# Chapter 10
# Assistive Technology in Low-Income Countries

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## 10.1 Introduction

World Health Organization (WHO) has estimated that 10% of the global population has a disability, with social educational and/or economical consequences. Although such estimates have a weak basis (Metts, 2000; Eide and Loeb, 2006a) it might be about 600 million people around the world with special needs in terms of health care, education, rehabilitation, appropriate assistive devices and social support. Furthermore it is indicated that 80% of people with disabilities live in low-income countries and also in very poor life conditions with limited access to health care services, rehabilitation and assistive devices. Case studies in developing countries show that higher disability rates are associated with higher rates of illiteracy, poor nutritional status, lower immunization coverage, lower birth weight, higher rates of unemployment and underemployment, and lower occupational mobility (Elwan, 1999). Disability can cause poverty by preventing the full participation of persons with disabilities in the economic and social life of their communities, especially if the appropriate supports and accommodations are not available. This chapter draws on results from recent studies on living conditions among people with disabilities in southern Africa (Eide et al. 2003a, b; Loeb and Eide, 2004; Eide and Loeb, 2006b) and aims at describing the situation for disabled people in low-income contexts with regards to assistive technology.

Assistive devices and technologies such as mobility aids, hearing aids, visual aids, wheelchairs, prostheses, and adapted computer software and hardware increase the possibilities for individuals with disabilities to participate in their societies and live independently.

The UN Resolution "The Standard Rules for Equalization of Opportunities for People with Disabilities" (UN, 1994) is an important document with strong impact on the future of people with disabilities. Standard Rule 4 on Support Services states: "States should ensure the development and supply of support services, including assistive devices for persons with disabilities, to assist them to increase their level

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of independence in their daily living and to exercise their rights". The resolution also states "States should ensure the provision of assistive devices and equipment according to the needs of persons with disabilities, as important measures to achieve the equalization of opportunities" and "States should support the development, production, distribution and servicing of assistive devices and equipment and the dissemination of knowledge about them."

The 58th World Health Assembly adopted the resolution "Disability, including prevention, management and rehabilitation" in 2005 (WHO, 2005). The resolution states that 80% of people with disabilities live in low-income countries and that poverty limits access to basic health services, including rehabilitation services. On assistive technology the resolution urges member states to "facilitate access to appropriate technology and to promote its development and other means that encourage the inclusion of persons with disabilities in society" and to "ensure provision of adequate and effective medical care to people with special needs and to facilitate their access to such care including prostheses, wheelchairs, driving aids and other devices."

The recent UN Convention on the Rights of Persons with Disabilities (UN, 2006) calls for member states to provide individuals with disabilities mobility aids, devices and assistive technologies, including new technologies, as well as other forms of assistance, support services and facilities. In spite of important high-level policy support (UN, 1994, 2006; WHO, 2005), the majority of people with disabilities living in low-income countries, however, have little or no access to assistive devices that could contribute to improving their life situation and help many to a more independent life (Øderud and Grann, 1999). Supply of assistive devices is very far from meeting the needs, and service delivery systems are either non-existent or limited.

WHO reports that rehabilitative services in the developing world reach only 1–2% of the disabled population (Frye, 1993). Production is low and often of limited quality. There is a scarcity of personnel trained to manage the provision of such devices and technologies, especially at provincial and district levels. In many settings where access might be possible, costs are prohibitive. The priorities of health care in low-income countries are largely preventive or promotive, and rehabilitation is not given priority. May-Teerink (1999) underlines the lack of knowledge and research on assistive technology and rehabilitation in low-income countries. In her study carried out in Uganda, May-Teerink found that the use of assistive devices were indicative of greater mobility, which led to better opportunities for formal education or employment. She further reported that gender-related issues may limit women's access to rehabilitative equipment due to limited financial resources of women living in low-income countries.

It has been estimated that there are around 37 million people in the world who are blind, and that an additional 135 million have a severe visual impairment (http://www.cbmicanada.org). It has further been estimated that 90% of the worlds' blind children have no opportunity to attend school, and that 80% of blind adults cannot work, because they lack training facilities and assistive devices. WHO has further estimated that there are around 250 million people worldwide with disabling

hearing loss that could benefit from hearing aids (AUDINEWS July 2002). The large majority of these live in low-income countries without any type of hearing aids.

