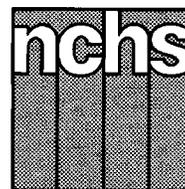


Advance Data



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Trends and Differential Use of Assistive Technology Devices: United States, 1994

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Abstract

Objective—This report presents data on annual estimates of the prevalence of use of selected assistive technology devices for vision, hearing, mobility, and orthopedic impairments, including missing limbs. Also presented are statistics on trends in the prevalence of use of selected mobility assistive technology devices for the years 1980, 1990, and 1994.

Methods—The data used for this report are from the 1994 National Health Interview Survey on Disability (NHIS-D), Phase I, which was cosponsored by a consortium of U.S. Federal agencies and private foundations. All estimates are based on data from the NHIS-D, Phase I, which represent the civilian, noninstitutional population of the United States.

Results—An estimated 7.4 million persons in the U.S. household population used assistive technology devices for mobility impairments, 4.6 million for orthopedic impairments (including missing limbs), 4.5 million for hearing impairments (not including impairments fully compensated by hearing aids), and 0.5 million for vision impairments. Use of any mobility device for all ages had the highest prevalence rate at 28.5 per 1,000 persons. There was a positive correlation between an increase in age and the increase in the prevalence rate of device usage; for example, of persons in the age group 65 years and over, the rate of mobility, hearing, and vision device usage was more than 4 times the rate for the total population.

Conclusion—Assistive technology use has increased because of population size, age composition changes, and a change in the rate of use. Medical and technological advances along with public policy initiatives have also contributed to increased usage.

Keywords: National Health Interview Survey on Disability, Phase I • assistive devices • assistive technology • disability • impairments

Introduction

The history of data collection on assistive technology devices in the

National Health Interview Survey (NHIS) reflects the long-standing interest in the topic in the health care

and disability communities. This interest is strong for several reasons.

- Because of the passage of the Americans with Disabilities Act (1), persons with disabilities have a legal right to reasonable accommodation in many public facilities and private workplaces. Accommodation often includes providing assistive technology devices (e.g., closed captioning or telephonic devices for the deaf in hotel rooms) or modifying the existing built environment (e.g., providing wheelchair ramps at the entrances to public buildings) to make services accessible to users of assistive technology devices.
- Government-sponsored programs and changes in health care financing have also encouraged the use of assistive technology devices. The Technology-Related Assistance for Individuals with Disabilities Act of 1988 (2), for instance, authorized a Federal-State initiative that established programs for informing and educating persons with disabilities and those who employ or serve them about available assistive technology devices and their use.
- Managed-care health plans have financial incentives to curtail the



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unnecessary use of expensive services, such as hospital stays, rehabilitation therapy, and home care—services for which assistive technology devices are sometimes less expensive alternatives.

- As the number of persons in need of assistive technology devices has grown, the industry that designs, produces, and markets these devices has grown also. Thus, recent changes in civil rights, Federal and State programs, the organization of health care delivery, and the market for assistive technology devices have continued to fuel the need for information about users of the devices.

The purposes of this report include the following:

- To present 1994 annual estimates of basic statistics on the prevalence of use of selected assistive technology devices for impairments of vision, hearing, mobility, and orthopedic impairments, including missing limbs.
- To present statistics on trends in the prevalence of use of selected mobility assistive technology devices in the years 1980, 1990, and 1994.

Questions on assistive technology devices (or “special aids” as they were formerly known) were asked in the NHIS in 1958–59, 1963 (hearing aids only), 1965, 1966, 1969, 1971, 1977, 1978, 1980, 1990, 1991 (hearing aids only), and 1994–95. The 1990–91 and 1994–95 surveys collected data for 2 consecutive years; all other surveys on assistive technology devices collected data for 1 year only. The National Center for Health Statistics (NCHS) has published reports on assistive technology based on the surveys conducted in 1958–59 (3), 1963 (4), 1969 (5), 1977 (6), 1990 (7), and 1991 (8).

This report presents preliminary data from the first year of NHIS-D, Phase I, which is a 2-year, two-phase study.

Methods

Survey background and design—In an effort to meet the historical and political need for information on

disability, four Federal offices (the Office of the Assistant Secretary for Planning and Evaluation, Health and Human Services (OASPE); Office of Planning and Security Income, Social Security Administration (SSA); Office of Disability, SSA; and Bureau of Maternal and Child Health, Health Resources and Services Administration) planned several national surveys about various aspects of disability in the early 1990’s.

Because many of these Federal offices had overlapping disability interests, efforts were merged into one survey and included with NHIS for two consecutive years. After the initial planning stage of the disability survey, other organizations with an interest in disability participated. NCHS, OASPE, and the other consortium members jointly planned the survey, and the Bureau of the Census conducted the field work. The estimates presented in this report are based on the first data released from that survey, the 1994 NHIS-D.

