National Screening Unit

National Cervical Screening Programme

Annual Report 2012

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About the authors

The authors are based in the Lowy Cancer Research Centre, Prince of Wales Clinical School, UNSW (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.

Selected results

Cancer incidence

- In 2012 there were 166 new diagnoses of cervical cancer, including 40 new diagnoses in Māori women.
- This is equivalent to an age-standardised rate (ASR) of 6.2 new diagnoses per 100,000 women in the population, and 12.7 per 100,000 for Māori women.
- Most cervical cancers were squamous (116 cases; 4.5 per 100,000 women ASR), with a smaller proportion comprising adenocarcinoma (26 cases; 1.0 per 100,000 women ASR), adenosquamous (one case; <0.05 per 100,000 women ASR) or other cervical cancers (23 cases; 0.8 per 100,000 women ASR).
- Overall, between 1996 and 2012 cervical cancer incidence has declined from 10.5 to 6.2 per 100,000 for women of all ethnicities, and from 25.0 to 12.7 per 100,000 for Māori women.

Cancer mortality

- In 2010, there were 52 deaths due to cervical cancer, including eight deaths in Māori women.
- This is equivalent to an age-standardised mortality rate of 1.7 per 100,000 women in the population, and 3.3 per 100,000 for Māori women.
- Overall, between 1998 and 2010 cervical cancer mortality has declined from 3.2 to 1.7 per 100,000 for women of all ethnicities, and from 10.3 to 3.3 per 100,000 for Māori women.

Coverage

- As of 31 December 2012, 76.7% of eligible women aged 25-69 years had been screened in the previous three years.
- Coverage varied by ethnicity, from 63.0% for Māori women and 82.2% for European/ Other women. Over the past five years, coverage has increased in Māori, Pacific and Asian women, and has remained broadly steady in European/ Other women.
- The 80% target was met in four age groups in 2012 (the five-year age groups between 40-59 years). The target was not met for women aged between 60-69 years, but coverage has been consistently increasing in these age groups in recent years. The target was not met in younger age groups (between 20-34 years), and coverage has been decreasing in recent years in women aged 25-29 and 30-34 years.

Regularity of screening

- Patterns of re-attendance for screening was examined in two cohorts of women with negative cytology and who were recommended to return in three years ("routine screening cohorts"); the first with their index negative cytology in 2001 and the second with their index negative cytology in 2007.

- Compliance with the recommendation to return in three years was higher for women in the 2007 routine screening cohort than in the 2001 routine screening cohort (less early re-screening; less late re-screening; higher on-time screening).

- Overall, 93% of the women in the 2007 routine screening cohort had returned within five years, compared to 89% in the 2001 routine screening cohort.

Cytology reporting

- During 2012, 418,607 women had a cytology sample collected, including 408,768 women aged 20-69 years. The overwhelming majority had a negative cytology result (910.6 per 1,000 women screened; 905.8 per 1,000 women screened ASR)

- Abnormalities were most common in younger women. LSIL was the most common cytological abnormality in younger women (aged 20-44 years). ASC-US was the most common cytological abnormality in older women (aged 45-69 years).

- All laboratories reporting on cytology throughout the full year achieved the minimum volume of 15,000 cytology samples processed.

Positive predictive value

- CIN2+ was subsequently confirmed in 79.8% of women who had histology within six months of an HSIL or SC cytology result. This is within the target range for positive predictive value.

- CIN2+ was identified in 66.6% of women who had histology within six months of an ASC-H, HSIL or SC cytology result (there is no target for this measure).

Histology reporting

- During 2012, histology samples were collected from 22,864 women, including 22,120 aged 20-69 years. This is a increase compared to 2011 (6.6%).

- High grade abnormalities were most common in women aged 25-29 years (including rates of CIN 2/3, CIN 2+ and CIN 3+).

- Negative/ benign histology comprised a minority of samples in younger women (less than 30% in women aged 20-24 and 25-29 years), but a majority of samples in older women (more than 60% in women aged between 40-69 years).

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

Incidence of no more than 7.5 per 100,000 women, and mortality of no more than 2.5 per 100,000 women in the New Zealand population[1].

Calculation

Registrations of cancer cases (by age, ethnicity, and histological type) over the period 2006 to 2012 were obtained from the New Zealand Cancer Registry (data extracted May 2013). 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 midpoint 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 B – *Population data*). 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 2012, and therefore age-standardised incidence rates were calculated for each year over the period 2006 to 2012, and five-year age-specific averages for incidence by ethnicity were calculated over the period 2008 to 2012. The most recent mortality data available relates to 2010, however, and therefore age-

[1] These targets are age-standardised to the Segi population.

standardised mortality rates and age-specific averages for mortality by ethnicity were calculated over the period 2006 to 2010.

Results

Incidence

In 2012, there were 166 new diagnoses of cervical cancer, or an age-standardised rate of 6.2 new diagnoses per 100,000 women in the population (Table 1). 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 2012 cervical cancer incidence has declined from 10.5 to 6.2 per 100,000 for women of all ethnicities, and from 25.0 to 12.7 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. 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.

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 2006-2012, 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 (2008-2012), 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 (2008-2012), 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

The most recent mortality data available is for 2010. In 2010, there were 52 deaths due to cervical cancer, or an age-standardised rate of 1.7 cervical cancer deaths per 100,000 women in the population (Table 4). 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 2010 cervical cancer mortality has declined from 3.2 to 1.7 per 100,000 for women of all ethnicities, and from 10.3 to 3.3 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. 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 (2006-2010) 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)).

