

# Beyond the excel spreadsheet!

## Re-imagining data for newborn hearing screening programs

UNHS and Early Intervention Programme's 10<sup>th</sup>  
Anniversary and nation hui  
11 May 2021

**Rachael Beswick**  
Director, Healthy Hearing Program



**SO EXCITED**

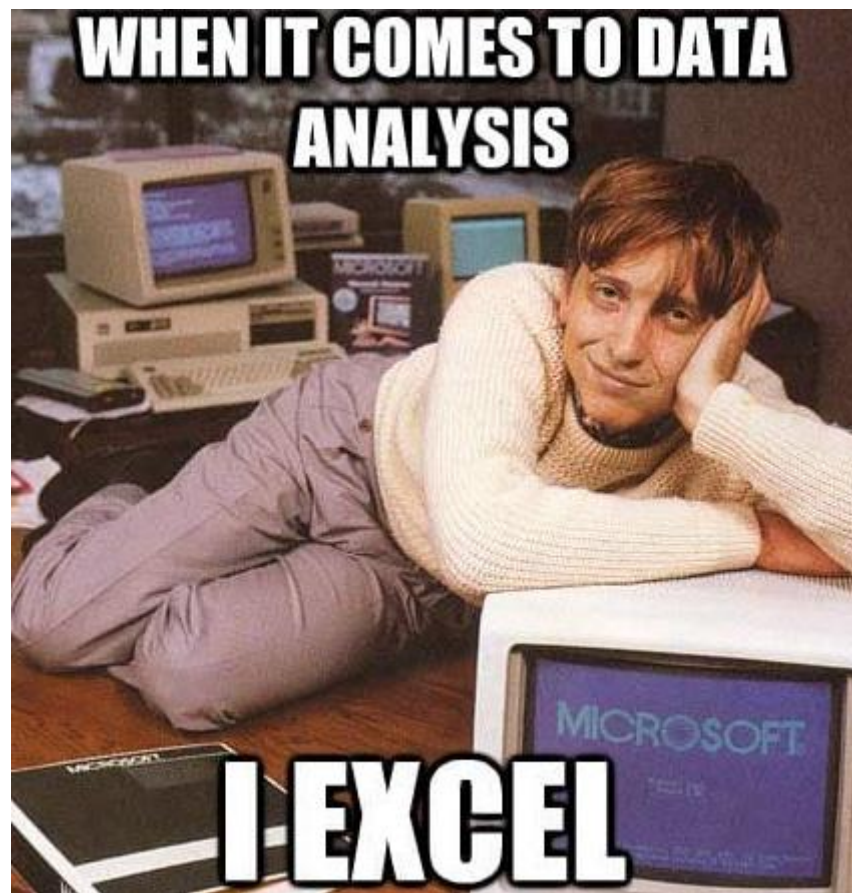
**I CAN'T WAIT!!**



**Me: This show is boring.**

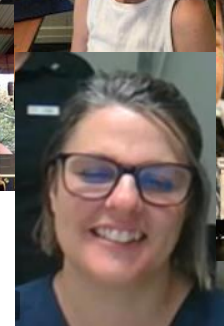
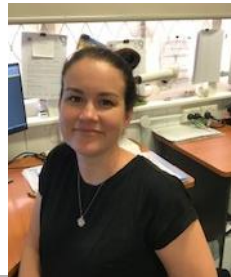
**Boss: Again, this is a Zoom conference.**





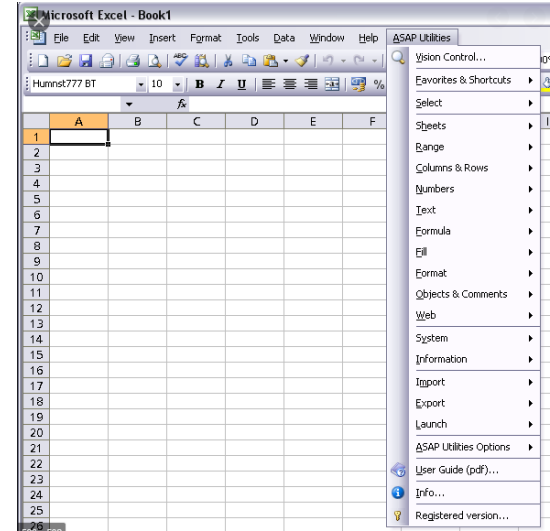


# Healthy Hearing team

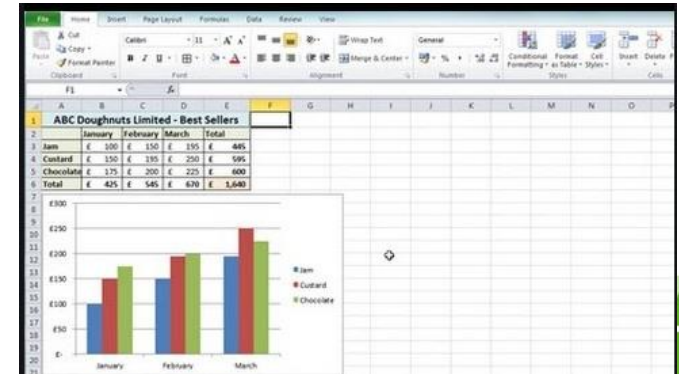


# Where it all began.....

October 4, 2004 Healthy Hearing began

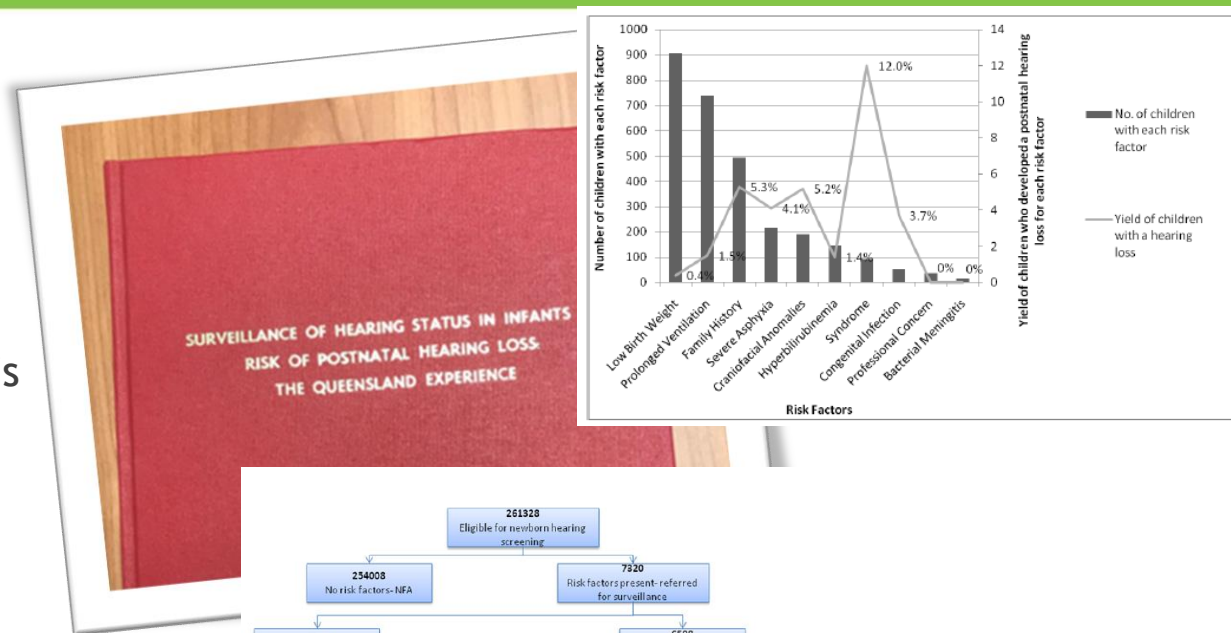


2008 moved to an off the shelf product Oz Systems eSP



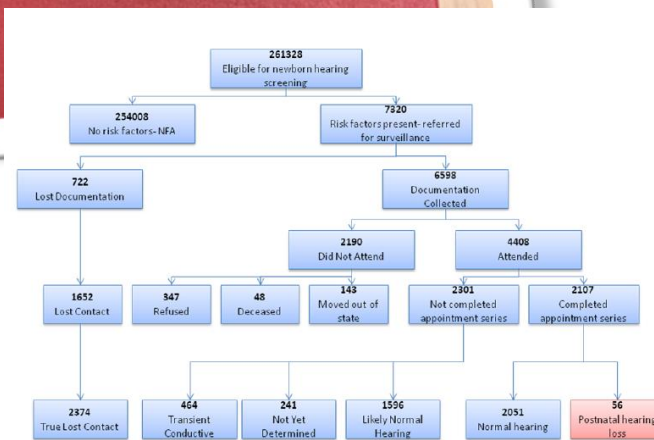
## What we could do

- ▶ State-wide reporting!
- ▶ Retrospective data analysis
  - ▶ Relied on data extraction tools and Macros



