

# Ensuring equal access to health services for the Deaf in South Africa

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Provision of adequate interpretation services should be complemented by programmes that boost agency of the Deaf in challenging the historical but persisting discrimination they experience.

In South Africa, up to 80% of healthcare consultations are conducted across language barriers. Access to quality health care is enshrined in our Constitution, and more recently promised by National Health Insurance. However, for persons born Deaf who rely on South African Sign Language (SASL) for communication, this access is thwarted by language barriers. Barriers include providers who cannot communicate in the patient's language, and an absence of SASL interpreter services. The consequences are particularly disadvantageous for Deaf healthcare users, who experience multiple axes of discrimination both in health care and in broader society, limiting their capacity to manage miscommunication in health care.

This chapter assembles research evidence in South Africa from the past 20 years. The research explores opportunities for health-system innovations that provide SASL interpreter services to improve quality of care and the health care experience of both Deaf users and providers. The chapter examines how a pilot of novel services can be upscaled

to expand healthcare access for deaf patients, allowing them to realise their right to health. The role of research informing advocacy is carefully explored, as are the economic arguments for addressing Deaf patients' needs in health care.

To meet Sustainable Development Goal commitments, ensuring "no one will be left behind" and "endeavour[ing] to reach the furthest behind first", the health system must find ways to ensure that Deaf patients reliant on SASL have their health needs met. The Western Cape provincial health department adopted a province-wide interpreter service, including SASL and other languages, enabling marginalised groups to access meaningful health care. This development is partly the result of consistent evidence-generation and advocacy done in partnership with researchers, activists and the deaf community. It provides lessons not only for enhancing access for persons with disability, but also signals the benefits of improved communication for all healthcare users marginalised by language exclusion.

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## Introduction

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*I also need respect and dignity. And I get that when the interpreter is available. With an interpreter it is clear communication; without ... I am confused and do not understand what is happening....* (Deaf respondent cited in Haricharan et al., 2013).<sup>1</sup>

In South Africa, up to 80% of healthcare consultations are conducted across language barriers.<sup>2</sup> Access to quality health care is enshrined in our Constitution, and more recently promised by National Health Insurance. However, for persons born Deaf, who rely on South African Sign Language (SASL) for communication, this access is thwarted by language barriers. Providers cannot communicate in the patient's language, and there is a dire absence of SASL interpreter services provided by qualified, trained professionals nationally. The consequences are particularly disadvantageous for healthcare users who are Deaf, who experience multiple axes of discrimination both in health care and in broader society,<sup>3</sup> limiting their capacity to manage miscommunication in health care. Yet this situation persists, despite South Africa having one of the most progressive constitutions in the world, affording everyone the right of access to health care. South Africa was one of the first countries to ratify the United Nations Convention on the Rights of Persons with Disabilities (UN CRPD) in 2007.<sup>4</sup>

This review assembles evidence from South Africa over the past 20 years. The research explores opportunities for health-system innovations providing patients who are Deaf with SASL interpreter services to improve the quality of their care and the healthcare experience of both users and providers. The chapter starts by describing the context, including efforts to characterise the prevalence and understand the social construction of Deafness in this country. The second section reviews the impact of communication and other barriers on the health of the Deaf, with particular attention to overlapping vulnerabilities experienced by women and children who are Deaf. Piloting of novel interventions is examined, and potential upscaling to expand healthcare access for Deaf patients is explored, allowing them to realise their right to health. The economic arguments for addressing Deaf patients' needs in health care are carefully assessed, as is the role of research informing advocacy. The chapter concludes by highlighting the resulting policy and human rights implications, and providing recommendations for how healthcare access may be improved for a marginalised group such as persons who are Deaf.

