Measuring the endangerment of deaf community sign languages: Critical perspectives on methodologies and ideologies

by

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Abstract

Language endangerment and extinction are phenomena that affect millions of people across the world. However, since academics began acknowledging them about 100 years ago, by and large only spoken languages were considered. The notion of sign language endangerment was almost entirely absent. Addressing this gap, this synoptic commentary draws together four articles that examine the possible causes of sign languages' vigour and/or decline. The articles refer to these potential causes as 'factors', for example governmental policies, generational language use, and the community's attitudes toward their own sign language. This 'factor approach' is drawn from research into spoken languages. This synoptic commentary reflects on the implications of quantifying language vitality in this manner. It highlights the tension between the practical need to assess endangerment levels for policy advocacy and the dangers of oversimplifying or misunderstanding language vitality. The factor approach is explored in terms of how it has shaped the trajectory of research into sign language vitality. Its possible future is highlighted in view of the increased prevalence of artificial intelligence, which was not yet in common use when the papers were written. Overall, this PhD by Published Work has resulted in an original contribution to knowledge by showing for the first time how to adapt a model that was developed for spoken languages to assess the vitality of sign languages, and deploying new methodological innovations such as a system of averaged scores devised by an international committee with both deaf and hearing members. It also presents components of a deaf-centred approach to language vitality research in a theoretical model. Finally, the PhD gives the first peer-reviewed, published account of the utility of an interactive atlas for assessing sign language vitality.

1. Introduction

Thousands of human languages have disappeared since the 1500s (Krauss 1998). However, the notion of endangered languages being worthy of study only begins to appear in the academic literature about a century ago. Among the first to mention languages as being endangered is Bloomfield (1927), who remarks on the dwindling numbers of speakers of some Native American languages, and the risk of these languages being lost before they can be documented (Tsunoda 2006; Whaley 2014). Writing 20 years later, Swadesh (1948) is perhaps the first scholar to acknowledge the importance of researching language endangerment as a phenomenon. It gained more traction as a sub-field of (socio)linguistics in the 1970s when academics started considering endangered languages as 'a distinct linguistic group that prompted unique theoretical issues, required particular research methodologies [and] warranted specialized vocabulary' (Whaley 2014). Since then, studies in this sub-field have led to insights into why languages decline and what can be done to maintain and revitalise them. These findings have informed efforts to preserve the cultural knowledge that these languages encapsulate and to uphold the linguistic rights of their users. Work on measuring endangerment levels, a key component of these efforts, commenced in the early 1990s with Fishman's (1991) Graded Intergenerational Disruption Scale. In 2003, UNESCO introduced its own language vitality scale.

However, until the 2010s, such research focussed almost exclusively on spoken languages, and even in 2025, studies of sign language endangerment remain thin on the ground (e.g. Nonaka 2012; Braithwaite 2018; Bickford & McKay-Cody 2019; Snoddon & De Meulder 2020; Barberà et al. 2022). It is still largely unknown, for example, how many sign languages in the world are at risk of disappearing. This gap is exacerbated by sign language researchers' need to rely on theories and

tools based on spoken languages. Sometimes these are a poor fit for sign languages, while in other cases they can be adapted to try to make them suitable for sign languages.

This thesis fills some of these gaps in the literature by examining how we can measure sign language endangerment in order to inform language policy, and what effects such measuring can have. Sitting within the discipline of sign language (socio)linguistics, it is comprised of four peer-reviewed published papers on sign language endangerment and vitality dating from 2019 to 2024. This synoptic commentary gives an overview of each one and takes a critical, hindsight perspective on their methods, findings, significance and contribution to knowledge. The first and fourth papers, from 2019 and 2024 respectively, analyse sociolinguistic data, while the second and third, from 2020 and 2022, are more theoretical and cover the ideologies and attitudes that underpin research into sign language vitality. Taken as a whole, these papers represent a rigorous, critical investigation and evaluation of an under-researched topic. The field of language endangerment existed and evolved for a substantial period of time without its scholars ever collectively being aware of sign languages. This work thereby contributes to the scholarly consciousness that sign language endangerment is an urgent issue.

I was lead author on the first, second and fourth papers and sole author on the third paper. All four articles examine, to differing extents, the possible causes of sign languages' vigour and/or decline – referring to these potential causes as 'factors' (for example governmental policies, generational language use, and the community's attitudes toward their own sign language). This 'factor approach' is drawn from research into spoken languages, in particular the 2003 survey by UNESCO which led to its publication of the *Atlas of the World's Languages in Danger* (Moseley 2010). Underlining a theme tying all of the papers together, the commentary reflects on the implications of quantifying language vitality, highlighting the tension between the practical need to assess endangerment levels for policy advocacy and the dangers of oversimplifying or misunderstanding language vitality. The utility and efficacy of the factor approach is explored in terms of how it has shaped the trajectory of research into sign language vitality, and its potential future in view of artificial intelligence and big data. Most of my articles pre-date the widespread use of AI. The remarks made about AI and machine learning in this commentary are not in the original papers. Rather, they are part of the reflexive offering of this commentary, as are my hindsight critiques of the factor approach such as its limited ability to account for interdependencies among factors.

This thesis demonstrates my understanding of research methods appropriate to the field of sign language (socio)linguistics, and has resulted in a significant contribution to knowledge. It has shown for the first time how to adapt a model that was developed for spoken languages to assess the vitality of sign languages. The study has also used new methodological innovations such as a system of averaged scores devised by an international committee with both deaf and hearing members. It presents components of a deaf-centred approach to language vitality research in a theoretical model, and provides the first account in a peer-reviewed, published journal article of the utility of an interactive atlas for assessing sign language vitality.

2. Scoring sign language vitality (2019, *Language Documentation & Conservation*)

The first paper is 'Scoring sign language vitality: Adapting a spoken language survey to target the endangerment factors affecting sign languages', written with Josefina Safar as my co-author. It explores factors that may influence the vitality levels of sign languages, and how these levels were

assessed through an international collaboration led by the International Institute for Sign Languages and Deaf Studies (iSLanDS), using a systematic scoring scheme.

