

CALIFORNIA ASSISTIVE TECHNOLOGY COALITION

Report #2

Current and Future Assistive Technology Needs of Californians

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CO-CONVENERS:

**Independent Living Partnership (ILP)
California Department of Aging (CDA)
California State University, Fullerton (CSUF)**

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ABOUT THIS REPORT

This is the second in a series of four reports regarding the current and future assistive technology needs of Californians. The first report provided a trend analysis of California's aging and disability communities, including the social, health, economic, policy, and regulatory challenges as they relate to assistive technology. This report takes a deeper look at a number of issues that need to be addressed to enable older adults and people with disabilities in California to maintain their independence and wellbeing.

Future reports will focus on the following topics:

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- Report #3: Review of how the assistive technology needs of California's aging and disability communities 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 disability communities.

To access a copy of the Coalition's first report, visit the Coalition's website at www.CATCoalition.org.

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I. Executive Summary

Research shows that assistive technology (AT) is playing an increasingly important role in the lives of people with disabilities and can not only enhance overall wellbeing, but also improve the efficiency of caregiving, delay or prevent institutionalization, and reduce health care costs. (1-3) A number of advances in AT have been made in recent years to improve interaction with the environment for people with disabilities and older adults and the field is expected to expand substantially, especially with regard to the development of high-tech devices. (4)

Despite its potential to enhance independence and wellbeing, there are a number of challenges that must be addressed if AT is to meet the future needs of California's aging and disability communities. This report looks at the following issues that require attention:

- Disability Trends
- Use of Assistive Technology
- Aging in Place
- Access to Health Care

Recommended action steps are also provided to help address the challenges identified.

A salient feature that permeates all of the challenges is the need for greater coordination and collaboration among appropriate stakeholders in the design, implementation, use, and evaluation of AT. Equally important is the need to improve data collection systems that identify disability trends and AT usage and need.

Disability Trends

The exact number of people with disabilities in the United States is difficult to determine and estimates range between 40 and 50 million individuals of all ages. Surveys conducted in California also reveal significant variances in disability data. According to the Institute of Medicine (IOM), the reason for variances in data monitoring is due to two main factors: 1) lack of consistent language used in surveys; and 2) inconsistency in the inclusion of all age groups and living situations. Different surveys use different terminology to assess similar conditions and situations. In addition, surveys may exclude

certain populations such as: young children; adults younger than retirement age; and individuals with disabilities who live in institutional settings or assistive living environments. Despite the inconsistent data in current disability monitoring, it is expected that the number of Americans of all ages with impairments in body structures or functions, including Californians, will increase substantially in coming years. To enhance the independence and wellbeing of people with disabilities in California, it is important to gain a clearer understanding of the state's disability demographics.

Use of Assistive Technology

Few studies of AT usage in both California and the United States as a whole have been conducted, making it difficult to accurately assess use and need among persons with disabilities. In general, surveys have been limited to a specific disability population, age group, or kind of technology that either control for the level of need or restrict the sample to a relatively homogenous disability population.

Low- and medium-tech devices continue to be widely used and will continue to be required in the future. However, in recent years, due to advances in technology, the field of AT has been expanding and more high-tech devices continue to be developed, including robotics, telemedicine, telepharmacy, physiologic and environmental sensors, advanced integrated sensor networks, and sophisticated communication tools, among others.

Because the field is evolving so rapidly, increased education is needed about the potential benefits of AT that targets different audiences, including users, caregivers, and health care and aging service providers. In addition, efforts to increase awareness of “try-before-you-buy” opportunities are needed to ensure the appropriateness of AT devices in addressing specific limitations. Furthermore, 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. An approach that is critical in both new product development as well as modification of existing devices is the concept of User Centered Design. A number of testing labs that involve potential users in AT development have been established in several states. In California, one such lab is currently under development at California State University, Fullerton.

Aging in Place

Studies show that a growing number of older adults and people with disabilities want to live in their own housing and communities for as long as possible. Home

modifications enable these individuals to remain independent and “age in place.” These modifications include adaptations made to existing home environments that make it easier and safer for individuals with disabilities to perform daily activities such as bathing, cooking, and climbing stairs. A fundamental concept that has been widely promoted in home modifications is that of “universal design” – i.e., the creation of an attractive, stylish, and safe space that everyone, regardless of age, size, or ability, can live in or visit. Unfortunately, most older adults, whether homeowners or renters, live in environments that are not conducive to achieving and maintaining independence and have made few or no basic modifications. In California, many older adults reside in substandard dwellings in need of repair or rehabilitation, which endanger their safety. A major barrier to implementing home modifications is the cost of complex changes to the home.

Access to Health Care

Adequate access to health care can help people with disabilities lead healthier lives. However, people with disabilities and elderly persons encounter significant problems in accessing and using health care facilities. Surveys conducted in California reveal that individuals with disabilities encounter numerous difficulties entering facilities and examination rooms as well as using radiology equipment, physical examination tables, weight scales, exercise and rehabilitation equipment, and toilet facilities. Furthermore, persons with a disability have been shown to be less likely than others to receive screenings for breast, cervical, and prostate cancer. Lack of accessibility to health services is particularly difficult for rural residents. The lawsuit filed in California against Kaiser Permanente in 2001 highlighted the lack of accessibility features for individuals with disabilities in health care facilities. Recognizing the need for improvement, Molina Healthcare in Long Beach created the Bridge2Access Statewide Advisory Committee to identify challenges it faces in providing health care to people with disabilities and older individuals.