The United Nations Statistical Office estimates there are 20 million people in the world who need a wheelchair but don't have one. Recently the global Consensus Conference on Wheelchairs organized by WHO, the International Society for Prosthetics and Orthotics (ISPO) and USAID (2003) have indicated that 1% of the world's population, or about 60–65 million people, are in need of a wheelchair. According to estimates by Hotchkiss and Knezevitch (1990), 1 million wheelchairs per year are needed if the supply of wheelchairs is going to meet the demand by the year 2020. This is most likely a gross underestimation, as it does not take the expected 5-year life span of a wheelchair into account. Distribution of wheelchairs to developing countries over the past several decades has, however, cumulatively provided less than half a million units (Pearlman et al. 2006), and there is currently a staggering and growing demand.

There is limited data and knowledge on assistive technology in low-income countries. This goes for demand, supply, quality and effect of assistive technology on the welfare of disabled individuals. Critics have for instance argued that wheelchairs supplied in low-income countries in many instances are sub-standard (Pearlman, 2006). Armstrong et al. (2007) state that two of the most common methods for distribution of wheelchairs are either mass produced in high- or middle-income countries or used wheelchairs delivered with minimal service provision. Furthermore, for wheelchairs that are damaged, replacement parts are typically not available. Most donated products are originally designed for indoor use and do not perform well for active users in rugged environments (Mukherjee and Samanta, 2005). Locally adapted and small-scale production found in low-income countries has amounted to around 50,000 units during the last two decades (Pearlman et al. 2006).

Supply of assistive devices is clearly more than a question of quantity and distribution. Equally important is the quality of what is offered. Unfortunately, much of the AT in use in these countries are either technically outdated and not adapted to local circumstances or imported sophisticated technology beyond common people's reach. There are furthermore many examples indicating that supply of AT without considering the need for a service delivery system that includes individual assessment, adaptation, training in use, follow up, maintenance, proper distribution, qualified personnel, etc., is the reality in many countries (Øderud, 2000).

Assessment of user needs and prescription of appropriate devices are key issues in the process of ensuring that people with disabilities are receiving equipment that is correctly fitted and meets the individual needs that could positively influence their quality of life. A poor fit can mean the development of complications like pressure sores and infections, which may even be life-threatening (Armstrong et al. 2007). The width, height and length of a wheelchair should be adapted to fit the individual size of the person and especially for children. If the wheelchair is not fitted correctly the child is at a risk of developing postural problems (scoliosis, kyfose, etc.) and possibly digestive problems. Individual adapted postural support including a cushion is needed to prevent the increase of disability, prevent possible pressure sores and development of additional problems.

In many low-income and middle-income countries, only 5–15% of people who require assistive devices and technologies have access to them. Production is low and often of limited quality. There is a scarcity of personnel trained to manage the provision of such devices and technologies, especially at provincial and district levels. In many settings where access might be possible, costs are prohibitive (WHO).

Since the development, production and distribution of assistive devices and technologies are not an integral part of the health care system in many countries, their provision falls to nongovernmental organizations and other groups. Because there is no central coordination for these efforts, in many instances assistive devices and technologies are produced without adequately taking into account the needs of people with disabilities, their living conditions or environments. In cases were external funding is in place, related programs often collapse when the funding is no longer available (WHO).

The following citation from Zimbabwe indicates the importance of availability of appropriate assistive technology and a service delivery system. Poor fit and/or lack of relevant assistive technology may imply a question of life and death in poor countries.

"We were 19 people being rehabilitated in 2001 and discharged in 2003. I am now the only person alive. The rest have died because of pressure sores. If someone can't afford a wheelchair and is using a wheelbarrow and doesn't have a cushion, what do you expect?" (Ms. Gladys Charowa, Chair of Disabled Women's group DWSO, Zimbabwe) (Personal communication, T. Øderud).