## What we couldn't do

- ▶ Restricted pathway information
- ▶ Restricted reporting





March 2013, developed  
QChild



Microsoft Dynamics CRM

Workplace

- Reporting
  - Dashboards
- Workplace
  - Facilities
- Children
  - Birth Records
  - Children
  - URs
  - Contacts

Workplace

- Screening
- Audiology
- FSS
- CHC

Dashboard: **Screening - In Process/To-Do**

Referrals: **Screening - Transfers**

Primary UR (Child)	Child	Date Of Birth (C...	To	From	Reason	Created On
D0		3/05/2013	Toowoomba Hosp			7/05/2013 2:50 ...
S6		26/04/2013	Logan Hospital Sc			6/05/2013 4:24 ...
33		16/04/2013	Gold Coast Hospi			6/05/2013 4:21 ...
T4		3/04/2013	Toowoomba Hosp			6/05/2013 4:02 ...
14		30/04/2013	Redcliffe Hospital			6/05/2013 1:10 ...
14		5/04/2013	Ipswich Hospital			3/05/2013 11:11...
14		5/04/2013	Caboolture Hospi			3/05/2013 11:06...
14		9/02/2013	Bundaberg Hospi			3/05/2013 10:06...

1 - 8 of 22 (0 selected)

Needs Screening

Screening - Needs Screen

■ Awaiting AABR1  
■ AABR1 - Refer L

URs: **Screening - All UR Search**

UR ID	Facility	Last Name (Child)	First Name (Child)	Date Of Birth (C...	Gender (Child)	Cr
	St Vincent's Hos				male	stew
	St Vincent's Hos				male	stew
	Mater Mother's				male	Mott
	Royal Children's				emale	Ziek
	Mater Mother's				female	Lavee
	St Vincent's Hos				emale	MAR
	Mater Townsville				male	Kreyr
	North West Priv				male	heal
	Wesley Hospital				male	MCKI
	Wesley Hospital				male	WILS
	Wesley Hospital				male	SZPE

1 - 11 of 65000+ (0 selected)

Children: **Screening - Too Young**





**Audiology**



**Family Support**



**Screening**



**Child Hearing Clinics**



**Deadly Ears**




**Early Intervention**



**Hearing Implant**



The background features a series of overlapping, semi-transparent green geometric shapes, primarily triangles and quadrilaterals, that create a sense of depth and movement. The colors range from a light, pale green to a vibrant, saturated lime green. The shapes are layered, with some appearing to be in front of others, creating a complex, layered effect. The overall composition is modern and clean, with a focus on geometric forms and color gradients.

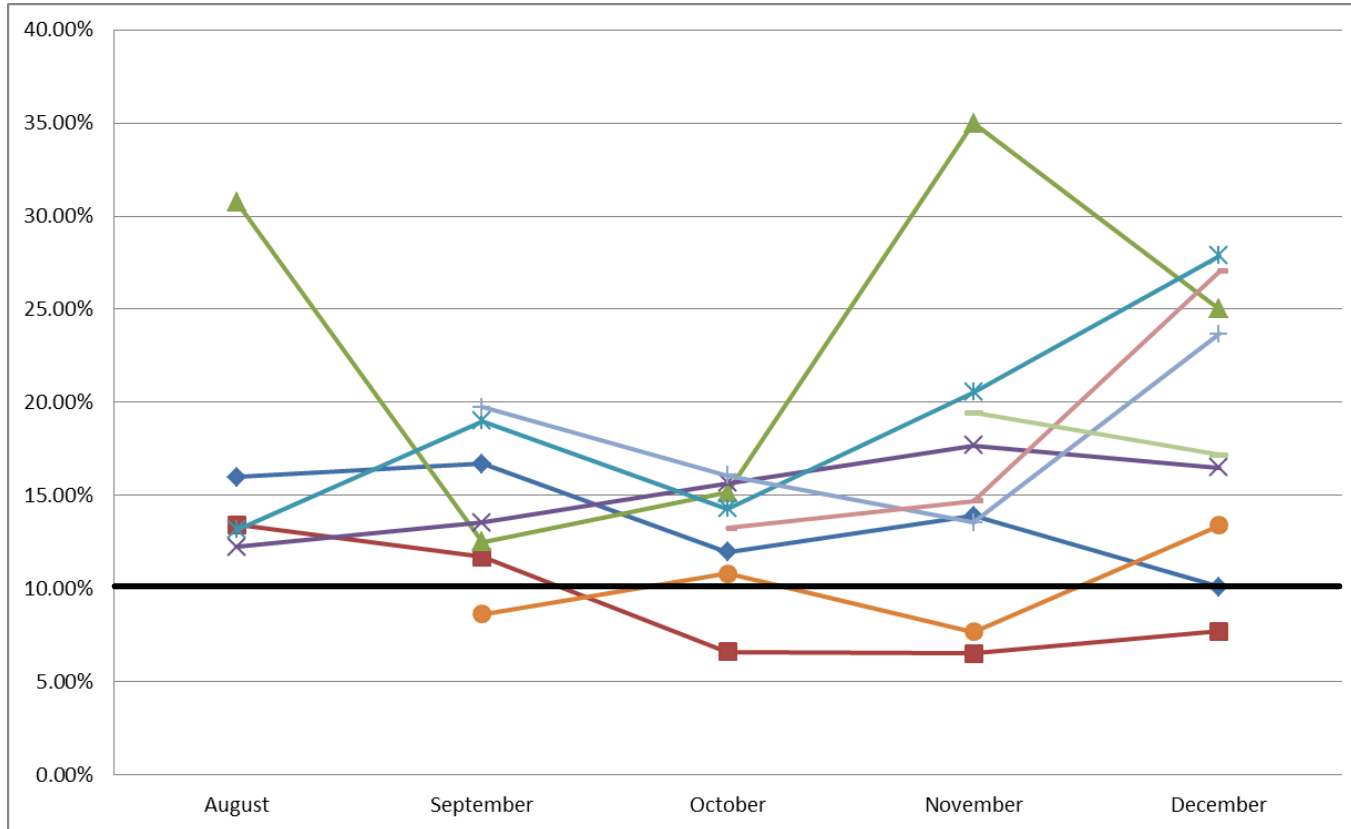
Data to explore  
current  
problems

# On-ward issues explored through data

- ▶ Dec 2014 approval to go to tender for new screening device
- ▶ Tender process and equipment evaluation - 12 months
- ▶ Extensive stakeholder group + consultation
- ▶ Extensive equipment trial
- ▶ Unanimous decision - Dec 2015
- ▶ Roll-out from Aug 2016