Recommended Actions

Based both on existing knowledge and lack of knowledge related to AT, several actions are recommended to meet the current and future needs of California’s aging and disability communities to enhance independence and quality of life. These actions include the following:

1. Improve the Monitoring of Disability. Clearly, the current disability monitoring system, both in the United States and in California requires improvement if the needs of people with disabilities and elderly persons

are to be adequately met. Currently, disability statistics are patched together from multiple, often inconsistent surveys. A coordinated effort should be undertaken by researchers where a common framework is agreed upon for conducting surveys. This entails the use of consistent language and concepts and the inclusion of individuals of all ages and in all living situations. In addition, surveys should provide information that can be used to monitor the incidence, prevalence, severity, and duration of the various components of disability.

2. **Improve the Monitoring of AT Usage.** Additional research is required to determine current usage of AT, attitudes towards AT, perceived obstacles to use, and future needs. This research needs to be well coordinated, more consistent in terms of concepts and language, and include individuals of all age groups and in all living conditions as well as other private and public stakeholders. A comprehensive framework similar to the Comprehensive Assistive Technology (CAT) model developed in Scotland could serve as a useful model. In addition, the California State Independent Living Council and the Department of Rehabilitation (Sacramento, CA) have developed a list of recommendations regarding improvements that can be made to meet the AT needs of California's aging and disability communities and should be considered when planning for the future.
3. **Increase Awareness of AT Availability and Benefits.** Increased educational efforts are needed to raise awareness of the wide range of AT devices that are available and how they can enhance independence and well-being. Such efforts should also include information about "try-before-you-buy" opportunities. Targets of education should include not only users of AT, but their formal and informal caregivers, long-term care providers, health care professionals, aging services providers, policymakers, and industry leaders as well. The Association of Assistive Technology Act Programs has identified several successful initiatives covering a wide range of issues that have been undertaken in various states to increase awareness and usage of AT and could be a useful resource for California.
4. **Involve Potential Users and Other Stakeholders in the Design and Development of AT.** 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. Many

devices that have been developed have been limited to specific age groups and are not appropriate for everyone. Future research with assistive technologies needs to proactively involve age-appropriate participants in determining specific needs, device design and privacy preferences, as well as outcome evaluations. Testing labs, similar to the one established at California State University, Fullerton and those that have been implemented in other states could be developed across California. These labs involve multi-disciplinary teams that include not only potential users, but also researchers, business partners, and universities, in the design, development, and deployment of AT innovations.

5. **Increase the Availability of Home Modifications.** Given the desire of most people to live independently for as long as possible, the number of individuals who require assistance reflects a large and growing need for housing units with features that make them accessible to and appropriate for persons with disabilities. Well-coordinated programs can be undertaken to demonstrate both the need for and the effectiveness of home modification. Programs also need to be implemented to educate people with disabilities and elderly persons about the benefits of home modifications. In addition, to achieve the goal of successful aging in place and increase the environmental supportiveness of new and existing housing, broad-based efforts need to be undertaken to improve the financial coverage of home modifications by both private and public insurers. The National Resource Center for Supportive Housing and Home Modification and the California Commission on Aging have made useful recommendations to help achieve successful aging in place programs. Also, examples of successful home modification programs that have been implemented in other states are discussed in this report and can serve as models for California.

6. **Improve Access to Health Care Facilities.** Findings from the surveys conducted in California and elsewhere underscore the need for public health practitioners, health-care providers, and community organizations to take a more proactive role in removing environmental barriers and improving access to health care facilities for persons with disabilities. Several researchers stress the need to develop a “disability competent” health care system that includes appropriate features to accommodate persons with disability. The guide *Removing Barriers to Health Care*, produced by The North Carolina Office on Disability and Health can serve as a model for California.

II. Disability Trends

According to the Americans with Disability Act (ADA) of 1990, a person with a disability has “a physical or mental impairment that substantially limits one or more of the major life activities of such individual.” (5) Major life activities include such things as attending school, going to work, ambulation, eating, bathing, and toileting. In other words, disability refers to the inability to perform an activity rather than to the condition itself.

Exact estimates of disability in the United States are difficult to determine. Current statistics indicate that the number of people with disability exceeds 40 million and could be as high as 50 million. In their detailed report, *The Future of Disability in America*, the Institute of Medicine (IOM) found that the reason for variances in estimates is due primarily to two factors: 1) lack of consistent language used in surveys; and 2) inconsistency in the inclusion of all age groups and living situations. For example, different surveys use different terminology to assess similar conditions and situations. In addition, surveys may exclude certain populations such as: young children; adults younger than retirement age; and individuals with disabilities who live in institutional settings or assistive living environments. (6)

The IOM committee recommends adopting the *International Classification of Functioning, Disability and Health* (ICF) of the World Health Organization as the framework for disability monitoring and research. The ICF is based on a global consensus-building process that provides a standardized, internationally accepted language and conceptual framework to facilitate communication across national and disciplinary boundaries. By agreeing on and using comparable concepts and terminology to describe and measure different aspects of disability, the research findings would be more useful for decision makers. Furthermore, the committee recommends that data collection and monitoring cover individuals of all ages and in all living situations, including the community, group residential care settings, and institutions. In addition, surveys should provide information that can be used to monitor the incidence, prevalence, severity, and duration of the various components of disability.

