

CALIFORNIA ASSISTIVE TECHNOLOGY COALITION

Report #1

Demographic and Socioeconomic Factors Impacting the Future Assistive Technology Needs of California's Aging Population

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CO-CONVENERS:

**Independent Living Partnership (ILP)
California Department of Aging (CDA)
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Demographic and Socioeconomic Factors Impacting the Future Assistive Technology Needs of Californians

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ABOUT THIS REPORT

This is the first in a series of four reports addressing the current and future assistive technology needs of California's senior population. This report provides a trend analysis of California's population of seniors with disabilities, including the social, health, economic, policy, and regulatory challenges created by the phenomenon as they relate to assistive technology for community living.

Future reports will focus on the following topics:

- Report #2: Projection of the kinds of assistive technology California's aging and disabled residents will need in order to maintain their independence and age in place to the extent possible.
- Report #3: Review of how the assistive technology needs of California's aging and disabled population are currently being met, focusing on identifying gaps, barriers, challenges, and unmet needs.
- Report #4: Recommendations for policymakers, regulators, and other public and private sector leaders on steps that can be taken to help the state meet the assistive technology needs of its aging and disabled population.

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I. Executive Summary

This report focuses on California seniors' use of assistive technology (AT) as a support to continue living in the community and to improve health outcomes. Although the author has made every effort to include relevant data in this meta-analysis, many areas of disability are noticeably absent, including AT in the employment setting and AT for specific types of disabilities such as traumatic brain injury (TBI).

Assistive technology (AT) has helped millions of Americans confronted with physical or mental limitations that were present at birth or were acquired later in life. A variety of low-, medium-, and high-tech devices have been developed to maximize health and wellness, independence, home safety and security, communication and social engagement, and learning. Due to advances in technology, the field of AT has been expanding and is expected to grow rapidly in coming years, especially with regard to the development of more high-tech devices.

Research has shown that AT can not only enhance individual wellbeing, but also improve the efficiency of caregiving, and reduce health care costs. However, despite its potential, there are a number of challenges that need to be addressed if AT is to achieve its goals. These challenges include:

- the aging of the population;
- increased disability and health problems;
- socio-economic issues;
- policy and regulatory issues;
- need for more research; and
- need for more education.

Aging of the Population

While AT can be used by people of all ages, studies show that older adults are the main users of AT devices. This segment of the population is predicted to increase significantly in the future. In California, the number of adults over age 60 is expected to more than double by the year 2050 and become more racially, ethnically, and culturally diverse.

Disability and Health

The Americans with Disability Act (1990) defines a disability as a condition which limits a person's ability to function in major life activities – including communication, walking, and self-care (such as feeding and dressing oneself) – and which is likely to continue indefinitely, resulting in the need for supportive services. Currently, approximately 4 million Californians over age 5 have at least one disability. Adults over age 65 account for more than 25% of these individuals. Women are more likely than men to report a disability, as are African-Americans, compared to Whites.

The Centers for Disease Control (CDC) defines chronic health conditions as non-communicable illnesses that are prolonged in duration, do not resolve spontaneously, and are rarely cured completely. Not all persons with disabilities experience chronic health conditions. Likewise, not all persons with chronic health conditions have a disability. However, research shows that older

people with disabilities also have 3 to 4 times the number of chronic health conditions compared to their age-matched peers without disabilities. Because the prevalence of both chronic illness and disability rises steeply with age, based on the anticipated growth in the population of older adults in California, the number of people with disabilities, as well as secondary chronic conditions, is also expected to increase sharply over the coming decades. At the same time, the number of caregivers, both informal and formal, is expected to decrease, thereby increasing the need for some other form of assistance such as AT.

Socio-Economic Issues

Public health care costs in California continue to increase. The average annual health spending growth is anticipated to outpace the average annual growth in the overall economy. Unless more preventive services are provided to help residents stay healthy, the state's health care system will likely see greater than expected increases in coming years. With its potential to reduce health care expenditures, AT can play a significant role in the financial future of California's health care system.

Economic status is a key factor when it comes to AT usage, since many individuals pay for devices out of pocket. In 2005, more than 4 million Californians were reported to be living in poverty. More than half of these individuals had either a disability or difficulty with self care. As the level of disability increases in coming years, so will the number of Californians living at or below the poverty level. Despite its potential, to reduce health care costs, many individuals who could benefit from AT may not be able to pay for devices, especially the more technologically advanced devices.

Studies show that, among disabled older adults, in addition to low levels of income, racial or ethnic minority status and lower educational attainment are also associated with less usage of AT. In addition, people with mental health disabilities or with most types of cognitive impairments are also less likely to use any AT device than persons without these disabilities.