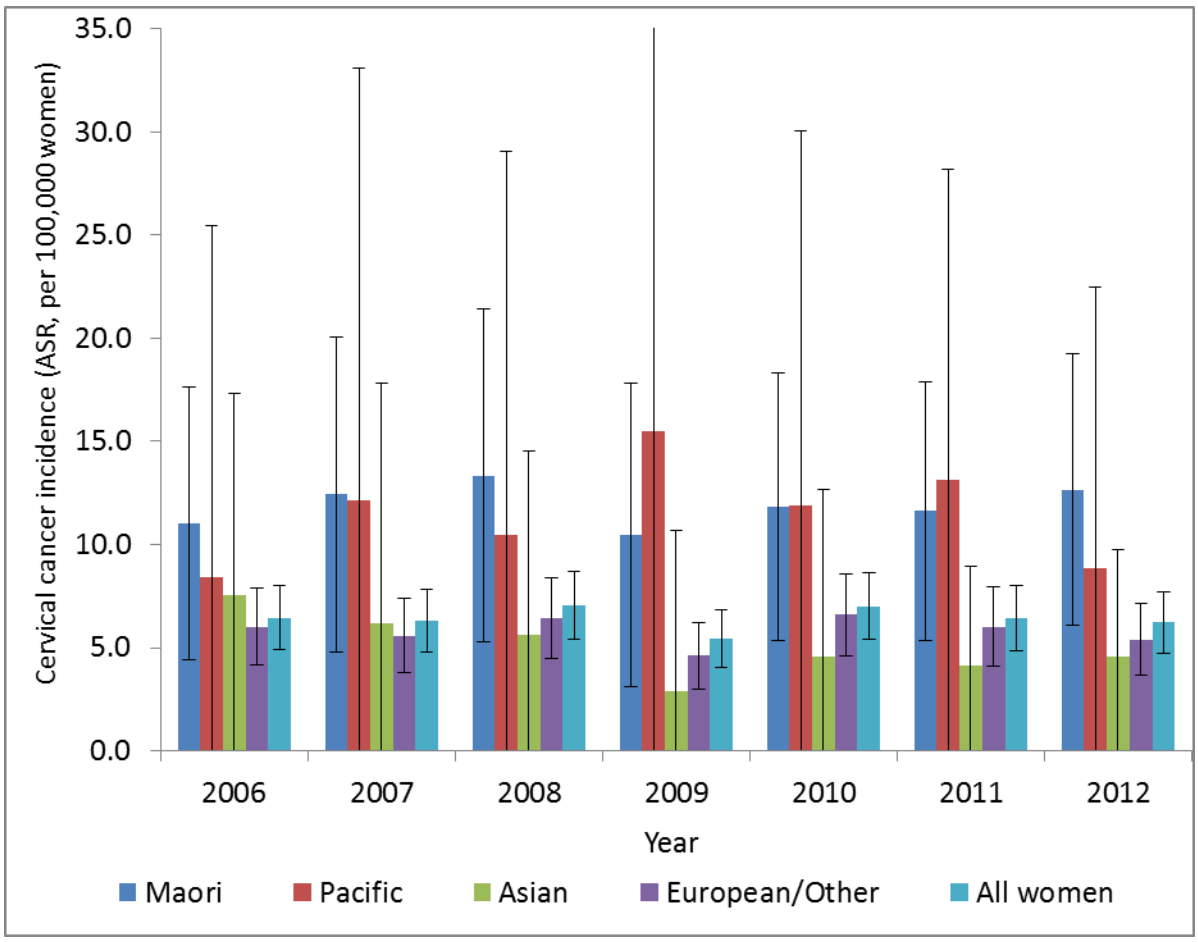
Comments

In this report incidence and mortality rates are standardised using the WHO Standard Population (see Appendix B – *Population data*), 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.

Consistent with other statistical data, the rates of cervical cancer incidence and mortality are expressed per 100,000 women in the population. The population is not adjusted to take into account hysterectomy prevalence.

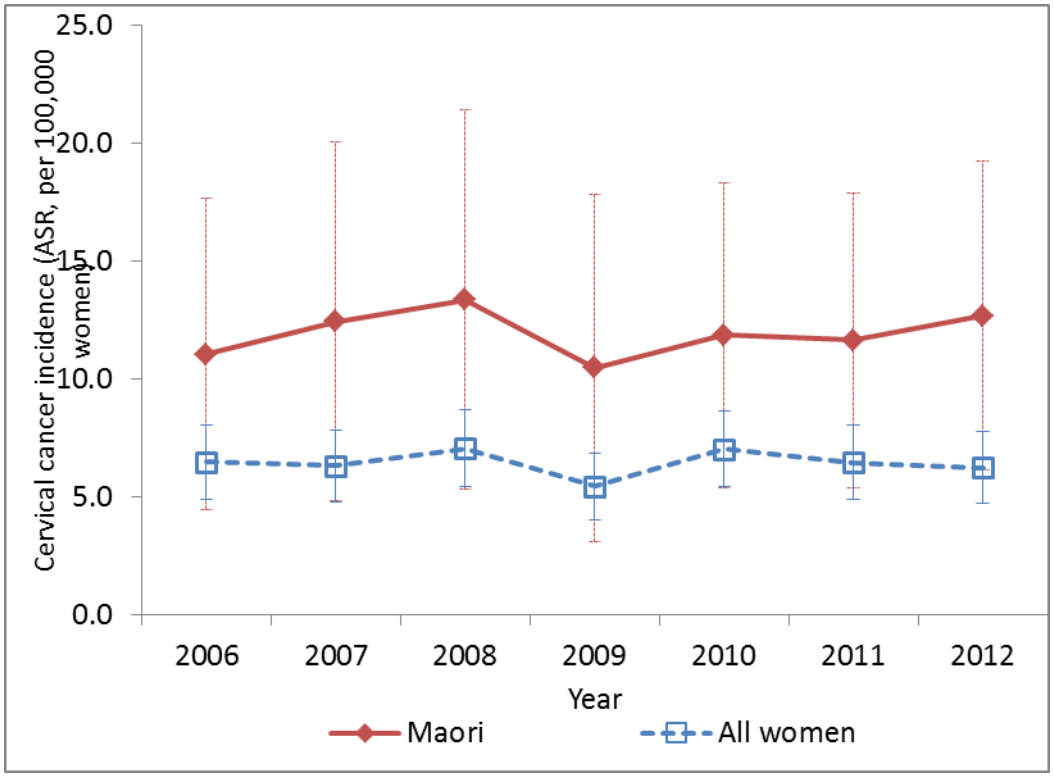
Figure 1 – Age-standardised cervical cancer incidence rates, 2006 to 2011, by ethnicity

