National Screening Unit

National Cervical Screening Programme

Annual report

(2010-2011)

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Acknowledgments

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We would like to acknowledge the contribution from Brendon Jones and Brendon Watson for NCSP Register data extraction, Dr Mark Clements for assistance with code development and importing data for analysis, and Michelle Hooper and Luke Testa for administrative support.

About the authors

The authors are based in the Lowy Cancer Research Centre, Prince of Wales Clinical School at the University of NSW (Sydney, Australia). They are part of a research group (led by A/Prof Karen Canfell) which has as its core research focus in the epidemiology of cervical cancer, cervical screening and human papillomavirus (HPV) vaccination. This research group has established an extensive track record both in research publication and in successful completion of commissioned projects related to national cervical screening programs in New Zealand, Australia and England. Expert advisors to the group's research work include Professor Dame Valerie Beral (Director, Cancer Epidemiology Unit, University of Oxford) and Professor Bruce Armstrong (Professor of Public Health, University of Sydney). The group has extensive experience in the analysis of descriptive data from cervical cancer screening programmes. The team also has a range of related skills in the analysis of linked datasets, systematic review and meta-analysis, biostatistics, health economics, and advanced statistical modelling techniques.

1 Cancer incidence and mortality

Definition

Cancer incidence is the annual rate of new registrations of invasive cervical cancer (per 100,000 women in the New Zealand estimated resident population at the end of that year), standardised to the WHO Standard Population according to Ahmad *et al*.(1)

Cancer mortality is the annual rate of deaths due to invasive cervical cancer (per 100,000 women in the New Zealand estimated resident population at the end of that year), standardised to the WHO population.

Target

Previous targets were incidence of no more than 8.0 per 100,000 women[1], and mortality of no more than 2.5 per 100,000 women in the New Zealand population, standardised to the Segi population.

Calculation

Registrations of cancer cases (by age, ethnicity, and histological type) over the period 2005 to 2011 were obtained from the New Zealand Cancer Registry (data extracted July 2012). Cervical cancer mortality data for 2005-2009 were also obtained (by age and ethnicity; data extracted July 2012).

Age-specific incidence and mortality rates were calculated for each calendar year, based on the estimated resident New Zealand female population at the end of that year. Age-specific rates were then weighted using the standard WHO population to derive age-standardised rates (details of the WHO Standard Population are provided in Appendix A). 95% confidence intervals were calculated according to the methods in *IARC Scientific Publication 95. Cancer Registrations: Principles & Methods (Chapter 11: Statistical Methods for Registries*).(2) Incidence rates were calculated separately for either each ethnic group, or for each histological type. Mortality rates were calculated separately for each ethnic group. Average rates were also calculated by five-year age group as the sum of all cases over the period within that age group, divided by the sum of the estimated population within that age group in each year contributing to the average.

In the current report, the periods over which rates are reported and averages are calculated vary for each measure, due to limitations in the availability of data. Population data by age and ethnic group were available from 2006 onwards, therefore rates and averages which are reported by ethnicity were calculated starting from 2006 (or later). Cancer incidence data is available to 2011, and therefore age-standardised incidence rates were calculated for each year over the period 2006 to 2011, and five-year age-specific averages for incidence by ethnicity were calculated over the period 2007 to 2011. The most recent mortality data available relates to 2009, however, and therefore age-standardised mortality rates and age-specific averages for mortality by ethnicity were calculated over the period 2006 to 2009. Five-year age-specific averages by ethnicity could not be calculated for mortality (as they had been for incidence) because there were only four years of available data (2006-2009), however it is envisioned that as further data becomes available, future annual reports

[1] Target has since been updated (2011) to 7.5 per 100,000 women, standardised to the Segi population.

will report all measures over a period of at least five years, and five-year averages for mortality, as well as incidence.

Results

Incidence

Cervical cancer incidence rates overall, and for each of Māori, Pacific, Asian and European/ Other women, are shown in Table 1, and with 95% confidence intervals in Figure 1a). Counts for incident cancer cases are also shown in Table 1. Rates could not be calculated for all four ethnicity groups prior to 2006 due to limitations in the availability of population data (although separate case numbers for 2005 only were available from previous Annual Monitoring Reports). Therefore cases and rates presented for "Other women" in 1996 to 2004 relate to all non- Māori women. These data were sourced from *Cancer: New Registrations and Deaths*.(3, 4)

Overall, between 1996 and 2011 cervical cancer incidence has declined from 10.5 to 5.7 per 100,000 for women of all ethnicities, and from 25.0 to 10.4 per 100,000 for Māori women (Table 1).

As shown in Figure 1a), there is some variation in the incidence rates by ethnicity, however the 95% confidence intervals are very wide, and the possibility that this variability is due to chance cannot be entirely excluded. As case numbers are quite small for Pacific women and Asian women, an additional figure is included which compares rates in Māori women to rates in all women in New Zealand (Figure 1b)), to supplement the detailed information in Figure 1a). Again, the comparatively wide confidence intervals indicate the uncertainty around rates in Māori women, and the possibility that the observed difference in cancer incidence is due to chance cannot be entirely excluded.

Cervical cancer incidence rates by histological type are shown in Figure 2 and Table 2. Squamous cell cancer remained the most commonly diagnosed type of cervical cancer over the period 2005-2011, with the exception of 2009, when there was no evidence of a difference between the incidence of squamous cell cancer and adenocarcinoma (that is, the confidence intervals for squamous cell cancer incidence and adenocarcinoma incidence overlapped – see Figure 2, Table 2).

Five-year average age-specific cervical cancer incidence rates (2007-2011), are shown overall (Figure 3 and Table 3) and also by ethnicity (Figure 4 and Table 3). Confidence intervals are generally very wide, so are not displayed on the chart, but are included in Table 3. Because of this, age-related trends are not straightforward to interpret. The general trend by age appears to be similar in all ethnic groups: low incidence at younger ages, increasing by around the age of 30-40 years to reach a plateau, however there are very small case numbers (five or less) in most age groups for Māori, Pacific and Asian women.

Five-year average age-specific cervical cancer incidence rates (2007-2011), by histological type are shown in Figure 5. The different histological types follow broadly similar patterns by age to each other (and to overall incidence), but the absolute rates vary, being highest for squamous cell cancer, and generally lowest for adenosquamous cancer in virtually all age groups.

Mortality

Cervical cancer mortality rates overall, and for each of Māori, Pacific, Asian and European/ Other women, are shown in Table 4, and with 95% confidence intervals in Figure 6a). Counts of deaths due to cervical cancer are also shown in Table 4. Rates could not be calculated for all four ethnicity groups prior to 2006 due to limitations in the availability of population data, however separate counts for deaths were available for 2005 from previous Annual Monitoring Reports.(5, 6) Therefore rates and deaths reported for "Other women" in 1998 to 2004 relate to all non- Māori women; these data were sourced from *Cancer: New Registrations and Deaths*.(4)

Overall, between 1998 and 2009 cervical cancer mortality has declined from 3.2 to 1.4 per 100,000 for women of all ethnicities, and from 10.3 to 3.1 per 100,000 for Māori women (Table 4).

As shown in Figure 6a), there is some variation in the mortality rates by ethnicity, however the 95% confidence intervals are very wide, and the possibility that this variability is due to chance cannot be entirely excluded. As for the incidence data, an additional figure is included which compares mortality rates in Māori women to rates in all women in New Zealand (Figure 6b)), to supplement the more detailed ethnicity information in Figure 6a).

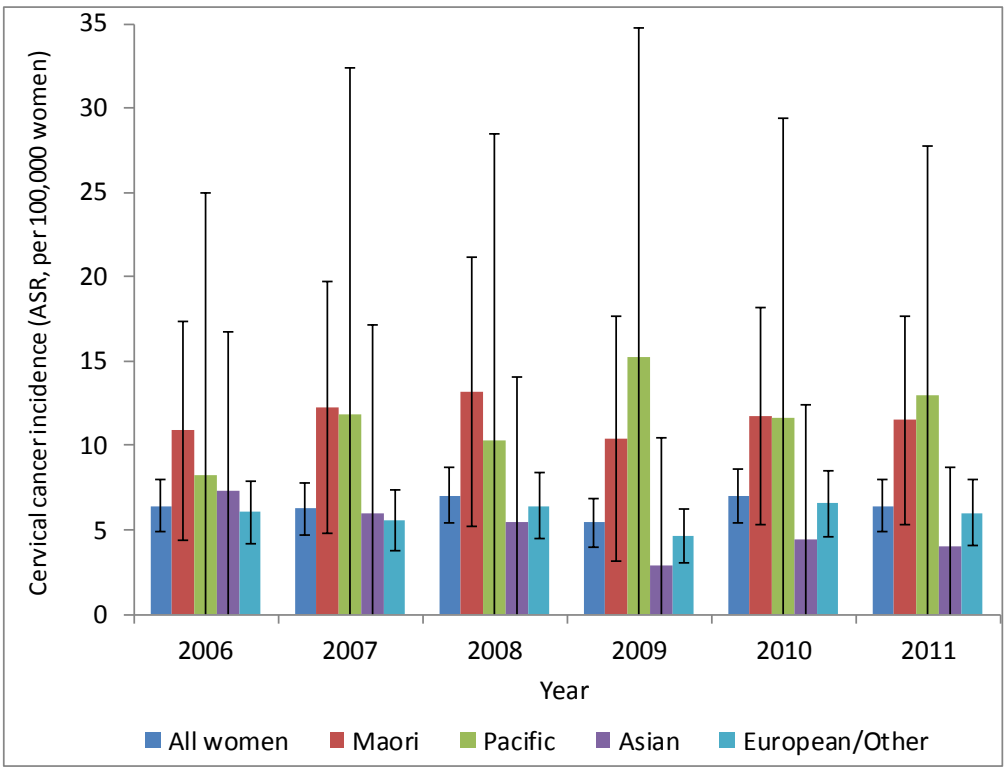
Average age-specific cervical cancer mortality rates (2006-2009) are shown for all women in Figure 7, and by ethnicity in Figure 8. As for incidence, the associated confidence intervals are wide, making trends by age more difficult to discern, but generally there appears to be a broad increase with age. Case numbers by age are generally very small for Māori, Pacific and Asian women (total deaths across all ages over the four year period ranged from ten (Asian women) to 42 (Māori women)).

Comments

In this report incidence and mortality rates are standardised using the WHO Standard Population (see Appendix A), consistent with the population used to produce standardised rates in *Cancer: New Registrations and Deaths*. Note that National Cervical Screening Programme Annual Monitoring Reports prior to that for 2008-2009 reported on rates which were standardised to the Segi population, and therefore these rates are not directly comparable.

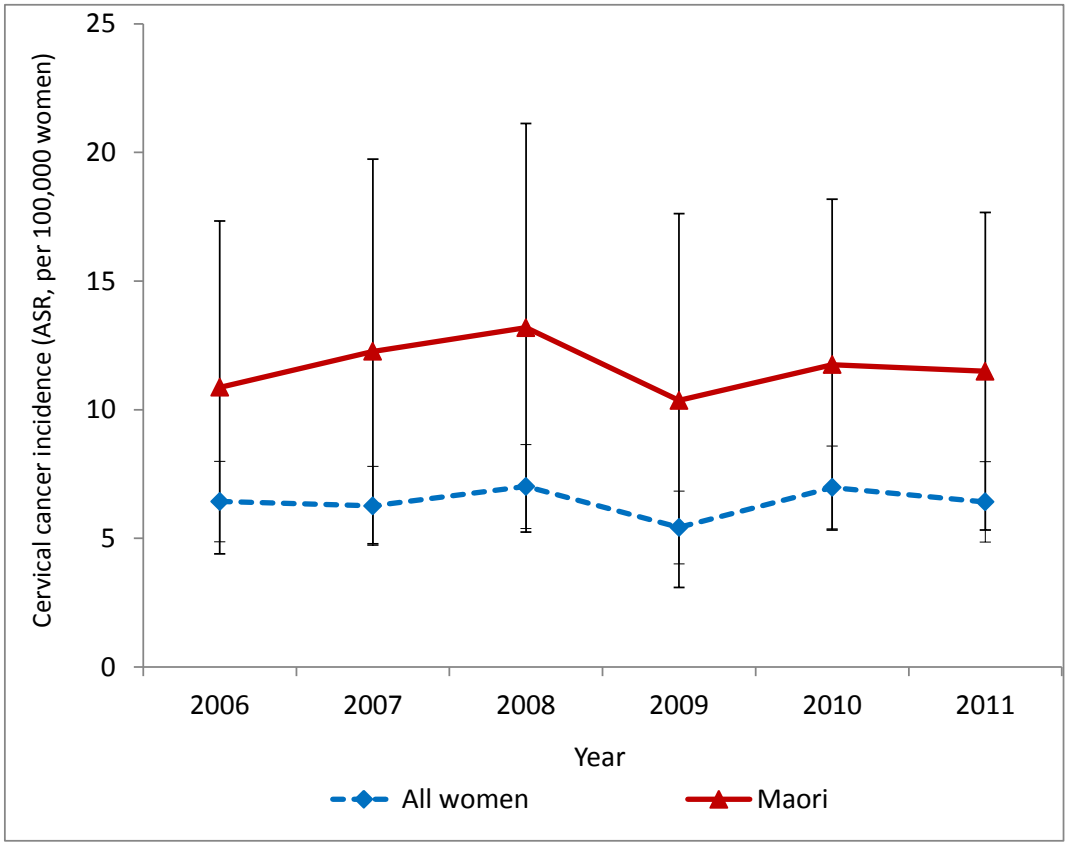
Figure 1 – Age-standardised cervical cancer incidence rates, 2006 to 2011, by ethnicity