Californians With Disability. As is the case across the nation, significant variances in current disability data have been reported in California. The 2000 US census, estimates the number of persons with disabilities aged 5 and over in California to be 5.9 million, or about 19% of the population. (7). The *American Community Survey* for 2005, which excluded people living in institutions,

estimates that more than 4 million Californians have at least one disability, or, approximately 13% of the population. (8) The 2007 *California Health Interview Survey*, a randomized telephone survey of non-institutionalized individuals, estimates the number to be closer to 8 million. (9)

A comprehensive listing of disability data collection survey instruments used in California, together with their strengths and limitations, can be viewed at <http://www.cdph.ca.gov/HealthInfo/injviosaf/Documents/disabilitydatainventory.pdf>

Projecting Future Trends in Disability. Just as we see variations in the monitoring of current disability data in the United States, we also find variations in the projection of future disability trends. The IOM found that increases in childhood ailments such as diabetes and obesity could lead to an increase in the number of adults and older adults with disability. However, no source of disability trends for children in the United States could be found and this lack of information represents a significant gap in current knowledge.

Among working-age individuals with disabilities, different surveys also reveal different data. In California, it appears that the employment of individuals with disability has generally decreased in recent years, due primarily to the economic recession. As a result, the poverty rates of these individuals have increased significantly. Researchers recommend that a state-specific plan be developed to measure and track progress in employing Californians with disabilities, using both existing and new data. One approach would be to follow people with disabilities over time so that actual changes in their individual circumstances and employment can be observed and analyzed. (10)

As for older adults, a recent study of disability trends in the United States found that adults aged 60 and over face a significantly increased prevalence of multiple types of disability. Furthermore, these trends are stronger among the fastest-growing subgroups of this population (non-Whites and obese and overweight persons). (11) According to the authors of the study, the growing number of individuals aged 60 years and older, with their increased prevalence of disability, will place increased demands on the health care system. Increased levels of disability (particularly among the youngest of the older adults) may also negatively affect economic productivity. This is due to the fact that individuals burdened by disability are more likely to reduce or eliminate their involvement in the labor market, thereby decreasing their contributions to tax revenues and simultaneously placing greater demands on the health care system. Disability

trends may also affect younger age groups if their members have to compete with older people for scarce resources in an overburdened health care system.

While exact numbers are difficult to estimate, because the prevalence of both disability and chronic illness rises steeply with age, based on the anticipated increase in the population of individuals aged 60 and over in California, the number of older adults with disabilities, as well as secondary health conditions, is expected to increase sharply over the coming decades. (12)

Despite the inconsistent data in current disability monitoring, based on the various surveys that have been undertaken, it is expected that the number of Americans of all ages with impairments in body structures or functions is likely to increase substantially in coming years. The number of individuals with disability now exceeds 40 million—and that number could grow to more than 50 million in the next few years, depending on the survey. According to the IOM, unless substantial progress is made to reduce the chances of such impairments developing into activity limitations and restrictions, particularly at older ages, the number of people in the United States facing barriers to work, health care, and independent living will no doubt escalate. (13)

III. Use of Assistive Technology

Assistive technology use and need in the United States today is difficult to estimate. Few studies of AT usage have been conducted. In general, they are limited to a specific disability population, age group, or kind of technology that either control for the level of need or restrict the sample to a relatively homogenous disability population. (14) Based on surveys that have been undertaken, AT usage has been found to vary by such factors as age, gender, educational attainment, income, race, and ethnicity. (15-17)

Data from past surveys administered by the National Center for Health Statistics between 1994 and 1997 and based on a weighted sample of 41.8 million Americans aged 18 years and older with disabilities revealed the following levels of usage and need:

- 8.3 million Americans needed equipment or aids (AT) to perform basic activities of daily living (ADLs);
- 15.4 million Americans reported using assistive devices or technologies (primarily medical), such as tracheotomy tubes, ostomy

- bags, catheterization equipment, glucose monitors, diabetic equipment and supplies, inhalers, nebulizers, hearing aids, crutches, canes, walkers, wheelchairs, scooters, and feeding tubes;
- 7.4 million Americans had surgical implants such as shunts to drain away fluid, artificial joints, implanted lenses, pins, screws, nails, wires, rods, or plates, artificial heart valves, pacemakers, silicone implants, infusion pumps, implanted catheters, organ implants, and cochlear implants;
 - 14 million Americans lived in homes modified to meet their needs. Among these, over 1.5 million persons reported needing further home modifications to already existing ones. An additional 1 million persons with disabilities who did not have any home modifications indicated that they needed such accommodations;
 - 511,000 Americans reported using modified cars or vans. 369 thousand persons with disabilities reported needing modifications to their cars or vans. Of these, 60 thousand persons needed modifications in addition to the ones they already had, and the remaining 309 thousand persons used vehicles that had no modifications but needed them;
 - 15.1 million Americans worked at the time of the interview. In this group, 4.2 million persons reported being limited in the kind or amount of work they could do;
 - 714,000 Americans reported having an accessible work environment that included hand rails or ramps, accessible parking or an accessible transportation stop close to the building, elevators, including elevators designed for persons with special needs, specially adapted work stations, restrooms designed for persons with special needs, automatic doors, voice synthesizers, TDDs, infrared systems or other technical devices, Braille, enlarged print, special lighting or audio tape devices, and special pens or pencils, chairs, or other office supplies;
 - 1.3 million working Americans reported needing one or more of the above mentioned work place designs and accessories;
 - 402,000 Americans were provided with special accommodations that included readers, oral and sign language interpreters, job coaches,

personal assistants, job redesign or slowing the pace of tasks, reduced work hours and more breaks, part-time work and other types of equipment, help, and work arrangements not named above; and

- 531,000 working Americans indicated a need for one or more of the previously mentioned special accommodations.