## Prevalence and context

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Estimates of the prevalence of deafness in South Africa must account for a spectrum of severity, ranging from slight to profound impairment, based on the degree of

audiometric loss of hearing. Anything more than slight impairment (able to hear and repeat words spoken in a normal voice at a distance of 1 m) is classified as 'disabling hearing impairment'. Global estimates of disabling hearing loss suggest that 6.1% of the world's population are affected,<sup>5</sup> while estimates from recent South African studies range from 4.6% to 8.9%.<sup>6-8</sup> A population survey using the World Health Organization (WHO) Ear and Hearing Disorders Survey Protocol in the Cape Metro in 2013 found the prevalence of disabling hearing impairment to be 4.6% among individuals aged four years or older.<sup>6</sup> A similar survey conducted in a rural municipality in Limpopo in 2018, and using the same WHO tool, found disabling hearing loss prevalence to be 8.9%,<sup>7</sup> a difference not clearly attributable to age or gender distributions, which were broadly similar in the two studies. Lastly, a 2018 facility-based study found a disabling hearing loss prevalence of 6.3% among patients screened at two primary care clinics in Gauteng.<sup>8</sup>

Thus, while the estimates show much variability, they are broadly consistent with global findings and suggest that a sizeable proportion of the South African population have significant hearing loss, affecting their ability to negotiate health care and secure resources needed for health.

This review concerns itself primarily with persons who are completely Deaf, particularly those who are born Deaf or who become Deaf as children and whose first language is SASL, and for whom the descriptor 'Deaf' refers and who identify as members of the Deaf culture and community. The numbers in this category are difficult to ascertain. In 2006, Heap and Morgans suggested that between 500 000 and 1.5 million South Africans are Deaf users of SASL.<sup>9</sup> Census statistics have suggested lower numbers (around 288 000 in 2011),<sup>10</sup> but rather simplistic measurement instruments were used that may have underestimated prevalence. Nevertheless, the Deaf constitute a sizeable population in South Africa, and their access to health care and to the social determinants of health should be high on the policy agenda.

A striking characteristic of the Deaf community is the role of signing, which creates networks of social relationships between Deaf persons, and sign-deaf spaces that sustain shared communication, "familiarity, sociability and communality in an often-hostile hearing world".<sup>11</sup> Thus, sign language is not simply a means of communication but a marker of identity and "a common denominator of Deaf people, irrespective of background or social standing". Proficiency in SASL "automatically allows membership of the Deaf community and in cultural events that occur in communities where Deaf people live".<sup>12</sup> Through signing, Deaf persons "make life meaningful for themselves and hearing people with whom they interact".<sup>9</sup> As a key mediator in bonding and building social capital, which can itself generate emotional, personal and health-related benefits,<sup>13</sup> SASL is both a means to access health care and also a key social determinant of health. Dense networks within the Deaf community, sustained through shared use of SASL, offer important opportunities to share health knowledge,

information and empowerment. Such networks and messaging could be further strengthened should the health system invest in health-promoting strategies that map and mobilise social capital for healthy outcomes.

Currently, the dominant approach in educating Deaf children recognises SASL as their primary language.<sup>12</sup> This was not always true in South Africa, and in the 1980s and 90s, schooling of children who were Deaf focused on the simultaneous use of spoken language and signing. While this is no longer the case, it implies that some Deaf adults today may not be fully fluent in SASL. Many were forced to rely on less effective methods of communication at school, involving degraded language forms such as haphazard and simplistic signing and exaggerated spoken languages that required lip reading.<sup>14</sup>

Furthermore, notwithstanding the way in which Deafness serves as the basis for common identification and belonging, it is also important to recognise the social stratification within the Deaf population, given that known intersections with class, race, gender and gender identity are likely to influence Deaf persons' experiences and access to care. Moreover, the foundations of the South African health system, rooted in colonisation and apartheid, have left deep imprints on how power is exercised within the health system to marginalise those who have previously been without voice. Discriminatory care for black people under apartheid reflected and reinforced a wider malaise of authoritarian and unequal treatment of other vulnerable groups with particular health needs.

## The impact of communication and other barriers

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Communication barriers based on language mismatch between patient and provider in the South African healthcare system are well recognised,<sup>15</sup> with a severe lack of trained interpreters resulting in serious adverse consequences for health.<sup>16</sup> This situation is compounded for Deaf patients, who already suffer multiple disadvantages in accessing care. Deafness reduces their employability and income; consequently, they have fewer resources for navigating an ableist society. For example, they must negotiate public spaces where oral language renders it easier to hail a taxi, and they must struggle with a lack of information to get the service they need. Akach has argued that the Deaf suffer a “double linguistic imperialism” because whereas indigenous languages have, with the overturning of colonialism, been forefronted as official languages in the developing world, sign languages have remained marginalised.<sup>12</sup>

The hegemony of oral language communication in wider society is reflected in the health system, where Deaf patients commonly report having to make do with sub-

standard methods of communication with health workers, such as written communication, lip reading, and “trying to talk while gesturing”.<sup>3</sup> Many healthcare professionals assume that communication with their Deaf patients can be conducted through written notes,<sup>17,18</sup> believing that sign language is a translation of written languages. However, SASL is a unique language, with grammar and syntax dissimilar to oral languages, and therefore difficult to communicate in writing. Moreover, educational disadvantage has left many Deaf persons unable to write easily, whether in English or other languages.<sup>1</sup> As a result, not only will the clinician fail to understand the patient, but the patient will be unlikely to understand what the health worker has written.

