ANTENATAL SCREENING FOR DOWN SYNDROME AND OTHER CONDITIONS

REPORT FOR 2012

National Screening Unit

Disclaimer
This publication includes information provided to Auckland District Health Board by screening providers. The purpose of this publication is to inform discussion and assist on-going quality improvements for antenatal screening for Down and other conditions. All care has been taken in the production of this report, and the data was deemed to be accurate at the time of publication. However, the data may be subject to updates over time as further information is received. Before quoting or using this information, it is advisable to check the current status with the National Screening Unit of the Ministry of Health.

Acknowledgements
Many people have assisted in the production of this report. In particular, we would like to acknowledge those who have collected this information and the staff at LabPLUS, Auckland District Health Board who have assisted in the production of this report.

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Executive Summary

Antenatal screening for Down syndrome and other conditions is available to all pregnant women in New Zealand who are up to 20 weeks pregnant. This screening is optional and provides a risk estimate for Down syndrome (trisomy 21), trisomy 18 (Edwards syndrome), trisomy 13 (Patau syndrome) and some other rare genetic disorders.

The two options for screening are:

- first trimester combined screening which involves an ultrasound scan to measure nuchal translucency (NT)) and crown rump length (CRL) and maternal serum screening, or
- second trimester maternal serum screening.

The results of the ultrasound scan and/or serum are combined with other demographic and maternal factors to provide a risk result. All risk assessments are performed by the screening laboratories, LabPLUS at Auckland District Health Board and Canterbury Health Laboratories at Canterbury District Health Board. Ultrasound scanning is performed by radiology practices around New Zealand and the ultrasound report is sent to the screening laboratories to include in the risk result.

Further information on the screening options is available at www.nsu.govt.nz.

Detection of fetal anomalies offers women information that may help them prepare for the birth of their child, the option of delivery in a setting that has access to specialist surgical or medical care, and the possibility of considering termination or palliative care in the newborn period.

Antenatal screening relies on the diligence and dedication of many health professionals including radiology staff, Lead Maternity Carers (LMCs), General Practitioners (GPs) and laboratory personnel. Screening is dependent on all providers performing to the highest quality - from informed consent and ultrasound scanning through to testing, issuing reports and follow-up as required. The information provided to the laboratories is critical to informing high quality results including details of the pregnancy and ultrasound findings. These details have a significant impact on the risk calculation and report that is issued.

Summary of data for 2012

- This report covers the period 1 January to 31 December 2012.
- 47,856 women commenced screening for either the first trimester or the second trimester.
- 42,314 women commenced screening in the first trimester.
- 5,515 commenced screening in the second trimester.
- 87% of women who commenced screening in the first trimester had a risk result issued.
- 36,718 first trimester and 5106 second trimester results (low risk and increased risk) were issued.
- 38,944 first trimester blood samples were received (including 1,429 blood samples received with no NT and 797 blood samples that were not tested).

- 89% of screens started (47,856) and 88% of total screens completed (41,824) were performed in the first trimester.

- 5623 first trimester combined screens were not completed. The reasons included:
    - scan but no blood sample received
    - blood sample but no ultrasound report received
    - risk estimation already reported
    - gestational age outside range
    - inadequate sample.

- 409 second trimester blood samples were not tested. The reasons included:
    - a risk result had already been reported
    - gestational age outside range.

- Overall the percentage of Māori and Pacific women having screening is less than for Asian and European women. These groups are also less likely to have first trimester screening.

- The mean age of women having screening is 31 years, compared to the mean age of women giving birth of 30 years.

- Young women (less than 25 years) are less likely to have screening than older women. They are also less likely to have a first trimester screen.

- Women with NZ Deprivation Index scores 7-10 (most deprived) are less likely to be screened and less likely to have first trimester screening.

- The positive test rate for trisomy 21 is 2.5% for first trimester screens and 5.4% for second trimester screens. The low positive test rate in the first trimester may be due to the use of nasal bone or to a low bias on NT measurements.