The surveys also revealed that the majority of persons using AT devices were over 65 years of age and included more women than men. (18-19) However, due to the narrow scope of questions and the dated information provided by the survey data, the figures cited above may substantially underestimate the full scope of AT use and need in the United States. (20)

The U.S. Department of Education/National Institute of Disability and Rehabilitation Research (NIDRR) has established a table of product categories for AT devices that are currently being used by people with disabilities of all ages and that will increasingly be needed to meet future demands. (See Table 1)

Table 1. Assistive Technology Product Categories

Assistive Technology Product Categories	
Product Category	Description
Architectural Elements	Door opening/closing devices, door levers, lifts and elevators, ramps, safety equipment
Communication Devices	Augmentative and alternative communication devices (AAC), speech synthesizers, communication boards, board overlays, talking books
Telecommunications	Wireless and wireline telephones, text telephones (TTY), amplified telephones, talking pagers
Sensory Aids	Non-computer based devices, such as hearing aids, assistive listening devices, tactile aids for the deaf/blind, alerting devices, braille notetakers

Computers	Hardware, software, accessories -- including screen readers, large print products, optical character recognition tools, braille displays
Environmental Controls	Remotely controlled door openers, telephones, lights, televisions
Aids to Daily Living	Aids for hygiene, dressing and undressing, toileting, washing, bathing, showering, manicure and pedicure, hair care, dental care, facial care and skin care, housekeeping, handling and manipulating products, and orientation
Mobility	Transportation safety, vehicle lifts and ramps, walking/standing aids, wheelchairs, seating systems, other types of wheeled mobility
Orthotics and Prosthetics	Spinal orthotic systems, upper/lower limb orthotic systems, hybrid orthotics, upper limb prostheses, upper/lower limb prosthetic systems, non-limb prostheses, functional electrical stimulators
Recreation, Leisure, and Sports	Accessible toys, indoor games, arts and crafts, photography, physical fitness, gardening, camping, hiking, fishing, hunting, shooting, sports equipment, musical instruments
Modified Furniture and Furnishings	Tables, light fixtures, sitting furniture, beds and bedding, adjustable height furniture, work furniture
Source: U.S. Department of Education/National Institute of Disability and Rehabilitation Research (NIDRR). 2003 http://www.icdr.us/atreportweb/index.htm	

While low- and medium-tech devices continue to be widely used and will continue to be required in the future, in recent years, due to advances in technology, the field of AT has been expanding and more high-tech devices continue to be developed, including robotics, telemedicine, telepharmacy, physiologic and environmental sensors, and advanced integrated sensor networks, among others. (21) In addition, a wide range of communication tools, including smart phones, Ipads, and other PDA devices are increasingly being used for AT purposes. It is also predicted that remote mobile health monitoring

will be the next major wave in the reform of healthcare delivery systems to help older persons remain independent for as long as possible, even in the face of increasing disability. Despite these advances, more research is warranted to gain a clearer picture of current AT usage, needs, problems, and attitudes.

AT Use in California. The use of assistive technology in California is also difficult to determine. However, a 2005 survey conducted among close to 2,000 consumers of Independent Living Centers (ILC) throughout California, aged 18 and older, revealed large differences in technology usage by age, race, ethnicity, education, income, and type and severity of disability. (22)

According to the survey, factors that appear to put people with disabilities at a disadvantage in accessing and using assistive devices include lower educational attainment, racial or ethnic minority status, lower household income, later disability onset, and disability related to mental as opposed to physical or sensory functioning. Findings also revealed that usage of AT increases with age. 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. The main AT devices used by participants addressed mobility, vision, hearing, mental health, cognitive, and speech impairments.

In 2003-2004, a *Statewide Independent Living Needs Assessment* was conducted among persons with disability in California. (23) A number of overall improvements were recommended to meet the needs of people with disabilities in the state. With regard to AT, the following recommendations were made:

- Increased discounts for the purchase of a vehicle with appropriate assistive technology adaptations;
- Increased accessibility to electric scooters;
- Expanded sources for durable medical equipment that accept Medi-Cal;
- Expanded insurance caps for power wheelchairs and other durable medical equipment that exceed current caps;
- Expanded funding for AT, including AT evaluations, training, and maintenance;
- Expanded opportunities to access the Internet, including training and development of more public access locations;
- Improved information on communication technology available from the phone company;

- Increased access to pagers such as Sidekick or Blackberry that are free or inexpensive;
- Increased accessibility to Acrobat reader PDF files that have the ability to enlarge on screen AND to print in large print; and
- Improved access to at-home entertainment, including reading, radio, television: “The blind need additional support with talking books and Braille books; people who are Deaf need TV captioning.”

To ensure that these needs and others are adequately addressed, more consistent and coordinated disability and AT monitoring in California is required.

