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Projections of Disability in the Department of Defense Workforce through 2031

Estimating Future Assistive Technology
Requirements for Department of Defense Civilian
Employees and Service Members



This report was optimized for accessibility in August 2024 and reflects minor formatting and editorial adjustments.

For more information on this publication, visit www.rand.org/t/RRA1359-1.

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Published by the RAND Corporation, Santa Monica, Calif.

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Library of Congress Cataloging-in-Publication Data is available for this publication.

ISBN: 978-1-9774-1203-4

Cover: Adapted from Rich McFadden/U.S. Air Force.

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About This Report

As part of the 2018 National Defense Strategy, the federal government articulated a need to cultivate “a motivated, diverse, and highly skilled civilian workforce” (U.S. Department of Defense [DoD], 2018, p. 8), including persons with disabilities. Furthermore, Sections 501, 504, and 508 of the Rehabilitation Act of 1973, multiple National Defense Authorization Acts, and a range of executive orders direct that DoD hire employees with disabilities and provide them with reasonable accommodations. To satisfy these legal mandates, DoD requires both current and projected estimates of the size of DoD’s workforce population with disabilities, with a need for specific estimates by type of disability, to determine the assistive technology (AT) required. To provide estimates of future AT requirements among DoD employees, this report first develops novel projections of the DoD civilian workforce by disability type from 2021 to 2031. Costs associated with potential anticipated requests for AT are estimated. Similar calculations are derived for injured and wounded service members. We note that our disability projections are for *all* civilian employees and service members within these disability categories, not only those who successfully seek out and obtain AT from DoD directly. Our estimates of anticipated requests for AT are subsequently derived from the total disability projections, and are the basis of our cost estimates. These estimates are, by construction, larger than requests that any given DoD agency would receive, since they attempt to estimate both these direct fulfilled requests, fulfilled requests to any potential accommodation provider, and unfulfilled requests.

The research reported here was completed in August 2023 and underwent security review with the sponsor and the Defense Office of Prepublication and Security Review before public release.

RAND National Security Research Division

This research was sponsored by Defense Human Resources Activity in the Office of the Under Secretary of Defense for Personnel and Readiness and conducted within the Personnel, Readiness, and Health Program of the RAND National Security Research Division (NSRD), which operates the National Defense Research Institute (NDRI), a federally funded research and development center sponsored by the Office of the Secretary of Defense, the Joint Staff, the Unified Combatant Commands, the Navy, the Marine Corps, the defense agencies, and the defense intelligence enterprise.

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Acknowledgments

We gratefully acknowledge the assistance of a number of individuals at the Computer/Electronic Accommodations Program (CAP), including Curtis D. Bell, the former director; Randy Cooper, the current director; and Elizabeth Sadler, the deputy director, for facilitating our data collection. We would also like to thank Brandon Kendrick at CAP for help interpreting the CAP data. At the RAND Corporation, we also thank Daniel Ginsberg and Molly McIntosh for their management support, Heather Krull for insightful comments, and Priyanka Anand for her excellent comments and critiques. We also thank Julie Ann Tajiri for administrative assistance. The Office of the Under Secretary of Defense for Personnel and Readiness deserves special thanks for sponsoring this research.

Summary

Issue

The Department of Defense (DoD) requires both current and projected estimates of the size of its workforce population with disabilities. These estimates support the strategic goals outlined in the 2018 National Defense Strategy to cultivate “a motivated, diverse, and highly skilled civilian workforce” (DoD, 2018, p. 8), as well as a range of executive orders directing DoD to hire employees with disabilities and provide them with reasonable accommodations. Furthermore, estimates by type of disability are necessary to determine the assistive technology (AT) required and its anticipated costs through 2031. Overall federal employee disability projections are also derived to provide information pertinent to the Rehabilitation Act of 1973 and multiple executive orders, including Executive Order 14035. Inasmuch as AT may aid in the recovery and retention of injured service members or may aid in the postservice employment of service members medically separating, we also seek to estimate potential demand for AT from these groups. As such, this report develops projections of the DoD civilian employee population, and of injured and wounded service members, with specific disabilities already categorized by DoD’s centralized AT procurer (hearing, vision, cognitive, and dexterity disabilities), as well as the potential anticipated requests for AT by these populations and their costs, between 2021 and 2031.

Approach

We take two general approaches to estimate the flow of potential requests: where possible, we use new diagnoses or new disability ratings by disability category among service members as direct estimates of potential requests. For certain service member disability categories, as well as for all DoD civilian workers, new diagnoses or ratings were not available to us, and hence we estimated the population, or “stock,” of all individuals in these categories. Although it is conceivable that, in any given year, this entire population would make AT requests, the academic literature on accommodation requests indicates that only a subset of individuals with particular disabilities requests accommodations in any particular year; as such, we convert our estimated stock of all individuals in these disability categories into estimated flows of potential requests by applying rates of accommodation requests drawn from this literature. These estimated flows still represent the *potential* requests, but under assumptions we consider more realistic than assuming all individuals annually make new AT requests.

To derive projections of DoD civilians with disabilities from 2021 to 2031, this report uses a combination of two large, long-running nationally representative survey sources (the

American Community Survey and the National Health Interview Survey), U.S. Census Bureau population projection data, and administrative data from the Defense Manpower Data Center. We first derive baseline (2021) disability prevalence by age, sex, and race/ethnicity subgroups. Next we derive two projections of the overall federal and DoD civilian workforces through 2031 based on U.S. Bureau of Labor Statistics (BLS) workforce projections and observed trends in the DoD civilian workforce. Baseline demographic composition of each workforce is adjusted throughout the period to reflect anticipated population composition changes in age and race/ethnicity through 2031. Finally, disability prevalence rates by age, sex, and race/ethnicity are applied to the projections to derive estimates of the number of federal and DoD civilian workers with specific disabilities through 2031. We present two scenarios to provide a range of estimates: one based on the BLS's anticipated changes (reduction) in the size of the overall federal workforce, and one based specifically on observed (status quo increasing) trends in the size of the DoD civilian workforce.

Anticipated costs for AT are then derived by first estimating the number of workers who will request accommodations among all workers with each type of disability. Administrative data from the Computer/Electronic Accommodations Program (CAP) are then used to estimate the average number and the average cost of accommodations for a given civilian worker with a given type of disability. Annual and total 2022–2031 cost estimates of AT are presented for both the shrinking workforce and status quo (increasing) workforce scenarios.

CAP procures technologies for two categories of service members. The first is those with health conditions interfering with their deployability and thus resulting in their referral to the Disability Evaluation System (DES) process. This process is discussed further in Chapter 4, but we note that entering the DES process begins with a referral to a Medical Evaluation Board; CAP refers to this status as wounded service member-referred to a Medical Evaluation Board (WSM-MEB). CAP also procures technologies for service members with health conditions who have not been referred to the DES, which it refers to as wounded service member-continuing on active duty (WSM-COAD).

For WSM-MEBs, we rely on DES administrative records and publicly available reports to measure the annual numbers of these service members who are potentially eligible to receive CAP AT by disability category given a disability rating for specific health conditions. We use these data sources to construct a measure of each CAP disability category under study, and then use historical case statistics to provide an estimated range for service members undergoing disability evaluation over the coming decade. Our primary scenario is an annual average across the available data from 2011 to 2018, and we provide two alternative annual estimates for each condition: the pre-2016 peak of cases during relatively high-conflict service experiences, and the post-2016 trough of cases during relatively less conflict-intensive periods. We assume that each newly disability rated WSM-MEB may potentially seek out AT, and we apply the CAP-provided average number and cost of technologies per disabling health condition, as in the civilian analysis.

Measuring the prevalence of accommodation-sensitive health conditions among WSM-COADs requires stronger assumptions, given that, unlike those separating via the

DES, there are no disability rating system records. We thus focus on diagnoses among active service members of specific conditions that represent the most frequent conditions for which WSM-COADs receive AT from CAP. Using existing publicly accessible documents, including military medical surveillance publications, RAND Corporation reports, and the military medical research literature, we estimate the average, peak, and trough prevalence of these diagnoses from fiscal year (FY) 2016 to FY 2020. As in the civilian analysis, we estimate the number of new requests for accommodations from each medical diagnosis group among WSM-COADs. We then draw on CAP administrative records to apply an assumption of average number of accommodations per request, and the cost per accommodation unit.

Key Findings

Overall, we find that projected annual costs for estimated potential requests are between \$14.5 and \$18.1 million in 2021 dollars. This range is between three and four times as large as recent annual costs for each of the populations—DoD civilian workers, WSM-COADs, and WSM-MEBs—that CAP procures AT for, but we note again that, by construction, these estimates are larger than requests that any given DoD agency would receive, since they attempt to estimate these direct fulfilled requests, fulfilled requests to any potential accommodation provider, and unfulfilled requests. That is, given historical data, we estimate many more individuals who are accommodation sensitive—those with health conditions that interfere with their work and for whom accommodations would lessen this interference—than CAP alone has procured technology for. Given that we focus on four specific categories of disability that are just a subset of all disabilities, the implication is that the accommodation-sensitive DoD civilian workers and service members are substantially greater in number than indicated by historical CAP procurement.

Our DoD civilian projections include two scenarios to provide a range of estimates: first, on the low end, that there will be a 2.4-percent decrease in the overall size of the workforce under the shrinking workforce scenario (in pace with the overall federal workforce projected by the BLS); or, second (based on observed trends since 2007 in the size of the DoD civilian workforce specifically), that there will be an increase of 12.4 percent in the growing workforce scenario. In both scenarios, the compositional change in the workforce with specific disabilities is the same between 2021 and 2031: we project that the proportion of the DoD civilian workforce with hearing disabilities will decline by 2.4 percent, the proportion with vision disabilities will decline by 0.7 percent, the proportion with cognitive disabilities will increase by 1.2 percent, and the proportion with dexterity disabilities will increase by 1.3 percent. Note that DoD civilian workers with dexterity disabilities are already the largest group of the four and represent more than half of all recent requests for AT by DoD civilian workers from CAP. These trends are generally consistent with the trends projected for the federal workforce, with the exception that the proportion of the federal

workforce with vision disabilities is projected to remain constant over time. We use the two workforce size projections to derive a low-cost scenario and a high-cost scenario for projected disabled DoD civilian workers.

In our projections for WSM-COAD and WSM-MEB costs, we also construct a range of scenarios, with a low-cost scenario based on lower prevalence after 2015, a high-cost scenario based on higher prevalence before 2015, and an average of the two to provide a middle-cost scenario.

We provide estimated annual costs in 2021 dollars, and then provide ten-year costs based on Congressional Budget Office (CBO) inflation projections through 2031. Our results are summarized in Table S.1, alongside CAP's own average annual costs from 2016 to 2019, inflated to 2021 dollars with the Consumer Price Index for All Urban Consumers.

We note again that our estimates are of *potential* requests, although they are based on empirical evidence of rates of actual requests in other populations. CAP itself is not the sole provider of accommodations to DoD civilian workers and service members with these disabilities. Furthermore, we discuss in Chapter 6 the assumptions underlying this result and how sensitive these findings are. In particular, if the rate at which a given DoD civilian worker requests an accommodation differs from our assumptions (based on estimates from other civilian populations of *any* requests by workers with a given disability, as well as the assumption that the frequency of these requests are once every two years for hardware or every year for software and services), our estimates would be directly and substantially affected.

But a general finding from our estimates are that we find that costs for civilian workers and service members are higher than historical CAP procurements (in particular, among WSM-MEBs), indicating that the prevalence of disabling conditions in these populations is much higher than rates of current CAP requests.

TABLE S.1
Costs, by Type of Recipient, FY 2017–FY 2021

Type of Recipient	CAP Average Annual Cost, 2016–2019 (in 2021 Dollars)	Annual Estimates (in 2021 Dollars)			Total Ten-Year Projections (CBO-Projected Inflation)		
		Low	Middle	High	Low	Middle	High
DoD Civilian	3,781,709	9,750,102		10,469,724	113,093,436		121,440,482
WSM-COAD	1,078,421	3,262,107	3,746,607	4,425,280	39,150,090	44,964,801	53,109,887
WSM-MEB	356,051	1,588,008	2,177,287	3,224,946	19,058,441	26,130,650	38,704,111
Total	5,216,181	14,600,217		18,119,950	171,301,967		213,254,480

NOTE: The range for DoD civilian workforce projections depends on assumptions with the overall DoD workforce shrinking by 2.4 percent over ten years (low estimate) or growing 12.4 percent over ten years (high estimate). The range of estimates for both wounded service member groups is based on the higher-conflict period before 2015 (high estimate), the lower-conflict period after 2015 (low estimate), or the average of the two (middle estimate).

Key Assumptions

The estimates and projections in this report are necessarily based on a large number of simplifying assumptions based on data limitations and a ten-year projection horizon. Estimates are likely sensitive to all the assumptions. Here we highlight key assumptions for which our projections are particularly sensitive.

For the civilian DoD and federal worker projections, the most fundamental assumptions relate to the projected workforce size trends over time. For the federal workforce, we adopt the BLS projection of a decline in total federal workforce size through 2031. For the civilian DoD workforce size, we assumed two scenarios that reflect hypothetical lower and upper estimates to provide a range; the lower estimate applies the BLS decrease assumption, and the upper estimate is based on the observed status quo trend in DoD civilian workforce size between 2007 and 2021. These two scenarios provide a range of total DoD civilian workforce sizes of between 747,000 and 860,000. To the extent that actual DoD workforce size diverges from either scenario, our estimates will similarly over- or underestimate the number of disabled workers; however, although the assumption of the overall growth of the DoD civilian workforce affects our estimates, the relative turnover in this workforce results in a narrow range for our final cost estimates, as shown in the first row of Table S.1.

Another consequential assumption is that the demographic composition of federal and DoD civilian workforces will shift at pace with the demographic shifts projected by the Census Bureau, with decreasing proportions of non-Hispanic white employees and a general shift toward older ages. Differences in disability prevalence by age and race/ethnicity will affect disability prevalence in the workforce as these demographics shift over time. If workforce demographic composition shifts diverge from population level shifts, our estimates will over- or underestimate the number of disabled workers depending on the demographic characteristic and the type of disability.

A third important limitation for our projections of DoD civilians with disabilities is that we have assumed that the prevalence of disabilities in the DoD civilian workforce is the same as in the overall federal workforce. If disability rates differ between DoD civilians and federal workers overall, our estimates will not reflect this. We note that our analysis is limited to full-time civilian DoD workers, which does not include the roughly 4 percent who are part-time, seasonal, or participating in internship programs. Furthermore, if federal or DoD employment policy substantially changes with regard to the hiring or continued employment of workers with disabilities, our projections may diverge from actual growth in employment of these workers.

A pivotal assumption for both our DoD civilian estimates and for the WSM-COAD estimates is how we estimate the fraction of accommodation-sensitive individuals that will request an accommodation each year, and how often. We drew on research based on rates of accommodation in the broader workforce for our disability categories, which itself provides limited information on how often an individual with a given disability seeks an accommodation. To arrive at the frequency of requests, we worked in consultation with CAP to arrive at

our assumption of every other year for hardware and every year for software and services; to the extent these rates systematically differ for the populations under study here or the rates of accommodation differ systematically from our estimation approach, our estimates will be biased accordingly.

For our WSM-COAD estimation, we relied on diagnoses to indicate the presence of an accommodation-sensitive health condition. If conditions are systematically underdiagnosed, or if specific diagnoses are indicative of conditions that are less likely to interfere with work, our findings on prevalence would be biased in one direction or the other. To the extent that diagnoses and rates of requests for accommodations differ substantially (e.g., if individuals seek out CAP services *instead* of medical treatment), then our estimates may be biased accordingly. These biases would particularly affect our dexterity and cognitive disability categories, since these categories represent the majority of costs.

Finally, we note one continuing source of uncertainty: the long-term impacts of COVID-19—namely, postacute sequelae of the virus (so-called long COVID) on rates of disability in the federal and DoD civilian workforces. Applying recent published estimates based on U.S. Department of Veteran Affairs patients to our populations, we find that the overall increase in cost would be approximately 3 percent in each of our scenarios, but we note that the evidence base on the consequences of long COVID for disability rates is rapidly evolving.

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Introduction

Established by the U.S. Department of Defense (DoD) in 1990, the Computer/Electronic Accommodations Program (CAP) conducts needs assessments and procures assistive technology (AT) for DoD civilian workers with disabilities and for wounded, ill, and injured service members.¹ As stated in the 2021 *CAP Annual Stakeholders Report*,

CAP was established to support DoD components, agencies and organizations by supplementing the reasonable accommodations process at no-cost to the employing agency or employee. Essential to CAP's values are the concept of adaptation and flexibility; when individuals with disabilities and or limitations experience difficulties in completing essential job functions, we use technology to adapt and consider various alternative solutions on a case-by-case basis to support the need and job requirements. (CAP, 2021, p. 1)

However, there have been no prior estimates of the prevalence of different categories of accommodation-sensitive disabling health conditions across both the overall DoD civilian workforce and service members,² nor projections of changes in prevalence and potential future demand for AT faced by CAP. This report estimates the number of DoD civilian employees with disabilities, as well as wounded, ill, and injured service members currently and through 2031, including type of disability. We provide estimates of costs associated with AT requests by these employees and service members, with the goal of informing CAP's anticipated need for AT as required by federal legislation and as directed by Executive Order 14035.

¹ We use the term *assistive technology* to refer to technological accommodations intended to facilitate work among individuals with disabilities or health conditions that may interfere with work or duty. AT is thus a subset of the broader set of all accommodations, which include not just technological accommodations but also changes in work requirements, scheduling, pace of work, and built work environments, among others. Although we focus on AT for our cost estimation, CAP provides needs assessments, which may result in accommodations that are not limited to AT. As such, we therefore use the term *accommodation* somewhat interchangeably with regard to CAP's services throughout the report. Throughout this report, we use the terms *employee* and *worker* interchangeably.

² *Accommodation-sensitive disabling health conditions* are those that would prevent work or reduce productivity if a worker or service member did not receive an accommodation; see Maestas, Mullen, and Rennane, 2019.

Study Tasks and Analytic Approach

Our tasks for this report included

- reviewing the literature on pertinent federal disability law and policy, as well as CAP's own service provision
- identifying measures of disability in civilian survey data and DoD administrative records that correspond to CAP's measures of disability
- deriving a model of populations with disabilities and estimates of their required employment accommodations
- producing estimates of the number of DoD employees with disabilities, as well as wounded, ill, and injured service members through 2031.

The data requirements to execute these tasks were substantial and varied, since we needed representative or exhaustive data on specific types of health conditions or impairments that mapped into four disability categories among three distinct populations, and we relied on demographic projections by age, sex, and race/ethnicity for project forward disability rates among DoD civilian workers. We thus gathered data from a wide range of sources, including CAP's own administrative records, Management Directive 715 (MD-715) records,³ DoD's Advana data analytics system, DoD civilian personnel records accessed through the Defense Manpower Data Center (DMDC), Disability Evaluation System (DES) records, military medical surveillance statistics, and civilian population labor and health survey data. Each source provides unique information needed for specific populations and disabilities, which in combination enable us to conduct the analyses. We use these data to produce estimates of current and recent trends in disability prevalence among the federal workforce, DoD civilian workers, and service members. We provide estimates for the four separate categories of disability corresponding to CAP's own disability categorizations: Cognitive, Dexterity, Hearing, and Vision.⁴ We then employ a demographic model to project forward prevalence of each category, as well as having any disability or a work disability, for civilian workers. For service members, we draw from variation in recent disability or diagnosis rates to construct a range of scenarios for future demand for CAP services. We frequently consulted with CAP to construct disability measures among these populations that are comparable with the workers

³ MD-715 records are annual reports in response to the Equal Employment Opportunity Commission's (EEOC's) requirement that all federal agencies submit an annual report to the EEOC on the gender, race, ethnic, and disability composition of their workforces, as well as their strategies for and progress in meeting employment goals.

⁴ We note, however, that the composition of disabling health conditions, both of type and severity, with each disability category differs between the three groups CAP procures technologies for: DOD civilian workers, wounded service members-continuing on active duty (WSM-COADs), and wounded service members-referred to a Medical Evaluation Board (WSM-MEBs). Thus, we separately estimate prevalence for each group, but the health conditions under study within each group vary, even though they are grouped within the same CAP disability category.

and service members for whom they procure AT. We apply rates of accommodation requests from the academic literature on work disability and accommodations, and we rely on CAP data to estimate the potential number and cost of AT requests for our projected populations, producing a central cost estimate as well as a range of potential total costs.

The Organization of This Report

The remaining chapters of this report provide detail on our analysis and the resulting population and cost estimates. Chapter 2 reviews DoD disability policy and the populations we focus on in our analysis. Chapter 3 describes the analysis that produces projected civilian worker disability prevalence; it reviews the data used in the construction of our demographic model and the assumptions we use to provide a decade of projected demand for AT. Chapter 4 describes our analysis of demand for AT among service members, and specifically service members who have been referred to a Medical Evaluation Board (MEB) and are in the DES process. Chapter 5 describes our other service member analysis: a projection of AT demand among service members continuing on active duty. Chapter 6 summarizes our cost projections across these three populations, discusses limitations, and offers conclusions. We include an appendix that presents the detailed tabular results that appear as figures throughout the report, presents supplemental analyses based on alternate survey estimates of disability rates, describes the data sources used in our analyses in greater detail, and details disability codes used in the service member analyses.