## 10.2 New Knowledge About Assistive Devices in Developing Countries

In Malawi, Namibia, Zimbabwe and Zambia, studies on living conditions among people with disabilities have recently been carried out (Eide et al., 2003a, 2003b; Loeb and Eide 2004; Eide and Loeb, 2006b) by SINTEF Health Research in collaboration with national universities, central statistical offices and national affiliates of the Southern Africa Federation of the Disabled (SAFOD). The studies were all National, representative household surveys with two-stage sampling; activity-based screening was carried out in a sample of small geographical areas (enumeration areas) drawn from the national sampling frames. Households with a disabled member were later revisited for data collection. One section in the research instrument was about disability, one on general living conditions in the households, and one on activity and participation. Individuals with disabilities responded to the disability related questions, otherwise the head of the household was interviewed. In some households the main respondent also reported for the individual with a disability if this person were unable to respond for some reason. Research instrument was based on previous surveys in the region and adapted to each context through a

comprehensive process involving all relevant stakeholders in each country. Although the different national studies are comparable, research instruments thus vary somewhat between the countries. All studies were carried out in close collaboration with the national federation of disabled people affiliated with Southern Africa Federation of the Disabled (SAFOD), Central Statistical Office in each country, and the National Universities. The Norwegian Federation of Organizations for Disabled People (FFO) has initiated, funded and supported all four studies. For further details on methodology (see Eide et al. 2003a, 2003b; Loeb and Eide, 2004, Eide and Loeb, 2006b).

Table 10.1 provides information about the sample in each country. The following analyses concern the sub-population of individuals with disabilities. The number of respondents in the tables below corresponds to the number of individuals with disabilities for each country given in Table 10.1 with small variations due to missing information, unless other information is given in the tables.

Some variables may differ between the countries with regards to formulations and number of answer categories. Whenever this is the case, footnotes in the tables provide explanation, and some results are referred to in the text if this is found most practical.

In all four countries assistive devices for personal mobility is by far the most frequent, followed by devices for sensory impairments (eye glasses, hearing aids, Braille). This reflects the proportion of the different impairment categories (see Table 10.2). The majority of those who reported that they had an assistive device stated that it was in good working condition (Malawi: 53.6%, Namibia 69.2%, Zimbabwe: 74.7%, Zambia: 77.2%).

**Table 10.1** Sample

| | Namibia | | Zimbabwe | | Malawi | | Zambia | |
|---|---|---|---|---|---|---|---|---|
| Disability | With | W/out | With | W/out | With | W/out | With | W/out |
| No. of households | 2,286 | 1,356 | 1,943 | 1,958 | 1,521 | 1,537 | 2,885 | 2,886 |
| Total no. of individuals in HH | 16,459 | 6,855 | 11,460 | 10,252 | 8,038 | 7,326 | 15,210 | 12,979 |
| Individuals with disabilities | 2,537 | | 2,071 | | 1,623 | | 2,898 | |

**Table 10.2** Source of assistive device (percentage of individuals with a device[a])

| Source | Namibia | Zimbabwe | Zambia | Malawi |
|---|---|---|---|---|
| Private | 29.1 | 31.2 | 42.8 | 34.4 |
| Government Health Service | 59.1 | 27.4 | 14.8 | 17.9 |
| Other Government Service | 0.7 | 3.2 | 3.2 | 1.4 |
| NGO | 2.3 | 8.3 | 8.8 | 9.3 |
| Other | 8.2 | 28.8 | 24.7 | 36.8 |

[a]Individuals with an assistive device. N = 304 (Malawi), 446 (Namibia), 372 (Zambia), 506 (Zimbabwe)

Different sources of the assistive devices were given.

In three countries, sources outside Government dominated, while in Namibia Government health service provided close to 60% of the devices. Private sources are here largely donations from the commercial sector. The domination of Government as a source in Namibia is also reflected in the reported information on maintenance of the assistive device (Table 10.3). In Namibia more than one third (36.3%) report that their device is maintained by Government, while this figure is between 3 and 6% for the other three countries. The combination of "self-repair" or "maintained by other family member" exceeds the figures for Government for all countries, but this is not as pronounced in Namibia as compared with the other three countries. The proportion of assistive devices that are not maintained at all is particularly high in Malawi (36%) and low in Namibia (12%).

Table 10.3 further reveals that a large proportion of assistive device users, in Malawi it is even a majority, do not get any information or guidance with regards to use. Between 22 and 42% state that the device (i.e. the main device) is not in good working condition. Combining these quality indicators may indicate that the situation is most difficult in Malawi and least in Namibia.