- There were 40,510 ultrasound scans provided to the screening laboratories (including dating scans and scans outside of the first trimester and scans where there was no blood sample received by the laboratory).

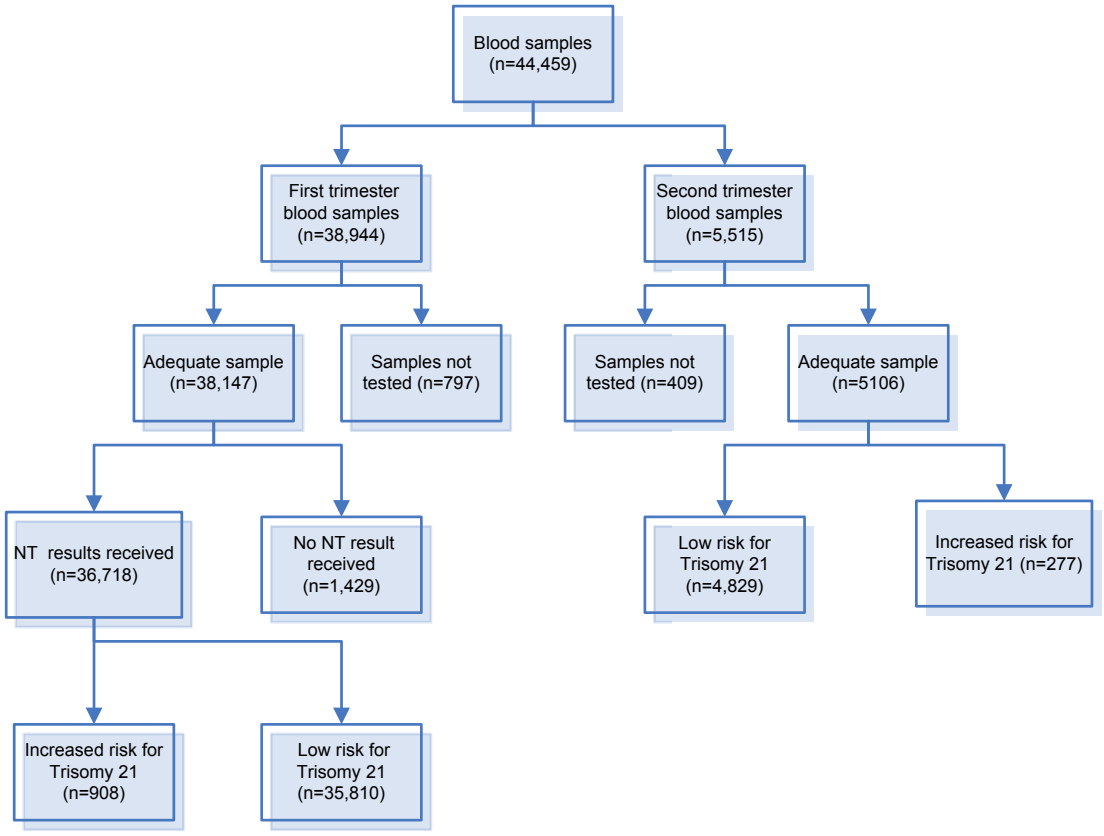

Figure 1 Summarised antenatal screening data for January to December 2012

1.0 Introduction

Quality improvements to antenatal screening for Down syndrome and other conditions were introduced in February 2010. This included incorporating maternal serum screening, providing practitioner guidelines and consumer resources.

Women are advised of the availability of either:

- first trimester combined screening, which includes a blood test that measures two maternal serum markers, pregnancy-associated protein A (PAPP-A) and free beta-human chorionic gonadotropin (βhCG). The blood sample is collected between 9 weeks and 13 weeks and 6 days gestation and combined with an ultrasound scan to determine nuchal translucency (NT) and crown rump length (CRL) measurements between 11 weeks and 2 days and 13 weeks and 6 days, or
- second trimester screening, which is a blood test that measures four maternal serum markers free beta-human chorionic gonadotropin (βhCG), alpha-fetoprotein (AFP), unconjugated oestriol (uE3) and inhibin A taken between 14 weeks and 20 weeks gestation.