Department of Defense Disability Policy, CAP Services, and the Literature on Disability and Accommodation Prevalence

A range of federal policies and programs promote the employment of persons with disabilities in the federal government. Section 501 of the Rehabilitation Act of 1973 specifically mandates that each federal agency design a program for the hiring and advancement for persons with disabilities, defined as someone with a “physical or mental impairment that substantially limits one or more of the major life activities of such individual” (Code of Federal Regulations, Title 29, Part 1630.2). The Rehabilitation Act serves as the foundation for several executive orders that address the issue of hiring and retaining employees with disabilities in federal agencies, starting with Executive Order 13163 in July 2000. This order mandates that each federal agency submits a plan to the Office of Personnel Management (OPM) outlining how it plans to support increasing hiring of employees with disabilities. Later in July 2000, Executive Order 13164 outlined “guidelines for the federal government on providing reasonable accommodations for (1) persons with disabilities in the federal employment application process, (2) federal employees with disabilities in order to perform the essential functions of a position, and (3) federal employees with disabilities in order to access benefits and privileges of employment equal to those available to nondisabled employees” (Matthews et al., 2018).

In 2010, Executive Order 13548 provided the OPM greater responsibility in helping federal agencies hire more persons with disabilities, and on January 3, 2017, the EEOC issued a final rule amending the regulations implementing Section 501. This rule required each federal agency to institute a goal for persons with disabilities to constitute at least 12 percent of its workforce and persons with targeted disabilities to constitute at least 2 percent of its workforce.¹ On June 25, 2021, President Joseph R. Biden signed Executive Order 14035, establishing that the advancement of equity, civil rights, racial justice, and equal opportunity is the responsibility of the entire federal government. As CAP describes in its 2021 *Annual Stakeholders Report*, “CAP’s mission supports Executive Order 14035, by providing AT and

¹ *Targeted disabilities* are a subset of other disabilities, consisting of deafness, blindness, missing extremities, paralysis, seizure disorders, distortion of limbs or spine, mental illness, dwarfism, and severe or intellectual impairments.

devices as reasonable accommodations to persons with disabilities and or limitations in DoD, to included service members, wounded, ill or injured” (CAP 2021, p. 1).

In addition to this recent EEOC final rule, DoD’s own long-standing targets, and these executive orders for employing civilians with disabilities, DoD Instruction 6025.22 outlines CAP’s role in providing AT to service members. First issued in 2008 and reissued in 2015, the instruction established AT policies in the Military Health System, institutionalizing CAP’s role in coordinating with wounded warrior programs and military treatment facilities. CAP has accordingly provided ATs to service members who have been referred to an MEB and are either in the process of or have already been evaluated for a disability leading to a medical separation. In 2015, recognizing the changing nature of injuries among service members as troop deployments to Afghanistan and Iraq drew down, CAP established another category of service member it provides AT to: WSM-COADS (CAP, 2016). We therefore seek to provide estimates of disability prevalence among three populations:

1. DoD civilian workers
2. WSM-COADS
3. WSM-MEBs.

CAP provides needs assessments for DoD civilian workers, service members, and workers at partner federal agencies; however, CAP is currently limited in procuring technology to DoD. CAP groups accommodations by the underlying limitation according to one of the following five disability categories:

1. **Cognitive:** “Cognitive conditions include any disorder that significantly impairs the cognitive function of an individual. Cognitive conditions may include dyslexia, attention deficit hyperactivity disorder (ADHD), multiple sclerosis, stroke, Alzheimer’s disease, and traumatic brain injury (TBI). Limitations could include memory loss, decreased organization, decreased concentration, word finding difficulty, or orientation difficulty” (CAP, undated-a).
2. **Communication:** “Communication conditions impact an individual’s ability to communicate. This may include apraxia or voice disorders. Limitations could include the inability to amplify the volume of speech or being non-verbal” (CAP, undated-b).
3. **Dexterity:** “Dexterity conditions refers to any physical disability that limits the physical function of one or more limbs. These may include quadriplegia, paraplegia, multiple sclerosis, cerebral palsy, carpal tunnel syndrome, tendonitis, arthritis, sciatica, amputations or degenerative disc disease. Limitations affecting mobility could include decreased range of motion in the arms, fingers, wrists, back or neck, and decreased muscle control, spasms, paralysis, tingling or numbness” (CAP, undated-c).
4. **Hearing:** “Hearing conditions impact the ability to hear, either partially or completely. These may include otosclerosis, tinnitus, and deafness. Limitations can include difficulty in hearing certain volumes, tones, or frequencies, ringing in the ears, or the inability to hear anything at all” (CAP, undated-d).

5. **Vision:** “Vision conditions impact the ability to see, either partially or completely. These may include glaucoma, cataracts, macular degeneration, retinopathy, or total blindness. Limitations could include blurriness, blind spots, floaters, tunnel vision or any other visual disturbances” (CAP, undated-e).

One particular point to note is that CAP does not itself procure technology for impairments that are exclusively mobility oriented (e.g., wheelchairs), since doing so falls outside its mandate for computer/electronic accommodations, although in conducting needs assessments, it may assess that a given worker or service member receive such an accommodation.

Throughout this report, we use the term *disability* to refer to one of these CAP categories. We note that the individuals we count as potential recipients of AT from CAP may not self-identify as having a disability, particularly if the AT itself mitigates a health condition’s interference with work or duty requirements. Furthermore, the type and severity of disabling health conditions within a disability category varies across recipient groups, since WSM-COADs continue to meet retention standards, WSM-MEBs have been determined not to meet these standards, and DoD civilian workers have different work requirements altogether. As shown throughout Chapters 3, 4, and 5, we thus use different metrics for measuring and projecting the prevalence of each disability category across recipient groups.

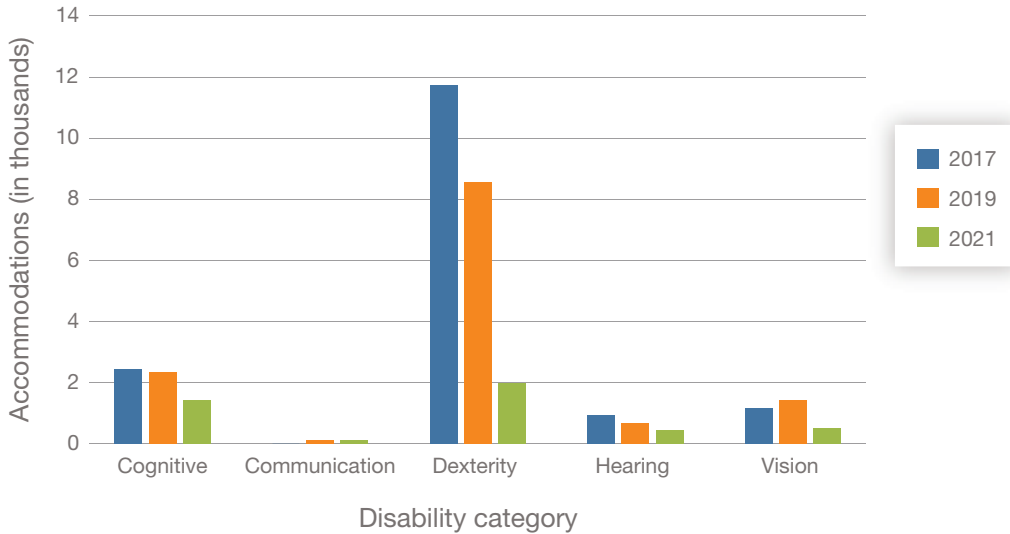
We note that CAP-procured accommodations can include hardware, software, or services. In what follows we list examples of accommodations procured by CAP for each disability category, noting that some AT can be provided for multiple disability categories and that this list is far from exhaustive:

1. **Cognitive:** speech recognition software; reader software to read content aloud; speech generation hardware; noise-canceling headphones.
2. **Communication:** voice amplification hardware; transcription services; speech generation software or hardware.
3. **Dexterity:** adjustable-height desks; flexible monitor arms; ergonomic keyboards or mice; voice recognition software.
4. **Hearing:** interpreting services; face-to-face communicator hardware; closed-captioning software; videophones.
5. **Vision:** magnifier/reader software to magnify and read content aloud and echo text input; large-screen computer monitors to provide more display space for magnified content; desktop magnifier hardware; braille notetaker hardware.

Figure 2.1 provides counts of accommodations by disability category for fiscal year (FY) 2017, FY 2019, and FY 2021.

Dexterity-related accommodations represent the largest single category for CAP, with cognitive-related accommodations as the second. Due to the very low number of communication-related accommodations and the difficulty in observing individuals who would be accommodation sensitive to the voice amplification technologies provided by CAP, we do not provide estimates for this disability category.

FIGURE 2.1
CAP-Provided Accommodations, by Disability Category, FY 2017, FY 2019, and FY 2021



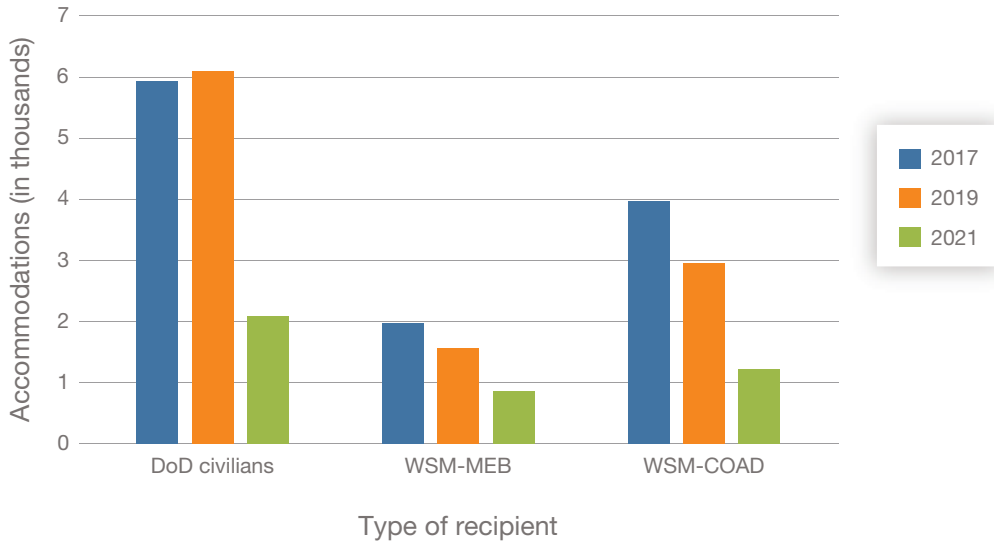
SOURCES: CAP, 2017; CAP, 2019; and CAP, 2021.

Figure 2.2 shows the distribution of accommodations by recipient group for FY 2017, FY 2019, and FY 2021 to illustrate persistent accommodations before the COVID-19 pandemic, as well as changes after its onset across the three groups CAP provides accommodations for.

Although CAP supported the widespread transition to telework in FY 2020, its need assessments office in the Pentagon, the CAP Technology Evaluation Center, was closed at the onset of the pandemic, limiting accessibility to its services. In discussions with CAP, we ascertained that the decline in accommodations from 2019 to 2021 was driven by this reduction in access to on-site needs assessments, as well as continued widespread telework that limits the demand for new workplace accommodations, such as adjustable desks or noise-canceling headphones. Even with this recent decline, the distribution of accommodations across recipient groups is relatively unchanged: DoD civilians represent the largest number of accommodations provided by CAP, with WSM-COADs being the next largest group.

We turn now to the annual costs of technology procurements by recipient group. Table 2.1 shows these annual costs in nominal terms and averaged in 2021 dollars by recipient group for 2016–2019 (we omit 2020–2021 due to pandemic-induced changes to total accommodations, as seen in Figures 2.1 and 2.2). Although we are providing overall costs here, in Chapters 3, 4, and 5 we provide per-accommodation costs by disability category for each population.

FIGURE 2.2

CAP-Provided Accommodations, by Type of Recipient, FY 2017, FY 2019, and FY 2021

SOURCES: CAP, 2017; CAP, 2019; and CAP, 2021.

NOTE: CAP separately records AT requests by type of requester, including DoD civilian workers, WSM-COADs, and WSM-MEBs.

TABLE 2.1

Annual Total Assistive Technology Costs for CAP in Nominal Dollars, 2016–2019, and the Average Annual Cost in 2021 Dollars, by Recipient Group

Year	DoD Civilians	WSM-COADs	WSM-MEBs
2016	4,190,614	588,928	502,939
2017	3,684,476	1,168,804	309,300
2018	3,221,288	1,537,309	221,212
2019	2,686,961	658,859	260,278
Annual average (in 2021 dollars)	3,781,709	1,078,421	356,051

SOURCE: Authors' calculations based on data from CAP administrative records.

We note that although we have these historical records on accommodations and their costs from CAP, not all accommodation-sensitive DoD workers or service members are aware of CAP's services, seek them out, or receive accommodations from CAP instead of an alternative source. Wherever possible, we seek to estimate the overall size of the accommodation-sensitive populations within each CAP recipient group and disability category; these populations therefore correspond to the *potential* set of individuals who would be eligible for

technology from CAP. As such, our estimates of accommodations and costs will be systematically higher than CAP's own historical experiences, since all recipients of AT from CAP are accommodation sensitive, but not all accommodation-sensitive DoD workers or service members are recipients of AT from CAP.

Evidence of Prevalence and Impact of Accommodations

A long-standing literature in occupational research has focused on the degree to which workers with disabilities ask for accommodations, how often employers provide these accommodations, and the resulting impacts on employment, productivity, and costs (Anand and Sevak, 2017; Burkhauser, Butler, and Kim, 1995; Campolieti, 2005; Campolieti, 2009; Daly and Bound, 1996; Hill, Maestas, and Mullen, 2016; Nevala et al., 2015; Schartz, Hendricks, and Blanck, 2006; Von Schrader, Xu, and Bruyère, 2014). This literature includes surveys of workers themselves (Anand and Sevak, 2017; Burkhauser, Butler, and Kim, 1995; Sundar et al., 2018); surveys of employers who sought out accommodations (Hartnett et al., 2011; Solovieva et al., 2009); or both (Schur et al., 2014).

A general conclusion from this literature is that worker-reported rates of accommodation requests are low, while employers report higher rates of providing these accommodations. Regardless, costs of accommodations are low, and often zero for many nonphysical accommodations; for positive-cost accommodations, an oft-quoted median figure is \$500 per onetime accommodation (Solovieva et al., 2009). Additionally, employers report both direct benefits in terms of improved productivity of the worker accommodated, as well as indirect benefits in creating a more inclusive work environment (Schartz, Hendricks, and Blanck, 2006).

However, empirical estimates of these direct effects on labor force attachment or productivity are scarce, and where available, show minimal effects (Burkhauser, Butler, and Kim, 1995; Hill, Maestas, and Mullen, 2016; Nevala et al., 2015), although recent research indicates that one-third of nonworking people with disabilities report that AT would address barriers to employment. Recent research points to one analytic challenge: the likelihood of a worker reporting an accommodation is often dependent on whether an individual previously answered yes to a question on having a work-limiting health condition. Yet, when asked independently, a substantially higher fraction of workers report receiving an accommodation but do not report a work-limiting health condition (Maestas, Mullen, and Rennane, 2019). There are thus a substantial number of workers receiving accommodations who are missing from large surveys, and these workers may disproportionately be likely to experience productivity improvements, since they do not report the presence of a health condition that interferes with their work.

In this analysis, we focus on estimating the *potential* accommodation-sensitive population that may request an accommodation from CAP. As will be discussed in Chapters 3 and 5, these estimates generally correspond to a “stock” of workers or service members, which we then must turn into “flows” of estimated annual accommodation requests. We

note a major drawback in the literature on accommodation requests; although we draw on cross-sectional information that estimates the fraction of a given population that has ever requested an accommodation (or requested an accommodation at a current job), and whether these requests were granted, to our knowledge there are no quantitative studies examining the *frequency* of these requests. Nearly every study under consideration focuses on whether or not a given worker has asked for accommodations, and although some studies break out whether accommodations are onetime or recurring in nature (such as receipt of personal assistance services as measured in Solovieva et al., 2009), there is no available evidence on repeated requests. That is, from these studies, we have estimates of how many individuals with a dexterity limitation who have worked at their employment for at least five years have requested and received an accommodation. But we are unaware of any study that asks such individuals whether they asked for and received an accommodation once in that time period, every year, or multiple times per year. Nor are we aware of longitudinal studies that consistently elicit the number of accommodations requested since the past interview wave.

As such, we draw on Schur et al. (2014), which provides the most recent and comprehensive analysis of accommodation requests by both type of accommodation and by disability category, both of which allow us to estimate the fraction of workers who have made an AT request analogous to the services CAP provides for each CAP disability category modeled. As will be discussed further in Chapter 3, given the tenure characteristics of the sample in Schur et al. (2014), we assume that the fraction of workers reporting, having made an accommodation request, make a new request for services and software every year and for hardware every other year. We assume that the fraction requesting services or software among accommodation requests is the same as the fraction of accommodations that were services or software among CAP requests from that disability category and population from 2019 to 2021, and we similarly assume that the fraction making hardware requests is the same as historical CAP requests from the analogous disability category and population. Going forward, any evidence CAP can bring to bear on the evolution of accommodation requests by a given worker or service member over their career would enable more sophisticated analyses given the direct impact these assumptions have on any projected requests. We now turn to our analytic approach.

Projecting Potential Demand from Federal Employees and Department of Defense Civilian Workers

In this chapter we describe how we calculate the potential demand for AT, and its cost, for two workforce populations: federal employees and the subset of federal employees that comprises DoD civilian workers. Although currently CAP is allowed to procure AT for only DoD civilian workers and service members, prior to October 2020 it procured technologies for partner federal agencies, including substantial caseloads from the U.S. Department of Homeland Security and the U.S. Department of Veterans Affairs (VA). As such, we provide projections for the entire federal government to inform any possible future expansions to other federal agencies.

Broadly, we identify disability rates for age, sex, and race/ethnicity subgroups using survey data and apply them to survey estimates of federal employees and administrative data on DoD civilian workers to derive counts of employees with disabilities in 2021. Next we project the size and demographic characteristics of each workforce through 2031 and apply the survey-based disability rates throughout the period. Finally, we derive estimates of the anticipated number of individuals requesting AT among the employees with disabilities. From these projections we estimate the costs associated with those requests.

Our estimates address a gap in existing projections of health in that they include a wide range of working-age adults (ages 15–74) and identify specific types of disabilities.¹ Existing disability projections, such as the Future Elderly Model (Bhattacharya et al., 2013), focus on the older population (age 51 or older in the Future Elderly Model, for example), and estimate presence of specific chronic conditions or general disability, not the specific types of disability relevant to CAP.²

¹ Note that this range reflects administrative data on the age range of DoD civilian workers; for example, nearly 4 percent of DoD civilian workers were age 65 or older in 2021.

² One notable exception includes a projection of adults with intellectual and developmental disabilities in Ontario, Canada, which combined age-specific prevalence rates and a cohort component population projection to derive projected disability of adults ages 18 to 99 over a ten-year period; see Ouellette-Kuntz, Martin, and McKenzie, 2016. Our projection method expands on this general approach.

Disability Data Sources

We derive disability prevalence in the federal and DoD civilian workforces using data from two long-running national survey sources: the American Community Survey (ACS) and the National Health Interview Survey (NHIS). Each survey contains one or more unique disability measures that we use in our estimates, each survey includes individuals in our target age range (ages 15–74),³ and federal employment status can be identified in each source. Using survey data reports of disability prevalence helps address concerns of the underreporting of disabilities in the workplace context—for example, in response to MD-715 data reporting. Administrative measures have been shown to consistently and significantly underestimate disability when compared with self-reported measures (Dasinger et al., 1999).

The ACS is a nationally representative survey of U.S. residents, conducted annually by the U.S. Census Bureau to provide intercensal information on detailed population and housing characteristics. Approximately 2.2 million interviews with individuals in housing units and group quarter facilities are completed each year. We assess vision, hearing, and cognitive disabilities using the ACS 2019 five-year estimates. We use these estimates, which pool 60 months of collected data, as they are more reliable and provide greater precision than the one-year estimates (U.S. Census Bureau, 2020). Vision disability is measured with the question “Is this person blind or does he/she have serious difficulty seeing even when wearing glasses?” Hearing disability is measured with the question “Is this person deaf or does he/she have serious hearing difficulty?” Cognitive disability is measured with the question “Because of a physical, mental, or emotional condition, does this person have serious difficulty concentrating, remembering, or making decisions?”

The NHIS is a nationally representative survey of noninstitutionalized civilians in the United States. The NHIS collects household- and individual-level demographic characteristics, physical and mental health conditions, and socioeconomic data to monitor epidemiological trends and support national health initiatives. The NHIS is conducted annually by the National Center for Health Statistics and captures about 100,000 people and 45,000 households each year. The pooled cross-section sample size from the 2015 to 2017 survey years is 279,090. To assess dexterity limitations, we used two NHIS variables that asked adult respondents to indicate their level of difficulty with “walking or climbing steps” and “using your hands and fingers, such as picking up small objects, for example, a button or pencil, or opening or closing containers or bottles.” Respondents were coded as having a dexterity limitation if they have “a lot of difficulty” or “cannot do at all” for either activity.