a) All ethnic groups



Vertical bars represent 95% confidence intervals

b) Māori women, compared to All women



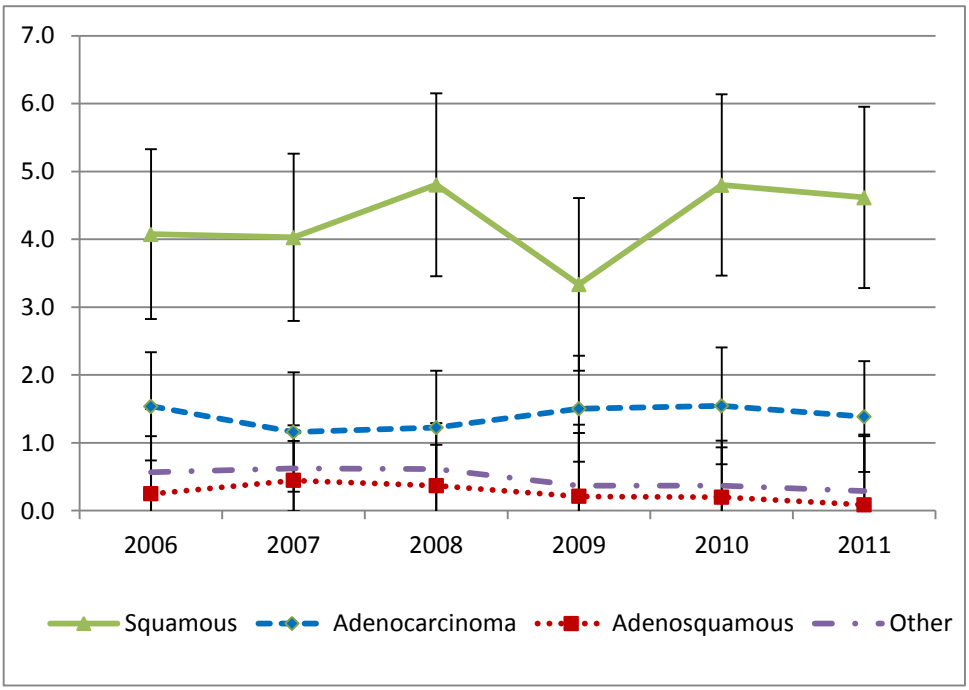
Vertical bars represent 95% confidence intervals

Table 1 – Cervical cancer incidence, 1996 to 2011, by ethnicity

	All women		Māori women		Pacific women		Asian women		Other women §	
Year†	N	Rate*	N	Rate*	N	Rate*	N	Rate*	N	Rate*
1996	211	10.5	47	25.0	NA	NA	NA	NA	*164*	*9.0*
1997	205	9.3	51	22.5	NA	NA	NA	NA	*154*	*7.6*
1998	200	9.1	36	17.7	NA	NA	NA	NA	*164*	*8.3*
1999	220	10.0	43	18.7	NA	NA	NA	NA	*177*	*8.9*
2000	204	9.4	43	16.8	NA	NA	NA	NA	*161*	*8.3*
2001	189	8.5	33	13.7	NA	NA	NA	NA	*156*	*8.0*
2002	181	7.7	33	15.1	NA	NA	NA	NA	*148*	*7.2*
2003	178	7.7	33	13.5	NA	NA	NA	NA	*145*	*7.1*
2004	157	6.6	33	14.4	NA	NA	NA	NA	*124*	*5.9*
2005	154	6.1	25	10.1	17	NA	15	NA	97	NA
2006	159	6.4	28	10.9	10	8.3	15	7.3	106	6.0
2007	159	6.3	33	12.3	12	11.9	12	6.0	102	5.6
2008	174	7.0	37	13.2	12	10.3	13	5.4	112	6.4
2009	141	5.4	29	10.4	18	15.3	7	2.8	87	4.6
2010	179	6.4	36	10.8	14	11.1	12	4.3	117	6.0
2011	161	5.7	34	10.4	16	11.9	11	3.7	100	5.3

† Cases and rates for 1997-2004 sourced from *Cancer: New Registrations and Deaths, 2007(4);* cases and rates for 1996 sourced from *Cancer: New Registrations and Deaths, 2006*.(3) § Counts and rates for "Other women" in 1996-2004 are combined for all non- Māori women ie they also include cases in Pacific and Asian women *Rates are per 100,000 women, age-standardised to the WHO Standard Population (all ages) NA = not available

Figure 2 – Age-standardised cervical cancer incidence rates, 2006 to 2011, by histological type



Vertical bars represent 95% confidence intervals

Table 2 – Cervical cancer incidence, 2005 to 2011, by histological type

Year	Squamous		Adenocarcinoma		Adenosquamous		Other	
	N	Rate* (per 100,000 women)	N	Rate* (per 100,000 women)	N	Rate* (per 100,000 women)	N	Rate* (per 100,000 women)
2005	97	4.0	27	1.1	8	0.4	22	0.7
2006	100	4.1	36	1.5	7	0.2	16	0.6
2007	101	4.0	30	1.2	11	0.4	17	0.6
2008	120	4.8	30	1.2	8	0.4	16	0.6
2009	86	3.3	38	1.5	5	0.2	12	0.4
2010	123	4.8	38	1.5	5	0.2	11	0.4
2011	115	4.6	34	1.4	2	0.1	9	0.3

* Age-standardised to the WHO population (all ages)

Figure 3 – Five-year average cervical cancer incidence rates (2007-2011), by age

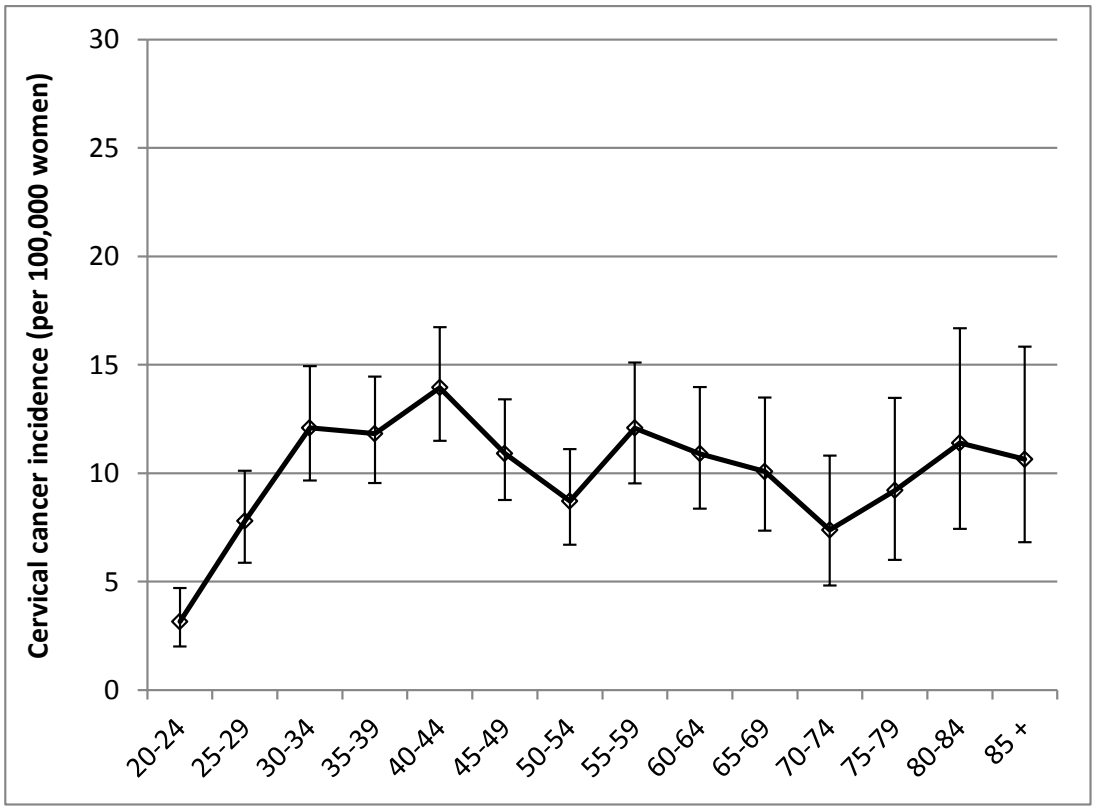
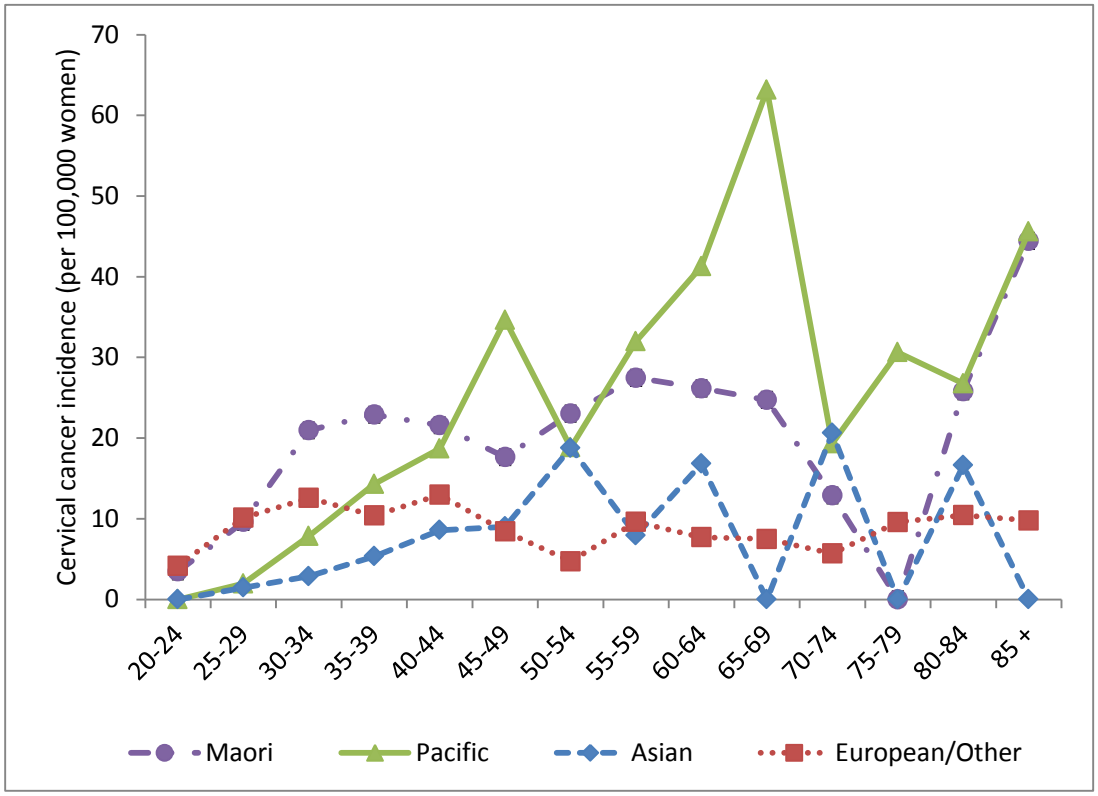
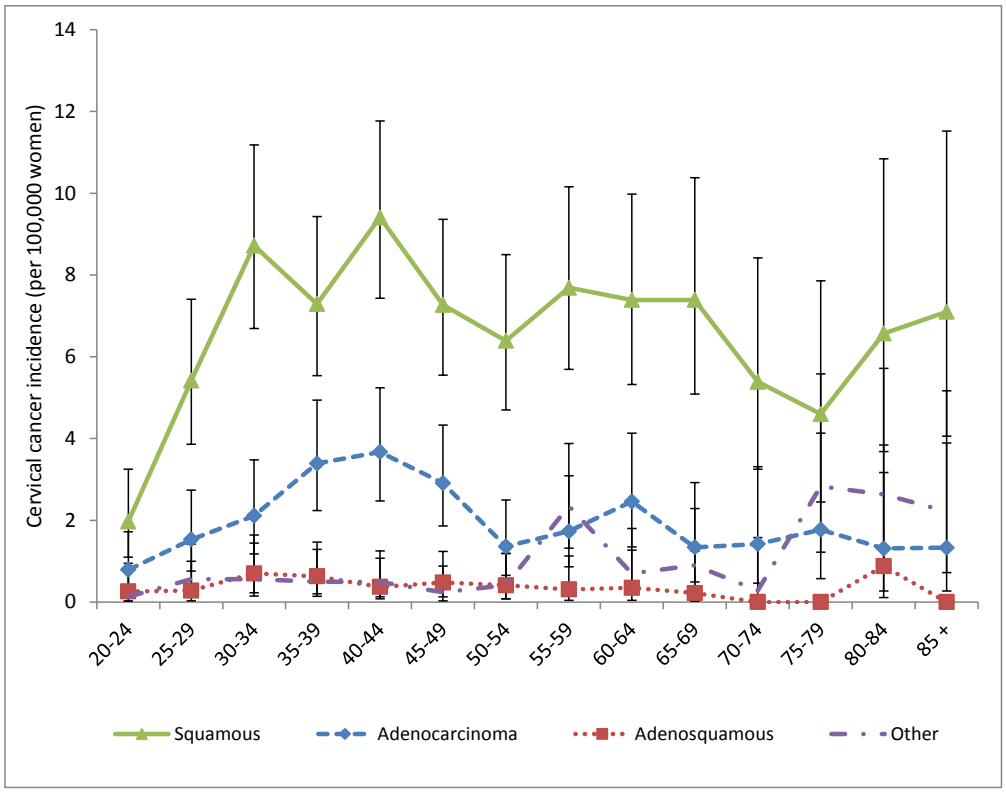


Figure 4 – Five-year average cervical cancer incidence rates (2007-2011), by age and ethnicity



Note that no cases were observed in Māori women aged 75-79 years, in Pacific women aged 20-24 years, or in Asian women aged 65-69 years, 75-79 years or 85+ years over this time period. See alsoTable 3.