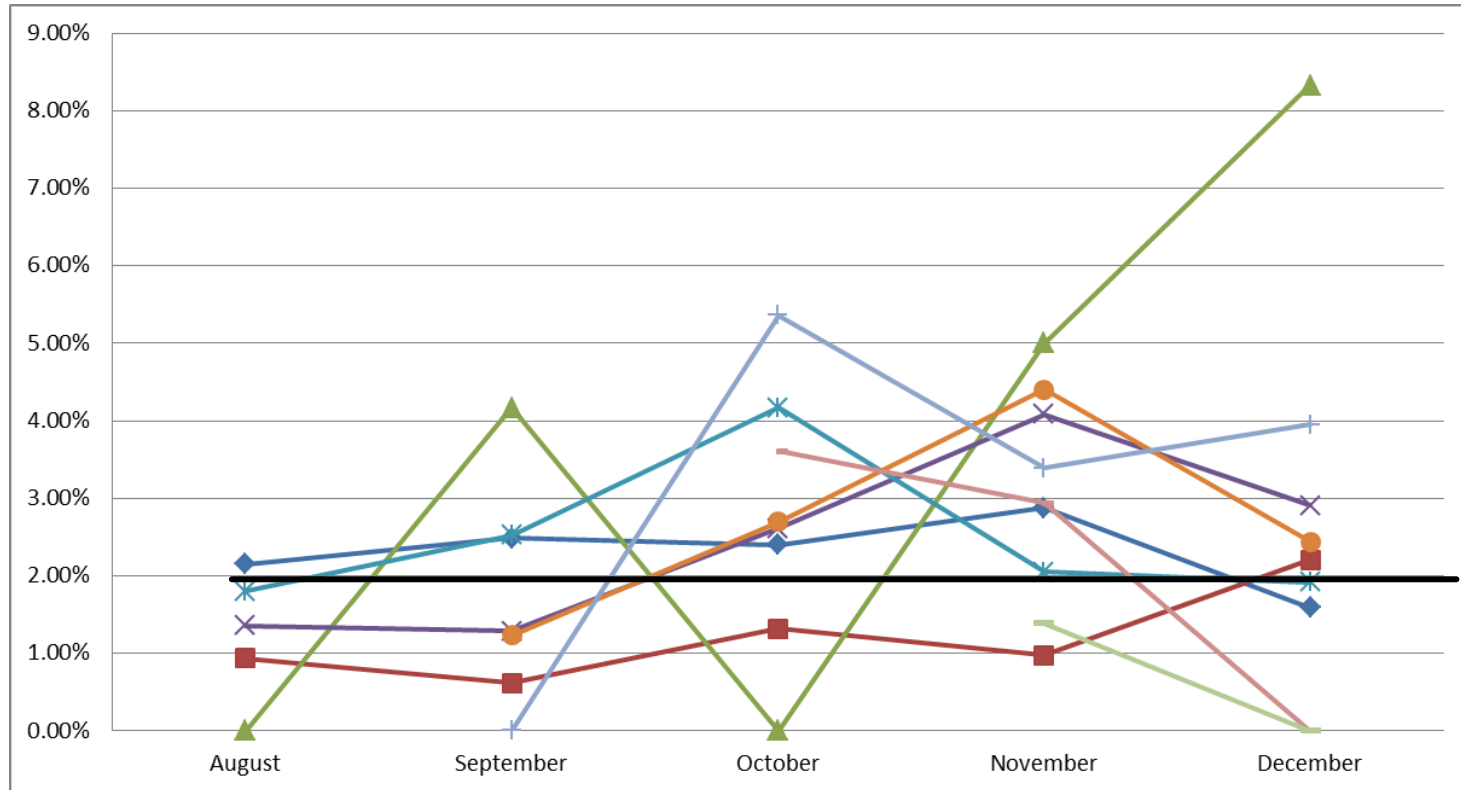
# The honeymoon is over - first refer rate