³ The NHIS data begin at age 18.

Baseline Employed Populations and Disability Prevalence, 2021

We estimate baseline federal employed population counts and characteristics, as well as employee disability prevalence (2021), by applying the rates identified in the survey data to Census Bureau population estimates (U.S. Census Bureau, 2017). We first prepared disability prevalence rate tables stratified by age, sex, and race/ethnicity for the federally employed sample population using the ACS and NHIS for each relevant measure. Respondents were categorized in five-year age groups (ten-year groups for dexterity estimates, given relatively smaller cell sizes) and the following racial/ethnic categories: Non-Hispanic White, Non-Hispanic Black, Non-Hispanic American Indian and Alaskan Native (AIAN), Non-Hispanic Asian, Non-Hispanic Hawaiian and Pacific Islander (HPI),⁴ Multiple Races, and Hispanic. Next, federal employment rates (defined as the percentage of all workers who were employed by the federal government without imposing any restrictive criteria based on hours worked) were derived for the same age, sex, and race/ethnicity groups using the ACS 2019 five-year estimate data. Given that the ACS provides population distributions, and not population counts, we then applied the federal employment rates specific to age, sex, and race/ethnicity groups to 2021 U.S. population estimates (also by age, sex, and race/ethnicity) obtained from the Census Bureau's National Population Projection data (2017–2060). Federal workforce demographic characteristics and counts derived through this process are presented in Table 3.1.

In addition to the federal workforce overall, we derive estimates specifically for DoD civilian employees. To do so we obtained administrative data on the size and demographic characteristics of the DoD civilian workforce from the Civilian Master File and Civilian Pay File maintained by the DMDC. The Civilian Pay File includes information on the type of employment and hours, and the Civilian Master File contains demographic information. We identified the size and demographic composition of full-time civilian employees (those working more than 34 hours per week) in FY 2021,⁵ and the size and demographics of the DoD civilian workforce are also presented in Table 3.1. Note that the federal workforce characteristics are based on survey data estimates and the DoD civilian workforce data are taken from administrative records.

⁴ The NHIS does not include the HPI category in the public use data files and includes them in a “Race Not Releasable” category due to confidentiality and small sample size.

⁵ This excludes 4 percent of the DoD civilian workforce that are seasonal, participate in internship programs, or are otherwise part-time (based on FY 2015–FY 2021 data).

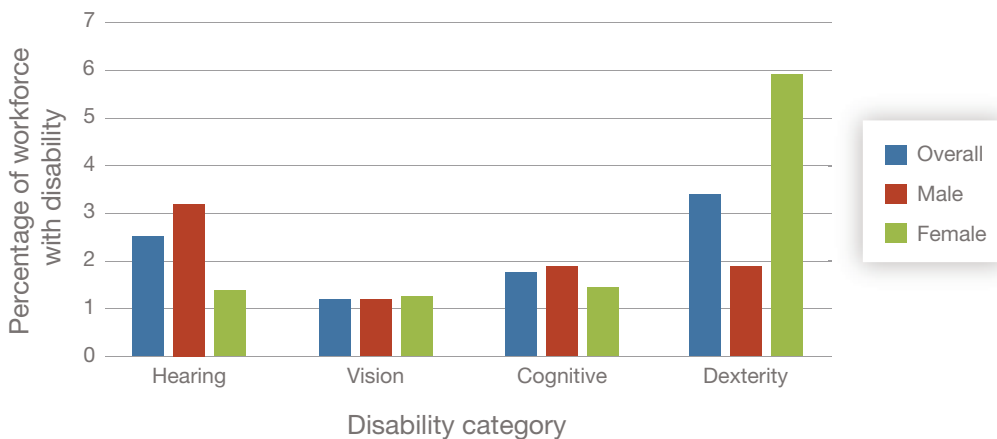
TABLE 3.1
Federal and Department of Defense Civilian Workforce Demographics, Ages 15–74
(Proportions): 2021

Demographics	Federal Workforce (Estimate)	DoD Civilian Workforce
Sex		
Male	0.633	0.680
Female	0.367	0.320
Race/ethnicity		
Hispanic	0.120	0.083
Non-Hispanic White	0.584	0.670
Non-Hispanic HPI	0.004	0.010
Non-Hispanic Black	0.188	0.147
Non-Hispanic AIAN	0.014	0.007
Non-Hispanic Asian	0.064	0.056
Non-Hispanic, two or more groups	0.026	0.027
Age		
15–19	0.033	0.001
20–24	0.105	0.029
25–29	0.115	0.067
30–34	0.122	0.097
35–39	0.116	0.127
40–44	0.102	0.127
45–49	0.096	0.117
50–54	0.106	0.142
55–59	0.100	0.158
60–64	0.068	0.096
65–69	0.027	0.031
70–74	0.009	0.008
Total workforce size	4,781,021	764,761

SOURCE: Authors' calculations based on ACS, Census Bureau, DMDC Civilian Master File, and DMDC Civilian Pay File data.

Finally, we applied federally employed population disability prevalence rates specific to age, sex, and race/ethnicity to the estimated federally employed population counts to get baseline disability prevalence numbers for 2021. Survey-based disability prevalence rates are presented for the federally employed population overall and by sex in Figure 3.1, and by race/ethnicity in Figure 3.2.⁶ Note that, as expected, these prevalence rates are substantially higher than those reported in MD-715 reports and via Advana (as shown in Figure A.1), which range from 0.1 percent to 0.5 percent for hearing, vision, cognitive, and dexterity limitations. To derive estimates of disability prevalence among the DoD civilian workforce we similarly applied the survey-based estimates of disability for federal employees specific to age, sex, and race/ethnicity to the 2021 DoD civilian workforce, as presented in Figures 3.3 and 3.4.⁷ Differences in the age, sex, and racial/ethnic composition of the DoD civilian workforce compared with the federal workforce overall (e.g., DoD civilians are older on average) contribute to slight differences in disability prevalence overall.⁸

FIGURE 3.1
Disability Prevalence Among the Federally Employed, by Sex, Ages 15–74: 2021



SOURCES: Authors' calculations based on ACS (hearing, vision, cognitive), and NHIS (dexterity) data.

⁶ These rates are also presented in tabular format in the Appendix.

⁷ Each survey source also includes an industry code identifier (9590) for national security and international affairs. Since the 2019 ACS estimates approximately 1,100,000 workers in the United States within this industry, DoD civilian employees comprise roughly 70 percent of these respondents and provides a closer approximation to disability specifically in the DoD civilian workforce than using disability in the federal workforce classification overall. We replicated the DoD civilian disability estimates and projections using disability rates based on federal employees in this more detailed industry assessment and present them in the Appendix. However, given the substantial reduction in sample sizes compared with the federal employee population overall, the detailed age, sex, and race/ethnicity disability rate tables include multiple empty cells that may lead to underestimates of the disabled population.

⁸ These disability prevalence rates are also presented in tabular format in the Appendix.

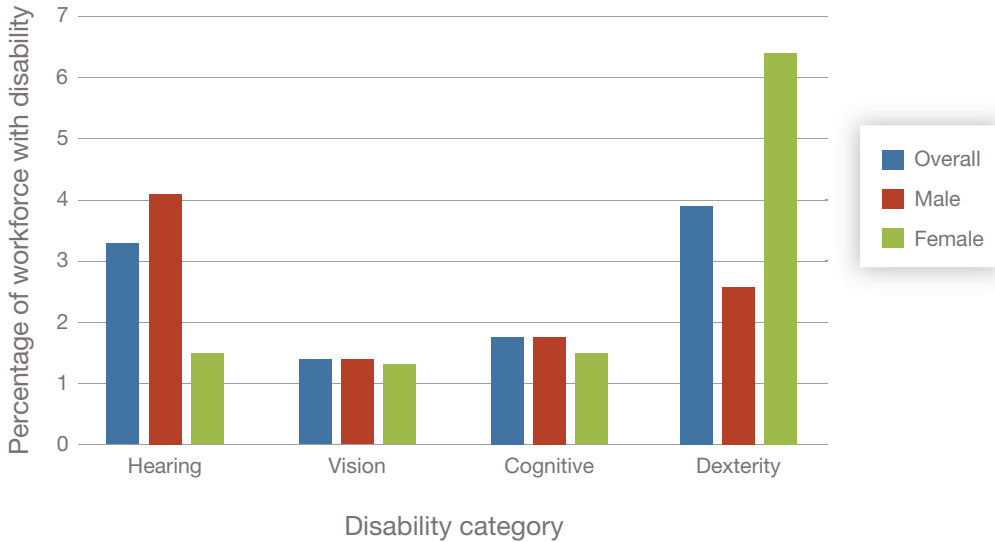
FIGURE 3.2
Disability Prevalence Among the Federally Employed, by Race/Ethnicity,
Ages 15–74: 2021



SOURCE: Authors' calculations based on ACS (hearing, vision, cognitive), and NHIS (dexterity) data.

NOTE: Percentages are based on an estimated 781,021 federal employees in 2021. The HPI category is not available in the public NHIS data (identified as "Race Not Releasable"), which is used to identify dexterity disability rates.

FIGURE 3.3
Disability Prevalence Among Civilian Department of Defense Employees, by Sex, Ages 15–74: 2021



SOURCES: Authors’ calculations based on ACS (hearing, vision, cognitive), NHIS (dexterity), DMDC Civilian Master File, and DMDC Civilian Pay File data.

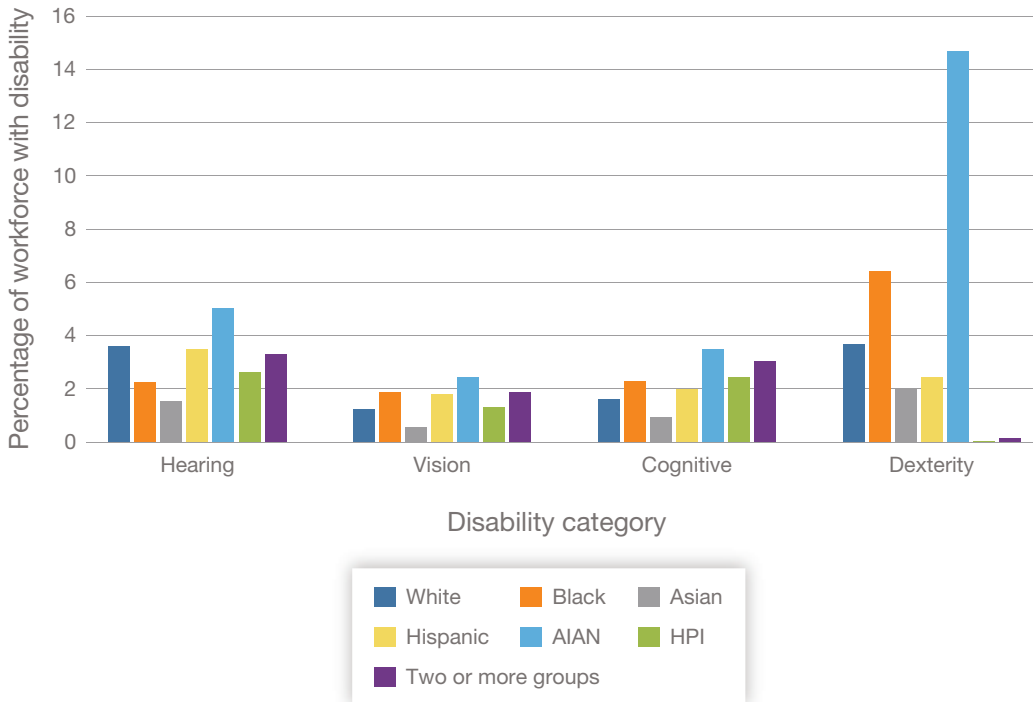
NOTE: Total number of civilian employees was 764,741 in FY 2021.

Disability Projections, 2021–2031

Deriving projections of the size of the disabled federal and DoD civilian workforces required two steps: projecting the overall size and demographic characteristics of each workforce between 2021 and 2031 and estimating disability prevalence within each projection. The U.S. Bureau of Labor Statistics (BLS) provides employment projections for a range of industries. Projections (Dubina et al., 2021) indicate that BLS anticipates a compound annual rate of change in the size of the total federal workforce of –0.2 percent per year between 2020–2030,⁹ which was the same rate of change that was observed for 2010–2020. Based on this projection, we expect that the size of the total federal workforce will shrink from approximately 4.78 million to 4.67 million workers between 2021 and 2031. Employment trends for the DoD civilian workforce have substantially differed from the federal workforce overall. Figure 3.5 presents the number of full-time DoD civilian workers observed from 2007 to 2021. During this time period, the size of the DoD civilian workforce increased by an average of 1.2 percent per year. Between 2010 and 2020, despite an initial downward trend around the drawdown in Afghanistan and Iraq, the DoD civilian workforce ultimately increased by 2.4 percent, even as the

⁹ Note that BLS does not distinguish between part-time and full-time workers in its projections, and that our federal population similarly includes all employed workers.

FIGURE 3.4
Disability Prevalence Among Civilian Department of Defense Employees, by Race/Ethnicity, Ages 15–74: 2021



SOURCES: Authors’ calculations based on ACS (hearing, vision, cognitive), NHIS (dexterity), and DMDC Civilian Master File data.

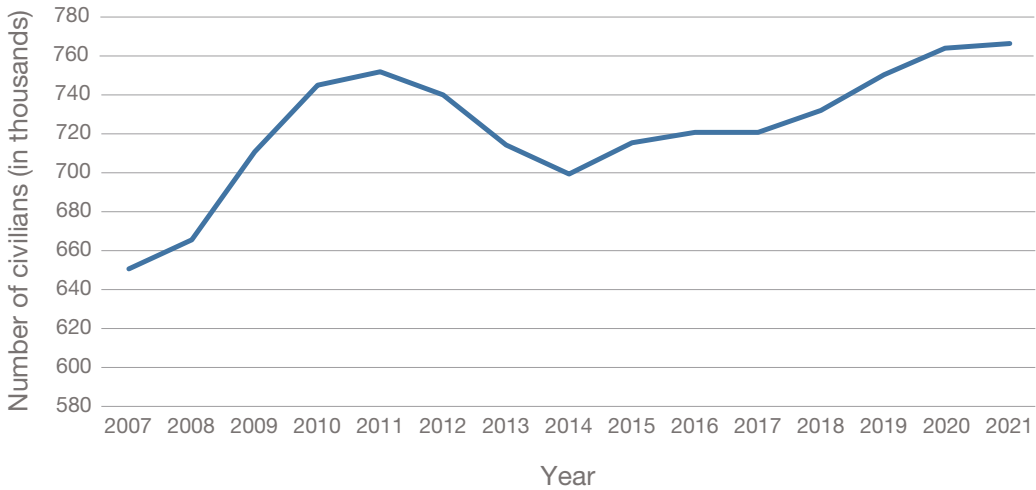
NOTE: Total number of civilian employees was 764,741 in FY 2021. The HPI category is not available in the public NHIS data (identified as “Race Not Releasable”), which is used to identify dexterity disability rates.

overall federal workforce decreased in size. The BLS does not provide projections for the size of the DoD civilian workforce. Similarly, although the Congressional Research Service provides short-term projections of DoD civilian costs for budgeting purposes through FY 2026, it explicitly notes that the projections are not of “on board personnel,” which are appropriate for employment counts (Congressional Research Service, 2023). Thus, we developed two sets of projections for the DoD civilian workforce to provide a range to our estimates: one using the BLS estimate based on the total federal workforce trend (–0.2 percent per year, shrinking from 765,000 to 747,000), and one based on the observed 2007–2021 trend (status quo of 1.2 percent per year, growing 12.4 percent overall from 765,000 to 860,000).¹⁰

The Census Bureau’s population projection data (U.S. Census Bureau, 2017) indicate that between 2021 and 2031 there will be shifts in the demographic composition of the popula-

¹⁰ Use of the historical trend has previously been used to estimate growth in the Army’s civilian workforce (e.g., Nataraj et al., 2014).

FIGURE 3.5
Size of the Department of Defense Civilian Workforce, 2007–2021



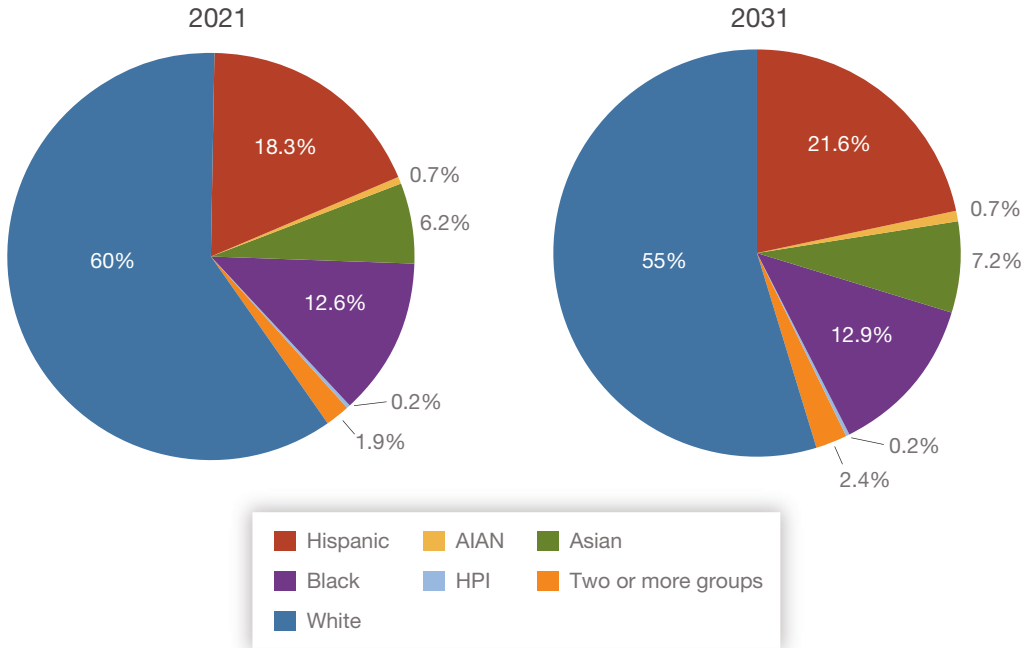
SOURCE: Authors' calculations based on analysis of DMDC Civilian Master File data.

tion, ages 15–74: primarily, race/ethnicity will grow increasingly diverse, and there will be a shift in the age structure by 2031. Figure 3.6 presents the racial/ethnic composition of the U.S. population, ages 15–74, in 2021 and 2031 and illustrates that the working-age population will proportionately comprise fewer non-Hispanic white employees, with Hispanic and Asian individuals making the largest gains in share.

Additionally, as shown in Figure 3.7, the working-age population is expected to shift to greater proportions in ages 35–49 and 65–74 by 2031 than in 2021.

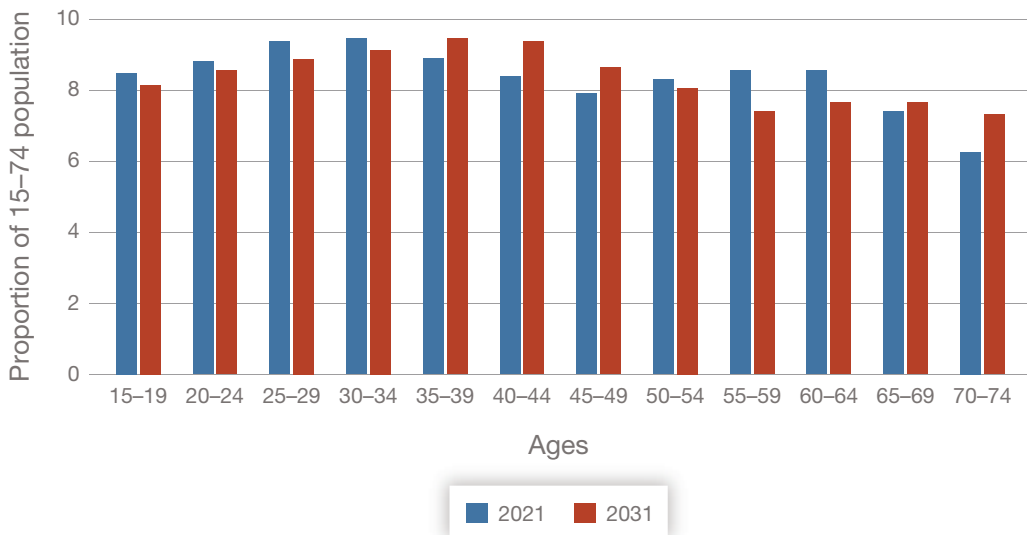
Under the assumption that the demographics of the federal and DoD civilian workforces will shift at pace with the national demographic trends in increasing racial/ethnic diversity and age patterns, we adjust our employed population projections to reflect these broader trends. If we assumed that the demographic composition of each workforce did not change over time, the number of employees with disabilities would change directly in proportion to the size of the workforce. Using the 2021 demographic distribution of each workforce as a baseline, we adjusted the distributions to approximate similar trends in the national age and racial/ethnic structure from 2021 to 2031. First, we adjusted the baseline populations to reflect racial/ethnic change over time. For example, in the national population, ages 15–74, Hispanic people increase from 18.3 percent to 21.6 percent of the population (an 18-percent increase in proportion) from 2021 to 2031, and non-Hispanic white people decrease from 60.0 percent to 55.0 percent (an 8-percent decrease in proportion). For each employed population projection, we adjust the baseline racial/ethnic distributions by similar amounts between 2021 and 2031. Next, we made similar adjustments reflecting national shifts to the age distributions within race/ethnicity groups between 2021 and 2031.

