MEDTRONIC **LABS**

TRANSFORMING PEDIATRIC HEARING CARE IN BHUTAN

- THE HEAR, LISTEN, AND SPEAK PROGRAM

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EXECUTIVE SUMMARY

The Hear, Listen, and Speak (HLS) Program is a public-private initiative launched in Bhutan in 2021 to address pediatric hearing loss among children aged 0–14 years. Recognizing hearing loss as an “invisible disability” with implications on child development and long-term quality of life, the program was designed to provide early screening, diagnosis, and intervention services across Bhutan. The program was implemented through a consortium of partners, and the collaboration ensures both technical and financial support to support the program’s rollout across Bhutan. The program was anchored on digital health systems that enabled real-time referral tracking between schools and health facilities, improving follow-up and continuity of care. School health coordinators and frontline screening staff were trained in the use of ENTraview devices and standardized protocols, ensuring consistent and quality service delivery across all districts.

At end of June 2025, the program screened over 104,746 children including 6,546 newborns, representing 65% of the target population and identified ear and hearing conditions in 14,003 (13%) children screened. The most common diagnoses included impacted earwax, chronic suppurative otitis media, and acute otitis media. Through strengthened referral pathways and continuum of care camps, 4,541 (32%) children among those screened were registered for treatments and 3,934 (87%) received treatment, including 81 hearing aid fittings and 73 surgical interventions. The program also introduced Bhutan’s first earmold lab and cochlear implant services, significantly enhancing national hearing care infrastructure. A network of trained professionals including audiologists, ENT technicians, and school health coordinators was established to ensure long-term sustainability and community-based service delivery. As it transitions into full government ownership, the program stands as a model for inclusive health systems in resource-constrained settings.

BACKGROUND

Hearing health is a critical public health issue, affecting individuals across all regions, age, gender and socio-economic backgrounds. Untreated hearing loss can significantly and permanently impair speech and language acquisition, reducing a child's ability to complete even primary education, and can have a life-long impact on the child's future quality of life.[1] According to the World Health Organization (2021), about 430 million people require rehabilitation to address disabling hearing loss, including 34 million children.[2] Hearing loss is often referred to as an "invisible disability" because, unlike other disabilities, it lacks visible symptoms leading to stigmatization.[3] In Bhutan, the Population and Housing Census (2017), estimates that 2.2% of the population have some form of hearing disorder[4], though it is likely that this number is higher, especially among young children, given the gaps in awareness, available services and adverse perceptions around hearing loss.

It is estimated that 60% of pediatric hearing loss is preventable with early interventions and children who have hearing loss can benefit from early identification and appropriate interventions.[5]However, in Bhutan, lack of infrastructure for screening, diagnosis, and rehabilitation, hinder progress towards reducing the burden of preventable hearing loss. Recognizing the challenges influencing hearing health in Bhutan, the Hear, Listen and SSpeak Program was launched in 2021 to address ear and hearing disorders, targeting children aged 0-14 years.

It is estimated that 60% of pediatric hearing loss is preventable with early interventions

The program is being implemented by a consortium of partners including the Ministry of Health, Ministry of Education and Skills Development (MoESD), Medtronic LABS, MED-EL under the Public Private Partnership program with the Austrian Development Agency and United Nations Technology Bank for Least Developed Countries (UNTBLDC). This initiative aligns with the National Policy for Persons with Disability 2019, Bhutan's commitment under the UNCRPD and Sustainable Development Goals (SDGs) of leaving no one behind. The HLS program aims to establish sustainable pediatric hearing care system in Bhutan by enabling early detection, timely intervention, and long-term rehabilitation for children with hearing loss and strengthening national capacity.

PROGRAM OVERVIEW

The Hear, Listen, and Speak (HLS) Program is a four-year public-private partnership launched in 2021 to support the Royal Government of Bhutan 's effort to improve pediatric hearing health and reduce the impact of hearing-related disabilities.