Figure 5 – Five-year average cervical cancer incidence rates (2007-2011), by age and histological type



Vertical bars represent 95% confidence intervals

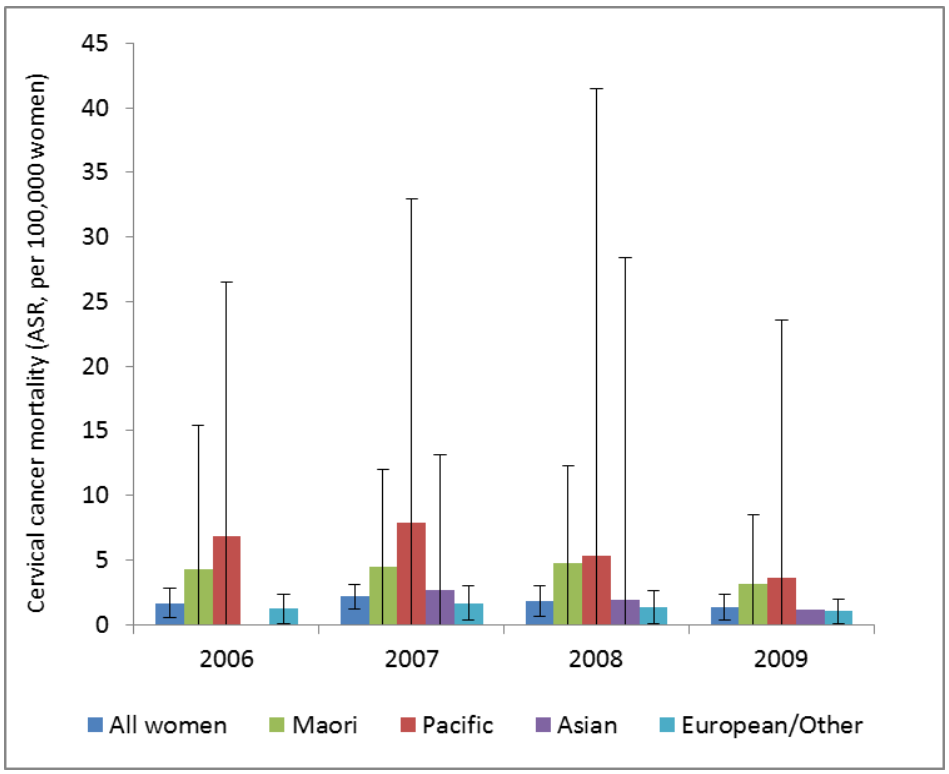
Table 3 – Five-year average cervical cancer incidence (2007-2011), by age and ethnicity

	All women		Māori women		Pacific women		Asian women		European/ Other women	
Age	**Rate**	**(95%CI)**	**Rate**	**(95%CI)**	**Rate**	**(95%CI)**	**Rate**	**(95%CI)**	**Rate**	**(95%CI)**
20-24	3.2	(2 - 4.7)	3.5	(1.1 - 8.1)	-	-	0.8	(0 - 4.5)	4.2	(2.5 - 6.6)
25-29	7.8	(5.9 - 10.1)	9.6	(4.8 - 17.2)	1.9	(0.1 - 10.8)	1.5	(0.2 - 5.2)	10.1	(7.3 - 13.7)
30-34	12.1	(9.7 - 14.9)	21.0	(13.3 - 31.5)	7.9	(2.1 - 20.1)	2.9	(0.6 - 8.4)	12.6	(9.5 - 16.3)
35-39	11.8	(9.6 - 14.5)	22.9	(15 - 33.6)	14.3	(5.8 - 29.5)	5.3	(1.7 - 12.5)	10.4	(7.9 - 13.5)
40-44	13.9	(11.5 - 16.7)	21.6	(13.7 - 32.4)	18.7	(8.6 - 35.5)	8.6	(3.7 - 16.9)	13.0	(10.2 - 16.3)
45-49	10.9	(8.8 - 13.4)	17.6	(10.5 - 27.9)	34.6	(18.9 - 58.1)	9.0	(3.9 - 17.8)	8.4	(6.3 - 11.1)
50-54	8.7	(6.7 - 11.1)	23.0	(13.9 – 36.0)	18.8	(6.9 – 41.0)	18.8	(10 - 32.1)	4.7	(3.1 - 6.9)
55-59	12.1	(9.5 - 15.1)	27.5	(16 – 44.0)	32.0	(13.8 – 63.0)	7.9	(2.2 - 20.3)	9.6	(7.1 - 12.7)
60-64	10.9	(8.4 - 14)	26.2	(13.5 - 45.7)	41.3	(17.8 - 81.3)	16.8	(6.2 - 36.6)	7.7	(5.4 - 10.7)
65-69	10.1	(7.4 - 13.5)	24.7	(10.7 - 48.7)	63.2	(28.9 - 119.9)	-	-	7.5	(5 - 10.8)
70-74	7.4	(4.8 - 10.8)	12.9	(2.7 - 37.7)	19.3	(2.3 - 69.8)	20.6	(5.6 - 52.8)	5.7	(3.3 - 9.1)
75-79	9.2	(6 - 13.5)	-	-	30.6	(3.7 - 110.6)	-	-	9.6	(6.1 - 14.3)
80-84	11.4	(7.4 - 16.7)	25.8	(3.1 - 93.2)	26.8	(0.7 - 149.1)	16.6	(0.4 - 92.6)	10.4	(6.5 - 15.8)
85 +	10.6	(6.8 - 15.8)	44.4	(5.4 - 160.6)	45.6	(1.2 - 254.1)	-	-	9.8	(6.1 - 15)

'-' indicates no cases recorded

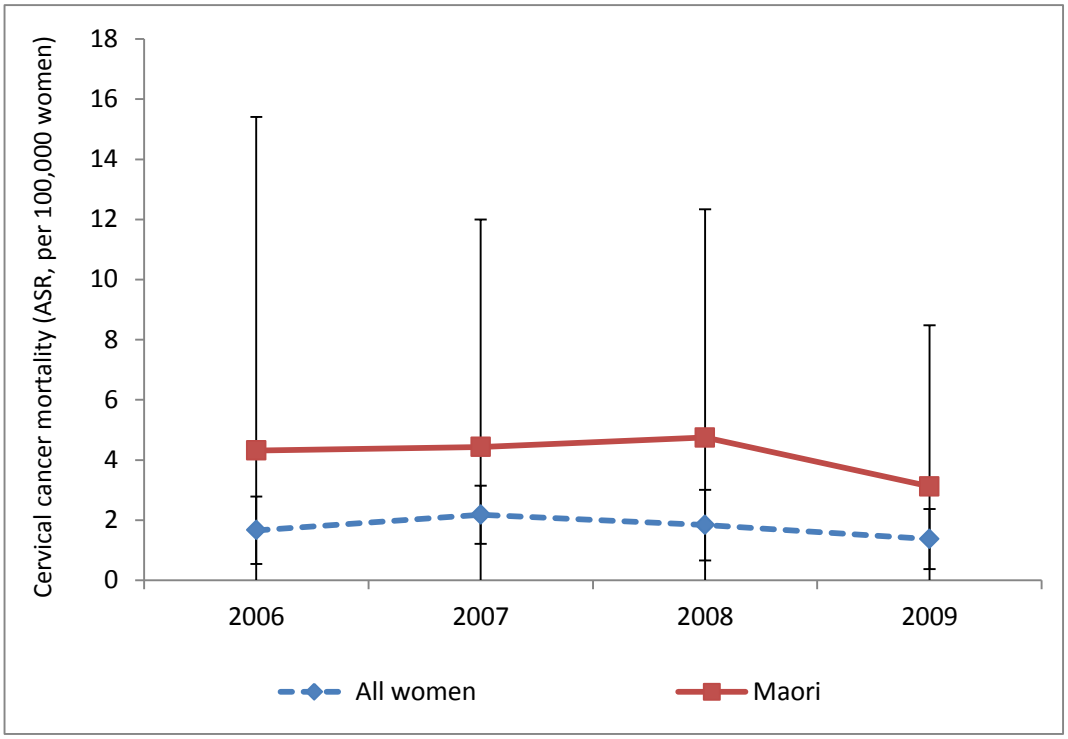
Figure 6 – Age-standardised cervical cancer mortality rates, 2006 to 2009, by ethnicity

a) All ethnic groups



Vertical bars represent 95% confidence intervals

b) Māori women, compared to All women



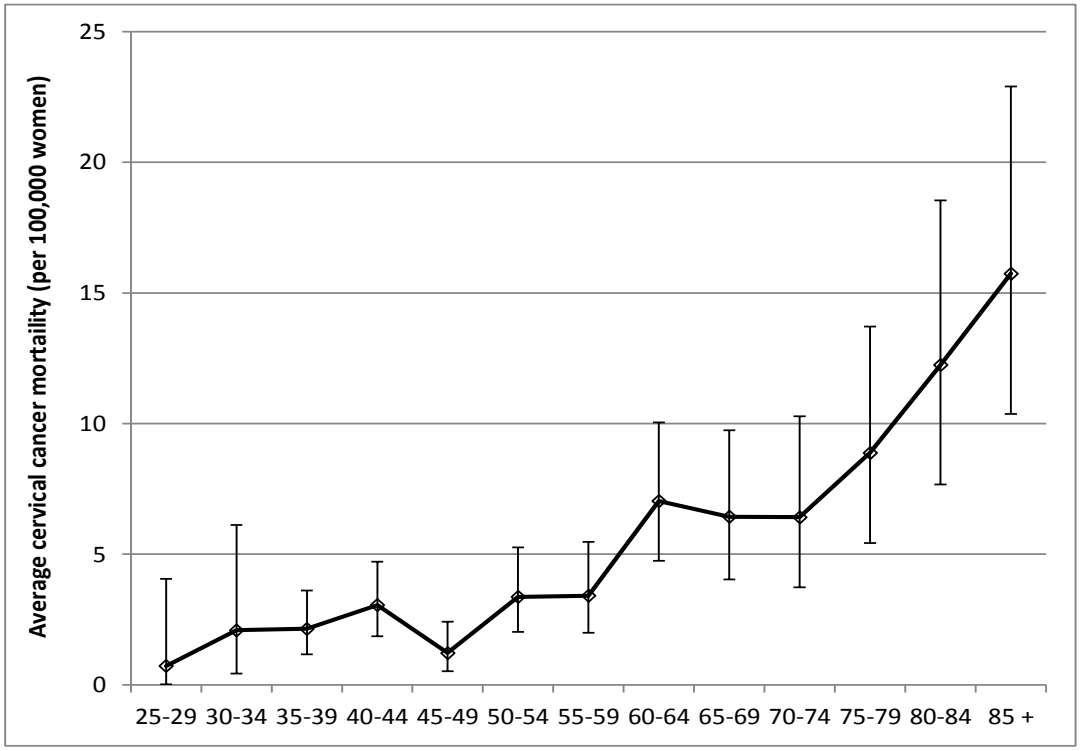
Vertical bars represent 95% confidence intervals

Table 4 – Cervical cancer mortality, 1998 to 2009, by ethnicity

	All women		Māori women		Pacific women		Asian women		Other women §	
Year†	N	Rate*	N	Rate*	N	Rate*	N	Rate*	N	Rate*
1998	77	3.2	17	10.3	4	NA	NA	NA	*60*	*2.7*
1999	71	3.0	20	10.6	7	NA	NA	NA	*51*	*2.3*
2000	66	2.7	17	8.7	3	NA	NA	NA	*49*	*2.1*
2001	63	2.4	13	7.0	1	NA	NA	NA	*50*	*2.0*
2002	65	2.4	12	5.8	2	NA	NA	NA	*53*	*2.1*
2003	58	2.1	8	3.5	5	NA	NA	NA	*50*	*2.0*
2004	71	2.7	15	5.8	4	NA	NA	NA	*56*	*2.2*
2005	54	1.9	13	6.5	6	NA	-	-	35	NA
2006	52	1.7	10	4.3	7	6.9	0	0.0	35	1.2
2007	65	2.2	11	4.4	8	7.9	4	2.7	42	1.7
2008	59	1.8	12	4.7	5	5.3	4	1.9	38	1.4
2009	44	1.4	9	3.1	4	3.6	2	1.1	29	1.0

