

# Universal Newborn Hearing Screening and Early Intervention Programme (UNHSEIP)

## Monitoring Report

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January to December 2015



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# Executive summary

Universal newborn hearing screening is the standard of care internationally, and in New Zealand. The early detection of hearing loss, and the application of appropriate medical and educational interventions, has been demonstrated to significantly improve the baby's long-term language skills and cognitive ability.

In August 2010 the national implementation of the Universal Hearing Screening and Early Intervention Programme (UNHSEIP) was completed. All 20 district health boards (DHBs) offer screening to the families and whānau of newborn babies.

Throughout 2015, following the recommendations of the report *Review of newborn hearing screening regimes and associated screening devices for the National Screening Unit*,<sup>1</sup> revised protocols and standardised screening equipment were implemented across all 20 DHBs. The move to aABR only screening and refined surveillance criteria, combined with new equipment, represented a significant change for the programme. Each DHB implemented the changes at a different time, linked to the timing of on-site training, which was provided at each DHB between March and September 2015.

The core goals of the programme, which are based on international best practice, are unchanged, and are described as '1–3–6' goals:

- 1 = ≥95% babies to be screened by one month of age
- 3 = ≥90% audiology assessments completed by three months of age
- 6 = initiation of appropriate medical, audiological and early intervention education services by six months of age.

This monitoring report covers the babies screened in the 12 month period from 1 January 2015 to 31 December 2015. Audiology data for these babies up to 9 August 2016, when final data was extracted, is captured in this report.

The *UNHSEIP Monitoring Framework 2009* was updated in 2015. Consistent with a maturing programme, the new framework shifts the focus of monitoring from the screening process to greater consideration of outcomes across the programme pathway and performance against international benchmarks. Some indicators in the revised framework are still under development, whilst others cannot be reported until additional data from the new newborn hearing information management system (NHIMS) and other sources is available.

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<sup>1</sup> Young Futures. 2014. *Review of Newborn Hearing Screening Regimes and Associated Screening Devices for the National Screening Unit*. Ministry of Health, New Zealand, March 2014.

## Key points from January 2015 to December 2015

- The total number of offers reported by DHBs for 2015 was 57,814 out of 58,972 live births (98.0%).
- 95.6% of parents/guardians that were offered screening consented, and 97.7% of those that consented completed screening.
- 83.1% of babies born completed screening by 1 month of age and a total of 91.5% completed screening for the period. Completion rates were higher for Other and Asian babies than for Māori and Pacific babies, and for babies from areas of lower deprivation compared to high deprivation.
- The rate of referral to audiology for babies screened during the period was 2.4%. Northland and Hawke's Bay DHBs had the highest rates.
- 2.2% of babies that passed screening were referred for surveillance due to the presence of a risk factor for development of hearing loss. Hawke's Bay and Nelson Marlborough DHBs had the highest surveillance rates, and rates by ethnicity varied from 3.5% for Māori to 1.6% for Asian babies.
- The most common risk factor identified for babies referred for surveillance was family history (45.6% of babies referred, 1.0% of completed screens).
- The positive predictive value (PPV) of screening for 2015 was 14%.
- 873 (66.5%) out of 1,318 babies referred to audiology had assessments completed by the date of data extraction for this report. 56.4% of referrals had their assessments completed by three months of age. There were also 104 babies for whom the audiology outcome was DNA/lost contact/declined. Assessment completion rates were lower for Māori and Pacific babies, and for babies living in areas of greater deprivation.
- 86.0% of babies that had a confirmed diagnosis of permanent congenital hearing loss<sup>2</sup> (PCHL) received that diagnosis by three months of age.
- 85.3% of completed audiology assessments were started and completed on the same day. These babies equated to 56.8% of all referrals to audiology for the period.
- Nationally, 2.2 babies per 1000 completed screens had PCHL diagnosed.
- Early intervention education services received referrals for 150 babies and children during the 2015 year. Of these, the families/whānau of 120 referrals (80%) were contacted within 10 working days.
- 91.3% of referrals to early intervention began receiving services within one month of referral, against a target of 90% or greater. The rates for all ethnicities except Asian and NZ European exceeded the target.
- 97.7% of referrals to early intervention began receiving services by six months of age, exceeding the target of 90% or greater. The target was met for all ethnicities.
- Just over half of all exits from early intervention services occurred before the child was three years of age. A portion of these exits may actually relate to instances of service change rather than complete withdrawal.
- In the Central North Education District, 95% of eligible children had language assessments completed within the recommended age period. Of these, 33% had a language level within six months of what that expected for their chronological age.

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<sup>2</sup> In this report permanent congenital hearing loss has been defined as a diagnosis that includes auditory neuropathy, sensorineural, conductive permanent, or mixed (combination of sensorineural and conductive) hearing loss.



**Table 1: Summary of newborn hearing screening participation indicators by DHB, 1 January to 31 December 2015**

DHB of first screen	Offers	Consents	Declines	Live births	1.1	1.2a	1.2b
					Offers as % of births	Consents as % of offered <sup>1</sup>	Declines as % of offers
					Percentage		
Number					Percentage		
Northland	2045	1734	78	2140	95.6	84.8	3.8
Waitemata	6118	5773	98	7622	80.3	94.4	1.6
Auckland	8015	7703	71	5937	135.0	96.1	0.9
Counties Manukau	7043	7086	26	8253	85.3	100.6	0.4
Waikato	5259	4728	52	5319	98.9	89.9	1.0
Lakes	1508	1401	4	1520	99.2	92.9	0.3
Bay of Plenty	2578	2387	129	2796	92.2	92.6	5.0
Tairāwhiti	705	705	3	741	95.1	100.0	0.4
Taranaki	1542	1480	17	1528	100.9	96.0	1.1
Hawke's Bay	1920	1816	28	2010	95.5	94.6	1.5
Whanganui	808	777	5	816	99.0	96.2	0.6
MidCentral	1968	1946	4	2131	92.4	98.9	0.2
Hutt Valley	1980	1941	7	1979	100.1	98.0	0.4
Capital & Coast	3680	3530	19	3561	103.3	95.9	0.5
Wairarapa	444	435	3	462	96.1	98.0	0.7
Nelson Marlborough	1529	1403	21	1426	107.2	91.7	1.4
West Coast	325	302	17	358	90.8	92.9	5.2
Canterbury	6245	6148	42	6262	99.7	98.4	0.7
South Canterbury	633	611	2	667	94.9	96.5	0.3
Southern	3469	3371	30	3444	100.7	97.2	0.9
<b>Total</b>	<b>57,814</b>	<b>55,277</b>	<b>656</b>	<b>58,972</b>	<b>98.0</b>	<b>95.6</b>	<b>1.1</b>

<sup>1</sup> The percentage consented and the percentage declined do not add to 100% (1.3% gap) due to offers and declines currently coming from a different data source than consents.

**Table 2: Summary of newborn hearing screening coverage indicators by DHB, 1 January to 31 December 2015**

DHB of birth	Screens completed by 1 month	Total screens completed	Consents	Live births	1.3a Complete by 1 month as % of births	1.3b Total complete as % of births	1.3c Complete as % of consented
	Number				Percentage		
Northland	1078	1691	1739	2140	50.4	79.0	97.2
Waitemata	5803	6825	6899	7622	76.1	89.5	98.9
Auckland	5325	5578	5628	5937	89.7	94.0	99.1
Counties Manukau	6675	7065	7963	8253	80.9	85.6	88.7
Waikato	4090	4738	4771	5319	76.9	89.1	99.3
Lakes	1287	1396	1397	1520	84.7	91.8	99.9
Bay of Plenty	1757	2353	2395	2796	62.8	84.2	98.2
Tairāwhiti	674	696	705	741	91.0	93.9	98.7
Taranaki	1447	1463	1473	1528	94.7	95.7	99.3
Hawke's Bay	1574	1763	1803	2010	78.3	87.7	97.8
Whanganui	733	754	760	816	89.8	92.4	99.2
MidCentral	1403	1934	1967	2131	65.8	90.8	98.3
Hutt Valley	1890	1898	1901	1979	95.5	95.9	99.8
Capital & Coast	3480	3603	3609	3561	97.7	101.2	99.8
Wairarapa	416	431	432	462	90.0	93.3	99.8
Nelson Marlborough	1308	1392	1394	1426	91.7	97.6	99.9
West Coast	264	287	292	358	73.7	80.2	98.3
Canterbury	5956	6176	6179	6262	95.1	98.6	100.0
South Canterbury	594	604	606	667	89.1	90.6	99.7
Southern	3231	3335	3364	3444	93.8	96.8	99.1
<b>Total</b>	<b>48,985</b>	<b>53,982</b>	<b>55,277</b>	<b>58,972</b>	<b>83.1</b>	<b>91.5</b>	<b>97.7</b>

**Table 3: Summary of newborn hearing screening coverage indicators by ethnicity and deprivation quintile, 1 January to 31 December 2015**

	Screens completed by 1 month	Total screens completed	Consents	Live births	1.3a Complete by 1 month as % of births	1.3b Total complete as % of births	1.3c Complete as % of consented
	Number				Percentage		
<b>Ethnicity</b>							
Māori	10,955	12,717	13,211	14,605	75.0	87.1	96.3
Pacific	4841	5389	5826	6064	79.8	88.9	92.5
Asian	8332	8807	8913	9226	90.3	95.5	98.8
Other	24,857	27,069	27,327	29,077	85.5	93.1	99.1
<b>Total</b>	<b>48,985</b>	<b>53,982</b>	<b>55,277</b>	<b>58,972</b>	<b>83.1</b>	<b>91.5</b>	<b>97.7</b>
<b>NZ Dep 2013</b>							
Quintile 1	7864	8287	8346	8305	94.7	99.8	99.3
Quintile 2	8419	9085	9180	9407	89.5	96.6	99.0
Quintile 3	8944	9846	9939	10,662	83.9	92.3	99.1
Quintile 4	10,783	12,047	12,248	13,348	80.8	90.3	98.4
Quintile 5	12,899	14,636	15,483	17,250	74.8	84.8	94.5
Unknown	76	81	81	–	–	–	100.0
<b>Total</b>	<b>48,985</b>	<b>53,982</b>	<b>55,277</b>	<b>58,972</b>	<b>83.1</b>	<b>91.5</b>	<b>97.7</b>

**Table 4: Summary of newborn hearing screening outcome indicators by DHB, 1 January to 31 December 2015**

DHB of first screen	Total screens completed	Referred to audiology Number	Referred for surveillance	Screened and passed	1.5	1.6a
					Referred as % of screens	Surveillance as % of passed screens Percentage
Northland	1687	113	46	1574	6.7	2.9
Waitemata	5714	102	148	5612	1.8	2.6
Auckland	7641	126	121	7515	1.6	1.6
Counties Manukau	6183	185	98	5998	3.0	1.6
Waikato	4698	140	113	4558	3.0	2.5
Lakes	1401	29	30	1372	2.1	2.2
Bay of Plenty	2343	64	40	2279	2.7	1.8
Tairāwhiti	698	9	19	689	1.3	2.8
Taranaki	1470	35	42	1435	2.4	2.9
Hawke's Bay	1774	104	79	1670	5.9	4.7
Whanganui	771	11	23	760	1.4	3.0
Mid Central	1913	60	51	1853	3.1	2.8
Hutt Valley	1938	69	44	1869	3.6	2.4
Capital & Coast	3524	97	81	3427	2.8	2.4
Wairarapa	434	6	8	428	1.4	1.9
Nelson Marlborough	1401	14	62	1387	1.0	4.5
West Coast	297	5	8	292	1.7	2.7
Canterbury	6146	88	102	6058	1.4	1.7
South Canterbury	609	19	9	590	3.1	1.5
Southern	3340	42	56	3298	1.3	1.7
<b>Total</b>	<b>53,982</b>	<b>1318</b>	<b>1180</b>	<b>52,664</b>	<b>2.4</b>	<b>2.2</b>

**Table 5: Summary of newborn hearing screening outcome indicators by ethnicity and deprivation quintile, 1 January to 31 December 2015**

	Total screens completed	Total referred to audiology	Referred for surveillance	Screened and passed	1.5a Audiology referrals as % of completed screens	1.6a Surveillance as % of passed screens
	Number				Percentage	
<b>Ethnicity</b>						
Māori	12,717	465	392	12,252	3.7	3.2
Pacific	5389	200	96	5189	3.7	1.9
Asian	8807	151	115	8656	1.7	1.3
Other	27,069	502	577	26,567	1.9	2.2
<b>Total</b>	<b>53,982</b>	<b>1318</b>	<b>1180</b>	<b>52,664</b>	<b>2.4</b>	<b>2.2</b>
<b>NZ Dep 2013 quintile</b>						
Quintile 1	8287	138	140	8149	1.7	1.7
Quintile 2	9085	171	196	8914	1.9	2.2
Quintile 3	9846	173	189	9673	1.8	2.0
Quintile 4	12,047	293	283	11,754	2.4	2.4
Quintile 5	14,636	541	369	14,095	3.7	2.6
Unknown	81	2	3	79	2.5	3.8
<b>Total</b>	<b>53,982</b>	<b>1318</b>	<b>1180</b>	<b>52,664</b>	<b>2.4</b>	<b>2.2</b>

**Table 6: Summary of newborn hearing screening audiology indicators by DHB, 1 January to 31 December 2015**

DHB of first screen	Total screens completed	Total referred to audiology	Audiology completed by 3 months	Total audiology completed	PCHL diagnosed by 3 months	Total PCHL diagnosed	Audiology DNA/lost contact/declined	2.2a	2.2b	2.3	2.4
								Audiology assessment completion by 3 months	PCHL diagnosed by 3 months	Audiology DNA/lost contact/declined	Hearing loss detected
								Percentage		Per 1000	
Northland	1687	113	45	64	5	6	22	39.8	83.3	19.5	3.6
Waitemata	5714	102	60	74	10	13	–	58.8	76.9	0.0	2.3
Auckland	7641	126	86	91	9	11	1	68.3	81.8	0.8	1.4
Counties Manukau	6183	185	67	93	7	10	1	36.2	70.0	0.5	1.6
Waikato	4698	140	73	85	9	10	30	52.1	90.0	21.4	2.1
Lakes	1401	29	15	18	1	2	5	51.7	50.0	17.2	1.4
Bay of Plenty	2343	64	33	43	7	8	11	51.6	87.5	17.2	3.4
Tairāwhiti	698	9	7	7	3	3	–	77.8	100.0	0.0	4.3
Taranaki	1470	35	22	23	3	3	1	62.9	100.0	2.9	2.0
Hawke's Bay	1774	104	45	58	2	2	10	43.3	100.0	9.6	1.1
Whanganui	771	11	8	9	1	1	1	72.7	100.0	9.1	1.3
MidCentral	1913	60	23	34	4	4	9	38.3	100.0	15.0	2.1
Hutt Valley	1938	69	65	65	8	8	2	94.2	100.0	2.9	4.1
Capital & Coast	3524	97	68	75	6	7	8	70.1	85.7	8.2	2.0
Wairarapa	434	6	6	6	2	2	–	100.0	100.0	0.0	4.6
Nelson Marlborough	1401	14	11	11	2	2	–	78.6	100.0	0.0	1.4
West Coast	297	5	2	2	–	–	1	40.0	–	20.0	0.0
Canterbury	6146	88	69	78	20	24	–	78.4	83.3	0.0	3.9
South Canterbury	609	19	17	17	2	2	1	89.5	100.0	5.3	3.3
Southern	3340	42	22	24	3	3	1	52.4	100.0	2.4	0.9
<b>Total</b>	<b>53,982</b>	<b>1318</b>	<b>744</b>	<b>877</b>	<b>104</b>	<b>121</b>	<b>104</b>	<b>56.4</b>	<b>86.0</b>	<b>7.9</b>	<b>2.2</b>

**Table 7: Summary of newborn hearing screening audiology indicators by ethnicity and deprivation, 1 January to 31 December 2015**

	Total screens completed	Total referred to audiology	Audiology completed by 3 months	Total audiology completed	PCHL diagnosed by 3 months	Total PCHL diagnosed	Audiology DNA/lost contact/declined	2.2a Audiology assessment completion by 3 months	2.2b PCHL diagnosed by 3 months	2.3 Audiology DNA/lost contact/declined	2.4 Hearing loss detected
	Number							Percentage		Per 1000	
<b>Ethnicity</b>											
Māori	12,717	465	206	255	29	34	73	44.3	85.3	15.7	2.7
Pacific	5389	200	90	115	11	14	8	45.0	78.6	4.0	2.6
Asian	8807	151	102	115	20	25	1	67.5	80.0	0.7	2.8
Other	27,069	502	346	392	44	48	22	68.9	91.7	4.4	1.8
<b>Total</b>	<b>53,982</b>	<b>1318</b>	<b>744</b>	<b>877</b>	<b>104</b>	<b>121</b>	<b>104</b>	<b>56.4</b>	<b>86.0</b>	<b>7.9</b>	<b>2.2</b>
<b>NZ Dep 2013</b>											
Quintile 1	8287	138	102	113	16	18	2	73.9	88.9	1.4	2.2
Quintile 2	9085	171	117	136	18	20	5	68.4	90.0	2.9	2.2
Quintile 3	9846	173	119	129	15	16	10	68.8	93.8	5.8	1.6
Quintile 4	12,047	293	175	203	34	40	25	59.7	85.0	8.5	3.3
Quintile 5	14,636	541	231	295	21	26	62	42.7	80.8	11.5	1.8
Unknown	81	2	–	1	–	1	–	0.0	0.0	0.0	12.3
<b>Total</b>	<b>53,982</b>	<b>1318</b>	<b>744</b>	<b>877</b>	<b>104</b>	<b>121</b>	<b>104</b>	<b>56.4</b>	<b>86.0</b>	<b>7.9</b>	<b>2.2</b>





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# Introduction

## The Universal Newborn Hearing Screening and Early Intervention Programme

The early detection of hearing loss, and the application of appropriate medical and educational interventions, has been demonstrated to significantly improve the baby's long-term language skills and cognitive ability.