10%



# The honeymoon is over - second refer rate



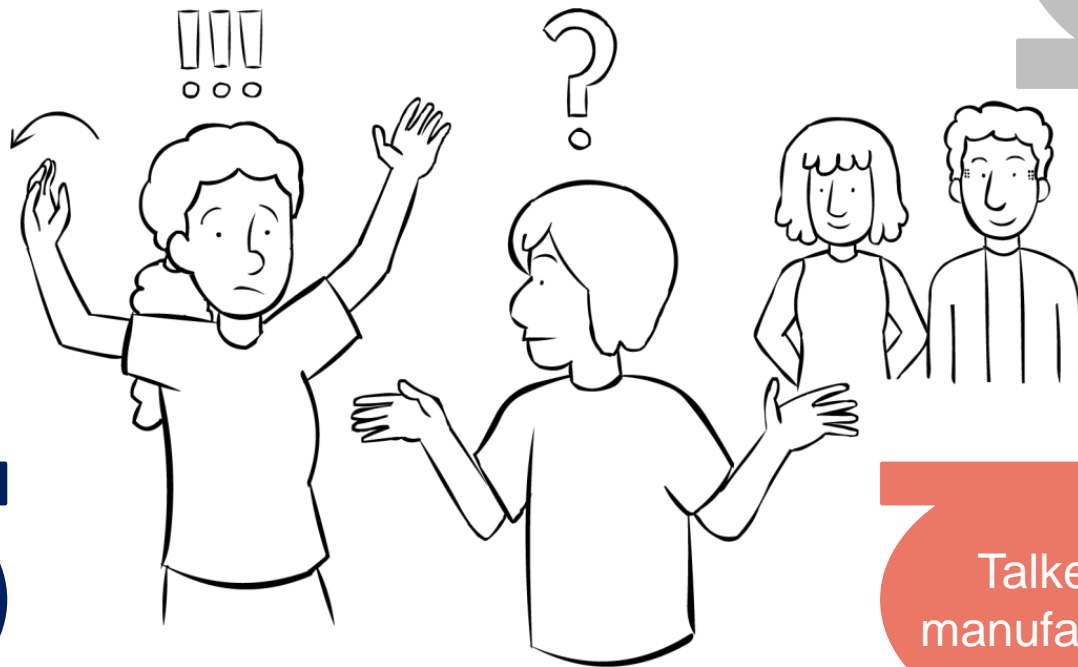
2%



## Time to trouble shoot

Talked to hospitals

Review broad data  
- hospitals,  
screening  
models

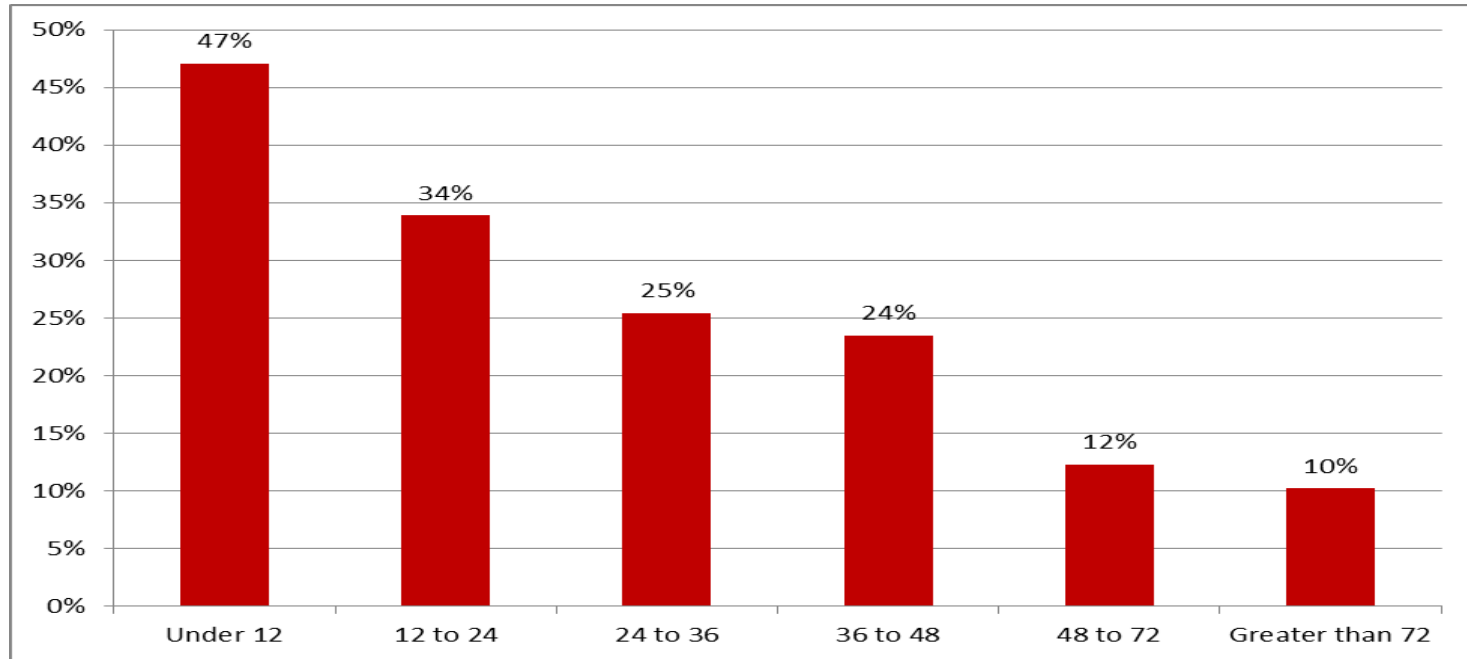


QChild data  
review

Talked to  
manufacturers

# QChild data review

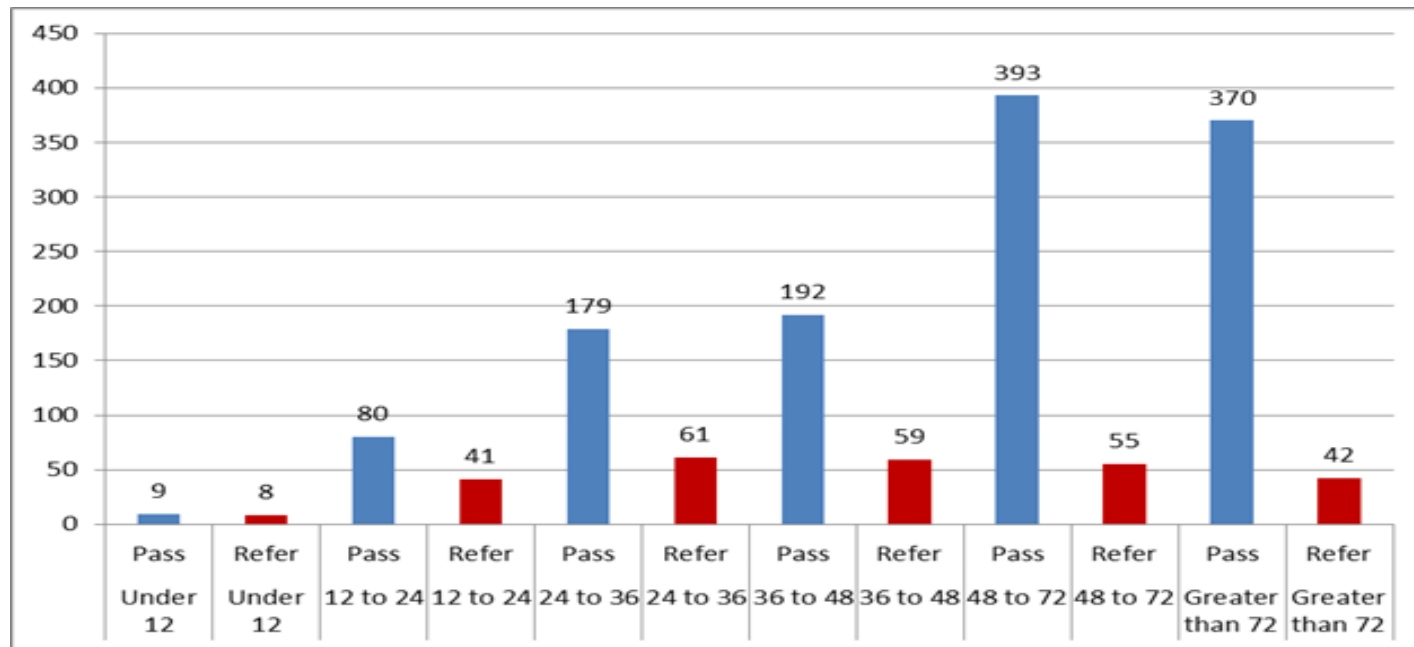
## First refer rate and time of screen





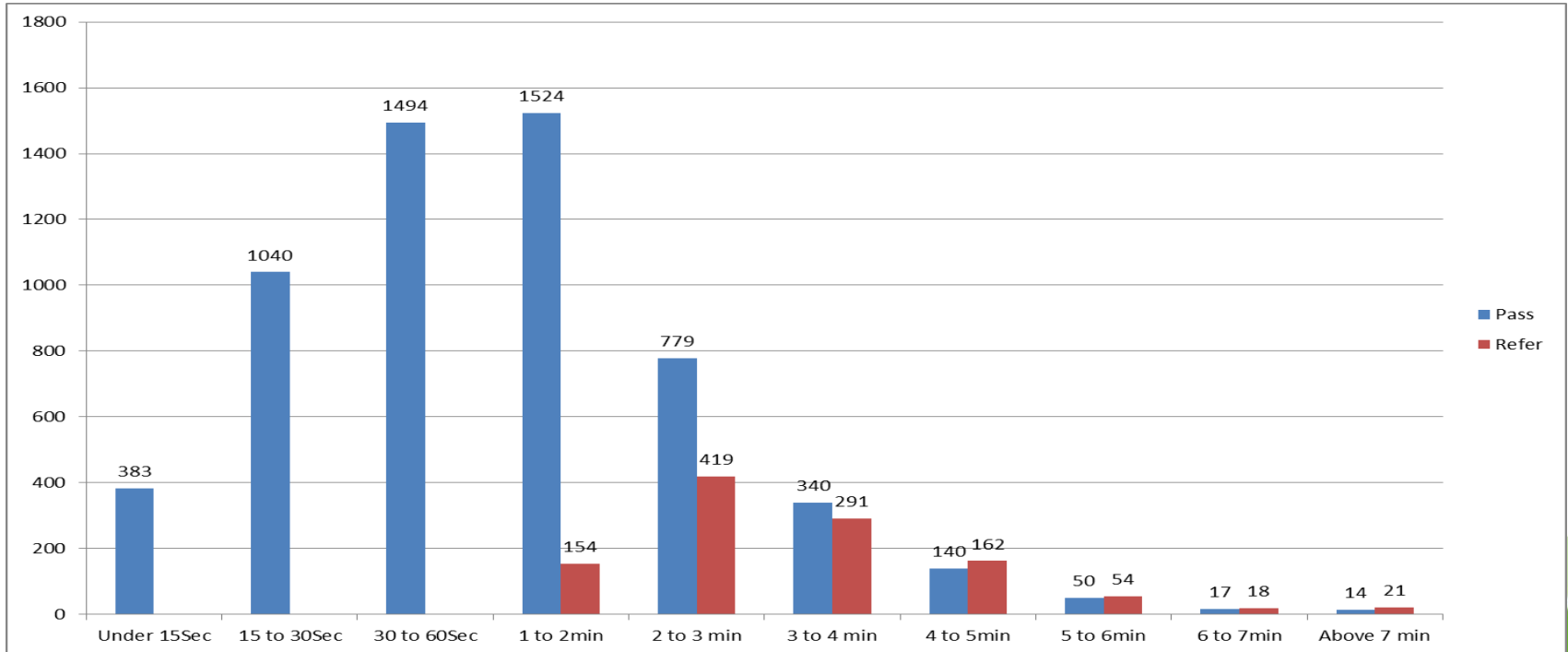
# QChild data review

## First refer rate and time of screen



# QChild data review

## Screen duration



# QChild data review

- **Comparison of individual devices**
  - No difference in referral rates
- **Ear Hugs vs. Couplers**
  - No difference



