

VI. 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 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 entity. 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 rulemaking, the Department adopts technical standards for web content 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 RIA that there are roughly 22.8 billion annual visits to State and local government entity websites (Section 4.3.2), 4.4 billion of which are by individuals with disabilities. Individuals with disabilities access State and local government entity websites and mobile apps for a variety of government services, programs, and activities. Some examples of the many services, programs, and activities provided on these 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 government entities' online services and mobile apps are not equally available to individuals with disabilities who cannot access web content and mobile apps because they have not been designed to be accessible. If an individual with a disability is unable to access the web content or mobile app that a State or local government entity uses to offer its services, programs, or activities, they may be denied access to critical benefits and

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>.

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 adopting 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 adopts 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 rule 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 rule provides more information on the Department’s regulation including, for example, more information about the problems the rulemaking seeks to address, WCAG 2.1, compliance timeframes, and exceptions. Please refer to the rule for more specific information about the final regulation. This document, the RIA, is focused on providing information about the costs and benefits associated with that rule.

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

1.2 SUMMARY OF BENEFITS AND COSTS

Requiring State and local government entity web content 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 web content and mobile apps to meet this standard. The Department estimates that 109,893 State and local government entity websites and 8,805 State and local government entity 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 government entities 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 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 \$3.3 billion assuming a 3 percent discount rate and \$3.5 billion assuming a 7 percent discount rate. This includes \$17.0 billion in implementation costs accruing during the first three years (the implementation period), undiscounted, and \$2.0 billion in annual O&M costs during the next seven years. All values are presented in 2022 dollars as 2023 data were not yet available at the time the final rule was drafted.

Benefits will generally accrue to all individuals who access State and local government entity web content and mobile apps, and additional benefits will accrue to individuals with

certain types of disabilities. The WCAG 2.1 Level AA standards for web content 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) 2022 data, the Department estimates that 5.5 percent of adults have a vision disability, 7.6 percent have a hearing disability, 11.3 percent have a cognitive disability, and 5.8 percent have a manual dexterity disability. Due to the incidence of multiple disabilities, the total share of people with one or more of these disabilities is 21.3 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 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 rule will also benefit governments through increased certainty about what constitutes an accessible website, a potential reduction in litigation, and a larger labor market pool (due to increased educational attainment and access to job-training).

⁴ Throughout this 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 rule, “individuals without relevant disabilities” or “individuals without disabilities” will be used to mean individuals without one of these four types of disabilities.

Annual and annualized monetized benefits of this rule are presented in Table 7, Table 8, and Table 9. Annual benefits, beginning once the rule is fully implemented, total \$5.3 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 \$5.2 billion per year, assuming a 3 percent discount rate, and \$5.0 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 \$1.9 billion per year using a 3 percent discount rate and \$1.5 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 regulation, the Department compares the costs to revenues for public entities. Because calculating this ratio for every public entity would be impractical, the Department used the estimated average annualized cost compared to the average annual revenue by each government entity type. The costs for each government entity type and size are generally estimated to be below 1 percent of revenues (the one exception is small independent community colleges, for which the cost-to-revenue ratio is

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.

1.05 percent and 1.10 percent using a 3 percent and 7 percent discount rate, respectively),⁶ so the Department does not believe the rule will be unduly burdensome or costly for public entities.⁷

The Department received some comments on the proposed rule’s estimated costs and benefits. These comments are discussed in the applicable section of the text. One methodological change was made on the timing of compliance for making password-protected course content accessible by public educational entities, which is discussed further in that section. However, the numbers in this final rule’s RIA will also differ from the proposed rule because data have been updated to reflect the most recently available data and monetary values are now reported in 2022 dollars.

⁶ However, the Department notes that revenue for small independent community colleges was estimated using the 2012 Census of Governments, so revenue for small independent community colleges would likely be underestimated if small independent community colleges had a greater share of total local government revenue in 2022 than in 2012. If this were true, the Department expects that the cost-to-revenue ratio for small independent community colleges would be lower.

⁷ As a point of reference, the United States Small Business Administration advises agencies that a potential indicator that the impact of a 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. 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> [<https://perma.cc/PWL9-ZTW6>]; 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> [<https://perma.cc/9XFZ-3EVA>] (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	\$1.00	\$6.42	\$5.35	\$12.70	\$4.03	\$0.00	\$0.62	\$30.1
Websites	\$253.0	\$819.9	\$2,606.6	\$1,480.7	\$408.5	\$2,014.0	\$7.1	\$1,417.4	\$9,007.3
Mobile apps	\$14.7	\$56.8	\$100.0	\$1.4	\$0.0	\$406.3	\$1.3	\$68.9	\$649.2
Postsecondary course remediation	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$5,508.5	\$5,508.5
Primary and secondary course remediation	N/A	\$50.8	\$19.8	\$42.8	N/A	\$1,134.1	N/A	N/A	\$1,247.5
Third-party website remediation	\$7.2	\$39.4	\$147.2	\$85.5	\$19.6	\$113.8	\$0.0	\$93.6	\$506.4
Total	\$275.0	\$967.8	\$2,880.1	\$1,615.8	\$440.8	\$3,672.2	\$8.4	\$7,089.1	\$16,949.1

Table 2: Average Annual Cost After Implementation (Millions)

Cost	State	County	Municipal	Township	Special District	School District	U.S. Territories	Higher Ed.	Total
Websites	\$22.0	\$71.9	\$237.3	\$136.9	\$43.8	\$181.7	\$0.6	\$123.4	\$817.8
Mobile apps	\$0.01	\$0.04	\$0.03	\$0.00	\$0.00	\$0.23	\$0.00	\$0.05	\$0.35
Postsecondary course remediation	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$1,001.6	\$1,001.6
Primary and secondary course remediation	N/A	\$5.1	\$2.0	\$4.3	N/A	\$113.4	N/A	N/A	\$124.7
Third-party website remediation	\$0.6	\$3.5	\$13.4	\$7.9	\$2.1	\$10.2	\$0.0	\$8.2	\$45.9
Total	\$22.6	\$80.6	\$252.7	\$149.1	\$45.9	\$305.6	\$0.6	\$1,133.2	\$1,990.3

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. Territories	Higher Ed.	Total
Regulatory familiarization	\$0.02	\$0.97	\$6.23	\$5.20	\$12.33	\$3.91	\$0.00	\$0.60	\$29.26
Websites	\$366.5	\$1,190.3	\$3,812.6	\$2,174.4	\$634.1	\$2,939.6	\$10.3	\$2,053.9	\$13,181.7
Mobile apps	\$14.1	\$54.2	\$95.8	\$1.3	\$0.0	\$385.4	\$1.2	\$66.2	\$618.1
Postsecondary course remediation	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$11,890. 1	\$11,890.1
Primary and secondary course remediation	N/A	\$79.6	\$31.1	\$67.1	N/A	\$1,778.9	N/A	N/A	\$1,956.8
Third-party website remediation	\$10.5	\$57.4	\$215.3	\$125.6	\$30.4	\$165.8	\$0.0	\$135.6	\$740.7
Total	\$391.1	\$1,382.4	\$4,161.0	\$2,373.7	\$676.8	\$5,273.6	\$11.5	\$14,146. 5	\$28,416.7

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. Territories	Higher Ed.	Total
Regulatory familiarization	\$0.02	\$0.93	\$6.00	\$5.00	\$11.87	\$3.76	\$0.00	\$0.58	\$28.16
Websites	\$323.3	\$1,048.5	\$3,327.8	\$1,892.9	\$548.3	\$2,570.7	\$9.1	\$1,811.7	\$11,532.2
Mobile apps	\$13.3	\$50.7	\$90.5	\$1.3	\$0.0	\$358.5	\$1.2	\$62.5	\$577.9
Postsecondary course remediation	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$10,188. 1	\$10,188.1
Primary and secondary course remediation	N/A	\$69.7	\$27.2	\$58.7	N/A	\$1,557.3	N/A	N/A	\$1,713.0
Third-party website remediation	\$9.3	\$50.5	\$187.9	\$109.3	\$26.3	\$145.3	\$0.0	\$119.6	\$648.2
Total	\$345.9	\$1,220.4	\$3,639.4	\$2,067.2	\$586.5	\$4,635.5	\$10.2	\$12,182. 5	\$24,687.6

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

Cost	State	County	Municipal	Township	Special District	School District	U.S. Territories	Higher Ed.	Total
Regulatory familiarization	\$0.00	\$0.11	\$0.73	\$0.61	\$1.44	\$0.46	\$0.00	\$0.07	\$3.43
Websites	\$43.0	\$139.5	\$446.9	\$254.9	\$74.3	\$344.6	\$1.2	\$240.8	\$1,545.3
Mobile apps	\$1.7	\$6.3	\$11.2	\$0.2	\$0.0	\$45.2	\$0.1	\$7.8	\$72.5
Postsecondary course remediation	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$1,393.9	\$1,393.9
Primary and secondary course remediation	N/A	\$9.3	\$3.6	\$7.9	N/A	\$208.5	N/A	N/A	\$229.4
Third-party website remediation	\$1.2	\$6.7	\$25.2	\$14.7	\$3.6	\$19.4	\$0.0	\$15.9	\$86.8
Total	\$45.8	\$162.1	\$487.8	\$278.3	\$79.3	\$618.2	\$1.4	\$1,658.4	\$3,331.3

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

Cost	State	County	Municipal	Township	Special District	School District	U.S. Territories	Higher Ed.	Total
Regulatory familiarization	\$0.00	\$0.13	\$0.85	\$0.71	\$1.69	\$0.54	\$0.00	\$0.08	\$4.01
Websites	\$46.0	\$149.3	\$473.8	\$269.5	\$78.1	\$366.0	\$1.3	\$257.9	\$1,641.9
Mobile apps	\$1.9	\$7.2	\$12.9	\$0.2	\$0.0	\$51.0	\$0.2	\$8.9	\$82.3
Postsecondary course remediation	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$1,450.6	\$1,450.6
Primary and secondary course remediation	N/A	\$9.9	\$3.9	\$8.4	N/A	\$221.7	N/A	N/A	\$243.9
Third-party website remediation	\$1.3	\$7.2	\$26.8	\$15.6	\$3.7	\$20.7	\$0.0	\$17.0	\$92.3
Total	\$49.2	\$173.8	\$518.2	\$294.3	\$83.5	\$660.0	\$1.5	\$1,734.5	\$3,515.0

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	\$813.5	\$1,022.1	\$2,713.9	N/A	\$4,549.5
Time savings - mobile apps	\$76.3	\$95.9	\$254.5	N/A	\$426.7
Educational attainment	\$10.2	\$295.8	N/A	N/A	\$306.0
Total benefits	\$900.0	\$1,413.7	\$2,968.5	\$0.0	\$5,282.2

[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	\$686.3	\$862.3	\$2,289.6	N/A	\$3,838.3
Time savings - mobile apps	\$64.4	\$80.9	\$214.7	N/A	\$360.0
Educational attainment	\$34.4	\$996.9	N/A	N/A	\$1,031.3
Total benefits	\$785.1	\$1,940.0	\$2,504.4	\$0.0	\$5,229.5

[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	\$668.1	\$839.4	\$2,229.0	N/A	\$3,736.6
Time savings - mobile apps	\$62.7	\$78.7	\$209.0	N/A	\$350.4
Educational attainment	\$31.4	\$910.8	N/A	N/A	\$942.2
Total benefits	\$762.2	\$1,828.9	\$2,438.0	\$0.0	\$5,029.2

[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)	\$3,331.3	\$3,515.0
Average annualized benefits (millions)	\$5,229.5	\$5,029.2
Net benefits (millions)	\$1,898.2	\$1,514.2
Cost to benefit ratio	0.6	0.7

2 BASELINE CONDITIONS

To estimate the costs and benefits of this rule, baseline web accessibility of government websites and baseline disability prevalence need to be considered both in the presence and absence of the 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 433 government units (representing a 0.48 percent increase) between 2017⁸ and 2022.⁹ 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.¹⁰ Finally, the ways in which government websites are used, and the types of websites (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

⁸ U.S. Census Bureau, *Census of Governments 2017 - Public use Files* (Jan. 2017), <https://www.census.gov/data/datasets/2017/econ/gus/public-use-files.html>.

⁹ U.S. Census Bureau. (2022). *Census of Governments 2022 - Public use Files*. (Jan. 2022), <https://www.census.gov/data/datasets/2022/econ/gus/public-use-files.html>.

¹⁰ 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), <https://www.census.gov/programs-surveys/sipp/tech-documentation/user-notes/2021-usernotes/estim-disability-preval.html>.

Department's automated and manual accessibility checking from September 2022 through October 2022. Benefits were estimated based on literature which compared current levels of accessibility to full compliance with WCAG 2.1 AA. The Department notes that these time savings studies may be calculating time savings relative to different levels of current web accessibility compliance than the levels measured by the Department in the cost section. This adds some additional uncertainty to the size of the benefits, though we expect the magnitude of benefits associated with these costs to be accurate. Therefore, benefits and costs may vary between government entities depending on baseline conformity. The Department did not feel confident quantifying baseline conformity with the requirements.¹¹ 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 2002.¹² That study found almost no

¹¹ Though SortSite does give what percentile a website falls into as far as accessibility, it does not give a raw "accessibility score."

¹² 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](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>.

change in accessibility from the previous 2002 study.¹³ Although most accessibility studies do not take this longitudinal approach, their conclusions, regardless of the standards against which 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.¹⁴ Another 2006 study found that only 18 percent of municipal websites met Section 508 standards.¹⁵ 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.¹⁶ While literature has consistently found that websites do not conform to accessibility standards, the Department does recognize that the standards to which web content is compared have gotten more advanced over the years. As a result, it is possible that web content is becoming more accessible, though literature continues to conclude that web content does not fully conform to accessibility guidelines, regardless of the standard to which it is compared. 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.

2.1 NUMBER OF GOVERNMENTS

This regulation will affect all State and local government entities by requiring them to comply with WCAG 2.1 Level AA web accessibility standards. The Department used the 2017

¹³ 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.

¹⁴ 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>.

¹⁵ Evans-Cowley, J. (2006). “The Accessibility of Municipal Government Websites.” *Journal of E-Government* 2(2), 75, https://doi.org/10.1300/J399v02n02_05.

¹⁶ 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.

Census of Governments to determine the number of affected governments, disaggregated by government entity type as defined by the Census Bureau.^{17,18} The Department estimates the number of government entities affected by the rule in Table 11. To account for differences in government characteristics, the Department stratified the government entities by population size, and analyzed impacts of the rule to each type of government entity within the population bounds.

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.¹⁹ 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

¹⁷ 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>.

¹⁸ The Department conducted sampling and calculated survey weights using the 2017 Census of Governments because it was the most recent data available at the time of the analysis. Drawing a new sample of public entities for the purposes of performing the analysis using the 2022 Census of Governments data would produce nearly identical results given the mere 0.48 percent change in the count of public entities between 2017 and 2022 discussed in Section 2.

¹⁹ 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>.

for Education Statistics (NCES).²⁰

No public comments were received on the methodology to estimate the number of affected governments.

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
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 arbitrarily displayed as small.

2.2 NUMBER OF INDIVIDUALS WITH DISABILITIES

The Department expects the benefits of this regulation will accrue to all individuals using State and local government entity 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.²¹ Identifying individuals with these disabilities is not straightforward, and different surveys yield different estimates of the number of individuals with these disabilities. The Department considered three main data sources: (1) the U.S. Census

²⁰ National Center for Education Statistics. (n.d.). *Summary Tables*. Retrieved from <https://nces.ed.gov/ipeds/SummaryTables/>.

²¹ See Section 4.2.

Bureau's American Community Survey (ACS),²² (2) the Center for Disease Control and Prevention's (CDC's) Behavioral Risk Factor Surveillance Survey (BRFSS),²³ and (3) the U.S. Census Bureau's SIPP.²⁴ 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 information on social, economic, housing, and demographic characteristics. For each person in a household, the following questions are asked:²⁵

- 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

²² U.S. Census Bureau. *American Community Survey (ACS)*. Retrieved from <https://www.census.gov/programs-surveys/acs>.

²³ Centers for Disease Control and Prevention. (2014, May 16). *About BRFSS*. Retrieved from <https://www.cdc.gov/brfss/about/>.

²⁴ See U.S. Census Bureau. (2022, August 16). *About this Survey*. Retrieved from <https://www.census.gov/programs-surveys/sipp/about.html>.

²⁵ Some disability questions are only asked of household members aged 15 or older. The 2021 survey questionnaire is available at U.S. Department of Commerce. (2020, May 18). *The American Community Survey*. Retrieved from <https://www2.census.gov/programs-surveys/acs/methodology/questionnaires/2021/quest21.pdf>.

preventative health practices. The disability questions are very similar to those in the ACS:²⁶

- 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 involves repeated observations of the same variables over time, created to provide data on income, employment, and government program participation. Data on several panels of respondents have been collected since 1983. 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 the SIPP. The relevant questions in the SIPP are:²⁷

- 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

²⁶ 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>.

²⁷ Questionnaire available at U.S. Census Bureau. (2023, June 23). *2022 Survey of Income and Program Participation (SIPP)*. Retrieved from https://www2.census.gov/programs-surveys/sipp/questionnaires/2022/2022_SIPP_Instrument_Specifications.pdf.

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.²⁸

The Department used data for 2021 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 are consistently below the BRFSS and the SIPP rates. The SIPP estimated that prevalence rates for hearing and vision disabilities are a little higher than the BRFSS estimates. But the SIPP estimate for cognitive disabilities is lower than BRFSS.

Table 12: Prevalence of Disabilities in 2021 for Adults Using Different Data Sources

Disability Type	ACS [a]	BRFSS [b]	SIPP [c]
Vision disability, prevalence	2.5%	4.8%	5.5%
Hearing disability, prevalence	3.6%	6.1%	7.6%
Cognitive disability, prevalence	5.4%	12.8%	11.3%
Vision disability, number (millions)	8.4	12.0	14.0
Hearing disability, number (millions)	12.0	16.2	19.4
Cognitive disability, number (millions)	17.8	29.1	28.6

[a] American Community Survey, Public Use Micro Data. Retrieved from:

<https://data.census.gov/mdat/#/search?ds=ACSPUMS1Y2021>. 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). [accessed Sep. 14, 2023]. URL:

<https://www.cdc.gov/ncbddd/disabilityandhealth/dhds/index.html>. Includes Puerto Rico.

[c] U.S. Census Bureau. Retrieved from: <https://www.census.gov/programs-surveys/sipp/data/datasets/2022-data/2022.html>. Note that the 2022 SIPP file contains data for 2021.

²⁸ This question is only asked in select years.

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.²⁹ 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 the SIPP data are more accurate.

The Department used the SIPP data over ACS data for three reasons. First, the 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

²⁹ 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>.

chose the higher prevalence rates in the SIPP data to minimize this underreporting.³⁰ 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.³¹ 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.³² The 2021 ACS data are used to calculate prevalence levels in the sensitivity analyses (Sections 3.9 and 4.3.6).

Using SIPP data, as shown in Table 13, the Department estimates that 5.5 percent of adults have a vision disability, 7.6 percent have a hearing disability, 11.3 percent have a cognitive disability, and 5.8 percent have a manual dexterity disability. Due to the incidence of multiple disabilities, the total share without any of these disabilities is 78.7 percent.³³ No public comments were received on the estimated number of individuals with disabilities.

³⁰ 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>.

³¹ See <https://www.w3.org/WAI/fundamentals/accessibility-intro/>. Accessed on 11/30/2022.

³² 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/>.

³³ 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.

Table 13: Disability Prevalence Counts, SIPP

Disability Type	Prevalence Rate	Number (Millions)	Marginal Prevalence Rate [a]	Marginal Number [a] (Millions)
Vision	5.5%	14.0	5.5%	14.0
Hearing	7.6%	19.4	5.9%	15.1
Cognitive	11.3%	28.6	7.6%	19.3
Manual dexterity	5.8%	14.7	2.3%	5.7
None of the above	78.7%	200.1	78.7%	200.1

Source: U.S. Census Bureau. <https://www.census.gov/programs-surveys/sipp/data/datasets/2022-data/2022.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).

3 COMPLIANCE COST ANALYSIS

3.1 SUMMARY OF COMPLIANCE COSTS

For governments to comply with the rule, they will have to invest time and resources to make inaccessible web 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 rule will generally require public postsecondary educational institutions and primary and secondary schools to provide accessible course content to students with disabilities and parents with disabilities.³⁴ The Department performed analyses to estimate the costs to test and remediate inaccessible websites, mobile apps, and education course content. Estimated initial costs of the rule can be found in Table 14. Average annual costs of the rule following the implementation period can be found in Table 15. Average 10-year annualized costs of the rule using a 3 percent and 7 percent discount rate can be found in Table 16 and Table 17, respectively.

³⁴ 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.

The cost section is organized as follows:

- Section 3.2: Regulatory Familiarization Costs
- Section 3.3: Website Testing, Remediation, and O&M Costs
- Section 3.4: Mobile App Testing, Remediation, and O&M Costs
- Section 3.5: Postsecondary Education Course Content Remediation
- Section 3.6: Elementary and Secondary Course Content Remediation
- Section 3.7: Cost Comparison With and Without the Password-Protected Course Content Exceptions
- Section 3.8: Costs for Third-Party Websites and Mobile Apps
- Section 3.9: Sensitivity and Uncertainty Analyses of Costs
- Section 3.10: Cost to Revenue Comparison

Comments on specific cost components are discussed in the applicable section of the text.

No methodological changes were made in response to these comments.

Table 14: 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	\$1.00	\$6.42	\$5.35	\$12.70	\$4.03	\$0.00	\$0.62	\$30.1
Websites	\$253.0	\$819.9	\$2,606.6	\$1,480.7	\$408.5	\$2,014.0	\$7.1	\$1,417.4	\$9,007.3
Mobile apps	\$14.7	\$56.8	\$100.0	\$1.4	\$0.0	\$406.3	\$1.3	\$68.9	\$649.2
Postsecondary course remediation	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$5,508.5	\$5,508.5
Primary and secondary course remediation	N/A	\$50.8	\$19.8	\$42.8	N/A	\$1,134.1	N/A	N/A	\$1,247.5
Third-party website remediation	\$7.2	\$39.4	\$147.2	\$85.5	\$19.6	\$113.8	\$0.0	\$93.6	\$506.4
Total	\$275.0	\$967.8	\$2,880.1	\$1,615.8	\$440.8	\$3,672.2	\$8.4	\$7,089.1	\$16,949.1

Table 15: Average Annual Cost After Implementation (Millions)

Cost	State	County	Municipal	Township	Special District	School District	U.S. Territories	Higher Ed.	Total
Websites	\$22.0	\$71.9	\$237.3	\$136.9	\$43.8	\$181.7	\$0.6	\$123.4	\$817.8
Mobile apps	\$0.01	\$0.04	\$0.03	\$0.00	\$0.00	\$0.23	\$0.00	\$0.05	\$0.35
Postsecondary course remediation	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$1,001.6	\$1,001.6
Primary and secondary course remediation	N/A	\$5.1	\$2.0	\$4.3	N/A	\$113.4	N/A	N/A	\$124.7
Third-party website remediation	\$0.6	\$3.5	\$13.4	\$7.9	\$2.1	\$10.2	\$0.0	\$8.2	\$45.9
Total	\$22.6	\$80.6	\$252.7	\$149.1	\$45.9	\$305.6	\$0.6	\$1,133.2	\$1,990.3

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

Cost	State	County	Municipal	Township	Special District	School District	U.S. Territories	Higher Ed.	Total
Regulatory familiarization	\$0.00	\$0.11	\$0.73	\$0.61	\$1.44	\$0.46	\$0.00	\$0.07	\$3.43
Websites	\$43.0	\$139.5	\$446.9	\$254.9	\$74.3	\$344.6	\$1.2	\$240.8	\$1,545.3
Mobile apps	\$1.7	\$6.3	\$11.2	\$0.2	\$0.0	\$45.2	\$0.1	\$7.8	\$72.5
Postsecondary course remediation	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$1,393.9	\$1,393.9
Primary and secondary course remediation	N/A	\$9.3	\$3.6	\$7.9	N/A	\$208.5	N/A	N/A	\$229.4
Third-party website remediation	\$1.2	\$6.7	\$25.2	\$14.7	\$3.6	\$19.4	\$0.0	\$15.9	\$86.8
Total	\$45.8	\$162.1	\$487.8	\$278.3	\$79.3	\$618.2	\$1.4	\$1,658.4	\$3,331.3

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

Cost	State	County	Municipal	Township	Special District	School District	U.S. Territories	Higher Ed.	Total
Regulatory familiarization	\$0.00	\$0.13	\$0.85	\$0.71	\$1.69	\$0.54	\$0.00	\$0.08	\$4.01
Websites	\$46.0	\$149.3	\$473.8	\$269.5	\$78.1	\$366.0	\$1.3	\$257.9	\$1,641.9
Mobile apps	\$1.9	\$7.2	\$12.9	\$0.2	\$0.0	\$51.0	\$0.2	\$8.9	\$82.3
Postsecondary course remediation	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$1,450.6	\$1,450.6
Primary and secondary course remediation	N/A	\$9.9	\$3.9	\$8.4	N/A	\$221.7	N/A	N/A	\$243.9
Third-party website remediation	\$1.3	\$7.2	\$26.8	\$15.6	\$3.7	\$20.7	\$0.0	\$17.0	\$92.3
Total	\$49.2	\$173.8	\$518.2	\$294.3	\$83.5	\$660.0	\$1.5	\$1,734.5	\$3,515.0

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 government entities 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 up 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. While it is possible regulatory familiarization will take longer or shorter than three hours, the extent to which this would affect the overall costs is negligible. For instance, regulatory familiarization is currently estimated to be 0.1 percent of all costs. In a scenario where this cost doubles, which the Department thinks is unlikely, it would account for 0.2 percent of total costs, showing that regulatory familiarization costs are minimal relative to the rest of the rule.

