

Health and the Built Environment: Exploring Impacts on People with Disabilities

Background

Nearly 50 million people in the US have a disability that may impair mobility, and the elderly population is projected to double in size to well over 70 million by 2025.ⁱ Environmental barriers of our communities can contribute to negative health impacts on these populations, from physical inactivity to social isolation and lack of appropriate healthcare. Many local health departments have to define a role for themselves in this arena as it relates to the design of our built environment, yet the need to have plans in place to accommodate the needs of individuals with limited mobility grows. People with disabilities are disproportionately affected by negative health outcomes as compared to nondisabled individuals. On average, high cholesterol levels, high blood pressure, and obesity rates are 2%, 8%, and 14% higher respectively for people with disabilities.ⁱⁱ

Statistics on the number of people with a disability in the USⁱⁱⁱ are indicative of the need to make strides in addressing the needs that these, and other, individuals face on a daily basis.

- 19.4% of noninstitutionalized US residents have a disability^{iv}, with nearly half considered to be severely disabled;
- 15.0% or 37.7 million have an activity limitation;
- Of these, 11.5 million people are unable to perform their major activity;
- 14.3 million people are limited in the kind or amount of major activity they can perform, and
- 11.9 million are limited in activities other than their major activity.

CDC has identified several factors that influence health outcomes among people with disabilities, including the environment, behavioral practices, and access to routine preventive care services.

“Participation in everyday living is an important aspect of health and well-being and environmental features can affect a person’s ability to participate. In 2002, the percentage of adults with disabilities who reported existing

barriers to participation in various environments is as follows -- **community** programs community (e.g., build places of **worship** (11%), **home** (10%), **work** (7.7%), and **school** (6.1%, reported by the parents of children with disabilities). In addition, 48% reported having access to local **health facilities** and wellness programs.”¹

The elderly can be negatively impacted by the built environment in ways that may also impact persons with disabilities. The elderly population is projected to double in size to well over 70 million by 2025, and people are living longer than in the past, forcing local jurisdictions to have plans in place to accommodate a rapidly changing demographic in terms of service and housing needs. The health and housing concerns for aging Americans are often connected, and aging in place is an ideal solution for allowing seniors to maintain healthy and independent lifestyles for longer. A lack of transportation options and separation of land uses, can result not only in isolation from limited social interaction from individuals who are unable to drive automobiles, but may also make accessing healthy foods, medicine, and doctors difficult or impossible. Further, newer housing is often divided by price range and housing type, making it impossible for older adults to remain in the same neighborhood where they may have raised their children, either because of affordability, or housing types not conducive to the needs of an aging population, such as multi-level homes or distance to medical needs.^v The need is clear for practitioners at the national, state and local levels to include considerations and plan for all members of their citizenry as a standard part of their operations.

Methodology

The National Association of County and City Health Officials (NACCHO) and the American Planning Association (APA) conducted two focus groups to determine what local health departments (LHDs) on people and local planning departments need to assist them in addressing the public health impacts of the built environment with disabilities. The purpose and goal of the focus groups were as follows:

Purpose: To discern from the local public health, planning, and civic community, the necessary action needed to enable local health departments to address environmental barriers that may limit the mobility and daily functioning of people with disabilities.

Goal: To understand the limiting barriers and define the supportive roles that should be considered to advance the needed research, funding, and technical assistance at the state, local and community levels.

A series of NACCHO and APA focus groups have been conducted in past years, focusing on various connections between planning and public health. Focus group topics included health equity, chronic disease, traffic safety and injury prevention, and collaboration. By bringing planners and public health practitioners together in a group discussion format, a variety of perspectives can be deeply explored, illustrating both the level of knowledge and the various needs found among practitioners at the local level to move forward on these issues. In addition, these focus groups served as a learning opportunity for the practitioners to gain a better understanding of the other profession and of how they are perceived by other professions.

In order to maximize on the cross-learning benefit of these focus groups, NACCHO and APA planned to conduct one focus group on the topic of public health and planning as it relates to persons with disabilities, with equal representation of the planning and public health communities within the single focus group.

Though several planners were invited and confirmed, only one attended. Consequently, rather than having one focus group which provided two perspectives simultaneously, a second focus group of planners was planned. This new approach allowed for the differences between the perspectives and where misperceptions may contribute to a lack of collaboration to be highlighted.

