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10 Speech Sound Disorders in Underserved and Unserved Populations

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Key information for local and national policy and lawmakers

the purpose of this chapter is to inform governmental bodies, professional organizations, health and educational service providers about the risk and consequences of speech sound disorders in children in underserved and unserved communities. Speech sound disorders (SSD) in children is a common reason for referral to speech-language pathology/phoniatric (SLP) services in many countries. SSD is a “persistent difficulty with speech sound production that interferes with speech intelligibility or prevents verbal communication” (American Psychiatric Association, 2013). It differs from other types of communication impairment such as developmental language disorder, autism spectrum disorder or social communication disorder and stuttering/stammering in that children with SSD have a specific problem with producing the sounds of speech in a clear and intelligible manner. In the majority of cases, the cause of SSD is unknown (e.g., Broomfield & Dodd, 2004; Shriberg, 2003). However, known causes are identified in a minority of children with SSD, which may include cognitive impairment, hearing loss, and craniofacial dysmorphias (such as cleft lip and/or palate, or cerebral palsy).

Incidence and prevalence of speech sound disorder

Estimates of prevalence of SSD vary depending on the definition and the assessment protocol used to measure speech. Rates ranging from 2.3% to 24.6% have been reported across a number of studies (Eadie et al., 2015; Jessup, Ward, Cahill, & Keating, 2008; Keating, Turrell, & Ozanne, 2001; Law et al., 2000; McKinnon, McLeod, & Reilly, 2007; Shriberg et al., 1997; Shriberg, Tomblin, & McSweeney, 1999; Wren et al., 2016) with clear evidence that rates decline as children get older. However, the prevalence studies to date have largely focused on children being brought up in Western countries where English is the primary language spoken. If one considers sub-Saharan Africa, for example, little is known about the prevalence of communication disorders. Pascoe, Rossouw and Mahura (2018) observe that prevalence of SSD has not been studied in South Africa. However, these authors contend that if the prevalence of children with

speech difficulties in South Africa is similar to what it is in other countries, children with speech difficulties form a significant proportion of SLPs' caseloads. This is supported by the findings of a survey of South African SLPs working with pre- and primary-school-aged children where children with SSD comprised a substantial proportion (40-70%) of the caseloads of the majority of the clinicians in the sample (Pascoe et al., 2010). Furthermore, a study which investigated the speech development of South African children using a sample of 308 3-5-year-old children showed that approximately 9% of the sample had speech difficulties (Pascoe, Mahura, & Le Roux, 2018). Lack of information about prevalence of SSD makes provision of equitable and evidence-based services difficult. To date, there is limited information on prevalence of SSD in many languages and also in communities which do not speak the language typically used in school and in the country they are living in.

Impact of speech sound disorder

Untreated, the impact of SSD can be far reaching if it continues beyond early childhood, leading to poor outcomes in education (Anthony et al., 2011; Wren et al., 2021), employment (Felsenfeld, Broen, & McGue, 2001; McCormack, McLeod, McAllister, & Harrison, 2009) and mental health (Beitchman et al., 2001). A study by Nicolini de Simoni and colleagues (2019) indicated that new environments are likely to make a child feel isolated, frustrated, shy and have a negative effect on their self-esteem and interpersonal relationships. When children have difficulty accessing education, as may be the case for children from underserved and unserved populations or children who are required to move frequently, they are at an even greater risk of problems with literacy development and success in education (e.g., Wofford & Tibi, 2018).

Key information for professionals, social workers, community leaders, and education practitioners

There is a crucial need for countries, nongovernmental organizations, and service providers as well as educators who work with or are responsible for children of underserved and unserved populations to be aware of the impact of SSD on children. It is imperative that children with SSD or those at risk of it are identified early to ensure intervention can begin promptly and long-term consequences either minimized or eliminated (Mire & Montgomery, 2009). Multidisciplinary working between the education, health and wellbeing providers in local areas is essential for this.