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 cost of this time is valued at the median loaded wage for “Software and Web Developers, Programmers, and Testers.” According to the 2022 Occupational Employment and Wage Survey (OEWS), the median hourly wage rate is \$54.90.³⁵ 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, as they will likely be the primary people charged with making web content and mobile apps accessible to help public entities comply with the rule.³⁶ The selected wage rate was multiplied by two to account for benefits and overhead.³⁷ Therefore, the Department has estimated regulatory familiarization costs to be \$30.1 million (\$109.80 per hour × 3 hours × 91,489 governments) (Table 18). Several commenters disputed that software and web developers, programmers, and testers are the only employees who would need to become familiar with the requirements of the rule. The Department reiterates that the familiarization time may be allocated among multiple categories of employees, but that the wage for software and web developers, programmers, and testers was used as a proxy for these other occupations, as these web professionals are likely to undertake a large part of the regulatory familiarization task. Several commenters also asked for more time to be attributed to regulatory familiarization. These commenters seemed to erroneously consider time taken to learn how to

³⁵ OEWS data available at: U.S. Bureau of Labor Statistics. (2023, April 27). *May 2022 National Occupational Employment and Wage Estimates United States*. Retrieved from https://www.bls.gov/oes/current/oes_nat.htm#15-0000.

³⁶ 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 \$48.33, and for management occupations it is \$51.62.

³⁷ 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>.

comply with WCAG 2.1 Level AA as part of regulatory familiarization, which in reality only includes time needed to read and comprehend the requirements of the rule.

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 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 \$4.0 million.

Table 18: Regulatory Familiarization Costs

Variable	Value
Potentially affected governments	91,489
Average hours per entity	3
Loaded wage rate	\$109.80
<i>Base wage [a]</i>	\$54.90
<i>Adjustment factor</i>	2.00
Cost year 1 (thousands)	\$30,137
Annual cost years 2-10 (thousands)	\$0
Average annualized cost, 3% discount rate (thousands)	\$3,430
Average annualized cost, 7% discount rate (thousands)	\$4,010

[a] 2022 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 this rule, State and local government entity 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 shown on a per-entity basis in Table 20. Because the cost values derived from the sample are right skewed, median costs on a per-entity basis may better represent a “typical” cost and thus are presented in Appendix A.7.

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	\$31.4	\$156.5	\$25.4	\$6.7	\$220.0
County (small)	\$9.5	\$39.3	\$17.6	\$1.7	\$68.2
County (large)	\$97.0	\$480.5	\$49.2	\$20.6	\$647.3
Municipality (small)	\$293.3	\$1,397.8	\$124.5	\$60.0	\$1,875.6
Municipality (large)	\$68.2	\$337.5	\$49.9	\$14.5	\$470.1
Township (small)	\$202.8	\$971.9	\$98.8	\$41.7	\$1,315.2
Township (large)	\$4.1	\$19.9	\$2.3	\$0.9	\$27.2
Special district	\$64.7	\$274.0	\$14.3	\$11.8	\$364.7
U.S. territory (small)	\$0.1	\$0.7	\$0.4	\$0.0	\$1.3
U.S. territory (large)	\$0.7	\$3.3	\$0.8	\$0.1	\$4.9
School district (small)	\$190.7	\$902.4	\$61.5	\$38.7	\$1,193.3
School district (large)	\$94.2	\$467.5	\$26.8	\$20.1	\$608.5
Public university	\$81.2	\$402.3	\$29.7	\$17.3	\$530.4
Community college	\$108.4	\$536.2	\$34.3	\$23.0	\$701.8
Total	\$1,246.3	\$5,989.8	\$535.5	\$257.1	\$8,028.7

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	\$614,758	\$3,068,935	\$498,633	\$131,717	\$4,314,044
County (small)	2,105	\$4,524	\$18,676	\$8,378	\$802	\$32,380
County (large)	926	\$104,755	\$518,916	\$53,113	\$22,272	\$699,055
Municipality (small)	18,729	\$15,661	\$74,634	\$6,646	\$3,203	\$100,145
Municipality (large)	766	\$89,093	\$440,605	\$65,134	\$18,911	\$613,742
Township (small)	16,097	\$12,601	\$60,376	\$6,139	\$2,591	\$81,707
Township (large)	156	\$26,505	\$127,666	\$14,808	\$5,479	\$174,458
Special district	38,542	\$1,677	\$7,109	\$370	\$305	\$9,462
U.S. territory (small)	2	\$70,677	\$348,530	\$204,869	\$14,959	\$639,035
U.S. territory (large)	3	\$222,541	\$1,107,845	\$270,932	\$47,548	\$1,648,866
School district (small)	11,443	\$16,663	\$78,859	\$5,376	\$3,385	\$104,283
School district (large)	779	\$120,986	\$600,073	\$34,358	\$25,755	\$781,172
Public university	744	\$109,118	\$540,731	\$39,854	\$23,208	\$712,910
Community college	1,146	\$94,551	\$467,896	\$29,899	\$20,082	\$612,427
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).³⁸ The Department used the United States Census of Governments³⁹ 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) based

³⁸ 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.

³⁹ 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>.

on definitions in the Regulatory Flexibility Act.⁴⁰ Additionally, the Department tabulated the nation's public universities and community colleges.⁴¹ 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
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 NCES.

<https://nces.ed.gov/ipeds/SummaryTables/>.

⁴⁰ Small Business Administration. (2017). *A Guide for Government Agencies: How to Comply with the Regulatory Flexibility Act*. Retrieved from <https://advocacy.sba.gov/wp-content/uploads/2019/06/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.

⁴¹ National Center for Education Statistics. (n.d.). *Summary Tables*. Retrieved from <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.⁴² As there are fewer than 15 U.S. territories in each size class, all covered U.S. territories were sampled.⁴³ The Department separately drew unstratified random samples of 10 public universities and 10 community colleges for use in its analyses of those entities.⁴⁴ (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

⁴² 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.

⁴³ 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.

⁴⁴ Technical colleges were included with community colleges.

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.^{45, 46} 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 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.⁴⁷ In response to a comment which suggested that this analysis may not capture the full breadth of the number of State and local government entity websites, the Department emphasizes that 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 rule and under the purview of its associated entity

⁴⁵ 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.

⁴⁶ 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/>.

⁴⁷ 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.

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.⁴⁸ Third-party websites that offer government services were excluded from this part of the analysis and analyzed separately (Section 3.8).

Social media sites were excluded from the analysis, but Youtube and Vimeo were included in the analysis. The Department added an exemption in the final rule for preexisting social media content, so there are no costs associated with preexisting social media content.

Regarding public entities' future social media content (*i.e.*, the content that they post themselves), which is covered under the 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

⁴⁸ 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.

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.⁴⁹

⁴⁹ 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.

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 Sites 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.

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 2022 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.⁵⁰ Table 24 shows the number of websites identified and tested by

⁵⁰ OEWS data available at: U.S. Bureau of Labor Statistics. (2023, April 27). *May 2022 National Occupational Employment and Wage Estimates United States*. Retrieved from https://www.bls.gov/oes/current/oes_nat.htm#15-0000.

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.

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.⁵¹ 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

⁵¹ 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.

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.⁵² 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
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

⁵² 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.

management system (CMS).⁵³ 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;⁵⁴
- The error appeared on a JSON or XML file type, suggesting it was more likely produced from a CMS⁵⁵; or
- The error appeared on the same line of code on at least 10 different webpages.⁵⁶

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.

⁵³ 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.

⁵⁴ 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.

⁵⁵ 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.

⁵⁶ 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.

Several commenters expressed a belief that the costs described here underestimate the remediation costs public entities will face. One trade association suggested that public entities may have to pay for expensive training materials for information technology staff to become familiar with accessibility practices in web development. However, several web accessibility professionals commented to confirm the existence of free or low-cost training materials to easily prepare web development staff to produce content compliant with WCAG 2.1 Level AA. The Department agrees that free and low-cost training materials are available which would help web developers to produce content compliant with WCAG 2.1 Level AA.

The same trade association questioned the methodology used to estimate remediation costs, suggesting that rather than sample public entities' websites and estimate the burden to remediate them from an audit of their accessibility errors, the Department should premise its cost estimates on the experience of federal agencies that have undergone the type of accessibility audit called for by this rule. Comprehensive data on website testing and remediation costs incurred by federal agencies is neither available nor directly applicable to State and local government entities, whose web presence and available resources differ significantly from those of federal agencies. The average per-issue remediation times used in the Department's estimates, however, are drawn from the extensive experience of the web accessibility professionals who contributed to this analysis. Thus, the Department believes its analysis more appropriately captures the costs of this rule.

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.^{57, 58} 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. 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.⁵⁹ 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

⁵⁷ 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.

⁵⁸ 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.

⁵⁹ 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.

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,⁶⁰ NVDA Screen Reader,⁶¹ and SortSite. The page was inspected manually, including reading the text and inspecting source code, and any identified issues were recorded. 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.

⁶⁰ WAVE. (2022). *WAVE Web Accessibility Evaluation Tools*. Retrieved from <https://wave.webaim.org/>.

⁶¹ NV Access. (2022). *Download NVDA*. Retrieved from <https://www.nvaccess.org/download/>.

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. One public entity endorsed the use of the NVDA screen reader in manual accessibility evaluations, lending support to this methodology.

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	\$3,068,935	\$156.5
County (small)	2,105	\$18,676	\$39.3
County (large)	926	\$518,916	\$480.5
Municipality (small)	18,729	\$74,634	\$1,397.8
Municipality (large)	766	\$440,605	\$337.5
Township (small)	16,097	\$60,376	\$971.9
Township (large)	156	\$127,666	\$19.9
Special district	38,542	\$7,109	\$274.0
U.S. territory (small)	2	\$348,530	\$0.7
U.S. territory (large)	3	\$1,107,845	\$3.3
School district (small)	11,443	\$78,859	\$902.4
School district (large)	779	\$600,073	\$467.5
Public university	744	\$540,731	\$402.3
Community college	1,146	\$467,896	\$536.2
Total	91,489	\$65,470	\$5,989.8

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,⁶² FOXIT,⁶³ and Adobe Acrobat Professional.⁶⁴ 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,⁶⁵ 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 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.

To do so, the Department first estimated the average page count and share of PDFs on government websites that are likely to be remediated as a result of the rule using a subsample of websites. 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 identify the PDFs

⁶² Available at: CommonLook. (2023). *CommonLook PDF*. Retrieved from <https://commonlook.com/accessibility-software/pdf/>.

⁶³ Available at: FOXIT. (2023) *Foxit PDF Editor*. Retrieved from <https://www.foxit.com/pdf-editor/>.

⁶⁴ Available at: Adobe. (2023). *Adobe Acrobat Plans & Pricing*. Retrieved from <https://www.adobe.com/acrobat/pricing.html>.

⁶⁵ See WebAIM. (2019). *PDF Accessibility*. Retrieved from <https://webaim.org/techniques/acrobat/>.

hosted on each. The Department used R⁶⁶ to determine the page count and date of last modification for each PDF found. The 43,502 PDFs on the 28 sampled government websites had a median page count of three pages.⁶⁷ 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 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. 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

⁶⁶ 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>.

⁶⁷ 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.

large variation in complexity of content between different documents.⁶⁸ These difficulties are compounded by the wide ranges in file origins, types and density of errors, and methods of 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.

One commenter who self-identified as a professional PDF remediation specialist asserted that this time estimate is too low. They said that six minutes is the minimum end of the range and depending on complexity could take up to one hour per page for remediation. They asserted that their personal average is 20 to 25 minutes per page. Several other commenters concurred that six minutes is too low an estimate to capture the amount of time needed to remediate particularly complex pages. The Department emphasizes that its experts identified six minutes as the average time needed to remediate one page of an inaccessible PDF. Implicit in this average is the recognition that some pages may take significantly longer than six minutes to remediate, while many will take less. Pages that are part of an inaccessible document but do not themselves require remediation are also included in this average. Thus, the Department believes its assessment represents an appropriate average, while recognizing that some pages may indeed take much longer or shorter than this average. The costs incurred to remediate preexisting PDFs scale linearly with the average time needed to remediate one page of an inaccessible PDF. For

⁶⁸ 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>.

instance, assuming an average of 10 minutes instead of six minutes per page would increase PDF remediation time costs by 66.7 percent, or total 10-year costs of the rule by 1.2 percent.

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 since 2012) = 15.3 minutes per PDF.⁶⁹ 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 for SortSite accessibility testing in Section 3.3.2, and extrapolating to all State and local governments. The 2022 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.⁷⁰ 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.

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.

⁶⁹ 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 rule.

⁷⁰ OEWS data available at: U.S. Bureau of Labor Statistics. (2023, April 27). *May 2022 National Occupational Employment and Wage Estimates United States*. Retrieved from https://www.bls.gov/oes/current/oes_nat.htm#15-0000.

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	\$25,418.1	\$25,430.3	17797
County (small)	\$504.9	\$17,131.7	\$17,636.7	291
County (large)	\$222.1	\$48,960.7	\$49,182.8	1888
Municipality (small)	\$4,492.7	\$119,984.0	\$124,476.7	229
Municipality (large)	\$183.7	\$49,708.7	\$49,892.5	2317
Township (small)	\$3,861.3	\$94,966.0	\$98,827.4	211
Township (large)	\$37.4	\$2,272.6	\$2,310.0	520
Special district	\$9,245.5	\$5,027.5	\$14,273.0	5
U.S. territory (small)	\$0.5	\$409.3	\$409.7	7307
U.S. territory (large)	\$0.7	\$812.1	\$812.8	9666
School district (small)	\$2,744.9	\$58,778.2	\$61,523.1	183
School district (large)	\$186.9	\$26,577.8	\$26,764.6	1218
Public university [a]	\$178.5	\$29,472.9	\$29,651.4	1415
Community college [a]	\$274.9	\$33,988.8	\$34,263.7	1059
Total	\$21,946.4	\$513,508.3	\$535,454.7	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	\$498,393	\$498,633
County (small)	2,105	\$240	\$8,139	\$8,378
County (large)	926	\$240	\$52,873	\$53,113
Municipality (small)	18,729	\$240	\$6,406	\$6,646
Municipality (large)	766	\$240	\$64,894	\$65,134
Township (small)	16,097	\$240	\$5,900	\$6,139
Township (large)	156	\$240	\$14,568	\$14,808
Special district	38,542	\$240	\$130	\$370
U.S. territory (small)	2	\$240	\$204,629	\$204,869
U.S. territory (large)	3	\$240	\$270,692	\$270,932
School district (small)	11,443	\$240	\$5,137	\$5,376
School district (large)	779	\$240	\$34,118	\$34,358
Public university [a]	744	\$240	\$39,614	\$39,854
Community college [a]	1,146	\$240	\$29,659	\$29,899
Total	91,489	\$240	\$5,613	\$5,853

[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.

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.⁷¹ 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 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

⁷¹ 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.

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.^{72, 73} 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 \$9.0 million. The ratio of these costs to website remediation costs is 4.3 percent. This ratio represents the estimated mean percentage increase in website costs when 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 underestimate the total cost burden associated with captioning in the event

⁷² 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/>.

⁷³ 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.

that secondary websites host audio or video content at a greater rate than an entity’s main website. However, the effect of this possible discrepancy on costs is likely to be minor. If secondary websites were to host on average 100 percent more covered audio or video content than indicated by the main sites in the above methodology, captioning costs would increase by 54 percent, and total costs of the rule over 10 years would increase by 0.47 percent.

Several commenters disputed the captioning costs estimated in the PRIA. In particular, the Small Business Administration’s Office of Advocacy (“Advocacy”) comment cited reports from small entities claiming that the Department’s analysis underestimates the quantity of video content that would need to be captioned under the rule. The Department acknowledges that as these estimates are an average, some entities will likely face greater costs than described here. 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. Further, several commenters suggested that \$15 per minute of video is more costly than most entities incur for captioning services. These 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 are a one-time burden that will be incurred over the course of the rule's implementation period. Testing costs incurred after the 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. Public comments on estimated testing costs are discussed below.

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):⁷⁴

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
ACHECKS [d]	\$2,988	per license per year
Average cost per entity with at least one website	\$972	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.achecks.org/pricing/>

ACHECKS (formerly Achecker) offers their services as a monthly subscription. 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. It was assumed that each entity with at least one website would 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 (\$972) by the number of entities in each cell with at least one website. Software costs are shown in Table 32.

3.3.7.2 Testing time

In addition to using an automated accessibility checker, the Department assumed that

⁷⁴ Versions of each of these checkers have been examined in the literature; see Vigo, Brown, and Conway (2013) and Abduganiev (2017).

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. Based on the experience of its digital accessibility experts in performing manual and automated web accessibility assessments, 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.

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	\$49.5	\$31,303.1	\$31,352.7	\$614.8
County (small)	\$1,661.5	\$7,862.6	\$9,524.1	\$4.5
County (large)	\$899.6	\$96,103.2	\$97,002.8	\$104.8
Municipality (small)	\$13,754.5	\$279,565.0	\$293,319.5	\$15.7
Municipality (large)	\$744.2	\$67,500.7	\$68,244.9	\$89.1
Township (small)	\$8,462.6	\$194,373.0	\$202,835.6	\$12.6
Township (large)	\$151.6	\$3,983.2	\$4,134.7	\$26.5
Special district	\$9,853.9	\$54,798.9	\$64,652.8	\$1.7
U.S. territory (small)	\$1.9	\$139.4	\$141.4	\$70.7
U.S. territory (large)	\$2.9	\$664.7	\$667.6	\$222.5
School district (small)	\$10,197.8	\$180,475.9	\$190,673.7	\$16.7
School district (large)	\$756.8	\$93,491.4	\$94,248.2	\$121.0
Public university	\$722.8	\$80,460.7	\$81,183.5	\$109.1
Community college	\$1,113.3	\$107,241.7	\$108,355.0	\$94.6
Total	\$48,373.0	\$1,197,963.5	\$1,246,336.5	\$13.6

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

One public entity and an accessibility services vendor each commented with an estimate that manual evaluation of a single webpage can cost an average of \$200 to \$350. The vendor further commented that the compliance standard set by W3C for WCAG 2.1 Level AA requires thorough manual testing of every webpage, which would lead to prohibitive testing costs for public entities with large web presences. The Department believes, however, that in

contemporary website architecture, many webpages share elements that are populated procedurally from a CMS. Many of these repeated elements can be manually assessed for accessibility issues on just one page, dramatically reducing the burden of manually testing redundant features. The Department believes that the efficiencies achieved through collectively evaluating these shared elements will reduce vendors' overall per-page testing costs.

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.⁷⁵

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 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 between three and ten times faster than retrofitting a fully launched site for web accessibility.⁷⁶ Given the estimate

⁷⁵ 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.

⁷⁶ Level Access. (2022). The Road to Digital Accessibility. The Department has a local copy of this resource, as it was taken offline.

that new web content is between three and ten 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.⁷⁷ For a discussion of public comments received regarding costs for training employees, see Section 3.3.3.

Table 33 displays the undiscounted annual O&M costs for each government type. The total annual cost across all governments is estimated to be \$817.8 million. O&M costs are 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 rule, and small governments would incur these full O&M costs beginning in Year 4. One public entity commented that covered entities will face increased storage needs as a consequence of the rule. O&M costs include a variety of miscellaneous ongoing costs not discussed in greater detail, including increased digital storage

⁷⁷ 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.

costs, so the Department believes these costs are captured here.

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	\$431.5	\$22,007.7
County (small)	2,105	\$3.4	\$7,104.4
County (large)	926	\$70.0	\$64,842.5
Municipality (small)	18,729	\$10.2	\$190,229.5
Municipality (large)	766	\$61.5	\$47,103.6
Township (small)	16,097	\$8.3	\$134,153.0
Township (large)	156	\$17.6	\$2,740.1
Special district	38,542	\$1.1	\$43,803.5
U.S. territory (small)	2	\$64.0	\$128.0
U.S. territory (large)	3	\$165.0	\$495.0
School district (small)	11,443	\$10.6	\$120,781.3
School district (large)	779	\$78.2	\$60,945.8
Public university	744	\$71.4	\$53,128.9
Community college	1,146	\$61.4	\$70,320.2
Total	91,489	\$8.9	\$817,783.3

[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	\$110.0	\$323.7	\$235.1	\$13.6	\$2.5	\$304.3	\$265.2
Year 2	\$121.0	\$356.1	\$258.6	\$15.0	\$2.7	\$334.7	\$291.8
Year 3	\$22.0	\$64.8	\$47.1	\$2.7	\$0.5	\$60.9	\$53.1
Year 4	\$22.0	\$64.8	\$47.1	\$2.7	\$0.5	\$60.9	\$53.1
Year 5	\$22.0	\$64.8	\$47.1	\$2.7	\$0.5	\$60.9	\$53.1
Year 6	\$22.0	\$64.8	\$47.1	\$2.7	\$0.5	\$60.9	\$53.1
Year 7	\$22.0	\$64.8	\$47.1	\$2.7	\$0.5	\$60.9	\$53.1
Year 8	\$22.0	\$64.8	\$47.1	\$2.7	\$0.5	\$60.9	\$53.1
Year 9	\$22.0	\$64.8	\$47.1	\$2.7	\$0.5	\$60.9	\$53.1
Year 10	\$22.0	\$64.8	\$47.1	\$2.7	\$0.5	\$60.9	\$53.1
PV of 10-year costs, 3% discount rate	\$366.5	\$1,078.9	\$783.7	\$45.5	\$8.2	\$1,014.2	\$884.0
Average annualized costs, 3% rate	\$43.0	\$126.5	\$91.9	\$5.3	\$1.0	\$118.9	\$103.6
Total costs per entity, 3% discount rate	\$7.2	\$1.2	\$1.0	\$0.3	\$2.7	\$1.3	\$1.2
Annualized costs per entity, 3% rate	\$0.8	\$0.1	\$0.1	\$0.0	\$0.3	\$0.2	\$0.1
PV of 10-year costs, 7% discount rate	\$323.3	\$951.7	\$691.2	\$40.1	\$7.3	\$894.6	\$779.8
Average annualized costs, 7% rate	\$46.0	\$135.5	\$98.4	\$5.7	\$1.0	\$127.4	\$111.0
Total costs per entity, 7% discount rate	\$6.3	\$1.0	\$0.9	\$0.3	\$2.4	\$1.1	\$1.0
Annualized costs per entity, 7% rate	\$0.9	\$0.1	\$0.1	\$0.0	\$0.3	\$0.2	\$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	\$121.6	\$22.7	\$625.2	\$438.4	\$0.4	\$397.8	\$350.9
Year 2	\$136.2	\$25.1	\$688.6	\$483.1	\$0.5	\$438.0	\$386.1
Year 3	\$150.8	\$27.5	\$752.0	\$527.8	\$0.5	\$478.3	\$70.3
Year 4	\$43.8	\$7.1	\$190.2	\$134.2	\$0.1	\$120.8	\$70.3
Year 5	\$43.8	\$7.1	\$190.2	\$134.2	\$0.1	\$120.8	\$70.3
Year 6	\$43.8	\$7.1	\$190.2	\$134.2	\$0.1	\$120.8	\$70.3
Year 7	\$43.8	\$7.1	\$190.2	\$134.2	\$0.1	\$120.8	\$70.3
Year 8	\$43.8	\$7.1	\$190.2	\$134.2	\$0.1	\$120.8	\$70.3
Year 9	\$43.8	\$7.1	\$190.2	\$134.2	\$0.1	\$120.8	\$70.3
Year 10	\$43.8	\$7.1	\$190.2	\$134.2	\$0.1	\$120.8	\$70.3
PV of 10-year costs, 3% discount rate	\$634.1	\$111.3	\$3,028.9	\$2,129.0	\$2.1	\$1,925.4	\$1,169.9
Average annualized costs, 3% rate	\$74.3	\$13.1	\$355.1	\$249.6	\$0.2	\$225.7	\$137.1
Total costs per entity, 3% discount rate	\$0.0	\$0.1	\$0.2	\$0.1	\$1.0	\$0.2	\$1.0
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	\$548.3	\$96.8	\$2,636.5	\$1,852.8	\$1.8	\$1,676.1	\$1,031.9
Average annualized costs, 7% rate	\$78.1	\$13.8	\$375.4	\$263.8	\$0.3	\$238.6	\$146.9
Total costs per entity, 7% discount rate	\$0.0	\$0.0	\$0.1	\$0.1	\$0.9	\$0.1	\$0.9
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	\$3,211.3
Year 2	\$3,537.5
Year 3	\$2,258.5
Year 4	\$817.8
Year 5	\$817.8
Year 6	\$817.8
Year 7	\$817.8
Year 8	\$817.8
Year 9	\$817.8
Year 10	\$817.8
PV of 10-year costs, 3% discount rate	\$13,181.7
Average annualized costs, 3% discount rate	\$1,545.3
PV of 10-year costs, 7% discount rate	\$11,532.2
Average annualized costs, 7% discount rate	\$1,641.9

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

Mobile apps offer convenient access to State and local government services, programs, and activities. According to U.S. Census Bureau data released in 2022, smartphones and tablet devices were present in 91 percent and 64 percent of U.S. households in 2020, respectively.⁷⁸ 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.⁷⁹ 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

⁷⁸ U.S. Census Bureau. "Types of Computers and Internet Subscriptions." American Community Survey, ACS 1-Year Estimates Subject Tables, Table S2801, 2022. Accessed on November 15, 2023.