Need for Education. As indicated in the first report (http://www.catcoalition.org/Publications_and_Reports.html), because the field is evolving so 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.

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. (24-26) According to the Institute of Medicine (IOM), education and experience of health care professionals involving care for people with disabilities have fared poorly. The committee recommends that disability-related educational modules and competency standards be developed that can be implemented in professional schools and also be offered as continuing education. (27)

Need for Awareness of “Try-Before-You-Buy Opportunities”. Many older adults and people with disabilities are unsure of the appropriateness of AT devices in addressing their limitations. Because many devices are expensive, programs that offer consumers the opportunity to try an assistive or adaptive device before they purchase it help consumers find the best fit and save money. While a “try-before-you-buy” program exists in California, many older adults and people with disabilities are unaware of its existence. The Device Lending Library (DLL) program is a service of the AT Network. It is run under a contract with the California Dept. of Rehabilitation with funding from the Assistive Technology Act of 2004. The DLL program loans devices to

consumers so they can test and evaluate their appropriateness before they buy them. The program also enables consumers to borrow devices on a short-term loan basis to meet temporary needs. Devices are available through the AT Exchange website (<https://exchange.atnet.org/welcome.aspx>). Efforts should be made to more widely publicize the availability of the program among California residents. Similar programs exist in other states. A list of these programs can be found on the RESNA website (<http://www.resna.org>).

Involvement of Consumers and Other Stakeholders in AT Research, Design, and Evaluation. Although many persons, especially older adults, appear receptive to assistive technologies in hypothetical scenarios, they tend to minimize personal need when such devices are offered to them. (28). 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. (29-30)

Furthermore, many devices that have been developed have been limited to specific age groups. For example, most assistive technologies designed to address cognitive deficits were developed principally for younger persons with non-progressive traumatic or anoxic brain injuries, thus raising concerns about their generalizability to the progressive deficits associated with neurodegenerative dementias in older adults. Future research with assistive technologies needs to proactively involve age-appropriate participants in determining specific needs, device design and privacy preferences, as well as outcome evaluations. (31)

An approach that will be critical both in new product development as well as modification of existing ones is the concept of User Centered Design. (32) User Centered Design is a product development philosophy and multistage problem-solving process that aims to take into account user needs, preferences, and values upfront to optimize user acceptance of the end product. The process begins with an analysis of user characteristics (demographic, cognitive, physical, and perceptual) and physical and social environments, and tasks that are the target of the proposed technological intervention. Next, user goals that would be necessary for successful implementation of the product are identified (i.e., esthetics, ergonomic design, cost). After a detailed user and task analysis, conceptual designs and prototypes are developed and subjected to iterative modifications within an experimental setting before deployment in real-world settings with actual users. Although the approach requires greater initial

research investment, it ultimately reduces product development time and cost while simultaneously improving user acceptance and satisfaction.

In several states, testing labs have been implemented that involve potential users and other stakeholders, including caregivers, health care providers, aging service providers, manufacturers, and engineers, among others, in the design and evaluation of assistive technology. For example, the Human Engineering Research Laboratories (HERL) at the University of Pittsburgh offers the following:

- Activities of Daily Living Laboratory
- Biomechanics and Neuromotor Control Laboratory
- Design and Prototyping Laboratory
- Electronics Laboratory
- Imaging/Modeling Laboratory
- Physiology Laboratory
- Robotics Laboratory
- Virtual Reality Laboratory
- Wheelchair Testing Laboratory
- Assistive Technology Evaluation Laboratory

For a complete description of each laboratory see

<http://www.herlpitt.org/laboratories.htm>

The Age Lab developed at the Massachusetts Institute of Technology (MIT) involves a multi-disciplinary team of researchers, business partners, universities, and members of the aging community to design, develop and deploy AT innovations. (See <http://agelab.mit.edu>) The MIT team examines the following:

- effects of the physical environment on aging, e.g., home, stores, hospitals, automobile, community, airports, transit systems, consumer electronics, products and packaging, medical devices, mobile phones, furniture, etc.;
- how older adults allocate their attention, seek information and advice, and make sense, as well as choices, of important issues, e.g., health & wellness, financial planning, insurance, aging-in-place, long-term care options, end-of-life planning, major product purchases, etc.; and

- how business strategy and government policies affect older people and ultimately establish the context for society aging to be an opportunity or a burden.

The Center for Assistive Technology and Environmental Access (CATEA) at Georgia Tech is another example of a broad-based testing lab that involves a multidisciplinary team. CATEA's work is organized under four laboratories: the Rehabilitation Engineering And Applied Research Laboratory (REAR Lab), the Accessible Workplace Laboratory, the Enabling Environments Laboratory (EE lab), and the Accessible Education and Information Laboratory. For more information, see <http://www.catea.gatech.edu/about.php>

In California, an interdisciplinary CATLab (the California Assistive Technology Laboratory) is being developed at California State University, Fullerton. The lab includes gerontologists, sociologists and engineers working together to find solutions for the elderly who want to age in place. For more information, see <http://www.fullerton.edu/initiatives/health>

To actively involve potential AT users, testing labs similar to the one being implemented at California State University, Fullerton and those created in other states could be developed across California. In addition to the labs cited above, examples of other AT testing laboratories can be viewed on the website of the Rehabilitation Engineering and Assistive Technology Society of North America (RESNA) and serve as models. For more information, see <http://resna.org/technical-standards/testing-labs>

