Centre for Community Child Health

Victorian Infant Hearing Screening Program

The relationship between risk indicators for permanent hearing loss and diagnostic audiology assessment results

Among infants referred on a newborn hearing screen in 2016-2017

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Background

- Universal Newborn Hearing Screening (UNHS)

→ well established rationale for the earlier identification of infant hearing loss

- Routine collection of risk indicator information

→ historical usage

→ targeted surveillance for postnatal hearing loss

- Improving efficiency of the hearing screening pathway

→ cost-effectiveness of UNHS

→ prioritising audiological waiting lists and aiding resource allocation

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The use of risk indicators in newborn hearing screening

- As a primary method for hearing screening
- Targeted surveillance for postnatal hearing loss
- Joint Committee on Infant Hearing (JCIH) criteria
- Concerns with using risk indicator information
- Current gaps in research

Research aims

Aim 1

- To examine associations between the risk indicator profile of infants referred through newborn hearing screening and their audiological diagnostic outcomes

Aim 2

- To establish whether service providers could utilise this information, along with the automatic results from newborn hearing screening, to improve efficiency across the screening pathway

Are referred infants with a specific reported risk indicator more likely to have a diagnosis of the target condition hearing loss?

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Victorian Infant Hearing Screening Program (VIHSP)

- Screening process and VIHSP protocol
- Risk indicator collection
- Infant Audiological follow-up in Victoria

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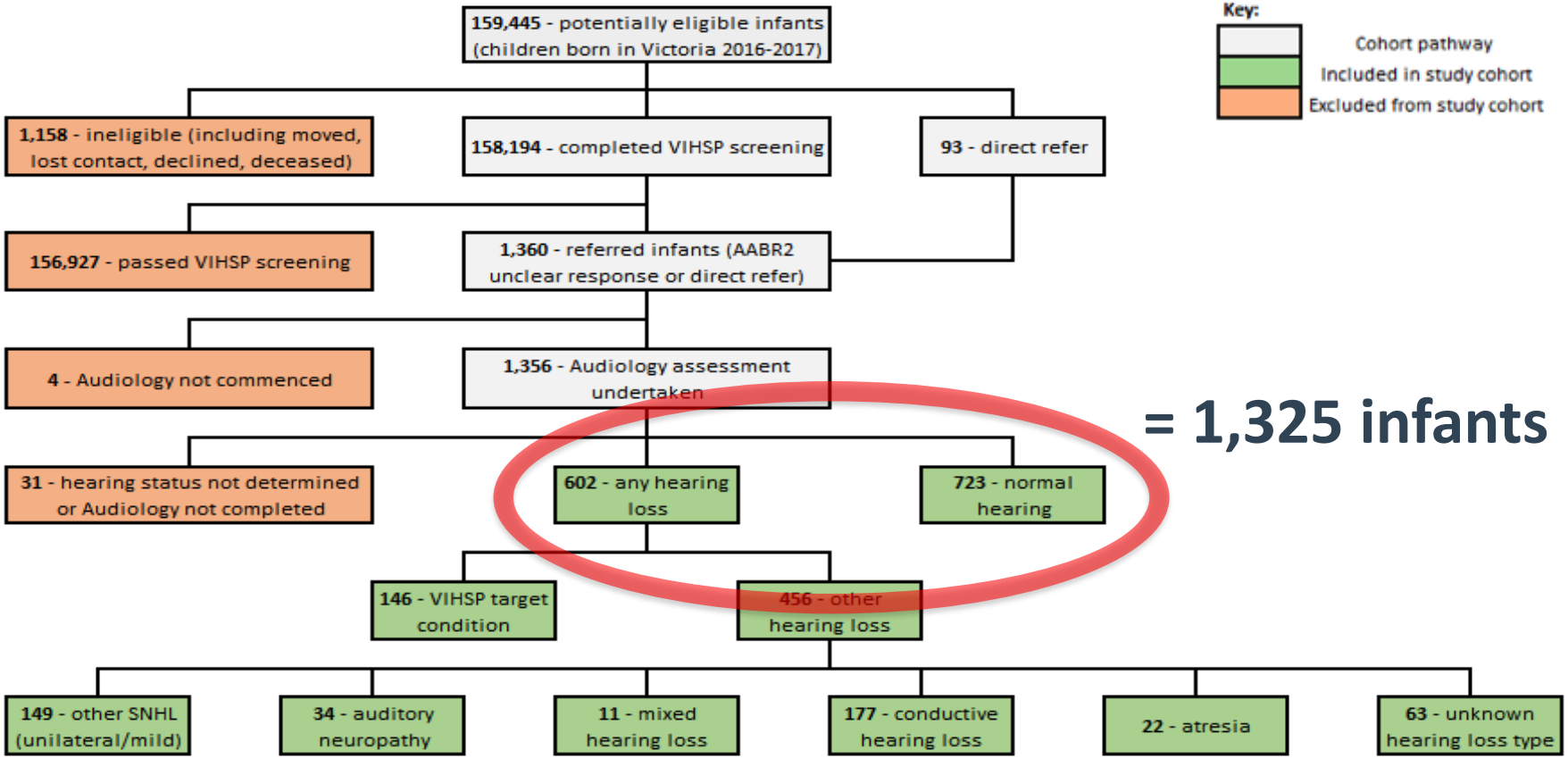
Study population



