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Bridging the Assistive Technology Divide: Access, Barriers, and Pathways to Equity for Persons with Disabilities in Low- and Middle-Income Countries

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ABSTRACT

Assistive technology, from wheelchairs and hearing aids to spectacles and communication devices, is a precondition for the participation, health, education, and livelihood of people with disabilities, yet its distribution is among the most unequal in global health. The WHO and UNICEF estimate that more than 2.5 billion people need one or more assistive products today and that this figure will approach 3.5 billion by mid-century, while access in some low-income settings reaches only a small fraction of need. This narrative review examines why the gap is so wide in low- and middle-income countries (LMICs) and what can close it. Organising the evidence around the World Health Organization's GATE building blocks of people, policy, products, provision, and personnel, we identify a consistent set of barriers: low demand rooted in limited awareness; products that are unaffordable or poorly suited to local environments; fragmented or absent provision systems weakly linked to health services; a scarce and under-trained workforce; and financing and social-protection systems that leave disability-related costs to fall on households already near poverty. We then synthesise the pathways that evidence and international consensus support: national assistive-technology policy, affordable and appropriately designed products, workforce capacity-building integrated with community-based rehabilitation, financing through universal health coverage and social protection, and the careful use of digital and tele-delivery. We argue that the central obstacle is no longer conceptual but a matter of political will and system-building, and that regional leadership, including Gulf models that frame disability through participation and rights, offers a template others can adapt. The review is limited by uneven and often descriptive evidence, particularly from the lowest-income and most fragile settings.

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1. Introduction

For a person who cannot walk, a wheelchair is not a convenience but the difference between a life confined to one room and a life in the world. For a child who cannot hear, a hearing aid can be the difference between silence and school. Assistive technology, the products and related services that maintain or improve functioning, is in this sense foundational: it is the means by which many of the rights affirmed in the Convention on the Rights of Persons with Disabilities, to education, to work, to participation, become achievable in practice. And yet, of all the interventions that could transform the lives of people with disabilities, assistive technology may be the one whose distribution is most starkly unequal between the world's richer and poorer countries.

The scale of the need is now well documented. The World Health Organization and UNICEF, in their landmark Global Report on Assistive Technology, estimate that more than 2.5 billion people need one or more assistive products today, a figure projected to rise toward 3.5 billion by 2050 as populations age and non-communicable disease increases (World Health Organization & UNICEF, 2022). Against this need stands a provision system that, in the poorest settings, reaches only a small minority: where access in some high-income countries approaches ninety per cent of those who need it, in parts of the low-income world it has been estimated at three to fifteen per cent. An earlier and much-cited WHO figure captured the global picture bluntly: only about one in ten people who need assistive technology have access to it (Tangcharoensathien, Witthayapipopsakul, Viriyathorn, & Patcharanarumol, 2018). The gap is not a detail of implementation; it is one of the largest unaddressed inequities in global health.

The international community has, belatedly, recognised this. In 2018 the World Health Assembly adopted resolution WHA71.8 on improving access to assistive technology, and the WHO's Global Cooperation on Assistive Technology (GATE) initiative has since organised a global effort around the goal of universal access. But recognition is not provision, and a scholar reviewing the field observed that states have been asked to facilitate access to assistive technology repeatedly for decades, the deeper question being whether, this time, they will act (Borg et al., 2021). This review takes that challenge as its point of departure. Focusing on low- and middle-income countries (LMICs), where the gap is widest, we ask three questions: how large is the unmet need and what does it cost? What barriers keep assistive technology from those who need it? And what pathways, supported by evidence and international consensus, can close the divide? We give particular attention to sub-Saharan Africa, where provision is thinnest, and we note the emergence of regional leadership, including in the Gulf, where a rights- and participation-oriented framing of disability is reshaping what access can mean (Alhumaidan & Habbal, 2025).