Written communication also limits how well complex problems can be explained and makes it difficult to ask questions or receive helpful answers. Writing notes is cumbersome, takes time, and health professionals are unlikely to give up precious time in busy clinics to communicate effectively through written means, especially when having to communicate complex terminology. This is exacerbated by illegible handwriting, and health professionals not understanding what the Deaf write, either because the grammatical construction is different or because a Deaf person has not mastered written language.

As cited in Haricharan et al.,<sup>1</sup> one Deaf patient recounted:

*The thing is: I try to ask a question again if I don't understand, but the doctors get angry and maybe they start bringing other patients in. Then I am asked to wait. Doctors get fed up, they just write something down. They don't have patience. They are too busy to write everything. That is why I don't like written notes. It does not help because I can't understand them.*

Another frequently utilised approach is to expect Deaf patients to bring their own interpreters, often family members or friends able to communicate both in Sign language and verbally. However, using lay interpreters has numerous drawbacks. Friends or family members may not have sufficient skills to understand and/or convey the meaning of technical information accurately. Relatives who translate may instinctively talk on behalf of the person. Additionally, waiting for their availability to attend an appointment increases dependence, and to have a friend or family member interpret imposes a breach of confidentiality.

Kritzinger and colleagues<sup>17</sup> argue that in addition to communication obstacles, interpersonal factors also play a role through pervasive disempowerment, passive attitudes, family over-protectiveness, feelings of alienation, and shame, all of which combine to create a sense of exclusion. More than just providing professional interpreters, health services need to empower Deaf patients to be assertive and “expect and demand the same access to health care that others enjoy”.

The consequences of poor communication are varied. These include delayed diagnoses, misdiagnosis, incorrect or delayed treatments, poor-quality care, poor adherence to medication resulting in poorer health outcomes, patients not understanding their diagnosis and treatment, or patients being unable to convey information to the provider.<sup>1,3,17,19,20</sup> Patients may exit the consultation with no idea of the diagnosis or treatment.<sup>17</sup>

On a psychosocial level, the absence of equal and authentic communication impacts on the quality of interaction. This can include situations such as patients finding themselves left in the waiting room at the end of a long and busy day in a state healthcare facility because they could not 'hear' or lip-read when their names were called; patients feeling that they are a burden because they are using valuable clinician time, therefore hurrying the consultation and further diminishing the quality of communication; if a parent is translating, reluctance to question him or her; anxiety; infantilisation when the doctor speaks to the interpreter; inability to follow instructions or know where services are available, resulting in shame, frustration, despondence, giving up on seeking care or skipping visits (sending family members to pick up medications); and humiliation at being mocked.<sup>17,20</sup> In many senses, it is the healthcare environment that is the disabling factor, because Deaf patients are not provided with adequate or sufficient communication support to ensure adequate access to health care.

Importantly, Deafness is largely invisible to the healthcare system. It is one of a number of disabilities poorly understood by both providers and other users, since there is no visible evidence of disability, such as a wheelchair or cane. For example, a study of health committees linked to primary care facilities dealing with disability<sup>21</sup> found that the committees were restricted in their understanding of disability to physical disabilities, most commonly associated with the visible signifier of a wheelchair.

## Multiple and overlapping vulnerabilities

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### Deaf women and pregnancy

It has been shown that pregnant women are particularly vulnerable to poor communication practices in South Africa, and that this affects their health and that of their infants. A study involving a purposive sample of Deaf, pregnant women in Cape Town found similar patterns of overall antenatal usage to that of the general female population, but a significant proportion delayed seeking care until after the first trimester, thus increasing the risk for adverse pregnancy outcomes.<sup>22</sup> While late antenatal booking is not uncommon in South African obstetric services, the evidence of poor communication and the prospect of an unhelpful and alienating service<sup>17</sup> may be responsible for Deaf women's avoidance of early contact with the services.