Various scales to measure language endangerment have been developed since the early 1990s. Some are 'positive', with higher ratings corresponding to more vitality, while others are 'negative', with higher levels meaning greater endangerment. Fishman's (1991) 8-level scale is of the latter type, with each successive level indicating less generational transmission and thus fewer young speakers (Lewis & Simons 2010). UNESCO's (2003) 6-level scale, on the other hand, is positive: languages with a score of 5 are safe and those with a score of 0 are extinct.

UNESCO's scale and its *Atlas of the World's Languages in Danger* (Moseley 2010) are among the main ways in which endangered languages have been catalogued and tracked. The *Atlas* contains information on thousands of endangered and extinct languages, showing the geographic location and vitality ranking for each one. UNESCO's 6-level system for rating vitality involves nine factors (see Table 1 below). The starting point for assessing each factor is the UNESCO Linguistic Vitality and Diversity survey, which provides a methodology for data collection. From 2002 and 2010, the survey was used to gather information on spoken languages. The initial group of experts who created the questionnaire did not include any sign language linguists. Like other frameworks for assessing language vitality, such as the aforementioned GIDS (Fishman 1991; Lewis & Simons 2010) and the Language Endangerment Index used in the Endangered Languages Catalogue (ELCat, see Lee & Van Way 2016), the focus was overwhelmingly on spoken languages. ELCat assesses vitality based on weighted scoring of four factors: transmission, absolute speaker numbers, increasing or decreasing speaker numbers, and usage domains. GIDS measures how 'disrupted' a language's transmission has been across generations, using a scale from 1 (least disruption) to 8 (most disruption). These tools implicitly assume spoken language as the default, and do not acknowledge sign languages. The linguists involved in designing them largely overlooked the fact that sign languages face distinct challenges, sociolinguistic dynamics, historical profiles and threat patterns. In most of the scholarly activity in the field of language vitality and endangerment, sign languages have simply not been considered in the core conceptual and methodological frameworks.

To address this, UNESCO's (2003) Linguistic Vitality and Diversity survey was adapted for sign languages in 2011 under the leadership of Professor Ulrike Zeshan at iSLanDS. This adaptation took into account the additional obstacles and unique characteristics that affect sign language communities, such as the fact that most deaf children have hearing, non-signing parents, and therefore transmission of sign languages takes place mostly in schools, not at home as is the case for spoken languages (Fenlon & Wilkinson 2015). Numerous peer reviewers around the world were invited to take part in the adaptation. The comparative lack of sociolinguistic research on sign languages made the process challenging; for instance, demographic statistics on sign language communities are scant, and there were disagreements among peer reviewers over what *sign language user* should mean and whether linguists or signers should fill in the survey, as there are few individuals who fall into both categories. The adaptation also had to account for the fact that some sign languages may have a double-minority status, being subject to influence from surrounding spoken languages as well as from more dominant sign languages. (In contrast, endangered spoken languages face threats only from other spoken languages.) This is especially so for village sign languages, which are small-scale linguistic isolates, commonly developing in rural communities with an unusually high incidence of hereditary deafness (Zeshan & De Vos 2012). For instance, Al-Sayyid Bedouin Sign Language is a village sign language in southern Israel whose signers are surrounded by not only spoken Hebrew and Arabic, but also Israeli Sign Language (Kisch 2012).

After the adaptation was completed, in 2012 the updated version was sent to linguists and deaf community leaders. A video in International Sign with a summary of the project and instructions on filling out the questionnaire were provided on the project website, to make the procedure accessible to deaf people for whom English was not a first language. More than a dozen experts from a range of countries, both deaf and hearing, submitted responses on their sign languages. A scoring committee was established to evaluate the questionnaires, with four deaf members and three hearing members, including myself. The participation of deaf people at all stages of the research – as peer reviewers, survey respondents, and scoring committee members – is rarely seen in linguistic studies and constitutes an important innovation.

From 2012 to 2014, I worked with the six other committee members (Kang-Suk Byun, Josefina Safar, Nick Palfreyman, Cesar Ernesto Escobedo Delgado, Anastasia Bradford, and Ulrike Zeshan) to systematically rate 15 of the sign languages for which respondents had submitted questionnaires. The existence of this scoring committee was innovative; no other studies to my knowledge have used a committee to score the endangerment levels of sign languages. The committee was also international, with its members being from Germany, Korea, Mexico, the USA, Austria, and the UK. Another innovation was that we communicated with the survey respondents during the scoring process, for example seeking clarification on or expansion of their answers. For the scoring scheme, the committee selected 10 factors, such as use of the language in education and media (see Table 1), that could each be rated on a scale of 0 to 5, with 5 reflecting the highest vitality. These numbers could then be added together and divided by 10 to reach an overall vitality score. This was the first time that this innovative methodology based on averages of numerical scores was applied. UNESCO's (2003) original survey, designed for spoken languages, includes 9 factors which are scored individually and evaluated qualitatively, but not averaged.

Table 1: Factors in original UNESCO survey and adapted survey for sign languages (from Webster & Safar 2019)

Factor #	Original UNESCO questionnaire	Questionnaire adapted for sign languages
1	Intergenerational language transmission	Proportion of signers in the reference community
2	Absolute number of speakers	Generational or age group language use
3	Proportion of speakers within the total population	Domains of language use
4	Shifts in domains of language use	New domains
5	Response to new domains and media	Materials for language spread and education
6	Availability of materials for language education and literacy	Governmental and institutional language attitudes and policies
7	Governmental and institutional language attitudes and policies, including official status and use	Use of the target sign language in deaf education
8	Community members attitudes towards their own language	
9	Type and quality of documentation	
10		Status of language programmes

After this process was complete, as shown in Table 2 three of the languages received a score of 1 (critically endangered) and four each were scored as 2 (severely endangered), 3 (definitely endangered), and 4 (unsafe/vulnerable). None received a score of 0 (extinct) or 5 (safe). The major factors threatening their vitality (which are explored further in Webster & Safar 2020) included a lack of supportive policies and the often indifferent or negative attitudes of governments and policy-makers. The study finds that some of the factors threaten small-scale 'village' sign languages (Zeshan & De Vos 2012) more than larger or national sign languages – an example is marriage patterns. On the other hand, the increase in cochlear implantation is a factor that threatens national sign languages more than village sign languages.