Appendix A details the information that participant's were sent before the focus group,

as well as the guiding questions that would frame the discussions. Guiding questions were based largely on the questions asked during previous NACCHO and APA focus group, but tailored for this topic area.

Findings

Understanding Disability

Focus group members embraced a definition of disability whereby a person is considered disabled only if they are unable to accomplish what they otherwise might. For example, a person with poor eyesight is not disabled if he/she has eyeglasses to correct his/her vision. Immediately a debate arose over the hypothetical situation of a housing development being built near a polluting smokestack and residents subsequently being diagnosed with asthma. Would these people be considered disabled? It was deemed a moot point as the focus here is to help people with disabilities, secondary prevention, rather than focusing on primary prevention and prevention of disabilities.

It is often assumed that the Americans with Disabilities Act (ADA) removes all barriers associated with living with a disability. However, many problems, such as easily understandable signage or lack of impediments to activities are not covered by ADA. Further, ADA is complaint driven with subsequent accessibility reviews rather than encompassing a prospective approach to ensuring accessibility on the front end. An example was given where the front door to a civic building had a button-operated front door, so could easily be opened by somebody unable to pull the door open. This meets ADA requirements. However, once inside, there was a large fire door, that by law, must remain closed at all times, that prevented a disabled person from completely entering the building. ADA states *"The ADA prohibits discrimination on the basis of disability in employment, State and local government, public accommodations, commercial facilities, transportation, and telecommunications. It also applies to the United States Congress."*

“To be protected by the ADA, one must have a disability or have a relationship or association with an individual with a disability. An individual with a disability is defined by the ADA as a person who has a physical or mental impairment that substantially limits one or more major life activities, a person who has a history or record of such an impairment, or a person who is perceived by others as having such an impairment. The ADA does not specifically name all of the impairments that are covered.”^{vi}

In housing, the term “visitability” is often used to discuss mobility as it expands the notion of accessibility. Visitability encompasses three components: zero step entrance, first floor bathroom, and wider doors and hallways. If a place is visitable for a person with a disability, the question becomes, *are there barriers between their home and their destination?* As nondisabled individuals, it can be hard to understand and anticipate the less obvious barriers that a person with a disability might encounter on a daily basis. Barriers such as high curbs or uneven sidewalks are easy to recognize, however, things like the impact of light or noise on a person are less perceptible. Issues of balance are brought to light in addressing the obvious and less obvious design issues. Balancing accessibility of even sidewalks with street trees or other amenities that are seen as features of good and healthy design is one example where balance is necessary and both sides must be clearly understood. Further, many people think only of accessibility, so individual places might be accessible, but the points in between still limit mobility.

The Role of Planners and Health Practitioners

During the focus group of planners, it was determined that many planners do not know that they have a role to play in ensuring accessibility. In their daily activities, this is not an issue that comes to light through any review or permitting process, as it is felt that others are probably taking care of these issues. In terms of accessibility, for the most part, planners are enforcing requirements and assessing whether requirements have been met, but their role does

not extend into other processes. For health officials, the conversation focused more on housing in general than on accessibility to housing. Health officials generally take interest in a housing situation when it goes against a health code. Health departments are leery of condemning a house, for example in the case of hoarding, without first exhausting all other options. There are international examples of health departments being heavily involved in housing inspections. Going door-to-door for inspections, health officials took note of aging housing stock, and looked not only at solutions for individual homes, but also at general areas for improvement. Through this, they were able to tap into grants from local authorities for improvements like wheelchair ramps.

Points of discussion

In some cases, accessibility can become a liability issue for the city. In a small town, a special needs task force was developed after the city learned of another city being sued because of failing to meet ADA standards. This town now has a plan to assess all public buildings and improve accessibility to them.

In terms of holding public meetings to vet these issues, it is important to keep in mind that people with disabilities related to visual or audio senses must also be accommodated or they will not come to meetings. The best of intentions for a meeting or street design may not fully accommodate all persons with disabilities. In one instance, curb cuts were painted yellow and texturized with skid patches to indicate that there was a crossing. However, the raised bumps became slippery when wet or frozen and the yellow color was very displeasing to the community. By following guidelines without an understanding of the need for why visual and tactile clues were necessary, the city spent money to provide unattractive and dangerous crossings.