Identification of speech sound disorder

SSD can be difficult to identify in young children because their speech is developing and changing all the time. Comparing children with their peers provides little help as there is much individual variation. However, there are some indicators to help distinguish those children whose problems with speech are indicative of a persistent difficulty and who would benefit from intervention from those who are displaying typical variation that will resolve with time.

1. *A 3-year-old can be understood by strangers.* A study by Wren and colleagues (2016) found that if children at age 3 could not be easily understood by strangers, they were at risk of persistent problems with their speech. This is a useful clinical marker and tools such as the Intelligibility in Context Scale are available in over 60 languages to help with this question (McLeod et al., 2012; McLeod, 2020). It is important that the 'stranger' is someone who understands and speaks the main language the child is exposed to at home and in their community.
2. *A 5-year-old can correctly produce almost all consonants within the language(s) they speak.* A review of speech acquisition in 27 languages from 64 studies reporting on over 26,000 children was undertaken by McLeod and Crowe (2018). They found that by 5 years of age, children could produce almost all consonants and vowels. On average, 5-year-old children produced 93% of consonants correctly and 98% of vowels correctly.

Other risk factors for SSD included parental report of concerns about children's coordination skills, problems with hearing and difficulties with repeating made up words (non-word repetition).

The impact of speech sound disorder on children's educational progress, wellbeing and social interaction.

A systematic review of 57 papers on the impact of SSD on the activities and participation domains of the International Classification of Functioning, Disability and Health (ICF-CY) (WHO, 2007) was conducted by McCormack and colleagues (2009). They found evidence of association with literacy, attention and thinking, calculating, mobility, selfcare, relationships and education. The difficulties in establishing relationships with peers can have additional impacts and place children with SSD at risk of being bullied. Indeed, a large-scale longitudinal study of 4-5-year-old Australian children found that teachers and children reported these challenges when the children were followed up at age 7-9 (McCormack et al., 2011). Early identification and provision of intervention is vital to improve children's speech and intelligibility and to reduce these negative impacts of having SSD.

What to do when child has suspected speech sound disorder (referral route)

Considering the potential impact of SSD on other areas of development, it is important for such children to be referred to a SLP as soon as SSD is suspected (even as young as 2 or 3 years of age). In many western countries, an open referral route is possible whereby anyone can refer a child directly to a SLP, including a caregiver or educator. In other contexts, referral may need to be made through a medical officer such as a paediatrician or a central system. No child is too young to be referred to a SLP and the quicker this process is initiated the better the outcome for the child and their family (Law, Reilly, & Snow, 2013).

How to help and support the child with SSD and his/her caregiver

A SLP can assess and diagnose the specific type of SSD which will then lead to a personalized intervention plan. It is important to remember that SSD can have a cognitive or motor basis or even a mixed pattern and that intervention varies depending on the nature of the condition and also the specific features affected. Some children will have problems with specific speech sounds while others may have problems with the use of intonation and stress in words, which can impact on their intelligibility. Sometimes it can be difficult to access speech-language pathology services. Nevertheless, there are some general principles which can help when access to SLP is limited.