Study population demographics and hearing profile

- **1,325 referred infants** born in 2016/2017, who underwent complete follow-up audiological assessment
- **Proportionally more males** (739 cases or 55.8% of the study population) than females
- **No significant difference** ($p > 0.05$) in proportions of infants with the target condition hearing loss between males/females, and pre-term/full-term infants

Normal hearing	Target condition	Other SNHL (mild or unilateral)	Conductive hearing loss	Other hearing loss
54.6%	11%	11.2%	13.4%	9.8%

Note: 'Other hearing loss' refers to mixed hearing loss, Auditory Neuropathy, atresia, and type unknown

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Risk indicator profile of referred infants

- **20.7% (274 infants)** of referred infants had any risk indicator recorded
- **14.4% (191)** of referred infants had one risk indicator recorded, while **6.3% (83)** had multiple risk indicators recorded

Risk indicator	Infants with reported indicator
Ototoxic medications	**8.2%** (109 infants)
Congenital abnormality of head/neck	**6.5%** (86)
Family history	**4.7%** (62)
Ventilation > 5 days	**4.1%** (54)
Syndrome related to hearing loss	**3.6%** (47)
Meningitis or encephalitis	<1% (9)
Maternal infections during pregnancy	<1% (8)
Severe jaundice at exchange transfusion levels	<1% (6)

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Diagnostic audiology outcome – any risk indicator

- **Almost three-quarters (73.7%)** of referred infants with any risk indicator recorded had a type of hearing loss diagnosed
- **61.9%** of referred infants with no risk indicator recorded had a diagnosis of normal hearing

	Normal hearing	Target condition	Other SNHL	Conductive hearing loss	Other hearing loss
No risk indicator	61.9%	8.5%	11.6%	10.1%	7.9%
Any risk indicator	26.3%	20.8%	9.9%	25.9%	17.2%
All referred infants	***54.6%***	***11%***	***11.2%***	***13.4%***	***9.8%***

Note: 'Other hearing loss' refers to mixed hearing loss, Auditory Neuropathy, atresia, and type unknown

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Target condition hearing loss and risk indicators

- **Maternal infections** had the highest yield of the target condition hearing loss (62.5% of referred infants with maternal infections recorded)
- **Family history, severe jaundice, ventilation,** and **ototoxic medications** were other risk indicators with relatively high yields of the target condition

Risk indicator	Number of infants with recorded cases	Yield of target condition hearing loss
Maternal infections	8	62.5%
Family history	62	40.3%
Severe jaundice	6	33.3%
Ventilation	54	20.4%
Ototoxic medications	109	18.3%
All referred infants	***1,325***	***11%***