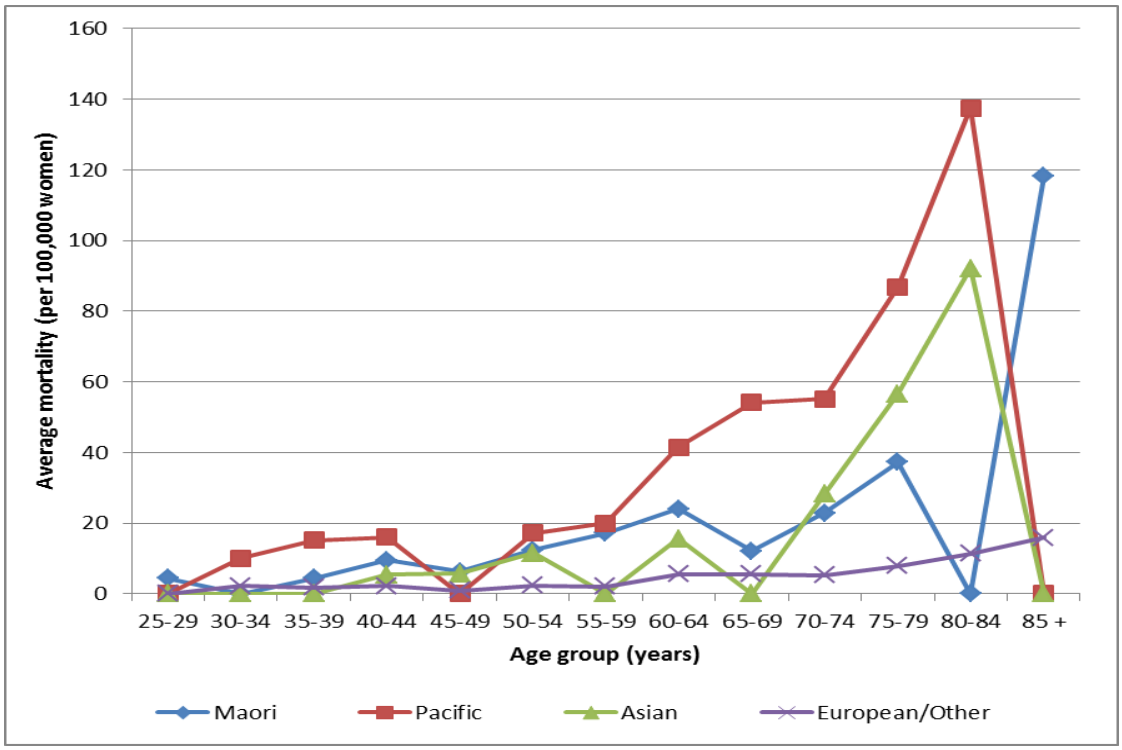
† Deaths and rates for 1998-2004 sourced from *Cancer: New Registrations and Deaths, 2007.(4)* Deaths and rates for 2005 sourced from *National Cervical Screening Programme Annual Monitoring Report 2008-2009.(5)* Separate data on deaths in Pacific women were sourced from *National Cervical Screening Programme Annual Monitoring Report 2006.(6)* § Counts and rates for "Other women" in 1998-2004 are combined for all non- Māori women ie they also include deaths in Pacific and Asian women * Rates are per 100,000 women, age-standardised to the WHO Standard Population (all ages) NA = not available. '-' = no cases recorded

Figure 7 – Average* cervical cancer mortality rates (2006-2009), by age



*Vertical bars represent 95% confidence intervals. * Five-year averages could not be calculated for this report, due to limitations in the available population data. See also Table 5.*

Figure 8 – Average* cervical cancer mortality rates (2006-2009), by age and ethnicity



** Five-year averages could not be calculated for this report, due to limitations in the available population data. Note that no deaths were recorded in Māori women aged 30-34 years or 80-84 years, in Pacific women aged 25-29 years, 45-49 years or 85+ years, in Asian women aged 25-39 years, 55-59 years, 65-69 years or 85+ years, or in European/ Other women aged 25-29 years over this time period. See also Table 5.*

Table 5 – Average cervical cancer mortality (2006-2009), by age

	All women		Māori women	
Age	**Rate**	**(95%CI)**	**Rate**	**(95%CI)**
20-24	-	-	-	-
25-29	0.7	(0.7 - 3.3)	4.4	(4.3 - 20.1)
30-34	2.1	(1.7 - 4)	4.4	(4.3 - 20.1)
35-39	2.2	(1 - 1.5)	4.4	(3.5 - 8.4)
40-44	3.1	(1.2 - 1.7)	9.5	(6 - 11.2)
45-49	1.2	(0.7 - 1.2)	6.2	(4.2 - 8.3)
50-54	3.4	(1.3 - 1.9)	12.4	(9.1 - 19.4)
55-59	3.4	(1.4 - 2.1)	17.1	(9.7 - 16.6)
60-64	7.0	(2.3 - 3)	24.0	(13.6 - 23.3)
65-69	6.4	(2.4 - 3.3)	12.0	(9.6 - 23.1)
70-74	6.4	(2.7 - 3.9)	22.8	(20.1 - 59.6)
75-79	8.9	(3.5 - 4.8)	37.2	(36.3 - 170.3)
80-84	12.2	(4.6 - 6.3)	37.2	(36.3 - 170.3)
85 +	15.7	(5.4 - 7.2)	118.3	(115.3 - 541)

'-' indicates no cases recorded

2 Coverage

Definition

The proportion of women aged 25-69 years at the end of the calendar year who are recorded on the NCSP Register as having had a screening event (sample taken for cytology, HPV, or histology) in the previous three years.

Target

75% of eligible women within three years

Calculation

The number of women who have had a cervical sample, HPV or histology specimen taken in the previous three years ("women screened") is extracted from the NCSP Register. The eligible population is estimated as the hysterectomy-adjusted population, as at 31 December in the year for which coverage is calculated. The underlying female population is derived from New Zealand 2006 Census data, projected to the end of the year for which coverage is calculated. A hysterectomy adjustment factor was applied to New Zealand population projections from Statistics New Zealand so that estimates were obtained of the number of women in the New Zealand population (by age) who had not had a hysterectomy prior to the end of each calendar year for which coverage is calculated in this report (2007-2011). The hysterectomy-adjustment used in this report uses estimates of the hysterectomy prevalence (both total and partial) in the New Zealand population, modelled by Alistair Gray (7), and are the adjustors recommended by the Health and Disability Intelligence Unit within the Ministry of Health. Hysterectomy incidence was estimated by fitting models to observed data on hysterectomies obtained from public and private hospital discharge data and estimates of the usually resident female population from Statistics New Zealand. The resulting estimates of hysterectomy incidence and survival in single-year age groups by calendar year were then used to estimate the prevalence of hysterectomy by five-year age group (among women aged 20-69 years) and calendar year (1988 to 2014). A known limitation of these estimates of hysterectomy prevalence is that they do not take into account deaths or women who leave New Zealand after they have a hysterectomy (which would tend to result in an overestimate of hysterectomy prevalence), nor women who migrate to New Zealand who have previously had a hysterectomy (which would tend to underestimate hysterectomy prevalence). These limitations may be mitigated by the fact they are working in opposite directions, and that some women who emigrate from New Zealand do return later in their lives. Further information about the hysterectomy prevalence methodology can be found in the document '*Methodology for estimating hysterectomy prevalence in women 20-69*' (14 September 2011) by A. Gray (7).

The analysis by ethnicity considered four groups – Māori, Pacific, Asian, or European/Other ethnic groups, based on their priority two ethnicity codes recorded on the NCSP Register. Ethnicity data in New Zealand is collected during encounters with the health system, such as registering with primary care, during an admission to hospital or during surveys. Coding of ethnicity on the NCSP Register follows the classification used by the Ministry of Health (8). Women for whom ethnicity information was not available were included in the "European/Other" category. The data download used for the

current analysis (NCSP Register data as at 5th March 2012) contained ethnicity codes for approximately 95% of women on the NCSP Register.

Age relates to the woman's age at the end of the year for which coverage is being calculated. For example, coverage estimates for 2007 for women aged 25-29 years refers to women aged 25-29 years on 31 December 2007, with a screening event in the period 1 January 2005 to 31 December 2007. Similarly, the hysterectomy adjustor used relates to the end of the three year period over which coverage is measured (2007 in the case of this example). Coverage is calculated for women aged 25-69 years at the end of the period, in order to restrict the calculation to women in five-year age groups who were in the target age range for screening (ages 20-69 years) for the full three-year period being assessed.

Results

The number of women aged 25-69 years with at least one cervical sample collected in the previous three years increased from 784,170 in 2007, to 858,019 in 2011 (Table 6). The estimated coverage rates in women aged 25-69 years over the period 2007-2011 are shown in Figure 9 and Table 6. Coverage over the five-year period increased from 73.6% in 2007 to 76.3% in 2011.

Estimated coverage varied by ethnicity (Figure 9, Table 6). The coverage target of 75% was met in European/ Other women throughout the five-year period (2007-2011), but was not met in any year during this period for Māori, Pacific, or Asian women. Nationally, the target was met for New Zealand overall from 2008. Coverage has increased in all four ethnic groups over the five-year period. The increase was greatest among Pacific women (from 55.4% in 2007 to 66.7% in 2011), and smallest among European/ Other women (from 81.3% in 2007 to 82.9% in 2011). As a result, the disparity between the groups with the highest and lowest coverage has narrowed from a difference of 27.8% in 2007 (between Asian and European/ Other), to a difference of 23.5% in 2011 (between Asian and European/ Other).

Estimated coverage also varies by age (Figure 10, Table 7). Coverage has increased in some, but not all, age-groups over the five-year period since (Figure 10). In 2007, the 75% target was met in four age groups (the age groups between 40-59 years), however by 2011 the target was being met in six of the age groups (the age groups between 35-64 years). Coverage increased every year between 2007 and 2011 for women aged 60-64 and 65-69 years. In some age groups the increase since 2007 predominantly occurred by 2009 or 2010, and in 2011 coverage was slightly lower than in 2010. This occurred among women in the five-year age groups between 25-59 years, and in women aged 25-29 years and 30-34 years coverage in 2011 did not exceed that for 2007. The disparity in coverage between age groups with the highest and lowest coverage has widened, from a difference of 11.9% in 2007 (between women aged 65-69 years and women aged 50-54 years) to a difference of 15.0% in 2011 (between women aged 25-29 years and women aged 45-49 years).

Comments

Undercounting of some ethnic groups on the NCSP Register may account for some of the observed difference in coverage between various ethnic groups. Previous reports by the Health & Disability Intelligence Unit investigated potential ethnic undercounting in the NCSP Register, by comparing NCSP Register data to data from the National Health Index (NHI) and Register of Births, Deaths &

Marriages (BDM).(9) Undercounting of Māori, Pacific, and Asian women (and as a result, overcounting of European/Other ethnic groups) was found, although the degree to which this occurred varied by age-group, and has changed over time. Undercounting was estimated to be around 20% for each of the Māori, Pacific, and Asian groups in 2007 (the most recent year for which estimates of the extent of undercounting are available). Undercounting may result in underestimates for coverage in Māori, Pacific, and Asian women, and overestimates in European/Other women. The NCSP is continuing with work to improve the accuracy of ethnicity recording on the register.

Coverage calculations require an estimate of the population eligible for cervical screening. This is approximated by applying a hysterectomy-adjustment to the estimated New Zealand female population, to exclude women with a hysterectomy from the eligible population. This is an imperfect adjustor of the proportion of the population eligible for screening, since women with a hysterectomy may or may not require further cervical smears, depending on the type of hysterectomy that they received. The hysterectomy adjustors used in the current report have been updated since the previous annual report (relating to 2008-2009) and since recent biannual monitoring reports (Reports 30-36). This was done because the previous estimates had become outdated (estimates were available up until the end of 2007 only). This means that coverage estimates differ from those in previous reports, however coverage for previous years has been re-estimated here, in order to allow trends to be examined.

Calculating NCSP coverage

The methods developed for calculating the indicators used to monitor the NCSP are reviewed and revised approximately every three years, consistent with other international programmes. In addition, revisions to calculations are made in accordance with changes to New Zealand statistics, such as the population census data and ethnicity recordings. These changes reflect Statistics New Zealand's modifications to methods for estimating population statistics. Any changes to methods for numerators or denominators are discussed with and supported by the NCSP Advisory Group. These changes are then approved by the National Screening Unit.

