Exploring the complex attitudes of stakeholders regarding the inclusion of genes associated with non-syndromic hearing loss in reproductive genetic carrier screening.

"Just because we can, does it mean we should?"

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Acknowledgement of Country

I would like to acknowledge the Gadigal people of the Eora Nation upon whose ancestral lands I am joining you from. I would also like to pay respect to the Elders both past, present and emerging, acknowledging them as the traditional custodians of knowledge for this land.

Outline

1. Non-syndromic hearing loss and RGCS and reproductive planning
2. Stakeholder views regarding inclusion of deafness in RGCS
    a. Healthcare professionals
    b. Consumers participating in RGCS
    c. Individuals with a personal experience of deafness
4. Where does this leave us regarding inclusion of NSHL genes in RGCS?

What is Reproductive genetic carrier screening (RGCS)?

- Genetic testing available to a couple planning a pregnancy or in early pregnancy
- Identifies couples who have an increased chance of having a child with a genetic condition
- Can screen single or multiple conditions simultaneously
- Australian Government has funded 3 gene test (CF/SMA/Fragile-X) for all people planning pregnancy or in early pregnancy and then self-pay if you want expanded screening for more conditions

Goal is to provide information to allow couples to make informed reproductive decisions

including IVF with PGT, prenatal diagnosis, planning for the future, donor gametes, adoption.

Should genes associated with non syndromic hearing loss (NSHL) be included in RGCS?

- 18/23 commercial RGCS panels include *GJB2* and other genes[1]
- Categorised as moderate severity using medically guided taxonomy[2]
- American ACMG practice guideline suggests including *GJB2* in RGCS due to incidence and severity[3]
- Some increased chance couples from RGCS have used PGT-M or PND to avoid having a child with NSHL[4]
- RGCS often described as screening for serious, severe, life-limiting conditions

These statements don't take into account the societal implications and messaging when offering population wide screening (possibly government funding) for those living with the screened conditions.

[1] Kirk et al., 2020
[2] Lazarin et al., 2017
[3] Gregg et al., 2021
[4] Ghiossi et al., 2018

Is being D/deaf a disability?

- While a lot of people who aren’t deaf often assume that being deaf is a disability, a lot of deaf people will disagree.
- Deaf gain
- Culturally and linguistically diverse group
- Variable severity including mild/moderate/profound
- Effective interventions available (auslan, hearing aids, cochlear implants, early intervention)
- Subjective

Capital D used in Deaf to represent culturally deaf

Views of **Healthcare Professionals** on including NSHL in RGCS

386 participants completed an online survey in 2022 : Genetics HCP (n=94), Reproductive HCP (n=153), GP (n=103) and hearing clinic HCP(n= 36)

Key Findings

- No consensus on whether deafness is a ***serious*** health condition
- Genetic HCP overall were less likely to agree that deafness is a serious disability.
- Majority agreed genes for NSHL should be included in RGCS
- Implementation challenges if included (seeing deafness as different to the ‘severe, life-limiting conditions screened)
- Potential for harm if included in a population wide RGCS program
- Hearing clinic HCP more supportive of inclusion and viewed deafness as having a greater impact on children’s wellbeing