# Analysis continues

- Reviewing trend data
  - 1<sup>st</sup> hospital met 1<sup>st</sup> refer KPI in December!
- Discussion with team reasons for improvement
  - Less births in December, less pressure to screen
  - Modification to practice:
    - ▶ NuPrep on every baby
    - ▶ Baby selection critical
    - ▶ Clarification on using “stop” vs “pause”



# Analysis continues

- Discussion with team reasons for improvement

- Less births in December, less pressure to screen



- Modification to practice:

- ▶ NuPrep on every baby

- ▶ Baby selection critical

- ▶ Clarification on using “stop” vs “pause”

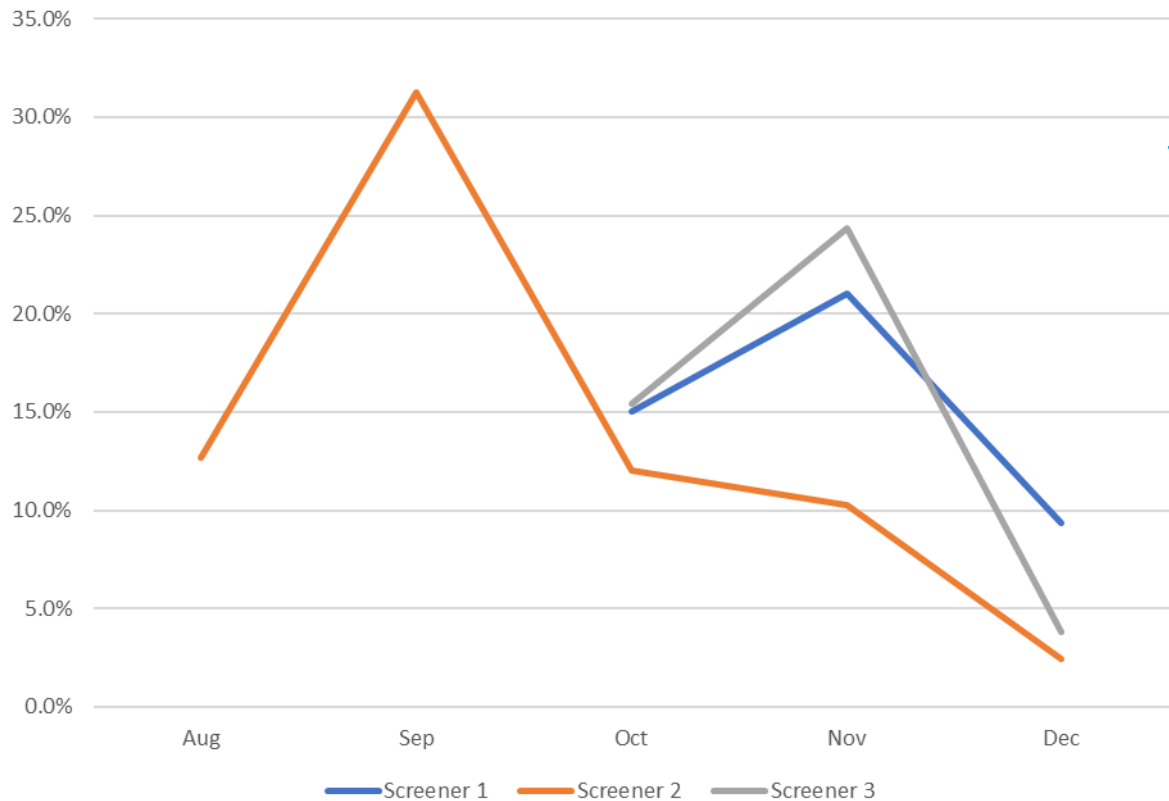


- Review of individual screener performance



# QChild data review

## Individual screener performance

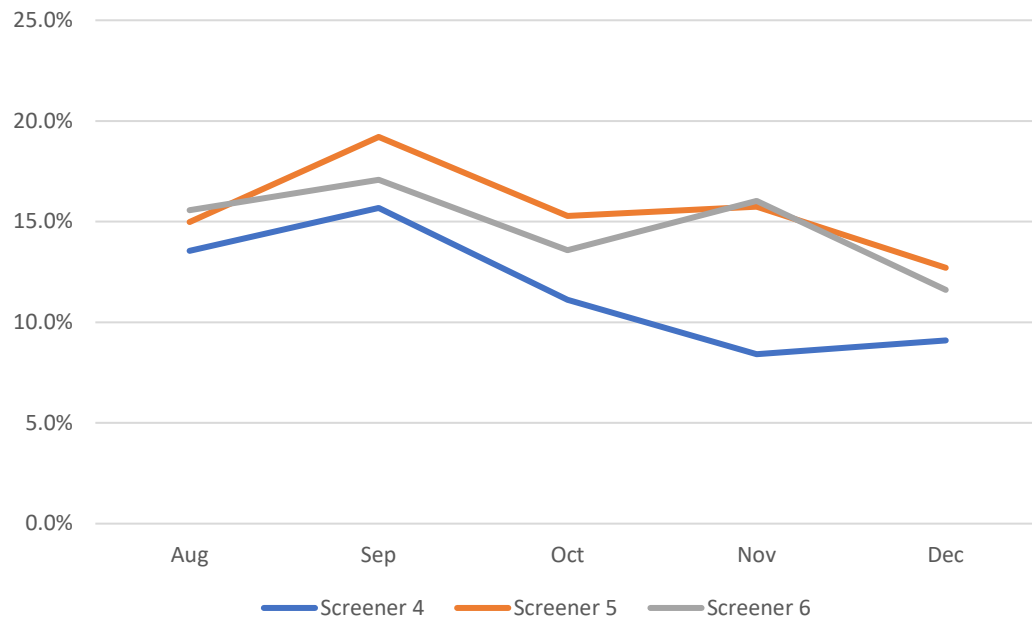


Improved performance meeting KPIs



# QChild data review

## Individual screener performance

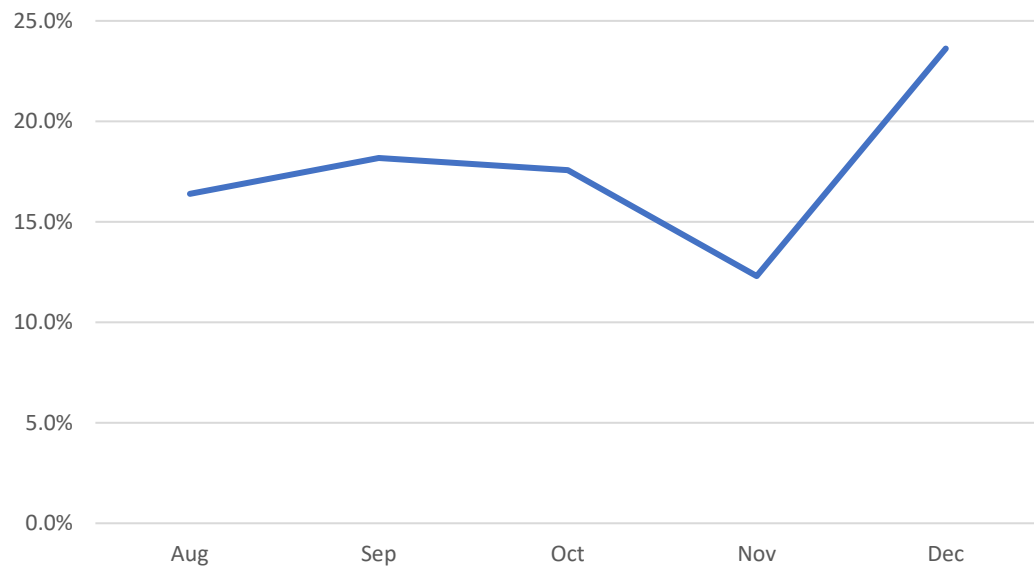


Improved performance  
- KPIs almost met



# QChild data review

## Individual screener performance



Not yet meeting KPIs



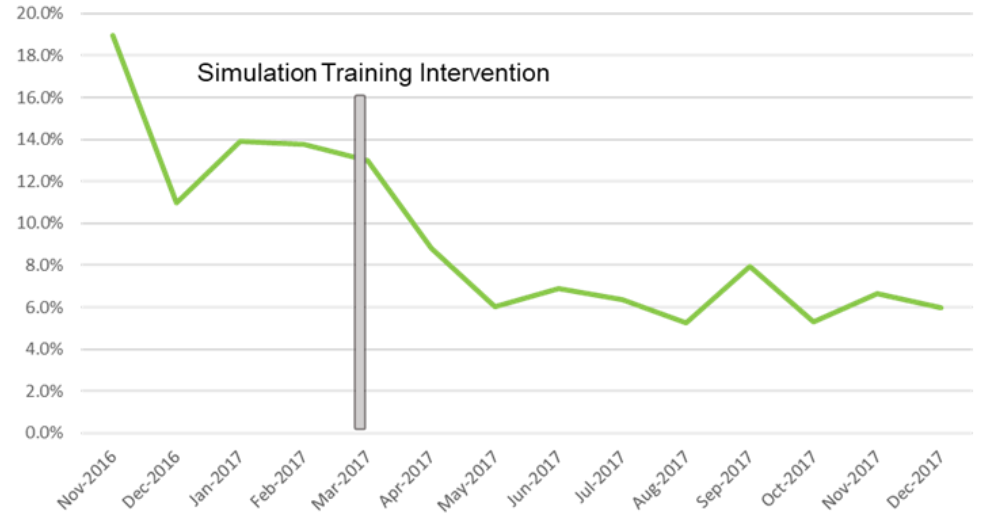
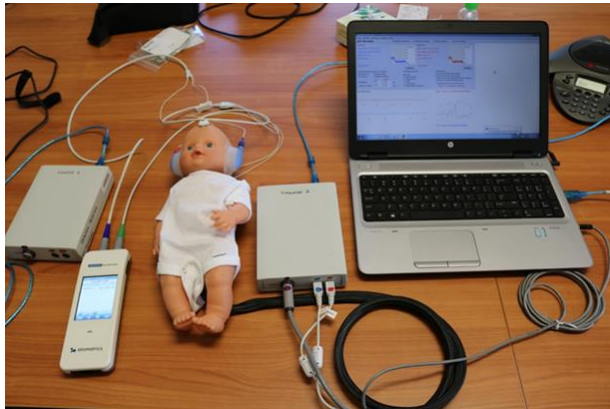
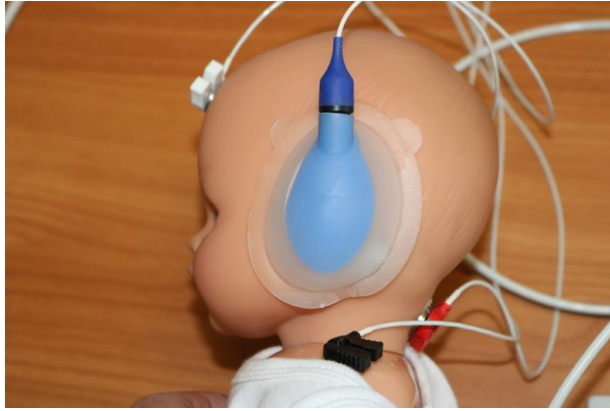


# What happens next

- ▶ Data provided to Director
- ▶ Director discussed results with team - story behind the data
- ▶ Tailored support to improve service delivery
- ▶ On-going state-wide review of hospital refer rates and screener performance



# “Hands on” teaching tool



# How has this data affected practice?

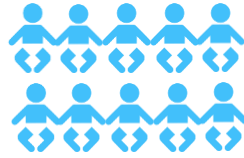
- ▶ The nurses decision making is the critical factor!
- ▶ Baby selection is key
  - ▶ Quiet, calm babies
- ▶ Swaddling to limit excessive movement
- ▶ Prep the skin for good sensor attachment for faster screens
- ▶ Nurses trust their experience and don't proceed with unsettled babies



The background features a series of overlapping, semi-transparent green triangles and polygons that create a dynamic, layered effect. The colors range from light lime green to dark forest green. The shapes are primarily located on the right side of the frame, extending towards the center.

Data to predict  
outcomes

# Challenge our practice

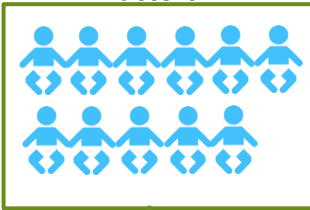


Out of every 10 babies  