FIGURE 3.6
National Race/Ethnic Composition, Ages 15–74: 2021 and 2031



SOURCE: U.S. Census Bureau, *National Population Projections Datasets: Projections for the United States: 2017 to 2060*, 2017.

FIGURE 3.7
National Working-Age Composition, Ages 15–74: 2021 and 2031



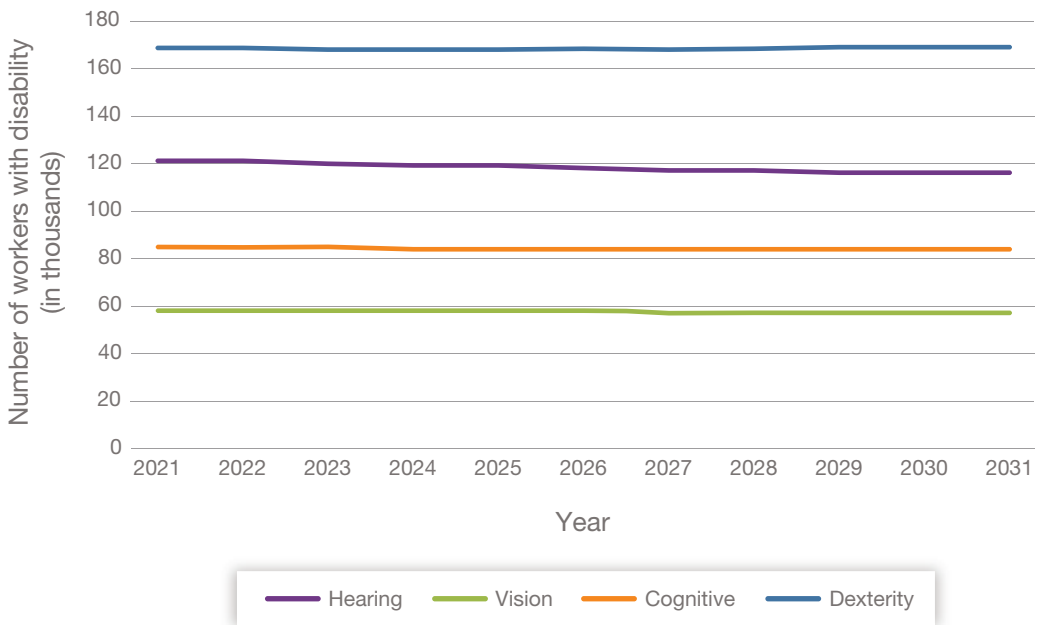
SOURCE: U.S. Census Bureau, *National Population Projections Datasets: Projections for the United States: 2017 to 2060*, 2017.

The final step in deriving estimates of disabilities within each workforce projection was to apply the survey-based disability prevalence rates specific to age, sex, and race/ethnicity to each year of each projection.

Figure 3.8 presents the number of federal workers with disabilities from 2021 to 2031, as well as the change in number over the period, based on the BLS projection for federal workforce size. Figure 3.9 presents the number of DoD civilian workers with disabilities from 2021 to 2031 with a shrinking workforce scenario based on the BLS projection of a shrinking federal workforce. Figure 3.10 presents the number of DoD civilian workers with disabilities from 2021 to 2031 in the growing workforce scenario based on the observed status quo (increasing) trend in the size of the DoD civilian workforce. Year-by-year numbers for each projection are also presented in tabular format in the Appendix.

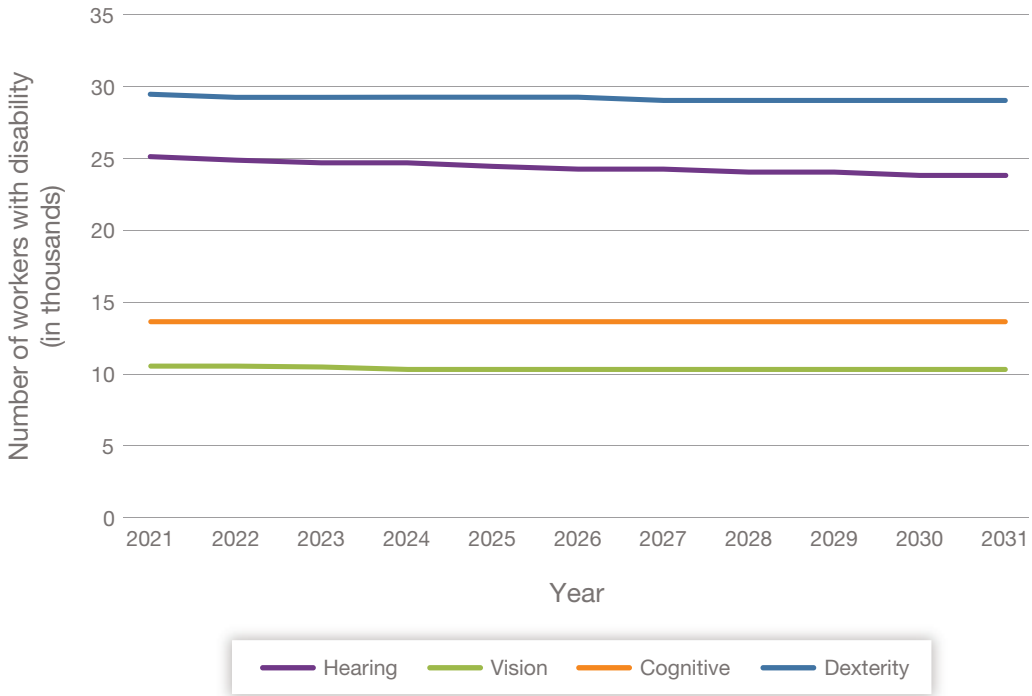
Given the relatively small changes in numbers of workers with disabilities over time relative to the baseline, trends in Figures 3.8–3.10 are generally difficult to see, and readers are referred to the Appendix for specific numbers. To highlight the trends, we present a summary of percentage changes in the workforce with each type of disability over the period, for federal workers (Figure 3.11) and for both DoD civilian scenarios (Figure 3.12).

FIGURE 3.8
Projected Number of Federal Employees with Disabilities, Ages 15–74: 2021–2031



SOURCES: Authors’ analysis of ACS, Census Bureau, and NHIS data, using BLS workforce projections by Dubina et al., 2021.

FIGURE 3.9
Projected Number of Department of Defense Civilian Employees with Disabilities, Ages 15–74: 2021–2031 (Shrinking Workforce Scenario)

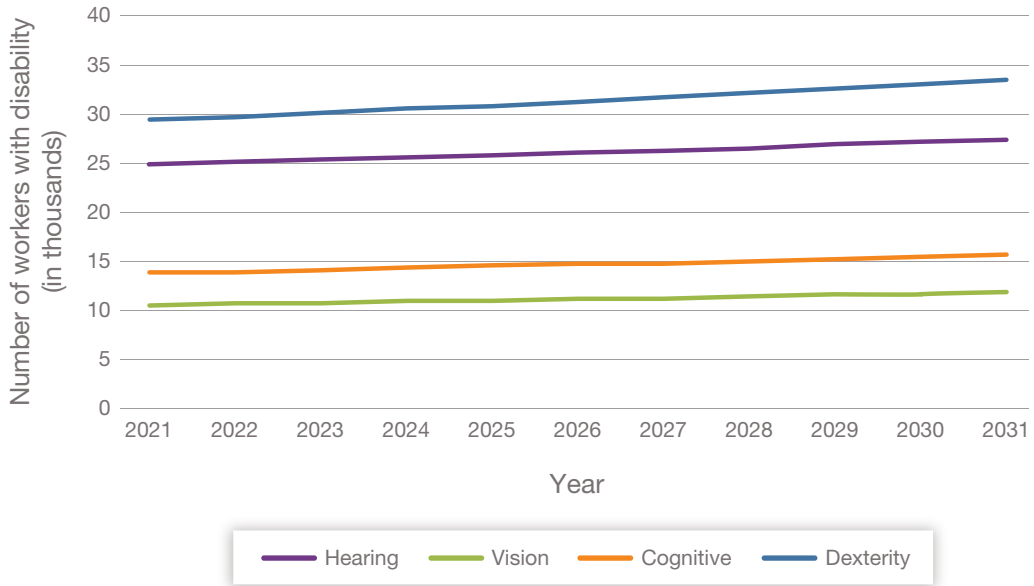


SOURCES: Authors' analysis of ACS, Census Bureau, DMDC Civilian Master File, and NHIS data, and using BLS workforce projections by Dubina et al., 2021.

Figure 3.11 indicates that the proportion of the federal workforce with hearing disability will shrink by 1.6 percent between 2021 and 2031, and that the proportion of the federal workforce with vision disability will remain steady over the period. In contrast, the proportion of the federal workforce with cognitive disability will increase by 1.6 percent, and the proportion of the federal workforce with dexterity disability (already the most prevalent of the four types of disability) will increase by 2.6 percent between 2021 and 2031.

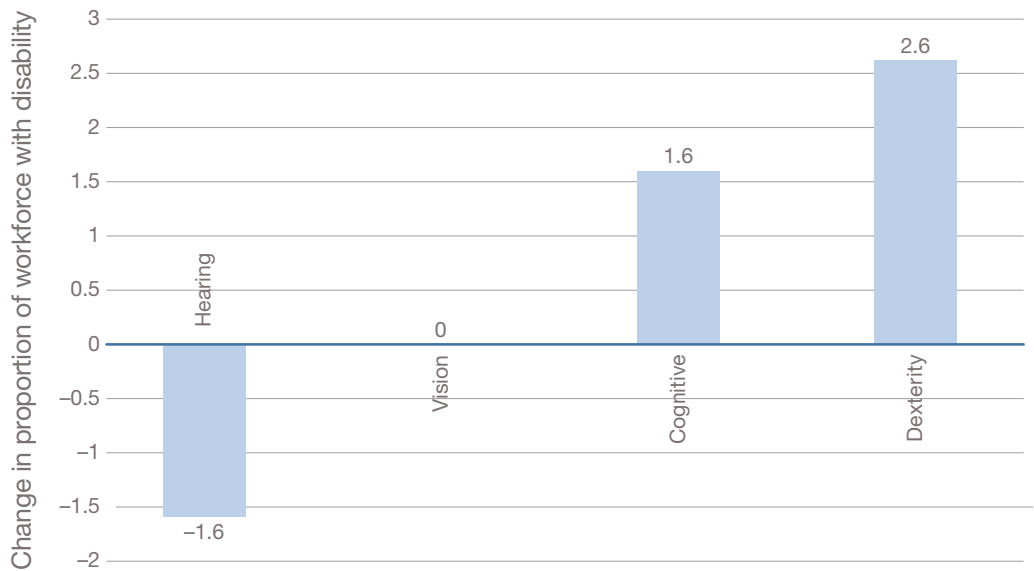
Figure 3.12 presents changes for the DoD civilian workers over time for both scenarios. Regardless of whether the DoD civilian workforce decreases or increases in total size, the proportion of the workforce with hearing disability will decrease by 2.4 percent, and the proportion with vision disability will decrease by 0.7 percent. Conversely, the proportion of DoD civilian workers with cognitive disability will increase by 1.1 percent, and the proportion with dexterity disability will increase by 1.3 percent between 2021 and 2031 (consistent with projected changes for the overall federal workforce).

FIGURE 3.10
Projected Number of Department of Defense Civilian Employees with Disabilities, Ages 15–74: 2021–2031 (Growing Workforce Scenario)



SOURCES: Authors' analysis of ACS, Census Bureau, observed workforce trend in the DMDC Civilian Master File, and NHIS data.

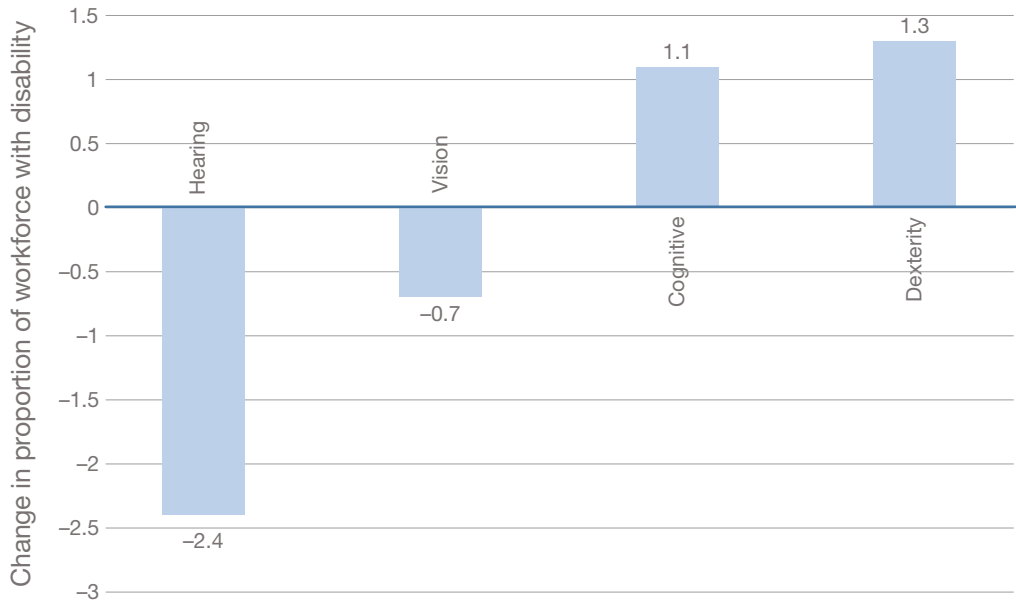
FIGURE 3.11
Projected Change in Proportion of the Federal Workforce with Specific Disabilities, 2021–2031



SOURCES: Authors' analysis of ACS, Census Bureau, and NHIS data, and using BLS workforce projections by Dubina et al., 2021.

FIGURE 3.12

Projected Change in Proportion of Department of Defense Civilian Workforce with Specific Disabilities, 2021–2031



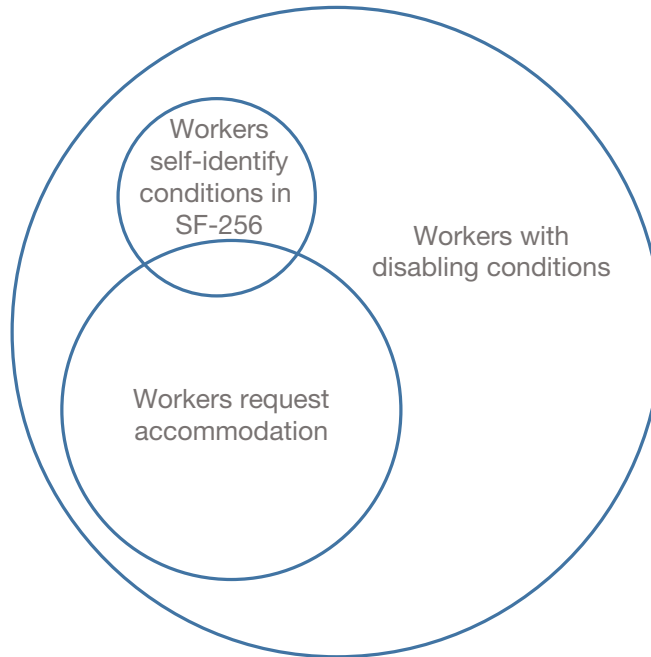
SOURCES: Authors' analysis of ACS, Census Bureau, DMDC Civilian Master File, and NHIS data, and using BLS workforce projections by Dubina et al., 2021.

Estimates of Requests for Assistive Technology

Not all individuals with disabilities in our projections will request AT. As is shown in Figure 3.13, the projection of all workers with disabling conditions represents a larger group than those who self-identify as having the conditions. In federal employment, individuals can volunteer their disability status in the SF-256 form they fill out when beginning employment, which includes self-identification of a range of disabling health conditions, as well as a disability “not identified” option. Federal agencies then collect these responses and publish them in MD-715 reports. Currently, DoD tracks these same statistics via its Advana data analytics system. In the Appendix we report comparisons of prevalence of the CAP disability categories with our estimates based on survey data, suggesting that for condition-specific disability estimation, analyses based on SF-256 responses undercount prevalence by approximately an order of magnitude.

Similarly, within the larger group with disabling conditions, only a portion of workers will request accommodations, overlapping to some degree with those who will appear in MD-715 and Advana statistics. Thus, the next step in the analysis is to estimate the number of workers who will request accommodations for specific disabilities from the projected total number of workers with those disabilities.

FIGURE 3.13

Overlap Between Workers with Conditions and Accommodation Requests

SOURCE: Authors' depiction.

In order to estimate the number of individuals making requests out of the total number of workers we have projected to have disabilities, and due to the lack of available comparable data specific to DoD, we rely on a unique study from 2014 that specifically examined workplace accommodation requests (Schur et al., 2014). The study identified the proportion of people with self-reported disabilities (any disability, hearing impairment, visual impairment, mobility impairment, or mental/cognitive impairment) who had requested accommodations.¹¹ Further, the study identified the type of accommodations requested by the type of disability; for each type of disability we are able to identify the proportion of requests that were for new or modified equipment (using a new or different type of computer equipment or information technology, modifying a type of computer equipment or information technology, using a new or different type of other equipment, or modifying another type of equipment) or for modifying the individual work environment (orthopedic chair, lower desk, etc.; see Schur et al., 2014, p. 602, Table II), which closely approximate the types of accommodations CAP

¹¹ There were 293 surveys of people with disabilities, from six companies, with two ranging in size from 1,000 to 5,000 employees and four with over 5,000 employees nationwide. Companies were chosen to ensure variation on industry sector and size. Employees surveyed generally had between zero and ten years of tenure.

procures. Combining these two proportions, we estimated the accommodations request rate by disability type.¹²

Table 3.2 summarizes the estimated average number of people making requests each year between 2021 and 2031 for accommodation for the federal employees and for DoD civilian employees in both the shrinking workforce and growing workforce scenarios. Note that in this chapter and the ones that follow, we estimate a constant average number of requests from 2021 to 2031 using the available data and assumptions in each setting, and then apply different assumptions to arrive at different scenarios of, again, a constant average number of projected requests.

Translating Federal and Department of Defense Civilian Assistive Technology Requests to Costs

With these projections of federal and DoD civilian workers, we now turn to quantifying the cost of procuring technologies for these individuals. This quantification involves two steps: applying an assumption of average number of accommodations provided for a given civilian

TABLE 3.2
Estimated Average Annual Number of Employees Making Requests for Assistive Technology, by Workforce, 2021–2031

Disability Category	Federal	DoD Civilian (Shrinking Workforce Scenario)	DoD Civilian (Growing Workforce Scenario)
Hearing	14,286	3,264	3,504
Vision	17,089	2,551	2,740
Cognitive	8,597	1,350	1,449
Dexterity	35,108	6,089	6,539

SOURCE: Authors' calculations from civilian worker projections and assumptions over fraction and frequency of accommodation requests.

¹² The survey estimates indicate that accommodations were requested at some point by 15.5 percent of people with cognitive disabilities, 38.7 percent of people with dexterity disabilities, 45.6 percent of people with vision disabilities, and 17.7 percent of people with hearing disabilities. Note that we are unable to identify whether the surveys reflect annual requests, a single request over (up to) a ten-year span, or if individuals have made multiple requests over time. We therefore rely on CAP's own rates of requests for services or software, which we assume are replaced annually due to the nature of services and software licenses, and for hardware, which we assume are replaced every other year. The percentages of accommodation procurements accounted for by hardware for DOD civilians from 2019 to 2021 were 68 percent (cognitive), 92 percent (dexterity), 63 percent (hearing), and 70 percent (vision). This approach implies that on an annualized basis, these type of accommodation requests are made by 10.2 percent (i.e., 15.5 percent \times (1 \times 32 percent + (1/2) \times 68 percent)) of workers with cognitive disabilities; 20.9 percent of workers with dexterity disabilities, 29.6 percent of workers with vision disabilities, and 12.1 percent of workers with hearing disabilities.

worker making a request in a given disability category, and then applying an assumption of the cost per unit of accommodation. We use administrative records provided by CAP in constructing both of these assumptions and, given this data source, we limit our cost estimates to the four CAP disability categories. Table 3.3 shows the average number of units of AT procured for civilian workers in each fiscal year from 2016 to 2020, by disability category, as well as the overall average over that time period. We use the weighted average (the average over these fiscal years, weighted by the cases in each fiscal year) as our assumed number of units per worker with the corresponding disability, but provide this range to show its variability from year to year and provide the reader the means to apply alternative scenarios based on recent experiences. We collapse down to a single average for both units of AT per request and costs per unit, since we observed no consistent trends in either across populations or groups, and thus average across available years (after the 2016 CAP recordkeeping change) to eliminate idiosyncratic variation.

Table 3.4 shows the per-unit price CAP paid for AT for DoD civilian workers, by disability category, for each year from FY 2016 to FY 2020, as well as the weighted average of these prices. We adjust for inflation employing the Consumer Price Index Research Series Using Current Methods (CPI-U-RS) to 2021 dollars. As above, we use the weighted average (the average over these fiscal years, weighted by the number of units in each fiscal year) as our assumed price per unit for the corresponding disability category, but provide this range to show its variability from year to year and provide the reader the means to apply alternative scenarios based on recent experiences.