Limitations

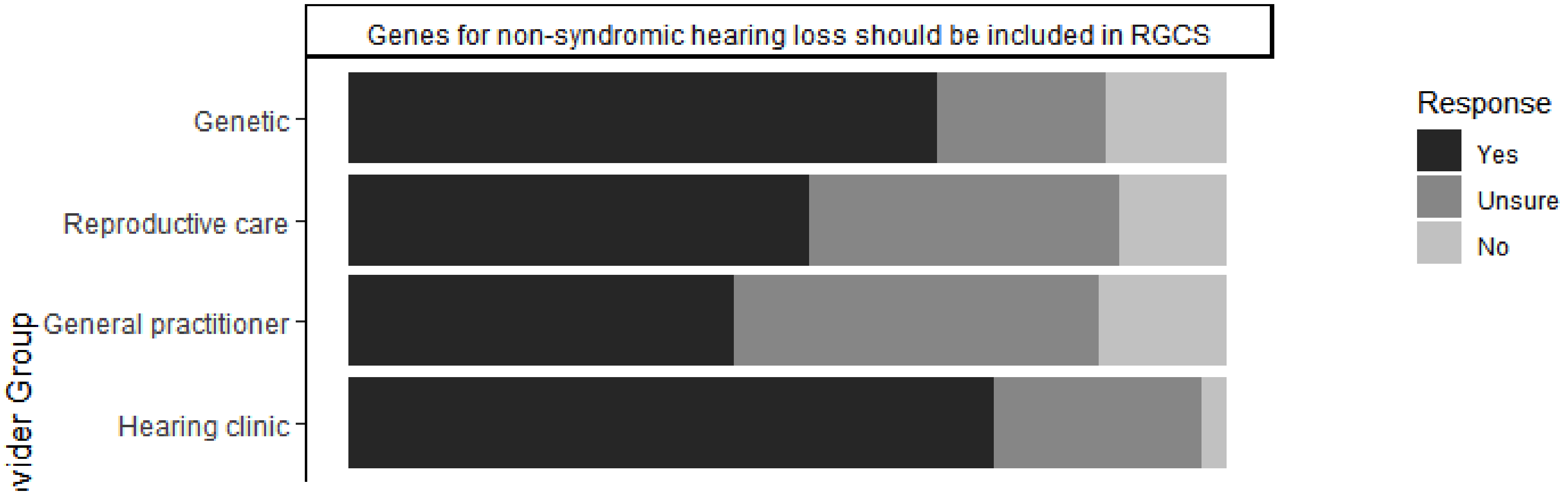
Small sample size; not necessarily generalisable

Recruitment method may have been biased to those wanting to express opinions

Freeman L, Delatycki MB, Scully JL, Briggs N, Kirk EP. Views of healthcare professionals on the inclusion of genes associated with non-syndromic hearing loss in reproductive genetic carrier screening. Eur J Hum Genet. 2023 Feb 9. doi: 10.1038/s41431-022-01239-y. Epub ahead of print. PMID: 36755103.

Views of **Healthcare Professionals** on including NSHL in RGCS

Majority agreed genes for NSHL should be included in RGCS



Yes responses by HCP group: Hearing clinic HCP: 67%; n=25; Genetic HCP: 67%; n=63; Reproductive care HCP: 52%; n=80, & General practitioners: 44%; n=45; p<0.05 between the groups

Views of those who have had RGCS

Online Survey to low chance couples in Mackenzies Mission
655 respondents (limitations as mostly female, higher educated)