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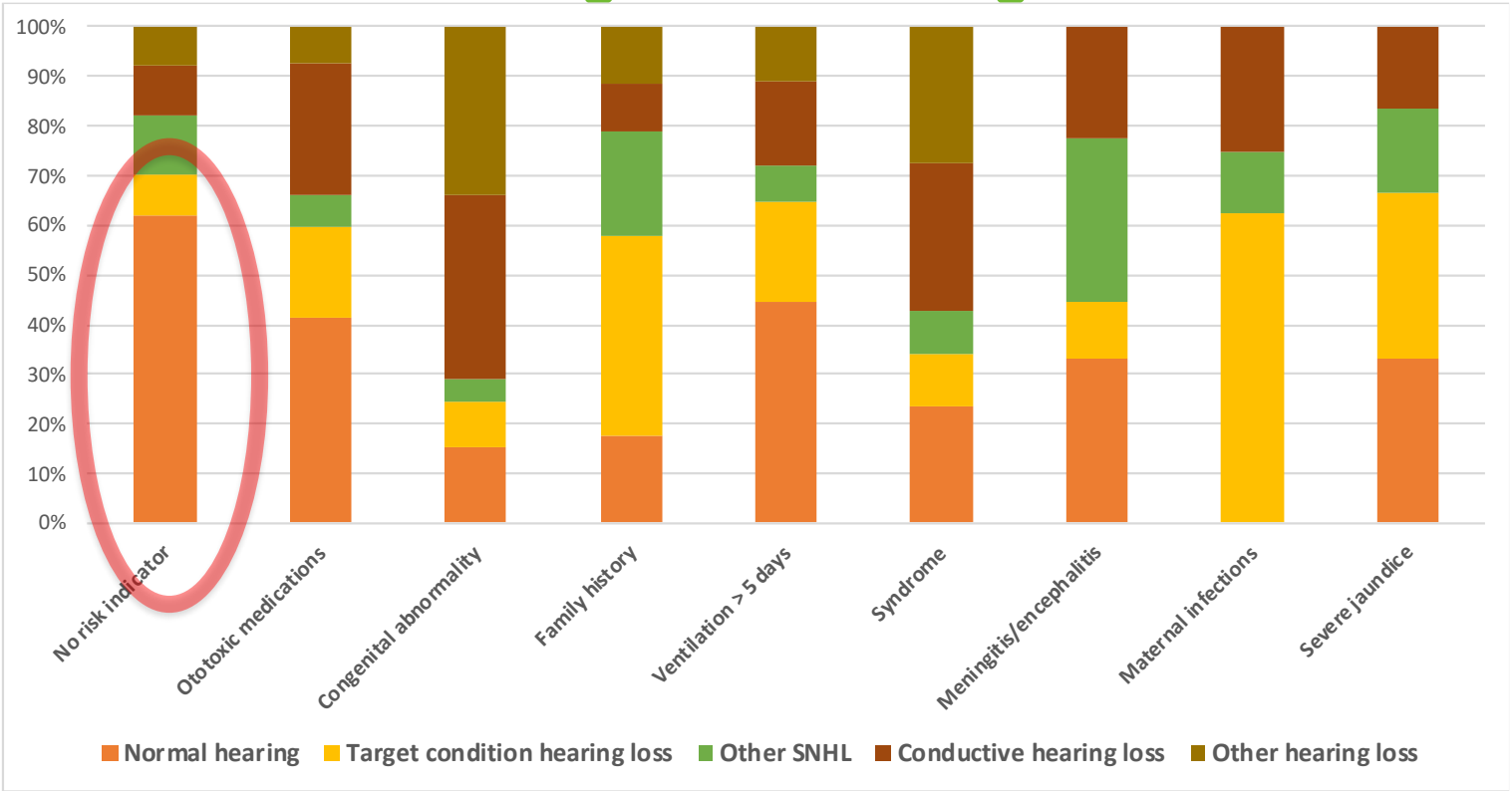
Risk indicators and diagnostic audiological outcome



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Further statistical analyses

- Chi-squared analyses (x^2)

→ Significant associations between the diagnosis of the target condition and **family history, ototoxic medications, ventilation**, and **maternal infections**

- Logistic regression analysis

Risk indicator	Yield of target condition hearing loss	Adjusted odds ratio	Standard error / 95% CI
Family history	40.3%	**6.4**	1.8 (3.7 – 11)
Maternal infections	62.5%	**11.6**	8.8 (2.6 – 51.5)
Ototoxic medications	18.3%	**1.8**	0.5 (1 – 3.1)

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Results overview

- UNHS-referred infants with specific recorded risk indicators – **maternal infections, family history**, and **ototoxic medications** – were more likely to be diagnosed with the target condition hearing loss
- Infants with the recorded indicators of **maternal infections, congenital abnormality of the head/neck**, and **family history**, were much less likely to have a diagnosis of normal hearing
- Infants with **any risk indicator** recorded had considerably higher proportions of the target condition hearing loss, and any type of hearing loss, than infants with no indicators recorded

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Discussion

- Comparisons with existing research

→ Wood, S. A., Davis, A. C., & Sutton, G. J. (2013)

→ Wróbel, M. J., Greczka, G., & Szyfter, W. (2014)

→ Beswick, R., Driscoll, C., Kei, J., Khan, A., & Glennon, S. (2013)

- Scope of existing research
- Methodological differences
- Comparing results

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Strengths and limitations

- Strengths

→ Data from a population-derived source

→ Established UNHS system

→ Audiological assessment and minimal loss to follow-up

- Limitations

→ Timeframe of data collection period and audiological follow-up information

→ Data items included in analysis

→ Collection and reporting of risk indicator information

Conclusion and future directions

Aim 1

- Referred infants with **specific recorded risk indicators** were more likely to be diagnosed with the target condition hearing loss, as well as other types of hearing loss

Aim 2

- This information has the potential to be **utilised within UNHS systems** to aid resource allocation and prioritise audiological waiting lists, improving the efficiency of the screening pathway

- **Future directions**

→ Expansion of population sample

→ Incorporation of other information from hearing screening

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Thank you. Questions?

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