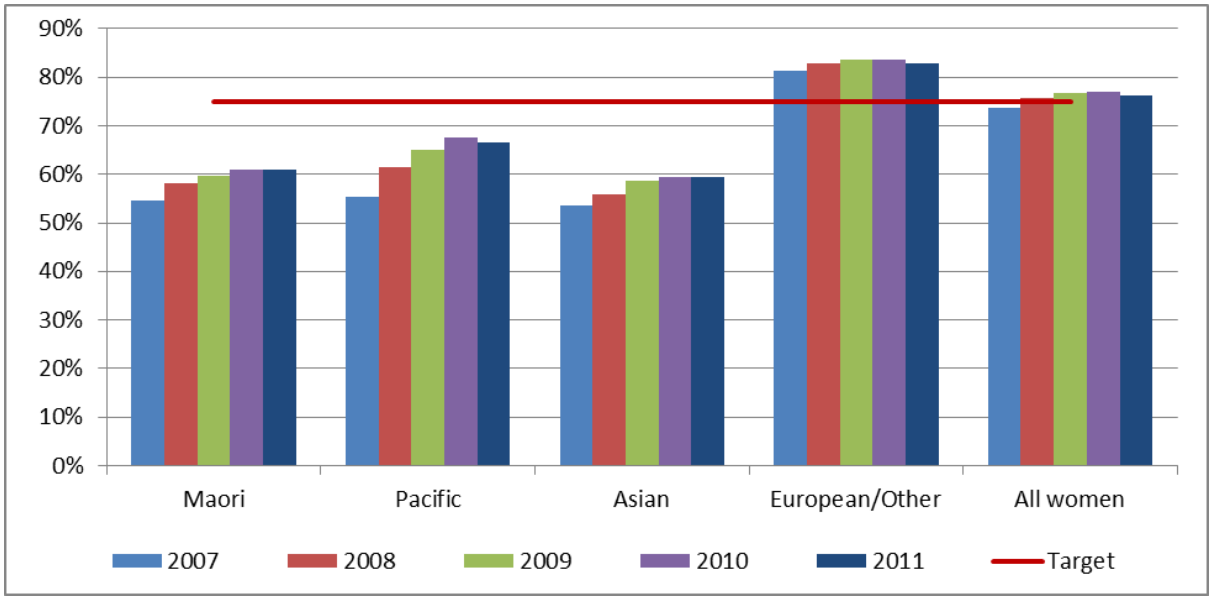
Until monitoring report 30 (1 July to 31 December 2008), coverage was calculated for women aged 20 – 69 years at the end of the monitoring period. However this includes some younger women who were not eligible for screening for the entire three years because those aged 22 or less at the end of the three year screening period were aged 17 – 19 years at the start of the three year period. This means that previously there may have been slightly underestimated coverage overall. Accordingly, a change to the method for measuring coverage was discussed and agreed on with the NCSP Advisory Group. The revised approach was to report coverage for women aged 25 – 69 years at the end of the monitoring period (which therefore includes women aged 22 and over at the beginning of the three year period but excludes women aged 20 or 21 years at the beginning). This approach is consistent with what has been done in Australia and the UK.

Beginning with NCSP Monitoring Report 30 (1 July to 31 December 2008), coverage has been reported using the revised method but estimates using the old method (20-69 years at end of period) are also included for comparison in the Biannual Monitoring Reports.

The difference between the new (25-69 at end of period) and the old (20-69 at end of period) estimates is small (about 1-2%). However the advantage of the new method is that it provides a fairer estimate of coverage (by excluding women who are not eligible for the full three year period) and allows international benchmarking with important peer group countries, including Australia and UK.

As with all indicators, coverage indicators and the statistics on which they are based continue to evolve and further changes in the construction of these indicators are to be expected in the future. Changes currently in progress include better methods for hysterectomy adjustment and ethnicity identifications.

Figure 9 – Percentage* of women aged 25-69 years screened in the previous three years, 2007 to 2011, by ethnicity



* As a percentage of the hysterectomy-adjusted population in that age-group and year, based on projections from 2006 census population to the end of the relevant calendar year and hysterectomy prevalence estimates relating to the end of the relevant calendar year.

Table 6 – Women aged 25-69 years screened in the previous three years, 2007 to 2011, by ethnicity

	2007		2008		2009		2010		2011	
Ethnicity	**N**	**%***	**N**	**%***	**N**	**%***	**N**	**%***	**N**	**%***
Māori	73,135	54.7	78,794	58.1	82,199	59.7	85,204	60.9	86,844	61.1
Pacific	31,584	55.4	35,727	61.4	38,636	65.0	40,999	67.5	41,435	66.7
Asian	61,063	53.5	67,648	56.0	74,403	58.5	79,123	59.5	82,157	59.4
European/ Other	618,388	81.3	633,488	82.9	643,313	83.6	650,191	83.7	647,583	82.9
All women	**784,170**	**73.6**	**815,657**	**75.6**	**838,551**	**76.7**	**855,517**	**77.1**	**858,019**	**76.3**

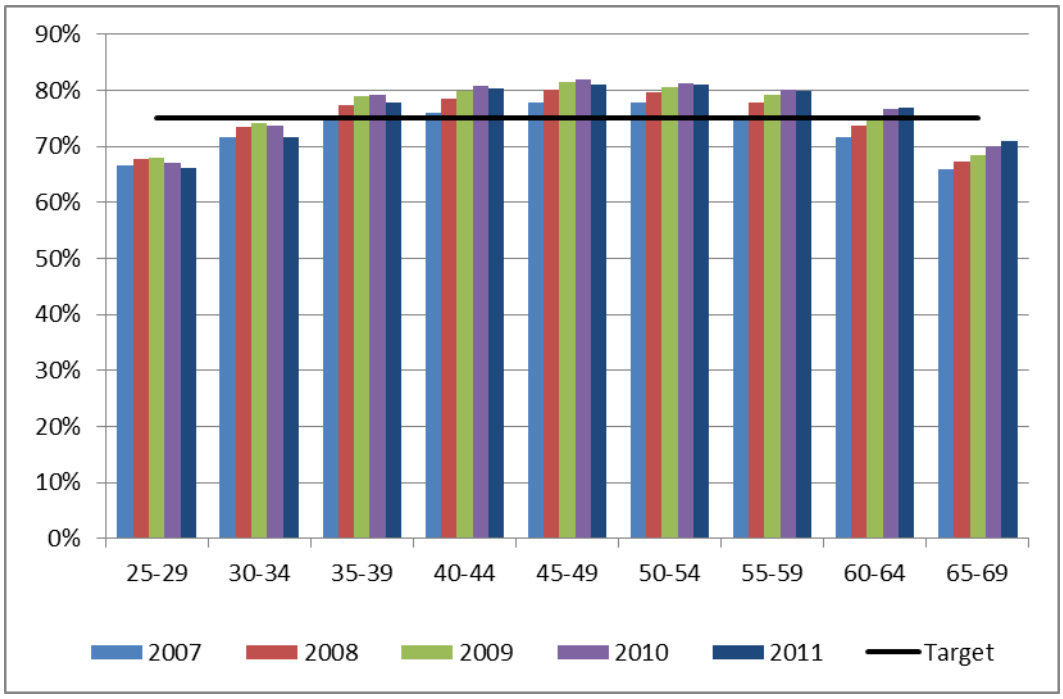
* As a percentage of the hysterectomy-adjusted population (ages 25-69 years) in that year, based on projections from 2006 census population to the end of the relevant calendar year and hysterectomy prevalence estimates relating to the end of the relevant calendar year.

Table 7 – Women screened in the previous three years, 2007 to 2011, by 5-year age group

	2007		2008		2009		2010		2011	
Age group	**N**	**% ***	**N**	**% ***	**N**	**% ***	**N**	**% ***	**N**	**% ***
25-29	90,599	66.6	94,211	67.7	96,898	67.9	98,040	67.1	98,037	66.1
30-34	100,008	71.6	100,845	73.4	101,668	74.1	102,307	73.6	101,436	71.6
35-39	117,283	74.9	120,233	77.4	120,774	78.9	118,486	79.1	113,224	77.9
40-44	114,644	75.9	117,803	78.5	120,027	79.9	122,750	80.9	123,387	80.4
45-49	110,157	77.7	116,258	80.2	119,646	81.6	120,320	81.9	118,444	81.1
50-54	87,573	77.9	92,811	79.7	97,248	80.5	102,004	81.3	105,485	81.0
55-59	70,507	75.6	73,639	77.7	76,934	79.2	80,176	80.1	82,767	79.8
60-64	53,980	71.7	58,810	73.7	62,619	75.0	66,516	76.6	67,964	76.8
65-69	39,419	66.0	41,047	67.4	42,737	68.3	44,918	70.1	47,275	70.9

* As a percentage of the hysterectomy-adjusted population in that age-group and year, based on projections from 2006 census population to the end of the relevant calendar year and hysterectomy prevalence estimates relating to the end of the relevant calendar year.

Figure 10 – Percentage of women* screened in the previous three years, 2007 to 2011, by 5-year age group



* As a percentage of the hysterectomy-adjusted population in that age-group and year, based on projections from 2006 census population to the end of the relevant calendar year and hysterectomy prevalence estimates relating to the end of the relevant calendar year.

3 Programme statistics

3.1 Cytology reporting

Definition

Cytology reporting rates are calculated using results for cervical cytology specimens collected during each 12-month report period which are recorded on the NCSP Register. Rates are reported as the number of women in each cytology category, per 1,000 women screened, based on the most severe cytology result for each woman during the one-year period.

The total number of cytology tests processed by each laboratory is also reported on (these include all tests and are not restricted to the most severe result per woman).

Target

None

Calculation

Records for all cytology samples which were collected during 2010 and 2011 were retrieved from the NCSP Register. The number of cytology tests processed by each laboratory is based on this result.

Where a woman had multiple cytology results during a year, the sample with the most severe result category was used in calculating cytology reporting rates for that year.

The cytology results in each result category were expressed as rates per 1,000 women in New Zealand screened during that year, by five-year age group. Screened women were defined as those women with a cytology, histology, or HPV test sample collected during the year and recorded on the NCSP Register.

A woman's age was defined as her age at the end of the calendar year.

Results

During 2010 there were 425,958 satisfactory cytology samples collected, and these related to 418,607 women, 410,367 of whom were aged 20-69 years at the end of 2010. Results for these women are shown in Table 7 (overall) and by five-year age group in Table 9.

During 2011 there were 422,327 satisfactory cytology samples collected, and these related to 413,752 women, 406,012 of whom were aged 20-69 years at the end of 2011. Results for these women are shown in Table 7 (overall) and by five-year age group in Table 10.

In both 2010 and 2011, abnormal cytology results were most common among women aged 20-24 years. Among women aged 20-44 years, LSIL was the most common type of cytological abnormality. LSIL reporting rates in women aged 20-44 years varied from 21.7 per 1,000 women screened (women aged 40-44 years) to 110.8 per 1,000 women screened (women aged 20-24 years) in 2010, and from 21.6 per 1,000 women screened (women aged 40-44 years) to 108.5 per 1,000 women

screened (women aged 20-24 years) in 2011. In women aged 45-69 years, the most common type of cytological abnormality was ASC-US. Reporting rates for ASC-US in this group varied from 10.8 per 1,000 women screened (women aged 60-64 and 65-69 years) to 21.5 per 1,000 women screened (women aged 45-49 years) in 2010, and from 9.7 per 1,000 women screened (women aged 65-69 years) to 19.2 per 1,000 women screened (women aged 45-49 years) in 2011.

In 2010 the rate of women with negative cytology ranged from 810.9 per 1,000 women screened (women aged 20-24 years) to 949.5 per 1,000 women screened (women aged 65-69 years). In 2011, this rate ranged from 814.4 per 1,000 women screened (in women aged 20-24 years) to 952.8 per 1,000 women screened (women aged 60-64 years).

Note that AGC and adenocarcinoma cytology results may include a number of endometrial abnormalities. It is not possible to determine the extent of these from the NCSP Register.

The number of cytology tests reported on by each laboratory processing cytology tests is reported on in Table 11. Laboratories generally met the recommended minimum volume of at least 15,000 specimens processed each year. LabPLUS did not reach this volume in 2010 (when it processed 11,082 cytology samples), but did meet this volume in 2011.