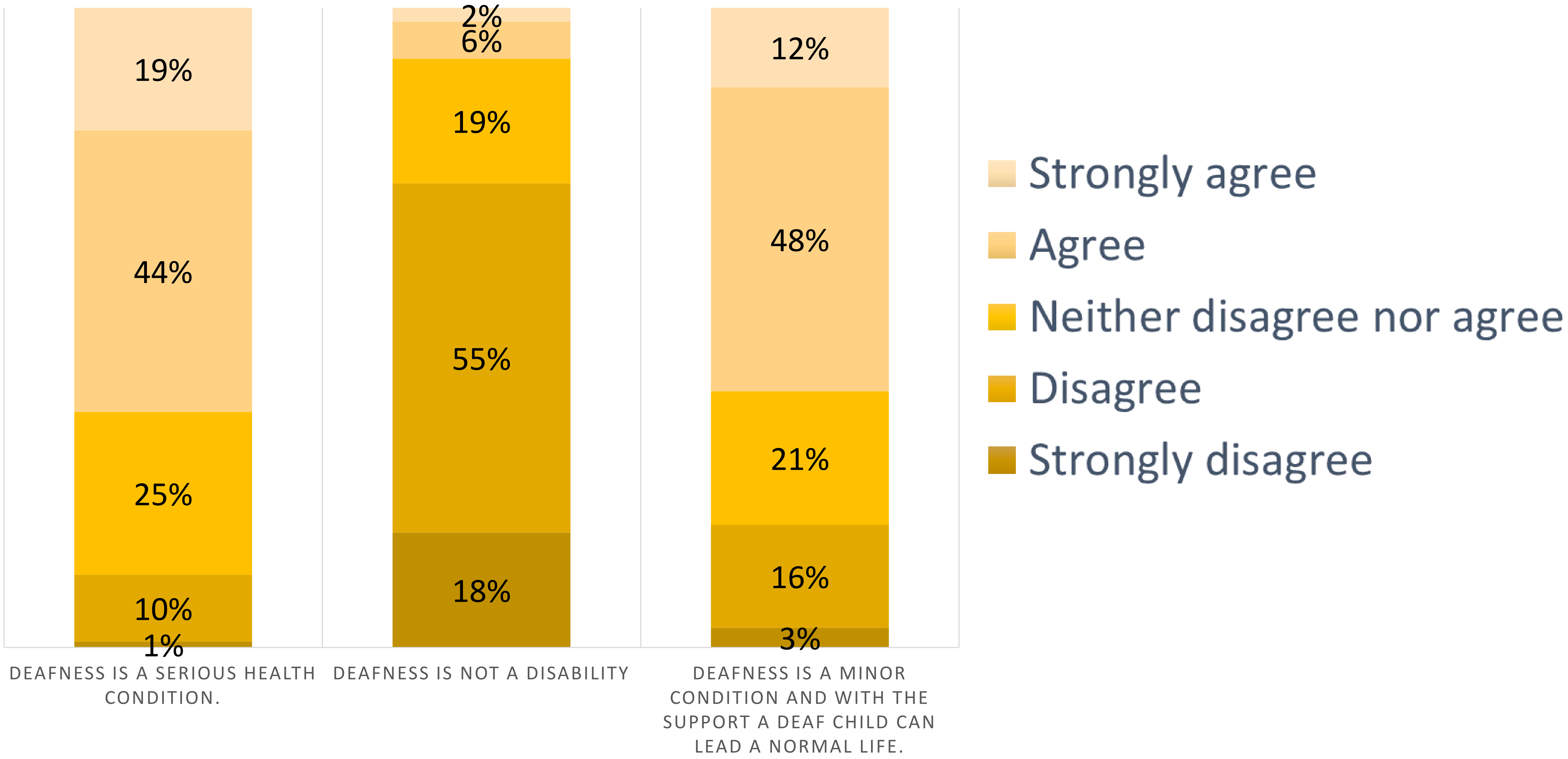
Key Findings

- Majority agree deafness is serious and a disability **but** also that support and interventions are available and lessen the impact to minor health condition (conflicted on severity)
- Majority would like to know their chances of having a child born deaf but wouldn’t necessarily change reproductive plans with this information
- More supportive of IVF with PGT-M but little support for TOP being available