NHIS-D, a supplementary questionnaire to the annual NHIS, was done in two phases. NHIS-D, Phase I, questions were conducted concurrently with the NHIS basic questionnaire or “core.” Disability information for all household members was obtained from the most knowledgeable adult respondent present at the time of interview. NHIS-D, Phase I, questionnaire included basic questions about disability and was used as a screening device to determine eligibility for NHIS-D, Phase II. Because disabilities occur infrequently within the noninstitutionalized civilian population, NHIS-D, Phase I, was fielded over a 2-year period from 1994–95.

The interviewed sample for the 1994 NHIS basic health questionnaire consisted of 45,705 households containing 116,179 persons. The household response rate was 94.1 percent. The 1994 NHIS-D, Phase I, included 107,469 persons. The response rate for NHIS-D, Phase I, was 87.0 percent. Data were collected throughout the entire year, and information was obtained about all family members residing in the household.

Definitions—The terms “impairment,” “disability,” and “handicap” are often used interchangeably. For greater precision and differentiation, this report uses the terminology of the *International Classification of Impairments, Disabilities, and Handicaps* (9).

Impairment—“Any loss or abnormality of psychological, physiological, or anatomical structure or function (9).”

Disability—“Any restriction or lack of ability to perform an activity that is generally accepted as [an] essential component of everyday life, such as personal hygiene or moving about (9).”

Handicap—A limitation on “the fulfillment of a role that is normal for that individual (9).” Because the term “handicap” is regarded by many persons in the United States to have pejorative connotations, the term “social participation” or “participation” will be used in this report.

In general, limitations in social participation are preceded by a disability, and a disability is preceded by an impairment. However, impairments do not necessarily lead to disabilities, and disabilities need not lead to limitations in participation. Furthermore, neither impairments, disabilities, or limitations in participation are irreversible (9).

Measurement of assistive technology devices—NHIS-D, Phase I, interview begins with the sensory, communication, and mobility section, which includes screening questions on visual and hearing impairments. The interviewer asks, “Does anyone in the family have SERIOUS difficulty seeing, even when wearing glasses or contact lenses? Who is this?” (Word printed in capital letters are verbally emphasized by the interviewer.) The interviewer continues by asking, “Do you expect to have SERIOUS difficulty seeing for at least the next 12 months?” and if “Yes,” then “Does ___ NOW use telescopic lenses, braille, readers, a guide dog, white cane, or any other equipment for people with visual impairments?” (The interviewer inserts the family member’s name in the underlined blank space.) The interviewer asks a similar set of questions about hearing impairments. Other sets of

questions are asked to determine use of mobility aids, braces, and artificial limbs. In this report “assistive technology device” is defined as any device or equipment reported in response to these questions.

The intention of the questions in the sensory, communication, and mobility section was to identify assistive technology used by persons with impairments. Each respondent is first asked whether any family member had hearing or vision trouble that was expected to last for the next 12 months (from the interview date). If the respondent answers “Yes,” the interviewer proceeds to ask questions about hearing or vision devices. Thus, only people with long-lasting or permanent impairment are included as users of assistive devices for hearing or vision trouble. Persons with temporary impairments who were using some type of hearing or vision device were not included. However, persons with permanent, long-lasting, or temporary impairments who were using any mobility assistive devices or braces were counted.

The estimates in this report may overstate the prevalence of long-term use because some temporary users may be included, especially persons with mobility or orthopedic impairments, which are mainly associated with acute episodes of injury or illness. Conversely, the prevalence of assistive technology device use may be underestimated for two reasons.

- The number of elderly persons aged 65 years and over with impairments using assistive technology may be underestimated because of the sample design. Estimates in this report are based on a sample of the noninstitutionalized population of all ages. Excluded are institutionalized individuals (e.g., persons in nursing homes who would be more likely to use assistive technology than the noninstitutionalized population).
- Questions were not asked that could capture all impairments and assistive devices used. For example, this report does not include information on the prevalence of speech impairments or speech assistive devices.

Results

Prevalence of assistive technology devices—The estimated numbers of persons in the U.S. civilian noninstitutionalized population who use assistive technology devices are shown in table 1. More people use assistive devices (7.4 million) to compensate for mobility impairments than any other general type of impairment: 4.8 million use canes—the single most utilized assistive technology device; 1.8 million use walkers; and 1.6 million use wheelchairs. In addition, hearing aids

were used by 4.2 million persons, and back braces were used by 1.7 million persons.