TABLE 3.3
Average Number of Units of Assistive Technology Procured by CAP per
Requesting Department of Defense Civilian Worker, by CAP Disability Category
and Fiscal Year

FY	Cognitive	Dexterity	Hearing	Vision
2016	2.0	2.3	1.8	2.1
2017	2.1	2.2	1.3	1.7
2018	2.1	2.0	1.5	1.8
2019	2.2	2.3	1.5	1.9
2020	2.2	2.7	1.7	1.9
Weighted average	2.1	2.2	1.5	1.9

SOURCE: Authors' calculations based on data from CAP administrative records.

TABLE 3.4**Average Unit Price to CAP of a Unit of Assistive Technology for Department of Defense Civilian Workers, by CAP Disability Category and Fiscal Year, in 2021 Dollars**

FY	Cognitive	Dexterity	Hearing	Vision
2016	338	354	299	542
2017	323	311	762	528
2018	282	318	530	667
2019	260	203	616	612
2020	349	129	447	624
Weighted average	307	287	443	585

SOURCE: Authors' calculations based on data from CAP administrative records, inflation adjusted with the CPI-U-RS.

Table 3.5 summarizes the projections of federal and DoD civilian workers across the four CAP disability categories we model from 2021 to 2031, with the assumptions over how many accommodations, on average, a civilian worker with a given disability receives and the per-unit cost of each accommodation from Tables 3.9 and 3.10. Note that the federal estimate is inclusive of DoD civilians, and that there is a single employment trend considered (the shrinking workforce scenario).

Table 3.6 applies these assumptions to the projection scenarios and calculates annual costs, and then translates these to ten-year costs at the bottom of the table. We follow Congressional Budget Office (CBO) projections of growth in the Consumer Price Index for All Urban Consumers (CPI-U) from 2022 to 2031.¹³ Given this projected cost growth, our growing workforce scenario projects a ten-year cost of \$121,440,482 and our shrinking workforce scenario projects a cost of \$113,093,436 for the DoD civilian population.

¹³ The CBO projects 2022 annual growth in the CPI-U of 6.6 percent, 2023 of 3.6 percent, 2024 of 2.5 percent, and approximately 2.3–2.4 percent annually from 2025 to 2031; see CBO, 2022, p. 44.

TABLE 3.5

Projections of Annual Federal or Department of Defense Civilian Workers with Disabilities and Utilization Assumptions, by CAP Disability Category, 2021–2031

Disability Category	Federal	DoD Civilian (Shrinking Workforce Scenario)	DoD Civilian (Growing Workforce Scenario)	Units/Request	Price/Unit
Cognitive	8,597	1,350	1,448.7	2.1	307
Dexterity	35,108	6,089	6,539	2.2	287
Hearing	14,286	3,264	3,504	1.5	443
Vision	17,089	2,551	2,740	1.9	585

NOTE: The average units requested are from Table 3.4, and the real price per unit is from Table 3.4. Accommodation request estimates are from Table 3.2.

TABLE 3.6

Projections of Federal or Department of Defense Civilian Worker Costs, by Cost Growth and Projection Scenario, in 2021 Dollars

Disability Category	Annual Projections of Cost (2021 Dollars)		
	Federal	DoD Civilian (Shrinking Workforce Scenario)	DoD Civilian (Growing Workforce Scenario)
Cognitive	5,582,273	876,449	940,736
Dexterity	22,082,989	3,829,666	4,113,282
Hearing	9,678,891	2,211,456	2,373,892
Vision	18,972,546	2,832,531	3,041,814
2022–2031 total (in 2021 dollars)	563,166,993	97,501,016	104,697,239
2022–2031 total (CBO CPI-U cost growth)	653,228,985	113,093,436	121,440,482

Projecting Potential Demand from Service Members Separating Through the Disability Evaluation System

Chapter 3 uses assumptions of disability prevalence among demographic groups in DoD civilian employment and demographic projections of the growth rates of these groups to estimate projections of disability in the DoD civilian workforce. We now turn to estimating future prevalence of disability among active duty service members, for which we pursue a different analytic approach. In contrast to the above analysis of the civilian DoD workforce, active duty service member demand for AT has distinct analytic requirements for at least three reasons:

1. Service members are screened at the time of accession to *screen out* individuals with physical or mental limitations, in contrast to civilian employment in federal government, for which agencies must make affirmative action to *screen in* individuals with physical or mental disabilities during the hiring process.
2. Prevalence of accommodation-sensitive health conditions among service members are thus more likely to be driven by health conditions arising *during service*; therefore, the prevalence of historical or future demand for accommodations is dependent on the nature of service.
3. Careerism, and thus persistence within the force, is much less common than within the federal civilian workforce; thus, overall demographic trends within the force are less determinative than service experiences.

In this chapter we draw on a process by which DoD—and CAP, in particular—identify a subset of service members with disabling health conditions: the DES, which we describe below. We use administrative records from the DES process accordingly. An alternative approach to modeling future demand for CAP services among service members would be relying on historical CAP provision to such members; however, as discussed in Chapter 2, CAP has only recently begun separately providing technology to WSM-COADs. Additionally, service members referred to the DES may nevertheless not seek out or receive AT from CAP. That is, historical data are likely to understate future demand due to a generally increasing amount of provision by CAP.

As such, we seek to provide estimates of the number of wounded service members that are likely to be aided by accommodations, by disability category, and we split our analysis by the two WSM initiatives through which CAP categorizes its accommodations: WSM-COADs, who are not in the DES process, and WSM-MEBs, as part of the DES. Table 4.1 shows the number of service members who received CAP services from FY 2016 to FY 2021 by service member category. In this chapter we discuss our estimates of WSM-MEBs, and in the next chapter, we turn to the WSM-COAD population.

WSM-MEBs

Service members may experience health shocks due to new health conditions arising during service or existing conditions being exacerbated during service, and these service members may then seek out medical care via the military health care system or outside purchased care. Persistent or severe health conditions can lead to duty limitations, and if these limitations persist or are expected to persist, service members may no longer meet retention standards. Retention medical standards are service specific and used in the determination of whether a current service member should be referred to an MEB for consideration for medical discharge. The primary consideration in these standards is whether the service member is medically fit to perform the duties of their current job.

Disability Evaluation

A service member who becomes wounded, ill, or injured while serving and, after a period of treatment to facilitate medical recovery, is deemed by a treating provider to be potentially medically unfit, may be referred for disability evaluation. Per service-specific medical retention standards, this service member is referred to DES, and, typically, to the Integrated Dis-

TABLE 4.1
Counts of Service Members Receiving CAP Services from FY 2016 to FY 2021, by Disability Category and Service Member Type

Disability Category	WSM-COADs	WSM-MEBs
Cognitive	3,076	6,197
Communication	59	47
Dexterity	12,383	2,476
Hearing	255	122
Vision	236	294

SOURCE: Authors' calculations using CAP administrative records, FY 2016–FY 2021.

ability Evaluation System (IDES), which is run jointly by DoD and VA, having been fully integrated across the two departments starting in FY 2012. In our analysis, we rely on the recordkeeping system for IDES, the Veterans Tracking Application (VTA) database. However, we note that services still maintain separate legacy DES systems for a set of service members referred to the DES process. Moreover, detailed disability code data are not populated in the VTA data for all service members in IDES.

An IDES disability evaluation consists of three phases. First, the MEB, made up of clinicians and personnel management officers, uses information from the exam to decide whether the service member meets medical retention standards. If these standards are met, the service member is returned to duty. If the service member is found to not meet medical retention standards, the case is forwarded to the Physical Evaluation Board (PEB). The PEB determines whether the conditions found by the MEB make the service member unfit for duty, taking into consideration the member's duty assignment, the severity of the condition, and other factors. If the service member is considered fit for duty, they are returned to duty. If the PEB determines that the service member is not fit for duty, the case is forwarded to VA, where each condition is assigned a Veterans Affairs Schedule for Rating Disabilities (VASRD) code and a corresponding disability rating.¹

During this process, service members may be referred to or directly contact CAP and be provided with AT free of charge, and they can then keep it into their civilian life or in service if they return to service. Since these service members are proceeding through the IDES process, this process directly records the number of service members every year with specific VASRD codes, which we map into CAP disability categories. As discussed above, VTA data provide detailed VASRD codes for a subset of service members entering the DES process. To supplement these data for a comprehensive measure of all service members that would be classified as potential WSM-MEBs by CAP, we also draw on the Disability Evaluation System Analysis and Research (DESAR) *Annual Reports*, which provide counts of major categories of VASRD codes by service (AMSARA, 2012–2019). These DESAR reports draw on both VTA data and service-specific data that include the comprehensive measures of disability category prevalence across all WSM-MEBs (Weber et al., 2022). However, these reports provide disability measures in broader categorizations than CAP's own categorizations (e.g., aggregating conditions that would classify as cognitive disabilities into a broader psychiatric disability category). As we discuss below, we rely on both data sets to estimate the number of WSM-MEBs by CAP disability categories based on these historical DES data sources (for details on VASRD-to-category matching, see the Appendix).

This approach corresponds to counting “flows” of WSM-MEBs on an annual basis, measuring the potential new accommodation requests to CAP. Our approach is not methodologically complicated: we draw from these data sources to estimate the number of service members in the IDES data with VASRD codes comparable with the corresponding CAP category under study; we then use historical IDES case statistics to provide an estimated range pro-

¹ Table A.11 includes a list of the VASRD codes used in this analysis and the corresponding conditions.

jected for WSM-MEBs over the coming decade based on different eras of conflict intensity. Our primary scenario is an annual average of WSM-MEBs in each disability category across the available IDES data from 2011 to 2018. However, DES evaluations across all services and categories saw a peak in 2015, with a sharp decline in 2016. This pattern follows the draw-down of troops from Afghanistan and Iraq from their peak levels in 2008 and 2009 and the resulting change in the size and composition of DES referrals over the subsequent half decade (CAP, 2016). We therefore provide two alternative annual estimates for each condition: the pre-2016 peak representing WSM-MEB flows resulting from high-conflict service experiences, and the post-2016 trough representing WSM-MEB flows in less conflict-intensive periods.

Cognitive Disabilities

Although there are a range of cognitive health conditions for which CAP procures technologies for the DoD civilian workforce, many of these conditions would prevent a potential service member from joining the military. In conversation with CAP, we found that the majority of WSM-MEB service members receiving cognitive accommodations had cognitive disabilities arising from TBIs, and, potentially, memory limitations that arose due to these injuries; the VASRD 8045 corresponds to a service member separating with a TBI. Memory limitations deriving from other etiologies are the next most common group of WSM-MEBs receiving cognitive accommodations, which are recorded with psychiatric VASRD codes from 9301 to 9326.

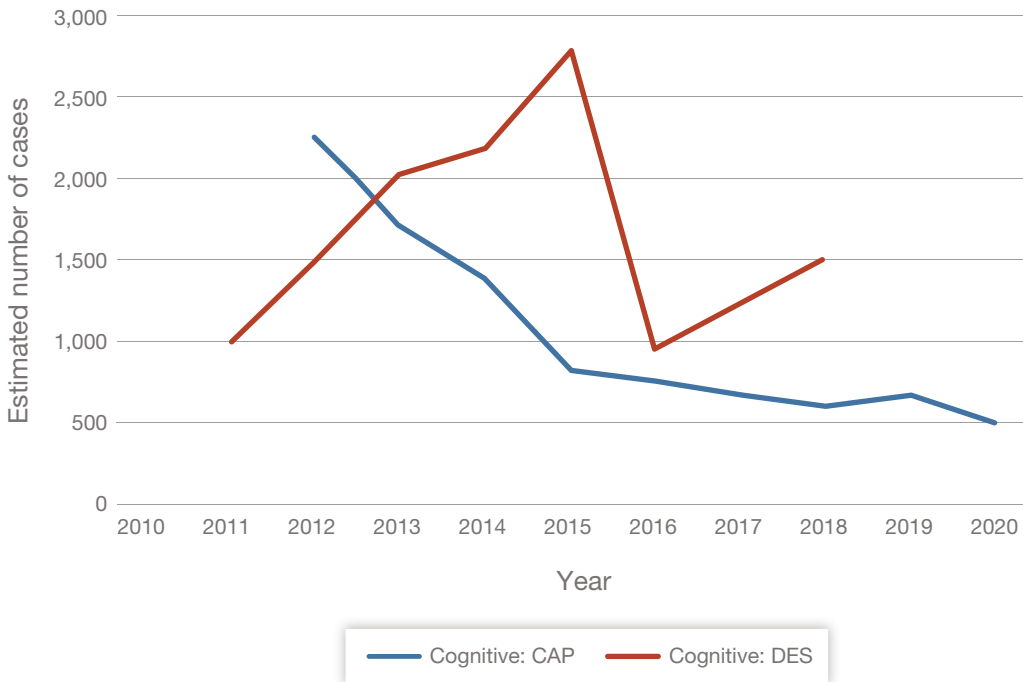
As such, we base our estimates of future CAP WSM-MEB cognitive caseloads on two sources. First, we use the aggregate counts of medically separating service members with a TBI VASRD provided in the annual DESAR reports, which is a comprehensive measure across all services. Second, we estimate the number of WSM-MEB service members with a memory-related VASRD but without a TBI VASRD by applying rates of memory VASRD codes among psychiatric VASRD codes in VTA data.

Although the VTA data contain records for all WSM-MEB service members separating through the IDES process, not all fields are complete, since services maintain legacy DES systems, and the U.S. Army uses an electronic PEB system instead of the VTA to record VASRD codes for a substantial portion of soldiers separating through the IDES process. Thus, we cannot observe VASRD codes for all medically separating service members to provide a complete count of every service member with a memory-related psychiatric VASRD. However, we have accurate counts of the *total* number of psychiatric VASRD codes from the annual DESAR reports. We therefore estimate the fraction of service members with non-TBI memory-related VASRD codes by counting the number of service members with *any* psychiatric VASRD codes in the VTA data (which is necessarily lower than the counts from the DESAR reports due to this issue of missing VASRD codes in our data), as well as the number of service members with non-TBI memory-related VASRD codes in the VTA data. By dividing the latter by the former, we have an estimate of the portion of service members with a

non-TBI memory-related VASRD among service members with any psychiatric VASRD. We apply this portion to the DESAR-provided counts of all service members with psychiatric VASRD codes in each year, which assumes that the rate of memory-related VASRD codes among service members with psychiatric VASRD codes observed in VTA data does not systematically differ from the corresponding rate for service members for whom we do not observe VASRD codes in these data. From 2011 to 2020 there were, on average, just over 1,600 service members separating with a TBI VASRD annually.

Approximately 0.63 percent of service members with a psychiatric VASRD had a non-TBI memory-related VASRD. Given that there are, on average, just over 13,000 service members with psychiatric VASRD codes every year, we estimate, on average, 83 service members per year with a non-TBI memory-related VASRD.

FIGURE 4.1
Estimated Number of WSM-MEBs with Cognitive VASRD Codes, from Disability Evaluation System Cases and Administrative Counts of WSM-MEBs Receiving CAP Services for a Cognitive Disability



SOURCES: Authors’ calculations using CAP administrative data for FY 2012–2020 and DES administrative data for FY 2011–2018.

NOTE: The Cognitive: CAP series comprises WSM-MEB caseloads for cognitive disabilities from CAP administrative data, shown from 2012 to 2020. The Cognitive: DES series comprises the estimated number of service members with disability ratings corresponding to the CAP cognitive disability category who were referred to an MEB (hence, WSM-MEBs) and rated in the DES process.

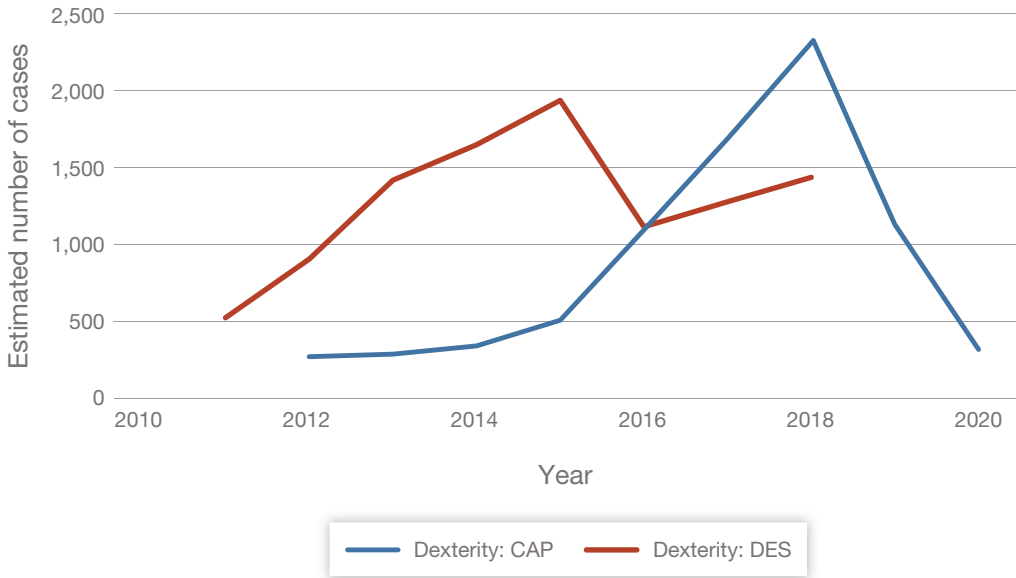
Figure 4.1 shows the combined number of WSM-MEBs with a TBI VASRD or memory-related VASRD codes (DES cases) based on our data from 2011 to 2018, as well as the counts of WSM-MEBs for which CAP provided accommodations for cognitive disabilities (based on administrative CAP records from 2012 to 2020). There is a gradual increase through 2015 in DES case-based estimates of WSM-MEBs, followed by a sharp decline in 2016. The eight-year annual average of these DES cases is 1,709, with a pre-2016 peak of 2,785 cases in 2015 and a 2016 trough of 987 cases. We note here a difference in trends between the number of service members separating with VASRD codes falling under CAP's cognitive disability category and those receiving AT from CAP in this category, although we do not have an explanation for this decline in CAP services from 2012 to 2015 when DES cases for cognitive disabilities rose in this same time period.

Dexterity Disabilities

Although dexterity limitations are common among WSM-MEBs, the AT that CAP provides is primarily limited to limitations of motion to upper extremities, since CAP does not provide mobility or lower extremity accommodations. As such, we focus on the subset of service members with limitation of motion VASRD codes (those in the 5051–5284 or 5301–5319 ranges) who have at least one upper extremity limitation of motion VASRD (5200–5230, 5120–5156, 5301–5309, 5051–5053, 5104–5106, 5108, 5109, or 5111).

We follow a similar procedure as in the cognitive disabilities analysis: DESAR reports provide accurate counts of the total number of service members with any limitation of motion VASRD codes; we adjust these counts downward by calculating the fraction in our VTA data of the number of service members with an upper extremity limitation of motion VASRD among all service members with any limitation of motion VASRD codes. From 2011 to 2020, according to DESAR reports, there was an average of approximately 9,500 service members annually with any limitation of motion VASRD. This number rose from 2011 to 2015, fell substantially in 2016, then rose slightly through 2018. Using VTA data, we estimate that 13.5 percent of service members with limitation of motion VASRD codes have limitation of motion in an upper extremity. Figure 4.2 shows the estimated number of DES cases with upper extremity VASRD codes every year. From 2011 to 2020, there is thus an average of 1,277 number of WSM-MEBs from DES cases with VASRD codes corresponding to CAP's dexterity disability categorization. The pre-2016 peak is 1,924 cases in 2015 and the 2016 trough is 1,117 cases. The figure also presents CAP WSM-MEB dexterity cases, annually, from 2012 to 2020. Although these cases are below the DES case-estimated number of WSM-MEBs up to 2016, CAP experienced a spike in caseload that exceeded DES cases in 2017 and 2018. This spike fell again, indicating a lack of strong correlation between DES WSM-MEBs and CAP services.

FIGURE 4.2
Estimated Number of WSM-MEBs with Dexterity VASRD Codes, from Disability Evaluation System Cases and Administrative Counts of WSM-MEBs Receiving CAP Services for a Dexterity Disability



SOURCES: Authors' calculations using CAP administrative data for FY 2012–2020 and DES administrative data for FY 2011–2018.