⁷⁹ 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.⁸⁰ Despite the current sparseness in literature, scientific interest in the topic of accessibility in mobile apps appears to be growing. Between 2016 and 2020, scientific production about accessibility in mobile apps experienced a major uptick.⁸¹ The Department expects that these resources will continue to grow as a result of this rulemaking and a resulting greater demand for mobile app accessibility resources. The Department received a public comment purporting that the Department underestimates costs associated with testing and remediation of mobile apps for compliance with WCAG 2.1 Level AA. The commentor, however, did not suggest alternative existing and reliable data to more accurately estimate costs associated with testing and remediating mobile apps, and the Department has reviewed emerging literature and remains confident in its approach. Thus, methodological changes were not implemented in response to this comment.

3.4.1 Mobile app count

Under this rule, State and local government entity mobile apps used to offer services, programs, and activities to members of the public must adhere to WCAG 2.1 Level AA. Adherence to WCAG 2.1 is suggested by recent scientific findings as an appropriate standard to achieve an adequate level of accessibility.⁸² Mobile apps are less common compared to websites, web applications, and mobile websites.⁸³ Mobile apps are generally more costly to build and maintain than mobile websites.⁸⁴ To evaluate costs associated with mobile app compliance, a simple random sample of five entities was selected for each type of government.

⁸⁰ See *id.*

⁸¹ Acosta-Vargas, P. (2021). *Accessibility in Native Mobile Applications for Users with Disabilities: A Scoping Review*. Retrieved from <https://www.mdpi.com/2076-3417/11/12/5707>

⁸² *Id.*

⁸³ Ganapati, S. (2015). *Using Mobile Apps in Government*. Retrieved from <https://www.businessofgovernment.org/sites/default/files/Using%20Mobile%20Apps%20in%20Government.pdf>.

⁸⁴ *Id.*

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 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 by the assumption that all non-compliant material will be remediated, when in reality, some material will be archived, removed, or will fall under one of the exceptions. Further, the Department notes that it does not believe the costs to remediate third party apps to be substantial, as many of them use the same platform and host the same content (such as parking apps) which, when remediated, will effectively remediate multiple apps at once.

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 Play⁸⁵ and Apple App⁸⁶ 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.⁸⁷ If a SortSite inventory 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.”⁸⁸

Once a mobile app was identified as providing a service, program, or activity, the Department recorded key data points 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

⁸⁵ Google Play App Store: https://play.google.com/store/apps?hl=en_US&gl=US.

⁸⁶ Apple App Store: <https://www.apple.com/app-store/>.

⁸⁷ Online database of Apple Apps: <https://theappstore.org/>.

⁸⁸ 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.

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 per Entity by Government Type

Type of Government Entity	Population of less than 50,000	Population of 50,000 or more	Total
State	N/A	4.40	4.40
County	0.20	0.60	0.32
Municipality	0.00	1.00	0.04
Township	0.00	0.20	0.00
Special district	0.00	[a]	0.00
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 RIA, 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 of less than 50,000	Population of 50,000 or more	Total
State	N/A	224	224
County	421	556	977
Municipality	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 RIA, they are displayed as entities with populations less than 50,000.

3.4.2 Testing and remediation cost

As previously discussed, very little data are available on the level of accessibility of mobile apps or the cost to remediate them. Yan & Ramachandran (2019)⁸⁹ 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. 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.⁹⁰

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 Yan & Ramachandran (2019) used a self-designed checklist of accessibility pulling from all three sources (WCAG 1.0, WCAG 2.0, and WABScore).

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 used mobile app development cost data made public by the mobile app developer SPD Load in 2022⁹¹ to estimate an average mobile app development cost of \$112,350 (in 2022 dollars). This results in an average mobile app accessibility testing and modification cost of \$73,028 (65 percent of \$112,350). 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 on desired app functions.⁹² A sensitivity analysis based on total mobile app development costs is included in Section 3.9 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.⁹³ 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

⁹¹ 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/>.

⁹² Ganapati, S. (2015). *Using Mobile Apps in Government*. Retrieved from <https://www.businessofgovernment.org/sites/default/files/Using%20Mobile%20Apps%20in%20Government.pdf>.

⁹³ 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/>.

government entity types. Weights were applied by multiplying the estimated average cost of modifying a mobile app (\$73,028) 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 \$73,028 by 90 percent for an estimated cost of \$65,725. 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.

Equation 1: Mobile app modification cost adjustment

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

Table 39 shows the average costs associated with testing and modifying an existing mobile app to meet accessibility criteria in the 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 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 of less than 50,000	Population of 50,000 or more
State	N/A	\$65,318
County	\$63,511	\$54,012
Municipality	N/A	\$130,456
Township	N/A	\$44,538
Special district	N/A [a]	[a]
School district	\$73,028	\$65,987
U.S. territory	\$144,440	\$70,589
Public university	\$55,838 [a]	[a]
Community college	\$82,902 [a]	[a]
Total (special districts and higher education)	\$69,370	[a]
Total (all else)	\$93,660	\$71,817

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

Table 40: Initial Mobile App Costs (Millions)

Type of Government Entity	Population of less than 50,000	Population of 50,000 or more	Total
State	N/A	\$14.7	\$14.7
County	\$26.7	\$30.0	\$56.7
Municipality	\$0.0	\$99.9	\$99.9
Township	\$0.0	\$1.4	\$1.4
Special district	\$0.0 [a]	[a]	\$0.0
School district	\$334.3	\$72.0	\$406.2
U.S. territory	\$0.1	\$1.1	\$1.3
Public university	\$49.9 [a]	[a]	\$49.9
Community college	\$19.0 [a]	[a]	\$19.0
Total (special districts and higher education)	\$68.9	[a]	\$68.9
Total (all else)	\$361.1	\$219.1	\$580.2

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

Costs for the rule are expected to be incurred at different times for each type of government entity because of differences in implementation timelines. Government entities serving populations over 50,000 will have two years to implement the 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 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.

3.4.3 O&M costs

Additionally, the Department assumed that government entities will incur O&M costs associated with accessibility upkeep starting after the 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 believes that O&M costs associated with accessible mobile apps would be similar to but likely somewhat lower than O&M costs associated with inaccessible mobile apps due to a reduced need to modify GUIs (Graphical User Interfaces).⁹⁴ 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 costs⁹⁵ and estimate the annual cost of O&M for an average mobile app. The estimated average annual cost of O&M per mobile app (\$401.25) was multiplied by 10 percent to calculate expected additional O&M costs incurred as a result of compliance with the rule (\$40.13). The Department then multiplied expected additional O&M

⁹⁴ Yan, S., & Ramachandran, P. G. (2019). The Current Status of Accessibility in Mobile Apps. *ACM Transactions on Accessible Computing (TACCESS)*, 12, 1-31.

⁹⁵ 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/>.

costs per app by the total estimated number of mobile apps. Undiscounted costs of compliance with the 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	\$264.3
Year 2	\$264.3
Year 3	\$120.5
Year 4	\$0.4
Year 5	\$0.4
Year 6	\$0.4
Year 7	\$0.4
Year 8	\$0.4
Year 9	\$0.4
Year 10	\$0.4
PV of 10-year costs, 3% discount rate	\$618.1
Average annualized costs, 3% discount rate	\$72.5
PV of 10-year costs, 7% discount rate	\$577.9
Average annualized costs, 7% discount rate	\$82.3

3.5 POSTSECONDARY EDUCATION COURSE CONTENT REMEDIATION

3.5.1 Overview

The Department estimated public postsecondary institutions' public-facing websites, mobile apps, and password-protected course material separately. Section 3.3 estimates public-facing websites and Section 3.4 estimates mobile apps. Public-facing websites were assessed for current levels of compliance using SortSite. 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.

Initially, the Department considered an exception which would allow institutions to remediate courses on an upon-request basis. Under this exception, the Department estimated that institutions would have remediated virtually all classes within two years following

implementation of the rule. Many comments indicated that this approach would be difficult logistically and would delay accessible course materials for students. The Department thus removed the course content exceptions, for reasons further explained in the final rule. This decision was further supported by the finding that institutions would remediate virtually all classes within two years after implementation of the rule. In the final rule analysis, the Department estimates annualized costs for postsecondary institutions over ten years to be \$1.4 billion at a 3 percent discount rate or \$1.5 billion at a 7 percent discount rate, an increase of about \$300 million from the estimates in the proposed rule with the education exceptions. Though this increase is largely driven by the removal of the education exceptions, a substantial portion of this increase is due to updates in wage rate and inflation data. For a full discussion on how the removal of the password-protected course content exceptions affected the costs of the rule, please see Section 3.7.

The Department assumes that schools will remediate courses at a constant rate during the first two years of implementation, completing all remediation by the start of year three. The Department estimates there to be 1.8 million courses offered by public universities and 965 thousand courses offered by community colleges, meaning we estimate roughly 902 thousand public university courses and 483 thousand community college courses will be WCAG 2.1 AA compliant in year one, and the remaining will be WCAG 2.1 AA compliant in year two. It is possible that some of these courses conform to WCAG 2.1 AA. However, the Department has not seen evidence to support that. Further, even courses that fully conform will likely need review to confirm accessibility. Therefore, the assumption that every course will need some remediation may overestimate total costs, but the Department feels it is reasonable without more data. Finally, because baseline accessibility is implicitly defined and accounted for in course

remediation estimates, total course remediation costs will capture baseline compliance of courses.

Although the Department assumes that course remediation is primarily a one-time cost, the Department acknowledges that courses are updated with new materials from time to time. As such, 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, updating material, and the like.

3.5.2 Compliance Cost Estimates

Table 42 shows the assumptions, data, and methodology used to estimate course costs. A more thorough discussion of the Department's findings is 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
Total number of courses offered	1,803,277	965,097	Calculation
Courses Remediated in Year 1	901,638	482,549	Calculation
Cost per course	\$1,809	\$1,809	Farr et al. (2009), NCDAE
Year 1 course remediation cost (millions)	\$1,631.0	\$872.9	Calculation
Courses remediated in Year 2	901,638	482,549	Calculation
Year 2 course remediation cost (millions)	\$1,631.0	\$872.9	Calculation
Total costs to remediate all courses (millions)	\$3,262.0	\$1,745.8	Calculation
Mean cost per institution to remediate all courses (millions)	\$4.4	\$1.5	Calculation
Mean cost per student to remediate all courses	\$364.7	\$365.4	Calculation
Yearly operation and maintenance cost per course	\$271	\$271	Calculation
Total yearly operation and maintenance cost (millions)	\$652.4	\$349.2	Calculation
Mean annual operation and maintenance cost per institution	\$876,877	\$305,474	Calculation

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 (4):

Equation 2: Number of classes per semester

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

Total courses offered per institution was calculated using an assumption that half the classes offered in a semester are not offered in the following semester⁹⁶ (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 (Equation 2) by 1.5 to estimate total classes offered in a year. The Department acknowledges that this could result in an overestimate of the number of courses requiring remediation because some instructors teach multiple sections of the same class, but the Department does not believe this would substantially impact the analysis. 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 necessitates 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

⁹⁶ This assumption was based on best professional judgment of former educators but lacks formal evidence. This could lead to an overestimate or underestimate of costs should the true percentage be higher or lower.

Disability and Access to Education (“NCDAE”) GOALS Course Cost Case Study (2014)^{97, 98}, to estimate the cost to remediate a course to be \$1,809. Each of these studies presented ranges of cost estimates for “simple” and “complex” courses.⁹⁹ To generate an average class cost, the Department first adjusted the cost estimates to 2022 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 simple.¹⁰⁰

The Department then multiplied the remediation cost per course by total estimated courses across all public universities and community colleges to estimate the total cost to remediate all existing course content. The Department expects public institutions will incur half of this remediation cost per implementation year, and cost a total of \$5 billion over the course of the first two years. On a per-student basis, this is \$365 for both four-year and above institutions and community colleges.

Whereas the Department estimates public-facing website O&M costs to be 10 percent of total remediation costs (see Section 3.3.8), the Department assumes course content to have higher annual O&M costs of 15 percent of the initial remediation costs, amounting to \$271 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 O&M cost for course content than for general web content. Additionally, this

⁹⁷ 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>.

⁹⁸ Rowland, C., et al. (2014, December). *GOALS Cost Case Study: Cost of Web Accessibility in Higher Education*. 86.

⁹⁹ “Simple” courses are loosely defined as courses that mostly house images and documents.

¹⁰⁰ 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.

50 percent higher assumption accounts for developing new accessible courses. O&M costs begin in year two to maintain the classes which were remediated in year one. 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. The costs differ from the initial course remediation costs in the NPRM as the removal of the exception effectively moves the timeline forward two years, meaning an additional two years' worth of O&M costs are considered. This change does not, however, influence the amount of remediation the Department predicts, or the course remediation costs themselves.

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

Institution Type	Public University	Community College	Total
Year 1	\$1,631	\$873	\$2,504
Year 2	\$1,957	\$1,047	\$3,005
Year 3	\$652	\$349	\$1,002
Year 4	\$652	\$349	\$1,002
Year 5	\$652	\$349	\$1,002
Year 6	\$652	\$349	\$1,002
Year 7	\$652	\$349	\$1,002
Year 8	\$652	\$349	\$1,002
Year 9	\$652	\$349	\$1,002
Year 10	\$652	\$349	\$1,002
PV of 10-year costs, 3% discount rate	\$7,745	\$4,145	\$11,890
PV of 10-year costs, 7% discount rate	\$6,636	\$3,552	\$10,188
Annualized costs, 3% discount rate	\$908	\$486	\$1,394
Annualized costs, 7% discount rate	\$945	\$506	\$1,451

3.6 ELEMENTARY AND SECONDARY COURSE CONTENT REMEDIATION

Under this rule, password-protected course content (*e.g.*, content provided through third-party Learning Management Systems) in a public elementary or secondary school must be accessible beginning in year three for large entities and year four for small entities following

promulgation of the rule. 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 over ten years with a 3 percent discount rate for elementary and secondary education institutions are \$229 million. The Department did not receive significant comments on elementary and secondary course content remediation costs but did receive comments on the timeline and exception for content remediation. Based on these comments, the Department is removing the exception that content be remediated on an upon-request basis, for reasons further explained in the final rule. As with postsecondary costs, this does not change the number of courses needing remediation in the Department's modeling, but only shifts the remediation timelines.¹⁰¹ Overall, this change represents an increase of \$34 million annually at a 3 percent discount rate over ten years, partially due to changes in inflation and wage rates, and partially due to the removal of the password-protected course content exceptions. For a full discussion on how the removal of these exceptions affects costs, please see Section 3.7.

To estimate costs, the Department began by estimating the number of schools with an LMS. 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. The Department then used the average number of LMS courses per grade to calculate the total number of LMS courses that must be remediated. Best available estimates suggest 66 percent of all schools (public and private) have

¹⁰¹ The Department acknowledges that in some instances the exceptions in the proposed rule could have led to some courses being remediated multiple times, which is not the case in the final rule. This means that there may be fewer remediation efforts needed in the final rule than the proposed rule. However, the Department believes that the extent to which this would have occurred is minimal, and the effect on costs is *de minimis*.

an LMS.¹⁰²,¹⁰³ Therefore, the Department multiplied the number of schools by 66 percent to estimate the number of schools with an LMS by grade. The Department assumed that this number will not change significantly in the next 10 years in the presence or absence of this rule.¹⁰⁴ 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.

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 LMS courses per grade level was based on best professional judgment by former educators but lacks formal evidence. The number of unique courses is lower for earlier grade levels¹⁰⁵ 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 12.¹⁰⁶ The Department then used the average number of LMS courses per grade to calculate the total number of LMS courses that must be remediated.

¹⁰² 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>.

¹⁰³ This estimate does not disaggregate by grade level, which could underestimate costs if higher grade levels are more likely to have LMSs than lower grade levels.

¹⁰⁴ 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 course remediation costs.

¹⁰⁵ 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.

¹⁰⁶ 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_ftable06_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	\$195	\$6.7
1	52,662	34,757	1	34,757	\$195	\$6.8
2	52,730	34,802	1	34,802	\$195	\$6.8
3	52,661	34,756	1	34,756	\$195	\$6.8
4	52,363	34,560	1	34,560	\$195	\$6.7
5	50,903	33,596	7	235,172	\$390	\$91.8
6	35,032	23,121	7	161,848	\$390	\$63.2
7	29,962	19,775	7	138,424	\$390	\$54.0
8	30,161	19,906	7	139,344	\$390	\$54.4
9	23,843	15,736	14	220,309	\$1,065	\$234.6
10	24,200	15,972	14	223,608	\$1,065	\$238.1
11	24,322	16,053	14	224,735	\$1,065	\$239.3
12	24,304	16,041	14	224,569	\$1,065	\$239.1
Total	N/A	N/A	N/A	N/A	N/A	\$1,248

[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 estimates from Farr et al. (2009) and the NCDAE GOALS Course Case Study.^{107, 108} 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 to estimate a high school course remediation cost of \$532 per semester, or \$1,065 per year.

¹⁰⁷ 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>.

¹⁰⁸ Rowland, C., et al., (2014, December). *GOALS Cost Case Study: Cost of Web Accessibility in Higher Education*. 86.

The Department made different assumptions to estimate course remediation costs for elementary and middle school courses. Research suggests that 8- to 12-year-olds spend 22 minutes on course work outside of class for every hour that teenagers spend.¹⁰⁹ Accordingly, the Department estimates that a 5th through 8th grade year-long course would cost \$390 to remediate (22 divided by 60, multiplied by \$1,065). 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 \$195 per year-long course (half of \$390). These figures are shown above in Table 44. 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 course remediation costs of \$1.2 billion.

Table 45 presents the costs incurred in the 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.¹¹⁰ The Department assumes existing course remediation costs will be incurred evenly over two years for large entities and three years for small entities, with O&M costs scaling up associated with the number of courses remediated in the year(s) prior.

The NCES public school data does not indicate whether the school is part of a small or large school district. Therefore, to allocate the costs to small and large school districts, the Department calculated the proportion of small and large entities among independent school

¹⁰⁹ Rideout, V., & Robb, M. B. (2019). *The Common Sense Census: Media Use by Tweens and Teens*. San Francisco: Common Sense Media.

¹¹⁰ 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.

districts (ISDs), which represent a large majority of all public school students and all public school districts in the U.S.¹¹¹ Within ISDs, the Department determined that 52.7 percent of students attend large school districts, and 47.3 percent of students attend small 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.

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	\$197	\$329	\$525
Year 2	\$197	\$329	\$525
Year 3	\$197	\$66	\$262
Year 4	\$59	\$66	\$125
Year 5	\$59	\$66	\$125
Year 6	\$59	\$66	\$125
Year 7	\$59	\$66	\$125
Year 8	\$59	\$66	\$125
Year 9	\$59	\$66	\$125
Year 10	\$59	\$66	\$125
PV of 10-year costs, 3% discount rate	\$892	\$1,065	\$1,957
PV of 10-year costs, 7% discount rate	\$775	\$938	\$1,713
Annualized costs, 3% discount rate	\$105	\$125	\$229
Annualized costs, 7% discount rate	\$110	\$134	\$244

In general, four types of governments 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 in Table 45 to estimate the cost per type of government entity.

¹¹¹ The 2017 Census of Governments shows that students enrolled in ISDs make up over 80 percent of all elementary and secondary public school enrollees, and the number of ISDs accounts for over 90 percent of all public school districts.

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 COST COMPARISON WITH AND WITHOUT THE PASSWORD-PROTECTED COURSE CONTENT EXCEPTIONS

To fully understand the impact of the Department’s removal of the course content exceptions on costs, the Department developed cost estimates for the rule with and without course content exceptions. A comparison between the annualized cost of the rule as published in August of 2023, the updated estimated costs with the exceptions, and the updated estimated costs without the exceptions, can be found in Table 47. The difference in estimated annualized cost between the rule with the password-protected course content exceptions and the rule without the password-protected course content exceptions is approximately \$236 million with a 3 percent discount rate, representing an increase of 7.6 percent in costs. The costs increase 8.8 percent between the rule as originally published to the rule with updated costs with exceptions, with the difference stemming primarily from significant inflation of 7.0 percent, as measured by the 2022 increase in the Implicit Price Deflator for Gross Domestic Product. The Department also updated its estimate of wages to 2022 values using OEWS, which showed wages increased 11 percent from the estimate used in the originally published rule.¹¹² Thus, total costs for the final rule and the rule as initially published—reflecting the lack of course content exceptions as well as inflation and other factors unrelated to these exceptions—differ by 17.0 percent. However, as

¹¹² The Department notes that in some instances cost increases are from updating numbers based on inflation (such as postsecondary education costs) and in other instances cost increases are from updated wage rates (such as website testing and remediation), depending on methodology.

we will discuss below, the difference in costs between the rule with and without course content exceptions is largely an artifact of the time horizon considered, and not the substance of the costs themselves. It is also noteworthy that although costs increase without the exceptions, net benefits are also expected to increase, as the benefits of the rule would be realized sooner.