Often various design decisions are made in different local departments. A traffic engineer may determine the length of time a “walk” sign stays illuminated, without regard to nearby shops that cater to elderly individuals, who may

walk slower than the time designated by the crossing sign.

When federal money is used for any project, ADA guidelines must be followed, but it is unclear if the recipients are aware of this. Federal projects also must follow ADA, but the cost must come from their regular budget, there is not additional money set aside for this work (with the exception of the “Beyond ADA” program). ADA states that services must be provided to a certain geographic area, but oftentimes, people with disabilities may live outside of the designated area.

Participants noted that attitudes drive the use of built space. Programming includes or excludes individuals even when space is universally designed. A Recreation Department may design a program for disabled youth at an area playground, which excludes nondisabled children and segregates their play. Further, some disabled children may not want to be segregated into programming for disabled children. The same holds true for programming designed for nondisabled children or with equipment that is not accessible. If the space and the programming is inclusionary, all children will be able participate.

Planners may be concerned about the need for historic preservation conflicting with the universal design of spaces. Health practitioners also mentioned this, using historic row homes in San Francisco as an example of buildings that might be difficult to retrofit to accommodate principles of universal design. It was noted that historic preservation can often accommodate while applying principles of universal design.

Universities are beginning to look at universal design in terms of making campuses more accessible and also in offering courses to students pursuing degrees in design fields.

Aging in Place

The discussion of aging in place, whereby people are able to age in their homes without having to move, arose during both focus groups. The planners discussed it first in terms of

shifting demographics of communities, wondering if most planners still look at population projections and pyramids. By looking at these demographics locally, better planning for the elderly would be possible. In one community, 17% of the city’s revenue comes from an estate tax upon the death of residents. Because of this, it is important that the elderly are staying in the community to age or the city could suffer a budget shortfall. As such, this community must plan appropriate and affordable homes for their elderly population, as well as providing services needed for them to move about the community.

Participant’s mentioned the trend in housing of younger, first-time homebuyers and older Americans being in the market for the same types of homes, smaller or ranch style homes. These “starter” homes are recycled in a sense, and the question arose over whether these homes could be built or retrofitted to outfit both populations.

The size of homes is also an issue. Most senior housing units are one-bedrooms or studios, thus creating a problem if the resident needs a live-in caregiver. Financing often prohibits the financing of larger units, making it difficult to accommodate this need.

Housing Affordability

Finding and affording housing is an area where disabled people find problems. Those disabled individuals with adequate income levels, may have a hard time finding housing that is universally designed or easily adapted to their needs. Those that can find housing can be party to discrimination. A Department of Housing and Urban Development (HUD) report shows disabled renters have faced discrimination in up to 50% of inquiries.^{vii} Many individuals with disabilities are low-income, thereby making even affordable housing, unaffordable. Additionally, participants noted that many members of the homeless population are disabled; compounding the problems they face on a daily basis. During the health practitioner’s focus group, discussion ensued about homeless access to public spaces, whether disabled or

nondisabled. Housing services for people with physical and/or mental disabilities are often segregated rather than integrated into mainstream housing, further stigmatizing these individuals. For planners, the discussion around homelessness was centered around the movement during the 1980s to end homelessness, relating that sort of uprising of support for a cause to what needs to happen for this issue in order to raise awareness and have resources allocated.

Marketing

Marketing housing that is accessible, visitable, allows for aging in place, and still meets the needs of younger, nondisabled individuals was discussed. In many communities, developers recognize the large market for building senior housing, however, marketing this housing to people with disabilities or younger individuals/families that could age in place in the homes, would serve to expand the market for these types of homes and contribute to a larger number being built. This could be a new trend in design, like green building has become, and allow for design to move in this direction of being universal.

Challenges and Opportunities

For public health and planning practitioners to work together to address issues the built environment for people with disabilities, a number of barriers need to be overcome. One barrier that relates to all aspects of the relationship between disciplines is language. All parties involved need to be “on the same page” and be able to understand the language of others. Often, this lack of understanding can prevent involvement. For health practitioners, the CDC means the Centers for Disease Control and Prevention, whereas for planners, it commonly refers to a community development corporation. Differences in jargon and technical terms can make effective communication difficult when one or both parties can understand what is being said.