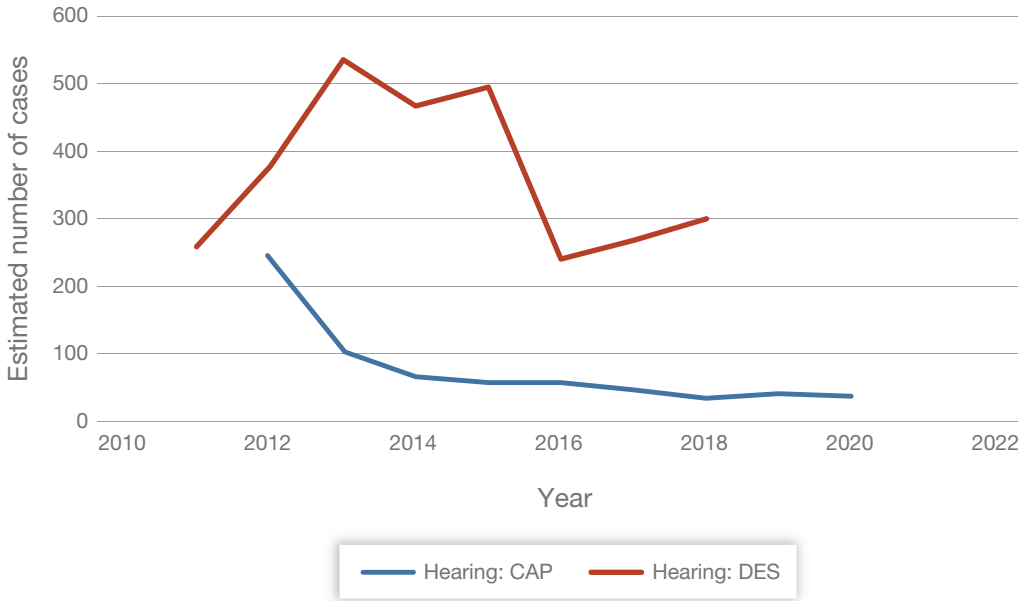
NOTE: The Dexterity: CAP series comprises WSM-MEB caseloads for dexterity disabilities from CAP administrative data, shown from 2012 to 2020. The Dexterity: DES series comprises the estimated number of service members with disability ratings corresponding to the CAP dexterity disability category who were referred to an MEB (hence, WSM-MEBs) and rated in the DES process.

Hearing Disabilities

The hearing-related IDES categories correspond to VASRD codes in the 6200s and include otosclerosis, tympanic membrane conditions, and tinnitus. The high-level counts across services provided in the annual DESAR reports therefore correspond directly to the relevant CAP category, representing *potential* CAP recipients. Figure 4.3 shows that across services and years, 2 percent or less of DES cases include hearing-related VASRD codes, corresponding to counts of WSM-MEBs with hearing disabilities in the hundreds per year. As seen in prior conditions, there is a gradual increase through 2015 in cases, followed by a decline. The eight-year annual average of DES cases is 379, with a pre-2016 peak of 534 cases in 2013 and a 2016 trough of 236 cases. WSM-MEB cases for hearing from DES data substantially exceed CAP WSM-MEB hearing cases throughout the entirety of the overlap of available data for both.

FIGURE 4.3

Estimated Number of WSM-MEBs with Hearing VASRD Codes, from Disability Evaluation System Cases and Administrative Counts of WSM-MEBs Receiving CAP Services for a Hearing Disability



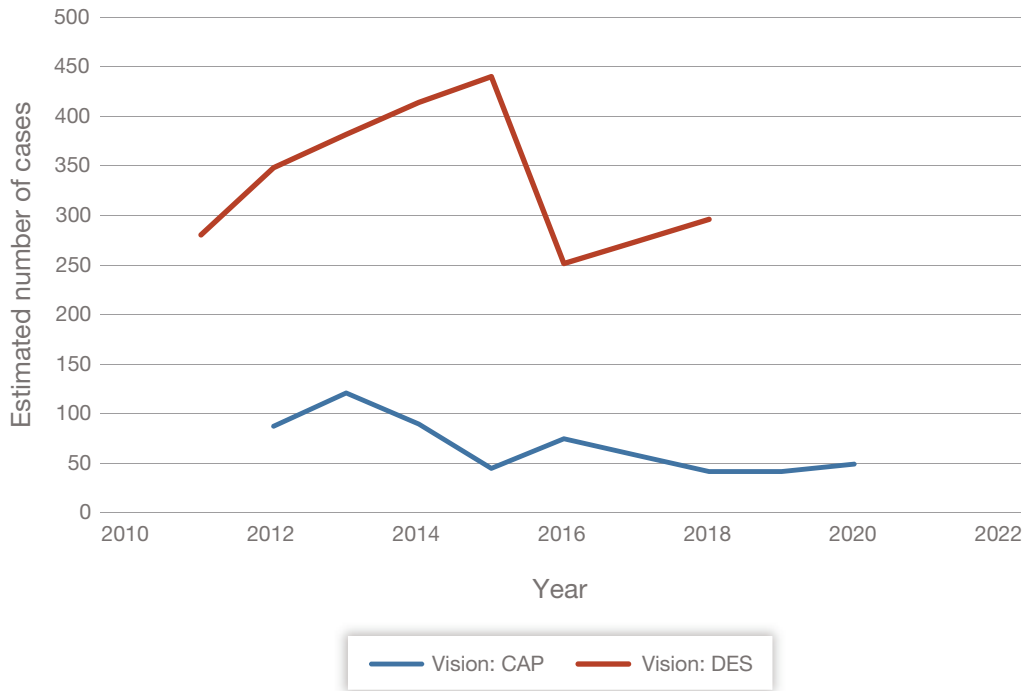
SOURCES: Authors' calculations using CAP administrative data for FY 2012–2020 and DES administrative data for FY 2011–2018.

NOTE: The Hearing: CAP series comprises WSM-MEB caseloads for hearing disabilities from CAP administrative data, shown from 2012 to 2020. The Hearing: DES series comprises the estimated number of service members with disability ratings corresponding to the CAP hearing disability category who were referred to an MEB (hence, WSM-MEBs) and rated in the DES process.

Vision Disabilities

The vision-related IDES categories correspond to VASRD codes 6061–6080 and include low vision, blindness, conditions that affect field of vision, and the loss of one or both eyes. The high-level counts across services provided in the annual DESAR reports therefore correspond directly to the relevant CAP category. In findings similar to those of the hearing disability analysis, Figure 4.4 shows that, across services and years, less than 2 percent of DES cases include vision-related VASRD codes, corresponding to counts of WSM-MEBs with vision disabilities in the hundreds per year. As seen in prior conditions, there is a gradual increase through 2015 in cases, followed by a decline. The eight-year annual average of DES cases is 344, with a 2015 peak of 439 cases and a 2016 trough of 250 cases. As with hearing disabilities, WSM-MEB cases for vision disabilities from DES data substantially exceed CAP WSM-MEB vision disability cases throughout the entirety of the overlap of available data for both.

FIGURE 4.4
Estimated Number of WSM-MEBs with Vision VASRD Codes, from Disability Evaluation System Cases and Administrative Counts of WSM-MEBs Receiving CAP Services for a Vision Disability



SOURCES: Authors' calculations using CAP administrative data for FY 2012–2020 and DES administrative data for FY 2011–2018.

NOTE: The Vision: CAP series comprises WSM-MEB caseloads for vision disabilities from CAP administrative data, shown from 2012 to 2020. The Vision: DES series comprises the estimated number of service members with disability ratings corresponding to the CAP vision disability category who were referred to an MEB (hence, WSM-MEBs) and rated in the DES process.

Translating WSM-MEBs to Costs

With these projections of service members based on average, peak, and trough DES cases, we now turn to quantifying the cost of procuring technologies for these individuals. This quantification involves two steps: applying an assumption of the average number of accommodations provided for a given WSM-MEB in a given disability category in the year that the VASRD disability rating was made, and then applying an assumption of the cost per unit of accommodation. We use administrative records provided by CAP in constructing both of these assumptions. Table 4.2 shows the average number of units of AT procured for WSM-MEBs in each year from FY 2016 to FY 2020, by disability category, as well as the overall average over that time period. We use the weighted average (the average over these fiscal years, weighted by the cases in each fiscal year) as our assumed number of units per WSM-MEB with

the corresponding disability, but provide this range to show its variability from year to year and provide the reader the means to apply alternative scenarios based on recent experiences.

Table 4.3 shows the per-unit price CAP paid for AT for WSM-MEBs, by disability category, for each year from FY 2016 to FY 2020, as well as the weighted average of these prices. We adjust for inflation using the CPI-U-RS to 2021 dollars. As above, we use the weighted average (the average over these fiscal years, weighted by the number of units in each fiscal year) as our assumed price per unit for the corresponding disability category, but provide this range to show its variability from year-to-year and provide the reader the means to apply alternative scenarios based on recent experiences.

Table 4.4 summarizes the projections based on the average, peak, and trough DES cases across the four CAP disability categories we model from 2021 to 2031, with the assumptions over how many accommodations, on average, a WSM-MEB service member with a given disability receives and the per-unit cost of each accommodation, from Tables 4.2 and 4.3.

TABLE 4.2
Average Number of Units of Assistive Technology Procured by CAP for WSM-MEBs, by CAP Disability Category and Fiscal Year

FY	Cognitive	Dexterity	Hearing	Vision
2016	2.4	2.1	1.3	2.1
2017	2.7	2.5	1.6	1.4
2018	2.5	3.5	1.3	2.0
2019	2.6	3.6	2.0	2.1
2020	2.5	3.0	1.5	2.8
Weighted average	2.5	2.6	1.4	2.1

SOURCE: Authors' calculations using CAP administrative records.

TABLE 4.3
Average Unit Price to CAP of a Unit of Assistive Technology for WSM-MEBs, by CAP Disability Category and Fiscal Year, in 2021 Dollars

FY	Cognitive	Dexterity	Hearing	Vision
2016	145	363	296	457
2017	148	195	519	1,098
2018	131	178	661	480
2019	164	139	346	1,033
2020	141	218	405	856
Weighted average	146	249	414	666

SOURCE: Authors' calculations using CAP administrative records, inflated to 2021 dollars with the CPI-U-RS.

Table 4.5 applies these assumptions to the projection scenarios and calculates annual costs, and then translates these to ten-year costs. Given the CBO projections of the CPI-U, as discussed in Chapter 3, our high scenario projects a ten-year cost of \$38,704,111, our low scenario projects a cost of \$19,058,441, and our average scenario is a cost of \$26,130,650 for the WSM-MEB group.

TABLE 4.4
Projections of Annual WSM-MEBs and Utilization Assumptions, by CAP Disability Category, 2021–2031

Disability Category	Average Scenario	High Scenario	Low Scenario	Units/ WSM-MEB	Price/Unit
Cognitive	1,709	2,785	987	2.5	146
Dexterity	1,277	1,924	1,117	2.6	249
Hearing	379	534	236	1.4	414
Vision	344	439	250	2.1	666

NOTE: The table includes the average units requested from Table 4.2 and the real price per unit from Table 4.3. Accommodation request estimates are from the “Cognitive Disabilities,” “Dexterity Disabilities,” “Hearing Disabilities,” and “Vision Disabilities” sections of this chapter.

TABLE 4.5
Projections of WSM-MEB Costs, by Cost Growth and Projection Scenario, in 2021 Dollars

Disability Category	Average Scenario	High Scenario	Low Scenario
Cognitive	634,938	1,034,700	366,696
Dexterity	834,941	1,257,970	730,328
Hearing	222,199	313,073	138,362
Vision	485,208	619,204	352,622
2022–2031 total (in 2021 dollars)	21,772,868	32,249,465	15,880,084
2022–2031 total (2% cost growth)	26,130,650	38,704,111	19,058,441

Projecting Potential Demand from Service Members Continuing on Active Duty

Estimating and projecting the population of WSM-COADs presents unique challenges relative to the other populations under study. Most notably, we have been measuring prevalence of disability by using metrics constructed to measure whether a given health condition interferes with work or other activities. For example, the DES process explicitly measures the presence and severity of the disabling effects of a health condition, while the survey questions used in the civilian workforce projections exhibit difficulty with activities or work limitation, not just the presence of a health condition itself.

One indicator of how health conditions may present limitations to active duty service members is through duty limitations, either temporary or permanent, as captured by profiles in the U.S. Air Force, U.S. Army, and U.S. Space Force and limited duties in the U.S. Marines and U.S. Navy. However, the number of service members with a duty limitation exceeds the number of WSM-COAD cases by several orders of magnitude every year, suggesting that this population is too broad to use as a measure of the accommodation-sensitive WSM-COAD population; for example, Krull et al. (2020) study the approximately 75,000 soldiers who transferred from the active component Army to the reserve component between 2010 and 2016. They find that one-half of these soldiers had a duty limitation within two years of transfer, and one-fourth had a duty limitation that lasted for at least one month. Even in this select population of soldiers, the number of service members with duty limitations exceeds CAP's WSM-COAD caseload (not taking into account all active component or activated reserve component service members). Without more detailed service-specific profile data, which were unavailable for this report, we cannot rely on high-level profile statistics to project demand for CAP services.

We thus focus on specific diagnoses of conditions that are commonly accommodated via AT and which, in consultation with CAP staff, fall within their disability categorizations for WSM-COADs. Given both budgetary and timeline constraints, we did not have access to longitudinal Defense Health Agency data that would allow us to examine both incidence and severity of specific diagnoses. However, in consultation with CAP, we identified a number of

overarching diagnosis categories, for which statistics were available in existing publicly accessible documents. Notably, we rely on three sources for diagnoses:

1. the *Medical Surveillance Monthly Report (MSMR)*, the journal of the Armed Forces Health Surveillance Division, which publishes a range of medical surveillance articles drawing on data from the Defense Health Agency and other data for populations covered by the military health care system and, in particular, the *MSMR*'s annually published "Absolute and Relative Morbidity Burdens Attributable to Various Illnesses and Injuries, Active Component, U.S. Armed Forces," which provides estimates for hearing disorders, dexterity limitations, and multiple sclerosis diagnoses; in addition, an article in the September 2019 *MSMR* (Reynolds, Williams, et al., 2019) provides point-in-time estimates of a range of vision-related conditions in 2018
2. a prior RAND report on the number of TBI diagnoses over time in the armed forces (Krull et al., 2021)
3. a 2019 *American Journal of Audiology* article on tinnitus (Moore et al., 2019).

As was noted in Chapter 4, the WSM-COAD initiative within CAP started in 2015, and thus we limit our analyses for the period FY 2016–FY 2020. We draw on the above resources to provide estimates of the diagnoses groups that, in consultation with CAP, correspond to service members who would be eligible for CAP-provided accommodations. We focus our estimates on the number of *unique service members* with diagnoses, not the counts of diagnoses themselves, since CAP administrative records are at the service member level.¹

We note that we expect our estimates of the eligible population to be substantially larger than for the WSM-MEB population, for three reasons. First, not all diagnoses sufficiently interfere with duties to lead to a service member being referred to or seeking out CAP's services. Second, service members may be reticent to be referred to or to seek out these services if they perceive receipt of AT to jeopardize their ability to deploy. Third, WSM-MEBs are undergoing a thorough evaluation of functional capacity and rating of disability severity, and thus are in contact with specialists in occupational health and are preparing for the potential for postservice employment; since CAP offers AT free of charge to such service members, and they can keep it into civilian employment, CAP services are particularly valuable.

¹ We also note that these diagnoses potentially include WSM-COADs and WSM-MEBs in the same year; that is, service members may be diagnosed with a condition in the same year they go through the DES process and are rated with a VASRD. We discuss this potential limitation further in the Appendix, but given that diagnoses do not immediately or always result in MEB referral; that, as noted in Chapter 4, there is typically a one-year period between diagnosis and referral to allow for medical recovery; that services use pre-MEB processes to prevent MEB referral, such as the MOS Administrative Retention Review for the Army and an Initial Review in Lieu of MEB referral in the Air Force; and that the DES and VASRD rating process itself has a goal of taking 180 days there is limited potential for overlap in these counts in each year.

Cognitive Disabilities

In consultation with CAP, we identified two categories of diagnoses for which medical surveillance data were available and which corresponded to conditions representative of WSM-COADs receiving AT for cognitive limitations or impairments: TBIs and multiple sclerosis. CAP indicated that other memory-related conditions represent the remainder of WSM-COADs in this category, yet the research team was unable to find reliable estimates of non-TBI memory-related diagnoses, and the prior WSM-MEB analysis indicates that this group is a relatively small fraction relative to service members with TBI-related memory limitations.

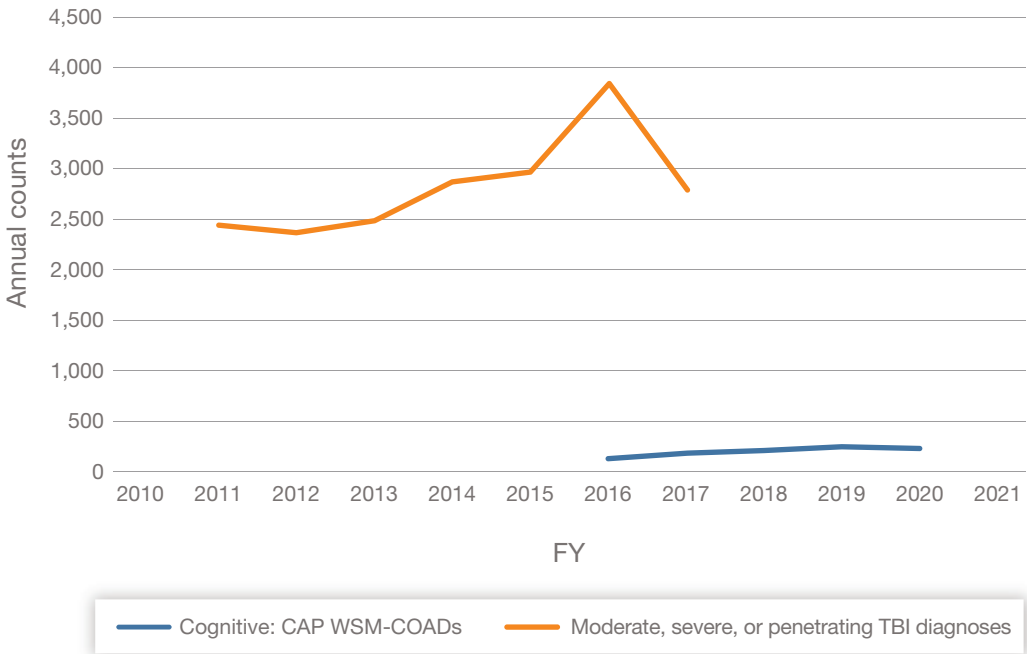
As was noted in Chapter 4, CAP provided cognitive-related AT for a *total* of 3,076 WSM-COADs between FY 2016 and FY 2021. However, Krull et al. (2021) find 16,130 new TBI diagnoses in FY 2016 *alone*. For this analysis, we therefore focus on the smaller set of new moderate, severe, or penetrating TBI diagnoses, which averaged 2,818 annually from FY 2011 to FY 2017, the most recent year reported in Krull et al. (2021). This number represents the potential flow of new WSM-COADs who may request cognitive-related CAP accommodations.

Although these diagnoses are an order of magnitude higher than the corresponding CAP caseload, given the severity of these diagnoses we consider them indicative of the accommodation-sensitive WSM-COAD population. Our decision to exclude mild TBI cases is not intended to argue that these service members would be ineligible for CAP's services currently, nor that CAP should exclude these service members in the future, but that the current scope of CAP services for WSM-COADs is a substantially smaller population than the population with any new TBI diagnoses, and thus relying on this population to project future demand for CAP services would be unrealistic under current policy.

We additionally include the set of service members diagnosed with multiple sclerosis, as reported in the *MSMR's* annual publication, *Absolute and Relative Morbidity Burdens Attributable to Various Illnesses and Injuries* (AFHSC, Annual Reports 2012–2021). Although diagnoses are reported at the service member level, this publication does not report the number of *new* diagnoses. Instead the *MSMR* reports the equivalent of the stock of diagnoses; as such, we apply the same stock-to-flow correction as was used in Chapter 3—namely, that 15.5 percent of workers reporting a cognitive disability reported having requested AT from their employer. Since the number of service members diagnosed with multiple sclerosis averaged just over 612 annually from FY 2011 to FY 2017 (authors' calculations from AFHSC, Annual Reports 2012–2018), and we assume that the rates of requesting accommodations reported in Schur et al. (2014) correspond to a new request, on average, every year for services or software (of which 8 percent of WSM-COAD cognitive CAP procurements account for) and every other year for hardware (of which 92 percent of WSM-COAD cognitive CAP procurements account for), we estimate a further 51 service members requesting CAP cognitive accommodations annually due to multiple sclerosis.

Figure 5.1 shows trends in WSM-COAD CAP caseloads for cognitive disabilities, as well as the available trends in new moderate, severe, or penetrating TBI diagnoses (given the small number of estimated multiple sclerosis requests, we omit illustrating this series in the figure), both of which represent flows of new CAP AT recipients or diagnoses. As noted

FIGURE 5.1
Annual Counts of WSM-COADs Receiving CAP Services for a Cognitive Disability and Service Members Newly Diagnosed with Select Cognitive Conditions, by Fiscal Year



SOURCES: The cognitive CAP WSM-COADs counts are from CAP administrative data, FY 2016–FY 2020; the moderate, severe, or penetrating TBI diagnoses are from Krull et al. (2021).

above, we project the average annual CAP cognitive requests for WSM-COADs to be 2,869. Our high scenario is based on the observed peak for each, totaling 3,892 annually; our low scenario is based on the observed trough for each, totaling 2,413 annually. We note here that although we focus on new moderate, severe, or penetrating TBI diagnoses, which, in 2016 were 3,892 in number (as opposed to 16,130 TBI diagnoses when including mild TBI diagnoses), this limitation to more severe TBI nevertheless greatly exceeds the 139 WSM-COADs that CAP provided services for in that year for cognitive disabilities. CAP’s peak in our data was 258 WSM-COADs receiving AT for cognitive disabilities, far below the diagnostic average of our series.