Another factor affecting low AT usage is the social stigma that many older persons attach to some devices, especially mobility devices. For many persons, these devices publicly symbolize loss of independence and decline. On the other hand, less stigma is attached to the newer high-tech devices. However, one of the key concerns regarding usage of more technologically advanced devices is their high cost. A key challenge to meeting the needs of disabled and elderly Californians will be to find ways to address the socio-economic disparities affecting usage.

Policy and Regulatory Issues

Funding is probably the biggest challenge facing the future for AT development and use. Although some funds for AT devices that assist people with disabilities are available through state assistive-technology and vocational rehabilitation programs, the major sources of funds for AT products are private health insurance and Medicare and Medicaid. Although a person must be eligible to receive its benefits, another source of funding for AT is the Department of Veterans' Affairs (DVA), which is considered by many to be a model payment system.

Medicare and Medicaid cover AT under their durable medical equipment (DME) benefit, yet spending in this area accounts for only a small portion of overall program spending. Advocates of AT have called for sweeping reforms in the way these public programs define medical necessity and how they view AT. Broader policies are required that not only cover devices for survival, but also technologies that provide increased social integration and participation. Overall, policy changes are needed that make the developing technology more affordable and accessible to disabled and elderly individuals. Manufacturers of AT have also expressed concerns that the outdated and cumbersome public policies may have a negative impact on the development of new products.

Research

Due to the evolving nature of AT, more research is required in several areas. Data on AT need, use, and effectiveness in the United States are scarce. This is particularly true for California. Given the epidemiological trends in California, more research is warranted to better understand the functional needs of current and future users of AT. Lower AT usage based on racial and cultural factors also merits further research. Because the field is evolving so rapidly, large scale studies that focus on health benefits and cost savings need to be undertaken. Evidence from these studies may help convince policymakers to make appropriate changes to public programs. Furthermore, because of the complex nature of the newer high-tech devices, more research is needed to create a more integrated nationwide health information technology system.

Education

Many people with disabilities, especially older adults, people with lower levels of education, minorities, cognitively impaired individuals, and their caregivers, lack the awareness of the potential benefits of AT. Greater efforts need to be undertaken to inform people with all kinds of disabilities, and of all ages and cultural backgrounds, about the broad range of technologies that are available, especially the newer high-tech devices, and how this technology can help them achieve greater independence and wellbeing. Overall, broad based educational programming needs to be undertaken that targets not only users of AT and their caregivers, but others as well, including long-term care providers, health care professionals, aging services providers, policymakers, and industry leaders.

Due to its evolving nature, the field of AT is currently relatively unstructured and fragmented. There is a widespread need for greater sharing of information and coordination of programming among all appropriate stakeholders if AT is to achieve its maximum potential to help disabled and elderly individuals, enhance caregiving, and reduce health care costs.

II. Background on Assistive Technology

The Americans with Disability Act of 1990 defines a disability as a condition which limits a person's ability to function in major life activities – including communication, walking, and self-care (such as feeding and dressing oneself) – and which is likely to continue indefinitely, resulting in the need for supportive services. (1)

Each year, thousands of Americans are confronted with some form of physical or mental limitation that was present at birth or acquired later in life. In recent years, manufacturers of

Assistive Technologies (AT) have been making great efforts to produce products that address these disabling conditions. According to the report *2010 Technology Market Overview* from Aging in Place Technology Watch, the field of AT is growing rapidly and continues to attract a steady stream of new vendors to a market that is expected to exceed \$20 billion by 2020.(2)

Types of AT Devices. The Technology Related Assistance Act of 1998 defines Assistive Technology (AT) as “Any item, piece of equipment or product system, whether acquired commercially, off the shelf, modified or customized that is used to increase, maintain, or improve functional capabilities of individuals with disabilities.”(3) This rather broad definition includes a variety of devices that are intended to maximize independence, health and wellbeing, home safety and security, social engagement and learning, and care management.

AT devices basically fall into three categories:

- low-tech (i.e., walkers, magnifiers, bathroom grab bars, door handles, oxygen tanks, and other non-motorized tools and devices that promote independence);
- medium-tech (i.e., hearing aids, flashing/vibrating alerting devices, and motorized or electronic devices); and
- high-tech (i.e., computer and other advanced technologies).