New Zealand's Universal Newborn Hearing Screening and Early Intervention Programme (UNHSEIP) was implemented over a three year period from 2007 to 2010. The UNHSEIP is jointly overseen by two Government agencies, the Ministries of Health and Education. The Ministry of Health has responsibility for screening, audiological diagnosis of hearing loss and medical interventions, and the Ministry of Education has responsibility for early intervention services. District Health Boards (DHBs) are the main providers of newborn hearing screening, follow-up audiology services and medical interventions.

Throughout 2015, following the recommendations of the report *Review of newborn hearing screening regimes and associated screening devices for the National Screening Unit*,<sup>3</sup> revised protocols and standardised screening equipment were implemented across all 20 DHBs. The move to aABR only screening and refined surveillance criteria, combined with new equipment, represented a significant change for the programme. Each DHB implemented the changes at a different time, linked to the timing of on-site training, which was provided at each DHB between March and September 2015.

Newborn hearing screening must be offered to the family/whānau of all babies born in a DHB region, whether they are born in hospital or at home, within a framework of nationally consistent policies, standards and guidelines.

## Programme monitoring

The aim of the UNHSEIP is early identification of newborns with hearing loss, so that they can access timely and appropriate interventions, inequalities are reduced and the outcomes for these children, their families and whānau, communities and society are improved. The core goals of the UNHSEIP are described as '1-3-6' goals which are based on international benchmarks:

- ≥95% of babies to be screened by one month of age
- ≥90% of audiology assessments to be completed by three months of age
- initiation of appropriate medical and audiological services, and early intervention education services, by six months of age.

Monitoring is a core aspect of quality improvement activities, which are concerned with maximising the likelihood that the day-to-day operations of the screening programme will deliver the expected outcomes. Routine monitoring based on newborn hearing screening and audiology data is reported to the Ministry by DHBs on a quarterly basis.

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<sup>3</sup> Young Futures. 2014. *Review of Newborn Hearing Screening Regimes and Associated Screening Devices for the National Screening Unit*. Ministry of Health, New Zealand, March 2014.

The data presented in this report covers the following indicators from the UNHSEIP Monitoring Framework:

- 1.1 Newborn hearing screening offered
- 1.2 Newborn hearing screening consents and declines
- 1.3 Newborn hearing screening coverage
  - (a) Completed by one month [*one month goal*]
  - (b) Completed total
  - (c) Completed of those consented
- 1.5 Referral rate to audiology assessment
- 1.6 Hearing surveillance rate
  - (a) Referral for surveillance rate
  - (b) Distribution of risk factors
- 1.8 Positive predictive value of the screening test
- 2.2 Audiology assessment completion
  - (a) Audiology assessment completion rate [*three month goal*]
  - (b) PCHL diagnosed by three months
- 2.3 Audiology not attended
- 2.4 Hearing loss detected
- 3.1 Contact with families following referral to Early Intervention education services
- 3.2 Commencement of Early Intervention education services
- 3.3 Continuation of Early Intervention services
- 3.4 Outcome of Early Intervention services

Other indicators from the framework, for which data is not currently available, are listed below:

- 1.4 Newborn hearing screening did not attend and lost contacts – the number of babies that do not complete screening due to not attending or the service losing contact as a proportion of all babies whose parents/guardians consented to screening.
- 1.7 Second screening rates – the number of babies referred from first to second automated auditory brainstem response (aABR) screening as a proportion of all babies that completed first aABR screens relates to the new protocol.
- 2.5 Outcome of hearing surveillance:
  - (a) Hearing loss detected
  - (b) Referred for surveillance but not assessed
- 2.6 Cases not identified from screening
- 2.7 Age at first assistive hearing device [*six month goal*]

The remaining indicator in the framework is indicator 2.1 (audiology assessment timeliness). This is not a national monitoring indicator but is instead reported by DHBs to the NSU as part of regular reporting. Further details for indicators not covered by this report are given at the end of this report.

## Information included in this report

The information included in this report relates to babies that commenced screening between 1 January 2015 and 31 December 2015.

## **Newborn hearing screening tests and audiology assessments**

Newborn hearing screening and follow-up audiology information is captured by the Ministry of Health's National Screening Unit (NSU) in two ways. Some DHBs collect and record information on paper forms, which are regularly submitted to NSU and the data is entered into the NSU's national hearing database. An increasing number of DHBs submit their data electronically which is then uploaded into the national database. Data for babies who started screening during the reporting period was extracted on 9 August 2016.

Additional information for monitoring was sourced from quarterly DHB contractual reporting. This information is used to monitor trends in the offer and decline of newborn hearing screening, as only information from babies with consent is recorded in the national database. In future this information will come from NHIMS.

## **Early Intervention education services**

Information on Early Intervention education services is captured by the Ministry of Education's Case Management System (CMS). Data for services provided during 2015 was extracted in August 2016. Ministry of Education services are divided into four regions (Northern, Central North, Central South and Southern) with 16 districts as shown on the map in Appendix 1. For comparison, DHB boundaries are shown in Appendix 2.

## **Ethnicity**

Ethnicity data for the hearing screening and audiology indicators is grouped according to a prioritised system, which is commonly applied across the health sector. Prioritisation involves allocating each person to a single ethnic group, based on the ethnicities they have identified with, in the prioritised order of Māori, Pacific, Asian, Other and European. For example, if someone identifies as being New Zealand European and Māori, under the prioritised ethnic group method, they are classified as Māori for the purpose of the analysis. In contrast, ethnicity data for Early Intervention education services indicators is reported by total response ethnicity. Using the same example as above, the person would be counted twice under the total response method; once against New Zealand European and once against Māori. This means that children with more than one ethnic group are counted multiple times for early intervention education service indicators.

## **Neighbourhood deprivation**

Deprivation data for screening and audiology indicators was sourced from the NHI database. The New Zealand deprivation index (NZ Dep) is the average level of deprivation of people living in an area at a particular point in time, relative to the whole of New Zealand. Deprivation refers to areas (based on New Zealand Census mesh blocks) rather than individuals. All reporting by NZ Dep is based on the 2013 New Zealand deprivation index decile associated with the residential address held in the NHI database for each baby at the time of data extraction.

In the deprivation index system used by the health sector, areas classified as decile 1 have the least deprivation and areas classified as decile 10 have the most deprivation. This is opposite to some other systems of classification, such as that used by education, where level 10 is the least disadvantaged and level 1 the most disadvantaged.

This report presents results by 2013 NZ Dep quintiles. Each quintile groups two deciles together and contains about 20% of small areas in New Zealand. The two quintiles at opposite ends of the scale are quintile 1 (deciles 1 and 2), which represents children living in the least deprived 20% of small areas ('the least deprived areas'), and quintile 5 (deciles 9 and 10), which represents children living in the most deprived 20% of small areas ('the most deprived areas').

## **Births**

The number of live births by DHB of residence was sourced from the National Maternity Collection, which combines information from live birth registrations from the Births, Deaths and Marriages (BDM) Register along with hospital discharge information and Lead Maternity Carer claims.

## **Data calculations**

### **Reporting by DHB**

Almost all screening and audiology indicators have been reported by the screening DHB as this DHB is responsible for ensuring screening is completed. The exceptions are indicators 1.1 and 1.3 (offer of screening and screening coverage) where the denominator is the number of births. As this data is only available by DHB of domicile at birth the numerator counts for these two indicators have also been calculated using DHB of birth. All remaining indicators (including audiology) are reported by the screening DHB location. For most babies (about 95%) this is the same as DHB of birth. In the past monitoring reports reported audiology indicators by the DHB that delivered the audiology assessment. The screening and audiology DHBs are usually the same. Exceptions to this are Waitemata and West Coast DHBs whose audiology is provided by Auckland and Canterbury DHBs respectively.

### **Gestational age**

Where gestational age was not recorded, a gestational age of 40 weeks was allocated (1% of records, n=523). DHBs will continue to be encouraged to include the correct gestational age on data forms. For babies born at less than full term, age is corrected by the length of time pre-term for the purposes of calculating age at screen and age at audiology.

### **Confidence intervals**

Rates and percentages presented in this report are accompanied by 95% confidence intervals (CI). CIs were calculated for all indicators using Wilson's method for a binomial distribution formula. The 95% CI indicates that there is a 5% chance that the 'true' value lies outside the range of values contained by the CI. Therefore, the wider the CI, the less precise the estimate is to the true population parameter.

## **Data limitations**

### **Accuracy of reporting**

Where hand written screening forms are provided to the NSU, data is entered manually into the national database. Data is also imported into the database from DHBs electronically. The potential for errors in data entry is minimised by a two-step data checking process – one at data entry and the other during data processing. Each record must contain a value in 11 mandatory

fields to be included in reporting. The NSU and screening providers have quality monitoring processes in place to maintain high data quality.

## **Audiology data**

This report includes audiology information on 877 (66.5%) of the 1318 babies that were referred for audiology assessment. A further 104 babies were identified as 'Did not attend' (DNA), declined or moved. The percentage of audiology referrals with completed assessment information recorded in the database is consistent with previous monitoring reports. Audiology assessment information had not been recorded in the national database for the remaining babies by the date of data extraction for this report.

## **Numerator and denominator source differences**

The data used for this report has come from different sources. Offers and declines data taken was from DHB contractual reporting and gives the count of offers and declines made during the 2015 year. Live births data relates to deliveries during the 2015 year. The screening and audiology data extracted from the national hearing database relates to babies that commenced screening during the 2015 year. There is a slight mismatch between these three cohorts. This mismatch leads to situations where a DHB may show as having offered screening to more than 100% of births, or as having more than 100% of births consenting to newborn hearing screening. The local over (and under) proportions should balance out at regional and national levels. All early intervention education services data was provided by the Ministry of Education.

# Screening and audiology monitoring indicators

## 1.1 Newborn hearing screening offers

Indicator 1.1	Target
The number of babies whose parents/guardians were offered screening as a proportion of live births.	100%

Using the numbers reported by DHBs for 2015, the national rate of screening offers was 98.0%. This is higher than the rate reported for the 2014 period (96.5%), but is below the target. As shown in Table 8, rates by DHB ranged from 80.3% (Waitemata) to 135.0% (Auckland). Most DHBs had rates above 95%.

The number of babies offered screening within a reporting period comes from a different data source and can be greater than the number of live births attributed to the DHB for the same period, leading to the percentage offered being more than 100%. The local over (and under) proportions should balance out at regional and national levels. When the three Auckland region DHBs are combined the rate of offers to live births is 91.7%.

**Table 8: Offer of newborn hearing screening by DHB, 1 January to 31 December 2015**

DHB of birth	Offered screening N	Live births N	Percentage offered %	95% confidence interval <sup>1</sup>
Northland	2045	2140	95.6	(94.6, 96.4)
Waitemata	6118	7622	80.3	(79.4, 81.1)
Auckland	8015	5937	135.0	
Counties Manukau	7043	8253	85.3	(84.6, 86.1)
Waikato	5259	5319	98.9	(98.6, 99.1)
Lakes	1508	1520	99.2	(98.6, 99.5)
Bay of Plenty	2578	2796	92.2	(91.2, 93.1)
Tairāwhiti	705	741	95.1	(93.3, 96.5)
Taranaki	1542	1528	100.9	
Hawke's Bay	1920	2010	95.5	(94.5, 96.3)
Whanganui	808	816	99.0	(98.1, 99.5)
MidCentral	1968	2131	92.4	(91.1, 93.4)
Hutt Valley	1980	1979	100.1	
Capital & Coast	3680	3561	103.3	
Wairarapa	444	462	96.1	(93.9, 97.5)
Nelson Marlborough	1529	1426	107.2	
West Coast	325	358	90.8	(87.3, 93.4)
Canterbury	6245	6262	99.7	(99.6, 99.8)
South Canterbury	633	667	94.9	(93.0, 96.3)
Southern	3469	3444	100.7	
<b>Total</b>	<b>57,814</b>	<b>58,972</b>	<b>98.0</b>	<b>(97.9, 98.1)</b>

<sup>1</sup> Confidence interval not able to be calculated due to denominator being less than the numerator.

## 1.2 Newborn hearing screening consents and declines

### 1.2a Newborn hearing screening consents

Indicator 1.2a	Target
The number of babies whose parents/guardians consented to screening as a proportion of those offered.	No target set

Nearly all families that were offered screening during 2015 accepted (95.6%). Offers data was sourced from DHB contractual reporting and gives the count of offers made during the 2015 year. Consents data was sourced from the national hearing database and relates to babies that commenced screening during the 2015 year. The slight mismatch between these cohorts has led to the situation where Counties Manukau has a result greater than 100%.

**Table 9: Consents for newborn hearing screening by DHB, 1 January to 31 December 2015**

DHB of screening	Consented N	Offered screening N	Percentage consented %	95% confidence interval <sup>1</sup>
Northland	1734	2045	84.8	(83.2, 86.3)
Waitemata	5773	6118	94.4	(93.8, 94.9)
Auckland	7703	8015	96.1	(95.7, 96.5)
Counties Manukau	7086	7043	100.6	
Waikato	4728	5259	89.9	(89.1, 90.7)
Lakes	1401	1508	92.9	(91.5, 94.1)
Bay of Plenty	2387	2578	92.6	(91.5, 93.5)
Tairāwhiti	705	705	100.0	(99.5, 100)
Taranaki	1480	1542	96.0	(94.9, 96.9)
Hawke's Bay	1816	1920	94.6	(93.5, 95.5)
Whanganui	777	808	96.2	(94.6, 97.3)
MidCentral	1946	1968	98.9	(98.3, 99.3)
Hutt Valley	1941	1980	98.0	(97.3, 98.6)
Capital & Coast	3530	3680	95.9	(95.2, 96.5)
Wairarapa	435	444	98.0	(96.2, 98.9)
Nelson Marlborough	1403	1529	91.7	(90.3, 93.0)
West Coast	302	325	92.9	(89.6, 95.2)
Canterbury	6148	6245	98.4	(98.1, 98.7)
South Canterbury	611	633	96.5	(94.8, 97.7)
Southern	3371	3469	97.2	(96.6, 97.7)
<b>Total</b>	<b>55,277</b>	<b>57,814</b>	<b>95.6</b>	<b>(95.4, 95.8)</b>

<sup>1</sup> Confidence interval not able to be calculated due to denominator being less than the numerator.