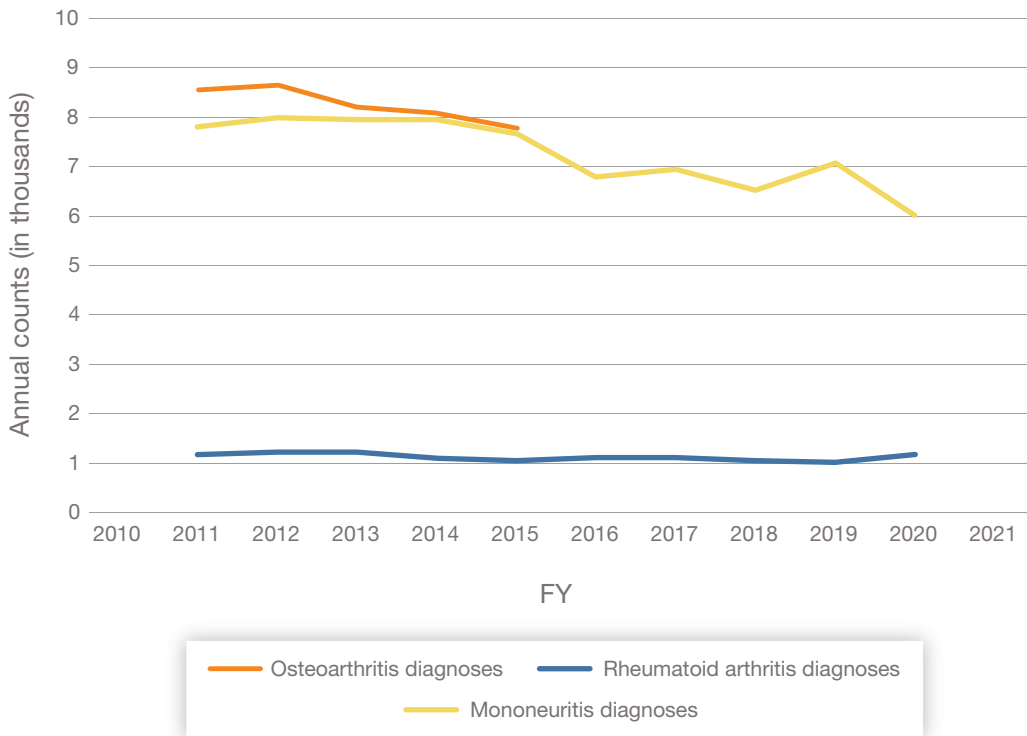
Dexterity Disabilities

In consultation with CAP, we identified three categories of diagnoses for which medical surveillance data were available and which corresponded to conditions representative of WSM-COADs receiving AT for dexterity limitations or impairments: osteoarthritis, rheuma-

toid arthritis, and mononeuritis. Diagnoses from these conditions, from the *MSMR* (AFHSC, Annual Reports 2012–2021), are shown in Figure 5.2.

However, as was noted in the “Cognitive Disabilities” section above, these diagnoses represent the stock of WSM-COADs with these dexterity condition diagnoses, in contrast to our measures of new diagnoses (i.e., flows) that we could show for cognitive diagnoses given available data for new TBI diagnoses. As such, we translate these stock of diagnoses into a flow of new potential CAP requests by applying our correction factor from Chapter 3 of 38.7 percent of new requests; furthermore, CAP records indicate that 4 percent of dexterity procurements for WSM-COADs were for software, which we assume is requested annually, while 96 percent were for hardware, which we assume is requested every two years. Given average diagnoses across these three conditions over the periods for which we have data, we estimate 3,334 requests for CAP dexterity services annually. Given the peaks of each diagnostic group, our high estimate is 3,583 requests. Given the troughs of each diagnostic group, our low estimate is 2,971.

FIGURE 5.2
Annual Counts of Service Members with Diagnoses for Select Dexterity Conditions, by Fiscal Year



SOURCES: Authors' calculations from the *MSMR* (AFHSC, Annual Reports 2012–2021), representing the count of service members with such a diagnosis in the prior year, not limited to new diagnoses.

Hearing Disabilities

CAP does not provide hearing-related AT for a substantial number of WSM-COADs; from FY 2016 to FY 2020, CAP provided these technologies for, on average, only 26 WSM-COADs annually. We note that the *MSMR* indicates that over this time period, there were, on average, 36,144 diagnoses of hearing disorders across all active-duty service members (authors' calculations from AFHSC 2017–2021). Even applying the relatively low rates of accommodation requests to translate this stock of diagnoses into a flow of new estimated CAP requests, our estimate would be 1,278 WSM-COAD hearing disability requests annually, two orders of magnitude higher than the average that CAP provides. Even limiting to specific conditions would produce estimates an order of magnitude higher than observed CAP WSM-COAD hearing disability caseloads (e.g., there are over 8,000 tinnitus diagnoses annually; Moore et al., 2019). As such, we base our projections on CAP's own utilization; regardless, hearing disability WSM-COADs are unlikely to be a substantial cost driver for CAP in the absence of major policy change (e.g., CAP involvement with hearing conservation programs).

Vision Disabilities

Similar to the case of hearing disabilities, there are few WSM-COADs receiving CAP services for vision disabilities. From FY 2016 to FY 2020, there were only, on average, 21 such cases annually. We therefore base our projections on CAP's own service provision, but we note that there are substantial numbers of service members diagnosed with vision-related issues annually. In 2018, for example, 2,703 service members were diagnosed with vision-threatening ocular injuries; 517 were diagnosed with blindness/low vision; 1,461 were diagnosed with optic nerve conditions; 2,286 were diagnosed with visual discomfort or disturbances (Reynolds, Williams, et al., 2019, p. 9, table); and 284 were diagnosed with chorioretinopathy (authors' calculations from incidence rate from Reynolds, Karesh, et al., 2019, p. 33). If CAP were to provide services to these diagnosed service members, its costs could be substantially higher; however, under current policy, WSM-COAD vision AT is not a major cost driver.

Translating WSM-COADs to Costs

With these projections of service members based on average, peak, and trough diagnoses and estimated accommodation requests, we now turn to quantifying the cost of procuring technologies for these individuals. This quantification involves two steps: applying an assumption of the average number of accommodations provided for a given WSM-COAD in a given disability category, and then applying an assumption of the cost per unit of accommodation. We use administrative records provided by CAP in constructing both of these assumptions.

Table 5.1 shows the average number of units of AT procured for WSM-COADs in each year from FY 2016 to FY 2020, by disability category, as well as the overall average during that time period. We use the weighted average (the average over these fiscal years, weighted by the cases in each fiscal year) as our assumed number of units per WSM-COAD with the corresponding disability, but provide this range to show its variability from year to year and provide the reader the means to apply alternative scenarios based on recent experiences.

Table 5.2 shows the per-unit price that CAP paid for AT for WSM-COADs, by disability category, for each year from FY 2016 to FY 2020, as well as the weighted average of these prices. We adjust for inflation using the CPI-U-RS to 2021 dollars. As above, we use the weighted average (the average over these fiscal years, weighted by the number of units in each fiscal year) as our assumed price per unit for the corresponding disability category, but provide this range to show its variability from year to year and provide the reader the means to apply alternative scenarios based on recent experiences.

TABLE 5.1
Average Number of Units of Assistive Technology Procured by CAP for WSM-COADs, by CAP Disability Category and Fiscal Year

FY	Cognitive	Dexterity	Hearing	Vision
2016	2.4	2.2	1.6	1.7
2017	3.0	2.1	1.2	1.8
2018	2.7	2.0	1.6	2.5
2019	2.4	2.2	1.5	1.7
2020	2.3	3.1	1.4	1.9
Weighted average	2.5	2.1	1.5	1.9

SOURCE: Authors' calculations using CAP administrative records.

TABLE 5.2
Average Unit Price to CAP of a Unit of Assistive Technology for WSM-COADs, by CAP Disability Category and Fiscal Year, in 2021 Dollars

FY	Cognitive	Dexterity	Hearing	Vision
2016	183	415	357	379
2017	170	354	502	405
2018	176	347	376	375
2019	196	258	318	492
2020	222	123	332	473
Weighted average	189	330	370	430

SOURCE: Authors' calculations using CAP administrative records, inflated to 2021 dollars with the CPI-U-RS.

Table 5.3 summarizes the projections based on the average, peak, and trough diagnoses cases across the four CAP disability categories we model from 2021 to 2031, with the assumptions over how many accommodations, on average, a WSM-COAD service member with a given disability receives and the per-unit cost of each accommodation, from Tables 5.1 and 5.2.

Table 5.4 applies these assumptions to the projection scenarios, calculates annual costs, and then translates these to ten-year costs. Given the CBO's projections of annual CPI-U growth through 2031, as discussed in Chapter 3, our high scenario projects a ten-year cost of \$53,109,887, our low scenario projects a cost of \$39,150,090, and our average scenario is \$44,964,801 for the WSM-COAD group.

TABLE 5.3
Projections of Annual WSM-COADs and Utilization Assumptions, by CAP Disability Category, 2021–2031

Disability Category	Average Scenario	High Scenario	Low Scenario	Units/ WSM-COAD	Price/Unit
Cognitive	2,869	3,892	2,413	2.5	189
Dexterity	3,334	3,583	2,971	2.1	330
Hearing	26	37	18	1.5	370
Vision	21	29	13	1.9	430

NOTE: The table includes the average units requested from Table 5.1 and the real price per unit from Table 5.2. Accommodation request estimates are from the "Cognitive Disabilities," "Dexterity Disabilities," "Hearing Disabilities," and "Vision Disabilities" sections of this chapter.

TABLE 5.4
Projections of WSM-COAD Costs, by Cost Growth and Projection Scenario, in 2021 Dollars

Disability Category	Average Scenario	High Scenario	Low Scenario
Cognitive	1,378,588	1,870,151	1,159,474
Dexterity	2,336,461	2,510,960	2,082,071
Hearing	13,997	19,919	9,690
Vision	17,561	24,251	10,871
2022–2031 total (in 2021 dollars)	37,466,066	44,252,804	32,621,069
2022–2031 total (CBO CPI-U cost growth)	44,964,801	53,109,887	39,150,090

Summary and Limitations

This report has produced estimates of current prevalence of disabilities among the federal workforce, DoD civilian workers, and service members. We provided estimates for four separate categories of disability employed by CAP: Cognitive, Dexterity, Hearing, and Vision. We then projected forward prevalence of each category for civilian workers. For service members, we drew from variation in recent disability or diagnosis rates to construct a range of scenarios for future demand for CAP services. Finally, the report derived projections of the costs associated with potential anticipated requests for AT from these individuals.

Baseline (2021) disability prevalence among the federally employed was estimated to be 2.5 percent with hearing disabilities, 1.2 percent with vision disabilities, 1.8 with cognitive disabilities, and 3.4 percent with dexterity disabilities. Baseline (2021) disability prevalence for the DoD civilian workforce was estimated to be slightly higher for most categories, at 3.3 percent with hearing disabilities, 1.4 percent with vision disabilities, 1.8 with cognitive disabilities, and 3.9 percent with dexterity disabilities.

We have assumed that the federal workforce will shrink in size by 2.4 percent by 2031, following the projection by the BLS. We estimated that federal employees with hearing disabilities would represent a smaller portion of the federal workforce in 2031, while those with cognitive and dexterity disabilities would represent an increased portion of the workforce. We estimated employees with vision disabilities to make up the same percent of the federal workforce in 2021 and 2031.

We derived two scenarios for the size of the DoD civilian workforce in 2031: one that follows the same shrinking workforce trend as the overall federal workforce (declining by 2.4 percent), and one that follows the observed recent trend of a growing DoD civilian workforce (growing by 12.4 percent). In both scenarios, people with hearing disabilities will make up a relatively smaller portion of the DoD civilian workforce over time, regardless of increases or decreases in the size of the workforce. Similarly, DoD civilian workers with vision disabilities will make up a relatively smaller portion of the workforce in either scenario (in contrast to the federal workforce, where they are stable over time). Finally, in both DoD civilian scenarios (as well as the federal workforce), workers with cognitive or dexterity disabilities will grow as a proportion of the workforce over time.

Based on the assumption that not all employees with disabilities will request AT, we estimated the number of anticipated requests by disability type and converted those requests into costs throughout the 2021–2031 period. Following CBO CPI-U projections of annual

increases in costs per unit, our high (growing workforce) scenario projects a ten-year cost of \$121,440,482 and our low (shrinking workforce) scenario projects a cost of \$113,093,436 for the DoD civilian population. Costs for the entire federal workforce were estimated to be \$653,228,985.

There are two categories of service members we provided projections for: WSM-MEBs (service members in the process of undergoing a disability evaluation or medical separation) and WSM-COADs (service members who are continuing on active duty). We used recent variation in VASRD codes among medically separating service members to project potential caseloads for the former group, and diagnoses available from medical surveillance, RAND, or academic publications for the latter group.

Since VASRD codes indicate the flow of new service members with condition-specific disabilities that have been evaluated, we assume that every one of these service members would potentially be eligible to receive CAP-procured technologies in the CAP category of their disability.

Following CBO CPI-U projections of annual increases in costs per unit, our high scenario projects a ten-year cost of \$38,704,111, our low scenario projects a cost of just under \$19,058,441, and our average scenario is \$26,130,650 for this WSM-MEB group.

For our WSM-COAD estimation, we use diagnoses that correspond to the dexterity and cognitive disability categories—the two largest categories—to estimate the potential population of service members who may receive AT from CAP. As with the civilian workforce population, we convert this estimate of the population to an estimate of annual requests for accommodations. For vision and hearing disability categories, we rely on CAP's own recent number of requests.

Following CBO CPI-U projections of annual increases in costs per unit, our high scenario projects a ten-year cost of \$53,109,887, our low scenario projects a cost of \$39,150,090, and our average scenario is \$44,964,801 for this WSM-COAD group.

Our preferred overall estimate, based on the growing workforce scenario for the DoD civilian workforce and the average projections for the service member calculations, yields an estimated ten-year cost for CAP-procured AT of \$192,535,933.

Limitations and Key Assumptions

The estimates and projections in this report are necessarily based on a large number of simplifying assumptions based on data limitations and a ten-year projection horizon, including how both disability categorizations *and available data to measure disability prevalence* differ across DoD civilian workers, WSM-COADs, and WSM-MEBs. Estimates are likely sensitive to all the assumptions and data availability. Here we highlight key assumptions.

For the civilian DoD and federal worker projections, the most significant and consequential assumptions relate to the projected workforce size trends over time. For the federal workforce, we adopt the BLS projection of a decline in total federal workforce size of 0.2 percent per year through 2031. This assumption matches the trend between 2010 and 2020 that BLS

reported. To the extent that this projection over- or underestimates future federal workforce size, our estimates of federal workforce disability will be affected.¹ For the civilian DoD workforce size we did not have similar existing projections to rely on, and thus we assumed two scenarios that reflect hypothetical lower and upper estimates to provide a range. Our lower estimate applies the BLS assumption of a 0.2-percent annual decrease in size of the federal workforce to the DoD civilians within that overall workforce. Our upper estimate is based on the observed trend in DoD civilian workforce size between 2007 and 2021, which showed an average annual increase of 2.4 percent. This growth rate is inclusive of a more rapid increase between 2008 and 2011, and a decrease during the drawdown of forces in Afghanistan and Iraq from 2012 to 2014, and a steady observed increase through 2021. These two scenarios provide a range of total DoD civilian workforce sizes of between 860,000 and 747,000, which each serve as the populations from which our disabled workers are estimated in each scenario. To the extent that actual DoD workforce size diverges from either scenario, our estimates will similarly over- or underestimate disabled workers.

Another consequential assumption is that the demographic composition of federal and DoD civilian workforces will shift at pace with the demographic shifts projected by the Census Bureau, with decreasing proportions of non-Hispanic white employees and a general shift toward older ages. If the demographic composition of the workforce were to remain static over time, disability prevalence would directly follow changes in the size of the workforce. However, differences in disability prevalence by race/ethnicity and age will affect disability prevalence in the workforce as they shift over time. If workforce demographic composition shifts diverge from population level shifts, our estimates will over- or underestimate the number of disabled workers depending on the demographic characteristic and the type of disability. For example, if hiring campaigns expand racial/ethnic minority representation in the workforce, growth in the minority racial/ethnic composition may outpace the assumed change, with consequences for disability estimates. (See Figure 3.4 for differences in disability prevalence among civilian DoD employees by race/ethnicity, for example.)

A third important limitation for our projections of DoD civilians with disabilities is that we have assumed that the prevalence of disabilities in the DoD civilian workforce is the same as in the overall federal workforce. If disability rates differ between DoD civilians and federal workers overall, our estimates will not reflect this. In the Appendix we explore this assumption and derive estimates using survey-based measures of disability specific to the federal national security and international affairs industry, which largely, but not completely, comprises DoD civilians. Given the small cell sizes involved when examining disability by age, sex, or race/ethnicity in this specific industry it is difficult to draw firm conclusions, although

¹ Note that BLS federal workforce projections are not expected to be precisely accurate but are used to provide a reasonable scenario for consideration. For instance, the original 2010–2020 BLS projections for federal workforce size overestimated the decline in the federal workforce for these years, although it did ultimately decline over the period. The observed trend over time was –0.2 percent per year, although the original BLS projection over this time period was a 1.3 percent decline per year; see Sommer and Franklin, 2012.

the data suggest that federal disability rates may underestimate DoD civilian disability rates in some cases (hearing disabilities, in particular).

An additional limitation to the analysis of the civilian DoD workforce is that we only include workers with more than 34 hours per week and do not include the roughly 4 percent who are part-time, seasonal, or participating in internship programs, based on DMDC data from FY 2015–FY 2021; data from FY 2007–FY 2014 indicate that 5 percent of civilian DoD employees fit this category.

A pivotal assumption for both our DoD civilian estimates and for the WSM-COAD estimates is how we translated the population of individuals (a “stock”) into potential accommodations (a “flow”)—that is, what fraction of accommodation-sensitive individuals will request an accommodation each year. We drew on research based on rates of accommodation in the broader workforce for our disability categories; to the extent that these rates systematically differ for the populations under study here, our estimates will be biased accordingly. Furthermore, we had to make assumptions over the frequency with which a given individual will request a new accommodation—namely, that individuals make such a request every year for services or software, and, on average, every other year for hardware. Our results would change considerably if we assumed that accommodation-sensitive individuals sought accommodations more frequently, less frequently, or only once per employer.

For our WSM-MEB estimation, we scaled the overall category estimates based on all DES cases downward using data that represented a fraction of cases but had more detail on specific conditions related to our disability categories of interest. To the extent that the proportions of specific conditions within each category systematically differ in the cases not included in our detailed data, this approach would be biased. However, changes in this assumption will not have as sizable an impact, since changes represent differences in a scale-down factor, not in entire multiples, as in the prior assumption.

For our WSM-COAD estimation, we relied on diagnoses to indicate the presence of an accommodation-sensitive health condition. If conditions are systematically underdiagnosed, or if specific diagnoses are indicative of conditions that are less likely to interfere with work, our findings would be biased in one direction or the other. These biases would particularly affect our dexterity and cognitive disability categories, since these categories represent the majority of costs. Furthermore, to the extent that these diagnoses are quickly referred to the DES process and receive a VASRD rating in the same year, our WSM-COAD counts will consist of a set of “double counts”: service members we count as both WSM-COADs and WSM-MEBs. However, that diagnosis at a military treatment facility does not automatically—or even conceivably—lead to DES referral, that there are pre-DES mechanisms that services use to ensure DES referral is required, and that the DES process itself is lengthily limit the potential impact of this assumption.

A simplifying assumption that underpins all the projections is that disability prevalence will not change substantially over the next ten years. Initial examination of the data did not identify clear time trends in the disabilities and populations considered here between 2009 and 2020, and we apply constant rates of disability through 2031, as described earlier. We

note one continuing source of uncertainty: the long-term impacts of COVID-19—namely, postacute sequelae of the virus (so-called long COVID) on rates of disability in the federal and DoD civilian workforces. Given the necessarily evolving nature of long-term disability effects of long COVID, estimates of prevalence are rare. One recent study (Xie, Bowe, and Al-Aly, 2021) analyzed long COVID symptoms among VA COVID-19 patients and estimated an excess burden of 6.91 per 1,000 such patients for memory problems, and 9.81 per 1,000 for muscle weakness. Applying these estimates to the number of reported cases of COVID-19 among DoD civilian workers (163,379 as of November 20, 2022; see DoD, undated), assuming that all additional workers with memory problem symptoms add to our pool of DoD civilian workers in the cognitive disability category, and assuming that all additional workers with muscle weakness symptoms add to the dexterity disability category, we find that the overall increase in cost would be approximately 3 percent in each of our scenarios—a relatively minor change. Again, we acknowledge that our understanding of the long-term consequences of COVID-19 on workers' health may be substantially different from this estimate, but its effect on the rates of disability among DoD workers is relatively small given our current understanding of the excess burden of long COVID. A related source of uncertainty is the impact of the pandemic on the future of telework for federal and DoD civilian employees. In July 2021 the OPM released a guidance report on the use of telework that indicated that the OPM expected more eligible federal employees would telework on a regular basis moving forward (Eames, 2021). It is possible that some employees who work from home already have AT that would have otherwise been requested, potentially reducing demand.