The National Health Interview Survey on Disability (NHIS-D) indicated the top four AT devices used by disabled and elderly individuals to be:

- 1) mobility devices (canes, walkers, wheelchairs, etc.);
- 2) anatomical devices (braces and artificial limbs);
- 3) hearing devices (hearing aids, amplified telephone, etc.); and
- 4) vision devices (telescopic lenses, readers, etc.).(4)

While low- and medium-tech devices continue to be widely used, in recent years, due to advances in technology, the field of AT has been expanding and has developed more high-tech devices that include robotics, telemedicine, telepharmacy, physiologic and environmental sensors, and advanced integrated sensor networks, among others.(5) These innovations have the potential to improve the quality-of-care and quality-of-life of older adults and their caregivers and delay or obviate the need for institutional placement.(6)

Remote health monitoring, while still in its nascent stage of development, is predicted to be the next major wave in health-care delivery and is intended to enable older persons to remain independent for as long as possible, even in the face of increasing physical limitations, cognitive disability, and secondary health conditions.(7) A listing of over 36,000 AT devices that are currently available is provided by the online catalog of ABLEDATA (see <http://www.abledata.com>). Depending on their level of complexity, the cost of these devices can range from as little as a few dollars to thousands of dollars.

Usage of AT. Actual AT use in the United States is difficult to determine.(8) However, data from the National Center for Health Statistics estimated that 7.4 million persons in the U.S. household population use AT devices for mobility impairments. Another 4.6 million use anatomical devices; 4.5 million use hearing aids and 500,000 use vision devices.(9) Due to the dated information provided by this survey, these figures may be substantially higher today. However, the survey did reveal that the majority of persons using AT devices were over 65 years of age and included more

women than men. Sixty-two percent of persons using mobility devices, 69% of persons using hearing devices, and 51% of persons using vision devices were over age 65.

A survey conducted among close to 2,000 consumers of Independent Living Centers (ILC) throughout California also revealed that usage of AT increases with age.(10) (Table 1) The survey found that 68% of respondents of all ages used at least one AT device, especially low-tech devices. Usage of high-tech devices declined with age. Among older adults, 79% of the sample of persons aged 65-74 used at least one AT device; 67% of respondents used a low-tech device; 47% used a medium-tech device; and 17% used a high-tech device. Among the sample of persons aged 75 and older, 91% used at least one device; 84% used a low-tech device; 50% used a medium-tech device; and 11% used a high-tech device. The main AT devices used by participants addressed mobility, vision, hearing, mental health, cognitive, and speech impairments.

Table 1. Percentage of Respondents Who Use AT

Age	Use of Any AT	Low-tech	Medium Tech	High-Tech
Entire	67.6%	53.2%	36%	19.4%
18-44	55.3%	36%	30.6%	21.5%
45-54	64.3%	50.5%	32.9%	18.5%
55-64	72.4%	59.7%	36.7%	22.5%
65-74	79.2%	66.7%	46.5%	17%
75+	90.9%	83.6%	49.7%	10.9%

Kaye, H.S., Yeager, P. & Reed, M. (2008) *Disparities in Usage of Assistive Technology Among People With Disabilities, Assistive Technology*, 20:194-203.

Benefits of AT. There is mounting evidence that AT devices can result in increased independence and cost savings, both to individual consumers and in health care expenditures.(11-15) For example, in a 3-month period study of assisted living residents, an activity monitoring technology was found to significantly reduce billable interventions (47 vs. 73), hospital days (7 vs. 33), and estimated cost of care (\$21,187.02 vs. \$67,753.88) and had a positive impact on professional caregivers' efficiency.(16)

It has also been found that AT can effectively prevent or delay institutionalization among frail elderly individuals and it is estimated that a 1-month delay in nursing home placement of persons older than 65 would reduce healthcare expenditures in the United States by \$1.2 billion annually.(17) Another study found that an initial investment of about \$2,000 in AT for home modification interventions resulted in an average net savings of \$33,000 per study participant over a 3-year period (\$11,000 per year) in home health care costs.(18) Overall, it is believed that, with greater use of AT devices, nursing facilities and other residential settings can either reduce staff, or use existing staff more productively, and thereby cut operating costs and increase efficiency.(19-20)

III. Aging

Demographics. The aging of California's population, especially the baby boomers, will have a tremendous impact on both the use of current AT devices and the development of new products. The elderly population (age 60 and over) in California has grown rapidly over the past decades. This trend will continue, as this population grows from 6.3 million in 2010 to 14.6 million by 2050, an increase of 128%. By 2050, it is estimated that nearly 25% of Californians will be age 60 or older. The highest growth rates will occur in the next 30 years, largely due to the aging of the baby boomers (persons born between 1946 and 1964).(21) In the year 2010, approximately 628,000 Californians were aged 85 or older. By 2050, an estimated 2.9 million individuals will be in this age group, representing a 364% increase.