## 1.2b Newborn hearing screening declines

Indicator 1.2b	Target
The number of babies whose parents/guardians declined screening as a proportion of those offered. No target set	

For the 2015 period a small number of families that were offered screening declined (1.1%). Decline rates varied from 5% (West Coast and Bay of Plenty) to 0.2% (MidCentral). The percentage consented and the percentage declined do not add to 100% (3.3% gap) due to offers and declines currently coming from a different data source than consents.

**Table 10: Newborn hearing screening declines by DHB, 1 January to 31 December 2015**

DHB of screening	Declined N	Offered screening N	Percentage declined %	95% confidence interval
Northland	78	2045	3.8	(3.1, 4.7)
Waitemata	98	6118	1.6	(1.3, 1.9)
Auckland	71	8015	0.9	(0.7, 1.1)
Counties Manukau	26	7043	0.4	(0.3, 0.5)
Waikato	52	5259	1.0	(0.8, 1.3)
Lakes	4	1508	0.3	(0.1, 0.7)
Bay of Plenty	129	2578	5.0	(4.2, 5.9)
Tairāwhiti	3	705	0.4	(0.1, 1.2)
Taranaki	17	1542	1.1	(0.7, 1.8)
Hawke's Bay	28	1920	1.5	(1, 2.1.0)
Whanganui	5	808	0.6	(0.3, 1.4)
MidCentral	4	1968	0.2	(0.1, 0.5)
Hutt Valley	7	1980	0.4	(0.2, 0.7)
Capital & Coast	19	3680	0.5	(0.3, 0.8)
Wairarapa	3	444	0.7	(0.2, 2.0)
Nelson Marlborough	21	1529	1.4	(0.9, 2.1)
West Coast	17	325	5.2	(3.3, 8.2)
Canterbury	42	6245	0.7	(0.5, 0.9)
South Canterbury	2	633	0.3	(0.1, 1.1)
Southern	30	3469	0.9	(0.6, 1.2)
<b>Total</b>	<b>656</b>	<b>57,814</b>	<b>1.1</b>	<b>(1.1, 1.2)</b>

## 1.3 Newborn hearing screening coverage

Information on the number of screens completed was sourced from the national UNHSEIP database and information on live births was sourced from the National Maternity Collection. Both the numerator and the denominator have been calculated by DHB of birth to be more consistent.

### 1.3a Newborn hearing screening completed by one month of age

Indicator 1.3a	Target



The number of babies for whom screening is completed by 1 month of age as a proportion of live births. ≥95%

Nationally, 83.1% of babies completed screening by one month against the target of greater than or equal to 95%. Three DHBs met the target (Hutt Valley, Capital & Coast, and Canterbury) and one was just slightly below (Taranaki) (see Table 11). Rates ranged from 50.4% (Northland) to 97.7% (Capital & Coast).

**Table 11: Newborn hearing screens completed by 1 month of age by DHB, 1 January to 31 December 2015**

DHB of birth	Completed by 1 month of age N	Live births <sup>2</sup> N	Percentage complete 1 month %	95% confidence interval
Northland	1078	2140	50.4	(48.3, 52.5)
Waitemata	5803	7622	76.1	(75.2, 77.1)
Auckland	5325	5937	89.7	(88.9, 90.4)
Counties Manukau	6675	8253	80.9	(80.0, 81.7)
Waikato	4090	5319	76.9	(75.7, 78.0)
Lakes	1287	1520	84.7	(82.8, 86.4)
Bay of Plenty	1757	2796	62.8	(61.0, 64.6)
Tairāwhiti	674	741	91.0	(88.7, 92.8)
Taranaki	1447	1528	94.7	(93.5, 95.7)
Hawke's Bay	1574	2010	78.3	(76.5, 80.1)
Whanganui	733	816	89.8	(87.6, 91.7)
MidCentral	1403	2131	65.8	(63.8, 67.8)
Hutt Valley	1890	1979	95.5	(94.5, 96.3)
Capital & Coast	3480	3561	97.7	(97.2, 98.2)
Wairarapa	416	462	90.0	(87.0, 92.5)
Nelson Marlborough	1308	1426	91.7	(90.2, 93.0)
West Coast	264	358	73.7	(69.0, 78.0)
Canterbury	5956	6262	95.1	(94.6, 95.6)
South Canterbury	594	667	89.1	(86.5, 91.2)
Southern	3231	3444	93.8	(93.0, 94.6)
<b>Total</b>	<b>48,985</b>	<b>58,972</b>	<b>83.1</b>	<b>(82.8, 83.4)</b>

1 Sourced from UNHSEIP national database.

2 Sourced from National Maternity Collection.

Completion of screening by one month of age varied by ethnicity from 75.0% for Māori to 90.3% for Asian (see Table 12).

**Table 12: Newborn hearing screens completed by 1 month of age by ethnicity, 1 January to 31 December 2015**

Ethnicity	Completed by 1 month of age N	Live births <sup>2</sup> N	Percentage complete 1 month %	95% confidence interval
Māori	10,955	14,605	75.0	(74.3, 75.7)
Pacific	4841	6064	79.8	(78.8, 80.8)
Asian	8332	9226	90.3	(89.7, 90.9)
Other	24,857	29,077	85.5	(85.1, 85.9)

<b>Total</b>	<b>48,985</b>	<b>58,972</b>	<b>83.1</b>	<b>(82.8, 83.4)</b>
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1 Sourced from UNHSEIP national database.

2 Sourced from National Maternity Collection.

Rates of completion by one month of age also varied by deprivation with the rate for the least deprived areas (quintile 1) being nearly 20 percentage points higher than the most deprived areas (quintile 5).

**Table 13: Newborn hearing screens completed by 1 month of age by deprivation, 1 January to 31 December 2015**

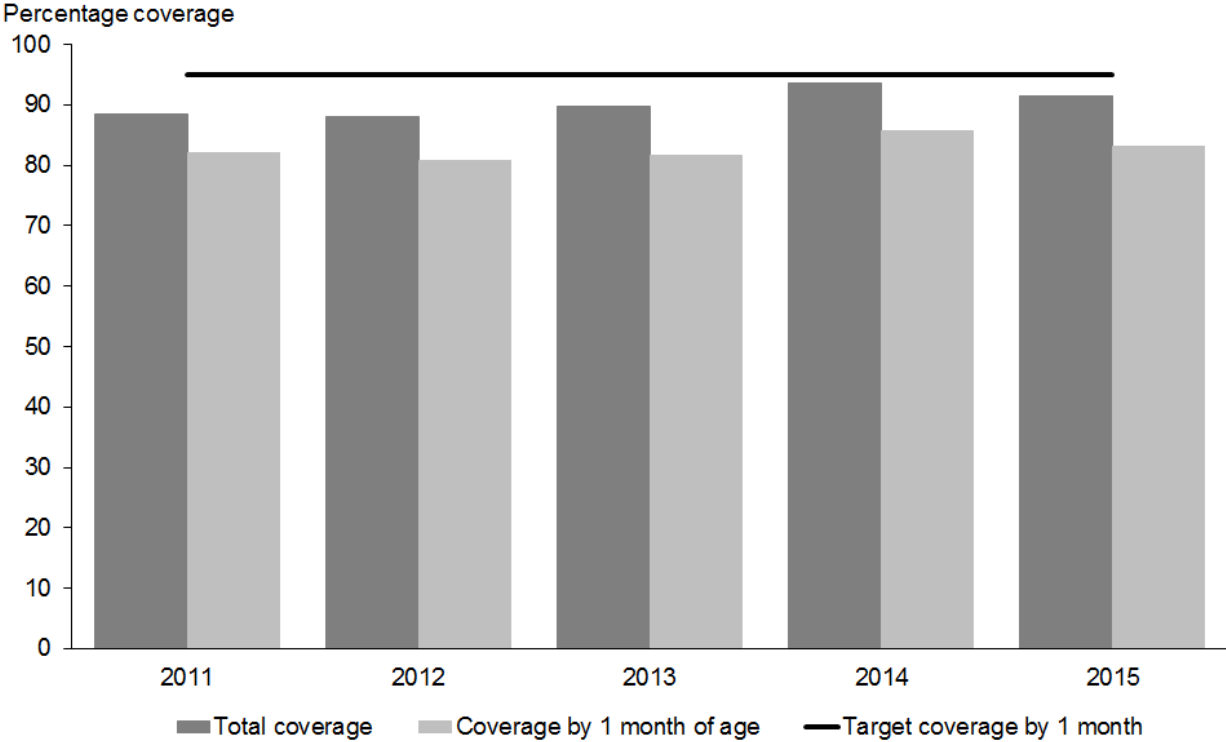
<b>NZDep 2013</b>	<b>Completed by 1 month of age N</b>	<b>Live births<sup>2</sup> N</b>	<b>Percentage complete 1 month %</b>	<b>95% confidence interval</b>
Quintile 1	7864	8305	94.7	(94.2, 95.2)
Quintile 2	8419	9407	89.5	(88.9, 90.1)
Quintile 3	8,944	10,662	83.9	(83.2, 84.6)
Quintile 4	10,783	13,348	80.8	(80.1, 81.4)
Quintile 5	12,899	17,250	74.8	(74.1, 75.4)
Unknown	76	–	–	
<b>Total</b>	<b>48,985</b>	<b>58,972</b>	<b>83.1</b>	<b>(82.8, 83.4)</b>

1 Sourced from UNHSEIP national database.

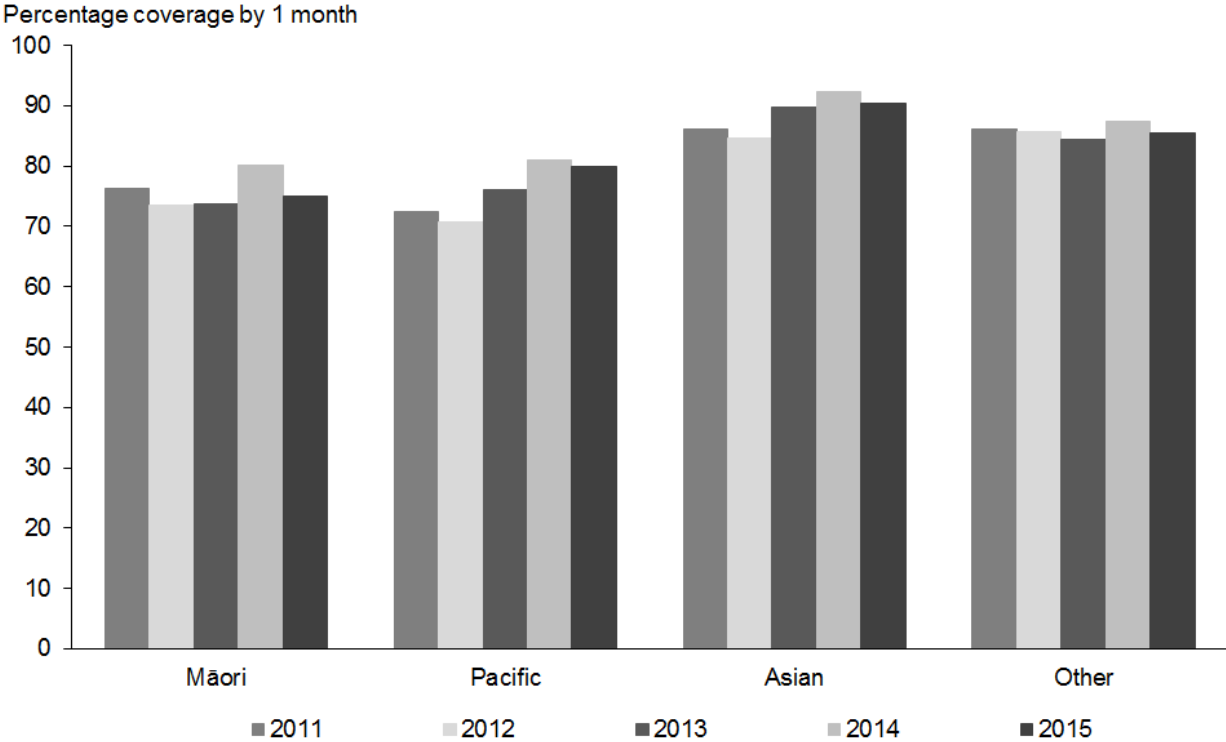
2 Sourced from National Maternity Collection.

Nationally, the screening coverage rate by one month of age increased in 2013 and 2014 before dropping slightly in 2015 (see Figure 1). The total coverage rate time trend was similar with increases from 2011 to 2014 before falling slightly in 2015. Coverage by one month of age fell for all ethnic groups in 2015 after a good gain in 2014 (see Figure 2). The drop in coverage between 2014 and 2015 is reflected across most DHBs (see Figure 3). The largest decreases were seen in Waikato, Bay of Plenty, and South Canterbury DHBs. Several others increased (Whanganui and MidCentral) or held steady over the same period.

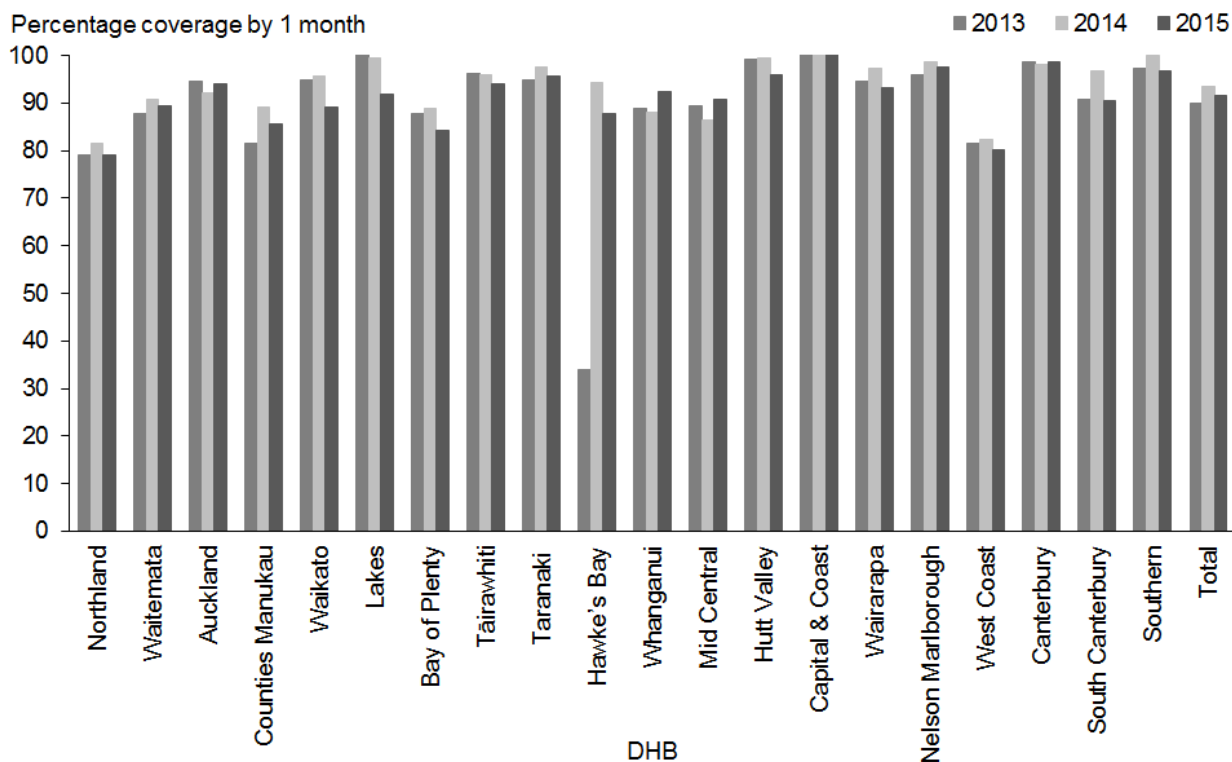
**Figure 1: National screening coverage by 1 month of age and total, 2011–2015**



**Figure 2: Screening coverage by 1 month of age by ethnicity, 2011–2015**



**Figure 3: Screening coverage by 1 month of age by DHB, 2013–2015**



### 1.3b Total newborn hearing screens completed

Indicator 1.3b	Target
The number of babies for whom screening is completed as a proportion of live births.	No target set

In total, 53,982 babies completed newborn hearing screening during the period, compared with 58,972 live births. While these figures come from different data sources, this indicates that approximately 91.5% of babies born in this period completed screening.