The information above is combined with demographic and maternal factors to produce a risk result.

For consistency all risk results are produced by the screening laboratories. The screening laboratories are LabPLUS at Auckland District Health Board (for samples Taupo north) and Canterbury Health Laboratories at Canterbury District Health Board (south of Taupo). Ultrasound scan services are provided by private and public radiology practices throughout the country and the radiology reports sent to the screening laboratories.

For the purposes of this report, data is sent to National Collections at the Ministry of Health where ethnicity, district health Board (DHB) and NZ Deprivation status are assigned.

This report covers the period 1 January to 31 December 2012.

2.0 Screening volumes

Table 1 outlines the screening volumes for 2012.

Table 1 Volume of screens, 2012

	First Trimester	Second Trimester
	Number	**Number**
Screens started	42,341	5,515
Screens completed and risk issued	36,718	5106
Incomplete screens		
Adequate blood sample received but no NT	1429	NA
NT received but no blood	3397	NA
Blood samples not tested	797	409
Total incomplete screens	5,623	409
Percentage of started screens that completed	*86.8%*	*92.6%*

Incomplete screens include:

- the blood sample was unsatisfactory (e.g. insufficient volume, too long in transit)
- the blood sample was taken outside the required timeframe
- a risk result had already been issued for that pregnancy
- an ultrasound scan report or blood sample wasn't received.

3.0 Timing of screening (blood samples and ultrasound scans)

The blood markers for screening are most informative in early pregnancy and the recommended time for testing is at 9-10 weeks gestation. The ultrasound scan NT and CRL measurements are more informative in early pregnancy but technically more difficult to measure. The recommended time for the ultrasound scan is at approximately 12 weeks gestation.

The timing of blood tests and ultrasound scans is given in Figure 2.

The following blood samples and NT scans are not used in the risk calculation:

- blood samples collected at 8 weeks or earlier
- blood samples collected at 21 weeks or later, and
- NT scans performed after 14 weeks gestation.