Cultural Diversity. Over the next decades, California's aging population will also grow more diverse (Table 2). While 61% of older adults are White/Non-Hispanic in 2010, by 2050, this group will only represent 36% of older adults. The majority of older adults will comprise a variety of racial, ethnic, and cultural groups, many with limited English capability. For example, the older Hispanic/Latino population will increase from 19% in 2010 to 39% in 2050; the Asian population will increase from 13% to 17% during this time period. The number of African- American older adults will decrease from 5% to 4.6%. Overall, non-White older adults tend to have poorer health and less education.

Table 2. California's Projected Population Age 60+ (by Race and Ethnicity)

Race/Ethnicity	2010	2030	2050
White/Non-Hispanic	60.9%	47.7%	35.7%
Hispanic/Latino	18.8%	29.2%	39.1%
Asian	13.0%	15.2%	16.9%
African-American	5.1%	4.9%	4.6%
Two or More Races	1.3%	1.7%	2.1%
American Indian/Alaskan Native	0.6%	0.9%	1.0%
Native Hawaiian/Pacific Islander	0.3%	0.4%	0.6%

State of California, Department of Finance, *Population Projections for California and Its Counties 2000-2050, by Age, Gender and Race/Ethnicity*, Sacramento, California, July 2007.

Women. Among Californians ages 6-64, 54% are women. Among those over age 85, 65% are women. Owing to their longer life expectancy and their tendency to marry men who are two to three years older than they are, women have a much higher probability to be widowed and to live alone in later years. Almost 57% of women in California are widowed compared to 20% of men. Forty percent of these women live alone.(22)

IV. Disability and Health

Demographics. While exact numbers are difficult to estimate, because the prevalence of both disability and chronic illness rises steeply with age, based on the anticipated growth in the

population of people over age 60 in California, the number of older adults with disability, as well as secondary health conditions, is also expected to increase sharply over the coming decades.(23) These demographics will also have a significant impact on the need for and use of AT in California.

More than 4 million Californians report having at least one disability, or, approximately 13% of the population aged 5 and over.(24) Those reporting a disability include the following:

Age	With a disability
5-17	342,000 (4.9%)
18-44	938,000 (6.8%)
45-64	1,359,000 (16.6%)
65-74	631,000 (32.6%)
75-84	679,000 (51.2%)
85+	319,000 (73.6%)

The prevalence of disability varies by gender, educational attainment, income, race, and ethnicity. Women are more likely to report a disability than men (2,305,000 and 1,963,000, respectively). African-Americans report the highest incidence of disability (17.3%), followed by Whites (14%), and Asian/Pacific Islanders (10%). Furthermore, more than 800,000 (27.5%) of Californians with a disability live alone.

Causes and Types of Disability. In the United States, the three most common causes of disability in non-institutionalized adults over age 18 include:

- 1) arthritis and rheumatism (8.6 million persons);
- 2) back or spine problems (7.6 million); and
- 3) heart trouble (3.0 million).(25)

A listing of the top 30 causes of disability, by age, is available at <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5816a2.htm>

The four most commonly reported disabilities among Californians over age 5 include:

- 1) mobility;
- 2) cognitive;
- 3) sensory; and
- 4) difficulty performing self-care activities, i.e., Activities of Daily Living.(26)

People who have arthritis often experience problems with mobility and self-care activities. In California, arthritis currently affects over 5.3 million adults (21%); 3.3 million are women and over 2.0 million are men.(27) Not all racial/ethnic groups are affected equally. Of the population of persons with arthritis, an estimated 30% are African-American, 27% non-Hispanic Whites, 15% other ethnicities, and 14% Hispanics.

Disability and Secondary Health Conditions. It is believed that people with disabilities have 3 to 4 times the number of secondary chronic health conditions compared to their age-matched peers without disabilities.(28) For example, large portion of people who have arthritis also have other chronic conditions: (29)

Chronic Condition	% With Arthritis
Heart disease,	52%
Hypertension,	40%
Diabetes,	42%
High cholesterol,	34%
Overweight and obese,	52%

Although it is not a risk factor for these other chronic diseases, arthritis may present a barrier to adopting healthier lifestyles, such as physical activity, for fear of increasing joint damage or pain. It is estimated that the number of persons with arthritis in California will increase 33% by 2030.(30)

Falls. Falls are a major threat to the well-being of older adults and resulted in more than 3 million incidences in 2005.(31) According to the California Department of Public Health, falls are the leading cause of non-fatal hospitalized injuries and the dominant injury cost in California and can result in back and spinal injuries, as well as death.(32) Approximately one-third of older Californians fall each year. Fall-related injuries in 2004 led to almost 80,000 hospitalizations, up 43% since 1991.(33) Non-fatal fall-related injuries in California cost over \$2 billion each year in direct medical costs.(34) A number of studies have shown that home modification using AT can directly lead to a reduction in the incidence and severity of falls. However, most older households have made few or no basic modifications.(35)