1. *Model rather than correct.* As they develop, children are making small changes in their speech all the time. Correcting a child when they make mistakes can make them self-conscious and reluctant to talk, which should be avoided. Instead of correcting them, just repeat what they have said, slightly emphasizing the correct word or words which were produced incorrectly.
2. *Have fun with sounds.* Have a 'sound table' or 'sound feely bag'. Select lots of objects or pictures which begin with a particular sound. Put them together on a table or in a bag and make time to play with the toys or take them out of the bag one at a time, perhaps trying to guess what they are. There is no need to ask the child to say the word. Rather the aim is for the child to hear the words being said with the target sound lots of times to help them become more aware of the sound and how it is used in words.
3. *Play minimal pair games.* Find pairs of words which differ in one sound or rhyme with each other (e.g., *key* and *tea*). Use these in games to help a child hear how one sound can change the meaning of a word.
4. *Play sound games.* 'I spy with my little eye' is a fun game to play with children when they are in the early stages of literacy development. An alternative for younger children is 'I hear with my little ear' – simply asking children to find something that begins with a target sound such as 'b' or 'sh' rather than a letter.
5. *Have fun making noises and sounds with your mouth.* Playing with sounds can be a useful way to help children explore what noises and sounds they can make without the pressure of trying to produce the sounds in speech.
6. *Clap syllables and sounds.* Help children appreciate that words are made up of sounds and syllables. Clapping the syllables in a multisyllabic word as you say it out loud can help a child appreciate that a word can be made up of multiple units (*elephant* has three syllables (claps) = *el - e - phant*). Taking this a step further and clapping or tapping for each sound in a word helps children to appreciate that syllables are made of discrete sounds or 'phonemes' (*chicken* has 5 sounds = *ch - i - ck - e - n*).

These phonological awareness skills are the origins of developing literacy skills in languages which use an alphabetic script. With the changes to delivery of services

and the expansion in the use of telehealth (as a result of the COVID-19 pandemic) (McLeod et al., 2020), access to SLP could become easier for those who have access to the internet and digital resources to connect with external providers. However, there will still be some, indeed many, who will have limitations on their ability to access support. Resources are available to share from these links, many of which include downloadable and printable material which can be shared with parents, teachers and children as needed.

Information for professionals working with children with speech sound disorders

With over 7000 distinct languages spoken (Eberhard, Simmons, & Fennig, 2021) and an increasingly connected world, SLPs could potentially provide services across the world, including to children with SSD living in places with poor or no access to speech-language pathology services.

Assessment approaches for children with speech sound disorders

Assessment of children's speech can have one or many purposes. Assessment can be used to determine if there is a problem or if the difference in speech output that we can hear is part of typical development and individual variation. Numerous screening measures have been determined for this purpose and a systematic review of these is available from Wallace and colleagues (2015). Historically, speech assessments have been dominated by those developed for use with English-speaking children. However, assessments are being developed all the time for a wide range of languages. A list of published assessments with links to further information is available on the Multilingual Children's Speech website and a review of 30 assessments in languages other than English has been published (McLeod & Verdon, 2014). A tutorial paper has been written to guide SLPs in how to assess the speech of children in language(s) that are not spoken by the SLP (McLeod et al., 2017).

While a number of single word naming tests are produced commercially, there are fewer tools to assist with transcription and analysis, leading to significant variability in how this is carried out. The UK and Ireland Child Speech Disorder Research Network has developed guidelines for transcription and analysis to help with this and these can be accessed and downloaded for free from the link at the end of this chapter (Child Speech Disorder Research Network, 2017a, b).

Assessment may include aspects which will help determine the impact of SSD on children's everyday lives. This will likely include an assessment of intelligibility and there are tools to assist with this which ensure collection of data in a consistent and reliable manner. For example, the Intelligibility in Context Scale (McLeod, 2020) is a rapid parent rating of children's intelligibility with a variety of conversational partners on a 5-point scale. Translated into over 60 languages with normative data or validation in over 20, it provides an easy-to-use measure of children's SSD in terms of its impact on intelligibility.

Intelligibility is not the only aspect of speech which is important. Acceptability

of speech production – to the child themselves in particular – is vital to their sense of wellbeing and social development. Based on the International Classification of Functioning, Disability and Health (WHO, 2007), the Speech Participation and Activity Assessment of Children (SPAA-C; McLeod, 2004) has been used as a basis for determining the degree to which SSD is impacting on a child's levels of activity and participation in their community. It was designed to support those working with children with SSD through asking questions to the children themselves as well as friends and family about their daily lives. It can be used to determine the impact that SSD has had on a child, assisting in the development of a management plan which targets not only speech output but also other aspects of a child's life which are important to them. It has been translated into a number of languages and is available from the Multilingual Children's Speech website.