Another challenge involves the structure of the public health and planning systems in a given area as public health structures vary from state

to state. Often, health departments are found at the county level, while planning departments are at the level of the city. Health departments have a challenge in working with the city planning departments without looking like they have overstepped their bounds as a county agency.

In recent years, health department priorities have been focused on all-hazards preparedness efforts, with already inadequate funding being decreased for other areas. Planners mentioned the fact that health departments were often overwhelmed with responsibilities, so adding another task to the list could be difficult.

Health officials see opportunities to get involved in accessibility issues by including considerations for people with disabilities when looking at opportunities for physical activity. So, when performing a walking audit, bringing along a person in a wheelchair would be telling as to the “walkability” of an area for a person with disabilities or the elderly. Further, using existing, or building new, relationships with between disciplines, would allow health officials and planners to work together on addressing these issues when looking at zoning codes or looking to implement design changes or new design.

For planners, knowing about demographic changes is not enough. They need education on the cause and effect of such changes, so that they can be considered in plans and regulations. This is an area where health officials and planners can work together to share knowledge, data and expertise about community changes.

Health assessment could include advocacy groups, so that these issues are brought to light, or individuals could mobilize and attend city council meetings to share personal stories that others can relate to. It was felt that advocacy training for both professionals and individuals would help raise awareness and “get the ball rolling for change.”

“Planners bring the tools, health departments bring the data.”

The US Census offers information down to the census tract level on statistics related to the number of people using assisted technologies, having trouble with daily living activities, and others. The data can be collected as used on its own or as part of a community health assessment to determine the intensity of the need to address built environment issues for people with disabilities.

Political cover can be given to planners by the health department. This allows both parties to get involved despite political realities that might otherwise prevent them from coming to the table. When health becomes a concern, it is difficult to argue against. Public health practitioners need to understand and be involved in planning processes early on in order for them effectively operate and take part in issues related to disabilities and the built environment. Likewise, planners need to understand public health in order for effective relationships to be built and maintained.

Staying within ones area of expertise will allow each agency to maintain credibility and strong working relationships. In one case, a health department spoke out against a planning department's plan to open a grocery store in a low-income neighborhood because of concerns over traffic. The planning department felt that the health department did not have expertise on traffic issues and should not have commented on this aspect of the project, which caused the relationship to be severed. Often, the health department is perceived as a naysayer, "standing in the way of" economic development and business opportunities.

Lessons Learned

Planning professionals felt that public health practitioners may not have the time to address these issues given their current attention to all-hazards preparedness issues and their general overwhelming workload. Planners further felt that a planner's role in addressing these issues might not be widely recognized within the profession. Generally, health practitioners did not fully understand the role of planners in tasks related to new construction or site review, and

incorrectly assumed that planner's had control over various aspects where they could effect change.

Differences between the perspective of planners and health practitioners were inline with the underlying training and situation in which each profession works. Planners approached the issue in a more systematic way, suggesting a stepwise approach of education, outreach to related professionals, and eventual systems change. For planners, much more education is needed to understand the health impacts on people with disabilities as well as the potential roles that planners can play in addressing these issues. Health practitioners approached the issue by looking at how it could mesh with other programmatic interventions, such as those related to walkability, obesity, and health assessments. Further, health practitioners saw their role in this as providing data and information to professions that have the ability to make the systems changes. Health practitioners also spoke of the need for residents to be trained in advocacy and to tell personal stories to decision-makers who can influence policy decisions.

Planners spoke more about building and marketing housing types intended for aging in place to people with disabilities in addition to first-time homebuyers and the elderly. This would result in a movement in the field whereby a "trend" would result in increased possibilities for persons with disabilities to find affordable, accessible, and visitable places to live and visit.

Future Needs

Both focus groups made clear the need for local planning and public health practitioners to receive training and educational opportunities to help them understand and define their role in addressing public health impacts of the built environment on people with disabilities. Other suggested recommendations from focus group participants included the following:

- Advocacy and access to the political process are starting points in making change at the local level to increase the

visibility of this problem and foster solutions. Advocacy training for health department staff as well as for individuals with disabilities is recommended.