Moreover, the quality of provider-patient interactions was found to be problematic in certain instances, reflecting many obstacles posed in other healthcare settings. Interpreters were present in only 28% of antenatal visits and 33% during labour and delivery. Interpreters were typically family members, which as previously stated, is problematic for confidentiality and ethical practice.<sup>22</sup> Written communication during labour and delivery is clearly impractical and ineffective, in addition to being disrespectful.

### Deaf children

The challenges for Deaf children are amplified, as early life experiences of the health system that are traumatic or unwelcoming impact on their later expectations and willingness to seek care.<sup>23,24</sup> Heap and colleagues have shown that mental health was the main reason for requesting interpreter services at a Deaf school in the Western Cape between 2013 and 2016.<sup>20</sup> Needs included general psychological support, drug rehabilitation, and trauma counselling. Qualitative interviews with 13 children revealed patterns of feeling excluded in consultations, disengagement, and withdrawal as a result of doctors speaking to the adult present, usually a parent. One learner described consultations as "boring", best managed by "ignoring them and chatting on my phone". Learners typically reported these exclusionary interactions as being 'just normal'.

In terms of children's agency, unequal power in the consultation renders Deaf children particularly passive. This is reflected in the words of one learner: "I just look away and give him the arm" (for an injection). Parents or accompanying adults become particularly important as gatekeepers of information, depending on what the adult believes. Given other findings<sup>17</sup> suggesting that feeling over-protected by accompanying adults is an equally disempowering experience, Deaf children face difficulties beyond those of hearing children in the healthcare setting. While children in this study strongly favoured the use of interpreters, developing agency through increased understanding of their health care and rights is additionally important.<sup>20</sup>

These findings are replicated in studies of Deaf adults and children from the United Kingdom,<sup>25</sup> the USA,<sup>26</sup> Brazil,<sup>27</sup> Nigeria,<sup>28</sup> New Zealand<sup>29</sup> and Spain.<sup>30</sup>

## Interventions can and do work

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Underlying the challenges facing Deaf patients is the problem of poor or absent communication. Local and international research points to the importance of sign language interpretation in the consultation as critical in establishing trustful and clinically effective relationships<sup>19,25</sup> and ensuring access to information and appropriate services.<sup>31</sup> Between 1995 and 2019, the Health and Human Rights Programme at the University of Cape Town, under

the leadership of Dr Marion Heap, developed a free SASL interpreter service for Deaf patients needing health care. A pilot service<sup>32</sup> was established with the support of organisations of the Deaf, and funded through research grants. This enabled patients to text a request and be accompanied or met by a professional SASL interpreter at the health service. Initiation of this service was specifically framed as a human rights initiative to afford the Deaf entitlement to equal treatment under the Constitution.<sup>11</sup>

Deaf staff were later trained to manage the service, representing the ethos of the Disability movement which insists that those most affected by discrimination be at the centre of action to address their disadvantage. When the project first started, it handled four or five requests per month. Towards the end of the pilot, numbers exceeded 30 per month.<sup>33</sup> This reflected both a substantial unmet need and the increasing ease of Deaf patients when using services that would normally be experienced as unwelcoming. The pilot enabled healthcare utilisation rates among the Deaf to approximate the national target of 3.5 visits per annum per capita.<sup>34</sup>

By 2018, the Western Cape government had extended its sub-contracted interpreter service to include SASL,<sup>35</sup> partly as a result of repeated lobbying efforts and presentations to various policy platforms and officials. To access this service, Deaf children and adults send a text-based message to a private language and translation service, which in turn clears the request with the Department of Health and books an accredited SASL interpreter for the patient's appointment.<sup>20</sup> Until this point in the public sector, SASL translation services were only available in the judicial sector and parliament. The successful mainstreaming of SASL interpreter services demonstrates the feasibility of upscaling pilot initiatives.

One unique result of this pilot, born of difficulty accessing eye care, was an ophthalmology outpatient service offering fast-track access for Deaf patients; intact vision is particularly important for these patients given their reliance on signing for communication. Using bulk SMSs, up to five Deaf patients could attend an outpatient clinic on a designated appointment day, supported by a professional SASL interpreter. The willingness of healthcare providers to accommodate Deaf patients was also reported in a primary care setting<sup>18</sup> to ensure equitable treatment of patients with greater need.