Table 2: Results from the sign language survey, with village sign languages in bold (from Webster & Safar 2019)

Name of Sign Language	Name of Contributor	Approximate Number of Users	Country	Level of Vitality
Algerian Jewish Sign Language (AJSL)	**Sara Lanesman and Irit Meir**	**50–100**	**Israel**	**1**
Alipur Sign Language (APSL)	**Sibaji Panda**	**10,000**	**India**	**3**
Al-Sayyid Bedouin Sign Language (ABSL)	**Shifra Kisch**	**1,500**	**Israel**	**3**
Austrian Sign Language (ÖGS)	Austrian Deaf Association (ÖGLB)	20,000	Austria	4
Ban Khor Sign Language (BKSL)	**Angela Nonaka**	**403**	**Thailand**	**2**
Brazilian Sign Language (Libras)	Ronice Müller de Quadros	Unknown	Brazil	4
Chican Sign Language (ChicanSL)	**Cesar Ernesto Escobedo Delgado and Olivier Le Guen**	**349 (17 deaf, 332 hearing)**	**Mexico**	**2**
Danish Sign Language (DTS)	Danish Deaf Association	4–5,000	Denmark	4
Ethiopian Sign Language (EthSL)	Eyasu H. Tamene	70,000	Ethiopia	3
Finland-Swedish Sign Language (FinSSL)	Karin Hoyer and Janne Kankkonen	300	Finland	2
Inuit Sign Language	Joke Schuit	40	Canada	1
Kata Kolok	**Connie de Vos**	**1,250**	**Indonesia**	**3**
Mardin Sign Language (MarSL)	**Hasan Dikyuva**	**40**	**Turkey**	**1**
New Zealand Sign Language (NZSL)	Rachel McKee	24,000	New Zealand	4
Yucatec Maya Sign Language (YMSL) – Nohkop variety	**Olivier Le Guen**	**34**	**Mexico**	**2**

The article goes significantly beyond the state of the art by showing that it is possible to adapt models that have been developed for spoken languages in order to assess and map the vitality level of sign languages. The paper outlines some features of sign languages that must be reflected on when adapting such a model. The article also describes for the first time the development of a factor-based scoring process for sign languages, and how the survey adaptation fed into this. There were often considerable differences between the spoken language and sign language factors, with some of

the former not meaningful for sign languages. These differences had been mostly ignored in the scholarly literature. A rating for the factor 'intergenerational transmission' is not meaningful for sign languages because only a small fraction of signers learn the language from their parents. Reliable data on the 'absolute number' of language users is usually not available for sign languages, and would not be very meaningful either as deaf people are always in a minority regardless of whether they use a large national or small-scale village sign language. A more meaningful metric is the *relative* number of signers in the reference community. On the other hand, the use of the language in education is much more important for sign languages than spoken languages, since most people acquire sign language at school instead of at home. So in the sign language survey, 'use of the target sign language in deaf education' is a distinct factor, whereas education in the spoken language survey is subsumed into factors relating to government policies and literacy materials. This was debated further by several survey respondents. They pointed out that formal education does not exist at all for deaf people in some locations, especially in village signing communities, making it potentially problematic to include 'use of the target sign language in deaf education' as one of the factors. Therefore, where this was the case, this factor was marked as not applicable and excluded from the average (meaning the total for all factors was divided by 9 instead of 10).

This was the first-ever attempt to score sign language vitality and extend UNESCO's atlas of endangered languages to cover signed languages as well as spoken languages. The significance of this for the field of linguistics and sub-field of language endangerment is substantial, as it brought sign languages to the attention of endangered language scholars for the first time. The linguists involved in the UNESCO committee in the early 2000s had little if any awareness of endangered sign languages. It is also one of the few examples of sign language research influencing spoken language research, leading to UNESCO revising their approach and releasing two separate surveys in 2018 – one for spoken languages and one for sign languages. Webster and Safar (2019) was published in a *Language Documentation & Conservation* which has an impact factor of 0.5. The paper is cited in Moriarty (2020), Jaraisy and Stamp (2022), Nemes (2024), Raz (2024), Horton and Waller (2024), Jokinen et al. (2024), and Surjo Prasodjo et al. (2024), among others. Two of these papers are about spoken languages (Nemes 2024 is about Berrichon, and Raz 2024 is about Anishinaabe, Lunaapeew and Hebrew), showing the significance of Webster and Safar (2019) for linguistics more broadly. It remains one of the few articles in the literature to demonstrate that including sign languages in research and policies on endangered minority languages is not just an additional feature, but rather an essential part of linguistics.

Making visible the endangerment status of sign languages helps to promote their legal recognition and the creation of policies to improve communication access for deaf people and protect their rights. The factor approach distils the complexity of linguistic vitality into a structured framework, quantifying endangerment as a score based on predetermined factors. The accessibility and transparency of this approach are high. It offers pragmatic benefits such as standardisation and comparability, which are advantageous for policy-making and advocacy. Numerical assessments offer a compelling way to communicate the urgency of language endangerment to policy-makers and funding bodies. These strengths of the approach apply to both signed and spoken languages, but may behove the former even more. This is because the study and official recognition of sign languages are more recent, and sign language users are far less likely to have opportunities to learn the language within the family home (De Meulder, Murray & McKee 2019), making it necessary for the gap to be filled by governments, who require evidence to direct resources and policies toward endangered sign languages. Webster and Safar (2019) provides a framework of 10 specific factors for identifying and comparing sign language vitality across different communities, presenting endangerment levels for 15 sign languages as exemplars. This framework facilitated efforts to bring

linguistic vitality into the realm of measurable and actionable data, empowering stakeholders to advocate for endangered languages more effectively. This systematic scoring contributed to one of the 15 languages, Finland-Swedish Sign Language, being recognised by the Finnish government in 2015 (De Meulder 2017: 197). Lhasa Tibetan Sign Language was scored by another researcher using this method, resulting in a level between 'severely' and 'definitely' endangered (Hofer 2017). As of 2025, scoring committee member Dr Kang-Suk Byun and one of his students are using the method to determine the vitality level of South Korean Sign Language (personal communication).