a) All ethnic groups



Vertical bars represent 95% confidence intervals

b) Māori women, compared to All women



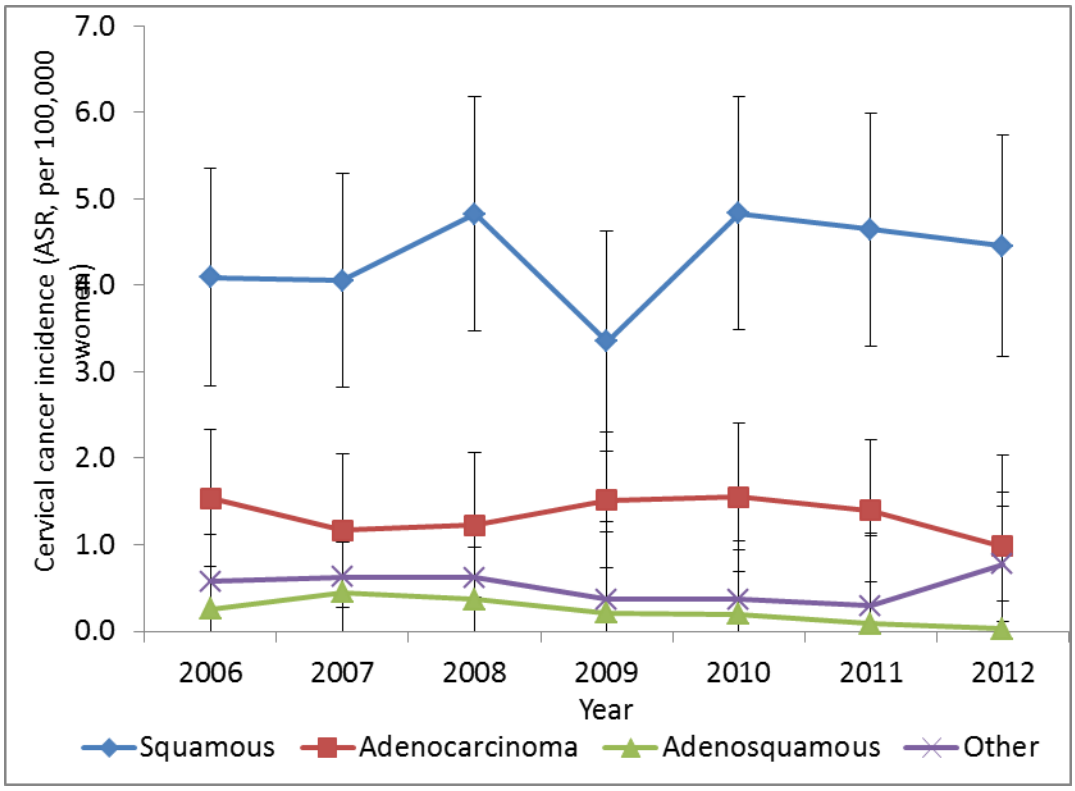
Vertical bars represent 95% confidence intervals

Table 1 – Cervical cancer incidence, 1996 to 2012, by ethnicity

	All women		Māori women		Pacific women		Asian women		European/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	6.5	28	11.0	10	8.4	15	7.6	106	6.0
2007	159	6.3	33	12.4	12	12.1	12	6.2	102	5.6
2008	174	7.0	37	13.4	12	10.5	13	5.6	112	6.4
2009	141	5.4	29	10.5	18	15.5	7	2.9	87	4.6
2010	179	7.0	36	11.8	14	11.9	12	4.6	117	6.6
2011	161	6.5	34	11.6	16	13.1	11	4.2	100	6.0
2012	166	6.2	40	12.7	11	8.8	12	4.6	103	5.4

† 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 "European/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 2012, by histological type



Vertical bars represent 95% confidence intervals

Table 2 – Cervical cancer incidence (per 100,000 women), 2006 to 2012, by histological type

	Squamous		Adenocarcinoma		Adenosquamous		Other	
Year	**N**	**Rate***	**N**	**Rate***	**N**	**Rate***	**N**	**Rate***
2006	100	4.1	36	1.5	7	0.3	16	0.6
2007	101	4.1	30	1.2	11	0.4	17	0.6
2008	120	4.8	30	1.2	8	0.4	16	0.6
2009	86	3.4	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
2012	116	4.5	26	1.0	1	<0.05	23	0.8

* Per 100,000 women, age-standardised to the WHO population (all ages)