The HLS project aimed at achieving the following:

1. Early detection and intervention: Establish universal hearing screening for school-going children and newborns across all 20 districts, ensuring timely identification and referral for children with ear and hearing disorders.
2. Integrated treatment and rehabilitation: Provide access to a full continuum of care—including hearing aid fittings, cochlear implants, surgeries, and auditory-verbal therapy—through strengthened referral systems and decentralized service delivery.
3. Capacity building and workforce development: Train and equip local health professionals, including audiologists, ENT technicians, and school health coordinators, to deliver quality hearing care services and ensure long-term sustainability.
4. Infrastructure and technology strengthening: Establish national infrastructure including earmold labs and digital referral systems and integrate hearing screening into existing health and education platforms.
5. Community engagement and policy integration: Raise awareness among families and communities about pediatric hearing loss and embed hearing care into national public health and education systems through policies, annual screenings, and Continuum of Care (CoC) camps.

Implementing and supporting partners

The program is based on a collaboration model with consortium partners to provide technical and funding support; MoH and MoESD to institutionalize protocols such as conducting annual screenings or Continuum of Care[OO1] [AK2] /Ear Camps; and local governments to facilitate community outreach.

Table 1: Roles and responsibilities of consortium partners

Organization	Role
Department of Public Health, Ministry of Health	Advise and support the Consortium in the implementation of work plans related to the health care aspects of the program including strategic oversight, resource mobilization and deployment of clinical teams.
Happiness and Wellbeing Division, Ministry of Education and Skill Development (MoESD)	Advise and support the Consortium in the implementation of work plans related to the screening and education aspects by training all the school health coordinators
JDWNRH, Department of ENT and Audiology	Clinical Lead on the program provides necessary clinical intervention and supports CoC camps for all referred cases.
UNICEF, UNRCO,	Technical Working Advisory Group

Program scope

TThe HLS Program operates through four core activities: delivering screening and hearing technology, training healthcare workers, enabling early detection and treatment, and introducing new care services across all 20 districts.

The program uses the ENTraview digital platform to streamline hearing care delivery. Health coordinators conduct school-based screenings using mobile phone-operated digital otoscopes for tympanic membrane imaging and calibrated handsets for field audiometry. The Shruti software manages the ear care application, capturing screening questionnaires, storing images, creating provisional diagnoses, and maintaining patient records for complete care digitization. The Fit2Go application conducts pure tone audiometry testing at 25dB HL threshold across frequencies of 500, 1000, 2000, and 4000 Hz using noise-canceling headsets.

The screening workflow follows four stages: health coordinators perform digital otoscopy and audiometry at schools, data and images are captured and stored, screening reports provide near real-time access for clinicians, and children receive clinical review, treatment planning, and outcome recording at facilities. Quality assurance includes screening accuracy reviews by trained teams with feedback to school health coordinators, continuous training and refresher programs for healthcare coordinators, and complete digitization enabling end-to-end tracking from community screening to facility treatment outcomes.

The continuum of care student treatment camps were established to deliver equitable ear care services, including surgical and audiology interventions, directly to communities, extending care beyond regional referral hospitals and bringing essential services to people's doorsteps.

Figure 1 summarizes the program’s core activities and workflows.

Core Program Activities

1

Technology delivery:
Screening and hearing technology deployment

2

Professional training:
Healthcare worker capacity development

3

Early detection and treatment:
Timely identification and intervention services

4

Service enhancement:
Introduction of new care services

ENTraview Digital Technology Platform

Hardware:

Mobile phone-operated digital otoscope

- High resolution tympanic membrane imaging
- Calibrated handset for field audiometry

Shruti software:

Ear care application

- Screening questionnaires
- Image capture and storage
- Provisional diagnosis
- Unique patient records
- Complete care digitization

Fit2Go Application:

Pure tone estimation

- Audiometry testing
- 25db HL threshold
- Frequecies- 500,1000,2000,4000 Hz
- Noise-cancelling headsets

Population Screening Workflow

School-based screening

Health coordinators perform digital otoscopy and audiometry

→

Data capture and storage

Tympanic membrane images, test results, provisional diagnosis

→

Digital Transfer to hospital

Near real-time screening report access for clinicians

→

Clinical review and treatment

Facility evaluation, treatment plan, outcome recording

Quality Assurance and Data Integrity

Screening accuracy reviews

Trained team conducts regular reviews with feedback to school health coordinators

Continuous training

Routine retraining and refresher programs for healthcare coordinators

Complete digitization

End-to-end digital tracking from community screening to facility treatment outcomes

Program implementation timelines and activities

Figure 2 details the phased implementation approach of the HLS program. The program was rolled out in four phases, each building on the previous one to expand geographic coverage, strengthen service delivery, and integrate new technologies. This phased strategy allowed for gradual scaling, adaptation to local contexts, and alignment with national health priorities, ultimately enabling the program to reach national scale.

