 A 4.1.1	The element nav must not appear as a descendant of the th element.	No
WCAG 2.1 A 4.1.1	The element noscript must not appear as a descendant of the noscript element.	No
WCAG 2.1 A 4.1.1	The element progress must not appear as a descendant of the progress element.	No
WCAG 2.1 A 4.1.1	The element section must not appear as a descendant of the address element.	No
WCAG 2.1 A 4.1.1	The element section must not appear as a descendant of the dt element.	No
WCAG 2.1 A 4.1.1	The element section must not appear as a descendant of the th element.	No
WCAG 2.1 A 4.1.1	The element select must not appear as a descendant of the a element.	No
WCAG 2.1 A 4.1.1	The element select must not appear as a descendant of the button element.	No
WCAG 2.1 A 4.1.1	The element table must not appear as a descendant of the caption element.	No

Success Criterion	Description	Fix Once, Fix Everywhere
WCAG 2.1 A 4.1.1	The element textarea must not appear as a descendant of the a element.	No
WCAG 2.1 A 4.1.1	The element textarea must not appear as a descendant of the button element.	No
WCAG 2.1 A 4.1.1	The embed element must not appear as a descendant of an element with role=button	No
WCAG 2.1 A 4.1.1	The embed element must not appear as a descendant of an element with role=link	No
WCAG 2.1 A 4.1.1	The iframe element must not appear as a descendant of an element with role=button	No
WCAG 2.1 A 4.1.1	The iframe element must not appear as a descendant of an element with role=link	No
WCAG 2.1 A 4.1.1	The img element with the attribute usemap must not appear as a descendant of an element with role=button	No
WCAG 2.1 A 4.1.1	The img element with the attribute usemap must not appear as a descendant of an element with role=link	No
WCAG 2.1 A 4.1.1	The input element must not appear as a descendant of an element with role=button	No
WCAG 2.1 A 4.1.1	The input element must not appear as a descendant of an element with role=link	No
WCAG 2.1 A 4.1.1	The interactive element a must not appear as a descendant of the a element.	No
WCAG 2.1 A 4.1.1	The interactive element a must not appear as a descendant of the button element.	No
WCAG 2.1 A 4.1.1	The interactive element audio with the attribute controls must not appear as a descendant of the a element.	No
WCAG 2.1 A 4.1.1	The interactive element audio with the attribute controls must not appear as a descendant of the button element.	No
WCAG 2.1 A 4.1.1	The interactive element button must not appear as a descendant of the a element.	No
WCAG 2.1 A 4.1.1	The interactive element details must not appear as a descendant of the a element.	No
WCAG 2.1 A 4.1.1	The interactive element details must not appear as a descendant of the button element.	No
WCAG 2.1 A 4.1.1	The interactive element embed must not appear as a descendant of the a element.	No
WCAG 2.1 A 4.1.1	The interactive element embed must not appear as a descendant of the button element.	No
WCAG 2.1 A 4.1.1	The interactive element iframe must not appear as a descendant of the a element.	No
WCAG 2.1 A 4.1.1	The interactive element iframe must not appear as a descendant of the button element.	No

Success Criterion	Description	Fix Once, Fix Everywhere
WCAG 2.1 A 4.1.1	The interactive element input must not appear as a descendant of the button element.	No
WCAG 2.1 A 4.1.1	The interactive element label must not appear as a descendant of the a element.	No
WCAG 2.1 A 4.1.1	The interactive element label must not appear as a descendant of the button element.	No
WCAG 2.1 A 4.1.1	The interactive element select must not appear as a descendant of the a element.	No
WCAG 2.1 A 4.1.1	The interactive element textarea must not appear as a descendant of the a element.	No
WCAG 2.1 A 4.1.1	The interactive element video with the attribute controls must not appear as a descendant of the a element.	No
WCAG 2.1 A 4.1.1	The interactive element video with the attribute controls must not appear as a descendant of the button element.	No
WCAG 2.1 A 4.1.1	The label element must not appear as a descendant of an element with role=button	No
WCAG 2.1 A 4.1.1	The label element must not appear as a descendant of an element with role=link	No
WCAG 2.1 A 4.1.1	The menu element with the attribute toolbar must not appear as a descendant of an element with role=button	No
WCAG 2.1 A 4.1.1	The menu element with the attribute toolbar must not appear as a descendant of an element with role=link	No
WCAG 2.1 A 4.1.1	The object element with the attribute usemap must not appear as a descendant of an element with role=button	No
WCAG 2.1 A 4.1.1	The object element with the attribute usemap must not appear as a descendant of an element with role=link	No
WCAG 2.1 A 4.1.1	The select element must not appear as a descendant of an element with role=button	No
WCAG 2.1 A 4.1.1	The select element must not appear as a descendant of an element with role=link	No
WCAG 2.1 A 4.1.1	The textarea element must not appear as a descendant of an element with role=button	No
WCAG 2.1 A 4.1.1	The textarea element must not appear as a descendant of an element with role=link	No
WCAG 2.1 A 4.1.1	The video element with the attribute controls must not appear as a descendant of an element with role=button	No
WCAG 2.1 A 4.1.1	The video element with the attribute controls must not appear as a descendant of an element with role=link	No
WCAG 2.1 A 4.1.1	This page has markup errors, causing screen readers to miss content.	No
WCAG 2.1 A 4.1.1	The element form must not appear as a descendant of the form element.	No