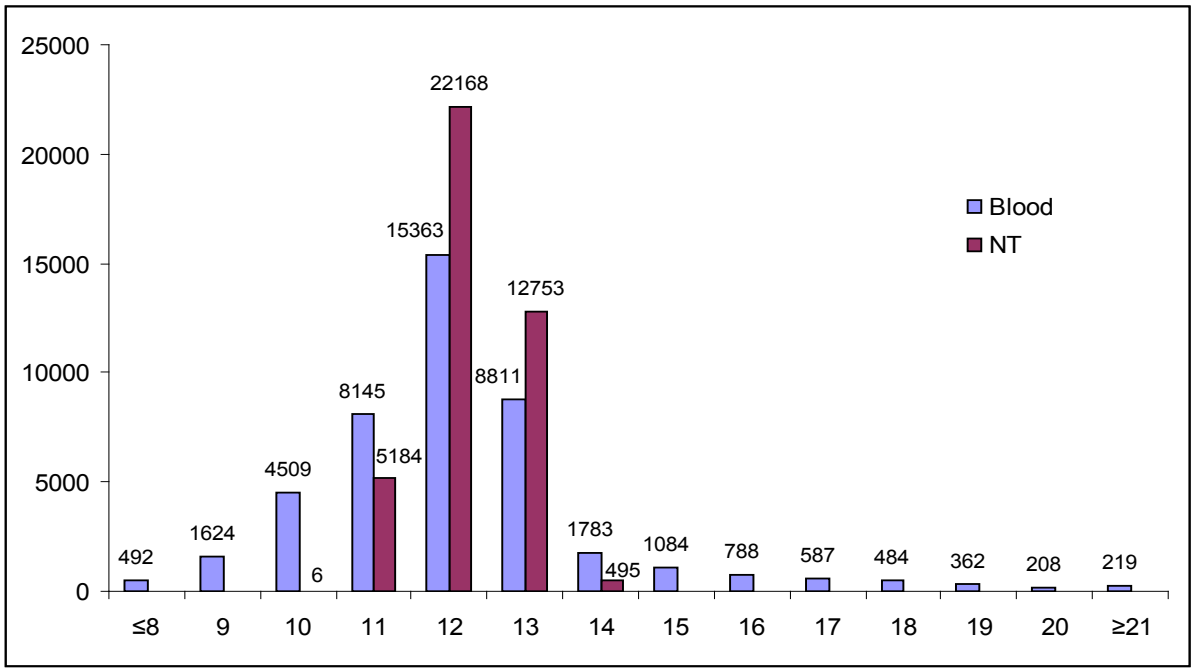

Figure 2 **Number of blood samples and number of NT scans at each gestational age, 2012**

4.0 Blood samples by ethnicity

Knowledge of the woman's ethnicity is important for screening. As well as access to screening services there are differences in the serum analyte levels in different ethnicities and these are adjusted for by the risk calculation algorithm.

Ministry of Health prioritised ethnicities are used in Table 2.

Table 2 Blood samples by ethnicity and trimester, 2012

Ethnicity	Number screened in First Trimester	Number screened in Second Trimester	Percent screened in First Trimester
Maori	4,171	1,153	78.3
Pacific	1,907	1,055	64.4
Asian	6,442	982	86.8
European	24,375	2,002	92.4
MELAA	714	148	82.8
Other	1,335	175	88.4
Total	**38,944**	**5,515**	**87.6**

Comparison of the proportion of women who had screening by ethnicity (data from 2012 National Maternity Database) indicates that Māori and Pacific have relatively less screening than other ethnicities particularly in the first trimester as shown in Table 2. This has not changed since February 2010.

