Addressing the Global Burden of Hearing Loss

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Decision Modeling Aims

Our model: Decision model of the Burden of Hearing loss Across the Lifespan (DeciBHAL)

Objectives:
- Develop and parameterize versions of DeciBHAL for Chile, India, and Nigeria.
- Identify quantitative estimates of hearing health care scale-up strategies.

Methods:
- Literature search for estimates of model parameters in countries of interest and proxy countries.
- Literature search for data on efficacy of scale-up strategies, such as hearing screening across the lifespan.
- Input estimates into DeciBHAL to estimate impacts and identify optimal strategies.

Model Validation Results:

<table>
<thead>
<tr>
<th>Model</th>
<th>Published Estimate</th>
<th>Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>% of persons with hearing loss</td>
<td>% of persons with hearing loss</td>
<td>% of persons with hearing loss</td>
</tr>
<tr>
<td>65</td>
<td>3.2 (0.1-3.46)</td>
<td>1.4</td>
</tr>
<tr>
<td>75</td>
<td>7.9 (4.4-9.5)</td>
<td>2.2</td>
</tr>
<tr>
<td>85</td>
<td>19.7 (13.9-24.0)</td>
<td>2.3</td>
</tr>
</tbody>
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- We validated the simulation model to natural history and treatment data in Chile, India, and Nigeria.

Cascade Results:
- Literature search for Universal Newborn Hearing Screening (UNHS) programs in countries of interest or proxy countries.
- Sample Cascade:

Key Findings

Developed a framework to identify effectiveness of hearing loss interventions that improve detection and linkage to care.

UNHS screening cascade shows varying follow-up rates in different settings, depending on hospital or community clinic program.

Developed costing strategy to determine recurring and one-time costs for health states in the model.

Conducted international validation comparing model output to Global Burden of Disease data in countries of interest: India, Chile, and Nigeria.

Patient financial constraints and lack of physician knowledge, training in cochlear implant surgery are the most frequently reported barriers in cochlear implant access and use.

Background

- The Lancet announced a commission in 2019 to identify ways to reduce the global burden of hearing loss.
- In 2015, 0.5 billion people had disabling hearing loss and 1.34 billion individuals had mild-to-complete loss in the better-hearing ear.
- The Lancet Commission and this Bass Connections team set out with the goal of finding innovative solutions to this global problem, splitting into a modeling team and a team to identify barrier and facilitators to hearing loss.

Barriers and Scale-up Strategies

Objective: Determine the barriers and facilitators of scaling-up hearing healthcare interventions.

Methods: Systematic review
Screening and data extraction: DistillerSR
Interventions: Cochlear Implants, Hearing Aids, Neonatal screening, Child screening, Adult screening

Analysis Framework: Access to health care framework (Levesque et al. 2013)

Results: Cochlear implant (CI) Analysis reveals 3 key dimensions of demand side and supply side barriers/facilitators.

Approachability: Lack of screening
- Availability: Rural location; provider time & availability
- Appropriateness: Quality; adequacy

Supply-side: health system, provider, organization’s perspective
Approachability: Lack of newborn, adult hearing screening & cognitive testing for CI candidates inhibits early receipt of CI; universal newborn hearing screening is a facilitator.
Availability: Living in rural and minority communities is associated with delays in CI; lack of audiologists, audiology clinics and provider time for hearing evaluation noted as barriers to CI uptake.
Appropriateness: Physician uncertainty and lack of knowledge regarding CI surgery, candidacy, and outcomes create gaps in quality of care.

Demand-side: population, community, HH, patient’s perspective
Ability to Perceive: Lack of patient awareness about availability, eligibility & impact/effectiveness of CI are barriers to receiving appropriate care.
Ability to Pay: High device and rehabilitation costs act as deterrents to CI uptake; insurance coverage of CI significantly influences patient decisions.
Ability to Engage: Patient disengagement and non-compliance are barriers to evaluation & management of CI; access to information packets/resources on CI and CI support services act as facilitators.

Source: (Ahmad 2011 in Malaysia)