Loss of Vision and Hearing.. Another major form of disability includes loss of vision and hearing. There are 15 million blind and visually impaired people in the United States.(36) Twenty-one percent of people aged 65 and over report some form of vision impairment. This represents 7.3 million people. In 2000, 1.7 million of 10.5 million California residents aged 45 or older, and 755,000 of 3.5 million who are 65 or older, had a self-reported vision problem. Seventy percent of severely visually impaired persons are aged 65 or older. Fifty percent of that group are legally blind. There is a higher incidence of vision loss among women due to their greater longevity. Persons who experience difficulties seeing also are at greater risk for falls.(37)

There is no solid, consistent data on the numbers of people with hearing loss of different kinds and degrees. The studies that exist vary in definitions and methods of measurement.(38) However, taken together, these studies suggest the following:

- 10% of all Americans have some hearing loss
- 14% of American adults have “a little trouble hearing”
- 3.4% of American adults have “a lot of trouble hearing” or are deaf
- 30% of all people over the age of 65 have hearing loss
- 65% of all people over the age of 85 have hearing loss
- Over 75% of people with hearing loss lost their hearing after the age of 19
- 50% of people with hearing loss are of working age (18 – 64)
- 83 out of every 1000 children in the United States have an educationally significant hearing loss
- 3 of every 1000 babies born in the United States has a hearing loss
- 75% of people who could benefit from hearing aids are not using them

It also appears that premature hearing loss is increasing among baby boomers and the need for hearing technology may be greater among this generation than among current seniors.(39)

Cognitive Disabilities. The number of Californians over age 55 who experience cognitive disabilities, including dementias and Alzheimer’s disease is increasing and is expected to double over the coming decades. For example, in 2008, 588,208 adults over age 55 were living with Alzheimer’s disease. The number is projected to increase to 1,100,000 by 2030.(40) Despite the level of cognitive impairment and the increasing availability of AT to address these problems, the study among California’s Independent Living Centers found that people with mental health disabilities or with most types of cognitive disabilities are less likely to use AT than others without these types of disabilities.(41)

Chronic Conditions. Chronic health conditions are defined as “non-communicable illnesses that are prolonged in duration, do not resolve spontaneously, and are rarely cured completely.” (42) Nearly half of all Americans live with a chronic medical condition. In 2007, more than one-third of 26,874,000 California adults (36%) reported having at least one chronic health condition (43). Over one-third of these individuals were also living in poverty The most commonly reported conditions were hypertension, psychological distress, asthma, diabetes, and congestive heart failure (CHF) (Table 3)

It is expected that, due to the sharp increase in the older population, the state will experience a dramatic increase in chronic conditions in the next 20 years. Since people with multiple chronic conditions currently account for more than 60% of the state’s health care expenditures, this has significant implications for the future of California’s health care budget.

Table 3. Reported Chronic Conditions in California, 2007

Condition	Total Number	65+ Total Number
Hypertension	7,017,000	4,647,000
Psychological Distress	7,007,000	920,000
Asthma	2,181,000	1,873,000
Diabetes	2,099,000	1,384,000
CHF	476,000	206,000

California Health Interview Survey, 2007, California HealthCare Foundation

In addition to the conditions reported by the California Health Interview Survey, other studies have shown high incidences of cancers and stroke, especially in older adults.(44-45)

Future of Institutionalization and Caregiving. The majority of older Americans want to stay in their homes for as long as they can.(46) But, in California, the outlook for nursing-home utilization is similar to that for disability rates, since the two are closely linked. Nursing home placement is expected to nearly double by 2050, from about 90,000 residents in the year 2000, to about 170,000 in 2050. Significant increases are also expected in assisted care and residential care facilities.(47) At the same time, the number of caregivers, both informal and formal is

expected to decrease. Baby boomers had fewer children than previous generations, so there aren't as many adults who can help older adults who have disability and/or health problems. Furthermore, there's a shortage of paid home caregivers today, and there's no indication Americans will be more willing to take these low-wage jobs in the future. (48)

V. Socio-Economic Issues

Health Care Expenditures. Overall costs to the health care system in the United States continue to increase. Between the years 2009-2019, average annual health spending growth (6.1%) is anticipated to outpace the average annual growth in the overall economy (4.4%). By 2019, national health spending is expected to reach \$4.5 trillion and comprise 19.3% of GDP. Public spending is projected to grow faster on average than private spending (7.0% versus 5.2%, respectively) for 2009 through 2019.