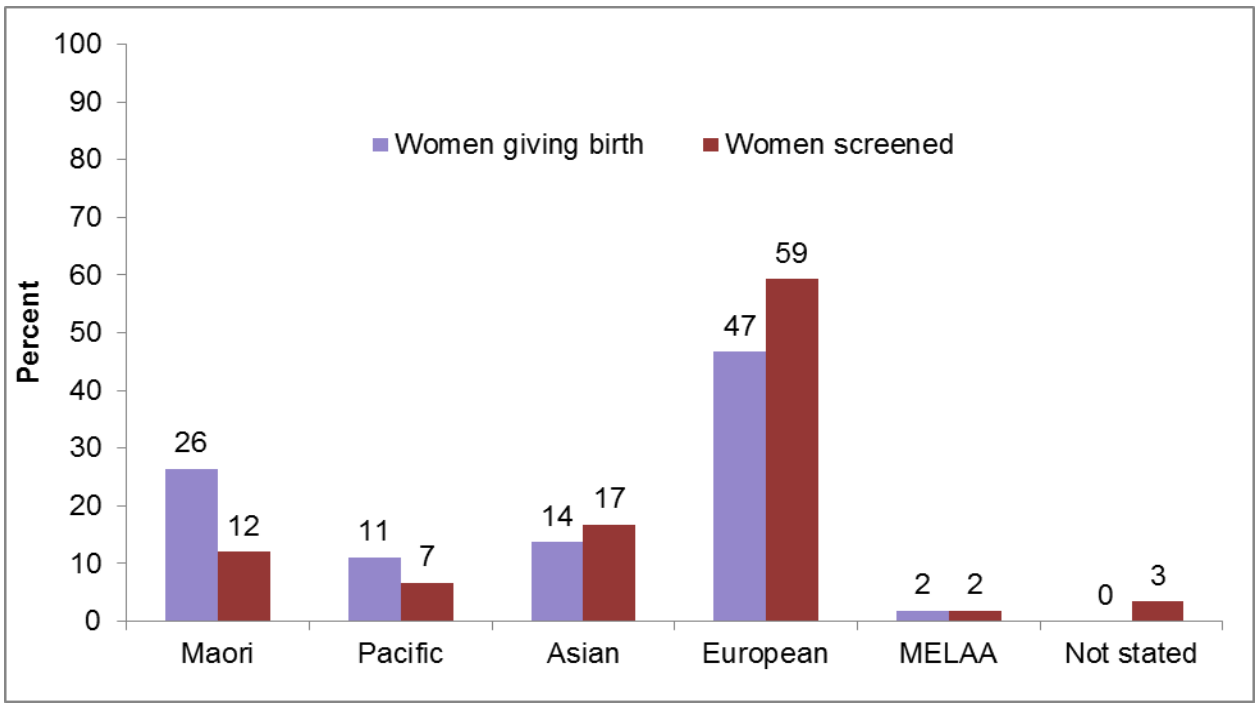

Figure 3 Percentage of women giving birth compared to percentage of women screened by ethnicity, 2012

5.0 Blood samples by age

The number of blood samples received by the age group of the woman is shown in Table 3. The proportion of younger women having first trimester screening is less than that for older women.

Table 3 Blood samples by age and trimester, 2012

Age	Number screened in First Trimester	Number screened in Second Trimester	Percent screened in First Trimester
<15	2	1	66.7
15-20	1,804	614	74.6
21-25	5,761	1,241	82.3
26-30	11,043	1,518	87.9
31-35	12,293	1,283	90.5
36-40	5,948	606	90.8
41-45	2,054	245	89.3
>45	39	7	84.8
Total	**38,944**	**5,515**	**87.6**

In February 2010 the mean age of screened women was 31.6 years and 30.6 years in late 2012. The average age of women giving birth in New Zealand in 2011 was 30[1].

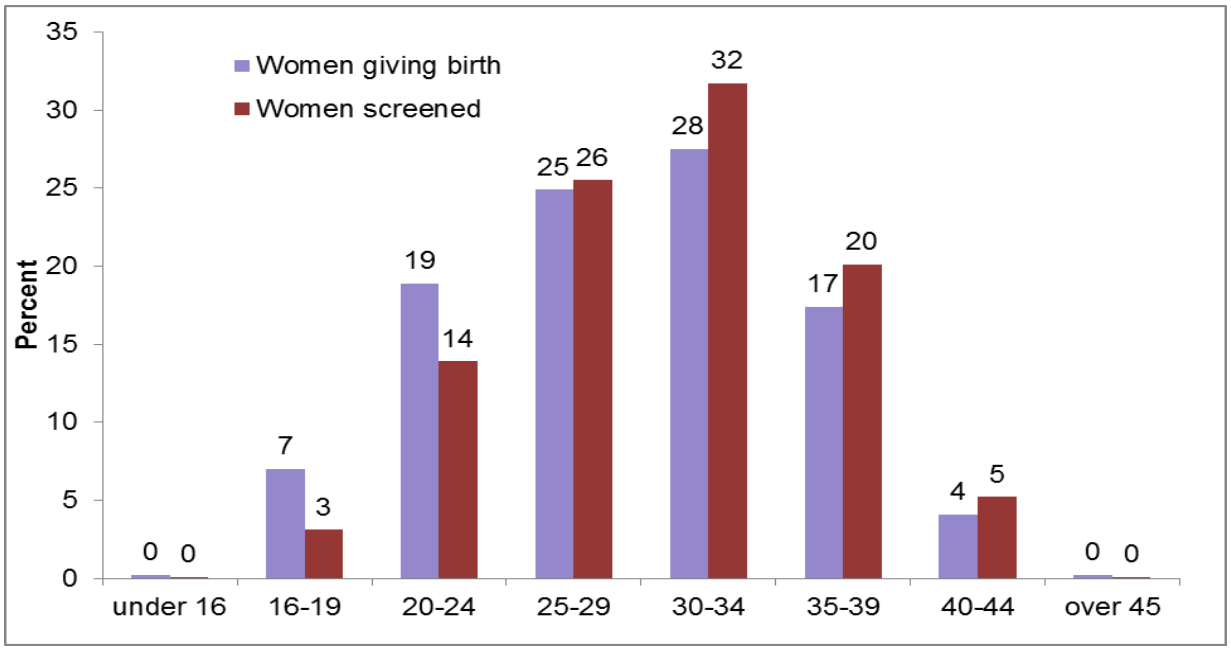

Figure 4 Percentage of women giving birth compared to percentage of women screened by age group, 2012

[1] http://www.stats.govt.nz/browse_for_stats/population/estimates_and_projections/demographic-trends-2012.aspx

6.0 Socioeconomic status

Socioeconomic status is measured by the NZ Deprivation Index (NZDep). This information is coded by the woman's residential address.