2. Approach

This is a narrative review supported by a structured search of the biomedical and global-health literature, an approach suited to a field whose evidence is heterogeneous, spanning epidemiology, health-systems research, engineering, and disability studies, and often descriptive rather than experimental. We searched peer-reviewed databases for studies on assistive technology access, barriers, and provision in low- and middle-income countries, drawing on regional reviews, country studies, policy analyses, and the flagship reports of the WHO and UNICEF, and supplemented these with citation searching. We did not attempt an exhaustive systematic review; rather, we sought to represent the principal patterns and the strongest available syntheses, and we flag the unevenness of the evidence as a limitation.

To organise the analysis we adopt the WHO GATE framework's building blocks, sometimes called the five Ps, shown in Figure 2: people, policy, products, provision, and personnel. This framework has the advantage of being both analytically clean and directly tied to the levers that policymakers control, and it lets us map barriers and solutions onto the same structure so that each barrier has a corresponding pathway. Where the evidence bears on financing and social protection, which cut across the five building blocks, we treat these as a distinct cross-cutting theme, because the affordability of assistive products is so consistently decisive in LMIC settings.

3. The Scale and Stakes of Unmet Need

The distinctive feature of the assistive-technology gap is that need is high and rising while provision is low and, in the poorest places, barely organised at all. Demographic ageing and the growth of non-communicable disease guarantee that need will increase across every region, and it will increase fastest where systems are least prepared (Tangcharoensathien et al., 2018). The consequences of leaving that need unmet are not confined to the individual. A person without a needed wheelchair or hearing aid is less able to attend school, to work, to access health care, and to participate in community and family life, and the resulting exclusion compounds the poverty that made the device unaffordable in the first place, producing a cycle in which disability and poverty reinforce one another (Cote, 2021). Figure 1 conveys the

order of magnitude of the divide between richer and poorer settings.

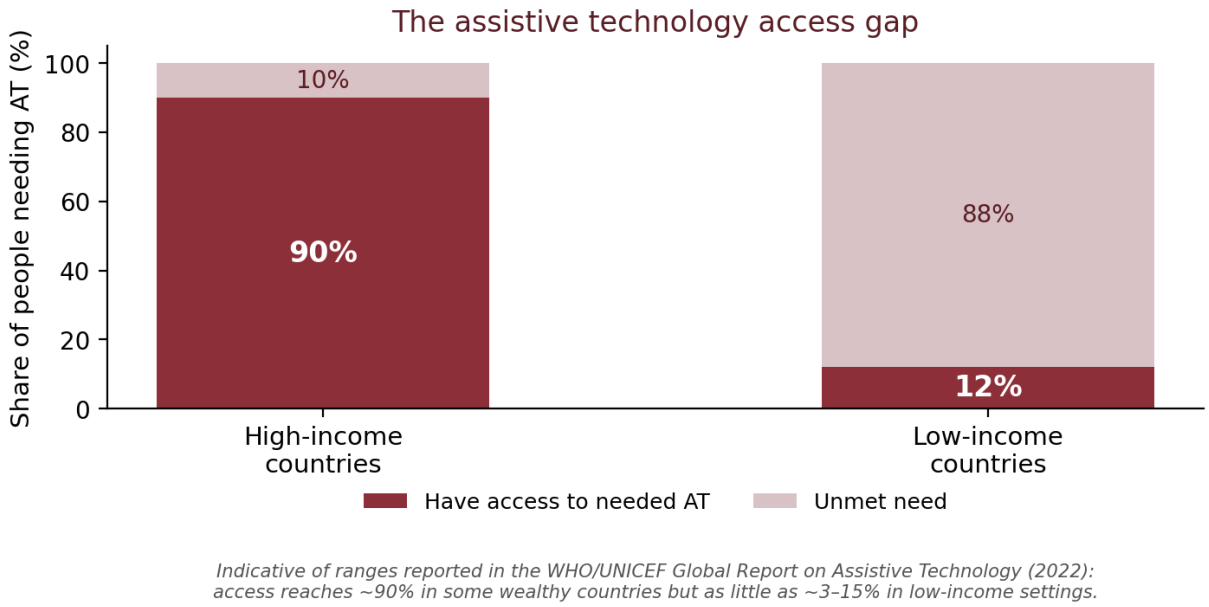


Figure 1. The assistive-technology access gap between high- and low-income settings, indicative of ranges reported by WHO and UNICEF (2022).