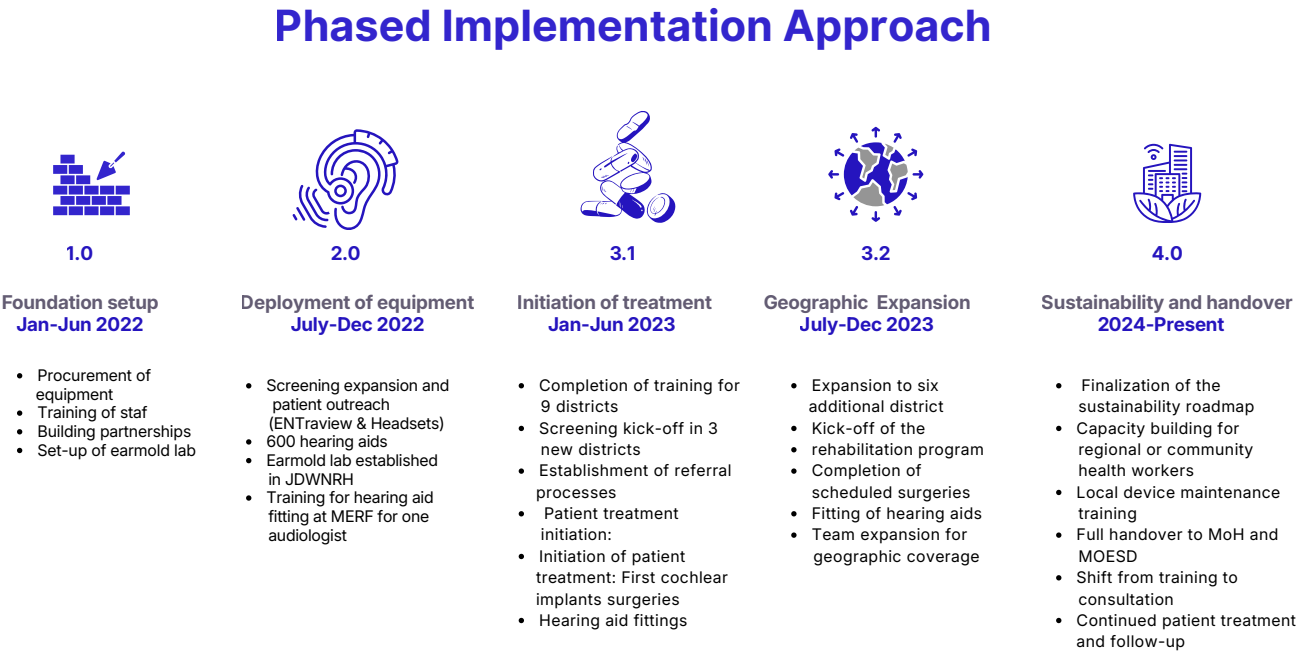

Figure 2 HLS program implementation phases

KEY ACHIEVEMENTS

Hearing screening of students at school ensures early detection of hearing impairment and helps to provide early interventions. To date, 104,746 students, constituting 65% of children [OO1] in the target age group, have been screened in the twenty districts, including 6,546 newborns. Five out of the twenty districts – Chhukha, [OO2] Thimphu, Punakha, Wangdue Phodrang, and Dagana – have completed the initial rounds of screening, with more than 80% children having been screened with a target to achieve full national coverage by the end of 2025. Figure 3 shows the screening coverage in the 20 districts in Bhutan.