Women from higher deciles of NZDep (i.e. the most disadvantaged) are less likely to have screening (Figure 5) and less likely to have screening in the first trimester.

Table 4 Blood samples by NZ Deprivation status and trimester, 2012

Deprivation Status	Number screened in First Trimester	Number screened in Second Trimester	Percent screened in First Trimester
1	3,617	323	91.8
2	4,342	390	91.8
3	4,348	474	90.2
4	3,587	374	90.6
5	3,917	499	88.7
6	4,539	634	87.7
7	3,946	578	87.2
8	3,303	618	84.2
9	3,526	716	83.1
10	2,544	730	77.7
Not Known	1,275	179	87.7
Total	**38,944**	**5,515**	**87.6**

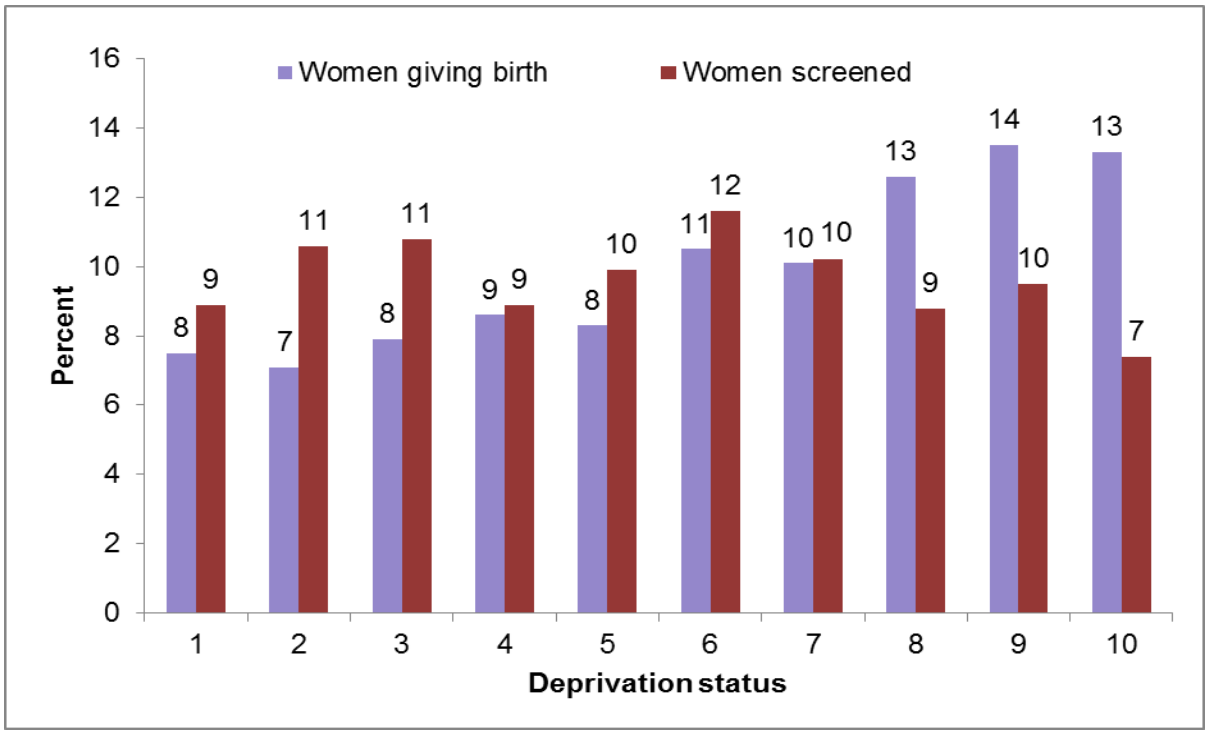

Figure 5 Percentage of women giving birth compared to percentage of women screened by NZ Deprivation status, 2012

7.0 Increased risk results summary

Reported increased risk results are summarised in Table 5. Some women will have more than one increased risk and/or more than one abnormal analyte, hence the number of women with increased risk results is less than the sum of the individual numbers of increased risk results.