In sum, additional research is required, both in California and the United States as a whole, to determine current usage of AT, attitudes towards AT, benefits of AT, perceived obstacles to use, and future needs. This research needs to be well coordinated, more consistent in terms of concepts and language, and include individuals of all age and ethnic/cultural groups and in all living conditions as well as other private and public stakeholders. A comprehensive framework would be very useful in achieving this goal. One example that could serve as a model for California is the Comprehensive Assistive Technology (CAT) model, developed in Scotland, which includes an ongoing dialogue among end-users, medical practitioners, clinical rehabilitation professionals, social support staff, and the engineering community. (33)

The Association of Assistive Technology Act Programs also provides a good overview of numerous initiatives that have been successfully implemented in various states across the country over the past decade to address a wide range of AT issues affecting all age groups. Based on these initiatives, advances have been made in the following areas: acquisition of new technology; training in specific areas of need; development of equipment loan programs and equipment recycling programs; and access to accessible information technology. The initiatives are well coordinated and involve consumers, public and private organizations health care providers, and state agencies. These initiatives can serve as a good model for California in addressing a wide range of issues related to research and development, education, funding, policy, and legislation. Examples of the initiatives that have been undertaken can be seen at <http://www.ataporg.org/atap/projects.php?id=highlights>

IV. Aging in Place

Aging in place is a phenomenon that is growing in importance, both from the standpoint of individuals and public policy. The term refers to the desire of older adults and people with disabilities to live in their own housing and communities as long as possible. (34) In an AARP survey conducted in 2000, more than 80% of respondents aged forty-five and over agreed with the statement: “What I’d really like to do is stay in my current residence for as long as possible.” (35) Other studies show that aging boomers fear moving into a nursing home and losing independence more than they fear death. (36)

The movement to age in place is gaining momentum due to the aging of the population. Another factor that is contributing to the aging in place movement is the increase in longevity of Americans that is linked to improvements in medical care and medical technology. Many conditions that, in the past, kept people in the hospital for two weeks or more are now treated on an outpatient basis. (37)

The ability of older adults to age in place is closely linked to the prevalence of disability in this group and the need for supportive services, including assistive technology and personal caregiving. For example, nationwide, approximately 3.2% of persons aged sixty-five to seventy-four and 9.4% of persons aged seventy-five and over need help with at least one activity of daily living (i.e., ambulation, bathing, feeding, eating, and toileting), while 6.6% of those aged sixty-five to seventy-four and 18.6% of those seventy-five and over need assistance with instrumental activities of daily living

(such as, shopping, cooking, cleaning). (38) In addition, 31.2% of older people have trouble climbing a flight of stairs and 31.8% have difficulty walking a quarter of a mile. (39)

Because of increased longevity compared to previous generations, a growing number of baby boomers will be living with chronic conditions that require changes in their physical environments. (40) To meet the needs of these individuals, a good deal of planning and coordination of services will be required.

Home Modifications. Home modifications are adaptations made to existing home environments that can make it easier and safer for individuals with disabilities to perform daily activities such as bathing, cooking, and climbing stairs and generally remain independent and “age in place”. These modifications can range from inexpensive railings, rearranged furniture, or extra lighting, to more costly ramps, elevators, roll-in showers, and fully remodeled bathrooms and kitchens. A number of studies have shown that home modification using AT can directly lead to a reduction in accidents, minimize the need for more costly personal care services, and delay institutionalization. (41)

A fundamental concept that has been widely promoted in home modification is that of “universal design.” Universal design is the process of designing public and private environments, services, and products to be usable, insofar as possible and practical, by people with a wide range of abilities, without the need for special adaptation. (42) With regard to home modifications, universal design refers to the creation of an attractive, stylish, and safe space that everyone, regardless of age, size, or ability, can live in or visit. Universal design features include among others, the following basic elements: no-step entry; single-floor living; wide doorways and hallways; reachable controls and switches; and easy-to-use handles and switches. A comprehensive listing of universal design features has been developed by the American Association for Retired Persons (AARP) and can be viewed at http://www.aarp.org/home-garden/home-improvement/recession_remodel_makeover.html

Given the desire of most people to live independently for as long as possible, the number of individuals who require assistance reflects a large and growing need for housing units with features that make them accessible to and appropriate for people of all ages with disabilities. (43) Unfortunately, most older adults and people with disabilities live in environments that are not conducive to achieving and maintaining independence and have made few or no basic modifications. Such environments often include outside steps, inside stairs, and unsafe

bathrooms, all of which pose potential hazards. Many, if not most, homes are not equipped to support the needs of an aging population with disability. In fact, the overwhelming majority of housing in which older Americans reside has been developed for independent residents. (44) Although the Fair Housing Amendments Act of 1988 (U.S. Code, Title 42, Section 3604) prohibits discrimination against people with disabilities in a variety of housing settings, a major barrier to implementing home modifications for both homeowners and renters is the cost of complex changes to the home.

Older adults with limitations in mobility and functional ability report the three greatest unmet needs in their homes are handrails/grab bars, ramps, and easy-access bathrooms. (45) If such features are lacking, older adults may be forced to restrict activities, take chances that decrease their personal safety, increase their dependence on others, and put themselves at risk for requiring higher levels of care and possible institutionalization.