The standardisation and comparability fostered by vitality ratings even allows these scores to enhance controls in linguistic studies, as shown by Koplenig and Wolfer (2023) for spoken languages. They use languages' vitality scores on the Expanded Graded Intergenerational Disruption Scale (EGIDS, Lewis & Simons 2010; see also Bickford, Lewis & Simons 2015) to control for possible effects arising from translation processes,

> as languages with lower EGIDS levels could be more likely to be used as source languages, while languages with higher EGIDS levels could be more likely to be used as target languages. For example, an EGIDS level of 0 (labelled 'International') pertains to the six official United Nations languages: Arabic, Chinese, English, French, Russian, and Spanish. On the other hand, languages with values of five and above pertain to languages that are not used in formal education, mass media or by the government, and they may consequently be more susceptible to (more) pronounced 'translationese' influences.
>
> (Koplenig & Wolfer 2023: 11)

However, while the factor approach provides a practical tool for identifying and comparing language vitality, it is a somewhat inflexible method and risks reducing the rich complexities of linguistic and cultural realities to mere numerical scores. There is the potential that diachronic changes will be overlooked and once a vitality score has been calculated, it will not be revised. And there is a tension between practicality and accuracy. While average scores for factors, such as use of the language in education and media domains, provide a snapshot of a language's status, they often fail to account for the interdependencies among factors. This interplay can have compounded effects on linguistic vitality; for instance, positive community attitudes can be amplified by proactive governmental support, such as funding for language education and the recognition of cultural heritage (e.g. Grinevald & Pivot 2013). This creates a complex ecosystem that cannot be fully captured through isolated numerical scores. This consideration became apparent when assessing the ideologies behind scoring endangerment factors, which was the focus of the second paper.

3. Ideologies behind the scoring of factors to rate sign language vitality (2020, *Language & Communication*)

The second paper applies theoretical perspectives to the scoring system described in the first paper by examining its underlying ideologies as well as those of a sign language survey released by UNESCO in 2018. 'Ideologies behind the scoring of factors to rate sign language vitality' (Webster & Safar 2020) was published in a special issue of the journal *Language & Communication* (impact factor 1.4) entitled *Ideologies in Sign Language Vitality and Revitalisation*, edited by Maartje De Meulder and Kristin Snoddon.

The paper is the first and to date only academic article that analyses the ideologies behind scoring levels of vitality for sign languages, a process that is itself rare in the literature. It has been cited by other sign language linguists including Jaraisy and Stamp (2022), Tay and Ng (2022), Jokinen et al.

(2024), Moriarty et al. (2024), Horton and Waller (2024), and West and Dettman (2025), as well as spoken language linguists such as Prawira, Khadafi and Danugroho (2025), writing about Osing in Indonesia; and Villamin de Roxas et al. (2025) on Bugkalot in the Philippines. This text has a more theoretical character than the first article, examining how discourse about sign language vitality often likens it to biodiversity – the idea being that speakers have the right to defend and preserve their languages as they would a species of plant or animal in the natural world (cf. Heller & Duchêne 2008). Such an ideology sometimes works to centralise the language itself instead of its user community. It is somewhat flawed in its logic, because animals and plants can exist without humans, but human languages cannot. The results of this flaw are seen for instance when governments 'recognise' a particular language without actually facilitating the language acquisition rights of its users. Such rights are essential for the government to uphold for deaf communities because so few deaf people have parents who sign.

This paper considers from an ideological perspective three factors from Webster and Safar (2019) that were among the most hotly debated by the survey respondents – generational language use, government policies, and the community's attitudes toward their own sign language. The latter is noted as being perhaps the most interesting and controversial: users' own attitudes and linguistic practices may not involve engagement with the same kinds of metalinguistic reflections that linguists do. This poses a problem when researchers frame sign languages within endangerment ideologies and yet aspire to represent the perspectives of sign language users in their research. Their perceptions of 'language' can be quite different to each other.

Several aspects of UNESCO's 2018 survey are also scrutinised in this paper. First, it is available only in spoken languages (English, French, Russian and Spanish) and not in any sign language, making it inaccessible to deaf signers who do not use one of these spoken languages. Second, in the hierarchical structure of its questions, the survey often appears to place economics above nature, international above local, and institutions over home life, reflecting globalist ideologies. These are defined by Steger (2023) as a set of beliefs based on the notion that worldwide economic integration, driven by free market capitalism, is a natural and inevitable process which benefits all humans. Third, the survey casts sign languages as if each one is a fixed entity separate from others, like a species of plant, rather than as e.g. a dynamic and flexible human practice (Moriarty 2020). Understanding sign languages as discrete, static entities with binary classifications (for instance, a classification of being either recognised by government or not recognised by government) makes it easier to collect data in a standardised way for comparison, but obscures longitudinal development, the fluidity of real-life communication, and the grey areas between options presented as mutually exclusive, such as 'Is the language legally/officially recognised or not recognised?' (a language may be mentioned in disability rights legislation but not explicitly protected by any law, and/or might be 'recognised' tokenistically without bestowing any language rights on users, see De Meulder et al. 2019).

This was the first time that this new survey on sign languages had been discussed in a journal article. The survey itself was the first one for sign languages to be released alongside a spoken language survey, meaning that UNESCO had taken the unprecedented step of putting sign languages on a par with spoken languages. But because the sign language survey is not available in any sign language, only in spoken languages, there is still an imbalance that disadvantages sign language users, and an opportunity is missed which would have increased the visibility of sign languages. This is discussed further in the third paper.

The findings in Webster and Safar (2020) include that the quantitative method could be improved by giving the factors various weights to reflect their differing contributions to endangerment. For

instance, generational language use could be weighted more heavily than government policies. However, this quantitative data collection should be used only as a starting point. Mixed-methods assessments with robust qualitative aspects that take account of the language users' own perspectives need to be applied in order to triangulate the quantitative findings from the survey and scoring (McKee 2017). The paper also concludes that there are problems with framing sign languages within endangerment ideologies and relying on academic perceptions of 'language' that differ from the beliefs of language communities themselves. The 2018 UNESCO survey on sign languages is deemed highly valuable for the purposes of comparability and awareness raising, and the paper suggests boosting its utility further via more active facilitation of signers' involvement, greater focus on their language beliefs and practices, and less emphasis on the notion of languages as bounded entities.