The stakes are best appreciated across the life course, because assistive technology is not the concern of a single age group but of nearly everyone at some point. A child who cannot see the board needs spectacles to learn; a young adult with a mobility impairment needs a wheelchair to work; an older person with hearing loss needs an aid to stay socially connected; and as populations age, the last of these becomes near-universal. The Global Report on Assistive Technology makes exactly this point, noting that most people who live long enough will use assistive products before the end of their lives (Borg et al., 2021). This universality has a policy implication that is easy to miss: because assistive technology serves such a broad constituency, investment in it is not a narrow expenditure on a minority but an investment in the functioning of the whole population, which strengthens rather than weakens the case for public financing.

It is useful to state the gap precisely. If a population's coverage is defined as the share of people needing assistive technology who actually have it, C = users / (people in need), then the access gap is simply G = 1 − C, and the striking fact about the global picture is how close G remains to one across much of the low-income world. Because need is rising, holding provision constant means the absolute number of people with unmet need grows even if the coverage rate does not fall, which is why standing still is, in effect, losing ground. This simple accounting frames the task: closing the divide requires provision to grow faster than need, sustained over years, which in turn requires the system-level changes to which we now turn.

4. Barriers to Access

Across the LMIC evidence the same barriers recur, and they map cleanly onto the GATE building blocks. Table 1 summarises them; the paragraphs below give the substance.

4.1 People: awareness and demand

A paradox sits at the centre of the problem: need is high, but expressed demand is low. Many people who would benefit from assistive technology, along with their families and even their health-care providers, are simply unaware that suitable products exist or that they might qualify for them, so the need never becomes a request that a system can respond to (Tangcharoensathien et al., 2018). Studies of specific populations confirm the pattern; among students with visual disability in schools for the blind in Delhi, lack of awareness and the non-availability of devices were principal barriers to use (Senjam, Foster, & Bascaran, 2020), and for people with intellectual disability a systematic review found low awareness among the most frequently reported obstacles to access (Boot, Owuor, Dinsmore, & MacLachlan, 2018). Stigma compounds low awareness, discouraging people from seeking or using devices that mark them as disabled.

4.2 Products: affordability and appropriate design

Even where demand exists, the products themselves are frequently unaffordable or ill-suited to the environment. Devices designed for well-resourced settings may be too expensive, too fragile, or poorly matched to unpaved roads, intermittent electricity, or rural distances, and

technology transfer to low-resource settings has historically been limited (Toro-Hernández et al., 2019). The result is that products either do not reach people or, when they do, fail in use: an African multi-country study found that a substantial minority of users experienced functional difficulties with their devices despite receiving them, particularly in rural areas where information and maintenance were scarcest (Visagie et al., 2017). Appropriate design and affordability are therefore not secondary engineering concerns but central determinants of whether assistive technology delivers on its promise.

4.3 Provision: fragmented service systems

Assistive technology is only as good as the system that assesses, fits, maintains, and follows up on it, and in much of the LMIC world that system is fragmented or absent. Provision is often split across government health services, non-governmental organisations, and private providers with little coordination, weak links to the wider health system, and thin coverage outside cities (Visagie et al., 2017). Reviews of rehabilitation services in sub-Saharan Africa describe the same picture from the service side: too few centres, poorly equipped units, and little government ownership, so that even willing users cannot find a functioning point of provision (Cyuzuzo, Dukuzimana, Muhire, Ames, & Ngwakongnwi, 2024). For children with disabilities the barriers are especially severe, layering transport, cost, and physical inaccessibility onto already scarce services (Adugna, Nabbouh, Shehata, & Butler, 2020).