Total screening completion rates by DHB ranged from 79% (Northland) to 101.2% (Capital & Coast). Seven DHBs had rates around 94% or above (see Table 14). Rates above 100% are due to the use of different data sources.

**Table 14: Total newborn hearing screens completed for the period by DHB, 1 January to 31 December 2015**

DHB of birth	Completed total <sup>1</sup>	Live births <sup>2</sup>	Percentage complete within period	95% confidence interval
	N	N	%	
Northland	1691	2140	79.0	(77.2, 80.7)
Waitemata	6825	7622	89.5	(88.8, 90.2)
Auckland	5578	5937	94.0	(93.3, 94.5)
Counties Manukau	7065	8253	85.6	(84.8, 86.3)
Waikato	4738	5319	89.1	(88.2, 89.9)
Lakes	1396	1520	91.8	(90.4, 93.1)
Bay of Plenty	2353	2796	84.2	(82.8, 85.5)
Tairāwhiti	696	741	93.9	(92.0, 95.4)
Taranaki	1463	1528	95.7	(94.6, 96.6)
Hawke's Bay	1763	2010	87.7	(86.2, 89.1)
Whanganui	754	816	92.4	(90.4, 94.0)
MidCentral	1934	2131	90.8	(89.5, 91.9)
Hutt Valley	1898	1979	95.9	(94.9, 96.7)
Capital & Coast	3603	3561	101.2	
Wairarapa	431	462	93.3	(90.6, 95.2)
Nelson Marlborough	1392	1426	97.6	(96.7, 98.3)
West Coast	287	358	80.2	(75.7, 84.0)
Canterbury	6176	6262	98.6	(98.3, 98.9)
South Canterbury	604	667	90.6	(88.1, 92.5)
Southern	3335	3444	96.8	(96.2, 97.4)
<b>Total</b>	<b>53,982</b>	<b>58,972</b>	<b>91.5</b>	<b>(91.3, 91.8)</b>

1 Sourced from UNHSEIP national database.

2 Sourced from National Maternity Collection.

Tables 15 and 16 show a breakdown of total screening completion rates by ethnicity and deprivation respectively. As for completion by 1 month, the rate of completed screens for Māori and Pacific babies was lower than for Asian and Other, and the rate for the most deprived areas (quintile 5) was lower than the least deprived areas (quintile 1).

**Table 15: Total newborn hearing screens completed for the period by ethnicity, 1 January to 31 December 2015**

Ethnicity	Completed total <sup>1</sup>	Live births <sup>2</sup>	Percentage complete within period	95% confidence interval
	N	N	%	
Māori	12,717	14,605	87.1	(86.5, 87.6)
Pacific	5389	6064	88.9	(88.1, 89.6)
Asian	8807	9226	95.5	(95.0, 95.9)
Other	27,069	29,077	93.1	(92.8, 93.4)
<b>Total</b>	<b>53,982</b>	<b>58,972</b>	<b>91.5</b>	<b>(91.3, 91.8)</b>

1 Sourced from UNHSEIP national database.

2 Sourced from National Maternity Collection.

**Table 16: Total newborn hearing screens completed for the period by deprivation 1 January to 31 December 2015**

<b>NZ Dep 2013</b>	<b>Completed total<sup>1</sup></b>	<b>Live births<sup>2</sup></b>	<b>Percentage complete within period</b>	<b>95% confidence interval</b>
	<b>N</b>	<b>N</b>	<b>%</b>	
Quintile 1	8287	8305	99.8	(99.7, 99.9)
Quintile 2	9085	9407	96.6	(96.2, 96.9)
Quintile 3	9846	10,662	92.3	(91.8, 92.8)
Quintile 4	12,047	13,348	90.3	(89.7, 90.7)
Quintile 5	14,636	17,250	84.8	(84.3, 85.4)
Unknown	81	–		
<b>Total</b>	<b>53,982</b>	<b>58,972</b>	<b>91.5</b>	<b>(91.3, 91.8)</b>

1 Sourced from UNHSEIP national database.

2 Sourced from National Maternity Collection.

### **1.3c Newborn hearing screens completed as a percentage of consents**

<b>Indicator 1.3c</b>	<b>Target</b>
The number of babies for whom screening is completed as a proportion of those who have been consented.	97%

Indicator 1.3(c) looks at the extent to which screening is completed for those parents/guardians who consented to have their baby's hearing screened. For the 2015 period the national rate was 97.7% (see Table 17). Rates by DHB all exceeded the 97% target, with the exception of Counties Manukau (88.7%).

**Table 17: Newborn hearing screens completed as percentage of consents by DHB, 1 January to 31 December 2015**

DHB of birth	Completed total N	Consented N	Complete as percentage of consented %	95% confidence interval
Northland	1691	1739	97.2	(96.4, 98.0)
Waitemata	6825	6899	98.9	(98.7, 99.2)
Auckland	5578	5628	99.1	(98.8, 99.3)
Counties Manukau	7065	7963	88.7	(88.0, 89.4)
Waikato	4738	4771	99.3	(99.0, 99.5)
Lakes	1396	1397	99.9	(99.6, 100)
Bay of Plenty	2353	2395	98.2	(97.6, 98.7)
Tairāwhiti	696	705	98.7	(97.6, 99.4)
Taranaki	1463	1473	99.3	(98.8, 99.7)
Hawke's Bay	1763	1803	97.8	(97.0, 98.4)
Whanganui	754	760	99.2	(98.3, 99.7)
MidCentral	1934	1967	98.3	(97.7, 98.8)
Hutt Valley	1898	1901	99.8	(99.5, 100)
Capital & Coast	3603	3609	99.8	(99.6, 99.9)
Wairarapa	431	432	99.8	(98.7, 100)
Nelson Marlborough	1392	1394	99.9	(99.5, 100)
West Coast	287	292	98.3	(96.0, 99.4)
Canterbury	6176	6179	100.0	(99.9, 100)
South Canterbury	604	606	99.7	(98.8, 100)
Southern	3335	3364	99.1	(98.8, 99.4)
<b>Total</b>	<b>53,982</b>	<b>55,277</b>	<b>97.7</b>	<b>(97.5, 97.8)</b>

Tables 18 and 19 provide breakdowns by ethnicity and deprivation. The rates for Māori (96.3%) and Pacific (92.5%) are lower than for Asian and Other (both approximately 99%). The difference in rates for babies from the least and most deprived areas was nearly 5%.

**Table 18: Newborn hearing screens completed as percentage of consents by ethnicity, 1 January to 31 December 2015**

Ethnicity	Completed total N	Consented N	Complete as percentage of consented %	95% confidence interval
Māori	12,717	13,211	96.3	(95.9, 96.6)
Pacific	5389	5826	92.5	(91.8, 93.2)
Asian	8807	8913	98.8	(98.6, 99.0)
Other	27,069	27,327	99.1	(98.9, 99.2)
<b>Total</b>	<b>53,982</b>	<b>55,277</b>	<b>97.7</b>	<b>(97.5, 97.8)</b>

**Table 19: Newborn hearing screens completed as percentage of consents by deprivation, 1 January to 31 December 2015**

<b>NZ Dep 2013</b>	<b>Completed total N</b>	<b>Consented N</b>	<b>Complete as percentage of consented %</b>	<b>95% confidence interval</b>
Quintile 1	8287	8346	99.3	(99.1, 99.5)
Quintile 2	9085	9180	99.0	(98.7, 99.2)
Quintile 3	9846	9939	99.1	(98.9, 99.2)
Quintile 4	12,047	12,248	98.4	(98.1, 98.6)
Quintile 5	14,636	15,483	94.5	(94.2, 94.9)
Unknown	81	81	100.0	(95.5, 100)
<b>Total</b>	<b>53,982</b>	<b>55,277</b>	<b>97.7</b>	<b>(97.5, 97.8)</b>



# 1.5 Referral rate to audiology

## 1.5 Referrals to audiology from screening test

Indicator 1.5	Target
The number of babies that are referred from screening to audiology as a proportion of all completed screens.	<2%

The average rate of referral to audiology for the period was 2.4%. Northland DHB had the highest referral rate at 6.7%, followed by 5.9% at Hawke's Bay. All other DHBs had rates between 0% and 3.6% (see Table 20). Rates for some DHBs are based on low numbers so care should be taken with interpretation.

**Table 20: Referrals to audiology from newborn hearing screening by DHB, 1 January to 31 December 2015**

DHB of screen	Referred to audiology N	Completed screening N	Percentage referred %	95% confidence interval
Northland	113	1687	6.7	(5.6, 8.0)
Waitemata	102	5714	1.8	(1.5, 2.2)
Auckland	126	7641	1.6	(1.4, 2.0)
Counties Manukau	185	6183	3.0	(2.6, 3.4)
Waikato	140	4698	3.0	(2.5, 3.5)
Lakes	29	1401	2.1	(1.4, 3.0)
Bay of Plenty	64	2343	2.7	(2.1, 3.5)
Tairāwhiti	9	698	1.3	(0.7, 2.4)
Taranaki	35	1470	2.4	(1.7, 3.3)
Hawke's Bay	104	1774	5.9	(4.9, 7.1)
Whanganui	11	771	1.4	(0.8, 2.5)
MidCentral	60	1913	3.1	(2.4, 4.0)
Hutt Valley	69	1938	3.6	(2.8, 4.5)
Capital & Coast	97	3524	2.8	(2.3, 3.3)
Wairarapa	6	434	1.4	(0.6, 3.0)
Nelson Marlborough	14	1401	1.0	(0.6, 1.7)
West Coast	5	297	1.7	(0.7, 3.9)
Canterbury	88	6146	1.4	(1.2, 1.8)
South Canterbury	19	609	3.1	(2.0, 4.8)
Southern	42	3340	1.3	(0.9, 1.7)
<b>Total</b>	<b>1,318</b>	<b>53,982</b>	<b>2.4</b>	<b>(2.3, 2.6)</b>

Referral rates by ethnicity are shown in Table 21. Rates were highly variable, with much higher rates for Māori and Pacific (both 3.7%) compared to 1.5% for Asian and 1.9% for Other.

**Table 21: Referrals to audiology from newborn hearing screening by ethnicity, 1 January to 31 December 2015**

Ethnicity	Referred to audiology N	Completed screening N	Percentage referred %	95% confidence interval
Māori	465	12,717	3.7	(3.3, 4.0)
Pacific	200	5389	3.7	(3.2, 4.2)
Asian	151	8807	1.7	(1.5, 2.0)
Other	502	27,069	1.9	(1.7, 2.0)
<b>Total</b>	<b>1318</b>	<b>53,982</b>	<b>2.4</b>	<b>(2.3, 2.6)</b>

The results for referral rate by deprivation show an association between higher rates of referral to audiology with higher levels of deprivation (Table 22). Babies resident in the most deprived areas had a referral rate that was more than twice that of babies in the least deprived areas.

**Table 22: Referrals to audiology from newborn hearing screening by deprivation, 1 January to 31 December 2015**

NZ Dep 2013	Referred to audiology N	Completed screening N	Percentage referred %	95% confidence interval
Quintile 1	138	8287	1.7	(1.4, 2.0)
Quintile 2	171	9085	1.9	(1.6, 2.2)
Quintile 3	173	9846	1.8	(1.5, 2.0)
Quintile 4	293	12,047	2.4	(2.2, 2.7)
Quintile 5	541	14,636	3.7	(3.4, 4.0)
Unknown	2	81	2.5	(0.7, 8.6)
<b>Total</b>	<b>1318</b>	<b>53,982</b>	<b>2.4</b>	<b>(2.3, 2.6)</b>

Table 23 shows the split between audiology referrals that were unilateral (for one ear), bilateral (for both ears), or for incomplete screens. For the 2015 period the majority of the 1318 babies that were referred to audiology were unilateral referrals (52.0%), followed by bilateral referrals (33.9%).

**Table 23: Breakdown of referrals to audiology from newborn hearing screening by type (unilateral or bilateral), 1 January to 31 December 2015**

Total referrals	Unilateral		Bilateral		Incomplete	
	N	%	N	%	N	%
1318	685	52.0	447	33.9	186	14.1

## 1.6 Hearing surveillance rate

### 1.6a Proportion of babies that pass screening but are referred for surveillance

Indicator 1.6a	Target
The number of babies who were referred to hearing surveillance as a proportion of all babies that completed screening with a pass result.	No target set

DHBs began transitioning to the updated aABR only screening protocol during the 2015 year. The transitions occurred throughout April to September, which means the annual surveillance data is a mix of old and new protocols. Under the new protocol surveillance referrals are made in a more targeted way with the presence of some risk factors no longer resulting in audiology follow-up. These changes mean that fewer babies are referred for surveillance compared with the previous AOAE/AABR screening regime and targeted follow up policy.

Nationally, 1180 babies (2.2%) that passed screening were referred for surveillance due to the presence of one or more risk factors for delayed onset/progressive hearing loss. The surveillance rate varied across DHBs from 4.7% at Hawke's Bay to 1.5% at South Canterbury (see Table 24). For reference, in 2014, nationally 2494 babies (4.6%) that passed screening were referred for targeted follow-up. The rate varied across DHBs from 10.5% at Hawke's Bay to 2.4% at South Canterbury.

**Table 24: Referrals for surveillance from newborn hearing screening by DHB, 1 January to 31 December 2015**

DHB of screen	Referred for surveillance N	Screened and passed N	Percentage referred for surveillance %	95% confidence interval
Northland	46	1574	2.9	(2.2, 3.9)
Waitemata	148	5612	2.6	(2.2, 3.1)
Auckland	121	7515	1.6	(1.3, 1.9)
Counties Manukau	98	5998	1.6	(1.3, 2.0)
Waikato	113	4558	2.5	(2.1, 3.0)
Lakes	30	1372	2.2	(1.5, 3.1)
Bay of Plenty	40	2279	1.8	(1.3, 2.4)
Tairāwhiti	19	689	2.8	(1.8, 4.3)
Taranaki	42	1435	2.9	(2.2, 3.9)
Hawke's Bay	79	1670	4.7	(3.8, 5.9)
Whanganui	23	760	3.0	(2.0, 4.5)
MidCentral	51	1853	2.8	(2.1, 3.6)
Hutt Valley	44	1869	2.4	(1.8, 3.1)
Capital & Coast	81	3427	2.4	(1.9, 2.9)
Wairarapa	8	428	1.9	(1.0, 3.6)
Nelson Marlborough	62	1387	4.5	(3.5, 5.7)
West Coast	8	292	2.7	(1.4, 5.3)
Canterbury	102	6058	1.7	(1.4, 2.0)
South Canterbury	9	590	1.5	(0.8, 2.9)
Southern	56	3298	1.7	(1.3, 2.2)
<b>Total</b>	<b>1180</b>	<b>52,664</b>	<b>2.2</b>	<b>(2.1, 2.4)</b>

Surveillance rates vary by ethnicity (see Table 25). The lowest surveillance rate was 1.3% for Asian. Rates for Pacific (1.9%) and Other (2.2%) were close to the national rate, but the rate for Māori was higher (3.2%).