Figure 3 – Five-year average cervical cancer incidence rates (2008-2012), by age

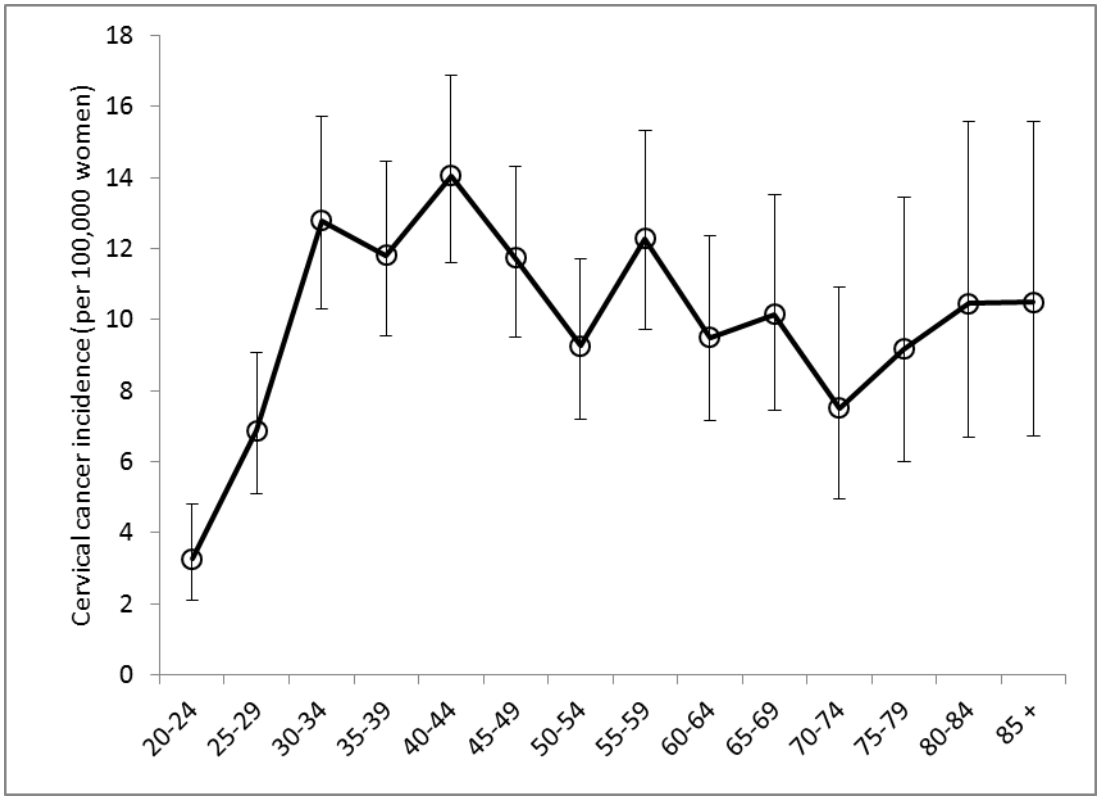
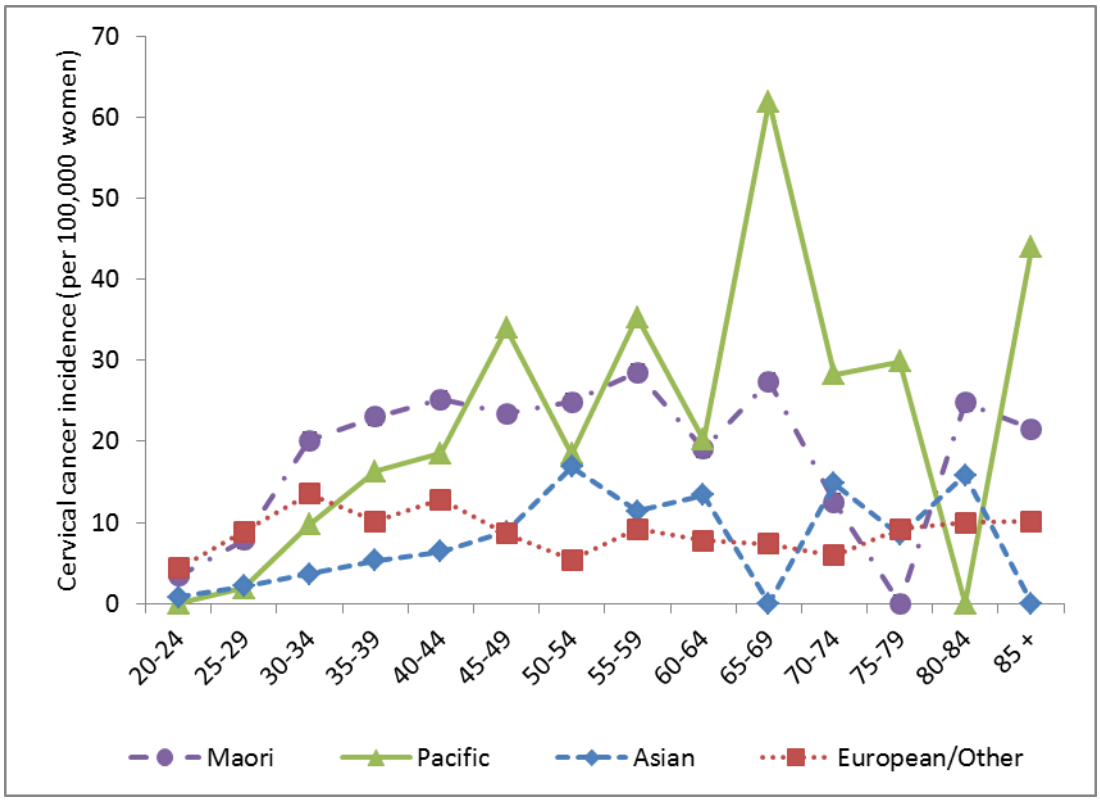
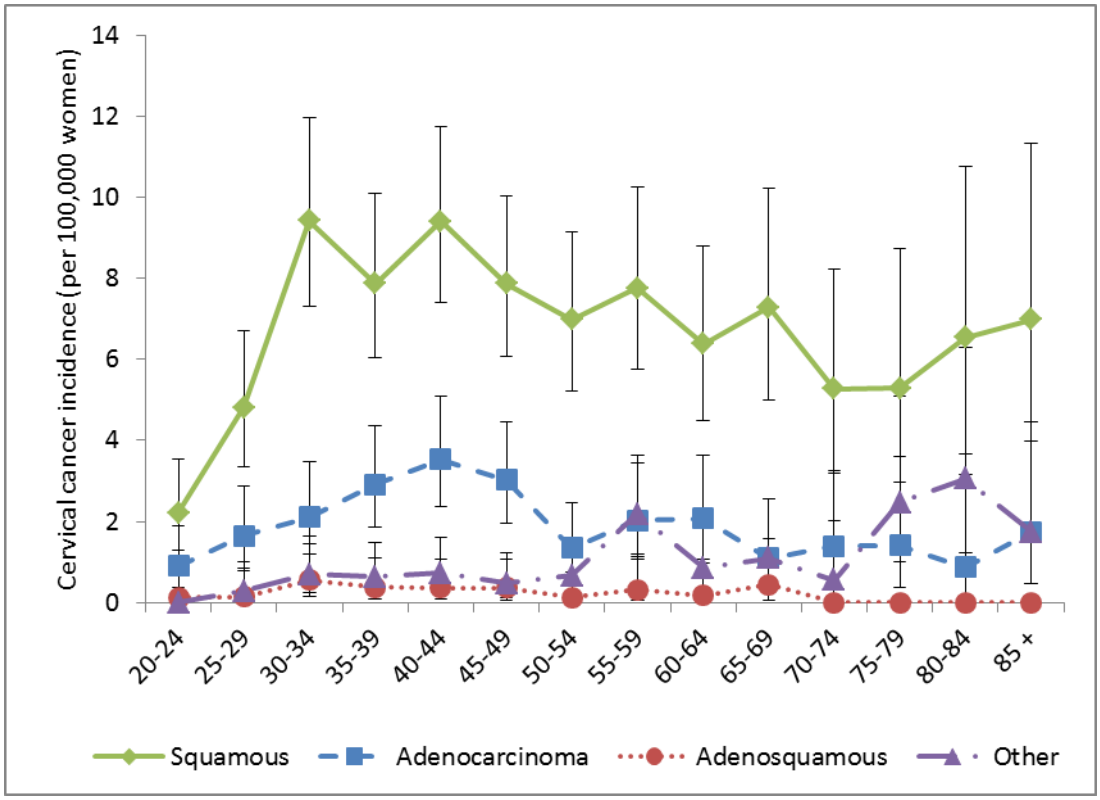


Figure 4 – Five-year average cervical cancer incidence rates (2008-2012), by age and ethnicity



Note that no cases were observed in Māori women aged 75-79 years, in Pacific women aged 20-24 years, and 80-84 years, or in Asian women aged 65-69 years or 85+ years over this time period. See also Table 3.

Figure 5 – Five-year average cervical cancer incidence rates (2008-2012), by age and histological type



Vertical bars represent 95% confidence intervals

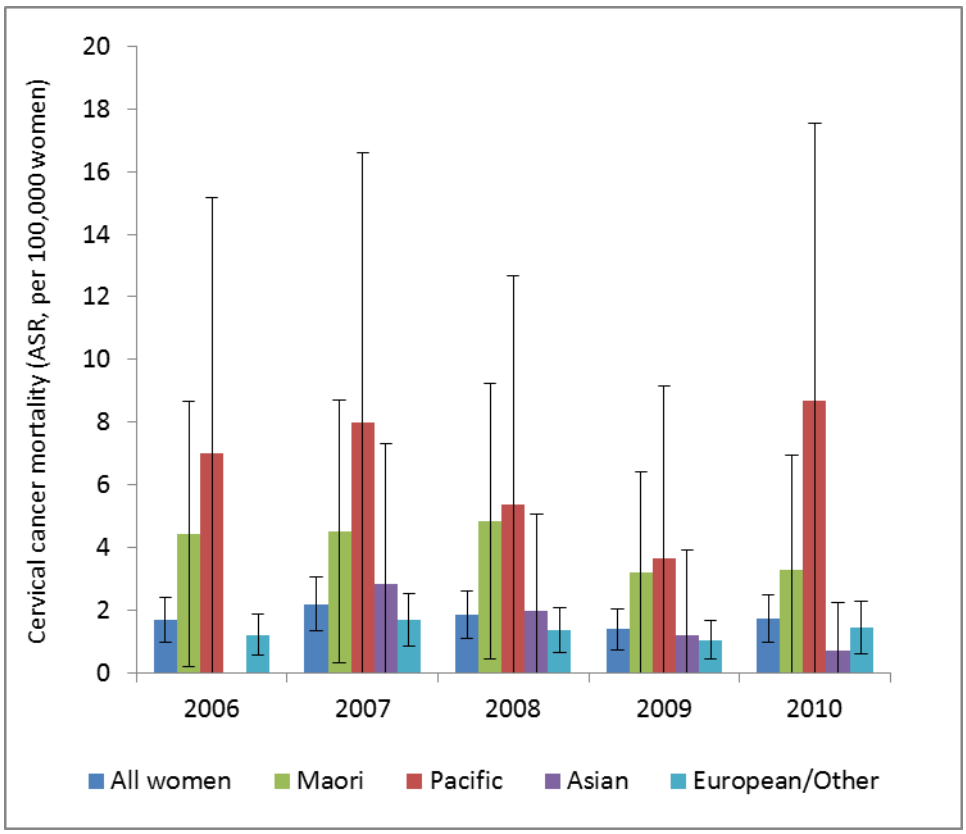
Table 3 – Five-year average cervical cancer incidence (2008-2012), by age and ethnicity