Age patterns—Table 2 shows percent distributions of persons by age according to the types of assistive devices. Among persons who use any mobility devices (61.5 percent), any hearing devices (68.6 percent), and any vision devices (51.0 percent), the majority were over 65 years of age, reflecting the higher prevalence of impairment in that population. However, among persons who use any anatomical

Table 1. Number of persons using assistive technology devices by age of person and type of device: United States, 1994

| Assistive device | All ages | 44 years and under | 45–64 years | 65 years and over |
|--|----------|--------------------|-------------|-------------------|
| Anatomical devices | | | | |
| Number in thousands | | | | |
| Any anatomical device ¹ | 4,565 | 2,491 | 1,325 | 748 |
| Back brace | 1,688 | 795 | 614 | 279 |
| Neck brace | 168 | 76 | 78 | *13 |
| Hand brace | 332 | 171 | 119 | 42 |
| Arm brace | 320 | 209 | 86 | *25 |
| Leg brace | 596 | 266 | 138 | 192 |
| Foot brace | 282 | 191 | 59 | 31 |
| Knee brace | 989 | 694 | 199 | 96 |
| Other brace | 399 | 239 | 104 | 56 |
| Any artificial limb | 199 | 69 | 59 | 70 |
| Artificial leg or foot | 173 | 58 | 50 | 65 |
| Artificial arm or hand | *21 | *9 | *6 | *6 |
| Mobility devices | | | | |
| Any mobility device ¹ | 7,394 | 1,151 | 1,699 | 4,544 |
| Crutch | 575 | 227 | 188 | 160 |
| Cane | 4,762 | 434 | 1,116 | 3,212 |
| Walker | 1,799 | 109 | 295 | 1,395 |
| Medical shoes | 677 | 248 | 226 | 203 |
| Wheelchair | 1,564 | 335 | 365 | 863 |
| Scooter | 140 | 12 | 53 | 75 |
| Hearing devices | | | | |
| Any hearing device ¹ | 4,484 | 439 | 969 | 3,076 |
| Hearing aid | 4,156 | 370 | 849 | 2,938 |
| Amplified telephone | 675 | 73 | 175 | 427 |
| TDD/TTY | 104 | 58 | *25 | *21 |
| Closed caption television | 141 | 66 | *32 | 43 |
| Listening device | 106 | *26 | *22 | 58 |
| Signaling device | 95 | *37 | *23 | 35 |
| Interpreter | 57 | *27 | *21 | *9 |
| Other hearing technology | 93 | *28 | *24 | 41 |
| Vision devices | | | | |
| Any vision device ¹ | 527 | 123 | 135 | 268 |
| Telescopic lenses | 158 | 40 | 49 | 70 |
| Braille | 59 | *28 | *23 | *8 |
| Readers | 68 | *15 | *14 | 39 |
| White cane | 130 | *35 | 48 | 47 |
| Computer equipment | *34 | *19 | *8 | *7 |
| Other vision technology | 277 | 51 | 76 | 151 |

* Figure does not meet standard of reliability or precision.

¹Numbers do not add to these totals because categories are not mutually exclusive; a person could have used more than one device within a category.

Table 2. Percent distribution of persons using assistive technology devices by age of person and type of device: United States, 1994

[Standard errors in parentheses]