Success Criterion	Description	Fix Once, Fix Everywhere
WCAG 2.1 A 4.1.1	HTML5 Parse Error.	No
WCAG 2.1 A 4.1.1	This page has duplicate IDs which cause problems in screen readers.	No
WCAG 2.1 A 4.1.1	Duplicate id - the same ID is used on more than one element.	No
WCAG 2.1 A 4.1.1	Quote " in attribute name. Probable cause: Matching quote missing somewhere earlier.	No
WCAG 2.1 A 4.1.1	" in an unquoted attribute value. Probable causes: Attributes running together or a URL query string in an unquoted attribute value.	No
WCAG 2.1 A 4.1.1	End tag a violates nesting rules.	No
WCAG 2.1 A 4.1.1	Element button not allowed as child element in this context.	No
WCAG 2.1 A 4.1.1	The interactive element input must not appear as a descendant of the a element.	No
WCAG 2.1 A 4.1.1	'= in an unquoted attribute value. Probable causes: Attributes running together or a URL query string in an unquoted attribute value.	No
WCAG 2.1 A 4.1.1	Element li not allowed as child element in this context.	No
WCAG 2.1 A 4.1.1	Element a not allowed as child element in this context.	No
WCAG 2.1 A 4.1.1	Element td not allowed as child element in this context.	No
WCAG 2.1 A 4.1.1	Element input not allowed as child element in this context.	No
WCAG 2.1 A 4.1.1	Element textarea not allowed as child element in this context.	No
WCAG 2.1 A 4.1.1	< in attribute name. Probable cause: > missing immediately before.	No
WCAG 2.1 A 4.1.1	' in an unquoted attribute value. Probable causes: Attributes running together or a URL query string in an unquoted attribute value.	No
WCAG 2.1 A 4.1.1	Element th not allowed as child element in this context.	No
WCAG 2.1 A 4.1.1	Element select not allowed as child element in this context.	No
WCAG 2.1 A 4.1.1	End tag b violates nesting rules.	No
WCAG 2.1 A 4.1.1	End tag em violates nesting rules.	No
WCAG 2.1 A 4.1.1	End tag strong violates nesting rules.	No
WCAG 2.1 A 4.1.1	End tag u violates nesting rules.	No
WCAG 2.1 A 4.1.1	End tag font violates nesting rules.	No
WCAG 2.1 A 4.1.1	End tag i violates nesting rules.	No
WCAG 2.1 A 4.1.1	Quote ' in attribute name. Probable cause: Matching quote missing somewhere earlier.	No
WCAG 2.1 A 4.1.1	No space between attributes.	No
WCAG 2.1 A 4.1.2	ARIA control has no label.	No

Success Criterion	Description	Fix Once, Fix Everywhere
WCAG 2.1 A 4.1.2	ARIA role=button element is empty and has no accessible name.	No
WCAG 2.1 A 4.1.2	ARIA role=menuitem element is empty and has no accessible name.	No
WCAG 2.1 A 4.1.2	Clickable controls should be keyboard accessible.	No
WCAG 2.1 A 4.1.2	HTML form control has no accessible name.	No
WCAG 2.1 A 4.1.2	This button element is empty and has no accessible name.	No
WCAG 2.1 A 4.1.2	This input button has no value attribute and no label.	No
WCAG 2.1 A 4.1.2	An element with a role that hides child elements contains focusable child elements.	No
WCAG 2.1 A 4.1.2	An element with aria-hidden=true contains focusable content.	No
WCAG 2.1 A 4.1.2	Bad value for attribute aria-controls.	No
WCAG 2.1 A 4.1.2	iframe and frame elements must have a title attribute.	No
WCAG 2.1 A 4.1.2	The aria-labelledby attribute references a blank element.	No
WCAG 2.1 A 4.1.2	This element uses JavaScript to make a div or span behave like a control, which is then inaccessible to screen readers.	No
WCAG 2.1 A 4.1.2	Missing required ARIA attribute.	No
WCAG 2.1 A 4.1.2	Element a is missing one or more required attributes.	No
WCAG 2.1 A 4.1.2	Element div is missing one or more required attributes.	No
WCAG 2.1 A 4.1.2	Element i is missing Hione or more required attributes.	No
WCAG 2.1 A F4	CSS text-decoration: blink has been used to make an element blink, and there's no way the user can turn this off. This causes severe problems for people with attention deficit disorders. Affects Firefox and Opera only.	No
WCAG 2.1 A F86	All fields in a group of input fields (for example phone numbers) need accessible names.	No
WCAG 2.1 A F90	The headers attribute references a non-existent table header ID or references an ID in a different table.	No

APPENDIX D: SORTSITE STEPS

The Department used the SortSite software program to identify accessibility issues on a sample of State and local websites. SortSite has various options so that the user can specify the type of search. In terms of the search, SortSite offers the options under Start Check:

- Entire Site
- Current Folder
- Current Page
- Page and Links

The Department searched the entire site.

SortSite has sets of scan options under the categories of rules, blocks, report, links, and crawler:

1. Rules

   a. Errors-All items were left unchecked.

   b. Accessibility-checked

      i. "WCAG" drop down menu-selected "WCAG 2.1 AA"

      ii. "Section 508" dropdown menu-selected "Section 508 Refresh (2017)"

      iii. "PDF/UA" drop down menu-selected "Not checked"

      iv. "AT compatibility" drop down menu-selected "Not checked"

      v. "Reading age" drop down menu

         ▪ Set the reading age to "Universal (*e.g.*, Reader's Digest)"

   c. Compatibility-left unchecked

   d. Search-left unchecked

     e.   Standards-left unchecked

     f.   Usability-left unchecked

2. Blocks

     a.   "Obey Robots.txt" was checked

3. Report

     a.   Javascript DOM changes-"Smart" option checked.

     b.   Under Reports, enter a value of 2000 for "Maximum pages listed per

        issue" and a value of 500 for the cell "Maximum line numbers per issue"

4. Links

     a.   Checked the box "Follow links to related domains"

     b.   Checked the circle "Check all external links"

     c.   Checked the circle "Explore all" under Link depth

5. Crawler-left the default settings