As a result of more rapid growth in public spending, the public share of total health care spending is expected to rise from 47% in 2008, exceed 50% by 2012, and then reach nearly 52% by 2019. From 2009 through 2019, Medicare and Medicaid spending growth are projected to average 6.9% and 7.9%, respectively.(49)

In California, personal health care expenditures rose from \$121,383,000 in 2000 to \$166,236,000 in 2004. Medicare costs accounted for 19% of the total expenditures; Medi-Cal accounted for 17% of these costs.(50) Unless more preventive services are provided to help residents actively work to stay healthy, the state's health care system will likely see greater than expected increases in the nearly \$15,000 per capita spent in 2004 on caring for the health of its seniors.(51-52) With its potential to reduce health expenditures, AT can play a significant role in the financial future of California's health care system.

Poverty Level. In 2005, more than 4 million Californians were reported to be living in poverty. Close to 700,000 of these individuals had a disability and 146,999 had difficulty with self-care.(53) According to the Current Population Survey Report conducted by the California State Department of Finance for the same year, among the older population, differences in poverty levels vary greatly by race and ethnicity.(54) An estimated three times as many older non-White Californians (74.8%) were living below 100% of the federal poverty level compared to older White adults (25.2 %). Among older adults of various racial groups, 25.2% of Hispanics, 14.5% of African-Americans, 14.3% of American Indian/Alaskan Natives, 19.4% of Asians, and 41.7% of Native Hawaiian/ Pacific Islanders were living below the federal poverty level.

A recent study by the UCLA Center for Health Policy Research and the Insight Center for Community Economic Development revealed that nearly half a million older adults living alone in California cannot make ends meet and it is believed that these numbers will increase, due to the current economic recession.(55) The study found that about three-fourths of Latinos who live alone, and almost half of those who lived with a spouse, could not cover their basic costs of living. Older women accounted for 72% of all older Californians who lived alone. Those women were more likely than older men to be unable to cover their basic needs (53.5% of women, compared with 44% of men. The study also found that a majority of all single persons aged 75 or older were economically insecure, regardless of ethnicity.

Factors Affecting Usage of AT. As indicated earlier, older adults have the highest level of disability and are the major consumers of AT devices. However, despite the potential of AT to enhance independence and well-being, there are a number of disparities in usage, many based on socio-economic factors. For example, among a sample of frail older adults with hearing difficulties, African-Americans were found to be much less likely to use hearing-related technology, including hearing aids, than their White counterparts.(56)

Another study of older adults who have difficulties in activities of daily living revealed that African-Americans used fewer assistive devices than White participants, especially with regard to devices for hearing and vision.(57) Other studies have found that, among seniors with disabilities, racial or ethnic minority status, lower educational attainment, and lower levels of income are associated with lower usage of assistive devices.(58-59)

The California Study of Independent Living Centers revealed similar findings.(60) In the study, women were found to have greater overall usage of assistive devices than men. African-Americans and Latinos had lower levels of usage than Whites, particularly of motorized or electronic devices, such as power wheelchairs or hearing aids and high-tech devices. Lower AT usage for medium- and high-tech devices was linked to lower levels of income and educational attainment. People with mental health disabilities, whose usage of any type of AT device was low, had basically no usage of high-tech devices. Those who could benefit from these devices were often forced to resort to more lower-tech devices that are either more affordable or easier to obtain through public programs.

Low levels of income, combined with high rates of disability, have significant implications for the use of AT, since people often pay for many AT and home accessibility features out of pocket.(61-62) For example, while home modifications have been shown to help achieve independence and reduce costs, both to individuals and the health care system, some of these modifications may be unaffordable to many individuals. The cost of home adaptations can range from a few hundred dollars to thousands of dollars, depending on the complexity of the technology. While there is a range of public and private financing sources available, these sources are far from comprehensive and eligibility requirements are often confusing, thus limiting access to those in need.(63)

Despite the fact that people with disabilities have a lot to gain from the new high-tech devices of the electronic age, overall, they have among the lowest rates of use of these technologies. Low level of use of high-tech devices, especially computers, is attributed to the fact that many people with disabilities cannot afford the equipment and monthly maintenance charges and are unaware of the potential benefits that computers can provide to help them achieve greater independence and social integration. Age also appears to be a factor in computer use. Adults over age 65, both with and without disability, report less computer usage than younger adults.(64) However, in the coming decades, as baby boomers age, this “digital divide” may decrease, due to greater current knowledge of computer capabilities among this generation.