| Assistive device | All ages | 44 years and under | 45–64 years | 65 years and over |
|-------------------------------------|----------|--------------------|---------------|-------------------|
| Anatomical devices | | | | |
| Percent and standard error | | | | |
| Any anatomical device | 100.0 | 54.6 (1.28) | 29.0 (1.11) | 16.4 (0.90) |
| Back brace | 100.0 | 47.1 (2.14) | 36.4 (1.94) | 16.5 (1.41) |
| Neck brace | 100.0 | 45.3 (5.98) | 46.7 (6.00) | *8.0 (3.07) |
| Hand brace | 100.0 | 51.5 (4.23) | 35.9 (4.22) | 12.7 (2.59) |
| Arm brace | 100.0 | 65.4 (5.03) | 26.7 (4.45) | *7.9 (2.57) |
| Leg brace | 100.0 | 44.6 (3.43) | 23.2 (2.52) | 32.2 (3.31) |
| Foot brace | 100.0 | 67.8 (3.98) | 21.0 (3.31) | 11.2 (2.74) |
| Knee brace | 100.0 | 70.2 (2.63) | 20.1 (2.23) | 9.7 (1.51) |
| Other brace | 100.0 | 59.9 (4.09) | 26.1 (3.49) | 14.0 (2.64) |
| Any artificial limb | 100.0 | 35.0 (4.95) | 29.6 (4.58) | 35.4 (5.10) |
| Artificial leg or foot | 100.0 | 33.4 (5.43) | 29.1 (4.92) | 37.6 (5.53) |
| Artificial arm or hand | 100.0 | *42.7 (16.53) | *30.9 (15.14) | *26.4 (15.61) |
| Mobility devices | | | | |
| Any mobility device | 100.0 | 15.6 (0.82) | 23.0 (0.81) | 61.5 (1.05) |
| Crutch | 100.0 | 39.4 (4.11) | 32.7 (3.20) | 27.8 (3.30) |
| Cane | 100.0 | 9.1 (0.77) | 23.4 (1.07) | 67.5 (1.22) |
| Walker | 100.0 | 6.1 (1.01) | 16.4 (1.35) | 77.5 (1.60) |
| Medical shoes | 100.0 | 36.6 (3.60) | 33.4 (2.89) | 30.0 (3.11) |
| Wheelchair | 100.0 | 21.4 (1.79) | 23.4 (1.86) | 55.2 (2.22) |
| Scoter | 100.0 | *8.4 (3.65) | 38.2 (7.08) | 53.4 (7.10) |
| Hearing devices | | | | |
| Any hearing device | 100.0 | 9.8 (0.78) | 21.6 (1.02) | 68.6 (1.20) |
| Hearing aid | 100.0 | 8.9 (0.77) | 20.4 (1.05) | 70.7 (1.21) |
| Amplified telephone | 100.0 | 10.8 (2.13) | 26.0 (2.66) | 63.2 (2.97) |
| TDD/TTY | 100.0 | 56.2 (9.01) | 24.0 (7.00) | *19.8 (7.26) |
| Closed caption television | 100.0 | 47.0 (8.18) | 22.7 (5.55) | 30.3 (6.84) |
| Listening device | 100.0 | *24.1 (7.34) | 21.1 (6.21) | 54.8 (8.70) |
| Signaling device | 100.0 | 38.8 (9.53) | *23.9 (7.58) | 37.3 (9.46) |
| Interpreter | 100.0 | 46.4 (11.38) | 37.5 (11.13) | *16.2 (9.09) |
| Other hearing technology | 100.0 | 30.0 (8.95) | 26.0 (7.36) | 44.1 (8.67) |
| Vision devices | | | | |
| Any vision device | 100.0 | 23.4 (3.34) | 25.7 (3.49) | 51.0 (3.91) |
| Telescopic lenses | 100.0 | 25.0 (5.29) | 31.1 (6.53) | 43.9 (6.24) |
| Braille | 100.0 | 47.6 (11.43) | 39.3 (11.15) | *13.1 (7.28) |
| Readers | 100.0 | *22.1 (7.63) | *20.2 (8.20) | 57.7 (9.56) |
| White cane | 100.0 | 26.8 (7.66) | 37.0 (7.43) | 36.2 (6.99) |
| Computer equipment | 100.0 | 57.2 (15.67) | *22.3 (14.21) | *20.5 (13.08) |
| Other vision technology | 100.0 | 18.4 (3.75) | 27.3 (4.96) | 54.3 (5.16) |

* Figure does not meet standard of reliability or precision.

NOTE: Percents may not total to 100 percent because of rounding.

devices, the majority (54.6 percent) were 44 years of age or younger.

The percent of persons who use assistive technology devices within categories of devices by age is shown in table 3. For all persons who use some type of hearing device, hearing aids accounted for 92.7 percent, and for all persons who use some type of mobility device, the cane accounted for 64.4 percent. Back braces accounted for 37 percent of any anatomical device used for all ages.

Prevalence rates by age—Table 4 shows total population in thousands, use

of devices by category in thousands, and prevalence rate of use per 1,000 persons. Except for any anatomical device, there is a positive correlation between age and the prevalence rate of device usage; that is, as age increases, the prevalence rate per 1,000 persons also increases. Use of any mobility device for all ages had the highest prevalence rate at 28.5 per 1,000 persons. For persons age 65 years and over, the rate of any hearing device use was 99.2 per 1,000 persons, or more than 5 times the rate for the total population (17.3 per 1,000 persons).

Trends in prevalence—To present trends over time, the 1990 National Health Interview Survey on Assistive Devices (NHIS-AD) and the 1994 NHIS-D, Phase I, were compared by assistive device category and type for data comparability. Table 5 presents each assistive technology device category, device type, and the tape locations from the 1990 NHIS-AD and the 1994 NHIS-D, Phase I. There is direct correspondence between many of the assistive device questions in the 1990 NHIS-AD and the 1994 NHIS-D, Phase I. However, there are at least two reasons why certain questions in the surveys may not be comparable:

- Particular questions are not repeated in both surveys; for example, the 1994 NHIS-D, Phase I, included a question on use of medically prescribed shoes, and the 1990 NHIS-AD did not.
- A question may have been asked on both surveys, but a prior screening question made the data not comparable. For example, the 1994 NHIS-D, Phase I, screened respondents for long-lasting or permanent impairments for hearing and vision assistive devices, while the 1990 NHIS-AD did not differentiate temporary from long-lasting or permanent impairments.