Framing sign languages as species-like, bounded entities (instead of continuous and flexible human activities, for instance) goes hand-in-hand with scoring and enumerating them. While this is advantageous for transparency and comparability, and convenient for quantitative data analysis and digitalisation, it may also lead to an oversimplification of what it means to use a language. According to Sallabank (2024: 8), enumeration 'reflect[s] the fascination of Western positivist science for categorisation, and the resulting overviews and comparisons are mainly useful to academia', and 'language planners find it more useful to have specific, bounded entities on which to base policies'. Such overapplication of the categorisation paradigm can in itself pose a threat to language vitality, for example if a language is shown to be critically endangered and a government then decides it must be too weak to be worth investing any resources in it. Positioning linguistic vitality as an enumerable phenomenon carries even greater risk in the age of AI (Gammelgaard et al. 2023). Since the popularisation of generative AI beginning in 2023, its trademark numbered and bulleted lists with bold headings have become ubiquitous. The prototypical listing of individual factors by large language models (including in internet search results), usually has little synthesis or indication of how the factors overlap, combine, interact or occur in either temporal or priority order.

To illustrate the potential issues with this way of thinking, it is worth considering other disciplines beyond linguistics where factor analysis has been critiqued. Studies focussing on the effect of factors in combination or sequence with other factors are seen in, for instance, transport (Carrodano 2024; Wu, Dong & Li 2025) and health (Parke, Eschle & Keatley 2024). Looking at road safety, Carrodano (2024: 1) points out that risk-assessing factors separately does not account for 'the complex dynamics of real-world analysis, in which multiple factors interact through nonlinear relationships' and 'the complex interdependencies among various risk factors and their cumulative impact'. She finds that two risk factors have different effects when considered individually versus in combination; for example, the combination of fatigue with snowy roads has an amplified effect on the risk level that is greater than simply adding the two individual risks together. Wu, Dong and Li (2025) study how 80 accidents on the metro in 18 provinces of China have resulted from temporal sequences of risks, with the most severe accidents being caused by one of two risk chains, which they call environmental-equipment-management and management-environmental-equipment-operational. They suggest that disrupting these risk chains can prevent accidents. Turning to health research, Parke, Eschle and Keatley (2024) find that the sequencing of factors is important in supporting or undermining a person's persistence with a weight loss plan. When a person believes a loss of dietary restraint to be normal and expected (versus a personal failing), they feel neutral and flexible around highly palatable foods. As a consequence, where they experience a lapse in restraint, they still tend to continue with their weight loss efforts. People who believe a loss of restraint is a personal failing feel anxious around highly palatable foods, which results in any dietary lapses provoking them to abandon their weight loss efforts.

Likewise, there is the potential for particular series and combinations of factors to more significantly affect languages, exceeding the sum of their parts. Rowley and Cormier (2023) propose that signers' negative attitudes toward lexical changes in British Sign Language are closely tied to their perceptions of external factors threatening the language such as shifts in educational policies and advice given to parents of deaf children:

> Older signers tend to dislike new signs such as 'sleep' and 'explain' when there are other signs to depict those concepts that already exist. Their dislike of new signs and preference for traditional signs seems to be related to their fear of BSL being endangered due to factors beyond the deaf community's control [...] The deaf community seem genuinely concerned about the vitality of BSL.
>
> (Rowley & Cormier 2023: 30)

Some factors may push against each other. For spoken languages, having higher numbers of speakers is correlated with a language being harder to learn (Koplenig & Wolfer 2023). Depending on the language and its context, a particular factor can have an outsized effect on vitality. Afolabi and Igboanusi (2024), who used the 2003 UNESCO framework, argue this is the case for the Nigerian language Yorùbá when it comes to the domain of radio. Its dwindling use in broadcast radio and replacement with English puts Yorùbá at risk, even though like Hausa and Igbo it is constitutionally recognised and a major indigenous language. On the other hand, some minority languages are found to be thriving overall despite low scores on some of the UNESCO factors. Despite having little in the way of orthography, supportive policy or documentation, the Dapeng dialect is still vibrant in China in part because of the community's 'loyalty to their mother tongue' (Chen 2023: 14):

> all individuals express[ed] their unreserved commitment to the maintenance of the local dialect. Irrespective of age, all interviewees emphasized that they had had or would have their children speak the Dapeng dialect. Some even went to the extent of stating, "One has to know how to speak the local dialect in order to qualify as a Dapenger."

This underlines again the schism that often exists between language users and the 'experts' involved in research and policy-making. No scholar had previously published a paper on ideologies in the context of measuring sign language vitality. Having noticed while examining the 2018 UNESCO survey the ideological influence that such large institutions wield over the way language vitality is measured and perceived, I made this the focus of the next paper.

4. Mitigating institutional attitudes toward sign languages (2022, *Journal of Deaf Studies and Deaf Education*)

The third paper is 'Mitigating institutional attitudes toward sign languages: A model for language vitality surveys' (Webster 2022), published in the *Journal of Deaf Studies and Deaf Education* (impact factor 2.0). It argues that UNESCO's publication of a sign language survey alongside a spoken language survey for the first time in 2018, while being already a very positive development, could generate further benefit by giving signers access to the questions in sign language and helping them contemplate what they could do to protect their sign languages. The paper takes a critical look at aspects of vitality surveys that had not been explored before: the self-reinforcing nature of institutional attitudes and means of representing the views of language users, as well as the tokenistic nature of language data. For instance, one of the reasons why surveys are done, and why they are worthwhile beyond the field of language research, is that they give language communities empirical data to take to policy-makers and funding bodies to lobby for revitalisation measures.

However, by denying these language users access to the very survey that could help their efforts, institutions may be unwittingly reinforcing their disadvantage. The survey reflects a supranational institutional lens that magnifies economic functionality. It had few questions or options that mention local culture or nature, and does not highlight the influences of the surrounding natural environment on signers' language use (cf. Zeshan & De Vos, 2012). UNESCO's discourse imparts the idea that sign languages are artifacts of heritage and nationality without considering deaf people's multi-level fight for recognition of their communication needs locally, regionally, nationally and globally (Parks 2015; UNESCO 2019).