Figure 2 HLS phased implementation approach

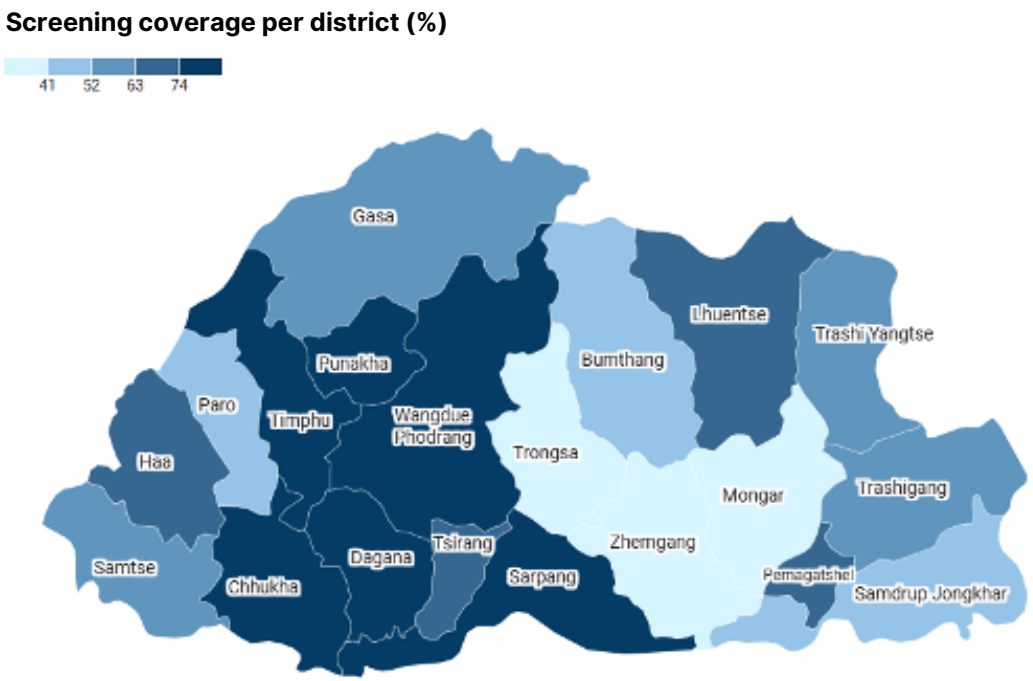

Figure 3 Screening coverage by district

Case identification of ear and hearing disorders

Among the children screened, 14,003 (13%) [OO1] showed signs of ear and hearing disorders and were referred for assessment at the facilities. The most frequent ear problems identified included impacted earwax (9,181), chronic suppurative otitis media (596 cases) and acute otitis media (427 cases). Figure 4 shows distribution of ear and hearing conditions identified during screening.