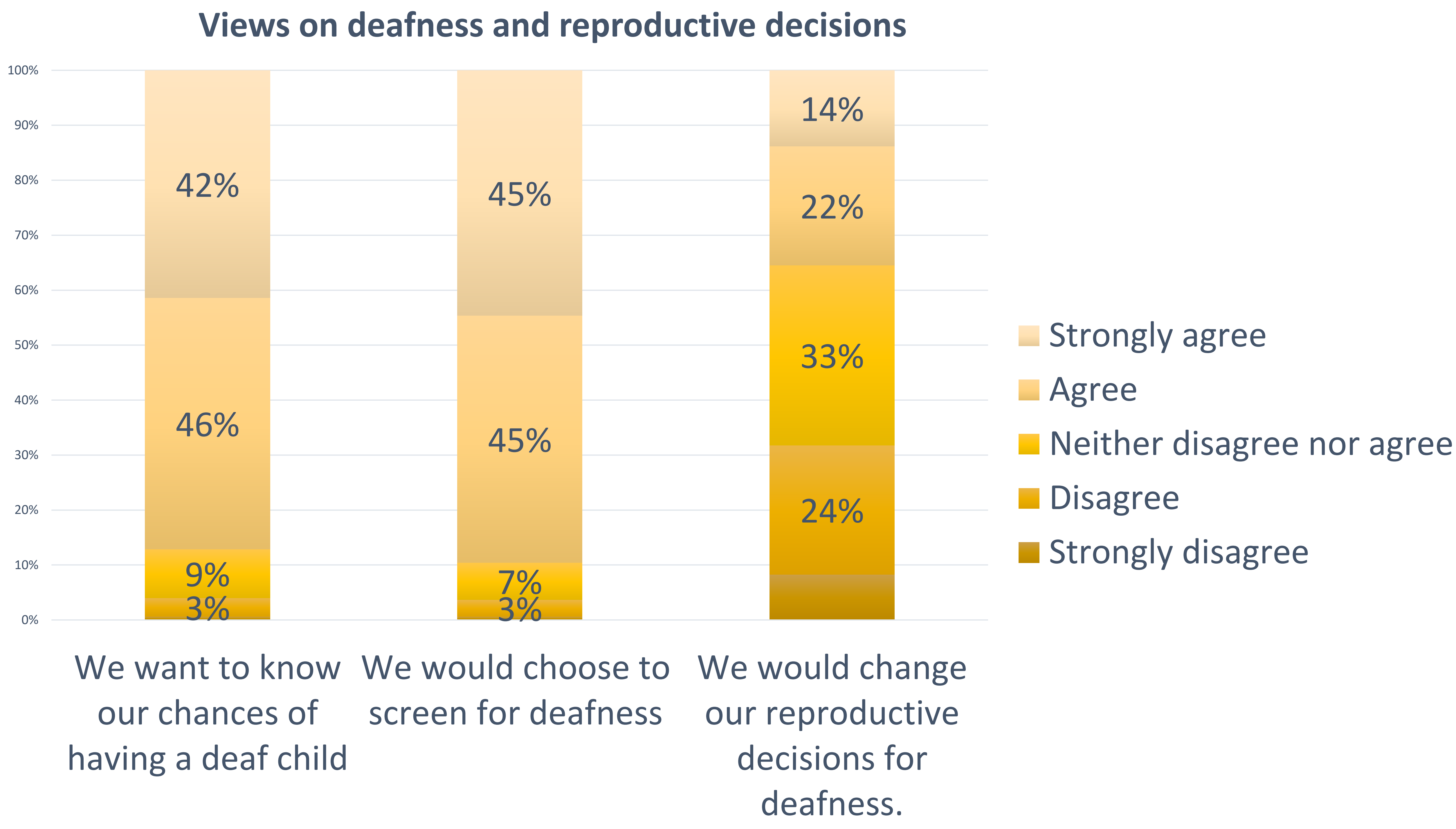
Freeman L, Delatycki MB, Leach Scully J, Kirk EP. Views of reproductive genetic carrier screening participants regarding screening for genes associated with non-syndromic hearing loss. Prenat Diagn. 2022 Dec;42(13):1658-1666. doi: 10.1002/pd.6253. Epub 2022 Nov 15. PMID: 36289583; PMCID: PMC10100309.

Deafness as a health condition

Conflicting views: Majority agree it is serious, it is a disability and also that is a minor condition with support and interventions