Diagnostic approaches for children with speech sound disorders

Diagnostic assessment can be used to determine the type and severity of SSD. This information is vital to the development of a management plan. A key distinction is whether a child's SSD has a cognitive-linguistic/phonological basis or is motor/articulatory in nature. Some children will have SSD associated with other conditions such as cleft lip and/or palate or cerebral palsy which could lead those working with the child to assume that there is a motor/articulatory basis to the speech disorder, linked to structural or neurological conditions. However, many children will present with a mixed picture because of the interactive nature of the development of speech in which both cognitive and motor elements are involved.

During the assessment process SLPs should seek to learn about specific segmental and suprasegmental aspects of speech sound acquisition in the child's language/s and dialect/s so that they can make an appropriate differential diagnosis between speech sound difference, delay or disorder (Hopf et al., 2021; McLeod et al., 2017). For example, in Fiji children speak on average three languages (Hopf et al., 2018). Information on the phonological profiles of every language spoken in Fiji is unavailable although there is information about the phonologies of Fijian Fiji English (FFE) and Fiji Hindi Fiji English (FHFE) (Hopf et al., 2016). In cases like Fiji, identification of a child's proficiency and use in their various languages and dialects is required for valid identification of SSD. McAlister and colleagues (2021) illustrated the importance of this consideration in completion of a relational analysis of 72 Fijian children's Fiji English speech production. When the Fiji English dialect was the target in relational analysis instead of an external English standard, children's mean percentage of consonants correct increased 10–20% and 25/27 students initially identified with SSD were reclassified as typically developing (McAlister et al., 2021). This finding is consistent with previous findings in other countries (e.g., *Australian Aboriginal English*: Toohill, McLeod, & McCormack, 2012; *Singaporean English*: Low et al., 2019). The Fiji example serves to illustrate the complexity of differential diagnosis of SSD for multilingual children and the need for SLPs to compare like with like to ensure that only true cases of SSD are identified in this population.

Intervention planning for children with speech sound disorders

Assessment is also used to inform response to intervention. The collection of robust baseline measures prior to the start of a period of intervention will enable comparison with outcomes post intervention, providing information to the practitioner on the effectiveness of the management plan for an individual child. When these data are collected on many children, it is possible to identify patterns regarding which interventions or patterns of service delivery are effective with specific groups of children, based on age or type of SSD or other factors. Assessment resources to inform the management plan and the collection of outcome data will often include the collection of a sample of a child's speech. This might be via a picture-naming task in which single words from a phonemically balanced list are produced by the child. Sometimes this might be supplemented by a sample of connected speech. This has the advantage of revealing problems that might occur across word boundaries as well as being more reflective of everyday speech when we rarely talk in single words.

Evidence-based interventions for children with speech sound disorders

There is a wide range of intervention approaches which are available to work with this population. A narrative review of interventions for SSD by Baker and McLeod (2011) identified 45 distinct approaches together with seven methods for identifying targets. More recently, Wren and colleagues (2018) reported on a model for SSD intervention which grouped interventions according to the aspect of speech being targeted. Similar approaches have been taken by Baker et al. (2018) and Brosseau-Lapr e and Rvachew (2020). Evidence for intervention for SSD varies with many having been trialled on small groups or through single-case series. Whilst this evidence is still important as it provides the basis for a future trial, many interventions have not been tested beyond this. Nevertheless, a summary of the evidence behind interventions is provided in review papers (Baker & McLeod, 2011; Wren et al., 2018) and also in the What Works Database (<https://ican.org.uk/i-cans-talking-point/professionals/tct-resources/what-works-database/>).

This database is hosted by I CAN, the UK-based children's communication charity, and provides information on many interventions in use for children with SSD as well as other types of speech, language and communication needs. All those listed on the database have evidence which may be in the form of a small group study or a randomized controlled trial. In a few cases, systematic reviews of interventions are reported. Importantly, though, a high level of evidence should not be confused with confirmation of effectiveness. At least one intervention has had multiple systematic reviews, each reporting that there is insufficient evidence to confirm the effectiveness of the intervention approach.