Respondents were asked to describe their impairment, and this was later used to categorize into some main impairment groups. Table 10.4 shows that the largest group of impairments fall into the "physical category", followed by sensory impairments, mental impairments and impairments related to communication.

The figures in Table 10.4 also indicate differentiation in needs with regards to different types of assistive devices. In the data material from Zambia for instance, the most frequent devices in use were mobility devices (wheelchairs, crutches, etc.) (78% of those with an assistive device). This was followed by sensory devices (eye glasses, hearing aids, Braille, etc.) (38% of those with a device), and communication devices (sign language, interpreter, portable writer, computer, etc.) (14% of those with a device). Other types of devices, i.e. for personal care and

**Table 10.3** Quality aspects of service delivery with regards to assistive devices

| Quality indicator | Namibia | Zimbabwe | Malawi | Zambia |
|---|---|---|---|---|
| Device maintained by owner or family | 43 | 66 | 38 | 58 |
| Device not maintained | 12 | 15 | 36 | 11 |
| No information or help given on use of device | 28 | 23 | 59 | 37 |
| Device not in good working condition | 31 | 22 | 42 | 25 |

**Table 10.4** Types of impairment (%)

| Types of impairment (%) | Namibia | Zimbabwe | Malawi | Zambia |
|---|---|---|---|---|
| Physical | 40 | 46 | 43 | 42 |
| Sensory; Visual/hearing | 28 | 32 | 39 | 44 |
| Psychological | 16 | 11 | 12 | 11 |
| Communication | 6 | –[a] | 3 | 3 |
| Others | 10 | 11 | 3 | –[a] |

[a]Answer category not included in the questionnaire

protection, for handling products and goods, and household items, were reported in use by very few individuals.

Table 10.5 first of all shows that impairments in this context are inflicted upon individuals early in life, contrary to what is the case in richer parts of the world. While demographic distribution in the populations explains some of this difference, it also reflects the vulnerability of children in poor contexts as well as problems related to health care services. This information further indicates the importance of a child perspective on service delivery in this particular context.

Table 10.6 indicates that the largest "service gaps" are found with regards to assistive devices and vocational training. Largely, the assistive device/service gap is around 50%, the vocational training gap around 30%, and the health service gap between 0 and 20%. As this is self-reported, it can be assumed that the real gap is larger as many individuals are not aware of, for instance, what kind of assistive devices could have helped them.

Zimbabwe stands out in this comparison as both the assistive device/service gap and the vocational training gap is considerably smaller than for the other three countries. The study in Zimbabwe was carried out before, or rather in the early stages of, the economic downfall of the country, and the result may reflect particularly developed services for individuals with disabilities in the country. With regards to health services, Zimbabwe and Zambia appears to have no gap, while Namibia and Malawi has reported around 20%. It is also indicated that the need for traditional healers is met and that this type of service is also given in excess of the stated need, indicating that this culturally embedded service to some extent replaces other types of services.

**Table 10.5** Age of onset of impairment (%)

| Age of onset | Namibia | Zimbabwe | Malawi | Zambia |
|---|---|---|---|---|
| From birth | 31 | 20 | 23 | 30 |
| 1–10 | 21 | 24 | 36 | 21.4[a] |
| 11–20 | 12 | 9 | 11 | 43.1[b] |
| 21–60 | 32 | 32 | 23 | |
| 61+ | 4 | 15 | 7 | |

[a] Acquired disability between birth and age of 10

[b] Acquired disability as children or young adults (less than or equal to 20 years)

**Table 10.6** Types of services that are needed and received (%)*

| | Namibia | Zimbabwe | Malawi | Zambia |
|---|---|---|---|---|
| Services | Need/Received | Need/Received | Need/Received | Need/Received |
| Health services | 91/73 | 94/92 | 83/61 | 77/80 |
| Assistive device/service | 67/17 | 57/37 | 65/18 | 57/18 |
| Vocational training | 47/5 | 41/23 | 45/6 | 35/8 |
| Traditional healer | 33/47 | 49/90 | 58/60 | 32/63 |

Need: Percent of total number of disabled.

Received: Percent of those claiming they needed the services actually receiving the services.