4.4 Personnel: a scarce and under-trained workforce

Behind fragmented provision lies a workforce shortage. Assessing needs, prescribing and fitting devices, and training users all require trained personnel, and these are in critically short supply across LMICs, with too few rehabilitation professionals and limited training pipelines (Toro-Hernández et al., 2019). In hearing care, for example, the shortage of trained fitters is one of the principal barriers to hearing-aid provision, and successful programmes have depended on building a sustainable local support base rather than importing devices alone (McPherson, 2014). The workforce gap also explains why devices so often fail after delivery: without personnel to maintain and adjust them, responsibility for maintenance falls to users and families who may lack the means to sustain it (Visagie et al., 2017).

4.5 Financing, poverty, and social protection

Cutting across all of the above is the question of who pays. Assistive products impose disability-related costs that, in the absence of financing mechanisms, fall directly on households, yet in many LMICs fewer than a fifth of people with significant disabilities receive any disability benefit, so the people most likely to need assistive technology are the least able to afford it (Cote, 2021). Financial exclusion reinforces the pattern: people with disabilities in LMICs face additional barriers to banking, credit, and the digital financial services through which support might flow (Puli, Layton, Bell, & Shahriar, 2024). Where social protection and health financing do not cover assistive technology, access becomes a function of personal wealth, and the divide widens along the fault line of poverty.

4.6 Equity within the gap

Finally, the gap is not evenly distributed even among people with disabilities in LMICs. Rural residents fare worse than urban ones on nearly every measure, from information to maintenance (Visagie et al., 2017); children, women, and people with certain impairments face distinctive obstacles; and crises magnify all of these, as the COVID-19 pandemic showed when assistive-technology users in one study reported being cut off from information and support precisely when they were most vulnerable (Naghavi, Faramarzi, Abbasi, & Badakhshiyan, 2022). A gap this structured cannot be closed by a single product or programme; it requires attention to who is being left furthest behind.

Table 1. Barriers to assistive-technology access in LMICs, mapped to the WHO GATE building blocks.

Building block	Principal barriers	Illustrative evidence
People	Low awareness and demand; stigma.	Tangcharoensathien et al. (2018); Senjam et al. (2020)
Products	Unaffordable, fragile, or context-inappropriate devices; limited technology transfer.	Toro-Hernández et al. (2019); Visagie et al. (2017)
Provision	Fragmented, uncoordinated services weakly linked to health systems; urban concentration.	Visagie et al. (2017); Cyuzuzo et al. (2024)

Personnel	Scarce, under-trained workforce; weak maintenance and follow-up.	Toro-Hernández et al. (2019); McPherson (2014)
Financing (cross-cutting)	Costs fall on poor households; minimal disability benefits; financial exclusion.	Cote (2021); Puli et al. (2024)

5. Pathways to Equity

The same framework that organises the barriers points to the solutions, and here international consensus has converged with striking clarity on a small set of actions. Table 2 maps them onto the barriers they address.

5.1 National policy and system leadership

The foundational step is a national assistive-technology policy that establishes governance, funding, and standards, and that treats access as a system to be built rather than a series of donations. A position paper from the first Global Research, Innovation and Education on Assistive Technology summit argued that every country should establish a national assistive-technology policy with a clear theory of change for its implementation, developed inclusively with users and linked to the Sustainable Development Goals (MacLachlan et al., 2018). Without such leadership the other pathways remain piecemeal; with it, they can be aligned and scaled.