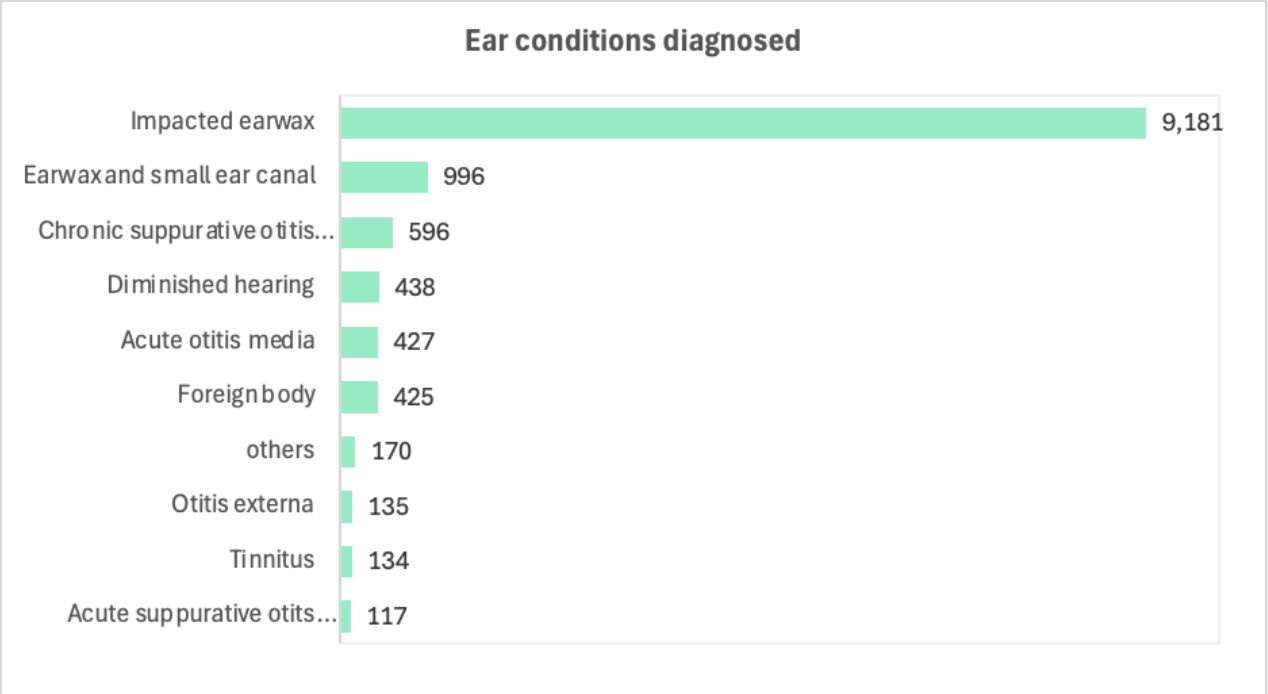

Figure 4 Distribution of ear conditions diagnosed

Referral, Follow-up and Treatment Pathway

The referral and follow-up mechanisms play a vital role as it ensures proper follow-up and prevents the loss to follow-up and access early intervention. Among the 14,003 children referred for further evaluation 4,541 (35%) were registered at the health facilities for treatment [OO1] [AK2] by ENT specialists and audiologists and among them 3,934 (87%) were treated. The majority of children were treated for wax impaction (3,063 cases), followed by AOM (191 cases), foreign body (121 cases), CSOM (119 cases), and diminished hearing (111 cases). Among the children with severe hearing loss, 81 were fitted with hearing aids at regional referral hospitals. Figure 5 compares the number of cases diagnosed with those successfully treated.