The proportion of individuals with disabilities having an assistive device varies from 14.9% in Zambia to 25.8% in Zimbabwe. A clear gender difference is demonstrated in Malawi and Zambia in that females have less access to assistive devices as compared with men. Also in Zimbabwe, more men have an assistive device, but the gender difference is not pronounced. In Namibia this question was phrased differently and it was asked for experience rather than ownership, and hence Namibia is not reflected in the table. Also in Namibia a clear gender difference was demonstrated, confirming the findings presented in Table 10.7; male individuals with disabilities report more experience with assistive devices than females.

A clear urban/rural difference is demonstrated, in that individuals with disabilities living in an urban setting report to a larger degree than rural dwellers state that they have an assistive device (Table 10.8).

There are marked differences with regards to type of impairment, as could be expected. Individuals with a physical disability report significantly higher access than other impairment groups, sensory comes as second, followed by age/other and lastly psychological. Controlling for gender revealed that there is a pronounced difference when it comes to physical and sensory impairments in that the proportion with an assistive device is significantly higher among men. For age/other and psychological impairments gender differences are smaller and not statistically significant due to low numbers (Table 10.9).

**Table 10.7** Assistive device by gender

| | Do you have any assistive device? (% Yes) | | |
|---|---|---|---|
| Gender | Malawi | Zambia | Zimbabwe |
| Male | 25.3 | 15.7 | 26.6 |
| Female | 14.1 | 11.9 | 25.0 |
| Total | 19.8 | 14.9 | 25.8 |

**Table 10.8** Assistive device by urban/rural (%)

| Yes, have an assistive device | Urban | Rural |
|---|---|---|
| Zimbabwe | 35.1 | 22.2 |
| Namibia | 24.7 | 16.0 |
| Zambia | 17.2 | 11.9 |
| Malawi | 20.4 | 19.7 |

**Table 10.9** Assistive device by impairment type

| | Do you have any assistive device? (% Yes) | | | |
|---|---|---|---|---|
| Impairment | Malawi | Zambia | Zimbabwe | Namibia |
| Sensory | 14.2 | 12.7 | 21.1 | 14.2 |
| Physical | 30.3 | 19.1 | 37.6 | 31.5 |
| Psychological | 3.2 | 2.2 | 2.7 | 1.2 |
| Age/other | 10.7 | – | 17.0 | 2.2 |
| Total | 19.6 | 14.2 | 25.8 | 18.4 |

In Table 10.10, the population of disabled is split in age groups of largely equal size. The proportion of disabled having an assistive device increases with age. Comparing the oldest age category with the youngest shows seven times higher proportion of individuals having an assistive device among the 61+ than the ones who are between 0 and 10 years of age. For all age categories women report lower figures than men. For the three oldest age categories, the gender difference is particularly high in that men report twice or more as high figures as boys. The gender differences in the younger categories are non-significant although among the 0–10 age group girls report 3.1% as compared to 6.8% among boys. The lack of significance is due to the low number having a device in this age group.

Table 10.11 demonstrates that individuals who report that they attend or have attended school are more likely to have an assistive device as compared to those who have never attended.

For the Namibian and Zimbabwean samples different answer categories were applied with regards to employment. No significant differences in use of assistive devices were found in these two samples when comparing those who were currently working with those who had been previously or never employed. For Malawi and Zambia (Table 10.12), it is demonstrated that those without any working experience

**Table 10.10** Assistive device by age groups

| | Do you have any assistive device? (% Yes) | | | |
|---|---|---|---|---|
| Age group (years) | Malawi | Zambia | Namibia | Zimbabwe |
| 0–10 | 4.9 | 10.0 | 5.5 | 11.2 |
| 11–20 | 9.7 | 10.2 | 11.0 | 14.9 |
| 21–40 | 19.5 | 29.7 | 25.0 | 15.3 |
| 41–60 | 23.8 | 31.4 | 35.7 | 27.9 |
| 61+ | 35.4 | 15.1 | 22.9 | 41.7 |
| Total | 18.7 | 12.1 | 17.8 | 25.5 |