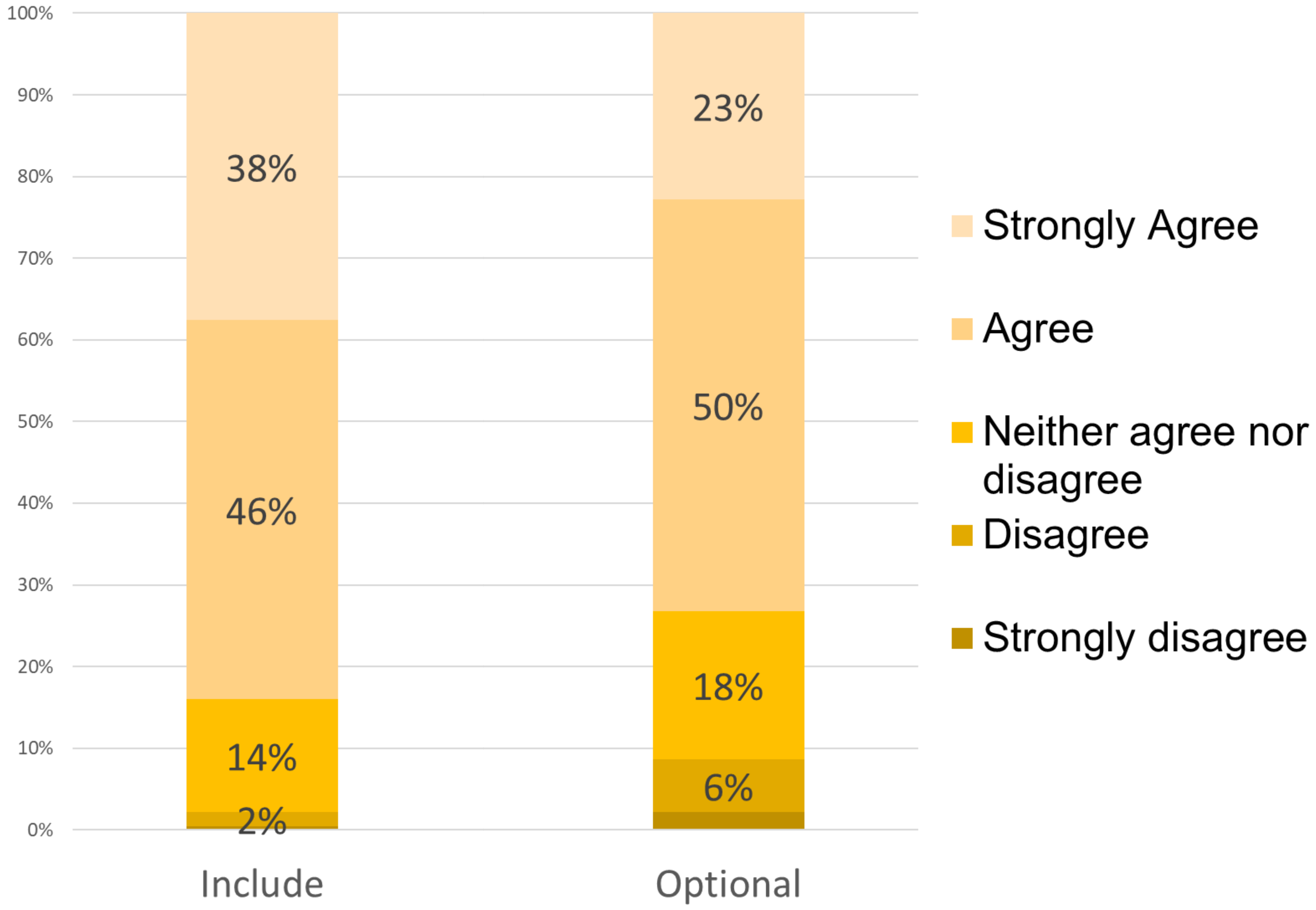


Reproductive decisions and deafness



- Majority would like to know their chances of having child born deaf and would choose to screen for deafness
- Mixed views on whether they would change their reproductive decisions if they had an increased chance of having a child born deaf.

RGCS and deafness



- Majority think genes should be included but the offer should be optional

Views of individuals with **personal experience** of deafness or a parent of a child born deaf

- Participants recruited from deaf organizations, hearing support clinics at children's hospitals and through snowballing
- 27 qualitative semi-structured interviews either by telephone or videoconference. Auslan interpreters were available at participant request
- Interpretive description methodology[1,2]
    - Acknowledges the theoretical and practical knowledge that researchers bring to a project
    - Generates clinical useful, applied knowledge that informs clinical practice
- Thematic analysis using interpretive phenomenological analysis was used from which broad descriptive themes and subthemes were developed[3]

[1] Thorne, S. 1997
[2] Thorne and O'Flynne-Magee, 2004)
[3] Braun and Clarke, 2006

Theme 1: RGCS promotes reproductive autonomy and severity is a key criterion for selecting conditions to include

Support for RGCS in general but severity is a key criterion in defining what should be included in an offer RGCS. It is for serious conditions and being deaf isn't serious.

Macy, a parent: "The more serious conditions that affect a parent's lifestyle, potentially the child becoming independent or having a bad quality of life, essentially. I think if that's something the parents want to look at, absolutely, I think it's great testing."