Attitude Towards AT. Research has also shown that one of the most significant and complex influences in the use of AT by older adults is their attitude. AT usage can be viewed positively, as a way to regain and maintain independence, or negatively, as a symbol of declining function and abilities. The social stigma that many older persons attach to AT devices, especially mobility

devices, plays a significant role in whether or not devices are accepted into a person's daily life.(65)

A series of focus groups convened in Canada among caregivers, Veterans, and older adults who used a wide range of AT devices found that perception of need and the use or rejection of a device was strongly influenced by the negative opinions associated with certain devices.(66) A majority of participants in the study indicated that many AT devices publicly symbolized the loss of independence and inevitable decline. The look and appearances of some of the devices contributed to this negative perception and avoidance of use.

On the other hand, although usage of high-tech devices is not widespread, compared to low-tech devices, less stigma is attached to the more technologically advanced devices. Both older adults and their caregivers appear more receptive to and interested in using them to maintain social contact, gather information, be safe at home, and promote personal health and wellness.(67-68) One of the major concerns, however, is the high cost of many of these high-tech devices.

VI. Policy and Regulatory Issues

Support for AT. There is growing understanding of the advantages of enabling people with disabilities and health problems to remain in their homes as long as possible. At a Town Hall meeting in 2009, President Obama stressed the benefits of home-based care in terms of its ability to keep older people out of more expensive institutional care and thereby control Medicare costs.(69) Also, the Department of Health and Human Services has incorporated the following goals into *Healthy People 2020*:

- 1) Increase the proportion of adults with disabilities who participate in social, recreational, community, and civic activities to the degree that they wish; and
- 2) Reduce the number of people with disabilities who report unmet need for assistive devices, service animals, technology services, and accessible technologies they need.(70)

Funding for AT. Despite the growing support for AT, there is a long way to go. There are several sources of funding for AT, including Medicare and Medicaid (Medi-Cal in California), the Department of Veterans' Affairs, private insurance, some private and nonprofit organizations, and self-funding. Medicare and Medicaid, the biggest funders, cover assistive technology under their durable medical equipment (DME) benefit, but spending in this area accounts for only a small portion of overall program spending. For example, based on the 2001 Medicare Current Beneficiary Survey, it was found that 6.2% of beneficiaries obtained mobility assistive technology under the Medicare durable medical equipment (DME) benefit. These beneficiaries were disproportionately poor, disabled, and users of both acute and post-acute services. Average per item spending ranged from \$52 for canes to \$6,208 for power wheelchairs. Among beneficiaries who acquired such technology through the DME benefit, these devices comprised just 2% of overall Medicare spending.(71)

Need for Policy Reform. Medicare's narrow focus on restorative rather than compensatory care is a well-documented problem for people with disabilities and chronic conditions.(72) In essence,

the coverage process undervalues many important services, such as assistive technology, where demonstrated evidence of therapeutic effect is limited.

The National Council on Disability (NCD) recommends that the Centers for Medicare and Medicaid Services (CMS) should update its current definitions of durable medical equipment and medical necessity, which are outdated and give little consideration to increasing an individual's functional status. According to NCD, the current patchwork of federal and state health care and private insurance coverage contains barriers and gaps that leave many people with disabilities unable to obtain needed assistive technology. As a starting point, more consistent and coherent federal eligibility and reimbursement policies are needed. New definitions of medical necessity are needed to ensure that effective assistive technology is deemed eligible for coverage and reimbursement.(73)

The Institute of Medicine (IOM) is another advocate for policy reform regarding AT and makes the following recommendations: (74)

- A comprehensive disability monitoring system should be created to help monitor disability and inform policymakers. There should be more public funding for disability research programs.
- The Department of Justice should increase efforts to enhance the Americans with Disabilities Act, which will require health insurers to cover assistive technologies and devices.
- Congress and administrative agencies should eliminate long waiting periods for disability insurance.
- Consumers and professionals alike should be better educated about the proper care for people with disabilities and about the challenges they face.