	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	3.3	(2.1 - 4.8)	3.4	(1.1 – 8.0)	-	-	0.8	(0.0 - 4.5)	4.4	(2.6 - 6.8)
25-29	6.9	(5.1 - 9.1)	7.8	(3.6 - 14.8)	1.9	(0.1 - 10.7)	2.1	(0.4 - 6.2)	8.9	(6.2 - 12.2)
30-34	12.8	(10.3 - 15.7)	20.1	(12.6 - 30.5)	9.8	(3.2 - 22.8)	3.7	(1.0 - 9.4)	13.6	(10.4 - 17.5)
35-39	11.8	(9.5 - 14.5)	23.0	(15.0 - 33.7)	16.3	(7.0 - 32.2)	5.3	(1.7 - 12.4)	10.2	(7.6 - 13.3)
40-44	14.1	(11.6 - 16.9)	25.2	(16.6 - 36.7)	18.6	(8.5 - 35.2)	6.4	(2.4 - 13.9)	12.8	(10.1 - 16.1)
45-49	11.7	(9.5 - 14.3)	23.4	(15.0 - 34.9)	34.0	(18.6 – 57.0)	8.9	(3.8 - 17.5)	8.6	(6.4 - 11.3)
50-54	9.3	(7.2 - 11.7)	24.9	(15.4 - 38)	18.4	(6.8 - 40.1)	16.9	(8.7 - 29.4)	5.4	(3.6 - 7.7)
55-59	12.3	(9.7 - 15.3)	28.5	(16.9 - 45.1)	35.4	(16.2 - 67.1)	11.4	(4.2 - 24.9)	9.2	(6.7 - 12.2)
60-64	9.5	(7.2 - 12.4)	19.1	(8.7 - 36.2)	20.2	(5.5 - 51.7)	13.4	(4.4 - 31.3)	7.8	(5.5 - 10.7)
65-69	10.1	(7.4 - 13.5)	27.4	(12.5 - 52.1)	62.0	(28.3 - 117.7)	-	-	7.4	(4.9 - 10.7)
70-74	7.5	(4.9 - 10.9)	12.5	(2.6 - 36.7)	28.3	(5.8 - 82.6)	14.8	(3.1 - 43.4)	5.9	(3.5 - 9.3)
75-79	9.2	(6.0 - 13.4)	-	-	29.9	(3.6 – 108.0)	8.5	(0.2 - 47.2)	9.2	(5.8 - 13.8)
80-84	10.5	(6.7 - 15.6)	24.8	(3.0 - 89.5)	-	-	15.8	(0.4 - 88.2)	9.9	(6.2 - 15.2)
85 +	10.5	(6.7 - 15.6)	21.5	(0.5 - 119.8)	44.0	(1.1 - 244.9)	-	-	10.1	(6.3 - 15.3)

'-' indicates no cases recorded

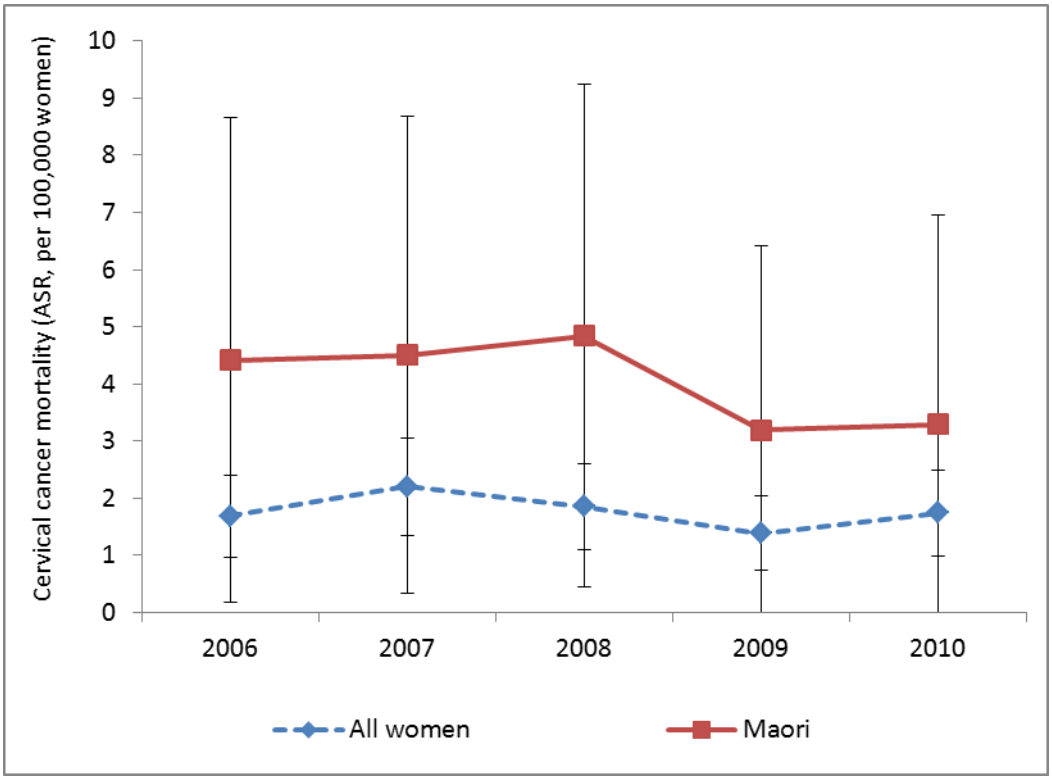
Figure 6 – Age-standardised cervical cancer mortality rates, 2006 to 2010, by ethnicity

a) All ethnic groups



Vertical bars represent 95% confidence intervals. Note: no deaths were recorded for Asian women in 2006