Table 47: Comparison of Cost Scenarios (Millions)

Scenario	Annualized Cost	Percent Increase from Original Rule	Percent Increase from Costs with Exceptions
Original Rule	\$2,846.6	N/A	N/A
Updated Costs with Exceptions	\$3,095.7	8.8%	N/A
Updated Costs without Exceptions	\$3,331.3	17.0%	7.6%

With the password-protected course content exceptions in the rule, the Department estimated costs using a probabilistic calculation that estimated the rate at which schools would need to remediate their courses. Applying this rate, the Department found that nearly all courses would be remediated within two years after implementation (years three and four). This finding is significant because it is the same number of years large entities would have to implement the rule, meaning that with or without the exceptions, all courses would be remediated over the span of two years. The primary difference between these two scenarios is in which two years the remediation occurs (e.g., years one and two or years three and four).¹¹³ The difference in costs therefore stems from the fact that there are two extra years of O&M costs in the ten-year time horizon for the rule without the exceptions as opposed to the rule with the exceptions. With the

¹¹³ A secondary, less impactful difference is that using a probabilistic rate of remediation, closer to 70 percent of courses remediated in the first year are eligible for remediation, whereas without the exceptions, the Department assumes courses are remediated at an even rate of 50 percent per year.

exceptions, the Department assumes a cost of \$0 in the first two years because the Department believes that entities will not incur costs earlier than they must.¹¹⁴

Because the number of courses requiring remediation is the same with and without the exceptions, and yearly O&M costs are the same with and without the exceptions, differences in annualized costs are largely a function of the time horizon. In both cases, as more years are added to the time horizon, annualized costs will decrease, converging over time to be equal to O&M costs. This also means that the difference between the annualized costs of the rule with and without the exceptions decreases the more years are considered. As a practical example, the Department evaluated annualized rule costs over a 20- and 50-year timeline. Over 20 years, the annualized difference in cost between the rule with and without the exceptions is \$135 million, and over 50 years, it is \$78 million, representing increases of only 4.9 and 3.2 percent respectively from the rule without the exceptions using a 3 percent discount rate (Table 48).

Table 48: Comparison of Costs with Different Time Horizons

Time Horizon	With Exceptions	Without Exceptions	Annualized Cost Difference	Percent Increase
Annualized 10-year cost	\$3,095.7	\$3,331.3	\$235.6	7.6%
Annualized 20-year cost	\$2,624.1	\$2,759.2	\$135.1	4.9%
Annualized 50-year cost	\$2,356.8	\$2,434.9	\$78.1	3.2%

These findings demonstrate that the difference in costs between the rule with and without the exceptions for course content is driven by when entities incur costs more than the actual

¹¹⁴ The Department notes that since educational institutions have existing obligations to make their courses accessible upon request, as described further in the preamble to the final rule, entities' current costs for accessibility remediation are likely greater than zero. But the Department assumes a cost of \$0 here for purposes of estimating the impact of this rule.

material being remediated. While the rule is more costly without the exceptions, the amount of extra cost steadily decreases over time.

Also of import is that benefits will increase with costs because as remediation costs are incurred, so too are benefits realized. Because annualized benefits are greater than annualized costs, we expect that net benefits will increase over time. As compared to average annualized net benefits of \$6,469.7 million in the originally published rule in August 2023, average annualized net benefits without the exceptions are estimated to be \$7,728.3 million in the final rule, representing an increase in net benefits of roughly 19.5 percent between the original estimate and the current estimate of net benefits. Although the Department has not calculated net benefits for the rule with the exceptions using 2022 values and updated disability prevalences, the Department expects that net benefits without the exceptions would be greater than net benefits with the exceptions over the life of the rule. This is because the earlier costs are incurred, the earlier benefits of accessibility are realized, and because benefits for educational attainment accumulate additively whereas all other benefits and costs plateau after all content is remediated.¹¹⁵ Educational attainment benefits increase every year that a new cohort graduates school and receives higher pay than they would have otherwise. Because this is the case, total benefits, and therefore net benefits, increase over time. For this reason, the Department expects net benefits to be higher without the exceptions than with the exceptions.

The Department recognizes that the removal of the exceptions and the associated methodological changes associated with it may lead to efficiencies in how entities remediate their course content. With the previous course content exceptions, remediation would happen on

¹¹⁵ Costs plateau at yearly O&M costs after all content is remediated and benefits other than educational attainment plateau once all time savings are fully realized. This means benefits increase over time relative to costs.

an upon request basis, and materials would need to be remediated within five business days if the public educational institution was on notice after the start of the term that there was a need for accessible content. The Department received many comments asserting that this timeline is problematic and too short for public entities to comply, while simultaneously being too long to avoid students with disabilities falling behind. Further, because courses would largely be remediated independently of each other (that is, courses would be remediated on different timelines, with little ability to plan remediation activities ahead of time), there would be limited opportunities for collaboration in remediation efforts. In contrast, when expectations are clearly defined ahead of time, entities may be able to create synergies between departments and instructors that allow them to benefit from economies of scale. The Department believes that this will likely be the case, and that entities will be able to remediate content more efficiently under the final rule than under the proposed rule containing course content exceptions.

Finally, the Department notes that the studies from which the course remediation cost estimates are derived are likely better suited to estimate costs under the current rule than the rule as proposed with course content exceptions included. The studies which estimated course remediation costs did not have the same time constraints as would have been imposed on the entities under the rule with the course content exceptions (five days in some circumstances). The constraints that would have been associated with the course content exceptions might have led to increased costs, as they would not have allowed for proper planning or coordination between relevant parties, and may have led to surcharges for rushed accessibility remediation of course content.

Upon its assessment of the rule's costs with and without the exceptions for course content, the Department concludes that the removal of the exceptions has minimal impact on costs, the

magnitude of which depends on the time horizon evaluated. The Department also notes that despite increases in costs without the exceptions, net benefits increase when compared to the rule with the course content exceptions. Finally, the Department believes that entities will be able to create efficiencies from remediation planning and collaboration that they would not be able to do with the course content exceptions included, which may lead to decreased costs. For instance, if all courses in a university use the same template for their course home pages, changing several lines of code in a style sheet to increase color contrast costs the same for 1,000 courses as it does for one course. Similarly, adding ARIA landmarks (to improve navigation by screen-reader users) to educational content published by a commercial publisher costs the same for 100 courses in an institution as it does for one course--and if this improvement is contributed back to the publisher's source code, it could save costs for all educational institutions using that publishers' content. Likewise, an accessibility improvement such as fixing the code for the button used to submit assignments in an LMS can have substantial economies of scale within a “once and done” institution-wide accessibility approach, and similarly for any institutions using that LMS.

3.8 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.¹¹⁶ Under this rule, such third-party websites and mobile apps must generally be made accessible in accordance with WCAG 2.1 Level AA. This section presents estimates 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

¹¹⁶ Please note that the final rule refers to third-party mobile apps as “external mobile apps.” The final rule describes external mobile apps as apps that are developed, owned, and operated by third parties, such as private companies, to allow the public to access the public entity’s services, programs, or activities.

because the Department was unable to find data or literature on the number of, and cost to remediate, third-party mobile apps used to provide government services.

These estimates 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 entity 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, though in many cases it is likely that the majority of the costs would be primarily incurred by individual third-party vendors. The Department also recognizes that in some circumstances a third-party vendor may be unwilling to make their content adhere to WCAG 2.1 Level AA. In these circumstances the Department assumes that other vendors will offer accessible content to fill demand for those services.

To estimate costs incurred from third-party website and mobile app compliance, the Department used a convenience sub-sample of the sample of government entities discussed in Section 3.3. This sub-sample includes 106 government entities (out of the 227 total government entities sampled) 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. This method of counting websites assumes that each third-party website uniquely serves only one government entity. This will overestimate 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 collect city fines. In this example, although the count of third-party websites in the sample treats a given city as the sole user of a third-party website, in reality, several cities could 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 the 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. The Department did consider that many third-party websites may be generated from the same CMS or other web template, which, when remediated, could account for many websites, but did not account for this in its methodology so as to not underestimate costs. The Department believes this is the most appropriate way to estimate these costs given the wide uncertainty regarding the number of third-party websites used by government entities.

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 Level 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 estimate of WCAG 2.1 Level 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 Level AA (shown in Table 49 and Table 50).

In aggregate, there are estimated to be 0.04 third-party websites for every government website. If all costs are passed along to governments, governments will incur additional costs for remediating third-party websites equivalent to about 4 percent of the costs to test and remediate their own websites. The PV of total 10-year costs incurred from third-party website compliance is estimated to be \$740.7 million at a discount rate of 3 percent and \$648.2 at a discount rate of 7 percent. The Department is also interested in how costs would change if the assumption that each website is shared by 25 government entities were varied. The Department found that if each website were shared by 50 entities, total 10-year costs would be \$370.4 million at a 3 percent discount rate, and if each website were shared by 10 governments, total 10-year costs would be \$1,852 million at a 3 percent discount rate. Although these changes are significant, they still represent a small percent of total costs of the rule (between 1.3 percent and 6.5 percent). Total costs from third-party website compliance are presented in Table 51.

Table 49: 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	\$3.2	\$13.6	\$14.3	\$0.5	\$0.0	\$23.5	\$17.5
Year 2	\$3.5	\$15.0	\$15.7	\$0.6	\$0.0	\$25.8	\$19.3
Year 3	\$0.6	\$2.7	\$2.9	\$0.1	\$0.0	\$4.7	\$3.5
Year 4	\$0.6	\$2.7	\$2.9	\$0.1	\$0.0	\$4.7	\$3.5
Year 5	\$0.6	\$2.7	\$2.9	\$0.1	\$0.0	\$4.7	\$3.5
Year 6	\$0.6	\$2.7	\$2.9	\$0.1	\$0.0	\$4.7	\$3.5
Year 7	\$0.6	\$2.7	\$2.9	\$0.1	\$0.0	\$4.7	\$3.5
Year 8	\$0.6	\$2.7	\$2.9	\$0.1	\$0.0	\$4.7	\$3.5
Year 9	\$0.6	\$2.7	\$2.9	\$0.1	\$0.0	\$4.7	\$3.5
Year 10	\$0.6	\$2.7	\$2.9	\$0.1	\$0.0	\$4.7	\$3.5
PV of 10-year costs, 3% discount rate	\$10.50	\$45.31	\$47.53	\$1.73	\$0.02	\$78.30	\$58.37
Annualized costs, 3% discount rate	\$1.23	\$5.31	\$5.57	\$0.20	\$0.00	\$9.18	\$6.84
Total costs per entity, 3% discount rate	\$0.21	\$0.05	\$0.06	\$0.01	\$0.01	\$0.10	\$0.08
Annualized costs per entity, 3% discount rate	\$0.02	\$0.01	\$0.01	\$0.00	\$0.00	\$0.01	\$0.01
PV of 10-year costs, 7% discount rate	\$9.26	\$39.97	\$41.92	\$1.52	\$0.01	\$69.07	\$51.49
Annualized costs, 7% discount rate	\$1.32	\$5.69	\$5.97	\$0.22	\$0.00	\$9.83	\$7.33
Total costs per entity, 7% discount rate	\$0.18	\$0.04	\$0.05	\$0.01	\$0.00	\$0.09	\$0.07
Annualized costs per entity, 7% discount rate	\$0.03	\$0.01	\$0.01	\$0.00	\$0.00	\$0.01	\$0.01

Table 50: 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	\$5.8	\$2.5	\$34.6	\$25.5	\$0.0	\$18.1	\$23.2
Year 2	\$6.5	\$2.7	\$38.1	\$28.1	\$0.0	\$19.9	\$25.5
Year 3	\$7.2	\$3.0	\$41.7	\$30.7	\$0.0	\$21.7	\$4.6
Year 4	\$2.1	\$0.8	\$10.5	\$7.8	\$0.0	\$5.5	\$4.6
Year 5	\$2.1	\$0.8	\$10.5	\$7.8	\$0.0	\$5.5	\$4.6
Year 6	\$2.1	\$0.8	\$10.5	\$7.8	\$0.0	\$5.5	\$4.6
Year 7	\$2.1	\$0.8	\$10.5	\$7.8	\$0.0	\$5.5	\$4.6
Year 8	\$2.1	\$0.8	\$10.5	\$7.8	\$0.0	\$5.5	\$4.6
Year 9	\$2.1	\$0.8	\$10.5	\$7.8	\$0.0	\$5.5	\$4.6
Year 10	\$2.1	\$0.8	\$10.5	\$7.8	\$0.0	\$5.5	\$4.6
PV of 10-year costs, 3% discount rate	\$30.44	\$12.09	\$167.75	\$123.87	\$0.01	\$87.52	\$77.25
Annualized costs per entity, 3% discount rate	\$3.57	\$1.42	\$19.67	\$14.52	\$0.00	\$10.26	\$9.06
Total costs per entity, 3% discount rate	\$0.00	\$0.01	\$0.01	\$0.01	\$0.01	\$0.01	\$0.07
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	\$26.32	\$10.51	\$146.02	\$107.80	\$0.01	\$76.19	\$68.14
Annualized costs per entity, 7% discount rate	\$3.75	\$1.50	\$20.79	\$15.35	\$0.00	\$10.85	\$9.70
Total costs per entity, 7% discount rate	\$0.00	\$0.00	\$0.01	\$0.01	\$0.01	\$0.01	\$0.06
Annualized costs per entity, 7% discount rate	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.01

Table 51: Projected Total Costs of Remediating Third-Party Websites (Millions)

Year	Total Costs (All Entities)
Year 1	\$182.2
Year 2	\$200.7
Year 3	\$123.5
Year 4	\$45.9
Year 5	\$45.9
Year 6	\$45.9
Year 7	\$45.9
Year 8	\$45.9
Year 9	\$45.9
Year 10	\$45.9
PV of 10-year costs, 3% discount rate	\$740.7
Annualized costs, 3% discount rate	\$86.8
PV of 10-year costs, 7% discount rate	\$648.2
Annualized costs, 7% discount rate	\$92.3

3.9 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 estimates for costs is in Table 53. Other assumptions not altered here also involve a degree of uncertainty, 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.¹¹⁷ 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 3.33. This altered assumption resulted in a 10-year total website testing and remediation cost of \$21.2 billion at a 3 percent discount rate. This is \$8.0 billion more than the primary estimate of \$13.2 billion. The analysis for estimating costs of remediating third-party websites (described in Section 3.8) 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 \$1.2 billion. This is \$500 million more than the primary estimate of \$741 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

¹¹⁷ 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*.

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 entity websites would be archived or removed rather than remediated. This calculation resulted in website costs of \$12.8 billion discounted at 3 percent over 10 years; \$345 million less than the primary estimate of \$13.2 billion. Once again, the analysis for estimating costs of remediating third-party websites (described in Section 3.8) was replicated using this altered PDF archival rate, resulting in a 10-year total third-party website testing and remediation present value cost of \$721 million. This is \$20 million less than the primary estimate of \$741 million.

For postsecondary course remediation cost, the Department generated a low-cost estimate and a high-cost estimate to remediate a course. 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, leading to increased uncertainty as to what the most appropriate remediation cost per course is. One possibility is 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 base its course cost estimates, and that because of

that there is less compliance in web accessible course content.¹¹⁸ To generate high-end estimates, 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 \$2,028 per course (compared with \$1,809 in the primary estimate), and an operation and management cost of \$304 per course (compared with \$271 in the primary estimate). Under these conditions, the Department found the annualized cost of the rule for course content remediation to be \$1.7 billion: \$281 million more than its primary estimates.

The Department also acknowledges that it may be the case that as time goes on and more material is born accessible, remediation costs may decrease. Using the same studies as above, the Department estimates a low-cost estimate of \$463 dollars per course, with an operation and management cost of \$147 per course. This results in an annualized cost of \$811 million dollars, \$583 million dollars less than the baseline 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. In its initial analysis, the Department assumed that high school students take classes for seven subjects, and that each subject has its own course shell. This assumption was based on the best professional judgment of former educators. For the sensitivity analysis, the magnitude of the increase and decrease is based on the judgment of the same individuals.

¹¹⁸ 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.

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 \$192 and its high estimate of \$1,065 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 \$229 million to \$336 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 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 \$229 million dollars to \$80 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 \$53,500 (in 2022 dollars), compared with \$112,350 for an average mobile app.¹¹⁹ 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 \$34,775. Using this assumption based on simple mobile apps, the present value of total mobile app testing and remediation costs

¹¹⁹ 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/>.

decreases from \$618.1 million to \$295.5 million at a 3 percent discount rate. 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 \$321,000 (in 2022 dollars).¹²⁰ 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 \$208,650. Using this assumption, the present value of total mobile app testing and remediation costs increase from \$618.1 million to \$1.8 billion.

The parameters changed for each analysis can be found In Table 52, and the total aggregated lower and higher estimates can be found in Table 53.

. Based on the Department’s analysis, the present value of total 10-year costs discounted at 7 percent will likely be between \$20.5 and \$34.0 billion.

Table 52: Sensitivity Analysis Parameters

Cost	Bound	Variations
Higher education course remediation	Lower estimate	Low course cost
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

¹²⁰ *Id.*

Table 53: Sensitivity Analyses of Total Costs (Millions)

Time Period	Primary	High Estimate	Low Estimate
Year 1	\$6,717	\$9,251	\$5,574
Year 2	\$7,533	\$9,985	\$5,982
Year 3	\$3,766	\$5,596	\$3,426
Year 4	\$1,990	\$2,747	\$1,663
Year 5	\$1,990	\$2,747	\$1,663
Year 6	\$1,990	\$2,747	\$1,663
Year 7	\$1,990	\$2,747	\$1,663
Year 8	\$1,990	\$2,747	\$1,663
Year 9	\$1,990	\$2,747	\$1,663
Year 10	\$1,990	\$2,747	\$1,663
PV of 10-year costs, 3% discount rate	\$28,417	\$39,174	\$23,669
Average annualized costs, 3% discount rate	\$3,331	\$4,592	\$2,775
PV of 10-year costs, 7% discount rate	\$24,688	\$34,018	\$20,548
Average annualized costs, 7% discount rate	\$3,515	\$4,843	\$2,926

3.10 COST TO REVENUE COMPARISON

To consider the relative magnitude of the estimated costs of this regulation, the Department compares the costs to revenues for these entities. The costs for each government entity type and size are generally estimated to be below 1 percent of revenues (the one exception is small independent community colleges, for which the cost-to-revenue ratio is 1.05 percent and 1.10 percent using a 3 percent and 7 percent discount rate, respectively),¹²¹ so the Department does not believe the rule will be unduly burdensome or costly for public entities.¹²²

¹²¹ However, the Department notes that revenue for small independent community colleges was estimated using the 2012 Census of Governments, so revenue for small independent community colleges would likely be underestimated if small independent community colleges had a greater share of total local government revenue in 2022 than in 2012. If this were true, the Department expects that the cost-to-revenue ratio for small independent community colleges would be lower.

¹²² As a point of reference, the United States Small Business Administration advises agencies that a potential indicator that the impact of a 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. 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> [<https://perma.cc/PWL9-ZTW6>]; 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->

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.¹²³ 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.¹²⁴

For ISDs, the local government finances data only include enrollment numbers, not population numbers. However, the population provisions in the 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.¹²⁵

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

[06/documents/guidance-regflexact.pdf](#) [<https://perma.cc/9XFZ-3EVA>] (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”).

¹²³ 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.

¹²⁴ 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.

¹²⁵ 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 determine which school districts were dependent vs. independent. Twenty-four 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.

Finances by Level of Government and by State: 2020, updated to 2022 dollars using the GDP deflator.^{126, 127}

Table 54 contains the average annualized cost using a 3 percent and 7 percent discount rate,¹²⁸ 2020 annual revenue estimates, and the cost-to-revenue ratios for each entity type and size. The costs are generally less than 1 percent of revenues in every entity type and size combination, so the Department believes that the costs of this 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-ISD 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 community colleges that are independent to total community college costs, the Department could compare costs to revenues for these independent community colleges.

¹²⁶ 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>.

¹²⁷ 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&1921=survey&1903=13>. Accessed September, 2023.

¹²⁸ 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 generally increase the cost-to-revenue ratio above 1 percent for any entity type and size.

Table 54: 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	\$1,070	\$1,119	\$3,050,149	0.04%	0.04%
County	Small	\$22	\$24	\$69,686	0.03%	0.03%
County	Large	\$140	\$150	\$480,199	0.03%	0.03%
Municipality	Small	\$377	\$399	\$197,709	0.19%	0.20%
Municipality	Large	\$110	\$119	\$562,027	0.02%	0.02%
Township	Small	\$268	\$284	\$59,802	0.45%	0.47%
Township	Large	\$10	\$10	\$13,552	0.07%	0.08%
Special district	N/A	\$79	\$84	\$298,338	0.03%	0.03%
School district [b]	Small	\$412	\$439	\$354,350	0.12%	0.12%
School district [b]	Large	\$235	\$252	\$333,852	0.07%	0.08%
Territory	Small	\$0	\$0	\$993	0.03%	0.03%
Territory	Large	\$1	\$1	\$35,794	0.00%	0.00%
Public university [c]	N/A	N/A	N/A	N/A	N/A	N/A
Community college [d]	N/A	\$201	\$211	\$41,189	0.49%	0.51%

[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 2022 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

Web content 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.¹²⁹ Aggregate data are unavailable for State and local government entities, but based on the analysis in Section 1.2, the Department estimates there are roughly 109,900 State and local government entity 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 \$5.0 billion, using a 7 percent discount rate, and \$5.2 billion using a 3 percent discount rate.
- Section 4.4 describes benefits that were quantified but excluded from the total benefits.
- Section 4.5 describes additional benefits that could not be quantified.

¹²⁹ 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.

The Department received some comments on the rule's estimated benefits. In general, these commenters agreed that the rule would have many benefits. Most commenters mentioned immediate benefits in providing access to public entities' services, programs, and activities to individuals with many different types of disabilities. Commenters also often noted expectations of increasing benefits in the future due to increased employment opportunities for individuals with disabilities.

Any comments on specific benefit components are discussed in the applicable section of the text. No methodological changes were made in response to these comments, for the reasons explained later in the analysis.

Table 55: 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	\$813.5	\$1,022.1	\$2,713.9	N/A	\$4,549.5
Time savings - mobile apps	\$76.3	\$95.9	\$254.5	N/A	\$426.7
Educational attainment	\$10.2	\$295.8	N/A	N/A	\$306.0
Total benefits	\$900.0	\$1,413.7	\$2,968.5	\$0.0	\$5,282.2

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

Table 56: 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	\$686.3	\$862.3	\$2,289.6	N/A	\$3,838.3
Time savings - mobile apps	\$64.4	\$80.9	\$214.7	N/A	\$360.0
Educational attainment	\$34.4	\$996.9	N/A	N/A	\$1,031.3
Total benefits	\$785.1	\$1,940.0	\$2,504.4	\$0.0	\$5,229.5

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

Table 57: 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	\$668.1	\$839.4	\$2,229.0	N/A	\$3,736.6
Time savings - mobile apps	\$62.7	\$78.7	\$209.0	N/A	\$350.4
Educational attainment	\$31.4	\$910.8	N/A	N/A	\$942.2
Total benefits	\$762.2	\$1,828.9	\$2,438.0	\$0.0	\$5,029.2

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

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.¹³⁰ 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 21.3 percent of adults have a relevant disability for purposes of this analysis.

Table 58 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

¹³⁰ For example, see <https://www.w3.org/WAI/fundamentals/accessibility-intro/>. Accessed on 11/30/2022.

than the numbers shown here. According to the Pew Research Center, 27 percent of people have a disability.¹³¹ 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 vision, hearing, cognitive, or manual dexterity disabilities may be impacted by the 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 59 shows how each of the WCAG 2.1 success criterion relates to these disability types.¹³²

Table 58: Disability Prevalence Counts, SIPP 2022

Disability Type	Prevalence Rate	Number (Millions)	Marginal Prevalence Rate [a]	Marginal Number [a] (Millions)
Vision	5.5%	14.0	5.5%	14.0
Hearing	7.6%	19.4	5.9%	15.1
Cognitive	11.3%	28.6	7.6%	19.3
Manual dexterity	5.8%	14.7	2.3%	5.7
None of the above	78.7%	200.1	78.7%	200.1

Source: U.S. Census Bureau. <https://www.census.gov/programs-surveys/sipp/data/datasets/2022-data/2022.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).