The effectiveness of interpreter services was captured in qualitative research undertaken to evaluate the service.<sup>1,20</sup> For example, one patient reported that with the SASL interpreter service, "I understood everything 100%. I did not struggle. [With a professional interpreter] everything is much better and quicker. You need to be able to ask complex questions.... I also need respect and dignity. And I get that when the interpreter is available".

Concurrently, providers reported highly positive experiences with interpreters. For example, one family physician noted:

*This was the first time that she had brought an interpreter with her.... The interpreter stood facing the patient square on, signing every little thing that I said, however insignificant, even if I was addressing her and not the patient.... the patient was not left out of anything.... Previous consultations must have just happened in a world of silence and inexplicable facial movements, signifying nothing.... She did not know that this was "blood sugar" that we were measuring, but through the miracle of sign language, it became clear to her, and I could literally see that clarity appearing on her face as the interpreter explained everything I was saying, and as she was having her many questions properly asked, understood, and answered.<sup>a</sup>*

Affording the Deaf opportunities to express themselves in their first language facilitates wider engagement. For example, members of the Deaf community expressed their views through a video using SASL-interpreted narration to a South African Human Rights Commission (SAHRC) Hearing on Access to Health Care in 2007,<sup>36</sup> a first in the history of SAHRC public hearings.

Yet, while necessary, providing SASL interpreter services is insufficient to overcome the other obstacles experienced by Deaf patients negotiating an alien and often hostile healthcare system.<sup>17</sup> Strategies must empower the Deaf to assert their rights,<sup>17,19</sup> and remove barriers such as by providing adequate signage, creating safe spaces,<sup>3</sup> educating service providers,<sup>3,35</sup> and engaging Deaf users so that they can expect more and not "silence themselves".<sup>17</sup>

Nonetheless, given that language is instrumental in so many other human rights (such as the right to information, dignity and equality), the provision of SASL interpreting is fundamental to meeting the healthcare needs of the Deaf. In the words of one Deaf participant, SASL interpretation is "feeling freedom".<sup>37</sup>

For that reason, expanding the pool of professional interpreters trained for healthcare settings is key to reduce human resource constraints. Together with DEAFSA, the University of the Free State (UFS) developed the first accredited SASL interpreter courses some two decades ago, but it was only in 2012 that the first professional medical SASL interpreter training course<sup>38</sup> was created. This two-year accredited programme emerged as a collaboration with the UFS, and the non-governmental organisations (NGOs) SLED (Sign Language Education and Development) and DCCT (Deaf Community of Cape Town).

Van Pinxteren<sup>39</sup> noted that for Deaf persons, the cell phone is a means to "negotiate their marginalised position as people living with a hearing impairment". It enables them to both "extend and intensify their social relationships"

a Neal David. Comment in Michael Mapongwana Community Health Centre Newsletter; 14 November 2013.

and to “negotiate barriers of existing Deaf and hearing communities”. It is thus an important contributor to both bonding and bridging social capital. Given extensive interest in the use of mobile technology as a way to deliver health-promoting messages and effect behaviour change,<sup>40</sup> and given that high levels of social capital can influence health through the rapid spread of healthy norms in a community, it is clear that mobile technology is important for health promotion and disease prevention among the Deaf. Early evidence suggests that this is the case among South African Deaf patients. For example, an SMS-based information campaign with Deaf adults improved knowledge about hypertension and healthy living. SMSs were a motivation to change behaviour, a reminder of the change required, and a sign of care, as the receiver felt that she or he was being looked after. The researchers also noted the importance of ensuring that interventions recognised the unique needs and communication preferences of the Deaf, including use of images, signed SMSs, and drama enacted using sign language that enabled questions to be answered.<sup>41</sup> The potential for upscaling these interventions is therefore high.