Table 8 – Overall cytology case reporting and rates per 1,000 women screened, 2010 and 2011

Cytology result	2010			2011		
	Total cases (20-69 yrs)	Crude rate (20-69 yrs)	ASR (20-69 yrs)	Total cases (20-69 yrs)	Crude rate (20-69 yrs)	ASR (20-69 yrs)
Negative	380,485	908.8	904.3	377,185	913.8	909.3
ASC-US	9,746	23.3	24.1	8,953	21.7	22.5
LSIL	14,748	35.2	38.6	14,460	35.0	38.2
ASC-H	2,056	4.9	5.3	2,118	5.1	5.6
HSIL	2,933	7.0	7.6	2,987	7.2	8.0
Invasive SCC	30	0.1	0.1	21	0.1	<0.05
AGC/AIS	298	0.7	0.7	240	0.6	0.6
Adenocarcinoma	65	0.2	0.1	47	0.1	0.1
Malignant neoplasm	6	<0.05	<0.05	1	<0.05	<0.05
Total	**410,367**			**406,012**		

Cases = women with cytology. ASR = age–standardised rate (standardised to WHO population)

Table 9 - Age-specific cytology case reporting and rates, per 1,000 women screened (aged 20-69 years), 2010

Cytology result category	Age group																			
	20-24		25-29		30-34		35-39		40-44		45-49		50-54		55-59		60-64		65-69	
	N	rate	N	rate	N	rate	N	rate	N	rate	N	rate	N	rate	N	rate	N	rate	N	rate
Neg	39,202	810.9	38,446	865.0	41,524	908.5	48,268	921.8	49,573	926.7	48,123	926.9	40,800	937.0	31,804	941.2	25,895	948.1	16,850	949.5
ASC-US	2,074	42.9	1,429	32.2	1,065	23.3	1,190	22.7	1,106	20.7	1,116	21.5	798	18.3	481	14.2	296	10.8	191	10.8
LSIL	5,357	110.8	2,777	62.5	1,657	36.3	1,352	25.8	1,163	21.7	953	18.4	654	15.0	417	12.3	272	10.0	146	8.2
ASC-H	551	11.4	439	9.9	284	6.2	209	4.0	176	3.3	108	2.1	105	2.4	90	2.7	64	2.3	30	1.7
HSIL	669	13.8	704	15.8	506	11.1	385	7.4	243	4.5	189	3.6	101	2.3	60	1.8	48	1.8	28	1.6
Invasive SCC	-	-	-	-	1	<0.05	4	0.1	1	<0.05	5	0.1	7	0.2	3	0.1	4	0.1	5	0.3
AGC/AIS	11	0.2	20	0.4	31	0.7	34	0.6	39	0.7	37	0.7	44	1.0	45	1.3	19	0.7	18	1.0
Adenocarcinoma	2	<0.05	1	<0.05	-	-	5	0.1	4	0.1	7	0.1	12	0.3	8	0.2	16	0.6	10	0.6
Malignant neoplasm	-	-	1	<0.05	1	<0.05	-	-	1	<0.05	-	-	1	<0.05	1	<0.05	-	-	1	0.1
Total	**47,866**	**-**	**43,817**	**-**	**45,069**	**-**	**51,447**	**-**	**52,306**	**-**	**50,538**	**-**	**42,522**	**-**	**32,909**	**-**	**26,614**	**-**	**17,279**	**-**

Table 10 - Age-specific cytology case reporting and rates, per 1,000 women screened (aged 20-69 years), 2011

Cytology result category	Age group																			
	20-24		25-29		30-34		35-39		40-44		45-49		50-54		55-59		60-64		65-69	
	N	Rate	N	rate	N	rate	N	rate	N	rate	N	rate	N	rate	N	rate	N	rate	N	rate
Neg	40,072	814.4	37,857	869.8	40,161	910.4	45,419	929.7	49,335	931.4	46,762	934.0	41,619	942.4	32,516	949.1	26,155	952.8	17,289	951.4
ASC-US	2,042	41.5	1,359	31.2	994	22.5	919	18.8	1,014	19.1	961	19.2	742	16.8	450	13.1	296	10.8	176	9.7
LSIL	5,337	108.5	2,661	61.1	1,668	37.8	1,216	24.9	1,143	21.6	879	17.6	692	15.7	416	12.1	277	10.1	171	9.4
ASC-H	589	12.0	429	9.9	273	6.2	229	4.7	176	3.3	127	2.5	96	2.2	96	2.8	62	2.3	41	2.3
HSIL	747	15.2	735	16.9	481	10.9	386	7.9	250	4.7	146	2.9	97	2.2	70	2.0	50	1.8	25	1.4
Invasive SCC	-	-	-	-	-	-	2	<0.05	2	<0.05	3	0.1	3	0.1	1	<0.05	5	0.2	5	0.3
AGC/AIS	7	0.1	25	0.6	18	0.4	21	0.4	30	0.6	20	0.4	36	0.8	44	1.3	23	0.8	16	0.9
Adeno-carcinoma	-	-	3	0.1	1	<0.05	2	<0.05	3	0.1	-	-	7	0.2	10	0.3	8	0.3	13	0.7
Malignant neoplasm	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	<0.05	-	-	-	-
Total	**48,794**	**-**	**43,069**	**-**	**43,596**	**-**	**48,194**	**-**	**51,953**	**-**	**48,898**	**-**	**43,292**	**-**	**33,604**	**-**	**26,876**	**-**	**17,736**	**-**

Table 11 – Cytology tests processed by laboratory, 2010 and 2011

Laboratory	Cytology tests processed (N)* 2010	2011
Aotea Pathology Ltd	45,114	45,215
Canterbury Health Laboratories	23,032	21,332
Diagnostic Medlab Ltd	122,686	111,029
LabPLUS	11,082	15,818
Medlab Central Ltd	36,555	36,535
Medlab South Christchurch	32,331	28,091
Pathlab	41,460	42,740
Southern Community Labs	129,834	132,941
TOTAL	**444,104**	**435,712**

Target : Total samples >15,000 per annum. * Includes satisfactory and unsatisfactory tests.

3.2 Positive predictive value

Definition

Positive predictive value for i) the combination of HSIL and SC cytology, and for ii) the combination of ASC-H, HSIL and SC cytology, is the proportion of women with these cytology results, and a subsequent histology sample within six months, who are confirmed by histology as having CIN2 or worse.

Target

HSIL+SC cytology: Not less than 65%, and not greater than 85%

ASC-H+HSIL+SC cytology: No target

Calculation

Results were retrieved from the NCSP Register for all satisfactory cytology samples which were collected over a one-year period ending on 30 June in the year reported on, and which were associated with a result of ASC-H, HSIL, or SC (Bethesda codes ASH, HS1, HS2, SC). Where there was more than one cytology test for a woman which fit this criteria, the most severe result category was used for the final result. Where there were two cytology tests with result categories of identical severity, the earliest sample taken was used.

For each woman, all histology samples taken in the period from five days before to six months after the ASC-H/HSIL/SCC cytology sample were identified from the NCSP Register. Where more than one histology result was found, the most severe SNOMED category was used to determine the histology result. Women whose histology result was CIN2 or more severe were regarded as having had their cytology report histologically confirmed. Details of the histology categories which were classified as CIN2 or worse are provided in Appendix B, and the relative severity rankings used for SNOMED codes are provided in Appendix C. An allowance was made for histology to be up to five days earlier than cytology in order to take into account some cytology samples that are received at laboratories without a collection date recorded; in these cases laboratories may enter the date the cytology sample was received by the laboratory as the collection date.

Results

Results were retrieved for all satisfactory cytology samples which were collected over a one-year period ending on each of 30 June 2010 and 30 June 2011. The number of women identified was similar over both years for both HSIL or SC cytology and for women with ASC-H, HSIL or SC cytology (Table 12). The positive predictive value for HSIL+SC cytology was within the target range and similar for both years (82.4% in 2010; 82.9% in 2011). The positive predictive value for ASC-H+HSIL+SC cytology was also similar for both years (70.4% in 2010, 70.6% in 2011; there is no target for this measure)(Figure 11; Table 12).

The proportion of women with high grade cytology for whom histology was available within six months remained quite consistent over the two year period, and was higher for HSIL+SC (90.8%-91.9%) than for ASC-H+HSIL+SC (85.7%-86.7%)(Table 12).

Comments

This estimate does not taken into account cytology predicting HSIL for which there is no histology available. Histology may be unavailable because the woman does not attend for follow-up colposcopy, or it may not be taken if the colposcopic impression is normal. When more colposcopy data is available on the NCSP Register, it may be possible to better distinguish between these two possibilities.

The calculations also do not discriminate between cytology taken as a screening or diagnostic test. Analysis separating community versus clinic-derived cytology would provide a clearer picture of positive predictive value in a screening setting.

Figure 11 – Positive predictive value, 2010 and 2011, by cytology result group

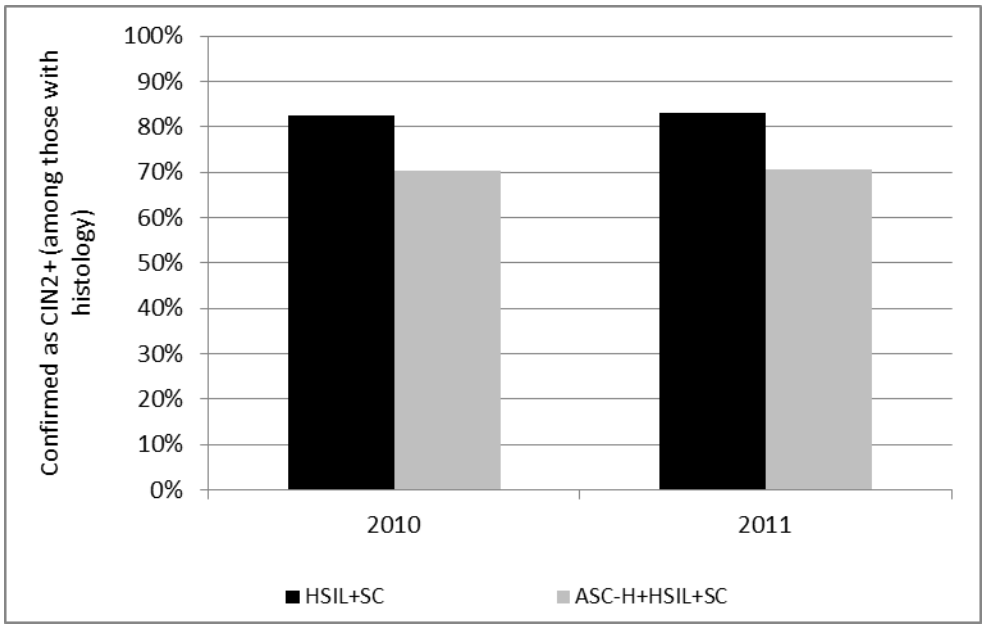


Table 12 – Positive predictive value, 2010 to 2011, by cytology result group

Year	Cytology result: HSIL + SC				Cytology result: HSIL + SC + ASC-H			
	Results	Histology available†		Confirmed as CIN2+	Results	Histology available†		Confirmed as CIN2+
	N	N	*(%)*	%*	N	N	*(%)*	%*
2010	2,877	2,644	(91.9)	82.4	4,857	4,209	(86.7)	70.4
2011	2,953	2,680	(90.8)	82.9	5,044	4,323	(85.7)	70.6

† Histology sample(s) collected from up to five days prior and up to six months after the cytology sample * As a percentage of women with a histology sample taken within six months of their cytology sample

3.3 Histology reporting

Definition

Histology reporting rates are calculated using results for histological specimens collected during each 12-month report period which are recorded on the NCSP Register. The Systematised Nomenclature of Medicine (SNOMED) histology codes (1986 and 1993 subsets) are used by the NCSP Register to record the histological results of vaginal and cervical histology specimens. Histology specimens include diagnostic biopsies, treatment biopsies, cervical polyps and the cervical tissue of total hysterectomy specimens. Rates are summarised into broad diagnostic categories, based on the most severe diagnosis code for each women over the calendar year.

Target

None

Calculation

In the current report, histology reporting rates are reported for 2010 and for 2011. All histology samples which were collected during 2010 and 2011 were retrieved from the NCSP Register. Where a woman had multiple histology results during the year, the sample with the most severe diagnosis code was used. SNOMED diagnosis categories were grouped into broad diagnostic categories for presentation in this current report. Details of the mapping between SNOMED codes and broad diagnostic category, and the relative severity ranking of the SNOMED codes which was used to determine the most severe diagnosis code for each woman in the year are provided in Appendix C (Table 21).

The histology results in each broad diagnostic category were expressed as rates per 1,000 women screened in New Zealand during that year, by five-year age group. Screened women were defined as those with a cytology, histology, or HPV test sample collected during the year and recorded on the NCSP Register.

A woman's age was defined as her age at the end of the calendar year.

Results

In 2010, there were 21,976 histology samples collected which were sufficient for diagnosis. These samples related to 19,919 women, 19,230 of whom were aged 20-69 years at the end of 2010. Results relating to histology in these 19,230 women aged 20-69 years are summarised in Table 13 and Table 14.

In 2011, there were 21,616 histology samples collected which were sufficient for diagnosis. These samples related to 19,525 women, 18,829 of whom were aged 20-69 years at the end of 2011. Results relating to histology in these 18,829 women aged 20-69 years are summarised in Table 13 and Table 15.

In both 2010 and 2011, the overall rate of women with histology samples taken per 1,000 women screened was highest among women aged 25-29 years (Table 14, Table 15). This reflected more disease (CIN 2+) in women of this age, as the rate of women with CIN 2+ per 1,000 women screened was also highest in this age group (Table 16). Rates of CIN 2/3, CIN 2+ and CIN 3+ were highest in women aged 25-29 years in both 2010 and 2011 (Table 16). Women in the youngest age groups were also the age groups with the lowest rates of negative/ benign histology. Women with negative/ benign histology made up less than 30% of all women with histology among women aged 20-24 years or 25-29 years. In contrast, in the five-year age groups between 35-69 years generally over half of all women with histology had negative/ benign histology.

Histology reporting by ethnicity is shown for 2010 in Table 17, and for 2011 in Table 18. Overall rates of histology per 1,000 women screened were lower for Pacific and Asian women than for Māori and European/ Other women in both 2010 and 2011. Rates of negative/ benign histology were highest in Māori, and lowest in Pacific women. Rates of high grade squamous histology (ie for each of CIN 2, CIN 3, HSIL not otherwise specified) were generally highest in Māori or European/ Other women, and lowest among Pacific and Asian women.