¹³¹ 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/>.

¹³² 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 59: 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	33.4
1.2.1 Prerecorded Audio-only and Video-only	A	V, H	33.4
1.2.2 Captions (Prerecorded)	A	H	19.4
1.2.3 Audio Description or Media Alternative (Prerecorded)	A	V	14.0
1.2.4 Captions (Live)	AA	H	19.4
1.2.5 Audio Description (Prerecorded)	AA	V, C	42.6
1.3.1 Info and Relationships	A	V, H	33.4
1.3.2 Meaningful Sequence	A	V	14.0
1.3.3 Sensory Characteristics	A	V, H	33.4
1.3.4 Orientation	AA	M	14.7
1.3.5 Identify Input Purpose	AA	C	28.6
1.4.1 Use of Color	A	V	14.0
1.4.2 Audio Control	A	V, H	33.4
1.4.3 Contrast (Minimum)	AA	V	14.0
1.4.4 Resize text	AA	V	14.0
1.4.5 Images of Text	AA	V, C	42.6
1.4.10 Reflow	AA	V	14.0
1.4.11 Non-Text Contrast	AA	V	14.0
1.4.12 Text Spacing	AA	V	14.0
1.4.13 Content on Hover or Focus	AA	V	14.0
2.1.1 Keyboard	A	V, M	28.6
2.1.2 No Keyboard Trap	A	V, M	28.6
2.1.4 Character Key Shortcuts	A	V, M	28.6
2.2.1 Timing Adjustable	A	V, H, C, M	76.7
2.2.2 Pause, Stop, Hide	A	C	28.6
2.3.1 Three Flashes or Below Threshold	A	C	28.6
2.4.1 Bypass Blocks	A	V, C, M	57.3
2.4.2 Page Titled	A	V, H, C, M	76.7
2.4.3 Focus Order	A	V, M	28.6
2.4.4 Link Purpose (In Context)	A	V, C, M	57.3
2.4.5 Multiple Ways	AA	V, C	42.6
2.4.6 Headings and Labels	AA	V, C	42.6
2.4.7 Focus Visible	AA	V, C	42.6
2.5.1 Pointer gestures	A	M	14.7
2.5.2 Pointer Cancellation	A	M	14.7
2.5.3 Label in Name	A	V, M	28.6

Success Criterion	Level	Disability Types [a]	Population (Millions)
2.5.4 Motion Actuation	A	M	14.7
3.1.1 Language of Page	A	V, C	42.6
3.1.2 Language of Parts	AA	V, C	42.6
3.2.1 On Focus	A	V, C, M	57.3
3.2.2 On Input	A	V, C	42.6
3.2.3 Consistent Navigation	AA	V, C	42.6
3.2.4 Consistent Identification	AA	V, C	42.6
3.3.1 Error Identification	A	V, C	42.6
3.3.2 Labels or Instructions	A	V, H, C, M	76.7
3.3.3 Error Suggestion	AA	V, C, M	57.3
3.3.4 Error Prevention	AA	V, H, C, M	76.7
4.1.1 Parsing	A	V, H, C, M	76.7
4.1.2 Name, Role, Value	A	V, H	33.4
4.1.3 Status Messages	AA	V	14.0

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 and hearing disabilities

Individuals who have vision disabilities often confront significant barriers because many websites and mobile apps provide information visually without features that enable screen readers or other assistive technology to retrieve the information. Individuals with vision disabilities often rely on changing the presentation of web content and mobile apps 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 readers); 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. Web content and mobile apps 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. Web content and mobile apps that conform to the requirements of WCAG 2.1 address these barriers (see Table 59).

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 59.

4.2.2 Cognitive disabilities

Individuals with cognitive disabilities could experience difficulties in accessing web content and mobile apps due to difficulties with orientation, attention, memory, abstraction, organizing and planning, experience and management of time, problem solving, language (reading and writing), and calculation.¹³³ 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

¹³³ 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.

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.

4.2.3 Manual dexterity disabilities

Individuals with manual dexterity disabilities may use specialized hardware or software to navigate web content and mobile apps, 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 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.

4.2.4 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.¹³⁴ 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.

Companions¹³⁵ may also benefit from this rule 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.¹³⁶ 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.¹³⁷ Benefits to companions are not quantified, but they are discussed further in Section 4.5.4.

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 200.1 million Americans without one of the four disabilities considered above.

4.3 MONETIZED BENEFITS

The Department monetized three benefits of accessible public entity web content and

¹³⁴ 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>.

¹³⁵ A companion may refer to a family member, friend, caregiver, or anyone else providing assistance.

¹³⁶ 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.

¹³⁷ PHI. (2023). Key Facts & FAQ: Understanding the Direct Care Workforce.

<https://www.phinational.org/policy-research/key-facts-faq/>.

mobile apps (Figure 1). The values presented in Sections 4.3.2 through 4.3.4 are annual benefits once the rule is fully implemented and benefits fully accrue. The timing of these benefits is discussed in Section 4.3.5. The three benefits include:

- Time savings for current users of State and local government websites (\$4.5 billion per year),
- Time savings for current mobile app users (\$426.7 million per year), and
- Earnings from additional educational attainment (\$306.0 million per year).¹³⁸

All three 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 entity web content and current users of mobile apps. 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.

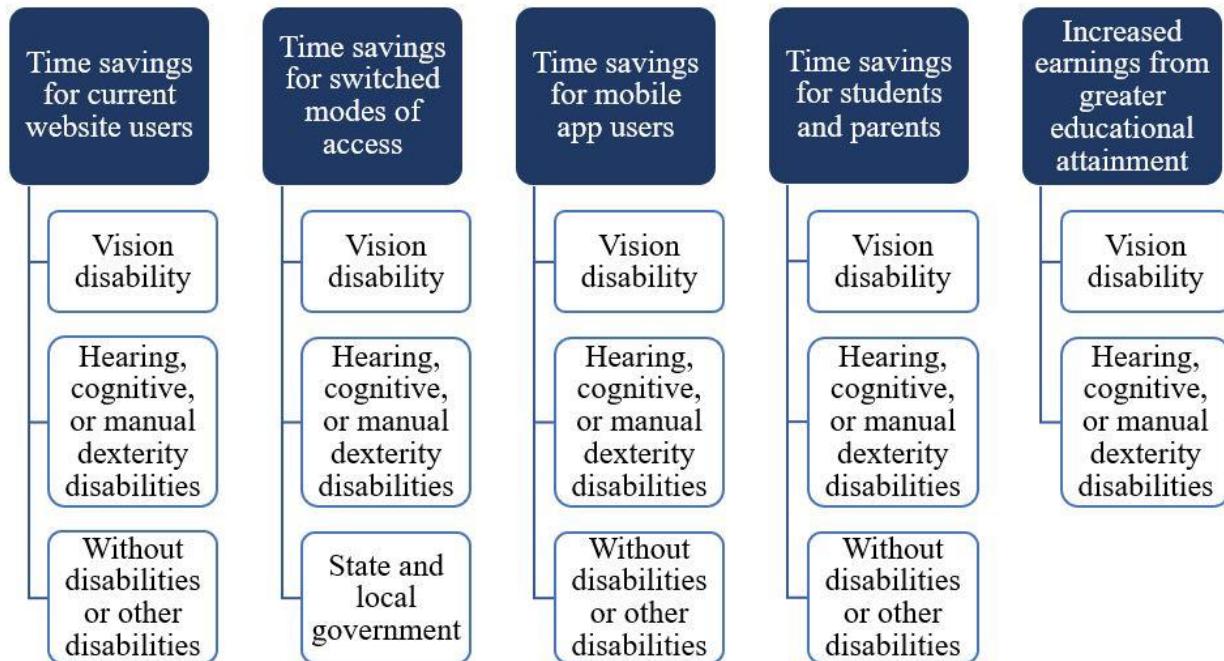
The Department further recognizes that there will be time savings to students, parents of students, government entities (from expending fewer resources on in-person transactions), and for new users of government websites. Although significant, the Department was unable to quantify these benefits with appropriate certainty, and therefore does not include them in its estimate of monetized benefits. However, the Department estimates them quantitatively in section 4.4, with an understanding that there are limitations to the underlying methodology.

Finally, there are many additional benefits of accessible web content and mobile apps, but data were not available to monetize these additional benefits. Therefore, they are addressed qualitatively in Section 4.5.

¹³⁸ Even after the implementation period, the size of the annual benefit increases over time as more cohorts graduate with additional educational attainment. \$306.0 million represents the annual benefit to one graduating class.

In total, the Department estimated benefits of \$5.0 billion per year on an average annualized basis, using a 7 percent discount rate. On a per capita basis, this equates to about \$19 per adult in the United States.¹³⁹ No public comments were received on the estimation of these monetized benefits.

Figure 1: Flow Diagram Summarizing Beneficiaries and Benefit Components



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 benefit estimates in this rulemaking rely on time savings estimates from

¹³⁹ 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>.

Schmutz et al. (2017).¹⁴⁰ 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 60. 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 savings. 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.¹⁴¹ That study also used WCAG 2.1, which is the standard used in this rule. However, because a 52 percent time reduction was in the

¹⁴⁰ 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>.

¹⁴¹ 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>.

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 60. Across all studies, when users with vision disabilities interacted with 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)¹⁴² 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) capped time on task, which limits the average time to completion by preventing many participants from completing the task. Participants who initially fail at completing the task may tend to spend longer than participants who complete the task on their first attempt. Removing unsuccessful participants negatively biases the mean completion time. Given that the authors find lower completion rates for the low-conformance site used in their study, the bias would be larger for the low-conformance site. This would explain why the authors found that less time is spent on low-conformance sites, which contradicts theory, anecdotal evidence, and the rest of empirical literature.

¹⁴² 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>.

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 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.¹⁴³

¹⁴³ 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 60: 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://disability-studies.leeds.ac.uk/wp-content/uploads/sites/40/library/DRC-Web-FI.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>.

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 SEMRUSH¹⁴⁴ and a sample of 452 State and local government entity websites (see Section 3 for how this sample was derived).¹⁴⁵ Across all entity

¹⁴⁴ For information on this application see <https://www.semrush.com/features/>.

¹⁴⁵ 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, 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.¹⁴⁶ 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 entity websites (96,584), the Department found that there were 22.8 billion annual visits (Table 62).¹⁴⁷ This excludes the 13,309 secondary websites for postsecondary schools because these websites were not included in the sampling methodology (see Section 3.5).

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, 5.5 percent of adults have a vision disability, 15.8 percent have a hearing, cognitive, or manual dexterity disability (but not a vision disability), and 78.7 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.¹⁴⁸ Therefore, the Department adjusted the website visitation proportions by incorporating the internet usage rates. A 2021 Pew Report found that 85 percent of persons with disabilities use the internet, as opposed to 95 percent of individuals without disabilities (Table 61). From this and disability prevalence rates, the Department calculated the population of

¹⁴⁶ Imperva. (2022). *2022 Imperva Bad Bot Report*. Retrieved from <https://www.imperva.com/resources/resource-library/reports/bad-bot-report/>.

¹⁴⁷ Data for September may not be representative of all months, but this is the only data readily available.

¹⁴⁸ Perron, A. and S. Atske. (2021). *Americans with disabilities less likely than those without to own some digital devices*. Pew Research Center. Retrieved from <https://www.pewresearch.org/short-reads/2021/09/10/americans-with-disabilities-less-likely-than-those-without-to-own-some-digital-devices/>.

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 61: Disaggregating Total Website Visits Among Beneficiary Types

Variable	Vision Disability	Hearing, Cognitive, or Manual Dexterity Disability [a]	Without Disability
Internet usage rate (PEW 2021)	85%	85%	95%
Disability prevalence rate (SIPP 2022)	5%	16%	79%
Share of visits	5%	11%	81%
Total annual visits (millions)	1,147	3,295	18,372

[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 appropriate 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 government entities 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 entity websites through the compliance assessment discussed in Section 3.3. Additionally, the literature has found government websites to have accessibility issues.¹⁴⁹ 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. It is also possible that content is removed rather than remediated, which could lead to fewer overall visits, and therefore

¹⁴⁹ 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/>.

less time savings, leading to an overestimate in benefits. However, the Department does not believe that this would be significant because the Department believes governments will remove content that is used least and from which very little benefit is derived.

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.¹⁵⁰ Using data from the OEWS, median hourly wage rates in May 2022 were \$22.26.¹⁵¹ This value was updated from the proposed rule, which relied on the May 2021 value of \$22.00. According to the Census Bureau, the tax rate for the median household is 8 percent.^{152, 153} Therefore, post-tax hourly earnings are \$20.58. Table 62 presents the calculations performed. The Department estimates that benefits to current website users, post implementation, total \$4.5 billion per year.

Table 62: 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)	1,147	3,295	18,372
Hours saved annually (millions)	40	50	132
Value of an hour of non-labor time	\$20.58	\$20.58	\$20.58
Benefits (millions)	\$813.5	\$1,022.3	\$2,713.9

¹⁵⁰ 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>.

¹⁵¹ U.S. Bureau of Labor Statistics. (2023, April 25). *May 2022 National Occupational Employment and Wage Estimates United States*. Retrieved from https://www.bls.gov/oes/current/oes_nat.htm#00-0000.

¹⁵² 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>.

¹⁵³ “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).”

- [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.

4.3.3 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 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 entity mobile apps. These data are not available, so the Department assumed the amount of time spent on State and local government entity mobile apps is on average the same as the amount of time spent on State and local government entity websites. For the compliance cost assessment, the Department estimated the number of State and local government entity 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 \$426.7 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 government entities 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.

4.3.4 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.¹⁵⁴ 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.¹⁵⁵

- 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.¹⁵⁶
- 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

¹⁵⁴ 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.

¹⁵⁵ U.S. Department of Education. (2017). *Characteristics and Outcomes of Undergraduates with Disabilities*. Retrieved from <https://nces.ed.gov/pubs2018/2018432.pdf>.

¹⁵⁶ 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.

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, but not included in the Department’s monetized benefits analysis, in Section 4.4.3 and Section 4.4.4. Here, the Department considers benefits associated with higher educational attainment. This could derive from accessibility of both public-facing websites and password-protected course content.

Figure 2 and Table 63 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 content and mobile app 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 63, individuals with more education earn more. Young workers with a bachelor’s degree or higher earn almost twice what a peer without a high school degree or diploma earns.¹⁵⁷

¹⁵⁷ National Center for Education Statistics. (2022). *Table 502:30: Median annual earnings of full-time year-round workers 25 to 34 years old and full-time year-round workers as a percentage of the labor force, by sex, race/ethnicity, and educational attainment: Selected years, 1995 through 2021..* U.S. Department of Education, Institute of Education Sciences. Retrieved from https://nces.ed.gov/programs/digest/d22/tables/dt22_502.30.asp. Inflated from 2021 to 2023 dollars using the GDP implicit price deflator. 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&1921=survey&1903=13>. Accessed September, 2023.

Figure 2: Educational Attainment by Disability Status, 25–34-Year-Olds

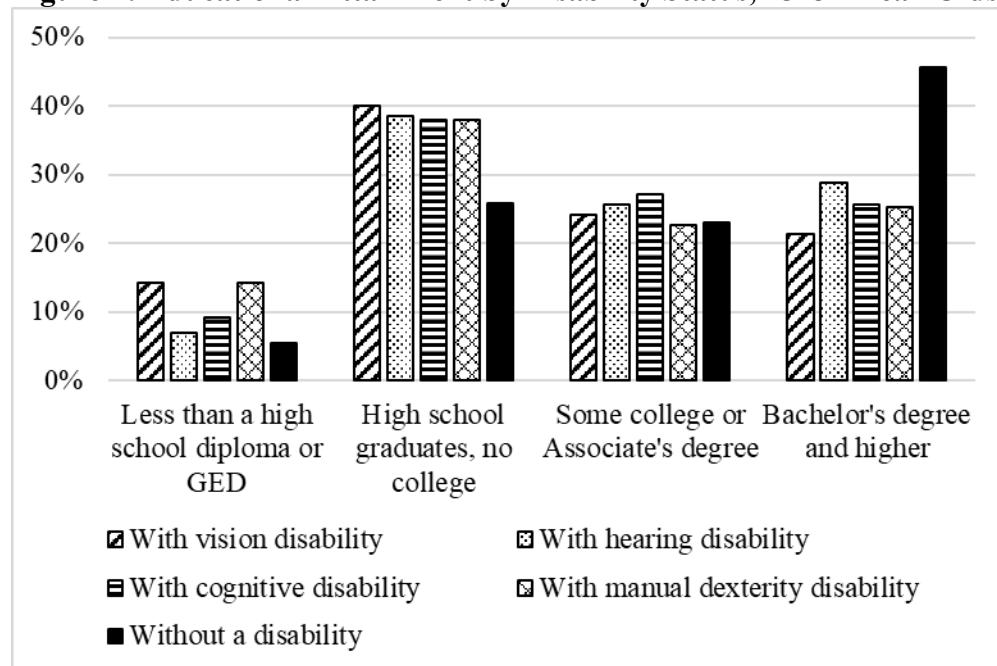


Table 63: Educational Attainment Distribution and Earnings for Young Workers

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%	26%	23%	46%
Vision [a]	14%	40%	24%	21%
Hearing	7%	39%	26%	29%
Cognitive	9%	38%	27%	26%
Manual dexterity	14%	38%	23%	25%
Median annual earnings	\$34,799	\$42,506	\$45,769	\$69,577

Sources: SIPP 2022; 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 2022 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,¹⁵⁸ of which, 0.3 percent have a vision disability, 1.0 percent have a hearing disability, 9.5 percent have a cognitive disability, and 1.8 percent have a manual dexterity disability (individuals with multiple qualifying disabilities are counted with the first disability in the list to avoid double counting).¹⁵⁹

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 64, benefits for one cohort, for one year, will total \$306 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 4.3.5. Additionally, this benefit will compound over time as additional cohorts of students graduate.

¹⁵⁸ 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>.

¹⁵⁹ 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 were not available.

Table 64: 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%	14,141	\$678	\$780	\$102	\$10
Hearing	1.0%	44,952	\$2,274	\$2,480	\$206	\$21
Cognitive	9.5%	408,872	\$20,292	\$22,560	\$2,268	\$227
Manual dexterity	1.8%	78,055	\$3,823	\$4,3057	\$483	\$48
Total	12.7%	546,019	\$27,068	\$30,128	\$3,060	\$306

[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 entity 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 entity 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).¹⁶⁰ 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

¹⁶⁰ 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 entity employees with disabilities being better able to navigate their employers' websites and mobile apps.

4.3.5 Projected 10-year benefits

Benefits after implementation were calculated in the preceding sections. However, during the implementation period, benefits will be lower. The rule allows either two or three years for implementation, depending on the covered entity's population. The Department believes all benefits will be fully accrued beginning in Year 4. For time savings benefits, 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 65).¹⁶¹

For educational attainment, benefits do not accrue until after the additional education is obtained. For simplicity, benefits are assumed to begin in Year 3, after two years of implementation. 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

¹⁶¹ 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.

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 \$942.2 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 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 rule.

Table 65: Timing of Benefits (Millions)

Year	Total Benefit (Million)	Time Savings Benefit Accrual	Time Savings Benefits (Millions)	Educational Attainment Accrual	Education Attainment Benefits (Million)[a]
Year 1	\$1,328	27%	\$1,328	0%	\$0.0
Year 2	\$2,656	53%	\$2,656	0%	\$0.0
Year 3	\$4,290	80%	\$3,984	1 cohort	\$306.0
Year 4	\$5,588	100%	\$4,976	2 cohorts	\$612.0
Year 5	\$5,894	100%	\$4,976	3 cohorts	\$918.0
Year 6	\$6,200	100%	\$4,976	4 cohorts	\$1,223.9
Year 7	\$6,506	100%	\$4,976	5 cohorts	\$1,529.9
Year 8	\$6,812	100%	\$4,976	6 cohorts	\$1,835.9
Year 9	\$7,118	100%	\$4,976	7 cohorts	\$2,141.9
Year 10	\$7,424	100%	\$4,976	8 cohorts	\$2,447.9

[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.

4.3.6 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 \$5.0 billion under the primary conditions. Using the low estimate assumptions, they are \$3.3 billion and under the high estimate assumptions they are \$10.1 billion (Table 66). The variations used for each benefit type are shown in Table 67.

Table 66: Average Annualized Benefits Sensitivity Analysis (Millions) [a]

Beneficiary	Low Estimate	Primary	High Estimate
Time savings - current users	\$2,772.2	\$3,736.6	\$8,016.2
Time savings - mobile apps	\$260.0	\$350.4	\$751.8
Educational attainment	\$300.7	\$942.2	\$1,365.8
Total	\$3,332.9	\$5,029.2	\$10,133.8

[a] 10-Year average annualized benefits, 7 percent discount rate.

Table 67: 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 - 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
Educational attainment	Low	ACS data for prevalence rates, instead of SIPP
Educational attainment	Low	Smaller share of achievement gap closed
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 \$3.7 to \$2.8 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 \$3.7 billion to \$8.0 billion.

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 \$260.0 million or increase to \$751.8 million from \$350.4 million.

For benefits of additional educational attainment, the Department altered two assumptions. First, ACS prevalence rates were used instead of SIPP. Second, 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 \$300.7 million or increase to \$1.4 billion from \$942.2 million.

4.4 BENEFITS QUANTIFIED BUT EXCLUDED FROM TOTAL BENEFITS

While reviewing costs and benefits of the final rule the Department identified four categories of benefits that are believed to be substantial but difficult to quantify. These benefits are time savings to new users of government services, time savings for government employees, time savings for postsecondary education students, and time savings for primary and secondary education students and their parents/guardians. The Department quantified these benefits with the best available data and methods but believes that there is a degree of uncertainty in the estimates. Specifically, there is a lack of data on which to base time savings benefits for course

content, and the Department is reluctant to apply the time savings estimates from Schmutz et al. (2017) to educational settings. Additionally, it is unclear how web accessibility will motivate individuals with disabilities who do not currently use government websites to use government websites, which is necessary to understand time savings for new users of government websites. Therefore, the Department is not including these quantified benefits in its primary benefits estimates. Nonetheless, quantified benefits for time savings for new users of government websites, time savings for governments employees, time savings for postsecondary education students, and time savings for elementary and secondary education are estimated in sections 4.4.1 to 4.4.4.

4.4.1 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 companion¹⁶²) 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.¹⁶³
- 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.

¹⁶² A companion may refer to a family member, friend, caregiver, or anyone else providing assistance.

¹⁶³ Time savings for companions who helped individuals with disabilities to use inaccessible State or local government websites is discussed in Section 4.5.4.

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 4.3.2), when estimating benefits to current website users, the Department incorporated literature finding that 85 percent of persons with disabilities use the web, compared to 95 percent of the public at large.¹⁶⁴ Consequently, website visits were adjusted to reflect lower visitation rates by individuals with disabilities. Here, the Department considers the differential of 10 percentage points (95 percent minus 85 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 1.4 million new web users with vision disabilities and 4.0 million new web users with hearing, cognitive, or manual dexterity disabilities. The Department acknowledges that it might not be the case that individuals with disabilities will switch from not using the internet to using the internet because government services are more accessible, but the Department uses these estimates due to a lack of better data.

The Department could not identify data to disaggregate potential new users between mode switchers and those who previously abstained from using government services, programs, or activities. Therefore, the Department has treated all 5.4 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.

¹⁶⁴ Perrin, A. and S. Atske. (2021). *Americans with disabilities less likely than those without to own some digital devices*. Pew Research Center. Retrieved <https://www.pewresearch.org/short-reads/2021/09/10/americans-with-disabilities-less-likely-than-those-without-to-own-some-digital-devices/>.

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. These assumptions are based on the Department's own experiences as a government agency, and the experience of contractors in using government services. While the Department thinks its estimates are reasonable, it acknowledges a high degree of uncertainty, which is a primary reason these estimates are not in the monetized benefits section of this RIA.

To estimate the benefits for new users of government services, 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. The Department assumed, using best professional judgment from the Department due to a lack of data, that 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.¹⁶⁵ However, this survey focused on only a few types of transactions, which may be more time intensive than average.¹⁶⁶

¹⁶⁵ Ramboll Management. (2004). *User Satisfaction and Usage Survey of e-Government Services*. Retrieved from https://www.stjornarradid.is/media/forsaetisraduneyti-media/media/utvefur-skjol/top_of_the_web_011204.pdf.