The paper proposes a model to help institutions mitigate this tendency and improve their chances of achieving the admirable goals of the survey designers (see Figure 1). The model carries the position that efforts to treat languages equally and empower signers should ideally be at the heart of sign language research (World Federation of the Deaf & Finnish Association of the Deaf 2015), the spirit of which is largely in line with the ethos of institutions and organizations that endeavour to collect data on language vitality such as UNESCO. Based on work in the previous two papers and aimed at enabling deaf communities to have a greater impact on sign language policy, this model makes an original contribution to knowledge by outlining three main criticisms of sign language vitality surveys, proposing how to address them, and suggesting what outcome this might have. In particular, to address the issue of not representing language users, the institution can adopt a critical perspective toward the power differential and biases toward economic aspects. It could make efforts to engage signers by including questions about their cultural identification with the language and its emotional value, day-to-day utility, and informal efforts to teach the language. The problem of institutional attitudes being self-reinforcing can be addressed by making the survey accessible to signers, which can result in greater empowerment for their language community. The issue of language data being tokenistic can be mitigated by making surveys tactical, i.e. including strategies and tactics that signers can deploy to strengthen their language. It is hoped that this original model will have an impact on charities and policy-makers outside of academia, providing a counterbalance to institutions' and authorities' increasing propensity to opt for top-down, easy-to-automate methods of data collection that flatten nuance and neglect minority or unexpected traits (Webster forthcoming).

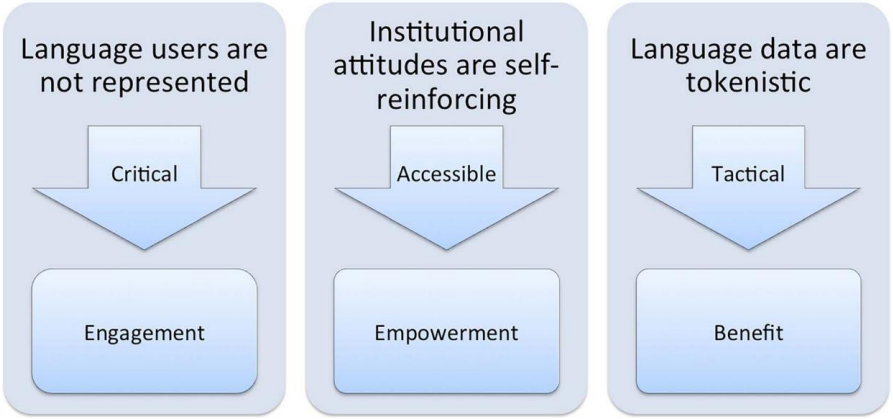


Figure 1: A conceptual model for institutions carrying out sign language surveys (from Webster 2022)

Since the paper was published in 2022, it has been cited by Ravinder et al. (2023), Nemes (2024), Ntelu et al. (2025) and others. As governments and institutions are in ever-greater thrall to

technology companies (Zuboff 2019), prompting them toward more and more digitalisation, quantification, automation, and application of AI tools (e.g. UK National Audit Office 2025), this distances institutions even further from signers and users of other minority languages (Weidinger et al. 2021). In studies of spoken language endangerment, too, globalist ideologies as defined above are found to be problematic for minority language communities. Coluzzi (2017) suggests that minority languages' chances of survival could be improved by preserving the local thinking and values of their speakers as a way to push back against globalisation. Digital automation, big data and AI present both opportunities and challenges for the factor approach to linguistic vitality. On one hand, digital tools can streamline data collection, analysis and longitudinal monitoring of language vitality. On the other hand, the reliance on algorithms and automated systems raises concerns about the reinforcement of biases toward quantifiable metrics and institution-led policies which interpret a language as a singular, bounded entity. Such ideologies also contribute to top-down language instruction policies that are at odds with internal linguistic diversity and community needs (Formato & Cordiero 2025). This leads us away from qualitative insights into the language usage, expertise and attitudes of signers and speakers.

UN agencies and supranational bodies significantly shape the discourse around endangered languages, but their involvement introduces regulatory capture (Stigler 1971) and the uneven application of AI tools. International agencies focus on cost-saving measures, prioritising the implementation of technological 'solutions'. This encourages an overzealous application of AI and digital automation, where the goal is to streamline processes rather than to engage meaningfully, and this can be detrimental to marginalised language communities with linguistic and cultural traits and needs that are outside the norm (Dickinson & Yates 2021). Institutions are at risk of inadvertently starting to favour an AI tool's decisions over a human's (Gendron, Andrew & Cooper 2022; Giray 2024). When humans are acting as part of larger institutions, they tend to apply automation and AI tools in ill-considered ways. This has emerged in government inquiries in the UK (Marshall 2022), Australia (Rinta-Kahila et al. 2023) and the Netherlands (Zajko 2023) into scandals that had devastating impacts on innocent citizens when institutions deployed algorithmic systems disproportionately and illegally, without sufficient human oversight. People who are already marginalised, such as sign language users, are more likely to suffer from institutional overreliance on AI tools. This is because these people more frequently have characteristics that are outside what the system is coded or trained to expect (Webster forthcoming). The lack of transparency in how these technologies are implemented can further alienate the users of small-scale and endangered languages, making advocacy and policy engagement more difficult, and impeding research co-production (Webster & Westaway forthcoming). Communities experiencing digital poverty or otherwise having little online presence are particularly likely to be excluded.

Machine learning models rely on large, structured datasets, which are feasible for dominant language varieties but much less so for regional dialects and minority or oppressed languages, especially sign languages. There may be a circuitous reinforcement of factors that can be studied through quantitative means, because of AI being more suited to analysing aspects like speaker numbers and digital representations of language use (cf. Gammelgard et al. 2023), increasing the emphasis on data-driven approaches and favouring numbers over kinaesthetic, emotional and cultural experiences. Striking a balance between computational efficiency and human interpretative depth is crucial for ensuring that endangered languages are assessed holistically. My model is therefore a good addition to the conceptual landscape, because it disrupts this cycle by centralising language users' engagement, empowerment and benefit. This integrates deaf-led and humanities-relevant approaches, encompassing aspects like the use of sign language folklore narratives to resist oppression and increase intercultural understanding (Byun & Kim 2025).