In addition, people of all ages with disabilities need to use a wide range of mainstream technologies in their daily lives. However, standard alarm clocks, microwaves, ovens, washing machines, thermostats, and a host of other products may not be accessible (either directly or with adaptive technologies) to people with disabilities. In that case, people must do without, accept products with significant shortcomings, or buy special products, often at a higher cost.

Over the past several years, however, a growing number of specialized companies, many which are web-based, have started to offer a wide range of mainstream products and gadgets that have been modified to make them accessible for people with vision, hearing, dexterity and mobility limitations. Many of these resources can be found on such websites as <http://www.abledata.com>, sponsored by the National Institute on Disability and Rehabilitation research. *TOOLS for Independence*, a special project of the Independent Living Partnership, also offers a newsletter and website information for consumers as to the availability of such products (<http://www.toolsforindependence.org>). The Device Lending Library program mentioned above (p. 15) also offers a large number of such devices to consumers who want to try them before they buy them.

For older people, falls can be a serious outcome of home hazards and a lack of supportive features. 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. (46) Approximately one-third of older Californians fall each year.

Fall-related injuries in 2004 led to almost 80,000 hospitalizations, up 43% since 1991. (47) Non-fatal fall-related injuries in California cost over \$2 billion each year in direct medical costs. (48) Estimates are that 30–50% of falls are related to environmental problems. (49) In California, many older adults reside in substandard dwellings in need of repair or rehabilitation, which endanger their safety. Instead of facilitating older persons' ability to grow old safely, independently, and with dignity, many settings have become a source of safety and health problems. (50)

The Los Angeles County Health Survey, conducted in 2002-2003 among more than 8,000 individuals over age 18 found that, among respondents to the survey who reported having a disability (1,333), almost 25% (311) reported they needed home modifications, but did not have them. (51) The need for home modifications was higher among low-income individuals and Hispanics and African-Americans. Because of the diversity and large geographic area and population size of Los Angeles County (i.e., approximately 4,000 square miles and 10.2 million residents), the results of this survey might not be generalizable to smaller or more homogenous populations.

To address the existing problems related to successful aging in place and increase the environmental supportiveness of new and existing housing, a 3-pronged *Aging in Place Initiative* has been proposed by the National Resource Center for Supportive Housing and Home Modification. (52) This proposal includes the following recommendations:

1. Increase the availability of home modifications by:
 - a. Raising public awareness about the benefits of home modifications;
 - b. Enhancing planning and coordination efforts;
 - c. Increasing funding for home modifications by reforming Medicare and Medicaid, the use of waiver programs, a change in income tax rules, and the use of reverse mortgages;
 - d. Creating demonstration projects that test innovative service delivery models and establish "best practices"; and
 - e. Using large datasets such as the American Housing Survey to analyze the need for and the effectiveness of home modification.

2. Retrofit existing multi-family units by:
 - a. Increasing funds for modernization of older, federally assisted housing stock with an emphasis on creating a supportive environment for frail older persons;

- b. Converting some government subsidized housing for the elderly into assisted living; and
 - c. Providing incentives to owners and sponsors of apartment buildings to modify their buildings to meet the needs of persons with disabilities.
3. Facilitate suitable housing by:
- a. Offering federal tax incentives for the provision of visitability and universal design features in new single-family homes and small apartments; and
 - b. Waiving permit fees for the construction and rehabilitation of homes that will incorporate visitability and universal design.

To achieve these goals, a coordinated, well-planned effort needs to be undertaken by public health organizations, community planning organizations, the disability community, the construction industry, zoning officials, senior organizations, policymakers, researchers, consumers, and other appropriate community organizations.

Recognizing the benefits of aging in place, The California Commission on Aging has made several recommendations to address current housing problems facing older adults in the state. (53) These recommendations include the need to provide:

- more affordable housing;
- funding for home improvements and modifications; and
- better linkage with community and health services.

These recommendations are also supported by the California Statewide Independent Living Needs Assessment which looked at the needs of Californians with disabilities of all ages. The report provides a wide range of information regarding the basic independent living needs of people with disabilities, the barriers to independence and the gaps in services and supports in California. (54)

In addition, the California Department of Housing and Community Development has compiled a comprehensive listing of resources, guidelines, examples of successful programs that have been implemented across the country, and toolkits that address the current and future problems related to environmental modifications to promote successful aging in place and community-based living for people with disabilities of all ages. (55) A complete listing can be viewed at: <http://www.hcd.ca.gov/hpd/aginginplace.pdf>

A number of successful home modification programs have been implemented in various states across the country. For example, Access Remodeling (AR) is a private for-profit business that has provided residential accessibility services to clients in the Washington, D.C. and Potomac, Maryland areas since 1987. AR provides remodeling services not only for older adults but also for younger individuals. Services include home visits, environmental assessments, and the installation of home modifications. (56)

Case examples of 5 other successful home modification programs that have been implemented, including in Pennsylvania, Maryland, Illinois, and California, can be viewed at:

http://www.usc.edu/dept/gero/nrcshhm/research/pages/hm_programs.htm

Financial Incentives. As indicated in the first report (http://www.catcoalition.org/Publications_and_Reports.html), and as we have seen in the studies cited above, the cost of many AT devices, especially the newer high-tech devices may be prohibitive for many people with disabilities and elderly persons who require them. In addition, the ability or lack of ability to pay for home modifications greatly influences the implementation of health and safety features that can help people with disabilities and elderly individuals lead independent and productive lives. Clearly, broad-based efforts need to be undertaken to improve the coverage of AT and home modifications by both private and public insurers. If the future needs of California's aging and disability communities are to be successfully met, financial incentives need to be provided both to users and their care givers as well as to health care professionals.