**Table 25: Referrals for surveillance from newborn hearing screening by ethnicity, 1 January to 31 December 2015**

Ethnicity	Referred for surveillance N	Screened and passed N	Percentage referred for surveillance %	95% confidence interval
Māori	392	12,252	3.2	(2.9, 3.5)
Pacific	96	5189	1.9	(1.5, 2.3)
Asian	115	8656	1.3	(1.1, 1.6)
Other	577	26,567	2.2	(2.0, 2.4)
<b>Total</b>	<b>1180</b>	<b>52,664</b>	<b>2.2</b>	<b>(2.1, 2.4)</b>

Differences by deprivation were smaller but surveillance rates were higher for babies in more deprived areas (see Table 26).

**Table 26: Referrals for surveillance from newborn hearing screening by deprivation, 1 January to 31 December 2015**

NZ Dep 2013	Referred for surveillance N	Screened and passed N	Percentage referred for surveillance %	95% confidence interval
Quintile 1	140	8149	1.7	(1.5, 2.0)
Quintile 2	196	8914	2.2	(1.9, 2.5)
Quintile 3	189	9673	2.0	(1.7, 2.2)
Quintile 4	283	11,754	2.4	(2.1, 2.7)
Quintile 5	369	14,095	2.6	(2.4, 2.9)
Unknown	3	79	3.8	(1.3, 10.6)
<b>Total</b>	<b>1180</b>	<b>52,664</b>	<b>2.2</b>	<b>(2.1, 2.4)</b>

## 1.6b Distribution of risk factors among babies referred for hearing surveillance

Indicator 1.6b	Target
The distribution of risk factors for babies referred to hearing surveillance.	No target set

The most frequently reported risk factor for babies referred for surveillance in the 2015 period was family history (45.6%), followed by being in a neonatal intensive care unit (NICU) for longer than five days (15.8%), and needing ventilation (13.7%). Of all completed screens the family history risk factor was present for 1.0% of babies. Table 27 shows the full count of babies for each risk factor. Where a baby had more than one risk factor reported they have been counted more than once.

On implementation of the aABR only screening protocol and revised surveillance criteria, the risk factors of family history and NICU for more than five days were removed. Although the new protocols were not in place for the full year, there are reduced numbers of babies being referred for these risk factors in 2015 compared with 2014. For reference, in 2014, 1448 babies (2.6%) had the risk factor family history, and 538 babies (1%) NICU more than five days. Further reductions across the risk factors are likely to be demonstrated in 2016.

**Table 27: Number and proportion of risk factors for babies referred for surveillance from newborn hearing screening, 1 January to 31 December 2015**

Risk factor	Number with risk factor N	Percentage referred with risk factor <sup>1</sup> %	Percentage of all screened <sup>1</sup> %
Family history	538	45.6	1.0
NICU more than 5 days	186	15.8	0.3
Ventilation	162	13.7	0.3
Jaundice – requiring phototherapy	116	9.8	0.2
Jaundice – all other levels	57	4.8	0.1
Head/brain trauma	68	5.8	0.1
Craniofacial anomalies	67	5.7	0.1
Meningitis	52	4.4	0.1
Congenital infection	17	1.4	0.0
Ototoxic medications above therapeutic levels	42	3.6	0.1
Syndrome	27	2.3	0.1
Severe asphyxia (Sarnat stage 2/3, cooled)	34	2.9	0.1
Other risk factor	81	6.9	0.2

<sup>1</sup> These percentage columns do not add to 100% because babies can have more than one risk factor. The total number of babies referred for surveillance was 1,180, and the total number of babies that completed screening was 53,982.

## 1.8 Positive predictive value of the screening test

Indicator 1.8	Target
The proportion of babies who are referred from screening and on audiology assessment are diagnosed with permanent congenital hearing loss.	No target set.

Positive predictive value (PPV) is a measure of the performance of the screening test. Results for this indicator give the probability that a baby referred from screening actually has permanent congenital hearing loss (PCHL). A high PPV means that there are few unnecessary referrals to audiology. If PPV is low, many children with no hearing loss will be referred for assessment, with associated costs and anxiety for families.

Of the 1318 referrals to audiology from screening during 2015, completed audiology assessment data for 873 babies was available at the date of data extraction for this report. There were 121 true positives (refer result from screening followed by a diagnosis of PCHL at audiology) and 752 false positives (refer result from screening but no PCHL diagnosed at audiology) for these 873 babies. This equates to a PPV of 14% (see Table 28). Because audiology assessment for the remaining babies referred to audiology is not included in this calculation, this result is only indicative and should not be considered the full programme PPV.

**Table 28: Positive predictive value of newborn hearing screening by type of audiology referral, 1 January to 31 December 2015**

Type of referral to audiology	True positives (TP)	False positives (FP)	PPV
	(Positive screen and PCHL on audiology)	(Positive screen but no PCHL on audiology)	TP/TP+FP
Bilateral	72	274	0.21
Unilateral	49	478	0.09
Incomplete screen	–	4	–
<b>Total screening referrals</b>	<b>121</b>	<b>756</b>	<b>0.14</b>

## 2.2 Audiology assessment completed

Data for this indicator relates to babies who were referred from screening to audiology (ie, did not pass screening). Reporting for periods up to and including the 2013 year calculated completed assessments as a proportion of babies that commenced audiology. The revised indicator used for the 2014 report onwards instead calculates completed assessments as a proportion of referrals.

### 2.2a Proportion of babies referred from screening that complete audiology assessments

Indicator 2.2a	Target
The proportion of babies referred from screening who complete audiology assessment.	≥90% by 3 months of age

A total of 1318 babies did not pass screening and were referred to audiology for the 2015 period. By the date of data extraction for this report 873 babies had completed audiology assessment (66.2%). This was made up of 744 (56.4%) babies that completed by the target time of three months of age, 116 (8.8%) that completed between three and six months of age, and 17 (1.3%) that were over six months of age when assessment was completed. There were also an additional 104 babies for whom the audiology outcome was DNA, lost contact, or declined.

The national result (56.4%) was well below the target of 90% of assessments being complete by three months of age but there has been a trend of improving performance since 2012, when only 35.6% of assessments were completed by three months of age (see Figure 4). Figure 4 also includes total audiology completion rates. These rates follow a similar trend with increases each year from 2012 onward.

**Figure 4: Audiology completion by 3 months of age and total, 2011–2015**

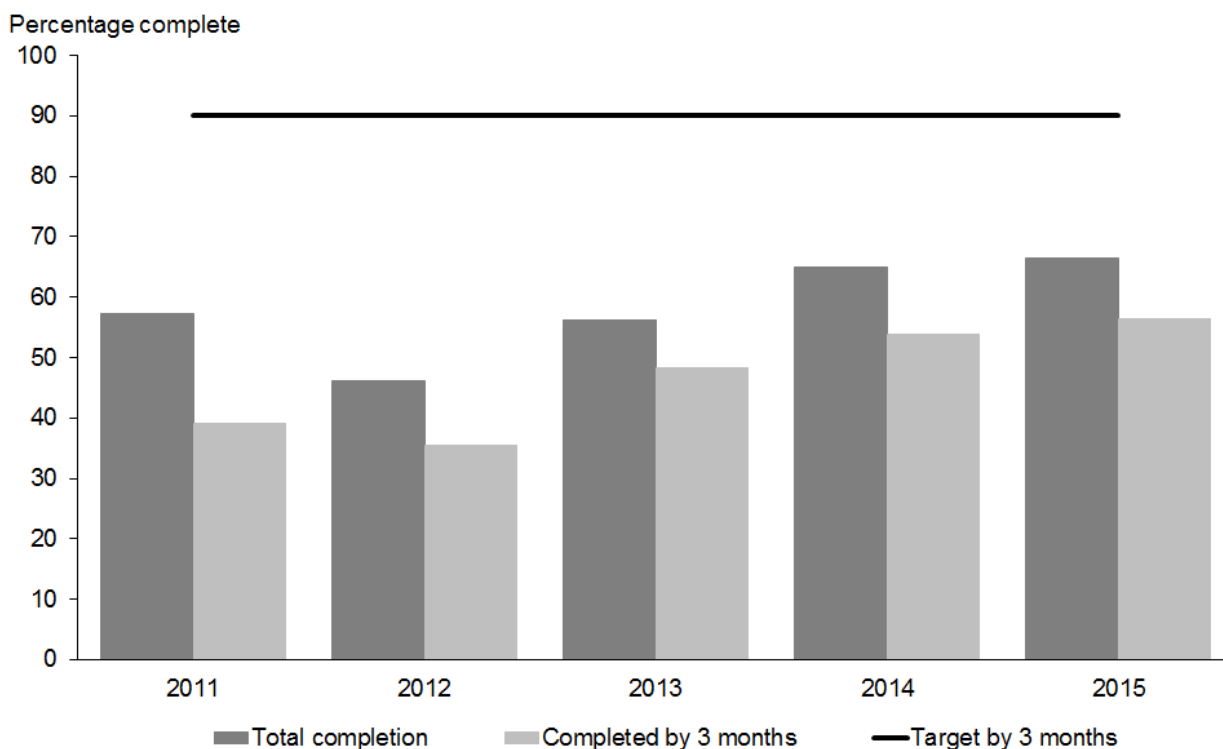


Table 29 shows performance at DHB level against the three-month target. Care should be taken when comparing DHB results due to the low numbers involved. These make the rates more unstable and lead to wide confidence intervals. Three DHBs met the 90% target (Wairarapa, Hutt Valley, and South Canterbury). A further five DHBs had rates above 70%. Appendix 3 contains further audiology completion tables showing the number and percentage completed later than three months and in total by DHB, ethnicity and NZ deprivation quintile.

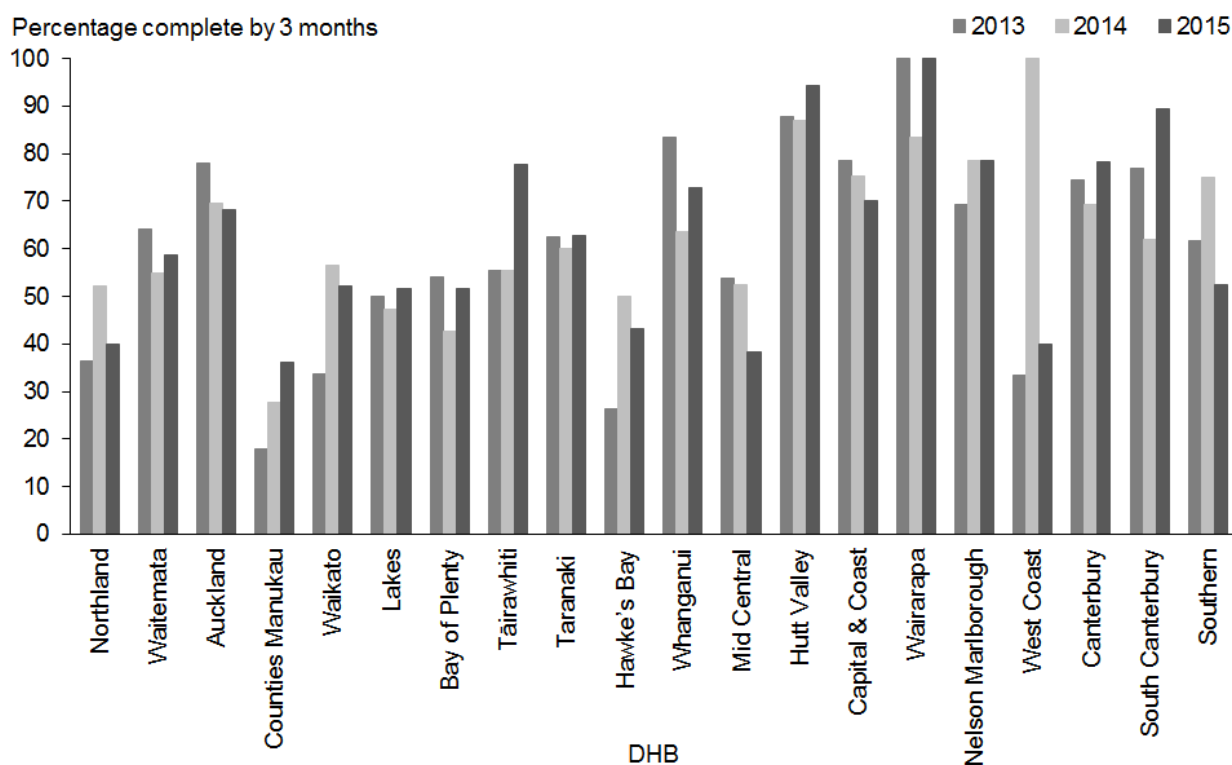
**Table 29: Audiology assessment completion for babies referred from newborn hearing screening by timeframe and DHB, 1 January to 31 December 2015**

DHB of screen	Completed audiology by 3 months N	Referred to audiology N	Percentage complete by 3 months %	95% confidence interval
Northland	45	113	39.8	(31.3, 49.0)
Waitemata	60	102	58.8	(49.1, 67.9)
Auckland	86	126	68.3	(59.7, 75.7)
Counties Manukau	67	185	36.2	(29.6, 43.4)
Waikato	73	140	52.1	(43.9, 60.2)
Lakes	15	29	51.7	(34.4, 68.6)
Bay of Plenty	33	64	51.6	(39.6, 63.4)
Tairāwhiti	7	9	77.8	(45.3, 93.7)
Taranaki	22	35	62.9	(46.3, 76.8)
Hawke's Bay	45	104	43.3	(34.2, 52.9)
Whanganui	8	11	72.7	(43.4, 90.3)
MidCentral	23	60	38.3	(27.1, 51.0)
Hutt Valley	65	69	94.2	(86.0, 97.7)
Capital & Coast	68	97	70.1	(60.4, 78.3)
Wairarapa	6	6	100.0	(61.0, 100)
Nelson Marlborough	11	14	78.6	(52.4, 92.4)
West Coast	2	5	40.0	(11.8, 76.9)
Canterbury	69	88	78.4	(68.7, 85.7)
South Canterbury	17	19	89.5	(68.6, 97.1)
Southern	22	42	52.4	(37.7, 66.6)
<b>Total</b>	<b>744</b>	<b>1318</b>	<b>56.4</b>	<b>(53.8, 59.1)</b>

Figure 5 shows DHB rates for audiology completion by three months for the past three years. Most DHB results vary year on year in keeping with the relatively low numbers involved which means rates are more changeable. The largest fluctuations relate to very small numbers of audiology referrals (for example, West Coast had only five referrals for 2015).