b) Māori women, compared to All women



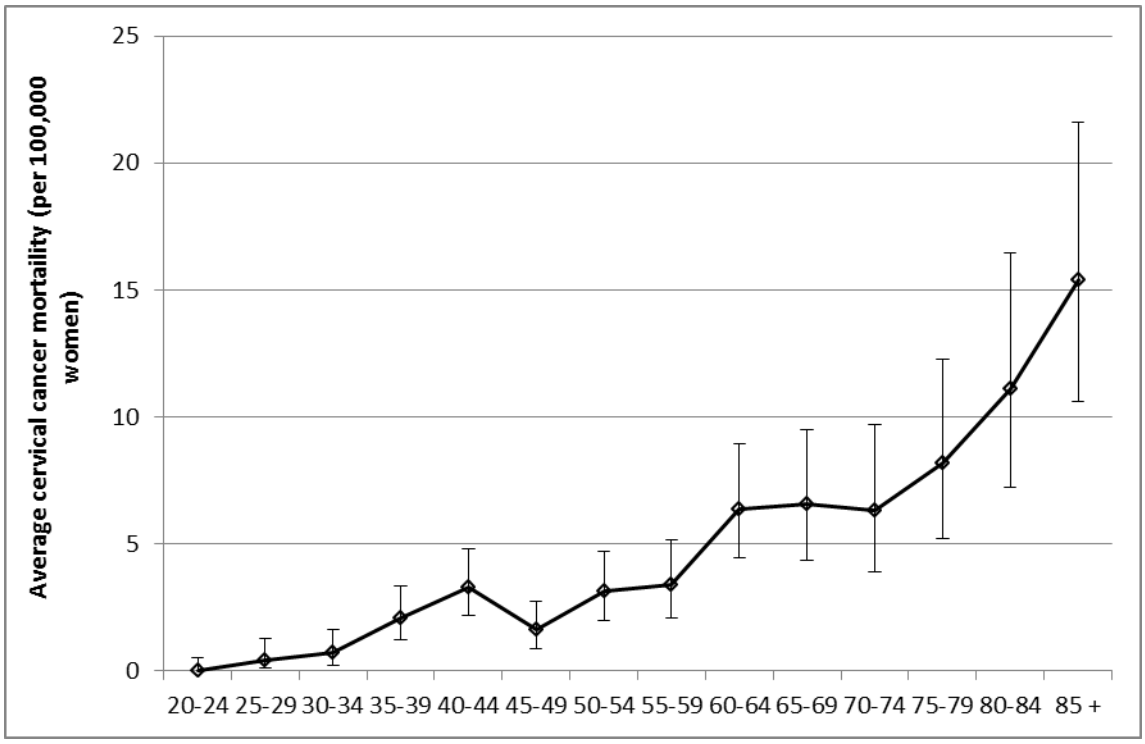
Vertical bars represent 95% confidence intervals

Table 4 – Cervical cancer mortality, 1998 to 2010, by ethnicity

	All women		Māori women		Pacific women		Asian women		European/ 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	4.4	7	7.0	0	0.0	35	1.2
2007	65	2.2	11	4.5	8	8.0	4	2.8	42	1.7
2008	59	1.9	12	4.8	5	5.4	4	2.0	38	1.4
2009	44	1.4	9	3.2	4	3.6	2	1.2	29	1.0
2010	52	1.7	8	3.3	9	8.7	2	0.7	33	1.4

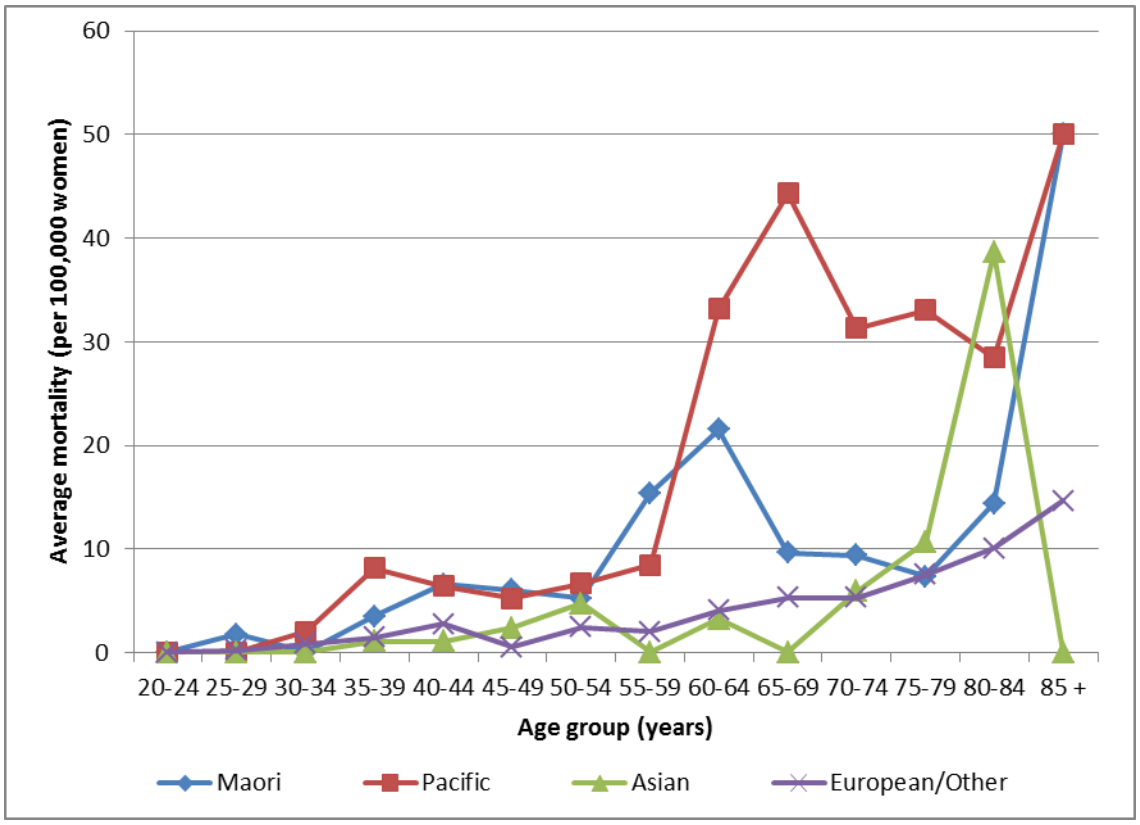
† Deaths and rates for 1998-2004 sourced from *Cancer: New Registrations and Deaths, 2007.(4)* Deaths and rates for 2005 sourced from *National Cervical Screening Programme Annual Monitoring Report 2008-2009.(5)* Separate data on deaths in Pacific women were sourced from *National Cervical Screening Programme Annual Monitoring Report 2006.(6)* § Counts and rates for "European/ 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 (2006-2010), by age



Vertical bars represent 95% confidence intervals. See also Table 5.