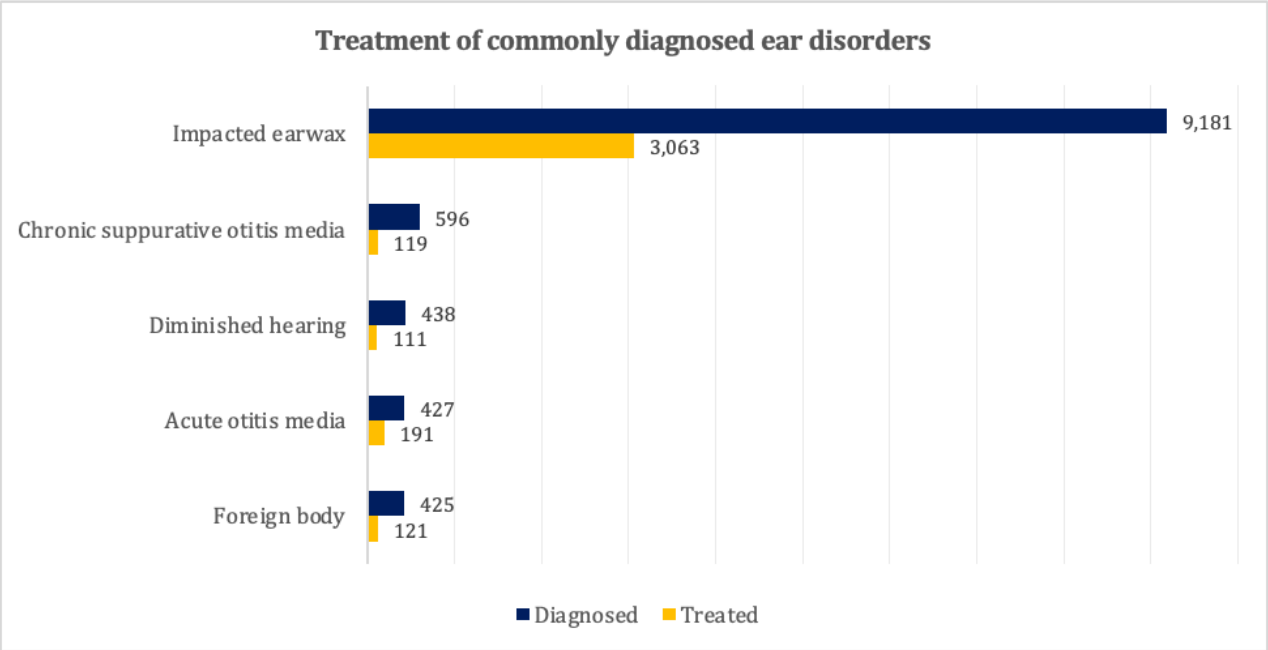

Figure 5 Treatment of commonly diagnosed ear disorders

Continuum of Care (CoC) camps [OO1] were conducted in 5 districts covering 2,047 referral cases[OO2] , ensuring accessibility, timely intervention, and reducing financial burden for people living in rural areas. Among the patients attending the camps for treatment, 156 PTA tests were done by audiologists for accurate diagnosis, and 73 surgical cases were successfully completed. Five children were fitted with hearing aids during CoC camp and additional fittings were directed to regional hospitals for fittings to be conducted in sound-proofed fittings rooms only available at the 3 regional referral hospitals. Figure 6 shows the impact of the program at the continuum of care camps.

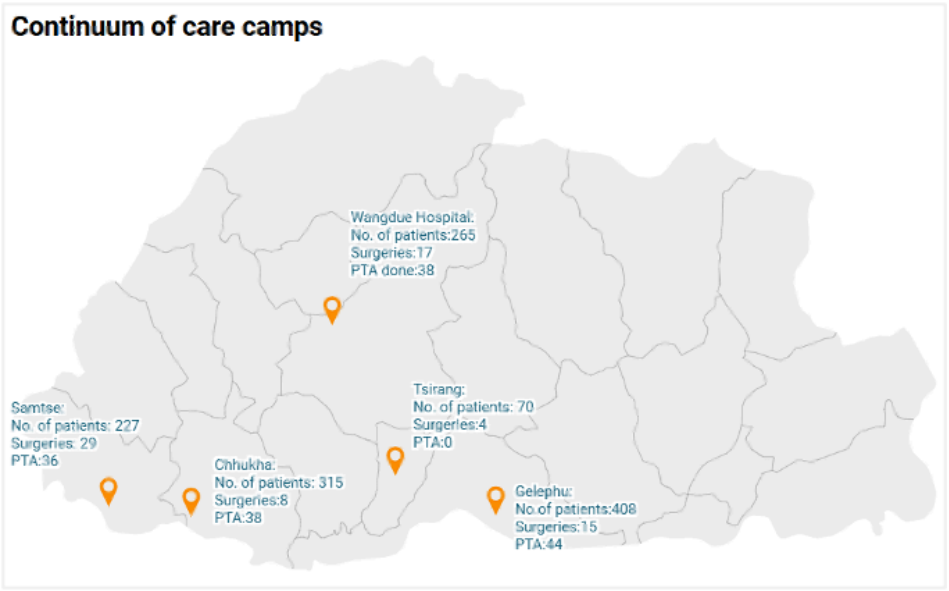

Figure 6 Program reach at continuum of care camps

Figure 7 presents the implementation timeline of the HLS Program, showing its phased rollout from 2022 to mid-2025 and the cumulative population reach achieved during this period. The highest increase in patients screened was observed during the geographic expansion phase, as services scaled to six additional. As the program transitioned into the sustainability and handover phase, screening activities continued, indicating strong institutional uptake and integration into routine health services. This ongoing implementation reflects the program's shift from externally supported operations to government-led service delivery, supported by trained local personnel, digital infrastructure, and decentralized care models