"There is real value in this type of testing in terms of severe conditions … I view deafness as nowhere near the category of life threatening or anything like that" Soren, Deaf, 50y

Defining severity is subjective and that it may be unrealistic to aim for consensus on severity for all conditions to include in RGCS. Participants acknowledged that this subjectivity is often based on individual life experiences as well as environmental factors.

Theme 2 - Defining deafness: identity, severity and stigma

Highlighted positive experiences associated with their identity, connections with the deaf community and achieving life goals

Felt that deafness was portrayed as a negative experience by the hearing world

Concern that only the medical view would be available to couples making reproductive decisions

“My hearing is more part of who I am rather than a health condition” Ella, 34yo, Deaf

Grace, a parent: “It’s just society that makes people think that there’s something wrong with [being deaf], but there’s not”.

Mia, parent of a deaf child: “if [my daughter] didn’t have access to hearing aids, I would probably consider it a disability”.

Theme 3 – Inclusion in RGCS may send a signal that deafness is something to avoid

- Seeking perfection in society
- Imagining the future …. loss of acceptance and empathy in society

Tali, deaf: "It doesn't feel correct to me, to be selective … if you want to rid the world of deafness, blindness, people who are short, where do you stop? I would reject that premise and that possibility not only because of deafness, because I'm deaf, but also because parents would start shopping for the perfect baby. And I do not want to see that … I think it's important for us to have diversity""

Macy, a parent: "Where's the line, it needs to stop somewhere and I think being deaf shouldn't be one of them. It's such a beautiful community… so I just don't think that should be something that we get to choose"

Alice, a parent: "I feel like the world would be a lesser place if people made a decision not to carry on with having deaf children, really I think it would a less rich place".

Theme 4 – If deafness is included in RGCS it needs to be done responsibly

Provide access to full information, education and understanding the knowing and being of deafness – need to have input from deaf people and parents of deaf children

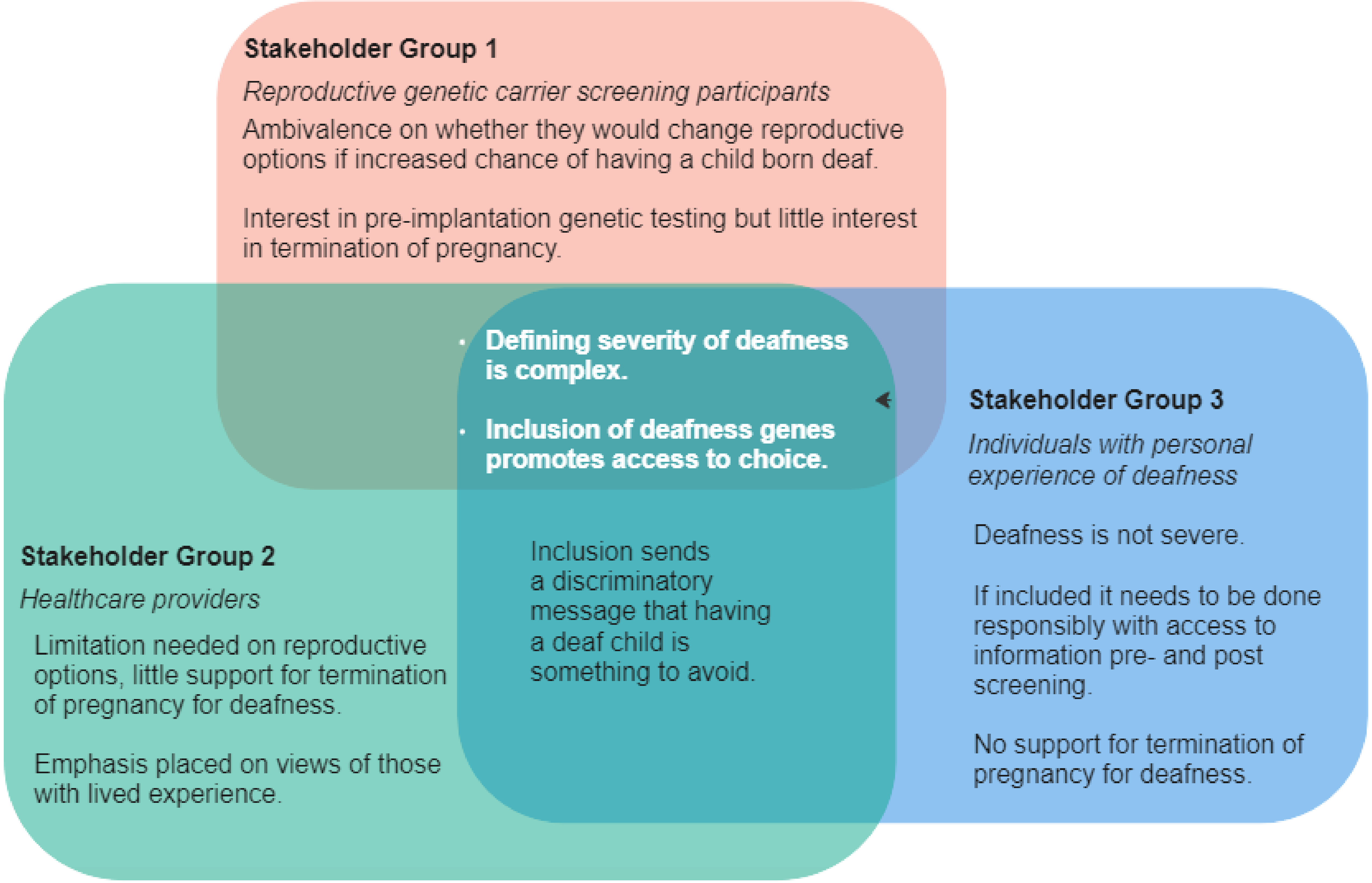
Information could be empowering and support preparing for a deaf child