Given comparable questions across survey years, trends for assistive device usage over time can be presented. The 1980 NHIS and the 1990 NHIS-AD collected data on some assistive technology devices in a manner consistent with the 1994 NHIS-D, Phase I. Table 6 shows these devices and their prevalence in 1980, 1990, and 1994 and the percent change during that period. Also shown are the age-adjusted estimates of prevalence for 1990 and 1994 using the population enumerated in the 1980 Census as the standard and the percent differences between those and the 1980 estimates. The age-adjusted estimates for 1990 and 1994 can be considered the numbers expected if the age composition of the population had not changed between 1980 and 1994.

Table 3. Percent of persons using assistive technology devices within categories of devices by age of person, United States, 1994

[Standard errors in parentheses]

| Assistive device | All ages | 44 years and under | 45-64 years | 65 years and over |
|--------------------------------------|-------------|--------------------|--------------|-------------------|
| Anatomical devices | | | | |
| Percent and standard error | | | | |
| Any anatomical device ¹ : | | | | |
| Back brace | 37.0 (1.29) | 32.0 (1.85) | 46.3 (2.13) | 37.3 (2.66) |
| Neck brace | 3.7 (0.43) | 3.1 (0.54) | 5.9 (1.03) | *1.8 (0.70) |
| Hand brace | 7.3 (0.61) | 6.9 (0.83) | 9.0 (1.23) | 5.6 (1.23) |
| Arm brace | 7.0 (0.76) | 8.4 (1.20) | 6.5 (1.09) | *3.4 (1.11) |
| Leg brace | 13.1 (0.84) | 10.7 (1.01) | 10.4 (1.25) | 25.6 (2.74) |
| Foot brace | 6.2 (0.58) | 7.7 (0.97) | 4.5 (0.75) | 4.2 (1.02) |
| Knee brace | 21.7 (1.18) | 27.9 (1.74) | 15.0 (1.64) | 12.8 (1.97) |
| Other brace | 8.7 (0.78) | 9.6 (1.08) | 7.9 (1.25) | 7.4 (1.49) |
| Any artificial limb | 4.4 (0.44) | 2.8 (0.52) | 4.4 (0.80) | 9.4 (1.54) |
| Artificial leg or foot | 3.8 (0.41) | 2.3 (0.49) | 3.8 (0.73) | 8.7 (1.46) |
| Artificial arm or hand | *0.5 (0.15) | *0.4 (0.18) | *0.5 (0.28) | *0.7 (0.52) |
| Mobility devices | | | | |
| Any mobility device ¹ : | | | | |
| Crutch | 7.8 (0.50) | 19.7 (2.47) | 11.1 (1.22) | 3.5 (0.41) |
| Cane | 64.4 (0.91) | 37.7 (2.68) | 65.7 (1.95) | 70.7 (1.09) |
| Walker | 24.3 (0.88) | 9.5 (1.61) | 17.4 (1.45) | 30.7 (1.16) |
| Medical shoes | 9.2 (0.59) | 21.5 (2.54) | 13.3 (1.26) | 4.5 (0.48) |
| Wheelchair | 21.2 (0.76) | 29.1 (2.34) | 21.5 (1.73) | 19.0 (0.90) |
| Scooter | 1.9 (0.28) | *1.0 (0.46) | 3.1 (0.77) | 1.6 (0.30) |
| Hearing devices | | | | |
| Any hearing device ¹ : | | | | |
| Hearing aid | 92.7 (0.65) | 84.2 (3.35) | 87.6 (1.65) | 95.5 (0.59) |
| Amplified telephone | 15.1 (0.95) | 16.5 (3.18) | 18.1 (2.00) | 13.9 (1.06) |
| TDD/TTY | 2.3 (0.42) | 13.3 (3.23) | *2.6 (0.90) | *0.7 (0.25) |
| Closed caption television | 3.2 (0.50) | 15.1 (3.26) | 3.3 (0.96) | 1.4 (0.38) |
| Listening device | 2.4 (0.42) | *5.8 (2.10) | *2.3 (0.79) | 1.9 (0.44) |
| Signaling device | 2.1 (0.43) | *8.4 (2.71) | *2.3 (0.90) | 1.2 (0.34) |
| Interpreter | 1.3 (0.33) | *6.1 (2.08) | *2.2 (0.87) | *0.3 (0.18) |
| Other hearing technology | 2.1 (0.38) | *6.3 (2.28) | *2.5 (0.80) | 1.3 (0.34) |
| Vision devices | | | | |
| Any vision device ¹ : | | | | |
| Telescopic lenses | 30.1 (3.29) | 32.2 (6.39) | 36.5 (7.67) | 25.9 (3.80) |
| Braille | 11.3 (2.44) | 23.0 (6.88) | *17.3 (5.46) | *2.9 (1.69) |
| Readers | 12.9 (2.37) | *12.2 (4.39) | *10.1 (4.46) | 14.6 (3.52) |
| White cane | 24.7 (3.35) | 28.4 (7.96) | 35.6 (6.99) | 17.6 (3.62) |
| Computer equipment | *6.4 (2.09) | *15.8 (6.00) | *5.6 (3.90) | *2.6 (1.91) |
| Other vision technology | 52.7 (3.69) | 41.6 (7.56) | 55.9 (7.51) | 56.1 (4.59) |

* Figure does not meet standard of reliability or precision.