SLPs also need to determine whether specific interventions are relevant for different languages. For example, while minimal pairs intervention is appropriate for use in many languages (e.g., Maltese, Spanish), it is not appropriate for use in others that contain very few minimal pairs (e.g., Icelandic) and needs to be modified in tone languages (e.g., Cantonese, Vietnamese) where tones as well as consonants and

vowels need to be matched when creating minimal pairs. In contrast, core vocabulary intervention can be applied to many languages (e.g., a child speaking isiXhosa and English; Pascoe et al., 2018).

Discussion

Provision of SLP services varies across the globe but some children are disadvantaged even when they live in countries with robust service provision. Those from non-dominant cultural and linguistic communities may be referred for assessment and therapy, but misdiagnosis is common. Over-identification and under-identification can result in incorrect assumptions that the problem is related to second (or third or more) language acquisition (Stow & Dodd, 2003). Some children are further disadvantaged as they are less likely to be referred in the first place; for example, Grech and Cheng (2010) found that forced migrants may not be aware of speech-language pathology services.

Diversity considerations in SLPs' clinical practice is also highlighted by Babatsouli (2021) who claimed that clinicians should strive for collaborative and culturally competent practices in order to offer equitable services while understanding better the context in which children with speech and language disorders live. A position paper, prepared by the International Expert Panel on Multilingual Children's Speech (2012; McLeod, Verdon et al., 2013) highlights the challenges that SLPs face when attempting to provide a service to children with SSD from different linguistic and cultural backgrounds. Recommendations are put forward to serve these children within the ICF-CY framework of the World Health Organization, bearing in mind personal and environmental factors.

When children live in low- and middle-income countries, the situation is even more concerning. Cheng and Levey (2016) report that the number of disabled children is expected to increase in the next decades, particularly in Majority World countries with basic health services, including speech-language pathology services. SLPs need to have realistic strategies that address the cultural and linguistic backgrounds of migrants and underserved populations. Such strategies need to be sustainable and reflect a holistic approach. Populations that are underserved need not come from contexts of war zones: China, with a population of around 1.4 billion, does not have a large number of SLPs and education and training programmes currently are limited to the larger cities. In such circumstances, children with SSD are likely not to be prioritized for direct face-to-face therapy. Hence, models of service have been reported that could be adopted to address the needs of children with SSD in these populations. Cheng and Levey (2016) present three different approaches that could be adopted in these circumstances. One of these refers to the training of local educators and practitioners by expatriate professionals. Various non-government organizations (NGOs) and charities exist that facilitate such services (e.g., Trinh Foundation working in Vietnam). Another model refers to capacity building and resources in the underserved or unserved contexts through networking and teaming SLPs from different parts of the globe with diverse service provision. The third model that was highlighted refers to how technology has served communities in rural areas remotely. More recently, an initiative of the IALP in collaboration with

Transforming Faces has linked SLPs from western countries to act as mentors to early stage SLPs working in countries where the service is still developing.

Resources for professionals

Resources for professionals can be found at the following sites:

- Child Speech Committee of the International Association of Communication Sciences and Disorders (IALP) has a section in their webpages of frequently-asked questions relating to SSD. <https://ialpasoc.info/committees/child-speech-committee/>
- UK Royal College of Speech and Language Therapists (RCSLT) provides information on SSD for parents. <https://www.rcslt.org/speech-and-language-therapy/clinical-information/speech-sound-disorders/>
- American Speech-Language Hearing Association (ASHA)
- Practice Portal: Provides information to facilitate SLPs' clinical decision making for children birth to school age with CLP; some information related to children with VPI <https://www.asha.org/Practice-Portal/Clinical-Topics/Cleft-Lip-and-Palate/>
- Evidence Map: Recommendations for SLPs for assessment and treatment of children with CLP or other craniofacial difference <https://www.asha.org/EvidenceMapLanding.aspx>
- I CAN: This children's communication charity has developed resources and information for parents of children with a range of speech, language and communication needs. www.ican.org.uk/i-cans-talking-point/parents
- I CAN What Works Database supports practitioners to deliver evidence-informed interventions and approaches to support children and young people with speech, language and communication needs <https://ican.org.uk/i-cans-talking-point/professionals/tct-resources/what-works-database/>
- Child Speech Disorder Research Network in the UK and Ireland aims to raise and maintain the profile of SSD in research. They have developed guidelines for transcription and analysis which can be downloaded for free. <https://www.nbt.nhs.uk/bristol-speech-language-therapy-research-unit/bsltru-research/child-speech-disorder-research-network>
- Speech-Language-Therapy hosted by Dr Caroline Bowen provides information and resources to Speech-Language Pathologists/Speech and Language Therapists (SLPs/SLTs), students, consumers of SLP/SLT services worldwide, and interested others www.speech-language-therapy.com
- Multilingual Children's Speech hosted by Charles Sturt University, Australia provides numerous resources for SLPs working with children in over 60 languages. <https://www.csu.edu.au/research/multilingual-speech/home>
- Speech Characteristics of Languages <http://www.csu.edu.au/research/multilingual-speech/languages>

- Multilingual Children's Speech Assessments
<http://www.csu.edu.au/research/multilingual-speech/speech-assessments>
- Intelligibility in Context Scale (ICS)
<http://www.csu.edu.au/research/multilingual-speech/ics>
- The Speech Participation and Activity Assessment of Children (SPAA-C)
<https://www.csu.edu.au/research/multilingual-speech/spaa-c>
- Summary of 250 cross-linguistic studies of speech acquisition www.csu.edu.au/research/multilingual-speech/speech-acquisition
- Trinh Foundation Australia includes resources developed by speech and language therapists in Australia and Viet Nam <https://trinhfoundation.org/our-resources/for-therapists/>

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11 Augmentative and Alternative Communication in Underserved or Unserved Populations

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Key information for regional and national governments

There is a crucial need for governments, nongovernmental organizations, service providers, and educators to identify persons with complex communication needs early in order to implement appropriate Augmentative and Alternative Communication (AAC) intervention. The purpose of this chapter is to inform governmental bodies, professional organizations, and health and educational service providers about the impact of AAC for persons with complex communication needs living in underserved and unserved communities. People with complex communication needs are those “*having limited or no access to functional verbal speech and are unable to use speech to meet their daily communication needs*” (Biggs, Carter, & Gilson, 2018, p.443).

AAC encompasses any form of communication used to supplement or replace oral speech when it is insufficient to meet communication needs (American Speech-Language-Hearing Association, 2015). The word ‘augmentative’ is important as it acknowledges that some persons require the use of supportive strategies to enhance their existing, partly functional, spoken communication abilities. Alternative communication refers to strategies that replace natural speech. Depending on the nature of the complex communication needs, AAC strategies can either augment communication abilities or provide an alternative method of communication.

Access to appropriate forms of AAC is critical in supporting communication and promoting the participation and inclusion of persons with severe communication disabilities (Beukelman & Light, 2020). AAC communication modes can include the use of external aids such as alphabet boards and picture communication boards, or technology-based aids that include speech-generating devices (SGDs), or unaided approaches (the use of gestures and manual sign language). The aim of all AAC strategies, techniques, symbols, and technologies is to maximize communication interaction and improve the participation of persons with complex communication needs in all aspects of life. AAC provides children with the right and the ability to express themselves and be heard as stated in Article 12 and 13 of the United Nations Convention on the Rights of the Child (UNCRC) (United Nations, 1989). This incorporates being listened to and having rights to freedom of expression that includes the expression of views and participation in decisions about their lives. According to International Classification