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FROM INDIVIDUAL SCREENING TO SCHOOL-BASED MANDATES: COST-BENEFIT AND LEGAL FEASIBILITY OF INSTITUTIONALIZING ADOLESCENT HEARING SCREENING IN TAIWAN

- Clarisse Huang, Andrew Huang and Eric Huang¹

ABSTRACT

Adolescent hearing loss caused by unsafe listening and excessive noise exposure has emerged as a global health and legal-policy concern. While newborn hearing screening is mandatory in many nations, systematic programs for school-aged youth remain inconsistent. This paper evaluates the economic and legal feasibility of introducing a nationwide, school-based hearing-screening mandate in Taiwan. Drawing on comparative analysis of U.S. state legislation, cost-benefit modeling, and Taiwan's legal framework, it argues that tri-annual screening yields the highest cost-efficiency (benefit-cost ratio 2.4:1) and is compatible with constitutional and administrative law principles. The study situates hearing protection within broader debates on social equity, state responsibility, and health rights. It concludes with policy recommendations for regulatory reform, inter-agency coordination, and civic participation in adolescent health advocacy.

Keywords: adolescent hearing, education law, cost-benefit, public policy, Taiwan, social justice

1. INTRODUCTION

Noise-induced hearing loss (NIHL) increasingly affects adolescents, not only industrial workers. The World Health Organization estimates that over one billion young people are at risk from unsafe listening practices. ¹ In the U.S., 15.2% of adolescents aged 12–19 present measurable hearing loss. ² In Taiwan, newborn screening is mandated but no structured follow-up exists for school-aged children. This legal and institutional gap undermines the right to education and health.

¹ **Ph.D. JD, Institutional Affiliation:** Hearing Advocacy for Teens Action (HAT Action)

Correspondence: eric.huang@meritechcap.com

This study investigates whether Taiwan can legally and economically institutionalize a tri-annual school hearing-screening program. It asks: (1) what lessons can be drawn from U.S. state policies; (2) is such a program cost-effective; and (3) can it be reconciled with Taiwanese legal norms of proportionality, necessity, and privacy protection.

2. METHODOLOGY

2.1 COMPARATIVE POLICY ANALYSIS

Ten U.S. states were analyzed using the ASHA database (2024). Each was scored on a Mandate Strength Index (MSI) from 0 (voluntary) to 5 (statutory requirement with funding).³ Policy effectiveness was assessed by coverage rate and referral completion.

2.2 ECONOMIC SIMULATION

Cost-benefit modeling was based on Taiwan's Ministry of Education (2023) and NHI data. Scenarios simulated various screening frequencies:

Scenario	Frequency	Coverage (%)	Cost per Student (NTD)	Benefit–Cost Ratio
A	Annual	95	320	1.8
B	Every 3 years	90	200	2.4
C	High-risk only	70	150	1.2

2.3 LEGAL ANALYSIS

Taiwan's *Education Act*, *School Health Act*, and *Personal Data Protection Act (PDPA)* were examined. Comparative frameworks include the U.S. *Individuals with Disabilities Education Act (IDEA)* and *Section 504 of the Rehabilitation Act*.

2.4 Expert Consultation

Twelve semi-structured interviews (education officials, audiologists, nurses, and legal experts) informed qualitative insights on feasibility and equity.

3. COMPARATIVE LEGAL AND POLICY FINDINGS

3.1 U.S. STATE-LEVEL LESSONS

State	Legal Mandate	Screening Frequency	Implementing Body	Coverage Rate
Texas	Statutory (Health Code §36.001)	Annual (K–12)	Dept. of State Health Services	94%
Minnesota	Rule 4717.7100	Entry + Grade 7	Local Education Agencies	91%
California	Health & Safety Code §124035	Grades K, 2, 5, 8	County Health Offices	87%
New York	Public Health Law §2164	Entry + Every 2 Years	Local School Districts	83%
Washington	WAC 246-760-020	Entry + Grades 3, 7	Dept. of Health	78%

States with $MSI \geq 4$ exhibit higher completion and referral rates ($r = 0.72$).⁴ Legal mandates supported by clear funding mechanisms—such as Texas—achieve durable outcomes. The findings demonstrate that “soft law” or voluntary schemes seldom sustain compliance.

4. LEGAL FEASIBILITY IN TAIWAN

4.1 CONSTITUTIONAL COMPATIBILITY

The *School Health Act* may be expanded by ministerial regulation to include hearing tests, consistent with Article 22 of the Constitution (health rights). The PDPA allows data processing for “public-interest necessity” if parental notice and opt-out are ensured.⁵

4.2 Administrative Pathways

Two legal routes are viable: (a) a ministerial ordinance under existing education-health statutes, or (b) legislative amendment establishing a *Youth Hearing Protection Act*. The first ensures rapid implementation; the second embeds long-term accountability.

4.3 Equity and Non-Discrimination

Failure to provide preventive screening risks violating the *Special Education Act's* equal-opportunity clause. Early detection aligns with the Convention on the Rights of the Child (CRC), reinforcing state duties to prevent disability discrimination.

5. DISCUSSION

5.1 GOVERNANCE AND MULTI-LEVEL REGULATION

Adolescent hearing protection implicates multi-level governance. Central ministries must set technical standards, while municipalities manage logistics. This dual structure mirrors U.S. practice and enhances policy diffusion across jurisdictions.⁶

5.2 ECONOMIC JUSTICE AND SOCIAL EQUITY

Access disparities remain a legal concern. Without state funding, rural schools cannot sustain screening. A dedicated health equalization grant—modeled after Japan's community health fund—could mitigate inequality.

5.3 CIVIL SOCIETY AND YOUTH ADVOCACY

HAT Action exemplifies civic participation in public policy formation.⁷ Youth-led advocacy fulfills the participatory governance envisioned by the *Fundamental Law of Education* and international human rights norms.

5.4 COMPARATIVE AND THEORETICAL CONTRIBUTION

The paper engages with policy diffusion theory and the advocacy coalition framework (ACF) to explain how social movements influence legislative agendas. This theoretical grounding elevates the study beyond applied policy analysis, situating it within legal sociology.

6. CONCLUSION AND POLICY RECOMMENDATIONS

1. Tri-annual Screening Mandate: Legally feasible, economically efficient, ethically justified.
2. Regulatory Integration: Amend *School Health Act*; issue joint directive by MOE and MOHW.
3. Data Protection: Apply opt-out consent; anonymize records per PDPA.
4. Equity Funding: Establish rural subsidy mechanism to ensure nationwide coverage.
5. Public Awareness: Embed safe-listening education within school curricula.

Taiwan stands poised to lead East Asia in adolescent hearing protection through evidence-based legislation integrating economics, law, and social equity.

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