¹ Percents within each category of devices do not add to 100 because they are not mutually exclusive; a person could have used more than one device within a category.

Table 4. Number of assistive devices used by category and number used per 1,000 persons: United States, 1994

| Assistive technology | All ages | 44 years and under | 45-64 years | 65 years and over |
|---------------------------------|----------|--------------------|-------------|-------------------|
| Total population in thousands | | | | |
| All persons | 259,626 | 178,198 | 50,403 | 31,025 |
| Device usage in thousands | | | | |
| Persons using: | | | | |
| Any anatomical device | 4,565 | 2,491 | 1,326 | 748 |
| Any mobility device | 7,394 | 1,151 | 1,699 | 4,544 |
| Any hearing device | 4,484 | 439 | 969 | 3,076 |
| Any vision device | 527 | 123 | 135 | 268 |
| Device usage per 1,000 persons | | | | |
| Any anatomical device | 17.6 | 14.0 | 26.3 | 24.1 |
| Any mobility device | 28.5 | 6.5 | 33.7 | 146.5 |
| Any hearing device | 17.3 | 2.5 | 19.2 | 99.2 |
| Any vision device | 2.0 | 0.7 | 2.7 | 8.6 |

Population size increased by about 19 percent between 1980 and 1994, but use of selected assistive devices increased more rapidly. The use of anatomical braces more than doubled as did the use of walkers and wheelchairs. Also, use of all types of braces and canes increased at a faster rate than the population.

Because the population aged between 1980 and 1994 and older people are more likely to use assistive devices than younger people, some of the increase in the prevalence of devices can be attributed to the aging of the population. However, comparing 1980 prevalence estimates with 1994 age-adjusted estimates controls for the aging of the population. The last column in table 6 shows percent differences between the 1980 estimates and the 1994 age-adjusted estimates. For each type of device, the age-adjusted percent difference is less than the unadjusted percent difference, indicating that the aging of the population did account for a substantial part of the overall increase in use of devices. However, with the exception of artificial limbs and crutches, the age-adjusted differences are greater than the 19-percent growth in population. Allowing for aging of the population, this indicates that the use of assistive devices grew more rapidly than the population during that 14-year period.

Summary and conclusion

As demonstrated in this report, the use of assistive devices has increased dramatically over the past decade. More people use assistive technology to compensate for mobility impairments than any other general type of impairment. Other assistive devices in wide use are hearing aids and back braces. Regardless of the type of assistive device, usage increases with age. Thus, among those persons using assistive devices, those over 65 years of age accounted for the majority of mobility, hearing, and vision device usage. Some assistive device usage also increased at a rate faster than expected given changes in population size and age composition.

Table 5. Data comparability and availability for assistive devices: 1990 NHIS-AD and 1994 NHIS-D, Phase I

| Device category/type ¹ | 1990 NHIS-AD ² | | 1994 NHIS-D, Phase I ³ | |
|-----------------------------------|---|----------------------------|---|---------------|
| | Data origin | Tape location ⁴ | Data origin | Tape location |
| Any assistive technology device | Recorded variable (Counted any brace, mobility, hearing, vision, artificial limb, speech, computer/typewriter, or other device) | 336 | ... (Could not count any brace, artificial limb, hearing, vision, or mobility device, but this would not be equivalent because there is no speech or other device category) | ... |
| Any anatomical technology device: | Recorded variable (Brace or artificial limb) | 399; 383 | Recorded variable (Brace or artificial limb) | 530; 540 |
| Leg brace | Question (Might capture knee brace) | 340–341 | Question (Might not be equivalent) | 535 |
| Foot brace | Question | 342–343 | Question | 536 |
| Arm brace | Question | 344–345 | Question | 533 |
| Hand brace | Question | 346–347 | Question | 534 |
| Neck brace | Question | 348–349 | Question | 532 |
| Back brace | Question | 350–351 | Question | 531 |
| Knee brace | ... | ... | Question | 537 |
| Other brace | Question (Might capture knee brace) | 352–353 | Question (Might not be equivalent) | 538 |
| Artificial leg or foot | Question | 384–385 | Recode variable | 540 |
| Artificial arm or hand | Question | 386–387 | Recode variable | 540 |
| Any mobility technology device | Question | 354 | Question | 515 |
| Crutch | Question | 355–356 | Question | 518 |
| Cane or walking stick | Question | 357–358 | Question phrased “cane”; did not include “walking stick”; cane only | 516 |
| Walker | Question | 359–360 | Question | 520 |
| Medically prescribed shoes | ... | ... | Question | 522 |
| Wheelchair | Recorded variable (Manual or electric) | 361–362; 363–364 | Recorded variable (Manual or electric) | 524; 526 |
| Scooter | Question | 365–366 | Question | 528 |
| Other mobility technology | Question | 367–368 | ... | ... |
| Any hearing technology device: | Question | 369 | ... (Could count number of any hearing devices used, but this would not be equivalent because of a prior screening question ⁵ ; might under count) | ... |
| Hearing aid | Question | 370–371 | Question | 432 |
| TDD or TYY | Question | 372–373 | Question not equivalent; phrased as “TDD, TYY or teletype”; prior screening question; might under count | 458 |
| Special alarm | Question | 374–375 | ... | ... |
| Amplified telephone | ... | ... | Question | 457 |
| Closed caption television | ... | ... | Question | 459 |
| Listening device | ... | ... | Question | 460 |
| Signaling device | ... | ... | Question | 461 |
| Interpreter | ... | ... | Question | 462 |
| Other hearing technology | Question | 376–377 | Question not equivalent; prior screening question | 463 |
| Any vision technology device: | Question | 378 | ... (Could count number of vision devices used, but this would not be equivalent because of a prior screening question; might under count) | ... |
| White cane | Question | 379–380 | Question not equivalent; prior screening question | 429 |
| Telescopic lens | ... | ... | Question | 425 |
| Braille | ... | ... | Question | 426 |
| Reader | ... | ... | Question | 427 |
| Guide dog | ... | ... | Question | 428 |
| Computer equipment | Question not equivalent; Phrased as “Typewriter/computer”, not under Vision section, and no prior screening question | 392–393 | Question; prior screening question | 430 |
| Other vision technology | Question | 381–382 | Question not equivalent; prior screening question | 431 |