**Figure 5: Audiology completion by 3 months of age by DHB, 2013–2015**



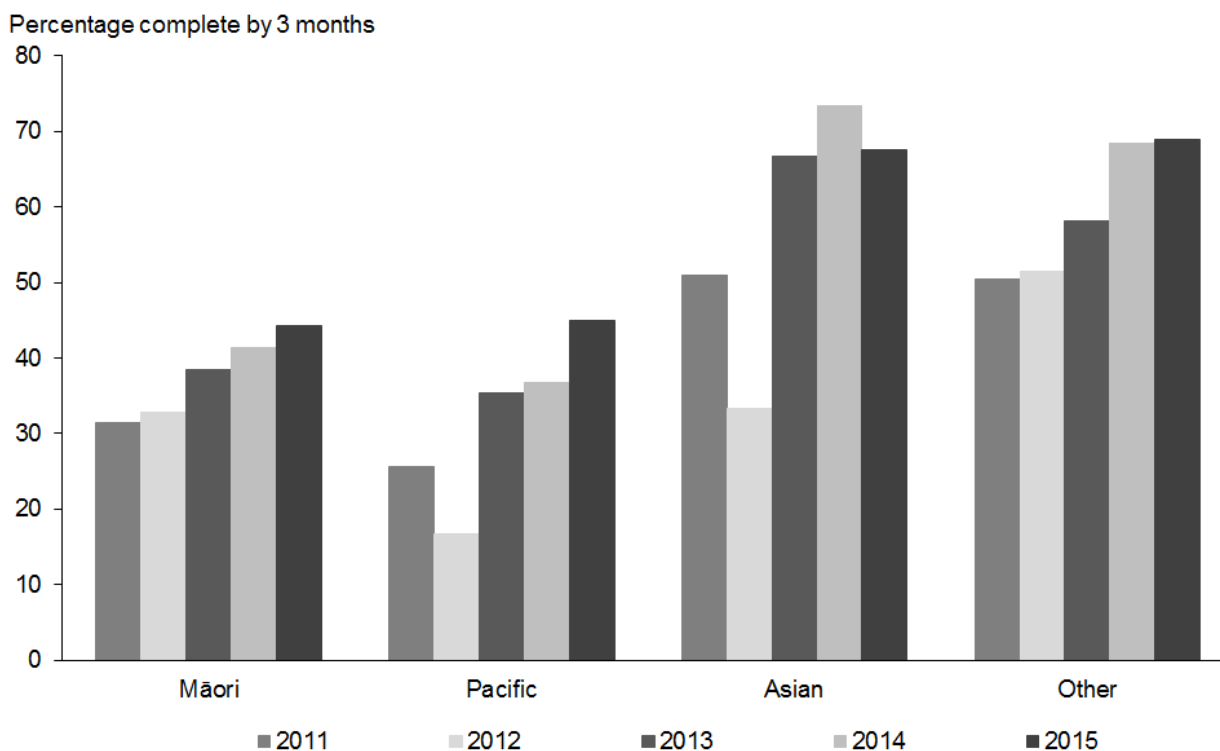
Audiology assessment completion by three months of age was below target for all ethnic groups (Table 30). The highest rate was 68.9% for Other, followed by 67.5% for Asian. Rates for Māori (44.3%) and Pacific (45.0%) were around half the 90% target.

**Table 30: Audiology assessment completion for babies referred from newborn hearing screening by timeframe and ethnicity, 1 January to 31 December 2015**

Ethnicity	Completed audiology by 3 months	Referred to audiology	Percentage complete by 3 months %	95% confidence interval
	N	N		
Māori	206	465	44.3	(39.9, 48.8)
Pacific	90	200	45.0	(38.3, 51.9)
Asian	102	151	67.5	(59.7, 74.5)
Other	346	502	68.9	(64.7, 72.8)
<b>Total</b>	<b>744</b>	<b>1318</b>	<b>56.4</b>	<b>(53.8, 59.1)</b>

Figure 6 shows the five-year time trend in audiology completion by three months of age by ethnicity. This demonstrates improvement in timely audiology completion for all ethnicities. Māori and Pacific rates have increased every year since 2012, while the rates for Asian and Other decreased or levelled off in 2015 after previous increases.

**Figure 6: Audiology completion by 3 months of age by ethnicity, 2011–2015**



Variation in three-month completion rates by deprivation was also evident. Quintile 5, the most deprived, had a rate of 42.7% compared to a rate of 73.9% for quintile 1 (see Table 31).

**Table 31: Audiology assessment completion for babies referred from newborn hearing screening by timeframe and deprivation, 1 January to 31 December 2015**

NZ Dep 2013	Completed audiology by 3 months N	Referred to audiology N	Percentage complete by 3 months %	95% confidence interval
Quintile 1	102	138	73.9	(66.0, 80.5)
Quintile 2	117	171	68.4	(61.1, 74.9)
Quintile 3	119	173	68.8	(61.5, 75.2)
Quintile 4	175	293	59.7	(54.0, 65.2)
Quintile 5	231	541	42.7	(38.6, 46.9)
Unknown	–	2	0.0	(0.0, 65.8)
<b>Total</b>	<b>744</b>	<b>1318</b>	<b>56.4</b>	<b>(53.8, 59.1)</b>

## 2.2b Proportion of babies with confirmed PCHL who have a diagnosis by 3 months of age

Indicator 2.2b	Target
The proportion of babies with confirmed permanent congenital hearing loss that have a diagnosis by three months of (corrected) age.	No target set

Assessment completion timeliness is particularly important for the group of babies that have a diagnosis of PCHL. Of the 1318 babies referred to audiology during 2015, 121 had a confirmed diagnosis of PCHL. Of these 121 babies, 101 (86.0%) had hearing loss confirmed by the time they reached three months of age. The low numbers involved limit DHB rate comparisons but these have been included for information in Table 32.

**Table 32: Proportion of babies with confirmed PCHL following newborn hearing screening who have a diagnosis by 3 months of age, 1 January to 31 December 2015**

DHB of screen	Confirmed PCHL by 3 months N	Total babies with confirmed PCHL N	% PCHL confirmed by 3 months %	95% confidence interval
Northland	5	6	83.3	(43.6, 97.0)
Waitemata	10	13	76.9	(49.7, 91.8)
Auckland	9	11	81.8	(52.3, 94.9)
Counties Manukau	7	10	70.0	(39.7, 89.2)
Waikato	9	10	90.0	(59.6, 98.2)
Lakes	1	2	50.0	(9.5, 90.5)
Bay of Plenty	7	8	87.5	(52.9, 97.8)
Tairāwhiti	3	3	100.0	(43.9, 100)
Taranaki	3	3	100.0	(43.9, 100)
Hawke's Bay	2	2	100.0	(34.2, 100)
Whanganui	1	1	100.0	(20.7, 100)
MidCentral	4	4	100.0	(51.0, 100)
Hutt Valley	8	8	100.0	(67.6, 100)
Capital & Coast	6	7	85.7	(48.7, 97.4)
Wairarapa	2	2	100.0	(34.2, 100)
Nelson Marlborough	2	2	100.0	(34.2, 100)
West Coast	–	–	–	–
Canterbury	20	24	83.3	(64.1, 93.3)
South Canterbury	2	2	100.0	(34.2, 100)
Southern	3	3	100.0	(43.9, 100)
<b>Total</b>	<b>104</b>	<b>121</b>	<b>86.0</b>	<b>(78.6, 91.0)</b>

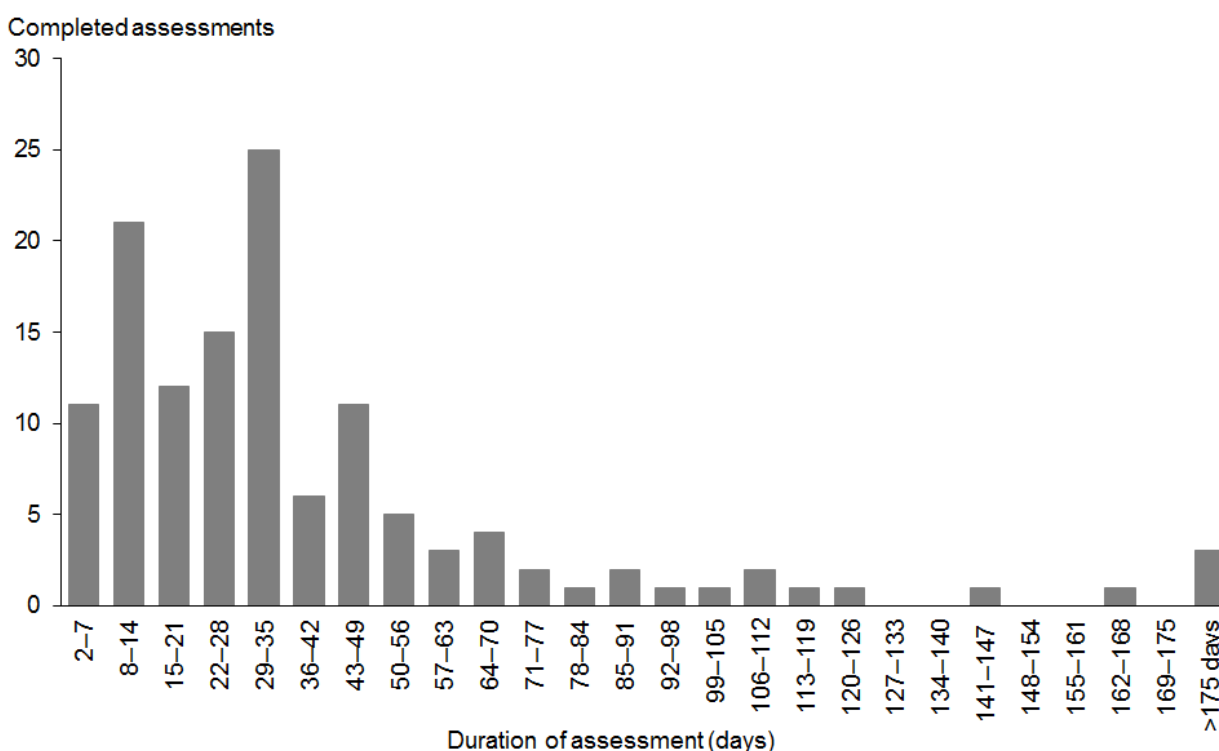
## 2.2c Duration of audiology assessment

Indicator 2.2c	Target
The duration of audiology diagnosis from assessment to completion.	No target set

This indicator looks at the duration of audiology assessment from the date assessment starts to date of completion. The national median assessment duration was one day, meaning that for most babies assessment was completed on the same day it started (748 out of 873 completed assessments, or 85.3%). All DHBs had a median assessment duration of 1 day.

Figure 7 shows the frequency distribution of completed assessments by duration of assessment. The duration range covered by the graph excludes those completed on the same day they were started (ie, duration of one day) because the size of this group would mean that the other bars would not be visible on the graph. Each bar represents one week, with the exception of the '> 175 days' category at far right. The labels used for each bar show the number of days.

**Figure 7: Audiology assessment duration for babies referred from newborn hearing screening, all DHBs, 1 January to 31 December 2015**



Note: A further 748 assessments were completed on the same day they were started.

## 2.3 Audiology assessment not attended

Indicator 2.3	Target
The proportion of babies referred from screening who did not complete audiology assessments due to DNA, lost contact, declined or deceased.	No target set

Attendance at audiology assessments is a key factor in the success of the programme. Indicator 2.3 analyses the reasons recorded for audiology assessments that were not attended. It should be noted that DHB policies vary regarding the number of attempts that should be made to contact parents before the appointment is classified as 'did not attend' (DNA). As audiology data completeness increases it is expected that the reasons for non-attendance will be available for more assessments, and hence the counts reported will increase.

According to the data available from the national database at the time of reporting, 104 out of 1318 (7.9%) audiology referrals were classified as either DNA, lost contact or declined for the 2015 period (see Table 33). Included within the 104 were 20 assessments that were declined by the baby's parents/guardians (1.5% of referrals).

**Table 33: Total audiology assessments not attended for babies referred from newborn hearing screening by DHB, 1 January to 31 December 2015**

DHB of screen	Total DNA, lost contact, declined N	Total referred to audiology N	Percentage not attended %	95% confidence interval
Northland	22	113	19.5	(13.2, 27.7)
Waitemata	–	102	0.0	(0.0, 3.6)
Auckland	1	126	0.8	(0.1, 4.4)
Counties Manukau	1	185	0.5	(0.1, 3.0)
Waikato	30	140	21.4	(15.4, 28.9)
Lakes	5	29	17.2	(7.6, 34.5)
Bay of Plenty	11	64	17.2	(9.9, 28.2)
Tairāwhiti	–	9	0.0	(0.0, 29.9)
Taranaki	1	35	2.9	(0.5, 14.5)
Hawke's Bay	10	104	9.6	(5.3, 16.8)
Whanganui	1	11	9.1	(1.6, 37.7)
MidCentral	9	60	15.0	(8.1, 26.1)
Hutt Valley	2	69	2.9	(0.8, 10.0)
Capital & Coast	8	97	8.2	(4.2, 15.4)
Wairarapa	–	6	0.0	(0.0, 39.0)
Nelson Marlborough	–	14	0.0	(0.0, 21.5)
West Coast	1	5	20.0	(3.6, 62.4)
Canterbury	–	88	0.0	(0.0, 4.2)
South Canterbury	1	19	5.3	(0.9, 24.6)
Southern	1	42	2.4	(0.4, 12.3)
<b>Total</b>	<b>104</b>	<b>1318</b>	<b>7.9</b>	<b>(6.6, 9.5)</b>

Tables 34 and 35 provide breakdowns by ethnicity and deprivation. The numbers involved are low but the rate for Māori is higher than other ethnicities, as is the rate for babies from areas of higher deprivation.

**Table 34: Total audiology assessments not attended for babies referred from newborn hearing screening by ethnicity, 1 January to 31 December 2015**

Ethnicity	Total DNA, lost contact, declined N	Total referred to audiology N	Percentage not attended %	95% confidence interval
Māori	73	465	15.7	(12.7, 19.3)
Pacific	8	200	4.0	(2.0, 7.7)
Asian	1	151	0.7	(0.1, 3.7)
Other	22	502	4.4	(2.9, 6.5)
<b>Total</b>	<b>104</b>	<b>1318</b>	<b>7.9</b>	<b>(6.6, 9.5)</b>

**Table 35: Total audiology assessments not attended for babies referred from newborn hearing screening by deprivation, 1 January to 31 December 2015**

NZ Dep 2013	Total DNA, lost contact, declined N	Total referred to audiology N	Percentage not attended %	95% confidence interval
Quintile 1	2	138	1.4	(0.4, 5.1)
Quintile 2	5	171	2.9	(1.3, 6.7)
Quintile 3	10	173	5.8	(3.2, 10.3)
Quintile 4	25	293	8.5	(5.8, 12.3)
Quintile 5	62	541	11.5	(9.0, 14.4)
Unknown	–	2	0.0	(0.0, 65.8)
<b>Total</b>	<b>104</b>	<b>1318</b>	<b>7.9</b>	<b>(6.6, 9.5)</b>

## 2.4 Hearing loss detected

Indicator 2.4	Target
The number of babies that have hearing loss detected as a proportion of all babies screened.	No target set

The detection of PCHL via newborn hearing screening is a key indicator of programme performance, and should be in line with international evidence on PCHL prevalence in comparable programmes. It is anticipated between one and two babies per 1000 screened will have moderate or more severe permanent congenital hearing loss identified. The national rate of PCHL for the 2015 period was close to the expected level with 2.2 babies per 1000 screens diagnosed with PCHL. A breakdown by DHBs has been provided but numbers are too low to make comparisons (Table 36).