**Table 10.11** Assistive device by school attendance

| Have you ever attended school? | Do you have any assistive device? (% Yes) | | | |
|---|---|---|---|---|
| | Malawi | Zambia | Namibia | Zimbabwe |
| Never attended | 17.8 | 11.3 | 12.9 | 15.2 |
| Attending/finished/left | 21.9 | 16.6 | 21.6 | 18.6 |

**Table 10.12** Assistive device by employment

| | Do you have any assistive device (% Yes) | |
|---|---|---|
| Are you currently working? | Malawi | Zambia |
| Yes, currently working | 26.1 | 19.7 |
| No, but have been employed previously | 39.6 | 22.6 |
| No, never been employed | 20.1 | 15.0 |
| I am a housewife | 11.3 | 14.3 |

more often report that they do not have an assistive device as compared to those with work experience. Between 20 and 30% of the population of individuals with disabilities state that they are currently working, and between 15 and 25% have no working experience whatsoever.

## 10.3 Discussion

The need for assistive devices among the majority of individuals with disabilities living in low-income countries are far from being met. Furthermore, the quality of much of what is offered is often not up to acceptable standards, and service delivery systems are underdeveloped or non-existent. Good intentions, charity and small-scale model programs characterize this arena in many poor countries. Individuals with disabilities are thus denied assistance that clearly could have increased their independence, level of activity and social participation, and thus their living conditions.

Research on assistive technology in low-income countries is scarce. We do have a broad picture of the situation, but lack more precise knowledge that could be of importance in policymaking, resource allocation and measures to improve the situation for individuals with disabilities in low-income countries. The four studies on living conditions among people with disabilities in Zimbabwe, Namibia, Malawi and Zambia provide unique representative information about disability in the Southern African Region, including information about use of assistive devices, quality aspects and service delivery.

The studies have indicated pronounced problems in service delivery when it comes to the quality of the devices (working conditions), instructions for use and maintenance which is to a large extent left to the owner of the device and his/her family or simply not maintained at all. Clearly this situation has negative consequences for the users of devices as well as their families, with increased risk for complications and secondary conditions due to wrong use or wrongly fitted devices (Armstrong et al. 2007). The role of Government vs. private sources on the supply side varies between the countries, and there are indications in the results that the relatively strong Government involvement in Namibia puts this country in a somewhat better position than the other countries in the study. There is, however, not sufficient information to conclude that the model in Namibia necessarily is optimal, as it is also the case that the "assistive device/service gap" in fact is comparatively largest in Namibia and actual use of devices is lower than Zimbabwe and equals the figures from Malawi. The relatively positive results from Namibia may simply reflect a comparatively better economic situation and that there is more money in place to import devices. The results are rather indications of a service delivery system in the region that is fragmented and that does not deliver the services needed to the population in question.

The four data materials have shown a large "needs gap" with regards to assistive devices, and that females and rural dwellers have less access to this technology. May-Teerink's observation with regards to gender is thus confirmed. Furthermore, as the demographic profile of most low-income countries is characterized by a large

proportion (often around 50%) of children and adolescents, the results indicate a pronounced need for taking a children's perspective in future service delivery systems.

With regards to school attendance and employment, the results bring support to May-Teerink's (1999) findings from Uganda and other literature on this issue (Armstrong et al. 2007). While the analyses here show that there is a positive association between having an assistive device and school attendance and having a job or work experience, this is, however, not sufficient to conclude that there is a simple cause and effect relationship. Other mechanisms may also be present, but the indication is clear and in line with previous findings and assumptions.

It is vital to promote the possibilities for people with disabilities to take part in education, employment and social activities in society using AT as a tool in order to improve their quality of life. The use of assistive devices is influenced by general knowledge, local supply, technical competence, adaptation to individual, follow up and environmental conditions, as well as local services. There is a chain of links that has to be fulfilled so that the assistive devices can be of best use in different contexts.

Although in no way sufficient, there are currently many ongoing, often small-scale, programs for production, import and distribution of assistive devices in low-income countries. There is a need for studying the many different models in order to extract the most promising experiences. In this way ongoing and new programs can learn from each other. It is further necessary to strengthen research-based knowledge about the role of assistive technology in reducing the link between disability and poverty in order to develop and improve current practice further. Assistive devices should contribute to improve the opportunities for individuals with disabilities to be active integrated members in their local community and in the society in general.

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