¹⁶⁶ 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.

Table 68: 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 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.¹⁶⁷

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 transaction, from Table 68). 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 5.4 million new website users results in 18.1 million hours saved per year.¹⁶⁸ As was done for current website users, the value of an hour of time was estimated to be \$20.58. Therefore, total benefits equal \$95.8 million for individuals with vision disabilities, \$275.1 for individuals with hearing, cognitive, or manual dexterity disabilities, or \$370.9 million total (Table 69).

¹⁶⁷ 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.

¹⁶⁸ 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.

Table 69: Time Savings Calculation for New Website Users

Variable	Vision Disability	Hearing, Cognitive, or Manual Dexterity Disability [a]
Adult population (millions)	14.0	40.1
Increased share using websites (PEW 2021)	10%	10%
New users (millions)	1.4	4.0
Transactions per person per year	8.0	8.0
Average hours saved per person	3.3	3.3
Hours saved annually (millions)	4.7	13.4
Value of an hour of non-labor time	\$20.58	\$20.58
Benefits (millions)	\$95.8	\$275.1

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

To understand the effect of the assumption that an individual has 8 transactions per year, the Department analyzed savings in scenarios where an individual has 4 or 10 transactions per year instead. If users instead had 4 transactions a year, time savings for new website users would be halved, resulting in \$185.5 million per year in time savings. If individuals have 10 transactions a year, benefits would rise to a total of \$463.6 million per year. The Department also changed its assumptions on the distribution of different contact methods. The Department assumed a uniform distribution due to a lack of available data, but if the distribution shifted to favor at-home methods of contact like email and phone calls, the savings would be different. For instance, if the distribution were: 10 percent in person, 10 percent assistance from a companion, 40 percent email, and 40 percent phone calls, benefits for new website users would be \$215 million a year, instead of \$371 million a year.

4.4.2 Cost savings to governments from reduced contacts

As discussed in Section 4.4.1, improved website accessibility may 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 would generate time savings for government

employees who would have assisted those individuals. As explained above, there are an assumed 5.4 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 (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 70: Time Savings Calculation for Government Entities

Variable	Number
Increased share using websites (PEW 2021)	10%
Persons with disabilities (millions)	54.1
New website users (millions)	5.4
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)	5.4
Value of an hour of labor time	\$44.66
Benefits (millions)	\$241.5

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 for different modes. For phone calls, this reflects the average length of a call.¹⁶⁹ 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

¹⁶⁹ 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.

on best professional judgment only and are hence imprecise.

This time was valued at \$44.66 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).¹⁷⁰ 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 \$241.5 million. Because some of these numbers are based on assumptions, the Department evaluated how benefits would change if the minutes saved per transaction was changed. The Department found that if the minutes saved per transaction was 5, cost savings to governments from reduced contacts would be halved to \$120.8 million per year. If the minutes saved per transaction was 15, cost savings to governments from reduced contacts would increase to \$362.3 million per year.

4.4.3 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. Unfortunately, the Department was not able to identify literature detailing time savings benefits from accessible course content for students. For the subsequent analysis, the Department uses Schmutz et al. (2017) to estimate time savings for students but has concerns about the study's applicability. For instance, the tasks evaluated in Schmutz et al. (2017) are likely simpler than what is required of students. However, individuals with disabilities in college may not be representative of individuals with disabilities as a whole, and therefore it may not be appropriate to apply findings from Schmutz et al. (2017) to a population of postsecondary students. Further, some schools may offer effective disability centers to help students with accessible course materials. For the reasons outlined above, the

¹⁷⁰ U.S. Bureau of Labor Statistics. (2023, April 25). *May 2022 National Industry-Specific Occupational Employment and Wage Estimates*. Retrieved from https://www.bls.gov/oes/current/naics2_99.htm#43-0000.

Department believes that Schmutz et al. (2017) could either underestimate or overestimate time savings benefits to students. However, the Department firmly believes that the benefits of course remediation are significant. Many public comments highlighted the need for course accessibility, citing their own personal struggles with inaccessible course content. The Department believes further that the web material with which students interface is significantly more complex than what is detailed in the Schmutz et al. (2017) study, and that time savings for students will be appreciable. Therefore, the Department estimates time savings for postsecondary education students below using Schmutz et al. (2017), but does not include these estimates in the primary benefits analysis, and emphasizes that these numbers have a high degree of uncertainty.

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. However, the Department notes that this could be an underestimate, as Schmutz et al. (2017) estimated time savings associated with simple tasks like looking up an e-mail address, whereas more complex content like coursework is generally more interactive, and there may be more benefit from accessible interactive materials. This may also be an underestimate because, as discussed above, literature specific to WCAG 2.1 is not available, but because WCAG 2.1 incorporates the standards in WCAG 2.0, the Department applies these estimates for time savings. The

Department also acknowledges the possibility that this is an overestimate, as students in college may be better suited to handle inaccessible materials, and they may have more resources such as disability centers at their disposal than the general population of individuals with disabilities.

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,¹⁷¹ and data from the NCES for information on student populations at public universities and community colleges.¹⁷² There are an estimated 13.7 million higher-education students in the U.S, roughly 14 percent of whom have a vision, hearing, cognitive, or manual dexterity disabilities (Table 71).

Table 71: 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
Vision disability prevalence rate (SIPP)	1.9%	2.3%	2.0%
Other disability prevalence rate [a] (SIPP)	11.9%	12.0%	11.9%
Total students with a vision disability (1,000s)	170.5	108.3	279
Total students with other disabilities (1,000s)	1,063.6	574.6	1,638
Total students with no disability (1,000s)	7,711.2	4,095.0	11,806

[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,¹⁷³ and no relevant disabilities, will interface with course content in a year. The Department used the finding from Fosnacht et al. (2018) that first-year undergraduate students at four-year institutions spend 13.8 hours on schoolwork outside of class per week, which the

¹⁷¹ 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.

¹⁷² Technical colleges and other degree granting institutions are included as community colleges.

¹⁷³ For the purposes of this analysis, “other” disabilities include cognitive, hearing, and manual dexterity disabilities.

Department assumes to be constant across all years.¹⁷⁴ 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.¹⁷⁵ The Department multiplied these total schoolwork hours by 0.25 to reflect only the time spent interfacing with online content that would require accessibility (such as PDFs, quizzes, and videos posted by an instructor). 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.¹⁷⁶ 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.

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 1.4 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 2022 Current Population Survey (CPS) to value an hour of time for the relevant age ranges and calculate monetary benefits from time saved.¹⁷⁷ Using the median tax rate of 7.6 percent,¹⁷⁸ this amounts to \$14.22

¹⁷⁴ 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>.

¹⁷⁵ 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.

¹⁷⁶ 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.

¹⁷⁷ U.S. Census Bureau. (2023). Median Hourly Earnings, Wage and Salary Workers Paid Hourly Rates. Series IDs: LEU0207635700 and LEU0207635500.

¹⁷⁸ 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>.

for four-year university students and \$17.45 for community college students. The Department estimates total annual time savings of \$2.5 billion.¹⁷⁹ The Department is also interested to know how time savings would be different if the proportion of time spent interfacing with online course content were different from the assumed 0.25. The Department evaluated how proportions of 0.50 and 0.10 would affect total benefits. The Department found that if students spent half of their schoolwork time on online course content subject to remediation, the total benefit resulting from time savings for higher-education students would be \$4.9 billion per year, and if students spent 10 percent of their schoolwork time on online course content, this benefit would be \$985 million per year.

Finally, although this section is concerned with time savings for students, the Department notes that there will likely be appreciable time savings for educators with disabilities. The Department believes these individuals will have more support from IT professionals and education services to make accessible course content under the rule, reducing the effort needed to access educational materials.

¹⁷⁹ 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 the first year following implementation. For a full breakdown of yearly benefits for time savings for students, see Table 65.

Table 72: 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)	1,176.8	514.2	Calculation
Hours spent on course content - other disabilities (1,000s)	3,669.6	1,364.2	Calculation
Hours spent on course content - no disabilities (1,000s)	26,603.6	9,721.2	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)	282.4	123.4	Calculation
Total hours saved per week- other disabilities [a] (1,000s)	770.6	286.5	Calculation
Total hours saved per week- no disabilities (1,000s)	2,660.4	972.1	Calculation
Total hours saved per week - all groups (1,000s)	3,713.4	1,382.0	Calculation
Weeks per semester	16	16	Best professional judgment
Value of an hour of non-labor time	\$14.22	\$17.45	CPS 2022
Monetary savings (millions per year)	\$1,690	\$771	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.

4.4.4 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 underlying methods here mirror those for postsecondary education. The Department also emphasizes than many of the same concerns with postsecondary education time savings apply here, and that these estimates should be understood to have a high degree of uncertainty. Additionally, the distribution of schools with LMSs is unclear, and in lieu of available data the Department had to estimate the number of LMSs sites per grade level, which plays a key role in these time savings estimates. Nonetheless, the Department believes these estimates are valuable to fully understand potential benefits of the rule.

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 73).¹⁸⁰ The Department used Census data on the number of households with two parents and one parent to estimate the number of guardians accessing coursework. This may not account for students in

¹⁸⁰ NCES. The Elementary/Secondary Information System (ElSi). Retrieved from: <http://nces.ed.gov/ccd/elsi/>.

foster care or other living situations, but the Department believes the estimates are adequately precise. According to Census data, roughly 71 percent of children under 18 live in two parent households.¹⁸¹ Using these values, the Department estimates there are 82.3 million parents who assist in children's coursework.¹⁸²

Table 73: 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	82,272
Age range [b]	6-12	13-18	25-65
Vision disability prevalence rate (SIPP)	1.3%	1.6%	4.2%
Other disability prevalence rate (SIPP) [c]	10.3%	10.3%	13.0%
Total with a vision disability (1,000s)	382.1	303.7	3,485.3
Total with other disabilities (1,000s)	2,978.6	1,976.9	10,720.7
Total with no disabilities (1,000s)	25,615.7	16,950.8	68,065.8

[a] 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,

¹⁸¹ U.S. Census (2023), “National Single Parent Day: March 21, 2023”. Accessed from Table FM-1 at <https://www.census.gov/newsroom/stories/single-parent-day.html>.

¹⁸² 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.

other disabilities,¹⁸³ 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.¹⁸⁴ 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.¹⁸⁵ 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. The Department notes that this estimate was made by parents of school-age children, but that it lacks formal evidence.

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.¹⁸⁶ Using the median tax rate of 7.6 percent,¹⁸⁷ the post-tax wage rate is \$20.58 per hour. The Department estimates total annual time savings for parents of \$1.9 billion per year.¹⁸⁸ Wage rates for students younger than working age

¹⁸³ For the purposes of this analysis, “other” disabilities include cognitive, hearing, and manual dexterity disabilities.

¹⁸⁴ 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>.

¹⁸⁵ 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.

¹⁸⁶ OEWS data available at: U.S. Bureau of Labor Statistics. (2023, April 25). *May 2022 National Occupational Employment and Wage Estimates United States*. Retrieved from https://www.bls.gov/oes/current/oes_nat.htm#00-0000;

¹⁸⁷ 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>.

¹⁸⁸ 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 the first year after implementation. For a full breakdown of yearly benefits for time savings for students, see Table 65.

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 \$689.8 million per year. The Department also evaluated how changes in the amount of time parents spend on accessing online content would affect benefits. The Department found that if parents spent one hour per week on course content, the benefit would double to be \$3.8 billion per year, and if the amount of time was halved (to be 15 minutes per week) the benefit would halve to be \$942 million per year.

Finally, as with time savings for higher-education students, the Department notes that it expects, but is unable to quantify, time savings for educators.

Table 74: 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 schoolwork subject to the rule	0.25	0.25	N/A	Best judgment
Hours spent interfacing with school 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)	490.4	1,063.0	4,084.5	Calculation
Hours spent on course content - other disabilities (1,000s)	1,911.3	3,459.5	6,281.9	Calculation
Hours spent on course content - no disabilities (1,000s)	16,436.7	29,663.8	39,883.7	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)	117.7	255.1	980.3	Calculation
Total hours saved per week- other disabilities (1,000s)	401.4	726.5	1,319.2	Calculation
Total hours saved per week- no disabilities (1,000s)	821.8	1,483.2	1,994.2	Calculation
Total hours saved per week - all groups (1,000s)	1,340.9	2,464.8	4,293.6	Calculation
Weeks per school year	25	25	25	Best judgment
Value of an hour of non-labor time	\$7.25	\$7.25	\$20.58	OEWS & judgment
Monetary savings (millions per year)	\$243	\$447	\$2,209	Calculation

4.5 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 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 web content 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. As Executive Order 12866 directs, when “deciding whether and how to regulate, agencies should assess all costs and benefits of available regulatory alternatives, including . . . qualitative measures of costs and benefits that are difficult to quantify, but nevertheless essential to consider.” Exec. Order No. 12866 of September 30, 1993, 58 Fed. Reg. 51,735 (Oct. 4, 1993). The January 20, 2021, Presidential Memorandum titled “Modernizing Regulatory Review”¹⁸⁹ directed OMB to identify ways to modernize and improve the regulatory review process through revisions to OMB’s Circular A-4 to ensure that analysis fully accounts for regulatory benefits that are difficult or impossible to quantify. OMB completed this work in 2023, when it revised

¹⁸⁹ 86 FR 7223 (Jan. 20, 2021).

Circular A-4 and provided updated and expanded discussion of methods for accounting for non-monetized benefits and costs. Office of Management and Budget, Circular No. A-4 at 44-48 (Nov. 9, 2023), <https://www.whitehouse.gov/wp-content/uploads/2023/11/CircularA-4.pdf>.

Many of the benefits in this rulemaking are exactly the type of benefits that are difficult to quantify, but nevertheless essential to consider.

These benefits are central to this 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 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 seek additional assistance to complete the form. Importantly, this is the experience people without disabilities have when accessing online government services. This 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 government entities make available to members of the public online.

There are many benefits of this rule—like equality and dignity—that have not been monetized in this FRIA due to limited data availability and inherent difficulty to quantify. Those benefits are discussed here qualitatively.

This section's description of the rule's unquantified benefits first discusses benefits to individuals followed by benefits to State and local government entities.

Benefits to individuals include, among others:

- Increased independence, flexibility, and dignity;
- Increased privacy;
- Reduced frustration;
- Decreased assistance by companions;
- Increased program participation; and
- Increased civic engagement and inclusion.

Benefits to governments include, among others:

- Increased certainty about the applicable technical standard and potential reduction in litigation; and
- Potential reduction in litigation.

4.5.1 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 RIA. 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 entity 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 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 government entities, 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 entity 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 entity 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 entity services, programs, or activities, without needing to rely on others. In public comments, a member of the public observed: “As an autistic and disabled woman of color, I know how humiliating it is to find out you cannot participate in something because the people who didn’t think about you as a possibility.”¹⁹⁰ 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.

¹⁹⁰ Individual Comment on Proposed Rule on the Basis of Disability: Accessibility of Web Info. and Services of State and Loc. Gov’t Entities (Aug. 15, 2023), <https://www.regulations.gov/comment/DOJ-CRT-2023-0007-0043> [https://perma.cc/54PF-HG5K].

4.5.2 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 entity 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. One commenter, an attorney who assists senior citizens completing health care and property powers of attorney, underscored that “[a] person who is blind cannot fill out [power of attorney] forms without getting help and this violates a person’s right to privacy,” whereas forms in an accessible format would allow “a blind person [to] complete them independently using a screen reader on a personal computer or mobile device.”¹⁹¹

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

¹⁹¹ Individual Comment on Proposed Rule on the Basis of Disability: Accessibility of Web Info. and Services of State and Loc. Gov’t Entities (Aug. 18, 2023), <https://www.regulations.gov/comment/DOJ-CRT-2023-0007-0050> [<https://perma.cc/4EBA-3EK7>].

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 entity 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 entity 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.

4.5.3 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.¹⁹² 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.¹⁹³ 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 activities that public entities offer through their web content 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

¹⁹² 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>.

¹⁹³ 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.

improvement in the quality of the lives of people with disabilities by reducing the frustration they experience.

4.5.4 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. One commenter noted the frustrations experienced when trying to support their mother's efforts to access services: "I am currently trying to help my mother access online services with the government and I'm running into problems, this is happening during a COVID surge, so this is a health and safety issue not just a convenience problem."¹⁹⁴ 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 activities of daily living. All of these benefits are difficult to quantitatively calculate, but they are nonetheless benefits that would accrue from the rule.

4.5.5 Increased program participation

Section 4.4.1 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 web content and mobile apps may prevent persons with disabilities from accessing information or using State or local government entity services, programs, and activities

¹⁹⁴ Individual Comment on Proposed Rule on the Basis of Disability: Accessibility of Web Info. and Services of State and Loc. Gov't Entities (Aug. 23, 2023), <https://www.regulations.gov/comment/DOJ-CRT-2023-0007-0055> [https://perma.cc/E4VB-LF9U].

that others without disabilities have access to online. Two commenters, who provide legal and rehabilitative assistance to people with disabilities, and who themselves are persons with disabilities, underscored the challenges posed by forms in inaccessible formats:

- “I am an attorney who is blind. I wanted to do some volunteer work with legal aid agencies to help senior citizens complete health care and property powers of attorney . . . When I tried to complete these statutory forms on the state websites, I was unable to do so because they were not PDF fillable forms.”¹⁹⁵
- “I am a professional working in the field of Vision Rehabilitation Therapy. I work with our blind and visually impaired veterans at a [Veterans Affairs] hospital. On top of that, I lost my vision 4 years ago, so I have been relying on screen readers to access both my computer and my phone . . . My experience with [S]tate entities is terrible. I had to undergo rehabilitation myself when I became blind, and the State provided this training. In order for me to be able to receive the services I needed, I had to sign inaccessible PDFs. There were two huge problems with this: I could not access the information so I did not know what I was signing, and I could not sign it electronically, so I had to print it out and then I had no idea what to sign. This represented a big barrier to receiving the training and the skills I needed to pursue my independence and I ended up wasting a lot of time waiting for someone to read and help me sign.”¹⁹⁶

¹⁹⁵ Individual Comment on Proposed Rule on the Basis of Disability: Accessibility of Web Info. and Services of State and Loc. Gov’t Entities (Aug. 18, 2023), <https://www.regulations.gov/comment/DOJ-CRT-2023-0007-0050> [<https://perma.cc/4EBA-3EK7>].

¹⁹⁶Individual Comment on Proposed Rule on the Basis of Disability: Accessibility of Web Info. and Services of State and Loc. Gov’t Entities (Sep. 20, 2023), <https://www.regulations.gov/comment/DOJ-CRT-2023-0007-0105> [<https://perma.cc/XD3L-MAHQ>].

As two commenters indicated, for students with disabilities, the absence of accessible course materials can be discouraging and have a detrimental impact in their educational attainment:

- “I am a student . . . with a visual impairment. For me, having websites that are accessible to screen readers are very important. It’s incredibly frustrating sometimes when I can’t access course material for my education, and I end up falling behind in my classes. Moreover, having textbooks that are PDF friendly or in an audiobook format, has really benefited me.”¹⁹⁷
- “When I started my Masters, the university was using Blackboard as the platform. I encountered many issues with accessibility of presentations posted there. It took me twice as long to complete tasks that my sighted peers could complete faster . . . It is frustrating . . . it seems that I do not deserve access to the same opportunities as the sighted Americans.”¹⁹⁸

While people with disabilities may nonetheless access government services, programs, and activities despite barriers due to inaccessible web content and mobile apps, 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 entity services, programs, or activities. Further, there may be some State or local government entity services, programs, or activities that individuals with disabilities

¹⁹⁷ Individual Comment on Proposed Rule on the Basis of Disability: Accessibility of Web Info. and Services of State and Loc. Gov’t Entities (Sep. 26, 2023), <https://www.regulations.gov/comment/DOJ-CRT-2023-0007-0119> [https://perma.cc/F99V-8MKJ].

¹⁹⁸ Individual Comment on Proposed Rule on the Basis of Disability: Accessibility of Web Info. and Services of State and Loc. Gov’t Entities (Sep. 20, 2023), <https://www.regulations.gov/comment/DOJ-CRT-2023-0007-0105> [https://perma.cc/XD3L-MAHQ].

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 government entities 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 government entities. 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.

4.5.6 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.

4.5.7 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 government entities 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 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 content 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 web content 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 web content 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 web content 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 Department notes that in the final rule the Department has added a provision covering the effect of limited noncompliance with the requirements in § 35.200(b). The Department anticipates that this provision could result in a reduction in litigation costs, given that if public entities meet the requirements of that provision, they may be able to show compliance with the rule even where they have not fully complied with the technical standard in every respect. In addition, the Department anticipates that 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.

5 COSTS AND BENEFITS OF REGULATORY ALTERNATIVES

The Department estimated costs and benefits for several possible alternatives to the rule.

These alternatives are described in Table 75.

Table 75: 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	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.¹⁹⁹ 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 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 criteria for some content.²⁰⁰ For those reasons, the Department did not quantify costs of requiring WCAG 2.1 Level AAA. Table 76 shows the projected 10-year costs of these alternatives. Table 77 shows the total incremental costs of these alternatives over 10 years with a 7 percent discount rate.

¹⁹⁹ 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/>.

²⁰⁰ See W3C®, *Understanding Conformance, Understanding Requirement 1* (last updated Aug. 19, 2022), available at <https://www.w3.org/WAI/WCAG21/Understanding/conformance>.

Table 76: Projected Total 10-Year Costs for Regulatory Alternatives (Millions)

Time Period	Longer Time Frame	WCAG 2.1 A	WCAG 2.0 AA	Rule	Shorter Time Frame Opt. 1 [a]	Shorter Time Frame Opt. 2 [a]
Year 1	\$4,469	\$6,436	\$6,412	\$6,717.3	\$14,723	\$10,961
Year 2	\$5,017	\$7,249	\$7,222	\$7,532.6	\$1,986	\$3,624
Year 3	\$5,596	\$3,636	\$3,634	\$3,766.4	\$1,986	\$3,797
Year 4	\$3,217	\$1,985	\$1,979	\$1,990	\$1,986	\$1,975
Year 5	\$1,990	\$1,985	\$1,979	\$1,990	\$1,986	\$1,975
Year 6	\$1,990	\$1,985	\$1,979	\$1,990	\$1,986	\$1,975
Year 7	\$1,990	\$1,985	\$1,979	\$1,990	\$1,986	\$1,975
Year 8	\$1,990	\$1,985	\$1,979	\$1,990	\$1,986	\$1,975
Year 9	\$1,990	\$1,985	\$1,979	\$1,990	\$1,986	\$1,975
Year 10	\$1,990	\$1,985	\$1,979	\$1,990	\$1,986	\$1,975
PV of 10-year costs, 3% rate	\$26,626	\$27,724	\$27,641	\$28,416.67	\$29,305	\$28,793
Average annualized costs, 3% rate	\$3,121	\$3,250	\$3,240	\$3,331.30	\$3,435	\$2,033
PV of 10-year costs, 7% rate	\$22,818	\$24,045	\$23,972	\$24,687.61	\$25,851	\$14,411
Average annualized costs, 7% rate	\$3,249	\$3,423	\$3,413	\$3,514.96	\$3,681	\$2,052

[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 77: Incremental Costs of Regulatory Alternatives (Millions) [a]

Alternative	Total	Incremental From Rule
Longer Timeframe	\$22,818	-\$1,870
WCAG 2.1 A	\$24,045	-\$643
WCAG 2.0 AA	\$23,972	-\$716
Rule	\$24,688	N/A
Shorter Timeframe Opt. 1 [b]	\$25,851	\$1,163
Shorter Timeframe Opt. 2 [b]	\$26,461	\$1,774

[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.

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.²⁰¹

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 rates to reflect the alternative timeframes. Table 78 shows the 10-year average annualized benefits decrease to \$4.5 billion from \$5.0 billion with the longer timeframe and increase to either \$5.3 billion or \$5.9 billion with the shorter timeframes (using a 7 percent discount rate).