Concern over routinisation of testing

> Elizabeth, a parent: “I think definitely the right information needs to be given and needs to inform the parents of what [having a deaf child] actually looks like”.

> Kareem, deaf: “[the couple] might be overwhelmed with all this information about different conditions ... and if it is free, they might just be like, ‘we’ll just get tested for everything’”.

Stakeholder Analysis



Stakeholder Group 1

Reproductive genetic carrier screening participants

Ambivalence on whether they would change reproductive options if increased chance of having a child born deaf.

Interest in pre-implantation genetic testing but little interest in termination of pregnancy.

- **Defining severity of deafness is complex.**
- **Inclusion of deafness genes promotes access to choice.**

Inclusion sends a discriminatory message that having a deaf child is something to avoid.

Stakeholder Group 2

Healthcare providers

Limitation needed on reproductive options, little support for termination of pregnancy for deafness.

Emphasis placed on views of those with lived experience.

Stakeholder Group 3

Individuals with personal experience of deafness

Deafness is not severe.

If included it needs to be done responsibly with access to information pre- and post screening.

No support for termination of pregnancy for deafness.

RGCS and NSHL

Implementation Challenges	Benefits	Harms
Lack of consensus on defining the severity of deafness.	Inclusion increases access to information and therefore promotes reproductive autonomy.	Ethical concerns for the value placed on those living with deafness.
Practical challenges of providing full information about deafness in an offer of RGCS		Sends an implicit message that couples may choose to avoid having a child born deaf.
Responding to the view of restricting reproductive choices by not offering termination of pregnancy for deafness		Impact on shaping society and possible ‘slippery slope’ of adding other conditions considered less severe into screening.

Conclusions

- Severity by its nature will mean something different for everyone … based on their life experiences and dependent on environment factors
- Not quite at the stage for inclusion as consideration needs to be given to preventing the potential harms to the Deaf community and broader society
- Responsible implementation can be achieved through separate screening for deafness from screening for other conditions (consent, information, decision making tool, optional)
- Provide education to community on deafness and provide genetic counselling to all couples who receive an increased chance result and offer opportunity to connect with people who are deaf or have children who are deaf or consider a creating a library of experiences which may facilitate decision making

Acknowledgements

- PhD Supervisors: Prof Edwin Kirk, Prof Jackie Leach-Scully and Prof Martin Delatycki
- Mackenzie’s Mission participants, investigators and funders
- Survey respondents and professional organisations who distributed the survey
- Interview participants and support organisations who distributed details about the study
- Funding through an Australian Government Research Training Scholarship and Mackenzie’s Mission PhD Scholarship