Trends by ethnicity in the age-standardised rate of high grade squamous (CIN 2/3) histology per 1,000 women screened are shown in Figure 10. Since 2002 the rate of histologically-confirmed CIN 2/3 per 1,000 women screened has been consistently higher in Māori women than in non- Māori women. The trends over that time period have been broadly similar in both groups, and remained reasonably stable over recent years.

Comments

Histology samples include diagnostic biopsies, treatment biopsies, cervical polyps and the cervical tissue of total hysterectomy specimens. Histology samples may also include samples from non-cervical sites, where there is also a cervical component in the sample, for example endometrial samples. This is likely to be contributing to the higher number of women with adenocarcinoma histology on the NCSP Register compared to the Cancer Registry.

Rates of CIN 3+ per 1,000 women screened need to interpreted with some caution, because of the use of the SNOMED code M67017 (HSIL not otherwise specified; or CIN2/3). Results of M67017 were not included in the calculations for CIN 3+, because this code does not distinguish between CIN 2 and CIN 3. Therefore depending on the extent to which these results harbour CIN 3, the estimate of CIN 3+ may be an underestimate. It is also possible that any observed changes in CIN 3+ rates reflect use of more definitive diagnostic categories rather than underlying changes. Where histology reporting rates of CIN 2+ and the combined category of CIN 2/3 are comparable between different years the use of more definitive diagnostic categories (and less use of the combined category of CIN 2/3) is likely to be the cause of observed changes in CIN 3+.

Table 13 – Histology cases and reporting rates per 1,000 women screened (ages 20-69 years), 2010 and 2011

Histology result category	2010			2011		
	Cases	Crude rate (20-69 yrs)	ASR (20-69 yrs)	Cases	Crude rate (20-69 yrs)	ASR (20-69 yrs)
Negative/benign (non neoplastic)	10,096	24.1	22.8	9,593	23.2	22.0
HPV	1,624	3.9	4.0	1,468	3.6	3.7
CIN1	3,048	7.3	7.8	3,092	7.5	8.0
CIN2	962	2.3	2.5	1,083	2.6	2.9
CIN3	1,760	4.2	4.6	1,942	4.7	5.2
HSIL not otherwise specified	1,466	3.5	3.8	1,401	3.4	3.8
Microinvasive	14	<0.05	<0.05	7	<0.05	<0.05
Invasive SCC	87	0.2	0.2	92	0.2	0.2
Glandular dysplasia	-	-	-	1	<0.05	<0.05
Adenocarcinoma in situ	43	0.1	0.1	42	0.1	0.1
Invasive adenocarcinoma	82	0.2	0.2	59	0.1	0.1
Adenosquamous carcinoma	2	<0.05	<0.05	1	<0.05	<0.05
Other cancer	46	0.1	0.1	48	0.1	0.1
TOTAL	**19,230**			**18,829**		

Cells containing '–' indicate no cases. ASR = age-standardised rate (WHO population) ; SCC = squamous cell carcinoma

Table 14 - Age-specific histology reporting rates per 1,000 women screened (ages 20-69 years), 2010

Histology result category	Age group																			
	20-24		25-29		30-34		35-39		40-44		45-49		50-54		55-59		60-64		65-69	
	N	rate	N	rate	N	rate	N	rate	N	rate	N	rate	N	rate	N	rate	N	rate	N	rate
Negative/benign (non neoplastic)	514	10.6	665	15.0	716	15.7	1155	22.1	1662	31.1	2066	39.8	1454	33.4	852	25.2	606	22.2	406	22.9
HPV	260	5.4	252	5.7	231	5.1	222	4.2	213	4.0	204	3.9	112	2.6	67	2.0	39	1.4	24	1.4
CIN1	701	14.5	551	12.4	511	11.2	388	7.4	331	6.2	283	5.5	149	3.4	65	1.9	43	1.6	26	1.5
CIN2	267	5.5	206	4.6	153	3.4	126	2.4	93	1.7	59	1.1	32	0.7	11	0.3	7	0.3	8	0.5
CIN3	387	8	444	10.0	333	7.3	241	4.6	147	2.8	99	1.9	51	1.2	30	0.9	18	0.7	10	0.6
HSIL nos	370	7.7	319	7.2	272	6.0	199	3.8	140	2.6	75	1.4	43	1.0	24	0.7	13	0.5	11	0.6
Microinvasive	2	<0.05	1	<0.05	2	<0.05	.		2	<0.05	3	0.1	2	0.1	1	<0.05	1	<0.05	.	
Invasive SCC	2	<0.05	6	0.1	12	0.3	6	0.1	11	0.2	14	0.3	9	0.2	9	0.3	8	0.3	10	0.6
Glandular dysplasia	.		.		.		.		.		.		.		.		.		.	
Adenocarcinoma in situ	5	0.1	5	0.1	7	0.2	10	0.2	6	0.1	3	0.1	1	<0.05	2	0.1	4	0.2	.	
Invasive adenocarcinoma	2	<0.05	2	<0.05	5	0.1	6	0.1	7	0.1	13	0.3	8	0.2	12	0.4	14	0.5	13	0.7
Adenosquamous carcinoma	1	<0.05	.		.		.		.		1	<0.05	.		.		.		.	
Other cancer	1	<0.05	.		2	<0.05	6	0.1	6	0.1	4	0.1	5	0.1	6	0.2	11	0.4	5	0.3
Total	**2,512**	**52.0**	**2,451**	**55.1**	**2,244**	**49.1**	**2,359**	**45.0**	**2,618**	**49.0**	**2,824**	**54.4**	**1,866**	**42.8**	**1,079**	**31.9**	**764**	**28.0**	**513**	**28.9**

HSIL nos = high grade not otherwise specified (CIN2/3, SNOMED code M67017) ; SCC = squamous cell carcinoma

Table 15 - Age-specific histology reporting rates per 1,000 women screened (ages 20-69 years), 2011

Histology result category	Age group																			
	20-24		25-29		30-34		35-39		40-44		45-49		50-54		55-59		60-64		65-69	
	N	rate	N	rate	N	rate	N	rate	N	rate	N	rate	N	rate	N	rate	N	rate	N	rate
Negative/benign (non neoplastic)	506	10.3	596	13.7	717	16.3	995	20.4	1640	31.0	1866	37.3	1479	33.5	848	24.8	564	20.6	382	21
HPV	285	5.8	230	5.3	216	4.9	177	3.6	168	3.2	168	3.4	114	2.6	54	1.6	36	1.3	20	1.1
CIN1	723	14.7	574	13.2	484	11.0	362	7.4	340	6.4	268	5.4	166	3.8	83	2.4	66	2.4	26	1.4
CIN2	315	6.4	257	5.9	169	3.8	139	2.9	92	1.7	48	1.0	33	0.8	17	0.5	10	0.4	3	0.2
CIN3	479	9.7	472	10.8	349	7.9	255	5.2	157	3.0	97	1.9	48	1.1	43	1.3	31	1.1	11	0.6
HSIL nos	358	7.3	351	8.1	243	5.5	176	3.6	128	2.4	73	1.5	34	0.8	16	0.5	14	0.5	8	0.4
Microinvasive	.		1	<0.05	.		4	0.1	.		1	<0.05	.		.		.		1	0.1
Invasive SCC	1	<0.05	6	0.1	18	0.4	12	0.3	11	0.2	12	0.2	11	0.3	6	0.2	5	0.2	10	0.6
Glandular dysplasia	.		.		.		.		1	<0.05	.		.		.		.		.	
Adenocarcinoma in situ	6	0.1	7	0.2	7	0.2	5	0.1	5	0.1	1	<0.05	4	0.1	7	0.2	.		.	
Invasive adenocarcinoma	1	<0.05	6	0.1	5	0.1	5	0.1	5	0.1	7	0.1	2	0.1	11	0.3	7	0.3	10	0.6
Adenosquamous carcinoma	.		.		.		.		.		1	<0.05	.		.		.		.	
Other cancer	1	<0.05	2	0.1	2	0.1	1	<0.05	.		4	0.1	5	0.1	12	0.4	11	0.4	10	0.6
Total	**2,675**	**54.4**	**2,502**	**57.5**	**2,210**	**50.1**	**2,131**	**43.6**	**2,547**	**48.1**	**2,546**	**50.9**	**1,896**	**42.9**	**1,097**	**32.0**	**744**	**27.1**	**481**	**26.5**

HSIL nos = high grade not otherwise specified (CIN2/3, SNOMED code M67017) ; SCC = squamous cell carcinoma

Table 16 – Summarised age-specific histology reporting rates per 1,000 women screened (ages 20-69 years), 2010 and 2011

Histology result category		Age group									
	Year	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69
Negative/ benign	2010	10.6	15.0	15.7	22.1	31.1	39.8	33.4	25.2	22.2	22.9
	2011	10.3	13.7	16.3	20.4	31.0	37.3	33.5	24.8	20.5	21.0
HPV	2010	5.4	5.7	5.1	4.2	4.0	3.9	2.6	2.0	1.4	1.4
	2011	5.8	5.3	4.9	3.6	3.2	3.4	2.6	1.6	1.3	1.1
CIN1	2010	14.5	12.4	11.2	7.4	6.2	5.5	3.4	1.9	1.6	1.5
	2011	14.7	13.2	11	7.4	6.4	5.4	3.8	2.4	2.4	1.4
*CIN2/3**	*2010*	*21.2*	*21.8*	*16.6*	*10.8*	*7.1*	*4.5*	*2.9*	*1.9*	*1.4*	*1.6*
	2011	*23.4*	*24.8*	*17.3*	*11.7*	*7.1*	*4.4*	*2.6*	*2.2*	*2.0*	*1.2*
CIN2+	2010	21.4	22.1	17.2	11.3	7.7	5.2	3.5	2.8	2.8	3.2
	2011	23.6	25.3	18.0	12.2	7.5	4.9	3.1	3.3	2.8	2.9
CIN3+ †	*2010*	*8.3*	*10.3*	*7.9*	*5.1*	*3.4*	*2.7*	*1.7*	*1.8*	*2.1*	*2.1*
	2011	*9.9*	*11.4*	*8.6*	*5.8*	*3.4*	*2.5*	*1.6*	*2.3*	*2.0*	*2.3*

* Here CIN2/3 includes result categories for CIN2, CIN3, and also the combined category HSIL nos (SNOMED code M67017) † CIN3+ excludes SNOMED code M67017

Table 17 Histology cases and reporting rates per 1,000 women screened (20-69 years) by ethnicity, 2010

Histology result category	Māori			Pacific			Asian			European/ Other		
	Cases	Crude rate*	ASR*	Cases	Crude rate*	ASR*	Cases	Crude rate*	ASR*	Cases	Crude rate*	ASR*
Negative/benign (non neoplastic)	1,090	24.5	24.5	413	20.6	20.9	877	23.3	21.3	7,716	24.4	23.0
HPV	186	4.2	4.0	70	3.5	3.4	134	3.6	3.4	1,234	3.9	4.1
CIN1	291	6.5	6.1	118	5.9	5.7	238	6.3	5.9	2,401	7.6	8.5
CIN2	128	2.9	2.6	30	1.5	1.4	63	1.7	1.6	741	2.3	2.7
CIN3	313	7.0	6.6	74	3.7	3.6	134	3.6	3.4	1,239	3.9	4.6
HSIL nos	241	5.4	5.1	25	1.2	1.2	48	1.3	1.2	1,152	3.6	4.2
Microinvasive	3	0.1	0.1	0	-	-	3	0.1	0.1	8	<0.05	<0.05
Invasive SCC	23	0.5	0.6	5	0.2	0.3	5	0.1	0.1	54	0.2	0.2
Glandular dysplasia	0	-	-	0	-	-	0	-	-	0	-	-
Adenocarcinoma in situ	4	0.1	0.1	1	<0.05	0.1	3	0.1	0.1	35	0.1	0.1
Invasive adenocarcinoma	15	0.3	0.4	8	0.4	0.5	9	0.2	0.2	50	0.2	0.1
Adenosquamous carcinoma	1	<0.05	<0.05	0	-	-	0	-	-	1	<0.05	<0.05
Other cancer	8	0.2	0.3	7	0.3	0.4	1	<0.05	<0.05	30	0.1	0.1
Total	**2,303**	**51.7**	**50.4**	**751**	**37.4**	**37.4**	**1,515**	**40.2**	**37.3**	**14,661**	**46.3**	**47.5**

* rates are per 1,000 women screened. ASR = age-standardised rate, standardised to WHO population (ages 20-69 years); HSIL nos = high grade squamous lesion not otherwise specified (CIN2/3; SNOMED code M67017); SCC = squamous cell carcinoma

Table 18 - Histology cases and reporting rates per 1,000 women screened (ages 20-69 years) by ethnicity, 2011