Table 5 Summary of increased risk results and conditions, 2012

	First Trimester	Second Trimester
Conditions	**Number (%)**	**Number (%)**
Trisomy 21	908 (2.5)	277 (5.4)
Trisomy 13	166 (0.5)	8 (0.2)
Trisomy 18	154 (0.4)	12 (0.2)
Turner Syndrome	126	12
Triploidy	0	0
Neural tube defect	NA	42
Cornelia de Lange	NA	0
Smith-Lemli-Opitz syndrome	NA	3
Unusual analytes		
Low PAPP-A	424	NA
High β-hCG	235	48
High NT	224	0
Summary of risks		
Increased risk results reported	913	329
Abnormal markers with low risk results	558	22
Screens completed & risk results reported	**36,718**	**5,106**

The positive test rate for trisomy 21 in the first trimester is lower than might be expected (3-5 5%[2]). The reason for this is unclear.

Nasal Bone

Nasal bone will be included in the risk calculation if it is reported to the screening laboratory at the same time as the NT and CRL measurements.

During 2012, increased risk results for trisomy 21 were reported in 369 women (3.6%) where the nasal bone report was not included in the risk estimation and in 162 women (1.8%) where the nasal bone report was included.

[2] Suruss Report found at http://www.hta.ac.uk

8.0 Radiology

The number of NT ultrasound reports received by the screening laboratories is given in Table 6.

Table 6 Number of NT scans received

NT scan summary	Number
NT scans received	40,510
NT scans used in risk estimation	36,718
NT scan received but no blood sample	3,397
Duplicate or updated NT scans	395
NT scans with nasal bone	20,613

Ultrasound scan reports were received from 89 radiology practices. As outlined in Figure 6, the numbers of scans reported by each practice in 2012 were between 1 and 5,837 (the radiology practice was not recorded for 3,890). This data is based on limited information provided on the radiology reports.

The ultrasound operator is known for 27,886 scans.