## Policy and human rights

Writing almost three decades ago, Penn and colleagues<sup>42</sup> bemoaned the observation that the Deaf had “themselves accepted the hearing world’s valuation of hearing as the norm and deafness as a deficit to be masked or remediated if at all possible”. However, all that has now changed due to strong advocacy led by the Deaf and their organisations.<sup>43</sup> It is anticipated that SASL will be adopted as an official language, which would open the way for much wider institutional recognition of and support for SASL. In September 2020, the Pan South African Language Board (PANSALB) launched the South African Sign Language Charter<sup>44</sup> (SASLC). Of the nine pledges, three speak directly to the need to ensure that Deaf persons have access to SASL interpreter services. These include guaranteed access to services and information through SASL, minimum standards of competency in SASL for those working directly with Deaf persons, and making professional SASL interpreting and translation services readily available.

South Africa’s Constitutional guarantees and international commitments under the UN CRPD provide strong human rights imperatives obliging the state to provide SASL interpreter services for Deaf patients. This is salient given that it was advocacy by disabled South Africans and their organisations that was key to adoption of the disability provisions in the Constitution. In fact, these provisions presaged the adoption of the CRPD at a global level, reflecting the importance of indigenous voices from the South in shaping policy for those with disability. A similar recognition of user agency and voice should be present in health-system responsiveness to the needs of the Deaf.

Provision of SASL interpreter services will not be cheap. It is suggested that the costs of upscaling the Western Cape pilot will be between 1% and 5% of the Provincial health budget.<sup>34</sup> However, different modes of delivery (e.g. remote interpreting<sup>45</sup>) and careful organisation of services may substantially reduce this cost. Additionally, such a service will promote equity, serving a population that has previously not benefitted from health services to the same extent as the hearing population.<sup>34</sup> Savings from avoiding missed or late diagnoses or inappropriate treatment remain to be estimated, although a UK study has suggested that the National Health Service might save £30 million annually through provision of British Sign Language.<sup>46</sup>

## Conclusion

The Sustainable Development Goals commit to ensuring that “no one will be left behind” and to reaching those “furthest behind first”. The South African health system must therefore ensure that Deaf patients reliant on SASL can be active citizens in the system rather than passive recipients of second-rate care. Equitable access to health care for the Deaf community therefore requires provision of SASL interpreter services that can simultaneously address autonomy, confidentiality, empowerment and information sharing.

The Western Cape has adopted a province-wide interpreter service, including SASL and other languages, enabling marginalised groups to access health care meaningfully. This development is partly the result of consistent evidence-generation and advocacy done in partnership with researchers, activists and the Deaf community. Such advocacy uses a human rights lens to provide lessons not only to enhance access to care for persons with disability, but also to signal the importance of improved communication for all healthcare users who are marginalised by language exclusion. The benefits of an inclusive approach to communication, bridging obstacles experienced by other healthcare users not conversant in the dominant language, may resonate across the health system and strengthen system responsiveness to users more generally.

Moreover, this knock-on benefit may also heighten awareness within the health system of disability as a human right and encourage more inclusive and rights-based health-system responses.<sup>47</sup> Providing a SASL interpreter service is a rights-based approach focused on reducing social barriers rather than on individual impairment. The service addresses the wider South African social context, similar to accessible public transport for disabled persons and wheelchair access to health facilities.

While access to interpretation is essential, on its own interpretation is insufficient to ensure adequate access to quality health care. Many barriers faced by the Deaf are also faced by other disabled and marginalised users. For that

reason, provision of adequate SASL interpretation services should be complemented by programmes that boost agency of the Deaf in challenging the historical but persisting discrimination they experience.

The words below, from a participant in Tshegofatso Senne's study,<sup>3</sup> capture both the challenges of a health system seeking to be responsive to Deaf patients, and the agency needed by the Deaf to make their constitutional rights real:

*You need to know that you have your rights and you must fight for them. I have the right to go to the police station or to the clinic. Tell them you're Deaf and you have a problem and that you need SASL. I have the right to be treated as a normal person.... We have a right to be recognised in South Africa as a whole. If people know about accessibility and understand this, then we just need to make SASL an official language. There's no other way to solve it.*

### Acknowledgements

This chapter would not have been written without a lifetime of dedication on the part of Dr Marion Heap, who empowered the Deaf to challenge their vulnerability. The chapter was written as a tribute to Marion, who died prematurely in August 2019. Much of the work cited here is the product of her singular, focused and ground-breaking research, particularly addressing efforts to improve equitable access to SASL interpreter services in the health sector. The research reflects her commitment to ensuring that the Deaf are able to assert their human rights to health, information and dignity in our healthcare system.

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