tested by an Audiologist...



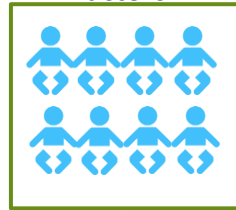
1 will be found to have a  
hearing loss in one or both ears

**Unilateral  
refer, no risk  
factors**



1 in 11

**Unilateral  
refer, risk  
factors**



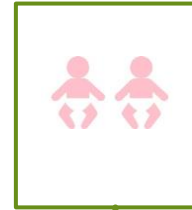
1 in 8

**Bilateral refer,  
no risk factors**



1 in 3

**Bilateral refer,  
risk factors**



1 in 2

**Medical  
exclusion**








1 in 2





## Predicting hearing loss from 10 years of universal newborn hearing screening results and risk factors

E. Jane Fitzgibbons<sup>a</sup> , Carlie Driscoll<sup>b</sup> , Joshua Myers<sup>b</sup> , Kelly Nicholls<sup>a</sup>  and Rachael Beswick<sup>a</sup> 

<sup>a</sup>Healthy Hearing Program, Children's Health Queensland Hospital and Health Service, Brisbane, Australia; <sup>b</sup>School of Health and Rehabilitation Services, University of Queensland, Brisbane, Australia

### ABSTRACT

**Objective:** This study investigated whether demographic variables, risk factor presence or absence and universal newborn hearing screening (UNHS) results can be used to predict permanent childhood hearing loss (PCHL) in infants referred from screening.

**Design:** Retrospective analysis of a UNHS database.

**Study sample:** Data were extracted from the state-wide UNHS database storing details of the 613,027 infants who were born in Queensland, Australia between 1 January 2007 and 31 December 2016 and participated in UNHS. This study included the 6735 children who were referred from the UNHS program for diagnostic audiology due to failing the screen in one or both ears or bypassing screening.

**Results:** Factors with a significant positive association with PCHL that were incorporated into a logistic regression model were: female gender, non-indigenous status, family history of PCHL, craniofacial anomalies and syndromes associated with PCHL, and a bilateral refer result on screening.

**Conclusions:** Odds of PCHL vary among infants referred for diagnostic assessment from UNHS programs. When an infant refers on the newborn hearing screen, information about their gender, indigenous status, identified risk factors and specific screening outcome can be used to predict the likelihood of a congenital PCHL diagnosis.