Histology result category	Māori			Pacific			Asian			European/ Other		
	Cases	Crude rate	ASR	Cases	Crude rate	ASR	Cases	Crude rate	ASR	Cases	Crude rate	ASR
Negative/benign (non neoplastic)	963	21.3	21.5	392	20.2	20.2	824	21.7	20.0	7,414	23.9	22.6
HPV	178	3.9	3.8	67	3.5	3.4	129	3.4	3.2	1,094	3.5	3.8
CIN1	344	7.6	7.3	124	6.4	6.4	247	6.5	6.7	2,377	7.7	8.5
CIN2	148	3.3	3.1	44	2.3	2.2	76	2.0	2.0	815	2.6	3.1
CIN3	310	6.9	6.5	56	2.9	2.8	163	4.3	4.2	1,413	4.6	5.3
HSIL nos	256	5.7	5.4	26	1.3	1.3	46	1.2	1.2	1,073	3.5	4.0
Microinvasive	1	<0.05	<0.05	0	-	-	0	-	-	6	<0.05	<0.05
Invasive SCC	26	0.6	0.6	8	0.4	0.5	6	0.2	0.2	52	0.2	0.2
Glandular dysplasia	0	-	-	0	-	-	0	-	-	1	<0.05	<0.05
Adenocarcinoma in situ	2	<0.05	<0.05	2	0.1	0.1	1	<0.05	<0.05	37	0.1	0.1
Invasive adenocarcinoma	4	0.1	0.1	6	0.3	0.4	6	0.2	0.1	43	0.1	0.1
Adenosquamous carcinoma	0	-	-	0	-	-	0	-	-	1	<0.05	<0.05
Other cancer	3	0.1	0.1	4	0.2	0.2	4	0.1	0.1	37	0.1	0.1
Total	**2,235**	**49.3**	**48.4**	**729**	**37.6**	**37.5**	**1,502**	**39.6**	**37.7**	**14,363**	**46.3**	**47.8**

* rates are per 1,000 women screened. ASR = age-standardised rate, standardised to WHO population (ages 20-69 years); HSIL nos = high grade squamous lesion not otherwise specified (CIN2/3; SNOMED code M67017); SCC = squamous cell carcinoma

Figure 12 – Age-standardised rates of histologically-confirmed CIN 2/3 per 1,000 women screened, 2002 to 2011, by ethnicity

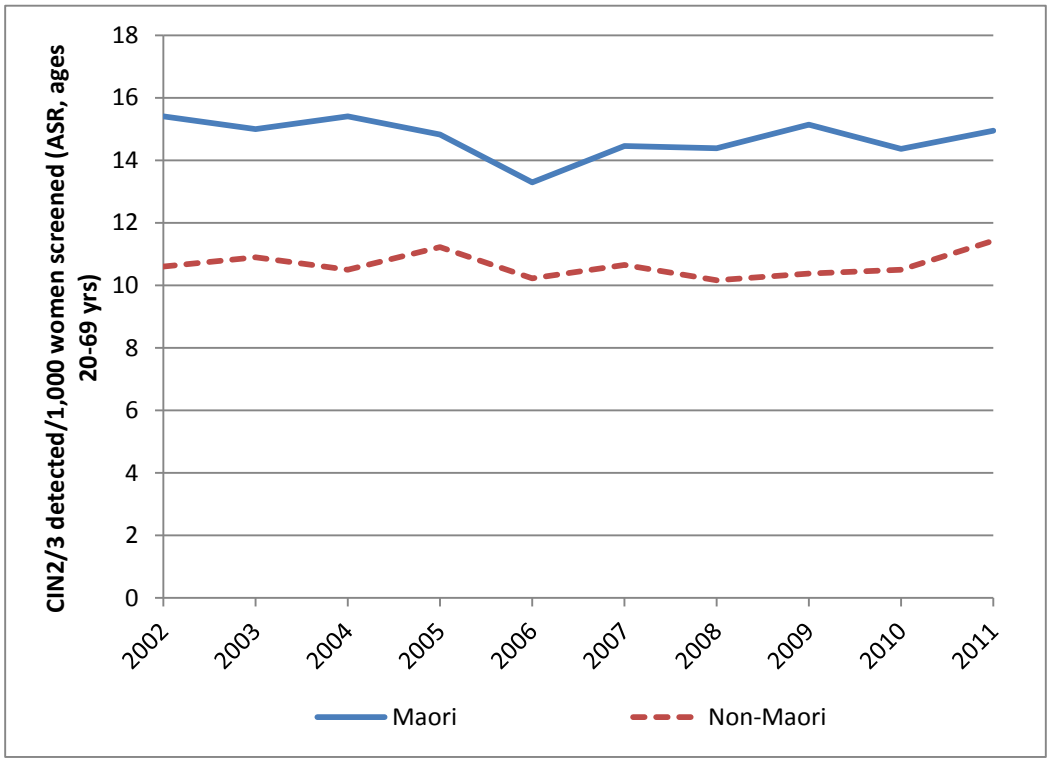
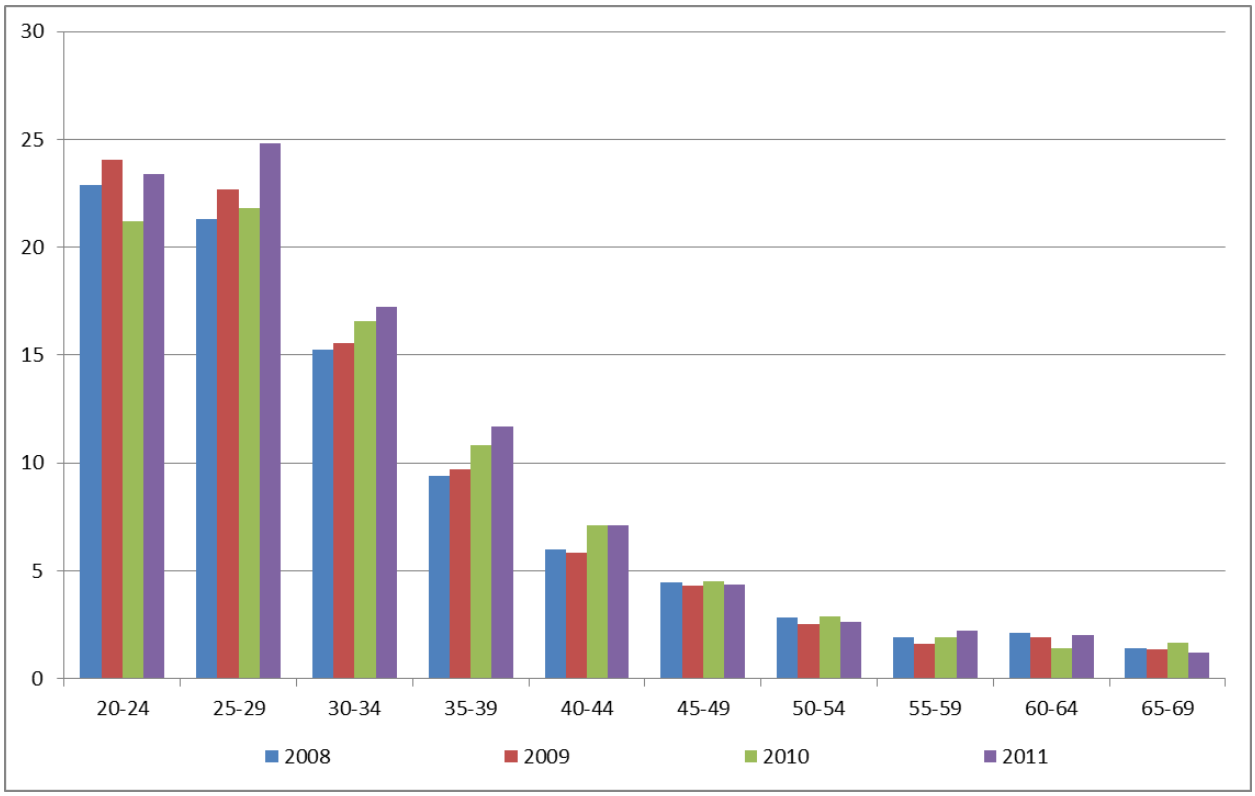


Figure 13 – Age-specific rates of histologically-confirmed CIN 2/3 per 1,000 women screened, 2008 to 2011



Appendix A – Population data

WHO Standard Population

Rates for cervical cancer incidence and mortality were standardised using the WHO World Standard Population according to Ahmad et al (2001)(1), as shown in Table 19.

Table 19 – WHO Standard Population

Age group	N	Proportion
00-04	8,860	0.088569
05-09	8,690	0.08687
10-14	8,600	0.08597
15-19	8,470	0.08467
20-24	8,220	0.082171
25-29	7,930	0.079272
30-34	7,610	0.076073
35-39	7,150	0.071475
40-44	6,590	0.065877
45-49	6,040	0.060379
50-54	5,370	0.053681
55-59	4,550	0.045484
60-64	3,720	0.037187
65-69	2,960	0.02959
70-74	2,210	0.022092
75-79	1,520	0.015195
80-84	910	0.009097
85 +	635	0.006348
Total	**100,035**	**1**

New Zealand estimated resident population

The estimated data for New Zealand female population was based on data from Statistics New Zealand. Populations from 2006 onward are based on projections from 2006 Census data, and relate to the end-of-calendar year population. Population estimates for 2005 were based on a linear interpolation between data from the 2001 Census and 2006 Census. Population data for 2005 were not available in the four required ethnic groups, and so ethnicity-specific estimates could not be calculated for 2005 for cancer incidence, cancer mortality, or coverage.

Appendix B - Positive predictive value calculations

Table 20 – Definition used for positive predictive value calculations

Histology Diagnosis	G1	Cytology interpretation code Squamous (G2)				
	G1	ASL	LS	ASH	HS1/2	SC
Negative				q	y	y
Squam-Atypia NOS				q	y	y
Squam-Low Grade/CIN1/HPV				q	y	y
Squam-High Grade/CIN2-3				p	x	x
Squam MI SCC				p	x	x
Squam-Invasive SCC				p	x	x
Gland-Benign Atypia				q	y	y
Gland-Dyplasia				p	x	x
Gland-AIS				p	x	x
Gland-Invasive Adeno				p	x	x
Other Malignant Neoplasm				p	x	x

PPV% (HSIL)= sum(x) / (sum(x)+sum(y))

PPV% (ASC-H+HSIL+SC)= (sum(p) + sum(x))/ (sum(p)+sum(q) +sum(x) + sum(y)

Appendix C – SNOMED codes and ranking

Table 21 – SNOMED codes and ranking for histology samples

Adequacy of specimen		**1986 Code**	**1993 Code**		
Insufficient or unsatisfactory material for diagnosis		M09000	M09010		
There is no code for satisfactory materials.					
Site (topography) of specimen		**1986 Code**	**1993 Code**		
Vagina		T81	T82000		
Cervix (includes endocervix and exocervix)		T83	T83200		
Summary diagnosis	**Code stored on register**	**1986 Code**	**1993 Code**	**Diagnostic category**	**Rank***
There will be a maximum of four M codes transmitted to the register.					
Negative result - normal tissue		M00100	M60000	Negative/benign	1
Inflammation		M40000	M40000	Negative/benign	2
Microglandular hyperplasia		M72480	M72480	Negative/benign	3
Squamous Metaplasia		M73000	M73000	Negative/benign	4
Atypia		M69700	M67000	CIN 1	7
HPV, koilocytosis, condyloma (NOS) Condyloma acuminatum	 M76700	M76700 M76720	M76700 M76720	HPV	9
Dysplasia / CIN NOS		M74000	M67015	CIN 1	10
CIN I (LSIL) (VAIN I when used with T81/ T82000)		M74006	M67016	CIN 1	11
CIN II (HSIL) (VAIN II when used with T81/ T82000)		M74007		CIN 2	15
CIN III (HSIL) (VAIN III when used with T81/ T82000) Carcinoma in situ		M74008 M80102 M80702	 M80102 M80702	CIN 3	16 17 18
HSIL NOS		M67017	M67017	HSIL	14
Polyp		M76800	M76800	Negative/benign	5
Other (Morphologic abnormality, not dysplastic or malignant)		M01000	M01000	Negative/benign	6
Microinvasive squamous cell carcinoma		M80765	M80763	Micro-invasive	19
Invasive squamous cell carcinoma		M80703	M80703	Invasive SCC	22
Benign glandular atypia		M81400	M67030	Negative/benign	8
Glandular dysplasia		M81401	M67031	Glandular dysplasia	12
Adenocarcinoma in situ		M81402	M81402	Adenocarc. in situ	13
Invasive adenocarcinoma		M81403	M81403	Invasive adenocarcinoma	21
Adenosquamous carcinoma		M85603	M85603	Adenosquamous carcinoma	20
Metastatic tumour		M80006	M80006	Other cancer	28
Undifferentiated carcinoma		M80203	M80203	Other cancer	23
Sarcoma		M88003	M88003	Other cancer	24

Other codes accepted	**Code stored on register**	**1986 Code**	**1993 Code**	**Diagnostic category**	**Rank***
Carcinosarcoma	M88003	M89803	M89803	Other cancer	25
Choriocarcinoma	M80003	M91003	M91003	Other cancer	26
Miscellaneous primary tumour	M80003	M80003	M80003	Other cancer	27
Small cell carcinoma	M80003	M80413	M80413	Other cancer	29
Malignant tumour, Small cell type	M80003	M80023	M80023	Other cancer	30
Melanoma	M80003	M87203	M87203	Other cancer	31
Other primary epithelial malignancy	M80003	M80103	M80103	Other cancer	32

* ranking used is equivalent to the diagnostic significance rank used within the NCSP Register

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