- Health departments should be involved early on in planning processes in order to affect change, thus a greater understanding of planning and the points of intervention where public health impacts can be brought to light, is needed.
- The academic community should be involved in educating the future workforce about the connections between planning and health, including the topic of disabilities.
- Planners need examples where the public health community was not a naysayer, rather a supporter of planning efforts.
- Knowledge needs to be effectively transferred between disciplines and within departments to more effectively manage information.
- Opportunities for cross-training should continue and be expanded.

- Funding and technical assistance is needed at the local level.
- Sharing information within the professions widely through journal articles would help to engage practicing planners, health officials, etc.
- Best practices are needed to serve as models that other agencies can follow.
- Other professions need to be engaged in this discussion, such as landscape architects, architects, and transportation engineers.

It is clear that leadership from national planning, public health, and other organizations is needed to guide local practitioners in moving forward to address the public health impacts of the built environment on people with disabilities, including educational, funding, and technical assistance opportunities. As planners and public health practitioners work to address the connection between disciplines, providing for the needs of people with disabilities, will result in more livable communities for all individuals.

NACCHO is the national organization representing local public health departments. NACCHO works to support efforts that protect and improve the health of all people and all communities by promoting national policy, developing resources and programs, seeking health equity and supporting effective local public health practice and systems. Funding for this project was provided by the Centers for Disease Control and Prevention.

The American Planning Association is the national organization representing professional planners and citizen planners who represent their communities on planning and zoning boards. APA provides leadership in the development of vital communities by advocating excellence in community planning, promoting education and citizen empowerment, and providing the tools and support necessary to meet the challenges of growth and change.

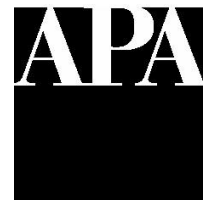
This focus group report is the sixth in a series focusing on the connection between public health and planning.

Focus group reports can be downloaded from:

http://www.naccho.org./topics/HPDP/land_use_planning/LUP_research_more.cfm

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Appendix A

Built Environmental Barriers That Affect People with Disabilities Focus Group

The National Association of County and City Health Officials (NACCHO) and the American Planning Association, with support from the Centers for Disease Control and Prevention (CDC), are seeking to ensure that all communities work toward meeting the principles of Universal Design,^{viii} such that the needs of special populations (e.g. aging, people with disabilities, etc.) are comprehensively addressed.

Purpose: To discern from the local public health, planning, and civic community, the necessary action needed to enable local health departments to address environmental barriers that may limit the mobility and daily functioning of people with disabilities.

Goal: To understand the limiting barriers and define the supportive roles that should be considered to advance the needed research, funding, and technical assistance at the state, local and community levels.

Primary Questions

- What are the primary built environment issues that affect the health and well-being of people that have a disability?
- What needs to be done to accelerate change in planning/zoning policies to better address the needs of people with disabilities?
- What is the current role of local public health in addressing this issue? What is the current role of planners in addressing this issue?
- What role should health officials play in the community design planning process to address these challenges? What role should land use planners have in working with health officials to effectively overcome challenges?
- What are the current barriers to LHD involvement to creating healthy living environments for special populations? How can these challenges be addressed?
- What should NACCHO and its partners do to support local initiatives to address the current barriers and advance opportunities to expand local level initiatives to address this issue?

Follow-up Questions

- How do outside factors (social, political, economic, growth pressure, etc) positively and negatively influence LHD participation and implementation of universal design strategy?
- What strategies/tools can public health officials employ to mitigate these influences?
- What strategies/tools can planning officials employ to mitigate these influences?
- What are the benefits of a cross-disciplinary collaboration with land use planning/community design and public health?

For the purposes of this focus group, the following terms were defined as follows for participants:

- **Built environment** - It encompasses all buildings, spaces and products that are created, or modified, by people. At the macro-level it includes homes, schools, workplaces, parks/recreation areas, greenways, business areas, transportation systems, etc. At the more micro-level it can include door handles, door widths, shelf and countertop heights, etc.