5.2 Affordable, appropriate products

On the product side, the priority is to encourage the development and supply of affordable, context-appropriate assistive products, through incentive schemes, priority-product lists, local production, and technology transfer suited to local environments (Tangcharoensathien et al., 2018; Toro-Hernández et al., 2019). Appropriateness matters as much as price: a device that survives rural conditions and matches users' lives will be used, while a technically superior product that does not will be abandoned. Country experiences show that pairing appropriate technology with a sustainable local support base is what makes provision durable (McPherson, 2014).

5.3 Workforce and service integration

Closing the personnel gap requires investment in training, both pre-service and in-service, and the integration of assistive-technology provision into the health system and into community-based rehabilitation so that services reach people where they live (Tangcharoensathien et al., 2018). Community-based approaches are particularly powerful in reaching rural and excluded populations, extending the workforce's reach through local workers and family training, and reducing the maintenance failures that follow when devices are delivered without support. Digital and tele-rehabilitation can further extend reach into hard-to-serve areas, though the evidence cautions that connectivity, cost, and accessibility can reproduce the very divides they aim to close (Cyuzuzo et al., 2024).

5.4 Financing through UHC and social protection

Because affordability is so often decisive, sustainable access depends on financing mechanisms that spread the cost, principally the integration of assistive technology into universal health coverage packages and social-protection systems, whether through insurance, subsidies, cash transfers, or direct provision (Cote, 2021). Aligning assistive technology with universal health coverage reframes it from a discretionary purchase into an entitlement, and doing so is among the most consequential decisions a government can take for people with disabilities. Complementary measures to improve financial inclusion, so that people with disabilities can actually access the banking and digital services through which support flows, reinforce the effect (Puli et al., 2024).

5.5 Awareness, user voice, and equity

Underpinning all of these is the work of raising awareness and centring the voice of users, without which demand stays low and services stay ill-fitted to real lives. Inclusive policy development, public-awareness efforts, and the meaningful participation of users and their representative organisations are recurring recommendations of the consensus literature (MacLachlan et al., 2018; Borg et al., 2021). Emerging regional practice illustrates how awareness and appropriate technology can be combined: programmes that pair assistive tools with structured training and family engagement have improved participation and independence for learners with disabilities, showing how the product, personnel, and people building blocks can be advanced together at the level of a single initiative (Shaikh, Sayed, Sahakyan, Muradyan, & Rubinger, 2025). Country studies from the region also remind us that access is meaningful only when devices are actually used, so attention to unmet need, satisfaction, and the specific obstacles facing sub-groups such as students and rural users must run through every pathway (Yilma et al., 2023).

5.6 Measurement and the evidence base

A pathway that is easy to overlook, but that underpins all the others, is the work of measurement. For much of the field's history, planning was hampered by the near-absence of comparable data on how many people need assistive technology, how many have it, who pays, and why the rest go without. The WHO's development of the rapid Assistive Technology Assessment (rATA) household survey was a deliberate response, designed to generate population-level data on use, source, payer, satisfaction, unmet need, and barriers across many countries and to inform both the global report and national programmes (Zhang et al., 2021). Better data matter for reasons beyond accounting: they make unmet need visible to decision-makers, allow progress to be tracked, and let countries learn from one another's experiments rather than repeating their mistakes. Country studies that quantify use and unmet need among specific populations, such as university students with disabilities in Ethiopia, add the granular evidence that national averages conceal and point to where capacity most needs building (Yilma et al., 2023). Investing in measurement is therefore not a diversion from action but a precondition for action that is efficient and accountable.

Table 2. Pathways to equity mapped to the barriers they principally address.

Pathway	Barriers addressed	What the evidence and consensus suggest
National AT policy & governance	Fragmented provision; weak leadership	Every country should adopt an AT policy with a theory of change and user involvement.
Affordable, appropriate products	Cost; inappropriate design	Priority-product lists, incentives, local production, and context-fit design.
Workforce & service integration	Personnel shortage; poor follow-up	Train personnel; integrate AT into health systems and community-based rehabilitation.
UHC & social-protection financing	Unaffordability; poverty	Fund AT through insurance, subsidies, cash transfers, or direct provision.
Awareness & user voice	Low demand; poor fit; inequity	Public awareness and meaningful participation of users and their organisations.