Table 5. Data comparability and availability for assistive devices: 1990 NHIS-AD and 1994 NHIS-D, Phase I—Con.

| Device category/type ¹ | 1990 NHIS-AD ² | | 1994 NHIS-D, Phase I ³ | |
|---------------------------------------|---------------------------|----------------------------|-----------------------------------|---------------|
| | Data origin | Tape location ⁴ | Data origin | Tape location |
| Any speech technology devices | Question | 388 | ... | ... |
| Any other types of technology devices | Recorded variable | 391; 394; 415 | ... | ... |
| Any home accessibility features | Recorded variable | 416 | ... | ... |

... Category not applicable.

¹The device categories or types listed in this table appear in table 1 in "Assistive Technology Devices and Home Accessibility Features: Prevalence, Payment, Need, and Trends" (7), which used the 1990 NHIS-AD as the data source. Otherwise other types of devices were provided by the 1994 NHIS-D, Phase I.

²For actual questions and tape format specifications, refer to the data file documentation (16).

³For actual questions and tape format specifications, refer to the data file documentation (17).

⁴Tape location for actual question or combinations of recorded variables.

⁵Screening questions were used in the 1994 NHIS-D, Phase I, to determine if an impairment was permanent, long-lasting, or temporary before data were collected on hearing and vision devices. The 1990 NHIS-AD did not collect data in this manner.

Table 6. Number of persons in the population using mobility assistive technology, percent change from 1980 and 1990 to 1994, and age-adjusted number using mobility assistive technology and percent difference for 1980, 1990, and 1994, United States, 1980, 1990, 1994

| Assistive device | 1980 | 1990 | 1994 | Change from 1980 to 1990 | Change from 1990 to 1994 | Change from 1980 to 1994 | 1990 | 1994 | Change from 1980 to 1990 | Change from 1990 to 1994 | Change from 1980 to 1994 |
|------------------------------------|---------------------|---------|---------|--------------------------|--------------------------|--------------------------|----------------------------------|---------|------------------------------------|--------------------------|--------------------------|
| | Number in thousands | | | Percent | | | Age-adjusted number in thousands | | Age-adjusted difference in percent | | |
| All persons | 217,923 | 246,099 | 259,626 | 12.9 | 5.5 | 19.1 | 246,099 | 259,626 | 12.9 | 5.5 | 19.1 |
| Leg or foot brace | 472 | 1,048 | 834 | 122.0 | (20.4) | 76.7 | 924 | 718 | 95.8 | (22.3) | 52.1 |
| Brace other than leg or foot | 1,000 | 2,740 | 3,651 | 174.0 | 33.2 | 265.1 | 2,436 | 3,192 | 143.6 | 31.0 | 219.2 |
| Artificial limb | 177 | 218 | 199 | 23.2 | (8.7) | 12.4 | 189 | 174 | 6.8 | (7.9) | (1.7) |
| Crutch | 588 | 671 | 575 | 14.1 | (14.3) | (2.2) | 590 | 501 | 0.3 | (15.1) | (14.8) |
| Cane or walking stick ¹ | 2,878 | 4,400 | 4,762 | 52.9 | 8.2 | 65.5 | 3,626 | 3,944 | 26.0 | 8.8 | 37.0 |
| Walker | 866 | 1,687 | 1,799 | 94.8 | 6.6 | 107.7 | 1,363 | 1,473 | 57.4 | 8.1 | 70.1 |
| Wheelchair | 720 | 1,411 | 1,564 | 96.0 | 10.8 | 117.2 | 1,185 | 1,315 | 64.6 | 11.0 | 82.6 |

¹The 1994 NHIS-D, Phase I, only asked about use of "canes", not walking sticks.