Figure 8 – Average* cervical cancer mortality rates (2006-2010), by age and ethnicity



Note that no deaths were recorded in Māori women aged 20-24 years or 30-34 years, in Pacific women aged 20-29 years, in Asian women aged 20-24 years, or in European/ Other women aged 20-24 years over this time period. See also Table 5.

Table 5 – Average cervical cancer mortality (2006-2010), by age

	All women		Māori women	
Age	**Rate**	**(95%CI)**	**Rate**	**(95%CI)**
20-24	-	(0 - 0.5)	-	(0 – 2.7)
25-29	0.4	(0.1 - 1.3)	1.8	(0.2 - 6.3)
30-34	0.7	(0.2 - 1.6)	0.0	(0 - 3.3)
35-39	2.1	(1.2 - 3.4)	3.5	(1.0 – 9.0)
40-44	3.3	(2.2 - 4.8)	6.6	(2.7 - 13.7)
45-49	1.6	(0.9 - 2.7)	6.0	(2.2 - 13.1)
50-54	3.1	(2.0 - 4.7)	5.2	(1.4 - 13.4)
55-59	3.4	(2.1 - 5.2)	15.4	(7 - 29.3)
60-64	6.4	(4.4 - 8.9)	21.5	(9.8 - 40.9)
65-69	6.6	(4.4 - 9.5)	9.6	(2 - 28.1)
70-74	6.3	(3.9 - 9.7)	9.4	(1.1 - 33.9)
75-79	8.2	(5.2 - 12.3)	7.4	(0.2 – 41.0)
80-84	11.1	(7.2 - 16.4)	14.4	(0.4 - 80.4)
85 +	15.4	(10.6 - 21.6)	50.0	(6.1 - 180.6)

'-' indicates no cases recorded

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

80% 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 (2008-2012). 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 March 2014) contained ethnicity codes for approximately 98% 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 2012 for women aged 25-29 years refers to women aged 25-29 years on 31 December 2012, with a screening event in the three-year period 1 January 2010 to 31 December 2012. Similarly, the hysterectomy adjustor used relates to the end of the three-year period over which coverage is measured (2012 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 815,596 in 2008, to 872,210 in 2012 (Table 6). As of 31 December 2012, 76.7% of eligible women aged 25-69 years had been screened in the previous three years (Table 6).

Estimated coverage varied by ethnicity (Figure 9, Figure 10, Table 6). The coverage target of 80% was met in European/ Other women throughout the five-year period (2008-2012), but was not met in any year during this period for Māori, Pacific, or Asian women, or nationally. Coverage has increased in Māori, Pacific and Asian women over the five-year period, and has remained broadly similar across the five years in European/ Other women (Figure 9, Table 6). The increase was greatest among Pacific women (from 63.1% in 2008 to 69.5% in 2012). As a result, the disparity between the groups with the highest and lowest coverage has narrowed from a difference of 24.5% in 2008 (between Asian and European/ Other), to a difference of 19.2% in 2012 (between Māori and European/ Other)(Figure 10, Table 6).

Estimated coverage also varies by age (Figure 11, Table 7). The 80% target was met in four age groups in 2012 (the five-year age groups between 40-59 years), and coverage in these age groups has been close to or met the target over the past five years. Coverage has been consistently increasing in the previous five years among women aged 60-64 and 65-69 years. Coverage has not increased in younger women aged less than 35 years however. In women aged 20-24 years, there has been little change in coverage over the five years, while in women aged 25-29 and 30-34 years coverage has been decreasing (Figure 11). Considering coverage in women eligible for screening throughout the full three years (women aged between 25-69 years at the end of the period), the disparity in coverage between age groups with the highest and lowest coverage has widened, from a difference of 12.8% in 2008 (between women aged 65-69 years and women aged 45-49 years) to a difference of 14.9% in 2012 (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.

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.

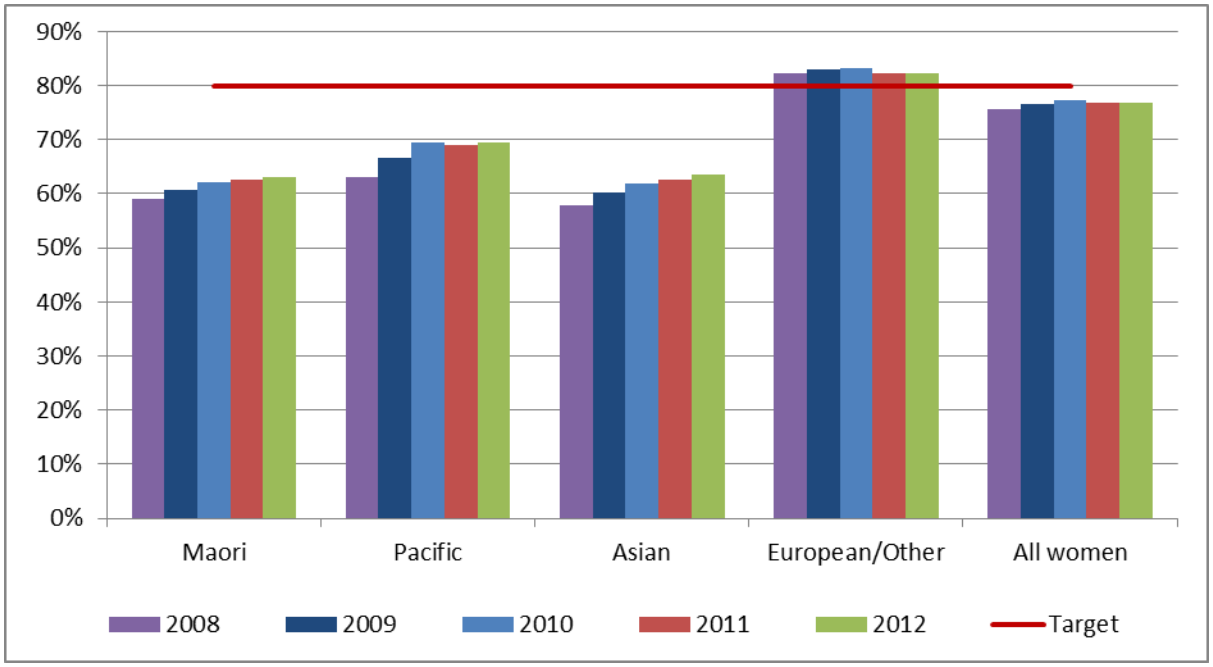
Until monitoring report 30 (1 July to 31 December 2008), coverage was calculated for women aged 20 – 69 years at the end of the monitoring period. However this includes some younger women who were not eligible for screening for the entire three years because those aged 22 or less at the end of the three 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.