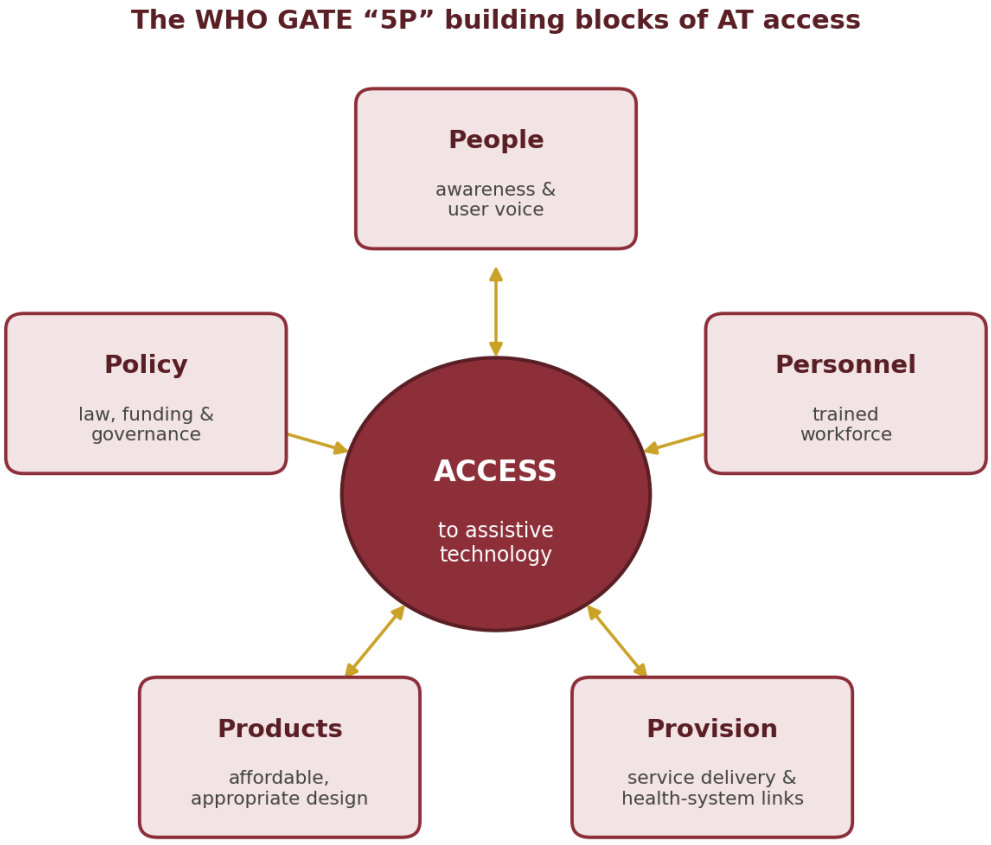


Figure 2. The WHO GATE building blocks of assistive-technology access, which organise both the barriers and the pathways.

6. Discussion

What is most striking about the assistive-technology divide is that it is not, at this point, a problem of knowledge. The need is quantified, the barriers are well understood, and the pathways enjoy a degree of international consensus rare in global health, expressed through the World Health Assembly resolution, the GATE initiative, and the Global Report on Assistive Technology. The obstacle is one of implementation and will: of whether governments choose to build the policies, finance the coverage, train the workforce, and organise the provision that the evidence prescribes. A leading voice in the field put the matter as a question, whether, having been asked for decades to facilitate access, states will this time actually do so (Borg et al., 2021). The analysis in this review suggests that the answer depends less on further research than on political commitment and sustained system-building.