Policy Restrictions. Unfortunately, the Medicare program doesn't seem to agree with the advocates for improvement in AT accessibility. The Centers for Medicare and Medicaid Services continues to advocate for policies and regulations that restrict patient access to medical equipment such as power wheelchairs and oxygen, which is critical to allowing individuals to remain in their homes. Even the recently enacted healthcare reform legislation follows this trend by eliminating an option allowing a Medicare beneficiary to purchase a power wheelchair in the first month that the product is prescribed. In addition, the government has enacted a 36-month cap on oxygen reimbursement. The fundamental problem is that the CMS has sought to control Medicare costs by adopting policies and regulations that harm providers and slow expansion of the Medicare mobility benefits.(75)

Model AT Program. The Department of Veterans' Affairs (DVA) purchases more assistive devices for individuals with disabilities than most other agencies. Although a person must be eligible to receive DVA benefits, DVA is considered by many to be a model payment system. It has a systematized structure to pay for its large volume of equipment and it provides widespread education for consumers and clinical personnel. Furthermore, it also invests in research and development, evaluation, development of standards, and development of procurement guidelines for assistive devices. The DVA program covers traditional medical equipment such as artificial limbs and

wheelchairs, as well as products that don't fall under the heading of "medical necessity" such as automobile and home modifications.(76)

Concerns of Manufacturers. In a survey of 359 U.S. manufacturers of AT conducted by the Bureau of Industry and Security, respondents expressed concerns about how cumbersome public and private insurance program participation procedures and outdated compensation methodologies may stifle innovation in new product development.(77) Because AT manufacturers are uncertain of when and under what reimbursement structure they will be permitted to sell their product, many product ideas remain on the shelf. The Bureau recommends that manufacturers of AT devices and interest groups representing people with disabilities need to work more closely with the state and federal governments to bring about changes in funding.

VII. Research

Clarifying Trends to Determine AT Need. Data on AT need, use, and effectiveness in the United States are scarce.(78) This is particularly true for California. Furthermore, due to the rapid advances in technology, the limited information that is available quickly becomes outdated. Given the epidemiological trends in California, more research is warranted to better understand the functional and chronic illness needs of both current and future users of AT. Clarifying distinctions among trends in chronic conditions, functional limitations, and disability – and their interrelationships – will help policymakers and program officials anticipate the need for specialized medical care services such as assistive technology devices. (79)

Large-Scale Studies Needed. Recent research has helped to quantify the value that some technology has to enhance independence and reduce costs. However, many of these studies have been conducted on a small scale, leaving questions about whether large-scale studies would produce similar results. This has led to a lack of consensus among many stakeholders, including policymakers, about the overall value of technology-enabling products and services and has affected funding for AT. More large scale studies are needed to provide convincing evidence that specific technologies increase independence, enhance the quality of care, and lower health care costs.(80)

Research Needed to Improve AT Infrastructure. Due to its evolving nature, the field of AT is relatively unstructured. The inadequate infrastructure has special implications for more high-tech products and services related to telehealth. According to the Center for Aging Services Technologies (CAST), the inability of different information systems to communicate with one another has slowed progress in creating an integrated, nationwide health information technology system. More research and development is needed in this area to ensure the needed interoperability of devices.(81)

VIII. Education

Need to Educate AT Consumers. Because the field is evolving rapidly, the need for education poses a significant challenge to ensuring future use of AT. Many people with disabilities, especially older adults, people with lower levels of education, minorities, cognitively impaired individuals, and their caregivers, lack the awareness of the potential benefits of the newer high-

tech AT devices, how this technology can help them achieve greater independence and wellbeing, and how to pay for it.(82-83)

The California study among Independent Living Centers concluded that “greater efforts need to be undertaken to inform people with all kinds of disabilities, and of all ages and cultural backgrounds, of the broad range of technologies that are available to assist with all types of functioning. The stigma often associated with public use of such technologies, from wheelchairs to hearing aids, to white canes, needs to be overcome through education campaigns, which emphasize the benefits of technology in enabling more active participation in community life.”(84)

Education is also needed on how to effectively use and maintain the various AT devices that are available, especially the newer high-tech devices. If users experience difficulty with utilization or do not understand how to service or repair a device, it may be abandoned.(85) The way the use of new technology is taught is critical to an individual’s comprehension, especially older adults, and they may require unique training approaches based on interactive adult learning principles.(86)

To gain wider acceptance and understanding of the benefits of AT, education programs need to take a holistic approach that considers people’s lifestyles. Furthermore, it is believed that proactive involvement of persons who use AT devices in their design and implementation will maximize the likelihood of their acceptance and continued successful use of the technology. (87-88)

Need for Broad-Based Educational Programming.. Targets of education need to include not only users of AT, but their formal and informal caregivers, long-term care providers, health care professionals, aging services providers (i.e., Area Agencies on Aging, senior centers, etc.) policymakers, and industry leaders as well. This broad-based educational programming needs to be presented by appropriate credible professional organizations and consortiums.(89)

In addition to providing education to potential users of AT, training of health care professionals in the practical uses of technological devices will increase their acceptability.(90) It has also been shown that, when health care providers discuss AT options, patients are much more receptive to using a device when the provider stresses independence and wellbeing rather than focusing on disability and limitations.(91)

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