More concerning still, algorithm-driven homogenisation, powered by techno-globalist ideologies, could speed up the loss of indigenous and minority languages. This is already evidenced for some spoken languages. The encroachment of English into language policy has caused the endangerment of indigenous languages in Bangladesh, for example (Ahmed 2025), where:

> the nation-building project has been influenced by societal changes and the USA- and UK-led economic and cultural globalization in which the English language is both a means and an end. While Bangla has remained as the language of emotional attachment to the country and its past, English has become the language of social mobility and cultural citizenship for joining an expanding class of global elite […] Despite initial resistance to English in the years after independence, language education policies in Bangladesh have embraced and strongly promoted English-medium education. Its main tool to distract people's attention has been the argument for developing human capital and participating in the economic globalization. […] In this situation, the policy distractions utilize a rhetoric of economic opportunities that obscures what lies beneath the surface, i.e. the marginalization of Indigenous people and their languages and cultural practices.
>
> (Ahmed 2025: 299–300)

Erdocia, Schneider and Migge (2025) go even further, raising the prospect of all human language becoming endangered due to the rise of machine-generated language which can be produced exponentially faster than human language. The majority of internet traffic is already being produced by bots instead of humans (Ahmed et al. 2024). It remains to be seen what impact this will have on sign languages specifically. At present there are no credible large language models that can generate sign language directly. There are, however, AI-based sign language *translation* tools, such as Signapse (2025), which aims to translate very small amounts of written text into British Sign Language or American Sign Language. It is likely that investments in technology will focus mostly on these and other national sign languages, further weakening the vitality of small-scale, endangered sign languages. This in turn diminishes the scope and vitality of human knowledge:

> We often frame the loss of Indigenous knowledge as a tragedy only for the local communities who hold it. But ultimately, the loss is not just theirs to bear, but belongs to the world at large. The disappearance of local knowledge is not a trivial loss. It is a disruption to the larger web of understanding that sustains both human and ecological wellbeing. Just as biological species have evolved to thrive in specific local environments, human knowledge systems are adapted to the particularities of place. When these systems are disrupted, the consequences can ripple far beyond their point of origin.
>
> (Varuvel Dennison 2025)

Using technology to engage sign language users, researchers and advocates can be a way to push back against the encroaching loss of small-scale sign languages. Such efforts include an interactive online atlas, which became the focus of my fourth paper.

5. Sign Hub data and interactive atlas (2024, *Journal of Linguistic Geography*)

The final paper is 'Sign language vitality through the lens of a pioneering interactive Atlas: A first look at the sociolinguistic profile data collected by the Sign Hub project' (Webster & Hosemann 2024) in the *Journal of Linguistic Geography* (impact factor 0.6). This paper evaluates a set of sociolinguistic data gathered as part of the Sign Hub subproject ATLAS (Hosemann & Steinbach 2023), which was led by my co-author and aimed at creating an interactive online tool enabling researchers, teachers and interpreters to compare sign languages' sociolinguistic, grammatical, lexical and phonological

features. In 2022, the Sign Hub team generously provided me with a first look at some of the socio-historical data that had been submitted to the subproject. The paper presents my analysis of the linguistic vitality of the 10 sign languages within this first batch of data. My findings are that nearly all of them have been subjected to oppression; their documentation is limited; their vitality is supported by good awareness among the hearing community and use within educational institutions, national deaf associations and local deaf clubs; and they are threatened by the low provision of sign language media and interpreter training. The paper concludes that the Atlas has considerable utility in research on sign language vitality, which may be augmented by adding further diachronic components, echoing the assertions in Webster and Safar (2019) about the value of tracking endangerment status over time.

This is the first paper written about the interactive Atlas generated by the Sign Hub project. This Atlas is the first time that data on sign languages has been put into an interactive map which permits comparisons of their linguistic structures and grammatical and socio-historical features. It allows users to quickly search for and identify e.g. all of the inputted sign languages that use the eye squint as a non-manual marker for yes/no questions. The paper makes an original contribution to knowledge because it provides an analysis of the first set of socio-historical data provided to the project, as well as the first account in a peer-reviewed, published journal article of the Atlas's utility in assessing sign language vitality.

My analysis of the answers in the three sections of the Sign Hub survey that are most relevant to vitality – history, community, and status – indicates that nearly all of the sign languages and deaf communities represented in the data have experienced oppression, and the recorded knowledge and research on them has quite limited time depth (less than 70 years). Indeed, few of the respondents were able to draw on documented analyses for their answers, and most had to rely on personal estimation for the majority of the questions. A reasonable level of awareness among the hearing community was reported for most of the languages, as well as use within educational institutions, national deaf associations, and local deaf clubs. These factors all support sign language vitality. However, vitality was dampened by the low availability of interpreter training and access to media in sign languages. The analysis revealed the existence of multiple dialects for most sign languages, painting a picture of complexity that makes the lack of training for interpreters pointedly problematic. This raises further questions about the tendency among governments and researchers to treat sign languages as singular, clearly-bounded entities.

The paper notes that the creation of the Atlas has also supported sign language vitality by bolstering engagement and knowledge transfer with and among signing communities, equipping them with the evidence that they need to advocate for their linguistic rights (cf. Webster & Safar 2020; Webster 2022). The collection of data on these languages, though, was and is very difficult. Since the paper was written, the problem of insufficient data has become more marked, for both signed and spoken languages – while the array of technologies that can support powerful data analysis and public engagement for language vitality research continues to grow significantly, the amount of data available to analyse has stayed very small, and gathering it remains challenging. This severe lack of data on languages makes it difficult to assess the various endangerment factors and formulate a meaningful vitality score (Sallabank 2024):

> all [language endangerment/vitality] scales and catalogues are only as reliable as the data they have available. Both UNESCO's online Atlas and Ethnologue [Eberhard, Simons & Fennig 2021] provide opportunities for users to update them, but the most common response among linguists is that while they are useful for an overall comparative perspective, the information

> for particular languages is inaccurate or out of date. All such indices are bedeviled by a lack of reliable and comparable data on which to base their assessments.
>
> (Sallabank 2024: 7)