### ARTICLE HISTORY

Received 15 July 2020

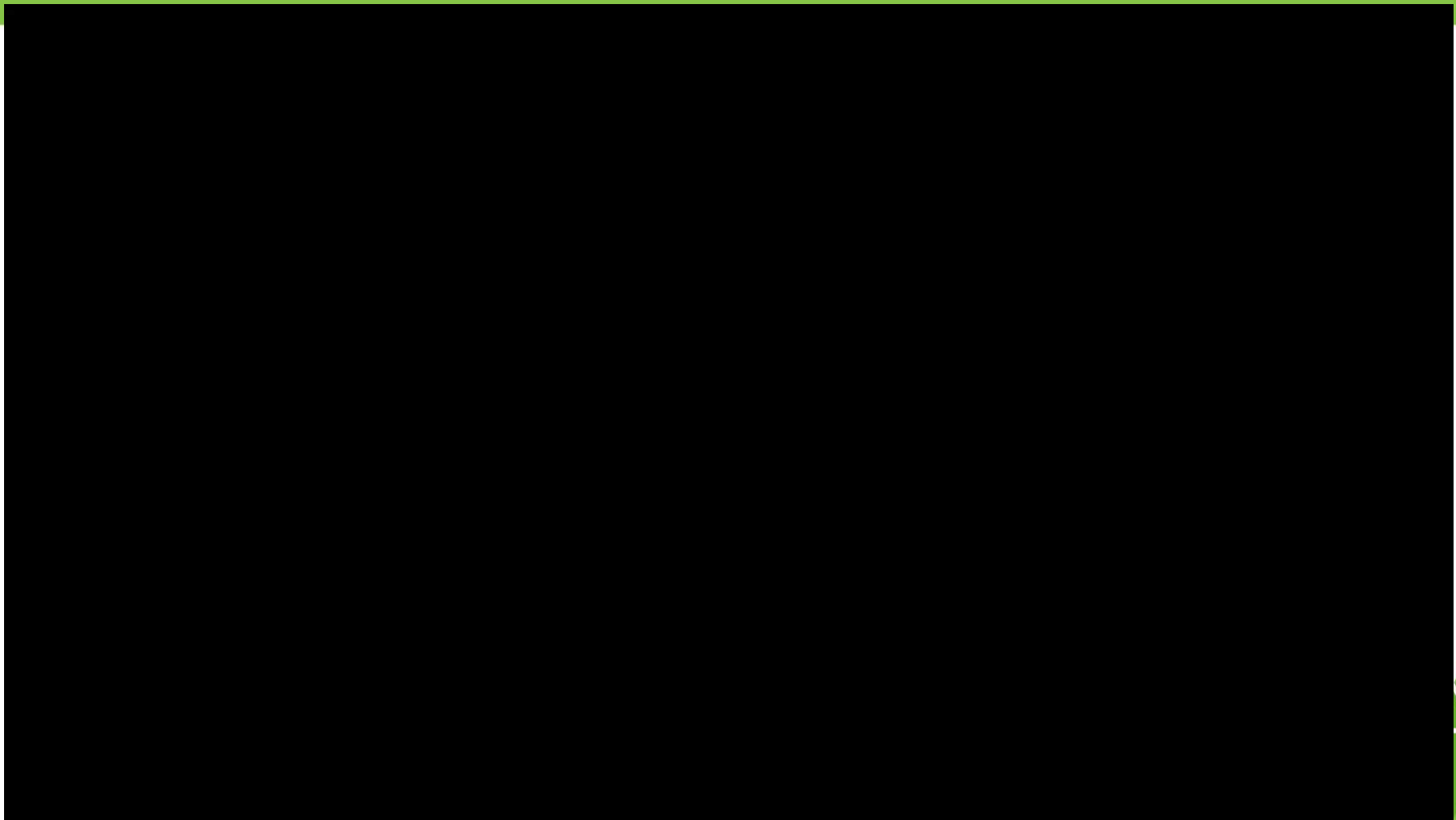
Revised 1 November 2020

Accepted 29 December 2020

### KEYWORDS

Audiology; hearing loss; infant; risk factors; screening

<https://healthy-hearing.shinyapps.io/Risk-calculator/>



# Clinical implications

- Patient scheduling
- Resource allocation

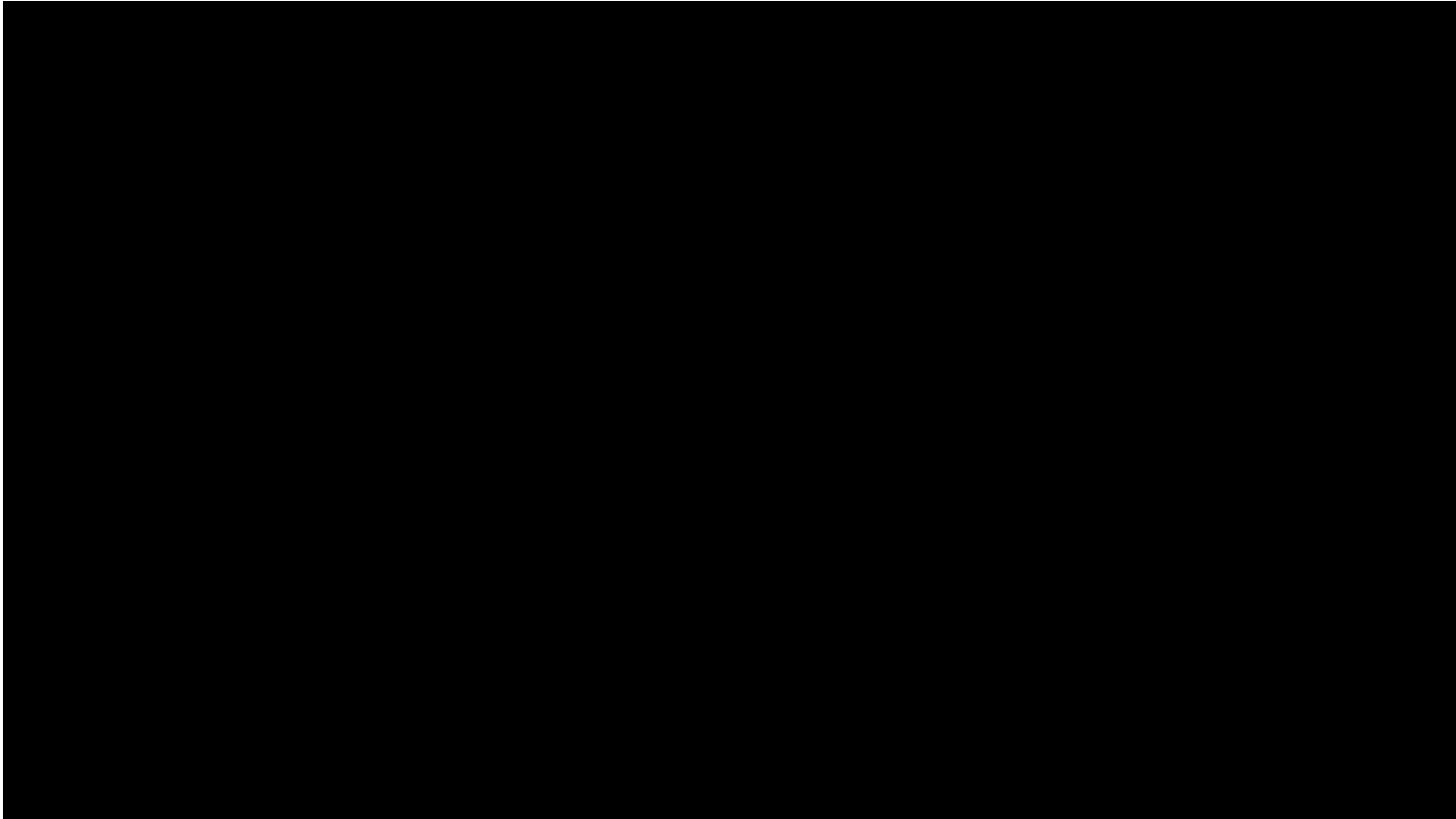






# Data visualisation and Machine Learning

# Data visualisation





Aboriginal and Torres Strait Islander children have one of the highest rates of middle ear disease and hearing loss in the world.