Many organizations accept donated used assistive technology devices, including durable medical equipment, and after ensuring their usability, give them to new users under their reuse programs. Financial incentives for recycling and reusing such devices would help organizations expand these programs and would be a key step toward making such devices more widely available to consumers, especially low-income consumers.

Several states across the country have instituted innovative reimbursement programs for a number of assistive technologies. A study of 50 states conducted by the Center for Applied Special Technology (CAST) revealed some exemplary programs. States cited for their innovative efforts include Pennsylvania, New York, South Carolina, and South Dakota. A listing of states and their reimbursement programs can be viewed at

<http://www.aahsa.org/cast.aspx>

V. Access to Health Care

Adequate access to health care can help people with disabilities lead healthier lives. However, due to problems encountered in accessing health care facilities and poor communication with providers, substantial disparities in health behaviors and overall health status exist between persons with and without disabilities. (57) Increasing access to health and wellness treatment programs for persons with disabilities and reducing the proportion of persons with disabilities who report environmental barriers to participation in daily activities are goals of *Healthy People 2010* (objectives 6-10 and 6-12). (58)

Overall, research on environmental barriers to health care facilities for people with disabilities has been limited. (59) However, some small national studies conducted among people with disabilities have reported widespread problems with access to health care facilities, communication with providers, as well as difficulty with physical examination tables, radiology equipment, exercise and rehabilitation equipment, weight scales, and toilet facilities. (60) In addition, compared with urban Americans, studies show that rural residents have higher poverty rates, a larger percentage of elderly, tend to be in poorer health, have fewer doctors, hospitals, and other health resources, and face more difficulty gaining access to health facilities. (61)

In the Los Angeles County Health Survey cited above, 22% of persons with disabilities reported having difficulty accessing a health-care provider's office because of the physical layout or location of the property and almost 13% reported unfair treatment at a provider's office because of a disability. These difficulties led to an increase in the severity of disability. In addition, the survey reported that people with a disability were significantly less likely than others to have received screenings for breast, cervical, or prostate cancer. (62)

The Los Angeles County Health Survey is consistent with another more recent survey of 400 Californians with mobility limitations which found that one in five respondents had problems with the main entrance to their physician's office and one-third had problems entering examination rooms. (63) Other problems cited in the survey included difficulty in the use of mammography and other imaging equipment by people in wheelchairs (45%); difficulty using physical examination tables (69%); inaccessible weight scales (60%); and difficulty reading medical information by people with vision problems (90%).

Enactment of the Americans with Disability Act in 1991 has helped increase awareness of the barriers facing persons with disabilities in accessing health care and other community facilities. Nevertheless, much remains to be done. The continued lack of accessibility features in places where people might expect them – notably, hospitals – was highlighted in a lawsuit filed against Kaiser Permanente in 2001. In the settlement, the organization agreed to provide accessible medical equipment in its facilities, survey its facilities and policies for barriers and remove such barriers, or review policies, and provide appropriate staff training. The plaintiff organization is currently monitoring progress by Kaiser Permanente in meeting the terms of the settlement. For more information on the case, go to:

http://www.dralegal.org/cases/health_insurance/metzler_v_kaiser.php

Several researchers have stressed the need to develop a “disability competent” health care system that includes appropriate features for people with disabilities. (64-65). Findings from the Los Angeles County Health Survey underscore the need for public health practitioners, health-care providers, and community organizations to take a proactive role in removing environmental barriers. In addition, to increase access to information, public health practitioners might compile lists of community-related disability resource information and distribute them to local health-care centers and physicians' offices.

One example of a model response to this issue is the Bridge2Access Statewide Advisory Committee, created by Molina Healthcare (Long Beach, CA) to bring stakeholders to the table to help Molina identify the challenges it faces in providing health care to aging and disability communities.

The North Carolina Office on Disability and Health has produced a guide called *Removing Barriers to Health Care* to enhance accessibility to health care facilities by people with disabilities. The guide provides a range of recommendations regarding both environmental features and training of providers, including the following:

- Weather protection at entrance doors
- Power door operators at interior and exterior entrances
- Spaces left open but dispersed in waiting areas where wheelchair users can sit out of traffic lanes but with other people.
- Chairs for use by people who cannot stand while transacting business

- Chairs that can be set at different heights for use by children, adults and older people, some equipped with arm rests for those who need assistance rising to their feet
- Scales that allow people with difficulty standing to hold on, and one that allows people to be weighed while sitting in a wheelchair
- Motorized, adjustable-height treatment and examining tables and chairs
- Mammography machines that can be used on a woman in a seated position
- A portable, amplified communication system or device with volume control at service desks and treatment spaces for people who are hard of hearing
- More than one accessible toilet and dressing room, some left-handed and some right-handed
- A TTY for use by people who are deaf to make phone calls from health care facilities
- Staff awareness and training in using the National Telephone Relay System
- Awareness and sensitivity training for all staff and professional personnel on interacting with people with disabilities

The entire guide can be viewed at <http://www.fpg.unc.edu/~ncodh/rbar>

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