²⁰¹ See W3C®, *Understanding Conformance, Understanding Requirement 1* (last updated Aug. 19, 2022), available at <https://www.w3.org/WAI/WCAG21/Understanding/conformance>.

Table 78: Average Annualized Benefits, Regulatory Alternatives (Millions) [a]

Beneficiary	Shorter Time-Frame Opt. 1 [b]	Shorter Time-Frame Opt. 2 [b]	Primary	Longer Time-Frame	WCAG 2.1 A	WCAG 2.0 AA
Time savings - current users	\$4,246.8	\$3,795.3	\$3,736.6	\$3,469.2	\$2,949.9	\$3,736.6
Time savings - mobile apps	\$398.3	\$355.9	\$350.4	\$325.3	\$276.6	\$350.4
Educational attainment	\$1,207.4	\$1,180.9	\$942.2	\$715.0	\$471.1	\$471.1
Total	\$5,852.6	\$5,332.1	\$5,029.2	\$4,509.5	\$3,697.7	\$4,558.1

[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 and current mobile app users, 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. 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).²⁰²

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).

²⁰² 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).

Table 78 shows the 10-year average annualized benefits for the alternative compliance levels, using a 7 percent discount rate. Benefits decrease to \$3.7 billion and \$4.6 billion from \$5.0 billion for WCAG 2.1 Level A and WCAG 2.0 Level AA, respectively. Table 79 presents the incremental benefits of the alternatives relative to the primary estimate.

Table 79: Incremental Benefits of Regulatory Alternatives (Millions) [a]

Alternative	Total	Incremental From Rule
Longer Timeframe	\$4,509.5	-\$519.7
WCAG 2.1 Level A	\$3,697.7	-\$1,331.5
WCAG 2.0 Level AA	\$4,558.1	-\$471.1
Rule	\$5,029.2	N/A
Shorter Timeframe Opt. 1 [b]	\$5,852.6	\$823.4
Shorter Timeframe Opt. 2 [b]	\$5,332.1	\$302.9

[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.

VII. FINAL REGULATORY FLEXIBILITY ACT (FRFA) ANALYSIS

1 WHY THE DEPARTMENT IS CONSIDERING ACTION

Title II of the ADA provides that no qualified individual with a disability shall, by reason of such disability, be excluded from participation in or denied the benefits of the services, programs, or activities of a State or local government entity. The Department has consistently made clear that the title II nondiscrimination requirements apply to all services, programs, and activities of public entities, including those provided via the web. It also includes those provided via mobile apps. In this rule, the Department establishes technical standards for web content 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 web content 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 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).²⁰³ 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.

In this rule, the Department is adopting technical requirements to provide concrete standards to public entities on how to fulfill their obligations under title II to provide equal access to all of their services, programs, and activities that are provided via the web and mobile apps. The Department believes the final rule's requirements 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).

²⁰³ 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.

3 DESCRIPTION OF STEPS THE DEPARTMENT HAS TAKEN TO MINIMIZE ECONOMIC IMPACT ON SMALL PUBLIC ENTITIES

Since the inception of its rulemaking efforts on web accessibility, the Department has been mindful of how a rule in this space could impact small public entities and has taken numerous steps to minimize the impact of its rulemaking on those entities. Several of these steps are summarized below.

Over thirteen years ago, in July 2010, the Department published an advance notice of proposed rulemaking (“ANPRM”) on web accessibility for State and local government entities, among others.²⁰⁴ As part of the ANPRM, the Department included questions specifically targeted at the impact of this rulemaking effort on small entities, including a question seeking data about the costs of the rule for small public entities and a question about regulatory alternatives that would alleviate the burden on small public entities. The Department carefully reviewed the approximately 400 public comments received in response to the ANPRM, including information about the impact of the rulemaking effort on small public entities, which have informed the Department’s thinking as its rulemaking efforts have progressed.

In May 2016, the Department published a Supplemental ANPRM, which solicited public comment about a variety of issues related to establishing technical standards for web access under title II.²⁰⁵ In the Supplemental ANPRM, the Department asked a series of detailed questions about the impact of the rulemaking on small public entities. The Department received and closely reviewed more than 200 public comments in response to the Supplemental ANPRM, including comments on the impact of the rulemaking on small public entities.

²⁰⁴ Nondiscrimination on the Basis of Disability; Accessibility of Web Information and Services of State and Local Government Entities and Public Accommodations, 75 FR 43460 (July 26, 2010).

²⁰⁵ Nondiscrimination on the Basis of Disability; Accessibility of Web Information and Services of State and Local Government Entities, 81 FR 28658 (May 9, 2016).

While those discrete rulemaking efforts were closed in 2017, the Department still benefited from the knowledge it acquired from those efforts. When the Department reengaged in another rulemaking on this topic, specifically in crafting its 2023 NPRM on web and mobile app accessibility, the impact on small public entities was front of mind. In recognition of the fact that small public entities may have fewer resources and less flexible budgets, the Department proposed that public entities with a population of less than 50,000 would have an extra year (or three years total) to comply with the rule. The Department also proposed a series of exceptions to the technical standard for certain types of content, which the Department believed would help to ensure that all entities, including small ones, could reasonably comply with the rule. And the NPRM proposed that like all other public entities, small public entities would not have to undertake any actions that are unduly burdensome or that fundamentally alter the nature of their service, program, or activity. In the preliminary RFA, the Department also considered a variety of regulatory alternatives to minimize the impact of the rule on small public entities. The Department also published a fact sheet describing the NPRM's proposed requirements in plain language to help ensure that members of the public understood the rule and had an opportunity to provide feedback.²⁰⁶

After the NPRM was published, the Department attended a roundtable session convened by the Small Business Administration on September 14, 2023 to listen to concerns and comments raised by small public entities. Approximately 200 members of the public attended this session. The Department also attended a listening session hosted by the Great Lakes ADA Center at the University of Illinois at Chicago, in conjunction with the ADA National Network, which

²⁰⁶ U.S. Dep't of Just., *Fact Sheet: Notice of Proposed Rulemaking on Accessibility of Web Information and Services of State and Local Government Entities*, ADA.gov (July 20 2023), <https://www.ada.gov/resources/2023-07-20-web-nprm/#> [<https://perma.cc/B7JL-9CVS>].

approximately 350 members of the public, including representatives from public entities, attended. The Department carefully considered the comments shared during these sessions as it crafted its final rule. The Department has also considered the approximately 345 public comments it received during the public comment period on the NPRM, many of which addressed the impact of the rule on small public entities.

In drafting the final rule, the Department has retained many of the previously noted provisions from the NPRM. For example, small public entities have three years, instead of the two years provided to larger public entities, to begin complying with the final rule. The Department has also retained the exceptions for archived web content, certain preexisting conventional electronic documents, content posted by a third-party, and individualized, password-protected conventional electronic documents. In addition, under the final rule, small public entities, like all other entities, will not have to undertake any actions that are unduly burdensome or that fundamentally alter the nature of their service, program, or activity.

The Department has also added new provisions that it believes will help make it easier for small public entities to comply with the rule. The Department has added an exception for preexisting social media posts, which will mean that small public entities do not need to devote resources to remediating their previous social media posts, which many commenters argued would be onerous. The Department has also added a new § 35.205 titled “Effect of noncompliance that has a minimal impact on access,” which is intended to help limit potential liability for public entities, including small public entities, in particular circumstances. Section 35.205 applies when the public entity can demonstrate that nonconformance with the technical standard has such a minimal impact on access that it would not affect the ability of individuals with disabilities to use the public entity's web content or mobile app in a substantially equivalent

manner. This provision is discussed at more length below and in the accompanying Section-by-Section analysis in Appendix D to 28 CFR part 35. As discussed below, the Department has continued to analyze alternative regulatory proposals to ensure that its approach in the final rule limits the burden on small public entities. The Department will also publish a small entity compliance guide to help small entities understand their compliance obligations.²⁰⁷

4 COMMENT BY THE CHIEF COUNSEL FOR ADVOCACY OF THE SMALL BUSINESS ADMINISTRATION

With one exception, the Department received no public comments addressing specific substantive issues regarding the PRFA that accompanied the NPRM. The Office of Advocacy (Advocacy) of the U.S. Small Business Administration did provide specific comments on the PRIA and PRFA, in addition to comments on the NPRM. The Department has addressed those comments here or referred to the appropriate section of the accompanying Section-by-Section analysis in Appendix D to 28 CFR part 35 where those comments are addressed.

4.1 COMPLIANCE COSTS OF THE RULE

The Department is grateful for Advocacy's expertise and the information Advocacy provided to support the Department's ability to calculate costs for small public entities. The Department has attempted to incorporate Advocacy's comments in this analysis where possible, though there were some areas where the Department was unable to implement changes due to a lack of data or because the Department believes its modeling is more precise than the suggested modeling. Advocacy's primary concern was that small public entities would incur significant costs and other burdens in complying with this proposed rule. Advocacy listed the average annualized total cost and the average initial website testing and remediation costs by type of

²⁰⁷ See Pub. Law 104–121, § 212, 110 Stat. 847, 858 (1996) (5 U.S.C. 601 note).

small entity that the Department estimated and stated that small governments believe compliance costs are higher than these estimates. However, Advocacy provided no information on specific components or more appropriate data to use to estimate any of the costs.

Advocacy also stated that the Department failed to estimate compliance costs by economically similar small regulated entities, implying that the Department is required to calculate and compare compliance costs to revenue by size categories within the small entity classification. The Department instead analyzed entities by type of government both in the RIA and RFA because it believes that is a more appropriate grouping of regulated entities in terms of estimating compliance costs. If population size is also an indicator of economic similarity, Table 80 in the RFA shows that the distributions of population size are considerably tighter with government type than the distribution of population size for all small entities. Similarly, the Department does not agree with Advocacy's suggestion that using the ratio of the mean compliance cost to the mean revenue is invalid because the ratio may obfuscate any differing impacts for the smallest of the small entities. As previously noted, the Department believes that grouping small entities by government type is more appropriate than grouping by population, so taking the ratio of the average compliance cost to average revenue for each group decreases the variability. Furthermore, without calculating and showing the estimated compliance cost to revenue ratio per entity, there is always a possibility that an outlier exists in a group for which the mean values are not representative.

4.2 REGULATORY ALTERNATIVES FOR SMALL GOVERNMENTS

4.2.1 Adopting a different technical standard

Advocacy recommended that the Department adopt WCAG 2.0²⁰⁸ as the technical standard for State and local government entities to reduce burdens for State and local compliance and match the requirements that apply to the Federal Government under section 508 of the Rehabilitation Act. Having carefully considered Advocacy’s recommendation, the Department believes that adopting WCAG 2.1 Level AA as the technical standard strikes the appropriate balance between creating a workable standard for public entities (including small ones) and ensuring accessibility for people with disabilities.

As discussed at more length in § 35.200 of the accompanying Section-by-Section analysis in Appendix D to 28 CFR part 35, the Department believes that WCAG 2.1 Level AA is the appropriate technical standard for this rule. A significant number of commenters who commented on this issue supported this approach. As those commenters indicated, WCAG 2.1 Level AA is a widely used, accepted industry standard that was published in 2018,²⁰⁹ meaning that web developers have had time to familiarize themselves with it. WCAG 2.1 builds on and fully incorporates WCAG 2.0, which has been available since 2008. There is significant overlap between WCAG 2.0 and WCAG 2.1, given that 38 of the 50 Level A and AA success criteria in WCAG 2.1 are also included in WCAG 2.0.²¹⁰ The Department therefore believes that it will not be significantly more burdensome for public entities to comply with WCAG 2.1 than WCAG 2.0. In addition, small public entities will have three years to come into compliance with a final

²⁰⁸ W3C, *Web Content Accessibility Guidelines (WCAG) 2.0* (Dec. 11 2008), <https://www.w3.org/TR/WCAG20/> [<https://perma.cc/9BHY-K9ZD>].

²⁰⁹ See W3C, *Web Content Accessibility Guidelines 2.1* (June 5, 2018), <https://www.w3.org/TR/2018/REC-WCAG21-20180605/> [<https://perma.cc/R6KE-BX3U>].

²¹⁰ *Id.*

rule, which should also provide sufficient time to get acquainted with and implement WCAG 2.1. Moreover, although WCAG 2.0 is the standard under section 508, that rule was promulgated before WCAG 2.1 was published.²¹¹

In adopting a technical standard, the Department must balance not only the concerns raised by Advocacy, but also the need to adopt a standard that will promote accessibility for people with disabilities into the future. WCAG 2.1 includes important new criteria that are especially helpful or essential for people with disabilities using mobile devices, people with vision disabilities, and people with cognitive or learning disabilities.²¹² Moreover, in adopting WCAG 2.1, the Department is striking a balance between those commenters who, like SBA, advocated for the adoption of WCAG 2.0, and those commenters who advocated for the adoption of WCAG 2.2, which was published in October 2023.²¹³ The commenters who supported the adoption of WCAG 2.2 pointed out that doing so could be important to help the rule keep pace with changes in technology. The Department is declining to adopt WCAG 2.2, because it is a newer standard, public entities have had less time to familiarize themselves with it, and there are likely fewer resources and less guidance available to assist public entities in complying with that standard. However, the Department is mindful of commenters' discussion of the need to ensure this rule continues to be relevant as technology develops into the future. Although the Department does not believe it is appropriate to adopt WCAG 2.2 as the technical standard, the

²¹¹ See Information and Communication Technology (“ICT”) Standards and Guidelines, 82 FR 5790, 5791 (Jan. 18, 2017).

²¹² W3C, *Web Content Accessibility Guidelines 2.1, 0.5 Comparison with WCAG 2.0* (June 5, 2018), <https://www.w3.org/TR/2018/REC-WCAG21-20180605/> [<https://perma.cc/R6KE-BX3U>].

²¹³ W3C, *Web Content Accessibility Guidelines (WCAG) 2.2* (Oct. 5 2023), <https://www.w3.org/TR/WCAG22/> [<https://perma.cc/4KJZ-AUOH>].

Department also does not believe it is appropriate to adopt WCAG 2.0, which is approximately 15 years old.

The Department also does not believe it would be appropriate to set WCAG 2.0 as the technical standard for small public entities while requiring larger public entities to comply with WCAG 2.1. The Department received many comments emphasizing the need to apply the same technical standard to all public entities, regardless of size. Many commenters argued that people with disabilities in small jurisdictions need access to web-based local government services just as much as, and sometimes more, than their counterparts in larger jurisdictions, particularly given the long distances that people in rural areas might otherwise need to travel to access services, and the lack of public transportation or rideshares in those areas.²¹⁴ Commenters highlighted the problems that may be associated with imposing different technical standards based on the size of the entity, including lack of predictability in which government services people can expect to be accessible and confusion for web developers. Commenters also noted that there are many factors that may make it easier for small public entities to comply, including that small public entities may have smaller and less dynamic websites, can claim the undue burden and fundamental alteration limitations where appropriate, and can preserve resources by incorporating accessibility early in the process of content creation, instead of as an afterthought.

As noted above, the Department is very sensitive to the need to set a workable standard for small public entities and has therefore carefully crafted the rule to ensure feasibility. For example, the Department has given public entities with a population of less than 50,000 an extra year to comply with the rule. The Department has also created a series of exceptions to the

²¹⁴ See, e.g., NORC Walsh Ctr. for Rural Health Analysis & Rural Health Info. Hub, *Access to Care for Rural People with Disabilities Toolkit*, (Dec. 2016), <https://www.ruralhealthinfo.org/toolkits/disabilities.pdf> [<https://perma.cc/YX4E-QWEE>].

technical standard for certain types of content. And like all other public entities, small public entities will not have to undertake any actions that are unduly burdensome or that fundamentally alter the nature of their service, program, or activity.

A related Advocacy concern was that the Department did not properly measure the number of State and local government entities that currently comply with WCAG standards and that the Department has therefore underestimated the costs that State and local government entities will incur to come into compliance with WCAG 2.1. The Department applied an appropriate sampling method to select a statistical sample of entities that were used to estimate the population values. The Department evaluated what steps were needed to comply with all WCAG 2.1 accessibility standards for the regulated websites of these sample entities, then estimated the costs of conformance. Thus, the Department believes that it appropriately measured the current baseline level of accessibility.

Advocacy also recommended that the Department provide additional guidance on how the agency will measure compliance with WCAG 2.1, in recognition of the difficulty that public entities may have in achieving 100 percent conformance with a technical standard, 100 percent of the time. The Department has adopted a new regulatory provision, § 35.205, “Effect of noncompliance that has a minimal impact on access,” which sets forth the Department’s approach to measuring compliance with this rule. As noted above, this provision is intended to help limit potential liability for public entities, including small public entities, in particular circumstances. Section 35.205 applies when the public entity can demonstrate that nonconformance with the technical standard has such a minimal impact on access that it would not affect the ability of individuals with disabilities to use the public entity's web content or

mobile app in a substantially equivalent manner. The Section-by-Section analysis in Appendix D to 28 CFR part 35 discusses this provision in more detail.

4.2.2 Exception for small entities

Advocacy recommended that the Department complete a supplemental Regulatory Flexibility Analysis to explore creating an exception to the rule for certain small public entities, given that those entities may have particularly limited or inflexible budgets. The Department does not believe that creating a wholesale exception for small public entities would be appropriate, for the same reasons that it would not be appropriate to adopt a different technical standard for those entities. Such an exception would reduce the benefits of the rule for people with disabilities and could mean that a person with a disability in a small town would not have access to their local government's web-based services, but someone with the same disability living in a larger city would have such access. This would create unpredictability for people with disabilities with respect to which web content they could expect to be accessible.

An exception for small public entities would also reduce the benefits of the rule for those entities. The Department has heard from public entities seeking clarity about how to comply with their ADA nondiscrimination obligations when offering services via the web. Creating an exception for small public entities from the technical standard described in this rule would leave those entities with no clear standard for how to satisfy their existing obligations under the statute and the title II regulation. Moreover, as noted above, there may be factors that make compliance for small entities simpler than compliance for larger entities, such as the relative simplicity of some small entity websites compared to larger entity websites.

As discussed above, the Department has adopted a series of measures to ease the burden of the rule on small entities, including giving certain small entities an extra year to comply with

the rule, creating a series of exceptions to the rule for certain types of content, and making clear that small public entities, like all other public entities, will not have to undertake any actions that are unduly burdensome or that fundamentally alter the nature of their service, program, or activity. The Department believes that these measures will ensure the rule is generally workable for small entities without creating an exception that would potentially deny people with disabilities access to the web- and mobile-app based services of those entities on a permanent basis. The full reasoning underlying the Department’s decision not to adopt a wholesale exception to the rule for small public entities can be found in § 35.200 of the accompanying Section-by-Section analysis in Appendix D to 28 CFR part 35.

4.2.3 Flexibilities and a safe harbor for small entities

Advocacy also asked the Department to consider creating flexibilities in the rule for small entities that lessen their vulnerability to litigation that might arise as a result of this rule. As noted above, in part to address public entities’ concerns about WCAG 2.1 Level AA compliance obligations, this final rule includes a new provision, at § 35.205, about the effect of noncompliance that has a minimal impact on access. A discussion of that provision can be found at § 35.205 of the accompanying Section-by-Section analysis in Appendix D to 28 CFR part 35.

4.2.4 Compliance time for small entities

Advocacy suggested that the Department should give small public entities four or five years to comply with the rule. The Department carefully considered Advocacy’s concerns related to the compliance timeframe for small entities. The Department appreciates that small public entities may sometimes face unique challenges in making their web content and mobile apps accessible, given that small entities may have more limited or inflexible budgets than other entities. However, the Department also received comments from other members of the public

arguing that small public entities should be required to follow the same compliance date as all other entities, to avoid excessive delays in access for people with disabilities.

After carefully weighing these comments, the Department has decided that the compliance dates in the final rule—two years for large public entities and three years for small public entities and special district governments—strike the appropriate balance between the various interests at stake. The Department believes this longer compliance timeframe is prudent in recognition of the additional challenges that small public entities may face in complying, such as limited budgets, lack of technical expertise, and lack of personnel. The Department believes that providing an extra year for small public entities to comply will give those entities sufficient time to properly allocate their personnel and financial resources to make their web content and mobile apps comply with WCAG 2.1 Level AA, without providing so much additional time that people with disabilities have a reduced level of access to their State and local government entities' resources for an extended period. The Department's full responses to these concerns and rationale for the approach in the final rule is captured in § 35.200 of the accompanying Section-by-Section analysis in Appendix D to 28 CFR part 35.

4.2.5 More flexibility for captioning requirements

Advocacy also suggested that the Department should provide more flexibility for small public entities with respect to captioning. The Department understands Advocacy's concerns related to the captioning requirements under the rule, particularly with respect to live-audio captioning and small entities' ability to comply with these requirements. The Department's responses to these comments and rationale for the approach in the final rule is captured in § 35.200 of the accompanying Section-by-Section analysis in Appendix D to 28 CFR part 35.

4.2.6 More compliance materials or funding for small entities

Advocacy asked the Department to provide more compliance materials or funding to help small public entities comply with the rule. The Department plans to issue the required small entity compliance guide,²¹⁵ which should help small public entities better understand their obligations. In addition, although the Department does not currently operate a grant program to assist public entities in complying with the ADA, the Department will consider offering additional technical assistance and guidance in the future to help entities better understand their obligations. The Department’s full responses to these comments can be found in § 35.200 of the accompanying Section-by-Section analysis in Appendix D to 28 CFR part 35.

4.3 EXCEPTIONS

4.3.1 Archived web content and preexisting conventional electronic documents

Advocacy indicated that it supports the rule’s exception for certain preexisting conventional electronic documents. However, Advocacy recommended that the Department revise the definition of “archived web content” that is used in the exception for archived web content. The Department has responded to these comments and the rationale for its approach in the final rule in §§ 35.104 and 35.201 of the accompanying Section-by-Section analysis in Appendix D to 28 CFR part 35.

4.3.2 Third-party content

Advocacy indicated that it supported the NPRM’s approach to third-party content. However, Advocacy recommended giving small public entities more time to comply with the

²¹⁵ Small Bus. Enf’t Fairness Act, Pub. Law 104–121 § 212.

accessibility requirements for third-party web content that does not fall under an exception. The Department has responded to these comments and explained the rationale for the approach to third-party content in the final rule in § 35.201 of the accompanying Section-by-Section analysis in Appendix D to 28 CFR part 35.

5 NUMBER OF SMALL GOVERNMENTS AFFECTED BY THE RULEMAKING

The Department has examined the impact of this rule on small entities as required by the RFA. For the purposes of this analysis, impacted small public entities are independent State and local government entity units in the United States that serve a population less than 50,000.²¹⁶ 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.²¹⁷ No State governments qualify as small. All special district governments²¹⁸ 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 80 contains information about the distribution of population sizes of small entities by government type.

²¹⁶ 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://advocacy.sba.gov/wp-content/uploads/2019/06/How-to-Comply-with-the-RFA.pdf>.

²¹⁷ 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>.

²¹⁸ The rule defines “special district government” as “a public entity—other than a county, municipality, or township, or ISD—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 80: 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]	8,806	792	5,095	22,728
U.S. territory	48,520	47,567	48,520	49,472
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.²¹⁹ Postsecondary educational institutions are considered as separate institutions because their funding sources are different from those of traditional State and local government entities. 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

²¹⁹ 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>.

Education Statistics (NCES).²²⁰

Few public comments were received on the estimated number of small entities. The comments the Department did receive generally agreed with the Department's definition and calculation of small entities.

6 COMPLIANCE REQUIREMENTS, INCLUDING REPORTING AND RECORDKEEPING

The provisions of this rule include only web content and mobile app accessibility requirements for State and local government entities. Thus, there will be no new reporting or recordkeeping compliance requirements for small entities.

7 IMPACT OF THIS 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 VI.3.10 for details). The costs are less than or slightly above 1 percent of revenues for every entity type, so the Department believes that the costs of this regulation would not be unduly burdensome or costly for the regulated small governments.^{221,222} These costs include one-time costs for familiarization with the requirements of the rule, the purchase of

²²⁰ National Center for Education Statistics. (n.d.). *Summary Tables*. Retrieved from <https://nces.ed.gov/ipeds/SummaryTables/>.