That reframing is, in an important sense, hopeful, because it means progress is achievable with existing knowledge and because, as one commentator noted, when the starting point is so low every increment is a meaningful gain. Regional experience reinforces the point. The Gulf states, and the United Arab Emirates in particular, have begun to demonstrate what a determined, rights-based commitment to disability inclusion can achieve, reframing people with disabilities as People of Determination and investing in the assistive and learning technologies that widen participation (Alhumaidan & Habbal, 2025; Shaikh et al., 2025). These are middle- and high-income settings, and their resources are not universally available; but their models of policy leadership, of technology paired with training and family engagement, and of integration across sectors are precisely the levers the consensus identifies, and they offer templates that lower-income neighbours and partners can adapt. The task for the global community is to help build, in the poorest and most fragile settings, the same building blocks that wealthier systems have shown to work.

The economic argument deserves to be made explicitly, because it is often what moves a finance ministry where a rights argument alone does not. Assistive technology is not only a cost; it is an investment that returns value through education completed, work made possible, health care accessed, and dependence avoided, and by keeping family members from having to leave work to provide care. When a person gains the mobility to attend school or the hearing to hold a job, the gain accrues not only to them but to their household and their economy, and the disability-related costs that would otherwise entrench poverty are reduced (Cote, 2021). Framed this way, the integration of assistive technology into universal health coverage is less an act of generosity than a prudent investment in human capital and social participation, aligned directly with the Sustainable Development Goals (MacLachlan et al., 2018). Building the local economic evidence for this proposition, especially in the lowest-income settings where it is currently thinnest, may be among the most practical contributions research can make, since it is frequently the economic case that unlocks the political commitment on which every other pathway depends.

Table 3. Priority actions to close the assistive-technology gap, by actor and time horizon.

Actor	Near-term action	Longer-term action
National governments	Adopt a national AT policy and priority-product list; assign clear governance.	Integrate AT into UHC and social protection; fund provision at scale.
Health systems	Establish AT service points and referral pathways within primary care.	Embed AT in community-based rehabilitation; build maintenance systems.
Universities & training bodies	Expand pre- and in-service training for the AT workforce.	Grow a sustainable local workforce and research capacity.
Industry & innovators	Develop affordable, context-appropriate products; enable local production.	Support technology transfer and durable supply chains.
Global partners & researchers	Support rATA-type data collection and awareness campaigns.	Build local economic and effectiveness evidence; enable cross-country learning.

7. Limitations

Several limitations bear on this review. As a narrative rather than a systematic review, it represents the principal patterns and strongest syntheses rather than an exhaustive account, and its selection of evidence, though structured, is not free of judgement. The underlying literature is itself uneven: it is thickest for the better-resourced LMICs and for a few well-studied device categories such as mobility and hearing aids, and thinnest for the lowest-income and most fragile settings, for certain impairment groups, and for the effectiveness of specific interventions, where high-quality comparative evidence remains scarce. Much of the evidence is descriptive or cross-sectional, which characterises the gap well but speaks less directly to which interventions most efficiently close it. Definitions of assistive technology, of need, and of access also vary across sources, complicating comparison. These constraints qualify the confidence of specific estimates without unsettling the review's central conclusions.

8. Conclusion

Assistive technology can change, and in the aggregate transform, the lives of the billions of people who need it, but its benefits are today distributed with a severity of inequality that few areas of health can match. In low- and middle-income countries the barriers are consistent and well understood, spanning awareness and demand, product affordability and design, fragmented provision, a scarce workforce, and above all the financing that determines whether the poorest can afford what they need. So too are the solutions: national policy, affordable and appropriate products, a trained workforce integrated with health systems and community-based rehabilitation, financing through universal health coverage and social protection, and the awareness and user voice that make the rest coherent. The knowledge exists and the consensus is broad; what remains is to act on them, deliberately and at scale, in the settings where the gap is widest. The measure of progress will be simple and unforgiving: the share of people who need assistive

technology and actually have it, rising, year on year, toward the equity that is their right.

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