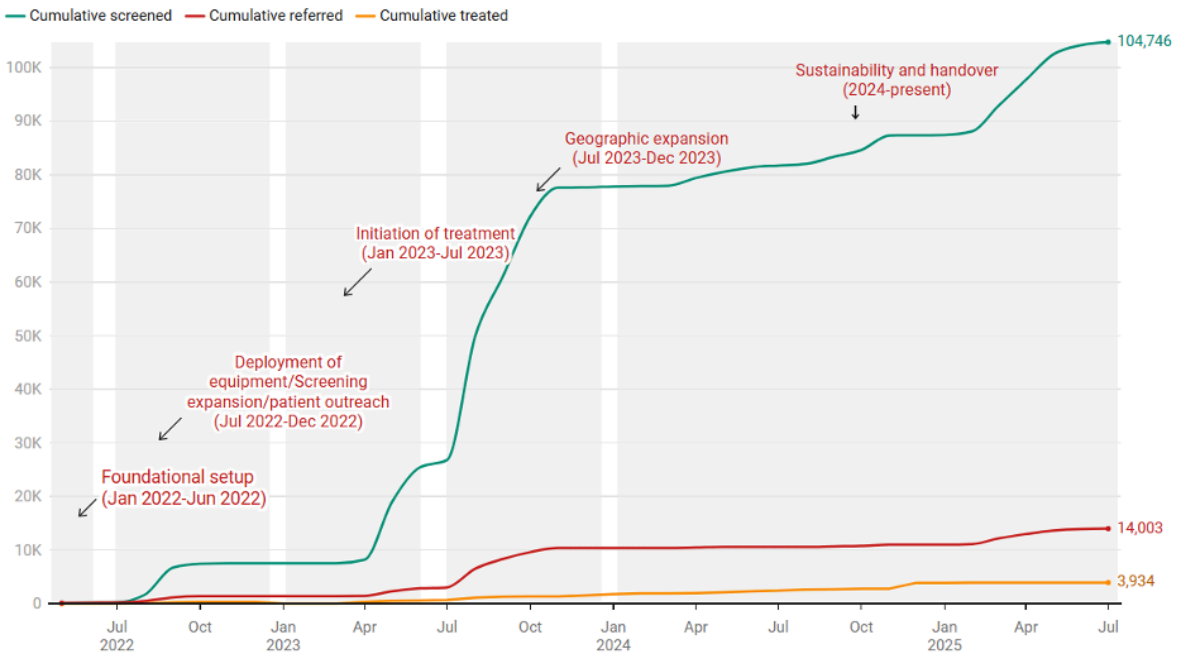

Figure 7 Overall program timelines and population reach

DISCUSSION AND IMPLICATIONS

The HLS Program's achievements underscore the potential of targeted, collaborative interventions in addressing pediatric hearing loss in resource-constrained settings such as Bhutan. Screening data from 104,746 school-going children revealed that 14,003 had ear and hearing disorders, indicating a prevalence of 12% among children aged 0–14 years in the program's catchment population. Hearing disorders were identified in 438 (0.4%) of the children screened, which is below 2.2% reported in 2017 Bhutan census.[4] However, the lower prevalence observed aligns with patterns reported in Bhutan where the prevalence of disability increases with increase in age.[4] These findings reinforce the importance of early screening and detection, which not only uncovers hidden or underreported conditions but also enables timely intervention to prevent lifelong impairments in speech, language, and learning.

Despite the HLS Program's success in screening over 100,000 children, a significant gap remains in treatment uptake, with 65% of referred students not registered at hospitals for follow-up care. This is largely attributed to competing outpatient department priorities, where conditions like impacted earwax which accounted for approximately 78% of referrals, are deprioritized due to their non-urgent nature and only 33% of the cases were treated after referral. While clinically less severe, untreated earwax and related conditions can still impair hearing and learning, especially in early childhood.[6,7] The findings highlight the need to reframe basic ear care as essential, particularly in school health programs.