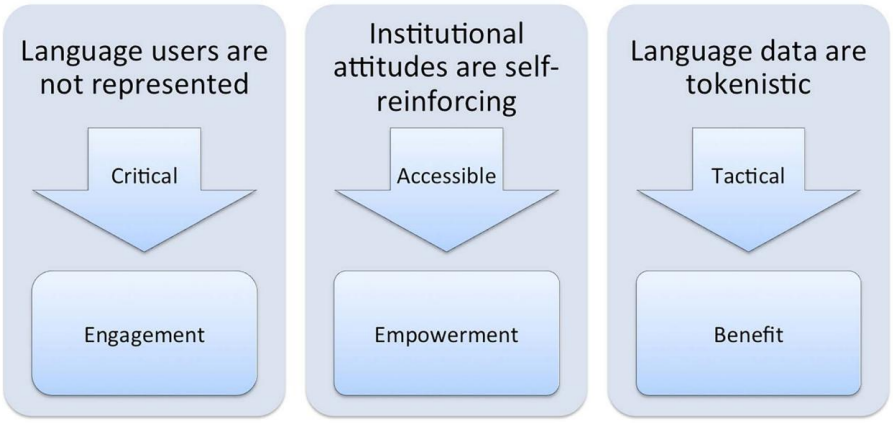
Sallabank is not referring here to sign languages specifically, but her point is even more pertinent for them, because sign language research began fairly recently. It still involves just a small group of scholars, a tiny proportion of whom are deaf signers themselves (Bahan, Padden, Supalla & Wallin 2024). This lack of current data, and the general intractability of digital information (Snowden 2019), means that a particular score given to a language may persist in the public domain long after the language has become either weaker or stronger. Put together with the points made above about enumeration and digitalisation, this could create a feedback loop as shown in Table 3.

Table 3: Feedback loop of digitalisation, enumeration and fragmentation in the study of sign language vitality

Digitalisation and use of automated tracking tools, dashboards, and databases, combined with the difficulty and expense of collecting qualitative data, creates a preference for enumeration and scalable metrics over nuanced insight.
⬇
Threats and individual languages are assessed in isolation, 'rather than in diverse, multilingual contexts or in ecosystems' (Sallabank 2024: 7), increasing fragmentation and reducing complexity to tickboxes and numeric fields.
⬇
Synergies and interactions among factors are overlooked, e.g. educational access + geographic isolation. Combinations that accelerate or mitigate endangerment may be missed.
⬇
Languages are categorised in fixed states (e.g. 'severely endangered') without capturing momentum or change, lacking historical trajectory or emergent resilience.
⬇
Visibility, policy interventions and funding are guided by narrow, simplified indicators, failing to allow for e.g. a language with a small number of users who exhibit strong cultural practices that sustain its use.
⬇
Local community perspectives may be marginalised and personal expertise excluded from assessment models. Preoccupation with institutional oversight squanders opportunities for grassroots empowerment.
⬇
Digitalisation and use of automated tracking tools, dashboards, and databases… (the cycle repeats)

Breaking this loop is likely to require engagement with human-led, human-centred research that is inherently complex, time-consuming and expensive – anathema to many institutions and governments in the present climate. For deaf signers working with hearing scholars who do not sign, interpreters are often required, making human-led sign language vitality research more resource-intensive than spoken language vitality research. At the same time, the smaller numbers of sign language users compared to spoken language users make sign language revitalisation less lucrative for technology firms and less appealing to the governments that serve the interests of technology

firms (cf. Metcalf 2025). This is why the conceptual model in Figure 1 (from Webster 2022, reproduced again below for convenience) is valuable; its principles are incompatible with techno-solutionism in endangered language research, fostering human engagement and real-life benefit to language users.



6. Conclusion

This synoptic commentary has discussed four papers on sign language vitality that represent a rigorous, critical investigation of a topic that has been rarely touched on in the field of linguistics, where the study of endangered languages proceeded for many years without including sign languages. The contribution to knowledge of these articles include a first-time explanation of how to adapt a model that was developed for spoken languages to assess the vitality of sign languages, an innovative system of averaged scores devised by an international committee with both deaf and hearing members, an original theoretical model for language vitality research, and analysis of a new interactive atlas in the context of assessing sign language vitality. The first paper explored factors affecting the endangerment of sign languages, and how their vitality levels were assessed through an international collaboration using a systematic scoring scheme. The second paper critiqued the beliefs and assumptions that underpin the ten factors identified in the first study, revealing how biases stemming from dominant language ideologies can distort our understanding of what constitutes language vitality. With ever-increasing automation and the application of AI tools, algorithms may reinforce existing biases by prioritising quantifiable data over nuanced narratives. The third paper shed light on how institutional priorities shape the implementation of the factor approach, dictating which languages are monitored and how they are assessed, thereby influencing the trajectory of linguistic vitality research. Standardised metrics, while practical for broad applications, can mask the interplay between different factors. As digital platforms increasingly dominate language data collection, the risk of misrepresenting linguistic diversity becomes more pronounced. While these platforms democratise access to information, they also exemplify the trend of quantifying linguistic diversity through digital tagging and enumeration. The interactive online resource discussed in the fourth paper highlights this duality: it empowers communities to advocate for their languages while simultaneously reinforcing a reductionist view of linguistic vitality.

Having a practical way of identifying endangerment levels is helpful for facilitating grassroots community advocacy and informing policies that protect endangered languages. But reflecting on these papers collectively, it seems evident that the interaction between an approach focussed on isolated factors, and increasing digitalisation and institutional influence, risks oversimplifying

linguistic vitality measurements and neglecting qualitative insights. This reductive approach can create an unfortunate feedback loop, obscuring the complex realities of languages and their communities, and hindering effective advocacy. Decommissioning this feedback loop may prove difficult at a time when automated and algorithmic tools are being touted as the cost-saving solution to enormous financial problems facing both public bodies and research institutions. However, there is reason for optimism given findings from the fourth paper that sign language vitality is supported by use by teachers, learners, national deaf associations and local deaf clubs, as well as by good awareness among the hearing community. Knowledge exchange among these groups will be increasingly key to driving human-led developments in sign language advocacy and research.

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