**Table 36: Proportion of babies screened that had permanent congenital hearing loss detected by DHB, 1 January to 31 December 2015**

DHB of screen	Number of babies with confirmed PCHL			Total babies screened	Babies with confirmed PCHL per 1000 screened			
	Unilateral	Bilateral	Total		Unilateral	Bilateral	Total	95% CI for total
Northland	2	4	6	1691	1.2	2.4	3.5	(1.7, 7.7)
Waitemata	8	5	13	6825	1.2	0.7	1.9	(1.1, 3.2)
Auckland	8	3	11	5578	1.4	0.5	2.0	(1.1, 3.5)
Counties Manukau	5	5	10	7065	0.7	0.7	1.4	(0.8, 2.6)
Waikato	3	7	10	4738	0.6	1.5	2.1	(1.2, 3.9)
Lakes	1	1	2	1396	0.7	0.7	1.4	(0.4, 5.2)
Bay of Plenty	3	5	8	2353	1.3	2.1	3.4	(1.8, 6.7)
Tairāwhiti	1	2	3	696	1.4	2.9	4.3	(1.5, 12.5)
Taranaki	2	1	3	1463	1.4	0.7	2.1	(0.7, 6.0)
Hawke's Bay	2	–	2	1763	1.1	0.0	1.1	(0.3, 4.1)
Whanganui	–	1	1	754	0.0	1.3	1.3	(0.2, 7.5)
MidCentral	2	2	4	1934	1.0	1.0	2.1	(0.8, 5.3)
Hutt Valley	4	4	8	1898	2.1	2.1	4.2	(2.2, 8.2)
Capital & Coast	4	3	7	3603	1.1	0.8	1.9	(1.0, 4.0)
Wairarapa	1	1	2	431	2.3	2.3	4.6	(1.4, 16.6)
Nelson Marlborough	1	1	2	1392	0.7	0.7	1.4	(0.4, 5.2)
West Coast	–	–	–	287	0.0	0.0	0.0	(0.0, 13.2)
Canterbury	8	16	24	6176	1.3	2.6	3.9	(2.6, 5.7)
South Canterbury	1	1	2	604	1.7	1.7	3.3	(1.0, 11.9)
Southern	1	2	3	3335	0.3	0.6	0.9	(0.3, 2.6)
<b>Total</b>	<b>57</b>	<b>64</b>	<b>121</b>	<b>53,982</b>	<b>1.1</b>	<b>1.2</b>	<b>2.2</b>	<b>(1.9, 2.7)</b>

Rates of PCHL diagnosis by ethnicity ranged from 1.8 per 1000 for Other to 2.8 per 1000 babies screened for Asian (Table 37). Overlapping confidence intervals indicate that the difference in observed rates by ethnicity were not statistically significant. There was no consistent trend in rates of PCHL diagnoses by deprivation (see Table 38).

**Table 37: Proportion of babies screened that had permanent congenital hearing loss detected by ethnicity, 1 January to 31 December 2015**

Ethnicity	Number of babies with confirmed PCHL			Total babies screened	Babies with confirmed PCHL per 1000 screened			
	Unilateral	Bilateral	Total		Unilateral	Bilateral	Total	95% CI for total
Māori	15	19	34	12,717	1.2	1.5	2.7	(1.9, 3.7)
Pacific	8	6	14	5389	1.5	1.1	2.6	(1.6, 4.3)
Asian	14	11	25	8807	1.6	1.2	2.8	(1.9, 4.2)
Other	20	28	48	27,069	0.7	1.0	1.8	(1.3, 2.3)
<b>Total</b>	<b>57</b>	<b>64</b>	<b>121</b>	<b>53,982</b>	<b>1.1</b>	<b>1.2</b>	<b>2.2</b>	<b>(1.9, 2.7)</b>

**Table 38: Proportion of babies screened that had permanent congenital hearing loss detected by deprivation, 1 January to 31 December 2015**

NZ Dep 2013	Number of babies with confirmed PCHL			Total babies screened	Babies with confirmed PCHL per 1000 screened			
	Unilateral	Bilateral	Total		Unilateral	Bilateral	Total	95% CI for total
Quintile 1	12	6	18	8287	1.4	0.7	2.2	(1.4, 3.4)
Quintile 2	10	10	20	9085	1.1	1.1	2.2	(1.4, 3.4)
Quintile 3	5	11	16	9846	0.5	1.1	1.6	(1.0, 2.6)
Quintile 4	17	23	40	12,047	1.4	1.9	3.3	(2.5, 4.5)
Quintile 5	12	14	26	14,636	0.8	1.0	1.8	(1.2, 2.6)
Unknown	1	–	1	81	12.3	0.0	12.3	(3.1, 65.7)
<b>Total</b>	<b>57</b>	<b>64</b>	<b>121</b>	<b>53,982</b>	<b>1.1</b>	<b>1.2</b>	<b>2.2</b>	<b>(1.9, 2.7)</b>

Table 39 provides a count of PCHL diagnoses according to right and left ear results. Bilateral sensorineural hearing loss was the most common type of hearing loss identified with 7.8 babies diagnosed per 10,000 completed screens. This equated to 34.7% of PCHL diagnoses for the 2015 period.

**Table 39: Proportion of babies screened that had permanent congenital hearing loss detected by type of hearing loss, 1 January to 31 December 2015**

Right ear result	Left ear result	Number of babies	Number per 10,000 screens	% of babies with PCHL
Auditory neuropathy	Auditory neuropathy	2	0.4	1.7
Auditory neuropathy	Normal	3	0.6	2.5
Conductive permanent	Conductive permanent	4	0.7	3.3
Conductive permanent	Conductive temporary	2	0.4	1.7
Conductive permanent	Normal	5	0.9	4.1
Conductive temporary	Auditory neuropathy	2	0.4	1.7
Conductive temporary	Sensorineural	3	0.6	2.5
Mixed	Mixed	13	2.4	10.7
Normal	Auditory neuropathy	5	0.9	4.1
Normal	Conductive permanent	5	0.9	4.1
Normal	Mixed	2	0.4	1.7
Normal	Sensorineural	18	3.3	14.9
Sensorineural	Conductive permanent	1	0.2	0.8
Sensorineural	Conductive temporary	1	0.2	0.8
Sensorineural	Mixed	2	0.4	1.7
Sensorineural	Normal	11	2.0	9.1
Sensorineural	Sensorineural	42	7.8	34.7
<b>Total</b>		<b>121</b>	<b>22.4</b>	<b>100.0</b>

A further breakdown of PCHL diagnoses by DHB and type of hearing loss is included as Appendix 4.



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# Early Intervention education services indicators

The remaining indicators relate to Early Intervention education services provided to babies referred from newborn hearing screening. During the 2015 calendar year the Ministry of Education Special Education group recorded a total of 150 referrals across the 16 Ministry of Education districts, as shown in Table 40. A map showing the boundaries of these districts is given in Appendix 1.

**Table 40: Referrals received by Ministry of Education districts, 1 January to 31 December 2015**

Ministry of Education district	Referrals N
Auckland City	18
Bay of Plenty East	4
Bay of Plenty West	4
Canterbury	19
Central Palmerston North	3
Gisborne	4
Greater Wellington	10
Hawke's Bay	4
Manukau	22
Nelson/Marlborough/Westland	8
North West Auckland	17
Otago	–
Southland	2
Tai Tokerau (Northland)	5
Taranaki	6
Waikato	24
<b>Total</b>	<b>150</b>

Table 41 shows referrals received with ethnicity groups identified. Babies with more than one ethnicity are counted in more than one ethnicity group.

**Table 41: Referrals received by ethnicity of child, 1 January to 31 December 2015**

Ethnicity (total response)	Referrals N
Asian	22
Māori	45
NZ European	58
Other	13

Pasifika	19
Unknown	18
<b>Total</b>	<b>175</b>

### 3.1 Making initial contact with families/whānau

Indicator 3.1	Target
The number of working days taken for Early Intervention education services to make contact with the family/whānau.	≥95% contacted within 10 working days

The earlier that contact is made with families/whānau the greater the opportunity to meet the international standard of intervention by six months. The target is for contact to be made within 10 working days for 95% or more of referrals. For the 2015 year, 120 out of 150 referrals (80%) were contacted within 10 days.

Table 42 shows a breakdown by ethnicity of the number of referrals where contact was made within 10 days. The rate for Pasifika exceeded the target but other ethnic groups were below.

**Table 42: Time taken for first contact by ethnicity, 1 January to 31 December 2015**

Ethnicity (total response)	Contact within 10 days N	Referrals N	Within 10 days %	95% confidence interval
Asian	16	22	72.7	(51.8, 86.8)
Māori	33	45	73.3	(59.0, 84.0)
NZ European	45	58	77.6	(65.3, 86.4)
Other	11	13	84.6	(57.8, 95.7)
Pasifika	18	19	94.7	(75.4, 99.1)
Unknown	15	18	83.3	(60.8, 94.2)

Table 43 shows a breakdown by education district of referrals where contact was made within 10 days. Due to low numbers, percentage calculations are not shown.

**Table 43: Time taken for first contact by education district, 1 January to 31 December 2015**

Ministry of Education district	Contact within 10 days N	Contact after 10 days N
Auckland City	14	4
Bay of Plenty East	4	0
Bay of Plenty West	4	0
Canterbury	16	3
Central Palmerston North	2	1
Gisborne	1	3
Greater Wellington	6	4
Hawke's Bay	3	1
Manukau	21	1
Nelson/Marlborough/Westland	7	1

North West Auckland	14	3
Otago	0	0
Southland	2	0
Tai Tokerau (Northland)	4	1
Taranaki	5	1
Waikato	17	7
<b>Total</b>	<b>120</b>	<b>30</b>

Reasons given for instances of greater than 10 working day response time include incorrect coding of referrals (not initially identified as UNHS referral), unable to make contact with families, contact details received for families had changed, Adviser on Deaf Children on leave (only one advisor in district), and vacancies for Adviser on Deaf Children roles.

The majority of referrals are responded to within five working days, as shown in Table 44.

**Table 44: First contact by time category, 1 January to 31 December 2015**

Time for first contact (days)	Number of referrals N	%
< 2 days	63	42.0
3 to 5 days	36	24.0
6 to 10 days	21	14.0
11 to 20 days	14	9.3
> 20 days	16	10.7
<b>Total</b>	<b>150</b>	

## 3.2 Commencement of Early Intervention education services

Indicator 3.2	Target
3.2a Proportion of children eligible for and referred to Early Intervention education services who began receiving a service within one month following receipt of referral. Number of months following receipt of referral that other families/whānau and children began receiving a service.	≥90%
3.2b Proportion of children up to six months of age eligible for and referred to Early Intervention education services who began receiving a service by six months of age.	≥90%
3.2c Proportion of children eligible for and referred to Early Intervention education services after six months of age.	No target set.

This indicator measures the timeliness with which all children diagnosed following screening are engaged in Early Intervention education services. The target is for at least 90% of children to begin receiving services within one month of referral. As Table 45 shows, this target was met for the 2015 period, with 91.3% of children referred to Early Intervention education services receiving a service within one month of referral.

**Table 45: Time taken for commencement of services, 1 January to 31 December 2015**

Time taken for service (months)	Number of referrals N	%
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< 1 month	137	91.3
1 to 2	7	4.7
2 to 3	3	2.0
3 to 4	2	1.3
Not recorded	1	0.7
<b>Total</b>	<b>150</b>	

Tables 46 and 47 provide further breakdowns by ethnicity and Ministry of Education District respectively. The observed rates for all ethnic groups except Asian and NZ European exceeded the 90% target. For all education districts the majority of referrals commenced services within one month.

**Table 46: Time taken for commencement of services by ethnicity, 1 January to 31 December 2015**

Ethnicity (total response)	Commenced within 1 month				Later commencement			
	Service commenced <1 month N	Referrals N	%	95% confidence interval	1–2 months N	2–3 months N	3–4 months N	Unknown N
	Asian	19	22	86.4	(66.7, 95.3)	2	1	–
Māori	41	45	91.1	(79.3, 96.5)	2	1	1	–
NZ European	51	58	87.9	(77.1, 94.0)	3	1	2	1
Other	12	13	92.3	(66.7, 98.6)	1	–	–	–
Pasifika	19	19	100.0	(83.2, 100)	–	–	–	–
Unknown	17	18	94.4	(74.2, 99.0)	1	–	–	–

**Table 47: Time taken for commencement of services by Education District, 1 January to 31 December 2015**

Ministry of Education district	Time taken for service (months)	Number of referrals N
Auckland City	<1	16
Auckland City	1 to 2	2
Bay of Plenty East	<1	4
Bay of Plenty West	<1	4
Canterbury	<1	18
Canterbury	1 to 2	1
Central (Palmerston North)	<1	2
Central (Palmerston North)	1 to 2	1
Gisborne	<1	4
Greater Wellington	<1	9
Greater Wellington	2 to 3	1
Hawkes Bay	<1	4
Manukau	<1	22
Nelson/Marlborough/Westland	<1	7
Nelson/Marlborough/Westland	3 to 4	1

North West	<1	16
North West	1 to 2	1
Southland	<1	2
Tai Tokerau	<1	5
Taranaki	<1	5
Taranaki	Not recorded	1
Waikato	<1	19
Waikato	1 to 2	2
Waikato	2 to 3	2
Waikato	3 to 4	1
<b>Total</b>		<b>150</b>

The second part of this indicator measures the proportion of children that began receiving Early Intervention services by six months of age. The target is for at least 90% to begin by six months, this target was met for the 2015 year with 97.7% of children receiving first service by six months of age. The target was also met for all ethnic groups (see Table 49).

**Table 48: Proportion of referrals where service received by 6 months of age, 1 January to 31 December 2015**

Age when service first received (months)	Number of children N	%
< 6 months	84	97.7
6 to 10 months	2	2.3

**Table 49: Proportion of referrals where services were received by 6 months of age by ethnicity, 1 January to 31 December 2015**

Ethnicity (total response)	Services started by 6 months N	Aged <6 months at referral N	95% confidence interval	
			%	
Asian	13	13	100.0	(77.2, 100)
Māori	21	22	95.5	(78.2, 99.2)
NZ European	34	36	94.4	(81.9, 98.5)
Other	10	10	100.0	(72.2, 100)
Pasifika	11	12	91.7	(64.6, 98.5)
Unknown	8	8	100.0	(67.6, 100)

The final part of this indicator measures the timeliness of referral. The required outcome is for referrals to be received before the child is six months of age. During the reporting period 150 referrals were recorded, of which 42.7% were received for children who were six months or older (see Table 50).

**Table 50: Proportion of referrals where child was aged >6 months, 1 January to 31 December 2015**

Age at referral (months)	Number of referrals N	%
<6	86	57.3

6 to 10	16	10.7
11 to 15	9	6.0
16 to 20	5	3.3
21 to 25	9	6.0
26 to 30	7	4.7
31 to 35	3	2.0
36+	15	10.0
<b>Total</b>	<b>150</b>	

Table 51 provides a further breakdown by ethnicity and referral timeframe. Both Māori and NZ European ethnicities had a higher number of referrals at older age ranges (21 months and older).

**Table 51: Referrals received by age at referral and ethnicity, 1 January to 31 December 2015**

Ethnicity (total response)	Referred before 6 months				Later referrals (grouped by month)				
	Referred <6 months N	Referrals N	%	95% confidence interval	6–10 N	11–15 N	16–20 N	21–25 N	26+ N
Asian	13	22	59.1	(38.7, 76.7)	1	3	–	2	3
Māori	22	45	48.9	(35.0, 63.0)	4	2	3	5	9
NZ European	36	58	62.1	(49.2, 73.4)	5	3	4	1	9
Other	10	13	76.9	(49.7, 91.8)	1	1	–	–	1
Pasifika	12	19	63.2	(41.0, 80.9)	3	–	–	1	3
Unknown	8	18	44.4	(24.6, 66.3)	4	1	–	–	5

### 3.3 Continuation of Early Intervention education services

Indicator 3.3	Target
3.3a The proportion of children referred as a result of newborn hearing screening and eligible for the Early intervention education service who exited services prior to three years of age.	No target set
3.3b The proportion of children referred as a result of newborn hearing screening and eligible for the Early Intervention education service who exited services prior to five years of age.	No target set

During the 2015 reporting period 66 children exited early intervention education services. Of these, 36 children (54.5%) were aged less than three years and 30 children were aged between three and five years (45.5%).