*“Hey, can you get QChild to display these otoscopy images so ENT’s can look at them outside of being on the trip in person?”*



## Right Ear

Add Image(s)



Demo oto 1.JPG  
Uploaded



Finding R

Aerated middle ear

Comments R

Cholesteatoma

Grommet

Foreign Body

Otitis Externa

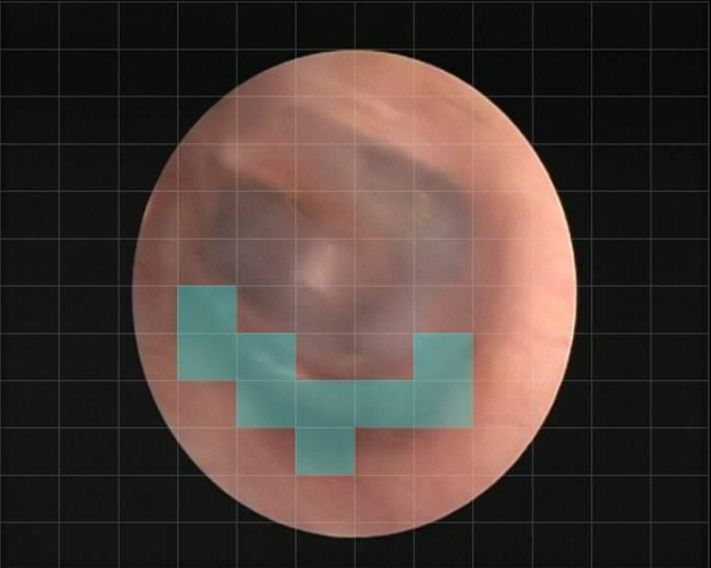
Wax

Retraction

Right Ear

 This ear has been flagged for referral (0.343 probability of Otitis Media with Effusion)

1 of 1




Diagnosis Degree  
Moderate


Diagnosis Type  
Mixed

Tymp Type  
B

AB Gap  
No

[View Full Audiology Report](#)

 Hide Area of Concern

 Full Screen



Custom Vision

HH Deadly Ears

TRAINING IMAGES

PERFORMANCE

PREDICTIONS



Sign out

Refine

Add images

Delete

Tag images

Select all

Workspace

Iteration History

Tags



- All (39)
- Aerated Middle Ear (23) ...
- Left (20) ...
- Not Determined (6) ...
- Otitis Media with Effusion (11) ...
- Right (19) ...
- Wax (6) ...
- Untagged (0)



## Right Ear



This ear was passed with no recognised issues



## Right Ear



This ear has been flagged for referral (0.343 probability of Otitis Media with Effusion)

1 of 1



Diagnosis Degree  
Moderate

Diagnosis Type  
Mixed

Tymp Type  
B

AB Gap  
No

[View Full Audiology Report](#)

View Area of Concern

Full Screen



# Potential applications

- ▶ Shortage of ENT specialists across QLD
- ▶ Primary care setting
- ▶ Other parts of our business including Audiology



The background features a series of overlapping, semi-transparent green geometric shapes, primarily triangles and quadrilaterals, that create a sense of depth and movement. The colors range from a light, pale green to a vibrant, saturated lime green. The shapes are layered, with some appearing to be in front of others, creating a complex, layered effect. The overall composition is modern and clean, with a focus on geometric forms and color gradients.

Supporting  
other state-  
wide programs



**Audiology**



**Family Support**



**Screening**



**Child Hearing Clinics**



**Deadly Ears**



**Early Intervention**



**Hearing Implant**





QVision ▼

Dashboards >



QVision

## Reporting



Dashboards



Reports

## Screenings



School Children



Vision Screens



School Visits

## Online Forms



School Children Cons...



Outcomes Online Form

## Management



Schools Management



Schools



Classes

# State-wide vision screening program

Online consent

## Parental Consent Form

### Welcome to the Parental Consent Form Portal

For more information on this site, please select from the following links:

- [Parent Information Sheet](#)
- [Translated Parent Information](#)
- [Email communication consent information](#)

If you would prefer to fill out a paper version of this form, please print and complete the attached consent form and return it to the school in a sealed envelope as soon as possible:

- [Paper Consent Form](#)

### First, please confirm your child's school

Step 1 of 5

**Name of School**

Aramac State School

**School's Post Code**

4726

**Name of Child's Class**

-- please select --

I'm not a robot

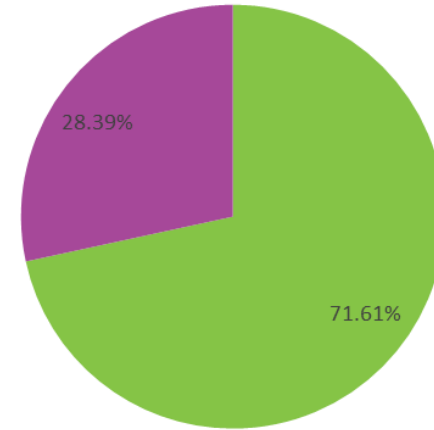
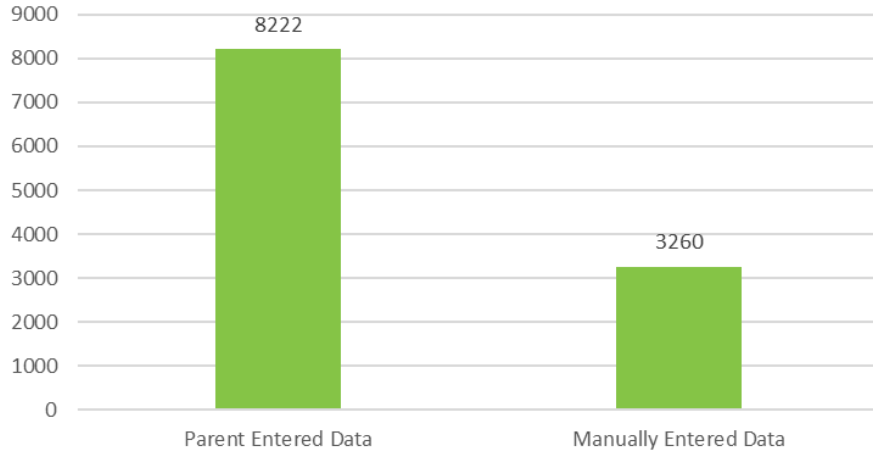


reCAPTCHA  
Privacy - Terms

# State-wide vision screening program

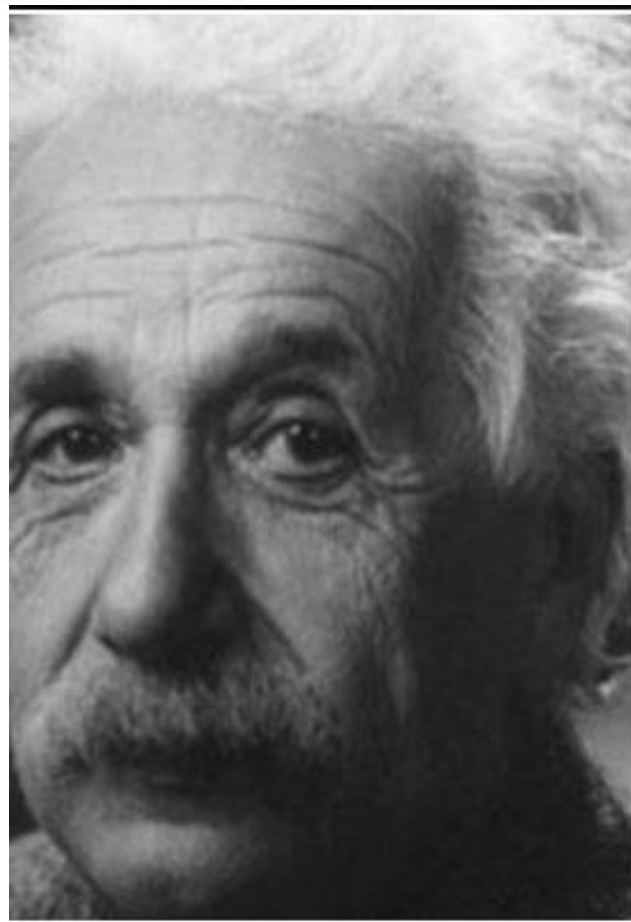
## Online consent

2021 Data Entry Source



>70% in Q1 entered via portal





The more I learn, the more I realize I  
don't know.

— *Albert Einstein* —

AZ QUOTES



**THERE IS NO FINISH LINE.**