- **Community design** – This is the broader, cross-cutting professional arena that includes architects, land use planners, transportation engineers, and many other design professionals who together make up the professionals who shape our communities from the micro- to the macro-levels.
- **Public health** – Public health is the broad, cross-cutting professional arena that promotes and protects the public’s health at a population level. This is, as opposed to medical care, which protects and promotes the public’s health at an individual level. Public health serves communities and individuals within them by providing an array of essential services. These include, but are not limited to: 1) preventing epidemics and the spread of disease, 2) protecting against environmental hazards, 3) preventing injuries, 4) promoting and encouraging healthy behaviors and mental health, 5) responding to emergencies and assisting communities in recovery, and 6) assuring the quality and accessibility of health services.
- **Universal design**^{ix} - Universal design is the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design. Universal design benefits people of all ages and abilities. The 7 principles of universal design are:
 - PRINCIPLE 1: Equitable Use - The design is useful/marketable to people with diverse abilities
 - PRINCIPLE 2: Flexibility in Use - The design accommodates a wide range of individual preferences and abilities
 - PRINCIPLE 3: Simple, Intuitive Use - Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level
 - PRINCIPLE 4: Perceptible Information - The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities
 - PRINCIPLE 5: Tolerance for Error - The design minimizes hazards and the adverse consequences of accidental or unintended actions
 - PRINCIPLE 6: Low Physical Effort - The design can be used efficiently and comfortably and with a minimum of fatigue
 - PRINCIPLE 7: Size/Space for Approach/Use - Appropriate size and space is provided for approach, reach, manipulation, and use regardless of user's body size, posture, or mobility
- **Environmental factors (barriers/facilitators)** - factors ranging from physical factors such as climate and terrain, to social attitudes, institutions, and laws that either prevent or support a person with a disability in functioning optimally and becoming completely integrated into their community.

ⁱ Joint Center for Housing Studies of Harvard University and Neighborhood Reinvestment Corporation. “Aging in Place: Coordinating Housing and Health Care Provision for America’s Growing Elderly Population.” October 2001. http://www.jchs.harvard.edu/publications/seniors/lawler_w01-13.pdf

ⁱⁱ Centers for Disease Control and Prevention. “Disability and Health in 2005: Promoting the Health and Well-Being of People with Disabilities Fact sheet.” Retrieved April 11, 2006 from: http://www.cdc.gov/nceh/ncbddd/factsheets/Disability_Health_AtAGlance.pdf

ⁱⁱⁱ Kraus, L., Stoddard, S., & Gilmartin, D. “Chartbook on Disability in the United States, 1996.” An InfoUse Report. National Institute on Disability and Rehabilitation Research. Washington, DC: 1996. Retrieved April 11, 2006 from: http://www.infouse.com/disabilitydata/disability/1_1.php

^{iv} InfoUse defines a person as having a disability if they met the following criteria: (a) used a wheelchair; (b) had used a cane or similar aid for 6 months or longer; (c) had difficulty with a functional activity; (d) had difficulty with an ADL; (e) had difficulty with an IADL; or (f) was identified as having a developmental disability or a mental or emotional disability. A person also was considered to have a disability if: (g) the person were 16 years and over and had a condition that made it difficult to do housework; (h) the person were between 16 and 67 years old and had a condition that limited the amount or kind of work the person could do at a job; (i) the person were under 21 years old and their parents responded on the survey about receipt of developmental services, and limitations in usual activities, the ability to do regular schoolwork, or the ability to walk, run, or use stairs; and (j) the person were under age 65 and covered by Medicare or received SSI. Activities of daily living (ADLs) cover getting around inside the home, getting into and out of bed or a chair, bathing, dressing, eating, and toileting. Instrumental activities of daily living (IADLs) cover going outside the home, keeping track of money or bills, preparing meals, doing light housework, and using the telephone.

^v Joint Center for Housing Studies of Harvard University and Neighborhood Reinvestment Corporation. “Aging in Place: Coordinating Housing and Health Care Provision for America’s Growing Elderly Population.” October 2001. http://www.jchs.harvard.edu/publications/seniors/lawler_w01-13.pdf

^{vi} US Department of Justice. “A Guide to Disability Rights Laws.” September 2005. Retrieved April 11, 2006 from: <http://www.usdoj.gov/crt/ada/cguide.htm>

^{vii} Urban Institute for the US Department of Housing and Urban Development. “Discrimination Against Persons With Disabilities - Barriers at Every Step.” June 2005.

^{viii} Universal design is the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design.

^{ix} North Carolina State University Center for Universal Design. “About Universal Design” Web site. Retrieved January 4, 2006 from: http://www.design.ncsu.edu:8120/cud/newweb/about_ud/aboutud.htm