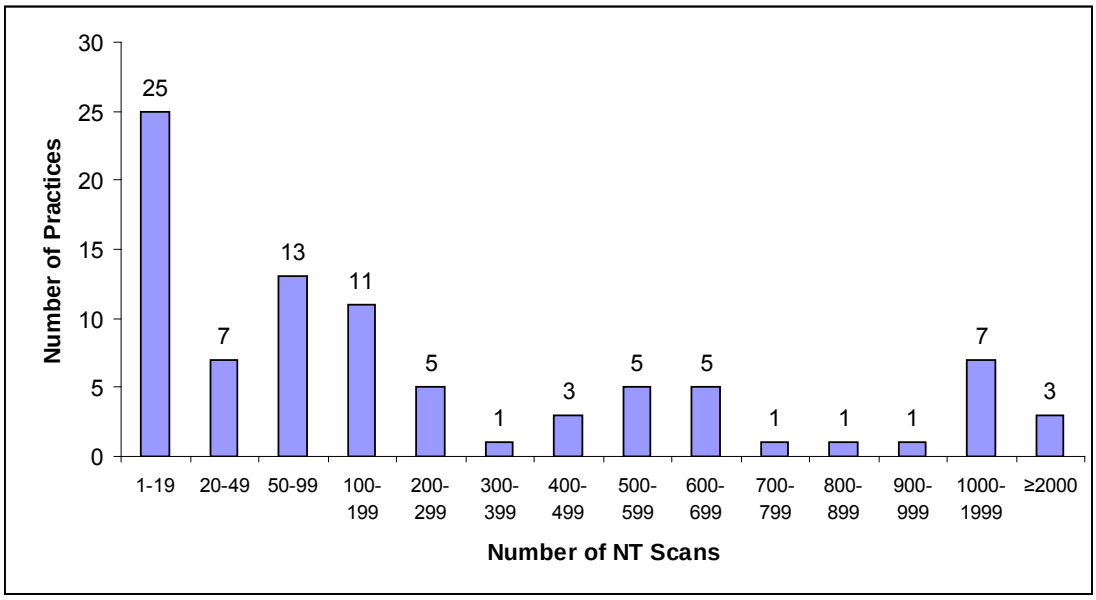

Figure 6 Number of NT scans by radiology practice, 2012

9.0 Glossary

Alpha-fetoprotein (AFP) − a protein that is normally produced by the fetus. Maternal serum AFP levels can be used as a biochemical marker in the detection of certain fetal abnormalities including NTDs after 15 weeks of pregnancy.

Analyte − a substance that is undergoing analysis or being measured. Analytes measured in antenatal screening include: pregnancy associated plasma protein-A, beta human chorionic gonadotropin, unconjugated oestriol, alpha fetoprotein and inhibin A.

Beta-human chorionic gonadotropin (ßhCG) − a hormone produced during pregnancy and present in maternal blood and urine. It is used as a biochemical marker for Down syndrome and other conditions in first trimester combined and second trimester maternal serum screening.

Crown rump length (CRL) − the measurement from the fetal crown to the prominence of the buttocks or breech. This is used for dating in the first trimester.

Cut-off point − the point that divides people into a group at lower risk or increased risk for the condition being screened for. In New Zealand the cut-off point in screening for Down syndrome and other conditions is 1:300 at term.

False negative result − when a woman receives a low risk screening result but the baby does have the condition screened for.

False positive result − when a woman receives an increased risk screening result but the baby does not have the condition screened for.

Inhibin A − a hormone secreted by the ovary that is used as a biochemical marker in second trimester maternal serum screening for Down syndrome and other conditions.

Multiple of the median (MoM) − a measure which compares the values of a biochemical marker in an individual sample with the median value of that biochemical marker in other women at the same gestation.

Neural tube defect (NTD) − a congenital anomaly involving the brain and spinal cord caused by failure of the neural tube to close properly during embryonic development. Open NTDs occur when the brain and/or spinal cord are exposed at birth through a defect in the skull or vertebrae. Examples of open NTDs are spina bifida (myelomeningocele), anencephaly, and encephalocele.

Nuchal translucency (NT) − sonographic appearance of the collection of fluid under the skin at the back of the fetal neck. NT is a marker for chromosomal and other anomalies and can be measured in the first trimester of pregnancy.

Pregnancy-associated plasma protein A (PAPP-A) − a protein originating from the placenta used as a biochemical marker in first trimester combined screening for Down syndrome and other conditions.

Risk calculation algorithm − an explicit protocol (in this case computer based) that combines a number of factors in determining overall risk of a particular outcome or condition.

Screening − a way of identifying a group of people who are more likely than others to have a particular condition. The screening process involves testing people for the presence of the condition, and predicting the likelihood that they have the condition. Antenatal screening for Down syndrome and other conditions predicts the likelihood of the conditions being present in the fetus.

Sensitivity −the ability of screening to identify individuals with the condition screened for. A test with high sensitivity will have few false negative results.

Specificity − the ability of screening to identify individuals who do not have the condition screened for. A test with high specificity will have few false positive results.

Trisomy − a group of chromosomal disorders in which there are three copies, instead of the normal two, of a particular chromosome present in the cell nuclei. The most common trisomies in newborns are trisomy 21 (Down syndrome), trisomy 18 (Edwards syndrome) and trisomy 13 (Patau syndrome).

Unconjugated oestriol (uE3) −a hormone produced by the placenta and used as a biochemical marker in second trimester maternal serum screening for Down syndrome and other conditions.

Further terms can be found at www.nsu.govt.nz