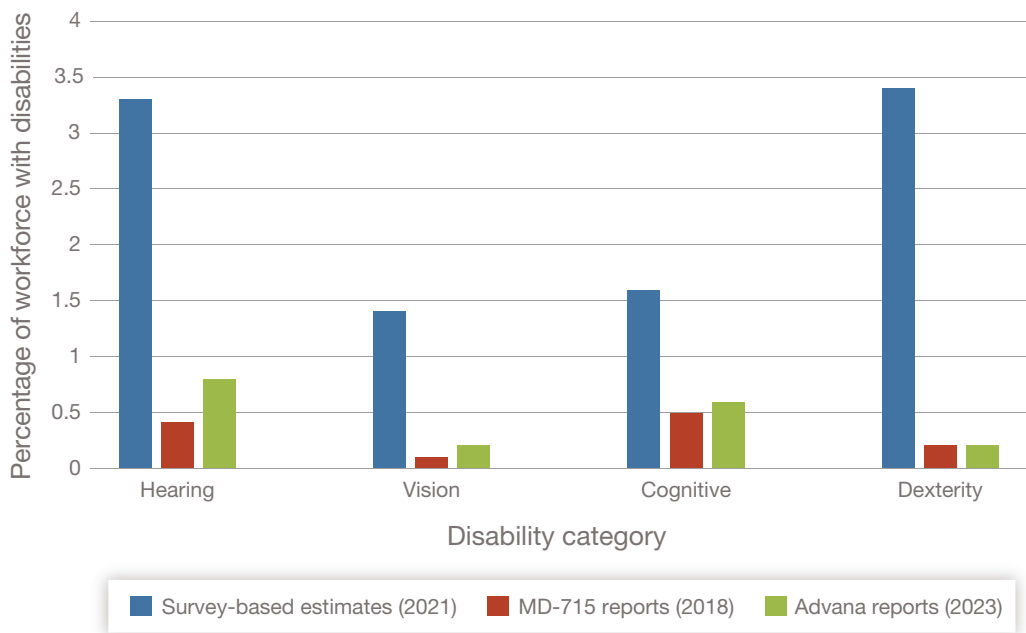
Finally, although we note that our overall estimates for annual AT costs for CAP are approximately three to four times that of CAP's historical annual costs, in this analysis, we are attempting to estimate potential demand for CAP AT among all accommodation-sensitive DoD civilian workers and service members. We note in particular that *potential* demand for AT is substantially higher for WSM-COADs (at three to four times historical CAP costs) and WSM-MEBs (at five to ten times historical CAP costs), indicating that these populations may either be seeking other providers of AT or not be receiving it. Overall, our approach relied on a range of data sets to estimate three multidimensional and difficult-to-observe populations of DoD employees or service members that may benefit from AT. In this context, our approach was tailored to the specific categories of disabilities for which CAP already procures AT, but it can be extended in future work to encompass other types of disabilities and the varied needs of different segments of the workforce with disabilities.

This appendix includes the data presented in figures in Chapter 3, set in tabular form here as Tables A.1–A.7. Supplemental analyses using survey-based disability rates for the federally employed national security and international affairs industry category, rather than federal disability rates, are also presented. Additionally, Figure A.1 compares our survey-based estimates of DoD disability prevalence by category with MD-715 reports for DoD civilian workers from 2018, as well as Advana data from 2023.

Comparisons with Management Directive 715 Reports

In Figure A.1 we compare our survey-based estimates of disability prevalence from Figure 3.3 with corresponding statistics about civilian workers in the Departments of the Air Force,

FIGURE A.1
Disability Prevalence Among the Federally Employed, by Survey-Based Estimates (2021) and Self-Reporting in Management Directive 715 (2018) and Advana (2023) Reports



SOURCES: Authors' calculations based on ACS (hearing, vision, cognitive) and NHIS (dexterity) data for survey-based estimates on DOD and service-published MD-715 reports, and on counts provided by CAP from Advana reports.

Army, and Navy; other DoD civilian workers, as provided in the 2018 MD-715 reports; and Advana-provided data from 2023 based on the same underlying SF-256 form used to populate the MD-715. The MD-715 and Advana reports include a range of possible conditions. We categorize these conditions into disability categories according to the following schema:

- cognitive disability: developmental disability, TBI, intellectual disability, or significant psychiatric disorder
- dexterity disability: missing extremities or partial/complete paralysis
- hearing disability: deafness or serious difficulty hearing
- vision disability: blindness or serious difficulty seeing.

Tabular Data for Chapter 3

TABLE A.1
Disability Prevalence (Proportion) Among the Federally Employed, by Sex, Ages 15–74: 2021

Type of Disability	Overall	Male	Female
Hearing	0.025	0.032	0.014
Vision	0.012	0.012	0.013
Cognitive	0.018	0.019	0.015
Dexterity	0.034	0.019	0.059

SOURCE: Authors' calculations based on ACS and NHIS data.

NOTE: The calculations are based on an estimated 4,781,021 federal employees in 2021.

TABLE A.2
Disability Prevalence (Proportion) Among the Federally Employed, by Race/Ethnicity, Ages 15–74: 2021

Type of Disability	White	Black	Asian	Hispanic	AIAN	HPI	Two or More Groups
Hearing	0.029	0.017	0.013	0.025	0.037	0.020	0.024
Vision	0.011	0.016	0.006	0.015	0.022	0.012	0.014
Cognitive	0.017	0.020	0.010	0.020	0.036	0.022	0.028
Dexterity	0.032	0.056	0.020	0.018	0.106	—	0.001

SOURCE: Authors' calculations based on ACS and NHIS data.

NOTE: The calculations are based on an estimated 781,021 federal employees in 2021. The HPI category is not available in the public NHIS data (identified as "Race Not Releasable"), which is used to identify dexterity disability rates.

TABLE A.3
Disability Prevalence (Proportion) Among Civilian
DoD Employees, by Sex, Ages 15–74: 2021

Type of Disability	Overall	Male	Female
Hearing	0.033	0.041	0.015
Vision	0.014	0.014	0.013
Cognitive	0.018	0.018	0.015
Dexterity	0.039	0.026	0.064

SOURCE: Authors' calculations based on ACS, DMDC Civilian Master File, and NHIS data.

NOTE: The total number of civilian employees is 764,741 for FY 2021.

TABLE A.4
Disability Prevalence (Proportion) Among Civilian DoD Employees, by Race/
Ethnicity, Ages 15–74: 2021

Type of Disability	White	Black	Asian	Hispanic	AIAN	HPI	Two or More Groups
Hearing	0.036	0.023	0.015	0.035	0.050	0.027	0.033
Vision	0.012	0.019	0.006	0.018	0.025	0.013	0.019
Cognitive	0.016	0.023	0.010	0.020	0.035	0.025	0.030
Dexterity	0.037	0.064	0.020	0.025	0.147	—	0.001

SOURCE: Authors' calculations based on ACS, DMDC Civilian Master File, and NHIS data.

NOTE: The total number of civilian employees is 764,741 in FY 2021. The HPI category is not available in the public NHIS data (identified as "Race Not Releasable"), which is used to identify dexterity disability rates.

TABLE A.5
Number of Federal Employees with Disabilities, Ages 15–74: 2021–2031

Type of Disability	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	Percentage Change from 2021 to 2031
Hearing	120,619	119,955	119,328	118,737	118,182	117,662	117,177	116,728	116,313	115,933	115,587	-4.17
Vision	58,457	58,252	58,062	57,887	57,726	57,581	57,450	57,333	57,231	57,144	57,070	-2.37
Cognitive	84,849	84,628	84,425	84,242	84,076	83,930	83,802	83,692	83,601	83,528	83,474	-1.62
Dexterity	168,156	168,012	167,906	167,837	167,806	167,813	167,858	167,941	168,062	168,221	168,419	+0.16

SOURCE: Authors' analysis of ACS, Census Bureau, and NHIS data, and using BLS workforce projections by Dubina et al., 2021.

TABLE A.6**Number of DoD Civilian Employees with Disabilities, Ages 15–74: 2021–2031 (Shrinking Workforce Scenario)**

Type of Disability	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	Percentage Change from 2021 to 2031
Hearing	24,969	24,818	24,675	24,539	24,411	24,290	24,176	24,070	23,971	23,879	23,794	–4.71
Vision	10,524	10,482	10,443	10,407	10,374	10,343	10,315	10,290	10,267	10,247	10,230	–2.79
Cognitive	13,733	13,708	13,686	13,667	13,651	13,639	13,629	13,622	13,619	13,619	13,621	–0.81
Dexterity	29,348	29,287	29,231	29,182	29,139	29,103	29,072	29,049	29,031	29,020	29,015	–1.14

SOURCE: Authors' analysis of ACS, Census Bureau, DMDC Civilian Master File, and NHIS data, and using BLS workforce projections by Dubina et al., 2021.

TABLE A.7
Number of DoD Civilian Employees with Disabilities, Ages 15–74: 2021–2031 (Growing Workforce Scenario)

Type of Disability	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	Percentage Change from 2021 to 2031
Hearing	24,969	25,170	25,379	25,597	25,824	26,060	26,305	26,560	26,826	27,101	27,387	+9.68
Vision	10,524	10,631	10,741	10,855	10,974	11,096	11,223	11,353	11,489	11,629	11,773	+11.87
Cognitive	13,733	13,902	14,076	14,256	14,441	14,632	14,828	15,031	15,240	15,455	15,676	+14.15
Dexterity	29,348	29,703	30,069	30,445	30,833	31,232	31,643	32,067	32,503	32,953	33,416	+13.86

SOURCE: Authors' analysis of ACS, Census Bureau, DMDC Civilian Master File, and NHIS data.

Supplemental Projections Based on National Security and International Affairs Industry Code Disability Rates

As has been noted in this report, the surveys used to derive disability prevalence rates identify a subgroup within the federal workers who are employed in the national security and international affairs industry (industry code 9590), which largely comprises DoD civilian workers. Sample sizes are substantially reduced,¹ and multiple age, sex, and race/ethnicity disability prevalence cells in the data are empty, which could lead to underestimating disability prevalence. Where disability rates specific to age, sex, and race/ethnicity are available for both federal and 9590 workers, a simple visual comparison indicates that the federal rates tend to be lower than the 9590 rates by a margin of a small number of age, sex, and race/ethnicity cells in most cases (i.e., there are a few more cells where the federal rate is lower than there are cells where the 9590 rate is lower). One exception is cognitive disability, where 9590 rates are lower than federal rates in a few more cells. A second and potentially more important exception is hearing disability, for which federal rates are lower than 9590 rates by a larger margin of cells (68 federal rates are lower, versus 51 of the 9590 rates). Thus, while this does not establish a clear difference in disability rates between federal and 9590 workers overall, it does suggest that at least for hearing disability there may be a benefit to using the specific disability prevalence associated with the more refined industry classification than the broader federal workforce, as shown in Table A.8. Projections based on the 9590 hearing disability rates result in larger numbers of DoD civilian employees with hearing disabilities over time when compared with projections based on the federal rates, while all other disability type projections are smaller using the 9590 rates. Tables A.9 and A.10 present the DoD civilian disability projection calculations using the more refined prevalence rates. Note that for dexterity we use the federal rates given the small NHIS sample.

TABLE A.8
Disability Prevalence (Proportion) Among Civilian DoD Employees, by Sex, Ages 15–74: 2021

Type of Disability	Overall	Male	Female
Hearing	0.036	0.046	0.014
Vision	0.011	0.012	0.010
Cognitive	0.017	0.019	0.013
Dexterity	0.039	0.026	0.064

SOURCE: Authors' calculations based on ACS, DMDC Civilian Master File, and NHIS data.

NOTE: Total number of civilian employees is 764,741 in FY 2021.

¹ For example, the ACS data include 486,387 records for federal workers and 116,489 records for the national security and international affairs workers.

TABLE A.9
Number of DoD Civilian Employees with Disabilities, Ages 15–74: 2021–2031 (Shrinking Workforce Scenario)

Type of Disability	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	Percentage Change from 2021 to 2031
Hearing	27,659	27,487	27,324	27,169	27,023	26,886	26,757	26,636	26,524	26,421	26,326	-4.82
Vision	8,683	8,661	8,642	8,624	8,609	8,596	8,586	8,578	8,572	8,568	8,567	-1.35
Cognitive	13,138	13,141	13,147	13,156	13,168	13,183	13,201	13,221	13,244	13,271	13,300	+1.23
Dexterity	29,348	29,287	29,231	29,182	29,139	29,103	29,072	29,049	29,031	29,020	29,015	-1.14

SOURCE: Authors' analysis of ACS, BLS, Census Bureau, DMDC Civilian Master File, and NHIS data.

TABLE A.10
Number of DoD Civilian Employees with Disabilities, Ages 15–74: 2021–2031 (Growing Workforce Scenario)

Type of Disability	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	Percentage Change from 2021 to 2031
Hearing	27,659	27,876	28,103	28,340	28,587	28,845	29,113	29,392	29,683	29,986	30,301	+9.55
Vision	8,683	8,784	8,888	8,995	9,107	9,222	9,341	9,464	9,591	9,723	9,859	+13.53
Cognitive	13,138	13,327	13,522	13,723	13,930	14,143	14,362	14,588	14,820	15,060	15,306	+16.51
Dexterity	29,348	29,703	30,069	30,445	30,833	31,232	31,643	32,067	32,503	32,953	33,416	+13.86

SOURCE: Authors' analysis of ACS, Census Bureau, DMDC Civilian Master File, and NHIS data.

TABLE A.11
VASRD Numbers and Corresponding Conditions for WSM-MEB Disability
Categorization

Category	VASRD Number	Condition
TBI/memory-related cognitive	8045	Traumatic brain injury residuals
	9301	Mental disorders, delirium, dementia, and amnestic and other cognitive disorders: infection
	9304	Mental disorders, delirium, dementia, and amnestic and other cognitive disorders: head trauma
	9305	Mental disorders, delirium, dementia, and amnestic and other cognitive disorders: vascular dementia
	9310	Mental disorders, delirium, dementia, and amnestic and other cognitive disorders: unknown etiology
	9312	Mental disorders, delirium, dementia, and amnestic and other cognitive disorders: Alzheimer's disease
	9326	Mental disorders, delirium, dementia, and amnestic and other cognitive disorders: other medical conditions
Upper-extremity dexterity	5051	Prosthetic implants: shoulder replacement
	5052	Prosthetic implants: elbow replacement
	5053	Prosthetic implants: wrist replacement
	5104	Anatomical loss of one hand and loss of use of one foot
	5105	Anatomical loss of one foot and loss of use of one hand
	5106	Anatomical loss of both hands
	5108	Anatomical loss of one hand and one foot
	5109	Loss of use of both hands
	5111	Loss of use of one hand and one foot
	5120	Amputation, arm: disarticulation
	5121	Amputation, arm: above insertion of deltoid
	5122	Amputation, arm: below insertion of deltoid
	5123	Amputation, forearm: above insertion of pronator teres
	5124	Amputation, forearm: below insertion of pronator teres
	5125	Loss of use of hand
	5126	Amputation: digits, five of one hand
5127	Amputation, digits, four of one hand: thumb, index, long, and ring	
5128	Amputation, digits, four of one hand: thumb, index, long, and little	
5129	Amputation, digits, four of one hand: thumb, index, ring, and little	
5130	Amputation, digits, four of one hand: thumb, long, ring, and little	

Table A.11—Continued

Category	VASRD Number	Condition
	5131	Amputation, digits, four of one hand: index, long, ring, and little
	5132	Amputation, digits, three of one hand: thumb, index, and long
	5133	Amputation, digits, three of one hand: thumb, index, and ring
	5134	Amputation, digits, three of one hand: thumb, index, and little
	5135	Amputation, digits, three of one hand: thumb, long, and ring
	5136	Amputation, digits, three of one hand: thumb, long, and little
	5137	Amputation, digits, three of one hand: thumb, ring, and little
	5138	Amputation, digits, three of one hand: index, long, and ring
	5139	Amputation, digits, three of one hand: index, long, and little
	5140	Amputation, digits, three of one hand: index, ring, and little
	5141	Amputation, digits, three of one hand: long, ring, and little
	5142	Amputation, digits, two of one hand: thumb and index
	5143	Amputation, digits, two of one hand: thumb and long
	5144	Amputation, digits, two of one hand: thumb and ring
	5145	Amputation, digits, two of one hand: thumb and little
	5146	Amputation, digits, two of one hand: index and long
	5147	Amputation, digits, two of one hand: index and ring
	5148	Amputation, digits, two of one hand: index and little
	5149	Amputation, digits, two of one hand: long and ring
	5150	Amputation, digits, two of one hand: long and little
	5151	Amputation, digits, two of one hand: ring and little
	5152	Amputation, single finger: thumb
	5153	Amputation, single finger: index finger
	5154	Amputation, single finger: long finger
	5155	Amputation, single finger: ring finger
	5156	Amputation, single finger: little finger
	5200	Ankylosis: scapulohumeral articulation
	5201	Limitation of motion: arm
	5202	Impairment of humerus
	5203	Impairment of clavicle or scapula

Table A.11—Continued

Category	VASRD Number	Condition
	5205	Ankylosis, elbow
	5206	Limitation of flexion: forearm
	5207	Limitation of extension: forearm
	5208	Limitation of extension and flexion: forearm
	5209	Impairment of elbow
	5210	Nonunion: radius and ulna
	5211	Impairment of ulna
	5212	Limitation of extension: radius
	5213	Limitation of extension: supination and pronation
	5214	Ankylosis: wrist
	5215	Limitation of motion: wrist
	5216	Ankylosis, hand, unfavorable: five digits of one hand
	5217	Ankylosis, hand, unfavorable: four digits of one hand
	5218	Ankylosis, hand, unfavorable: three digits of one hand
	5219	Ankylosis, hand, unfavorable: two digits of one hand
	5220	Ankylosis, hand, favorable: five digits of one hand
	5221	Ankylosis, hand, favorable: four digits of one hand
	5222	Ankylosis, hand, favorable: three digits of one hand
	5223	Ankylosis, hand, favorable: two digits of one hand
	5224	Ankylosis, digits, individual: thumb
	5225	Ankylosis, digits, individual: index finger
	5226	Ankylosis, digits, individual: long finger
	5227	Ankylosis, digits, individual: ring or little finger
	5228	Limitation of motion: thumb
	5229	Limitation of motion: index or long finger
	5230	Limitation of motion: ring or little finger
	5301	Injury, muscle, group I function: upward rotation of scapula
	5302	Injury, muscle, group II function: depression of arm
	5303	Injury, muscle, group III function: elevation and abduction of arm
	5304	Injury, muscle, group IV function: stabilization of shoulder

Table A.11—Continued

Category	VASRD Number	Condition
	5305	Injury, muscle, group V function: elbow supination
	5306	Injury, muscle, group VI function: extension of elbow
	5307	Injury, muscle, group VII function: flexion of wrist and fingers
	5308	Injury, muscle, group VIII function: extension of wrist, fingers, thumb
	5309	Injury, muscle, group IX function: forearm muscles

SOURCE: Code for Federal Regulations, Title 38, Part 4.

Abbreviations

ACS	American Community Survey
ADHD	attention deficit/hyperactivity disorder
AIAN	American Indian and Alaskan Native
AT	assistive technology
BLS	U.S. Bureau of Labor Statistics
CAP	Computer/Electronic Accommodations Program
CBO	Congressional Budget Office
CPI-U	Consumer Price Index for All Urban Consumers
CPI-U-RS	Consumer Price Index Research Series Using Current Methods
DES	Disability Evaluation System
DESAR	Disability Evaluation System Analysis and Research
DMDC	Defense Manpower Data Center
DoD	Department of Defense
EEOC	Equal Employment Opportunity Commission
FY	fiscal year
HPI	Hawaiian and Pacific Islander
IDES	Integrated Disability Evaluation System
MD-715	Management Directive 715
MEB	Medical Evaluation Board
<i>MSMR</i>	<i>Medical Surveillance Monthly Report</i>
NHIS	National Health Interview Survey
OPM	Office of Personnel Management
PEB	Physical Evaluation Board
TBI	traumatic brain injury
VA	U.S. Department of Veteran Affairs
VASRD	Veterans Affairs Schedule for Rating Disabilities
VTA	Veterans Tracking Application
WSM-COAD	wounded service member-continuing on active duty
WSM-MEB	wounded service member-referred to a Medical Evaluation Board

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The Department of Defense (DoD) requires both current and projected estimates of the size of its workforce population with specific categories of disabilities. These estimates support the requirements under the Rehabilitation Act of 1973 as well as the goals outlined in multiple executive orders, including Executive Order 14035, directing DoD to hire employees with disabilities and provide them with reasonable accommodations. These estimates are necessary to determine the assistive technology (AT) required and its anticipated costs through 2031.

AT also furthers DoD's goals in aiding the recovery and retention of injured service members, as well as the broader DoD and U.S. Department of Veteran Affairs (VA) community in aiding in the post-service employment of service members who are medically separating. Thus, the authors seek to estimate the potential demand for AT from these groups.

The authors give projections of the DoD civilian employee population—and of injured and wounded service members—with specific disabilities categorized by DoD's centralized AT procurer (hearing, vision, cognitive, and dexterity disabilities), as well as the potential anticipated requests for AT by these populations and their costs between 2021 and 2031.

\$30.00

ISBN-10 1-977-4120-33
ISBN-13 978-1-977-4120-3-4



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