**Table 52: Age of children at exit from early intervention education services, 1 January to 31 December 2015**

Age when service exited (years)	Number of children N
< 3 years	36
3 to 5 years	30

Interpretation of these data needs to be done in a considered way as the reasons for withdrawal are varied. Some families may withdraw due to emigrating or because their child has age-appropriate development. The list below gives the reasons reported for withdrawals during 2015. In many cases the exit is actually a change in service as opposed to a complete withdrawal from services.

Rationale for exiting services:

- parent decision to close, service no longer required (n=20)
- case closed and reopened with a change of lead worker (n=11) – still receiving a service
- case closed and reopened, coded incorrectly not as newborn screening referral (n=11) – still receiving a service
- transition to school, code changed (n=13) – still receiving a service
- transition to other service provider (n=1) – still receiving a service
- deceased (n=5)
- family immigrated (n=4)
- contact lost with family (n=1).

### 3.4 Outcome of early intervention

Indicator 3.4	Target
3.4a Proportion of children referred as a result of newborn hearing screening and eligible for the Early Intervention education service who received a language assessment between four years six months and five years of age.	No target set
3.4b Proportion of children referred as a result of newborn hearing screening and eligible for the Early Intervention education service whose language level was within six months of their chronological age at four years six months to five years of age.	No target set
3.4c Proportion of children referred as a result of newborn hearing screening and eligible for the Early Intervention service whose language level was delayed six months or more for their chronological age at four years six months to five years of age.	No target set

For the 2015 period reporting for this indicator covers the Ministry of Education Central North region only. Data for the Northern, Central South and Southern Ministry of Education regions should be available from the reporting period 2017 onwards.

During the 2015 year 19 children in the Central North region were eligible for assessment and 18 (95%) has assessment completed. Of these, six children (33%) presented with language levels within six months of their chronological age at four years six months to five years of age.

The remaining 12 children presented with a language level that was delayed six months or more for their chronological age at four years six months to five years of age. The reasons recorded for these delays are shown in the list below.

Rationale for language level delay that was six months or more for their chronological age at four years six months to five years of age:

- children presenting with additional disabilities to hearing loss (n=5)
- family initially declined service, delayed hearing aid and cochlear implant use (n=2)
- late diagnosis after screening (n=2)

- low family engagement and delayed and inconsistent use of hearing aid/cochlear implant, (n=3).



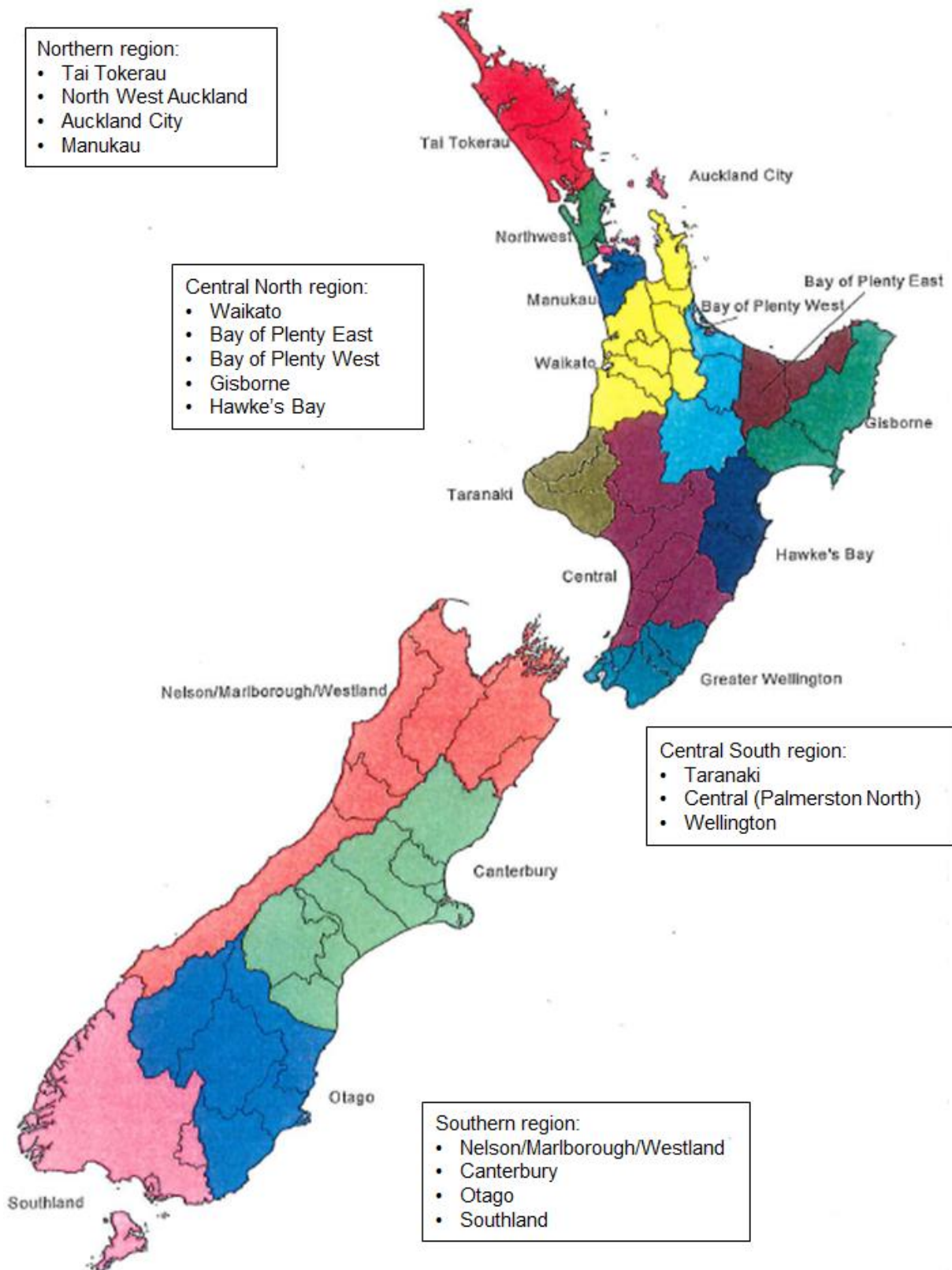
# Hearing screening indicators not yet monitored

The indicators below are either under development or data is not currently available. Indicator 2.1 will be monitored by DHBs using data contained in NHIMS rather than in the annual national monitoring report.

Indicator	Target
1.4 Newborn hearing DNAs and lost contact The number of babies that do not complete screening due to not attending or the service losing contact as a proportion of all babies whose parents/guardians consented to screening.	No target set
1.7 First refer rates The number of babies referred from first to second aABR screening as a proportion of all babies that completed first aABR screens.	No target set
2.1 Audiology assessment commencement	
2.1a The proportion of babies referred from screening who are offered audiology appointments dated within four weeks of referral.	100%
2.1b The proportion of babies referred from screening who start audiology assessment within four weeks of referral, and in total for the reporting period.	No target set
2.5 Outcome of hearing surveillance	
2.5a The proportion of babies with identified risk factor(s) that have permanent congenital hearing loss (PCHL) identified.	No target set
2.5b The proportion of babies who are referred for hearing surveillance that do not have an audiology assessment.	No target set
2.6 Cases not identified by screening The number of cases of moderate or more severe hearing permanent hearing loss identified during the reporting period in children less than six years of age that were not referred from screening to audiology.	No target set
2.7 Age at first assistive device The number of babies referred from screening diagnosed with PCHL who have an assistive hearing device fitted by six months of age as a proportion of all babies referred from screening diagnosed with PCHL.	No target set

# Appendix 1

Figure 8: Ministry of Education regions and districts



# Appendix 2

Figure 9: Ministry of Health District Health Board boundaries



# Appendix 3

**Table 53: Audiology assessment completion by timeframe and DHB, 1 January to 31 December 2015**

DHB of screen	Complete <3 months N	Complete 3–6 months N	Complete >6 months N	Total referred to audiology N	Complete <3 months %	Complete 3–6 months %	Complete >6 months %	Total complete %
Northland	45	19	–	113	39.8	16.8	0.0	56.6
Waitemata	60	12	2	102	58.8	11.8	2.0	72.5
Auckland	86	4	1	126	68.3	3.2	0.8	72.2
Counties Manukau	67	23	3	185	36.2	12.4	1.6	50.3
Waikato	73	11	1	140	52.1	7.9	0.7	60.7
Lakes	15	3	–	29	51.7	10.3	0.0	62.1
Bay of Plenty	33	9	1	64	51.6	14.1	1.6	67.2
Tairāwhiti	7	–	–	9	77.8	0.0	0.0	77.8
Taranaki	22	1	–	35	62.9	2.9	0.0	65.7
Hawke's Bay	45	12	1	104	43.3	11.5	1.0	55.8
Whanganui	8	–	1	11	72.7	0.0	9.1	81.8
MidCentral	23	9	2	60	38.3	15.0	3.3	56.7
Hutt Valley	65	–	–	69	94.2	0.0	0.0	94.2
Capital & Coast	68	4	3	97	70.1	4.1	3.1	77.3
Wairarapa	6	–	–	6	100.0	0.0	0.0	100.0
Nelson Marlborough	11	–	–	14	78.6	0.0	0.0	78.6
West Coast	2	–	–	5	40.0	0.0	0.0	40.0
Canterbury	69	9	–	88	78.4	10.2	0.0	88.6
South Canterbury	17	–	–	19	89.5	0.0	0.0	89.5
Southern	22	–	2	42	52.4	0.0	4.8	57.1
<b>Total</b>	<b>744</b>	<b>116</b>	<b>17</b>	<b>1318</b>	<b>56.4</b>	<b>8.8</b>	<b>1.3</b>	<b>66.5</b>

**Table 54: Audiology assessment completion by timeframe and ethnicity, 1 January to 31 December 2015**

Ethnicity	Complete <3 months N	Complete 3–6 months N	Complete >6 months N	Total referred to audiology N	Percentage complete <3 months %	Percentage complete 3–6 months %	Percentage complete >6 months %	Total percentage complete %
Māori	206	46	3	465	44.3	9.9	0.6	54.8
Pacific	90	21	4	200	45.0	10.5	2.0	57.5
Asian	102	11	2	151	67.5	7.3	1.3	76.2
Other	346	38	8	502	68.9	7.6	1.6	78.1
<b>Total</b>	<b>744</b>	<b>116</b>	<b>17</b>	<b>1318</b>	<b>56.4</b>	<b>8.8</b>	<b>1.3</b>	<b>66.5</b>

**Table 55: Audiology assessment completion by timeframe and deprivation, 1 January to 31 December 2015**

<b>NZ Dep 2013</b>	<b>Complete &lt;3 months</b>	<b>Complete 3–6 months</b>	<b>Complete &gt;6 months</b>	<b>Total referred to audiology</b>	<b>Percentage complete &lt;3 months</b>	<b>Percentage complete 3–6 months</b>	<b>Percentage complete &gt;6 months</b>	<b>Total percentage complete</b>
	<b>N</b>	<b>N</b>	<b>N</b>	<b>N</b>	<b>%</b>	<b>%</b>	<b>%</b>	<b>%</b>
Quintile 1	102	8	3	138	73.9	5.8	2.2	81.9
Quintile 2	117	17	2	171	68.4	9.9	1.2	79.5
Quintile 3	119	9	1	173	68.8	5.2	0.6	74.6
Quintile 4	175	25	3	293	59.7	8.5	1.0	69.3
Quintile 5	231	57	7	541	42.7	10.5	1.3	54.5
Unknown	–	–	1	2	0.0	0.0	50.0	50.0
<b>Total</b>	<b>744</b>	<b>116</b>	<b>17</b>	<b>1318</b>	<b>56.4</b>	<b>8.8</b>	<b>1.3</b>	<b>66.5</b>

# Appendix 4

**Table 56: Number of babies screened that had permanent congenital hearing loss detected by type of hearing loss and DHB, 1 January to 31 December 2015**

DHB of screening	Right ear result	Left ear result	Number of babies
Northland	Conductive permanent	Normal	1
Northland	Normal	Sensorineural	1
Northland	Sensorineural	Sensorineural	4
Waitemata	Auditory neuropathy	Normal	2
Waitemata	Conductive permanent	Conductive permanent	1
Waitemata	Conductive temporary	Conductive permanent	1
Waitemata	Normal	Auditory neuropathy	2
Waitemata	Normal	Conductive permanent	1
Waitemata	Sensorineural	Normal	2
Waitemata	Sensorineural	Sensorineural	4
Auckland	Conductive permanent	Conductive permanent	1
Auckland	Conductive temporary	Conductive permanent	1
Auckland	Normal	Auditory neuropathy	1
Auckland	Normal	Conductive permanent	1
Auckland	Normal	Sensorineural	4
Auckland	Sensorineural	Normal	1
Auckland	Sensorineural	Sensorineural	2
Counties Manukau	Conductive permanent	Normal	1
Counties Manukau	Mixed	Mixed	1
Counties Manukau	Sensorineural	Conductive temporary	1
Counties Manukau	Sensorineural	Normal	3
Counties Manukau	Sensorineural	Sensorineural	4
Waikato	Auditory neuropathy	Auditory neuropathy	1
Waikato	Auditory neuropathy	Normal	1
Waikato	Mixed	Sensorineural	1
Waikato	Sensorineural	Normal	2
Waikato	Sensorineural	Sensorineural	5
Lakes	Mixed	Mixed	1
Lakes	Normal	Conductive permanent	1
Bay of Plenty	Mixed	Mixed	2
Bay of Plenty	Mixed	Normal	1
Bay of Plenty	Sensorineural	Conductive temporary	1
Bay of Plenty	Sensorineural	Normal	1
Bay of Plenty	Sensorineural	Sensorineural	3
Tairāwhiti	Sensorineural	Normal	1

<b>DHB of screening</b>	<b>Right ear result</b>	<b>Left ear result</b>	<b>Number of babies</b>
Tairāwhiti	Sensorineural	Sensorineural	2
Taranaki	Mixed	Sensorineural	1
Taranaki	Normal	Sensorineural	1
Taranaki	Sensorineural	Normal	1
Hawke's Bay	Normal	Sensorineural	1
Hawke's Bay	Sensorineural	Normal	1
Whanganui	Sensorineural	Sensorineural	1
Mid Central	Mixed	Mixed	2
Mid Central	Normal	Conductive permanent	2
Hutt Valley	Conductive permanent	Normal	1
Hutt Valley	Normal	Sensorineural	1
Hutt Valley	Sensorineural	Normal	2
Hutt Valley	Sensorineural	Sensorineural	4
Capital & Coast	Auditory neuropathy	Conductive temporary	1
Capital & Coast	Conductive temporary	Sensorineural	1
Capital & Coast	Normal	Sensorineural	1
Capital & Coast	Sensorineural	Normal	1
Capital & Coast	Sensorineural	Sensorineural	3
Wairarapa	Auditory neuropathy	Normal	1
Wairarapa	Sensorineural	Sensorineural	1
Nelson Marlborough	Mixed	Mixed	1
Nelson Marlborough	Sensorineural	Normal	1
Canterbury	Auditory neuropathy	Auditory neuropathy	1
Canterbury	Auditory neuropathy	Conductive temporary	1
Canterbury	Conductive permanent	Conductive permanent	2
Canterbury	Conductive permanent	Normal	1
Canterbury	Conductive permanent	Sensorineural	1
Canterbury	Mixed	Mixed	6
Canterbury	Mixed	Normal	1
Canterbury	Normal	Sensorineural	2
Canterbury	Sensorineural	Conductive temporary	1
Canterbury	Sensorineural	Normal	2
Canterbury	Sensorineural	Sensorineural	6
South Canterbury	Auditory neuropathy	Normal	1
South Canterbury	Sensorineural	Sensorineural	1
Southern	Conductive permanent	Normal	1
Southern	Sensorineural	Sensorineural	2
<b>Total</b>			<b>121</b>