²²¹ 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 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. 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>.

²²² As noted below, small independent community colleges are estimated to have cost to revenue ratios of 1.05 percent and 1.10 percent using a 3 percent and 7 percent discount rate, respectively. However, which entities are small and the revenue estimates are measured with a large amount of uncertainty. For example, the 2012 Census of Governments was the most recent data available that would allow the Department to estimate the composition of local government revenue by type of government entity and size (small or large). Revenue for small independent community colleges would be likely underestimated if there were more small independent community colleges in 2022 than there were in 2012. If this were true, the Department expects that the cost-to-revenue ratio for small independent community colleges would be lower.

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, these analyses involved multistage stratified cluster sampling to randomly select government entities, government entity websites, and 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 \$1.7 billion assuming a 3 percent discount rate and \$1.8 billion assuming a 7 percent discount rate (Table 84). Additional details on how these costs were estimated are provided in Section 3.

Calculating small government revenues was a three-step process. The most recent data disaggregating revenue by size are from the 2012 U.S. Census Bureau's database on individual local government finances (Table 81).²²³ The Department then multiplied the percentage of the total local government revenues in each entity type from the 2012 data by more recent total (*i.e.*, not separated into small and large) government revenue values, by entity type, from the U.S. Census Bureau's State and Local Government Finances.²²⁴ The Department used the 2020 total

²²³ 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.

²²⁴ U.S. Census Bureau. (2022, September 20). *2020 State & Local Government Finance Historical Datasets and Tables*. Table 1. State and Local Government Finances by Level of Government and by State: 2020. Retrieved from <https://www.census.gov/data/datasets/2020/econ/local/public-use-datasets.html>.

local government revenue instead of the more recent data to remove the influence of COVID-19 appropriations to State and local government entities. Revenue data for the small territories are from the United States Government Accountability Office.²²⁵ Lastly, the Department multiplied these 2020 revenue numbers by the ratio of the 2022 GDP deflator to the 2020 GDP deflator to express these revenues in 2022 dollars.²²⁶ See Section 3.10 for additional details on how these revenue numbers were derived.

Table 81: 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 82 and Table 83.

Table 84 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 except independent community colleges, for which costs are 1.05 percent and 1.10 percent of revenues using 3 percent and 7 percent discount rates respectively, so the Department

²²⁵ GAO. (June 2023). *U.S. TERRITORIES: Public Debt Outlook-2023 Update*. Retrieved from <https://www.gao.gov/assets/830/827340.pdf>.

²²⁶ 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&1921=survey&1903=13>. Accessed September, 2023.

believes that the costs of this regulation would not be unduly burdensome or costly for small entities affected by the rule.²²⁷

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 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.

In addition to Advocacy, several other commenters stated that small governments face greater burdens to making content accessible. These commenters generally cited a lack of staff availability and limited budgets. Although one title III trade group claimed that the small government cost estimates expressed in different ways in the NPRM's PRIA and PRFA were inconsistent, streams of costs over time can be expressed in various valid ways. The Department reported the same costs in different ways in different sections of the PRIA and PRFA depending on the type of analysis presented. Additionally, the Department believes all values were sufficiently labelled to allow the reader to understand the differences between the cost values.

²²⁷ 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 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. 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 ISD) are not compared to revenues. Revenues are not available directly for these community colleges. Further, 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.

The Department believes that comparing the average annualized cost to average annual revenue is the most appropriate measure of the financial burden of a rule. As this comparison of these values for small entities is less than one percent for every type of government entity except independent community colleges, the Department believes this rule will not be unduly burdensome or costly for a large number of small government entities.

Table 82: 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	\$320	\$16,452	\$0	N/A	N/A	\$790	\$17,561
County (small)	2,105	\$320	\$52,893	\$12,022	N/A	\$19,949	\$5,743	\$90,927
Municipality (small)	18,729	\$320	\$161,722	\$0	N/A	\$876	\$8,957	\$171,875
Township (small)	16,097	\$320	\$132,260	\$0	N/A	\$2,198	\$7,695	\$142,472
School district (small)	11,443	\$320	\$168,261	\$27,634	N/A	\$81,971	\$7,648	\$285,834
U.S. Territory (small)	2	\$320	\$1,026,731	\$68,209	N/A	N/A	\$6,160	\$1,101,420
Community College	1,146	\$320	\$1,020,862	\$15,916	\$3,617,001	N/A	\$67,409	\$4,721,508

Table 83: 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	\$308	\$14,226	\$0	N/A	N/A	\$683	\$15,217
County (small)	2,105	\$308	\$45,992	\$11,147	N/A	\$17,463	\$4,993	\$79,904
Municipality (small)	18,729	\$308	\$140,772	\$0	N/A	\$767	\$7,797	\$149,643
Township (small)	16,097	\$308	\$115,101	\$0	N/A	\$1,924	\$6,697	\$124,029
School district (small)	11,443	\$308	\$146,475	\$25,624	N/A	\$71,758	\$6,658	\$250,822
U.S. Territory (small)	2	\$308	\$894,141	\$63,264	N/A	N/A	\$5,365	\$963,078
Community College	1,146	\$308	\$900,471	\$15,031	\$3,099,245	N/A	\$59,460	\$4,074,515

Table 84: 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	\$10,659.4	\$11,376.5	\$22.4	\$23.9	\$69,686.3	0.03%	0.03%
Municipality	18,729	\$20,149.0	\$21,305.8	\$377.4	\$399.0	\$197,708.7	0.19%	0.20%
Township	16,097	\$16,666.1	\$17,616.8	\$268.3	\$283.6	\$59,802.5	0.45%	0.47%
Special district	38,542	\$2,058.7	\$2,166.5	\$79.3	\$83.5	\$298,338.3	0.03%	0.03%
School district [a]	11,443	\$36,023.7	\$38,347.6	\$412.2	\$438.8	\$354,350.5	0.12%	0.12%
U.S. territory	2	\$129,120.0	\$137,120.7	\$0.3	\$0.3	\$992.6	0.03%	0.03%
CCs [b]	960	\$553,504.8	\$580,119.2	\$531.4	\$556.9	N/A	N/A	N/A
CCs - independent	231	\$553,504.8	\$580,119.2	\$127.9	\$134.0	\$12,149.5	1.05%	1.10%
Total (includes all CCs)	87,878	\$19,245.7	\$20,324.4	\$1,691.3	\$1,786.1	N/A	N/A	N/A
Total (only independent CCs)	87,149	\$14,776.6	\$15,641.7	\$1,287.8	\$1,363.2	\$993,028.5	0.13%	0.14%

[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 VI.3.2), government website testing and remediation costs (Section VI.3.3), mobile app testing and remediation costs (Section VI.3.4), postsecondary education course remediation costs (Section VI.3.5), elementary and secondary education course remediation costs (Section VI.3.6), and costs for third-party websites (Section VI.3.7) averaged over ten years.

The Department quantified six types of benefits in the regulatory impact analysis, but due to data constraints, only includes three in its estimates of benefits. Those benefits are:

- Time savings for current users of State and local government entity websites;
- Time savings for current mobile app users; and
- Earnings from additional educational attainment.

The benefits which the Department estimated but did not incorporate are:

- Time savings for students and parents;
- 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); and
- Time savings for State and local government entities from reduced contacts (*i.e.*, fewer interactions assisting residents).

Only the last of these types of benefits directly impacts State and local government entity budgets. The Department quantified these benefits but has concerns regarding its estimates, thus these benefits are not included in the primary monetized benefit. The following discussion and estimates should be viewed in light of the limitations in the Department's methodology.

Improved website accessibility may 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 VI.4.4.2, the Department assumed that for each of the 5.4 million new users of State and local government entity 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 5.4 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 2022 OEWS, the median hourly wage rate is \$22.33.²²⁸ This was multiplied by two to account for benefits and overhead.²²⁹ This results in a loaded hourly wage rate of \$44.66 per hour. Multiplying 5.4 million hours by 80 percent and \$44.66 per hour results in time savings to small governments of \$192.6 million. Assuming lower benefits during the implementation period (see Section VI.4.3.5) results in average annualized benefits of \$162.5 million and \$158.1 million using a 3 percent and 7 percent discount rate, respectively.

The parameters used here are the same as those used in the RIA 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.

²²⁸ OEWS data available at: U.S. Bureau of Labor Statistics. (2023, April 25). *May 2022 National Industry-Specific Occupational Employment and Wage Estimates*. Retrieved from https://www.bls.gov/oes/current/naics2_99.htm#43-0000.

²²⁹ 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>.

8 RELEVANT FEDERAL RULES DUPLICATING, OVERLAPPING, OR CONFLICTING WITH THE RULE

The Department has determined that there are no other Federal rules that are either in conflict with this 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 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.

9 ALTERNATIVES TO THE RULE

Under the Regulatory Flexibility Act, agencies must consider any significant alternatives to the 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 rule to meet these requirements, presented in Table 85 below.

Table 85: 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	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 VI.3.3.3–VI.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.²³⁰ 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 VI.5.1 and VI.5.2,

²³⁰ 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/>.

respectively. Here, the Department summarizes the costs and benefits of these regulatory alternatives for small entities. See Section 4.2 for additional discussion about regulatory alternatives.

Costs differ for the regulatory alternatives as explained in Section VI.5.1. The results are summarized in Table 86 and Table 87.

Table 86: Average Annualized Costs for Small Entities of Regulatory Alternatives, 7 Percent Discount Rate (Millions)

Government Type	Rule	WCAG 2.1 Level A	WCAG 2.0 Level AA	Longer Implementation Period
County	\$23.9	\$23.9	\$23.9	\$22.7
Municipality	\$399.0	\$398.0	\$399.0	\$379.6
Township	\$284.3	\$283.2	\$284.2	\$270.3
Special district	\$83.5	\$83.4	\$83.5	\$79.4
School district [a]	\$438.8	\$437.8	\$437.6	\$414.4
U.S. territory	\$0.3	\$0.3	\$0.3	\$0.3
CCs [b]	\$556.9	\$555.2	\$552.2	\$527.0
CCs - independent	\$134.0	\$133.6	\$132.9	\$126.8
Total (includes all CCs)	\$1,786.7	\$1,781.8	\$1,780.6	\$1,693.6
Total (only independent CCs)	\$1,363.8	\$1,360.2	\$1,361.3	\$1,293.4

[a] Excludes community colleges, which are costed separately.

[b] Includes all dependent community college districts and the small independent community college districts.

Table 87: Average Annualized Costs Per Small Entity of Regulatory Alternatives, 7 Percent Discount Rate

Government Type	Rule	WCAG 2.1 A	WCAG 2.0 AA	Longer Implementation Period
County	\$11,377	\$11,342	\$11,353	\$10,770
Municipality	\$21,306	\$21,250	\$21,302	\$20,267
Township	\$17,659	\$17,595	\$17,656	\$16,791
Special district	\$2,167	\$2,165	\$2,167	\$2,059
School district [a]	\$38,348	\$38,257	\$38,239	\$36,216
U.S. territory	\$137,121	\$136,238	\$136,782	\$130,597
CCs [b]	\$580,119	\$578,378	\$575,198	\$548,982
CCs - independent	\$580,119	\$578,378	\$575,198	\$548,982
Total (includes all CCs)	\$20,332	\$20,276	\$20,262	\$19,272
Total (only independent CCs)	\$15,649	\$15,607	\$15,620	\$14,841

[a] Excludes community colleges, which are costed separately.

[b] Includes all dependent community college districts and the small independent community college districts.

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 A1 shows the counts for the universe of State and local governments affected by the 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 A1: 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 ISDs 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 91,489 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 A1, 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 A2 below, among the entity types in Table A1 (excluding institutions of higher education).²³¹ 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

²³¹ The sample size grew to 207 entities, as minor corrections were made to capacity estimates.

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 following formula:

$$c_g = \min \left(c_{\min} + \left(\hat{F} - \left(c_{\min} \times |G^{c_{\min}}| + \sum_{g \in G^{c_{\min}}} c_g \right) \right) \times \frac{c_g}{\sum_{g \in G^{c_{\min}}} c_g}, c_{\min} \right)$$

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 as²³²:

$$c_{\text{School district (small)}} = \min \left(15 + \left(200 - (15 \times 10 + 2 + 3) \right) \times \frac{11,443}{89,594}, 11,443 \right) = 21.$$

Table A2 displays the number of entities in the final sample of each entity type.

²³² Sample size calculations were rounded to the nearest whole number.

Table A2: 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
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 A3: Sample Frames and Sample Sizes for States

Variable	Stratum 1	Stratum 2
Definition	$\leq 4,505,836$ in population	$>4,505,836$ in population
Pop. size	26	25
Sample counts	9	7
Sampling rate	34.6%	28.0%

Table A4: Sample Frames and Sample Sizes for Small Counties

Variable	Stratum 1	Stratum 2
Definition	$\leq 15,617$ in population	$>15,617$ in population
Pop. size	1053	1052
Sample counts	8	8
Sampling rate	0.76%	0.76%

Table A5: Sample Frames and Sample Sizes for Large Counties

Variable	Stratum 1	Stratum 2
Definition	$\leq 128,987$ in population	$>128,987$ in population
Pop. size	463	463
Sample counts	8	8
Sampling rate	1.7%	1.7%

Table A6: 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 $\leq 3,484$ 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 A7: Sample Frames and Sample Sizes for Large Municipalities

Variable	Stratum 1	Stratum 2
Definition	$\leq 86,141$ in population	$>86,141$ in population
Pop. Size	383	383
Sample counts	8	7
Sampling rate	2.1%	1.8%

Table A8: Sample Frames and Sample Sizes for Small Townships

Variable	Stratum 1	Stratum 2	Stratum 3	Stratum 4
Definition	≤ 221 in population	>221 and ≤ 880 in population	>880 and $\leq 2,472$ in population	$>2,472$ in population
Pop. size	4038	4015	4022	4022
Sample counts	7	6	6	6
Sampling rate	0.17%	0.15%	0.15%	0.15%

Table A9: Sample Frames and Sample Sizes for Large Townships

Variable	Stratum 1	Stratum 2
Definition	$\leq 73,604$ in population	$>73,604$ in population
Pop. Size	78	78
Sample counts	8	7
Sampling rate	10.3%	9.0%

Table A10: 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 A11: Sample Frames and Sample Sizes for Small School Districts

Variable	Stratum 1	Stratum 2	Stratum 3	Stratum 4
Definition	$\leq 1,944$ in population	$>1,944$ and $\leq 5,095$ in population	$>5,095$ and $\leq 11,774$ 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 A12: Sample Frames and Sample Sizes for Large School Districts

Variable	Stratum 1	Stratum 2
Definition	$\leq 87,948$ in population	$>87,948$ in population
Pop. size	392	387
Sample counts	8	7
Sampling rate	2.0%	1.8%

Table A13: 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 A14: 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 A15: 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 A16: Sample Frames and Sample Sizes for Community Colleges

Variable	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 entity 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.²³³ 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 A1): 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

²³³ 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.

variables were collected in the first stage of sampling, with no clusters or SSUs.²³⁴ Therefore, 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:

$$W_{hi} = \frac{1}{P_h \times P_i} = \frac{N_h}{n_h} \times \frac{M_i}{m_i}$$

²³⁴ 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.

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 9.4²³⁵ was used to calculate the following quantities separately for each entity type described in Table A86:²³⁶

- 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 A1. 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

²³⁵ 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

²³⁶ 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.

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, 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.²³⁷ 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 0.²³⁸

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 A17 and Table A18 show the resulting 90 percent confidence intervals (CIs) for the final website costs derived in Section 3.3.

²³⁷ @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/>

²³⁸ Due to truncation, some confidence intervals may not be centered around the calculated value.

Table A17: 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	\$3,211.3	\$2,724.4	\$3,901.4
Year 2	\$3,537.5	\$3,001.6	\$4,296.5
Year 3	\$2,258.5	\$1,858.9	\$2,741.7
Year 4	\$817.8	\$696.1	\$981.8
Year 5	\$817.8	\$696.1	\$981.8
Year 6	\$817.8	\$696.1	\$981.8
Year 7	\$817.8	\$696.1	\$981.8
Year 8	\$817.8	\$696.1	\$981.8
Year 9	\$817.8	\$696.1	\$981.8
Year 10	\$817.8	\$696.1	\$981.8
PV of 10-year costs, 3% discount rate	\$13,181.7	\$11,205.1	\$15,865.5
Average annualized costs, 3% discount rate	\$1,545.3	\$1,313.6	\$1,859.9
PV of 10-year costs, 7% discount rate	\$11,532.2	\$9,802.5	\$13,885.8
Average annualized costs, 7% discount rate	\$1,641.9	\$1,395.7	\$1,977.0

Table A18: 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	\$366.5	\$254.9	\$478.4	\$323.3	\$224.9	\$422.0
County (small)	\$111.3	\$70.0	\$158.9	\$96.8	\$60.8	\$138.2
County (large)	\$1,078.9	\$644.4	\$1,545.9	\$951.7	\$568.4	\$1,363.6
Municipality (small)	\$3,028.9	\$1,752.2	\$4,361.9	\$2,636.5	\$1,524.6	\$3,797.4
Municipality (large)	\$783.7	\$478.1	\$1,115.4	\$691.2	\$421.7	\$983.9
Township (small)	\$2,129.0	\$1,542.8	\$2,771.1	\$1,852.8	\$1,342.3	\$2,412.0
Township (large)	\$45.5	\$22.9	\$79.6	\$40.1	\$20.2	\$70.2
Special district	\$634.1	\$193.2	\$1,240.4	\$548.3	\$164.4	\$1,076.3
U.S. territory (small)	\$2.1	\$2.1	\$2.1	\$1.8	\$1.8	\$1.8
U.S. territory (large)	\$8.2	\$8.2	\$8.2	\$7.3	\$7.3	\$7.3
School district (small)	\$1,925.4	\$1,166.5	\$2,783.0	\$1,676.1	\$1,015.2	\$2,423.0
School district (large)	\$1,014.2	\$519.8	\$1,603.0	\$894.6	\$458.5	\$1,414.0
Public University	\$884.1	\$482.9	\$1,554.9	\$779.8	\$425.9	\$1,371.6
Community College	\$1,169.9	\$415.6	\$2,305.4	\$1,031.9	\$366.5	\$2,033.6
Total	\$13,181.7	\$11,205.1	\$15,865.5	\$11,532.2	\$9,802.5	\$13,885.8

A.7 MEDIAN COSTS PER ENTITY

To complement the mean website testing and remediation costs per entity presented in Section 3.3.1, this section presents median costs in each of the categories that comprise website testing and remediation.

These results are included because the cost data in the sample are right skewed, so for most entity types, high costs for a few sampled entities disproportionately drive averages. This skew should have no bearing on the estimates for total costs but means that averages may indicate a higher cost than most entities can expect to incur. The weighted median values in the following tables show central values for the population of entities without respect to the magnitude of outliers. They can serve as a further resource for public entities to use in estimating their potential cost burden.

Table A19: Median Initial Website Remediation and Testing 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	\$331,454	\$1,652,409	\$336,866	\$70,921	\$2,568,425
County (small)	2,105	\$1,971	\$4,993	\$982	\$214	\$11,335
County (large)	926	\$42,259	\$206,436	\$29,281	\$8,860	\$299,120
Municipality (small)	18,729	\$1,801	\$4,145	\$268	\$178	\$8,333
Municipality (large)	766	\$74,606	\$368,169	\$67,398	\$15,802	\$498,141
Township (small)	16,097	\$1,152	\$898	\$278	\$39	\$3,157
Township (large)	156	\$4,009	\$15,184	\$7,176	\$652	\$37,923
Special district	38,542	\$0	\$0	\$240	\$0	\$240
Territory (small)	2	\$70,783	\$349,057	\$204,876	\$14,981	\$639,698
Territory (large)	3	\$224,689	\$1,118,584	\$296,500	\$48,009	\$1,687,782
School district (small)	11,443	\$12,216	\$56,221	\$270	\$2,413	\$71,213
School district (large)	779	\$44,150	\$215,892	\$8,012	\$9,266	\$277,187
Public university	744	\$31,351	\$151,893	\$17,519	\$6,519	\$236,581
Community college	1,146	\$18,573	\$88,007	\$16,749	\$3,777	\$131,335

Table A20: Median 10-Year Total and Annualized Website Testing and Remediation Costs per Entity

Type of Government Entity	PV of 10-Year Costs per Entity, 3% Discount Rate	Annualized Costs per Entity, 3% Rate	PV of 10-Year Costs per Entity, 7% Discount Rate	Annualized Costs per Entity, 7% Rate
State	\$4,278,650	\$501,588	\$3,774,296	\$537,375
County (small)	\$18,985	\$2,226	\$16,471	\$2,345
County (large)	\$499,037	\$58,502	\$440,149	\$62,667
Municipality (small)	\$14,165	\$1,661	\$12,273	\$1,747
Municipality (large)	\$830,515	\$97,362	\$732,559	\$104,300
Township (small)	\$5,856	\$686	\$5,036	\$717
Township (large)	\$64,004	\$7,503	\$56,389	\$8,029
Special district	\$1,816	\$213	\$1,466	\$209
Territory (small)	\$1,027,795	\$120,489	\$895,068	\$127,438
Territory (large)	\$2,811,906	\$329,641	\$2,480,423	\$353,156
School district (small)	\$115,117	\$13,495	\$100,194	\$14,265
School district (large)	\$462,508	\$54,220	\$407,925	\$58,079
Public university	\$394,876	\$46,291	\$348,264	\$49,585
Community college	\$219,584	\$25,742	\$193,633	\$27,569

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 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: Cost Analysis Statistical Methodology.

Table B1: 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 B2: 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 B3: Sampled Counties ($\geq 50,000$ 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
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 B4: 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
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 B5: Sampled Municipalities ($\geq 50,000$ 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 B6: 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 B7: Sampled Townships ($\geq 50,000$ 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
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 B8: 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
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

Name	State	County	Locality	First Stage Survey Weight, W_h	Second Stage Survey Weight, W_{hi}
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
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

Name	State	County	Locality	First Stage Survey Weight, W_h	Second Stage Survey Weight, W_{hi}
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 B9: Sampled ISDs (<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 ISD 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
Dover School District	Pennsylvania	York	Dover	4	554.20	1385.50

Name	State	County	Locality	Stratum	First Stage Survey Weight, W_h	Second Stage Survey Weight, W_{hi}
Haddonfield Borough School District	New Jersey	Camden	Haddonfield	4	554.20	1108.40
Port Neches ISD 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 B10: Sampled ISDs ($\geq 50,000$ 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 ISD 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
Amarillo ISD	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 B11: 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 B12: U.S. Territories ($\geq 50,000$ 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 B13: 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 B14: 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 C1.

Table C1: 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.^{239,240}

²³⁹ PowerMapper Software. (2022). *Accessibility Standard: WCAG 2.1*. Retrieved from <https://www.powermapper.com/products/sortsite/rules/accwcag2.1/>.

²⁴⁰ 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.

Table C2: 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
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

Success Criterion	Description	Fix Once, Fix Everywhere
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
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

Success Criterion	Description	Fix Once, Fix Everywhere
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
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

Success Criterion	Description	Fix Once, Fix Everywhere
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
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=treemap 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

Success Criterion	Description	Fix Once, Fix Everywhere
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
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

Success Criterion	Description	Fix Once, Fix Everywhere
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
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

Success Criterion	Description	Fix Once, Fix Everywhere
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
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

Success Criterion	Description	Fix Once, Fix Everywhere
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
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

Success Criterion	Description	Fix Once, Fix Everywhere
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
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

Success Criterion	Description	Fix Once, Fix Everywhere
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
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

Success Criterion	Description	Fix Once, Fix Everywhere
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
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

Success Criterion	Description	Fix Once, Fix Everywhere
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
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

Success Criterion	Description	Fix Once, Fix Everywhere
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
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

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 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
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

Success Criterion	Description	Fix Once, Fix Everywhere
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
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

Success Criterion	Description	Fix Once, Fix Everywhere
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
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

Success Criterion	Description	Fix Once, Fix Everywhere
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
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

Success Criterion	Description	Fix Once, Fix Everywhere
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
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

Success Criterion	Description	Fix Once, Fix Everywhere
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