The HLS Program has also significantly strengthened Bhutan's pediatric hearing care system by investing in local capacity and digital innovation. Prior to the implementation of the HLS program, Bhutan had only five ENT specialists who were serving at the national referral hospital and patients to travel to the capital to seek specialist services.[8] Training school health coordinators, audiologists, and ENT professionals has created a sustainable workforce capable of delivering consistent, community-based services. This is particularly important in Bhutan, where specialist availability is limited and geographic barriers hinder access to care.[8] The integration of digital platforms such as Shruti and Fit2Go has also enhanced diagnostic accuracy and enabled real-time data tracking by supporting timely referrals, reducing loss to follow-up, and enhancing continuity of care. Importantly, the potential integration of the HLS dashboard into national systems like the Health Management Information System (HMIS) and Education Management Information System (EMIS) positions Bhutan to institutionalize pediatric hearing care within its broader public health and education frameworks. This approach not only improves service delivery but also supports evidence-based planning and long-term sustainability.

The HLS Program has contributed significantly to strengthening Bhutan's national hearing care infrastructure. The establishment of the country's first earmold laboratory and cochlear implant services marks a major milestone in expanding access to advanced hearing interventions. These facilities not only improve treatment options for children with severe hearing loss but also reduce reliance on external referrals, making care more accessible and locally sustainable.

Additionally, the rollout of Continuum of Care (CoC) camps in five districts has decentralized service delivery, enabling children in rural and remote areas to receive timely diagnosis and treatment. By reducing financial and geographic barriers, these camps have enhanced equity in healthcare access. In a country like Bhutan, where terrain and specialist availability pose challenges, such infrastructure investments are critical. They lay the foundation for long-term integration of pediatric hearing care into the public health system and support Bhutan's broader goals of inclusive development and health equity.

CHALLENGES AND LESSONS

Challenges

Despite the remarkable outcomes of the program, challenges were faced during its planning and implementation. Expansion to the eastern and highland regions of the country were done in a phased manner due to budget and resource constraints which also caused a delay in screening and follow-up services. Limitation of medical specialists such as ENT surgeons and audiologists caused delays in timely diagnostic evaluations and surgical interventions. Competing OPD priorities and wait listed surgeries further delayed diagnosis and interventions.

Also, limited understanding about hearing disorders among parents makes them hesitant to get their children screened and follow-up for further evaluation. Some parents refuse to follow up due to the cost and distance of reaching health services.

Lessons learned

Several valuable lessons have been learnt that can help similar public health programs in the future targeting early diagnosis and preventive care. Getting the local professionals involved is important project success. The achievements in screening, diagnosis and early intervention for hearing impairment are due to the active involvement and proper coordination of teachers, parents and health workers. Training school health coordinators and other staff who aren't specialists really made it easier for more children to get hearing care through task shifting in communities, and initiate processes for proper interventions.

Cross-sector collaboration also enabled the project's success. The collaboration between the Ministry of Health and Ministry of Education enhanced planning, coordination and implementation, creating more comprehensive and responsive service delivery.

The decentralized services like school screenings and district follow-ups helped reduce the burden on regional hospitals and made it easier for students in rural schools to get the support they need. The digital health information systems used for data collection improved monitoring and planning, allowing accurate tracking, and proper follow-up services at the national level.

CONCLUSION

The Hear, Listen, and Speak Program represents a landmark achievement in Bhutan's efforts to combat pediatric hearing loss, transforming an "invisible disability" into a manageable condition through early detection, innovative technology, and empowered communities. By screening over 65% of children, establishing pioneering services such as cochlear implants and earmold labs, and building a robust network of trained professionals, HLS has not only addressed immediate health needs but also laid the groundwork for long-term sustainability under government stewardship. Despite hurdles posed by Bhutan's rugged landscape and resource limitations, the program's multi-sectoral approach highlights the power of partnerships in achieving national and global goals for inclusive development especially in ear care.

As HLS concludes its phased implementation, it leaves a legacy of improved quality of life for Bhutanese children, reduced societal stigma, and enhanced health equity. Moving forward, continued monitoring, policy integration, and adaptive strategies will ensure these gains endure, inspiring similar initiatives worldwide and affirming that timely hearing care is essential for every child's potential to hear, listen, and speak.

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