NOTE: Age-adjusted by the direct method using the 1980 population as standard and age groups 44 years and under, 45–64 years, 65–74 years, and 75 years and over.

Increases in the prevalence and rate of assistive technology use over the time covered in this report may be due to medical and technological advances, public policy initiatives, and population change (10). For example, more people are in need of assistive technology because of advances in health and medical technology—those advances have helped to improve the survival chances of persons who have experienced severe trauma (injury) or disease (10). Technological advances in composite materials, microelectronics, and microcomputers have influenced and improved the designs of assistive devices making them lighter, safer, stronger, easier to use, and, in some cases, less expensive. Public initiatives through legislation enacted over the past 10 years have also influenced availability and use of assistive technology. Legislation such as the Technology-Related Assistance for Individuals with Disabilities Act of 1988 (2), Americans with Disabilities Act (1), and the 1986 Rehabilitation Act Amendments (11) has certainly contributed. Lastly, assistive technology use as noted has increased because of population size and age composition changes.

Assistive technology can have a major impact on the lives of people with disabilities by enabling them to use their abilities more effectively (12,13). Although assistive technology may not eliminate a disability, it may allow a person to improve everyday function and independence, thus enabling that person to participate more fully.

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Technical notes

Source of data and sample design

The National Health Interview Survey (NHIS) is a continuous, nationwide, household interview survey of the U.S. civilian noninstitutionalized population conducted by the National Center for Health Statistics, Centers for Disease Control and Prevention. The NHIS sample is selected so that a national probability sample of households is interviewed each week throughout the year. Refer to *Current Estimates* from the 1994 NHIS for a discussion on sampling design and a complete copy of all questionnaires (14). For an extended discussion on estimations and sampling design refer to Massey, et al (15).

The NHIS questionnaire consists of two major parts: (a) The basic health questionnaire (the “core” questionnaire) that remains the same each year and is completed for everyone in the household, and (b) special health questionnaires that vary from year to year, and may be presented to selected persons in each household. In 1994 there were four special health topics questionnaires: Family resources; year 2000 objectives; acquired immunodeficiency; and disability (NHIS-D), which was administered in two phases.

NHIS-D, Phase I Questionnaire—NHIS-D, Phase I, requested information on assistive devices as well as health conditions, activities of daily living (ADL), instrumental activities of daily living (IADL), functional limitation, mental health, services and benefits, special health needs of children, early childhood development, education, relations to respondent, and perceived disability, and it included a disability condition page.

Based on responses given in NHIS-D, Phase I, questionnaire, certain persons were then eligible for the Disability Followback Survey known as Phase II. This survey consisted of four individual questionnaires, one each for children under 18 years of age, adults aged 18 years and over, elderly persons aged 69 years and over without any

indications of a disability, and persons with a past history of polio. Only the first year of Phase I data (1994) is included in this report; the second year of Phase I (1995) and both years of Phase II will be released in late 1997 and 1998.

Weights—All NHIS data files for 1994 utilized the adjusted Census population controls, which were designed to account for the 1990 Census undercount.

Sampling errors—Because the estimates shown in this report are based on a sample population, they are subject to sampling error. In the case of small estimates, sampling errors may be relatively high. Further, estimates based on complex, multistage sampling designs such as the NHIS lead to larger sampling errors than those based on simple random samples. The standard errors shown in tables 2 and 3 were calculated using SUDAAN (SURvey DATA ANALYSIS) developed by Research Triangle Institute for analysis of complex sample surveys. The procedure used was CROSSTAB, and the design was WOR (without replacement sampling).

Tests of statistical significance were performed using the difference of means tests (*t*-test). The standard error used for performing this procedure was derived from the pooled variances of the populations being compared. Differences between means that were at least twice as large as the pooled standard error were considered to be significant at the 5 percent level. In the case of multiple comparisons, such as one age group with all others, a Bonferroni adjustment was used to determine the appropriate level of significance. In this procedure, the significant alpha level is divided by the number of tests being performed to determine the adjusted significance level. Terms relating to difference (e.g., “greater than” or “less than”) indicate that differences are statistically significant. Lack of comment regarding the difference between any two estimates does not mean that the difference was tested and found to be not statistically significant. Estimates that do not meet the reliability criteria of 30-percent relative standard error are marked on the tables.

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