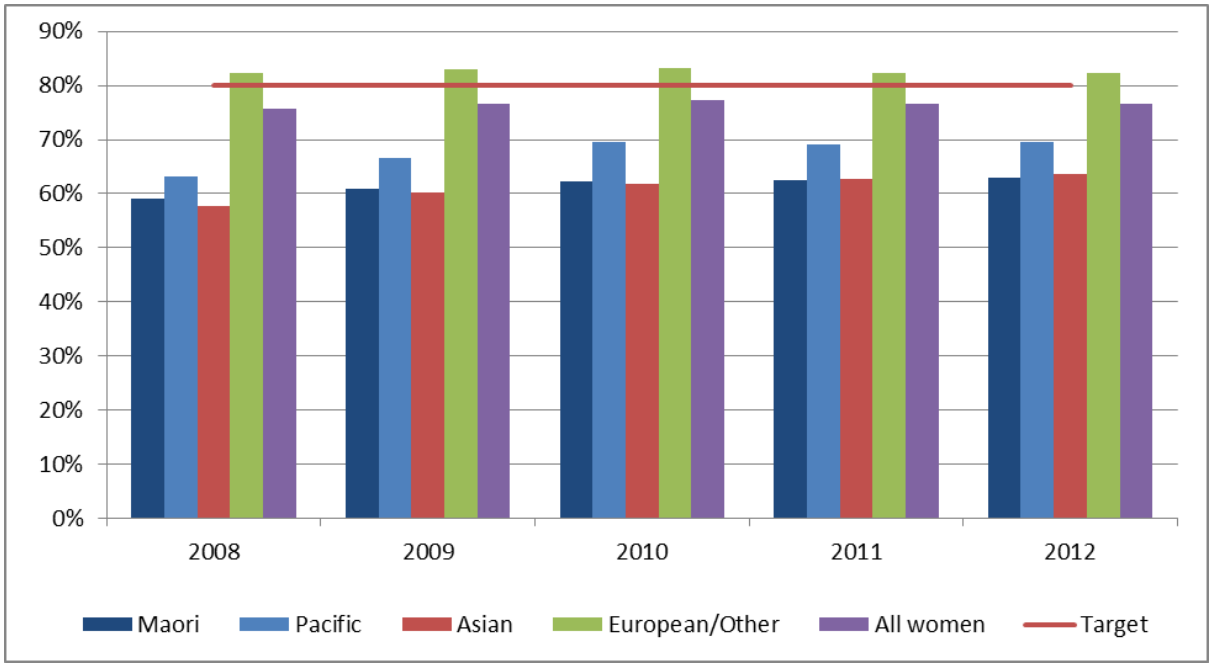
As with all indicators, coverage indicators and the statistics on which they are based continue to evolve and further changes in the construction of these indicators are to be expected in the future. Changes currently in progress include better methods for hysterectomy adjustment and ethnicity identifications.

Figure 9 – Percentage* of women aged 25-69 years screened in the previous three years, 2008 to 2012, 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.

Figure 10 – Percentage* of women aged 25-69 years screened in the previous three years, by year and ethnicity



Attendance is within the three year period ending on 31 December of the year indicated. * 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, 2008 to 2012, by ethnicity

	2008		2009		2010		2011		2012	
Ethnicity	**N**	**%***	**N**	**%***	**N**	**%***	**N**	**%***	**N**	**%***
Māori	80,235	59.2	83,699	60.8	87,000	62.2	88,909	62.5	91,254	63.0
Pacific	36,680	63.1	39,635	66.7	42,218	69.5	42,942	69.1	44,182	69.5
Asian	69,827	57.8	76,519	60.2	82,232	61.9	86,686	62.7	91,350	63.7
European/ Other	628,854	82.3	638,717	83.0	645,405	83.1	643,537	82.4	645,424	82.2
All women	**815,596**	**75.6**	**838,570**	**76.7**	**856,855**	**77.2**	**862,074**	**76.7**	**872,210**	**76.7**

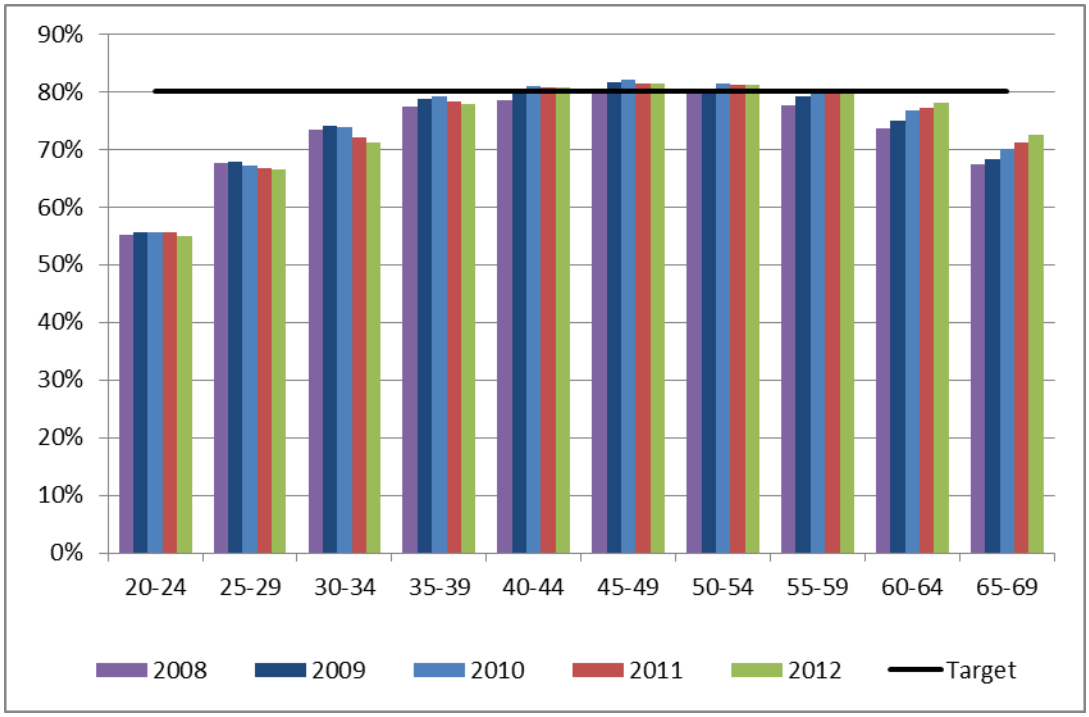
* As a percentage of the hysterectomy-adjusted population (ages 25-69 years) in that year, based on projections from 2006 census population to the end of the relevant calendar year and hysterectomy prevalence estimates relating to the end of the relevant calendar year.

Table 7 – Women screened in the previous three years, 2008 to 2012, by 5-year age group

	2008		2009		2010		2011		2012	
Age group	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
20-24	80,492	55.3	82,950	55.7	85,098	55.6	87,064	55.6	87,423	54.9
25-29	94,214	67.8	96,910	67.9	98,306	67.3	98,786	66.6	99,382	66.6
30-34	100,836	73.4	101,669	74.1	102,517	73.8	102,103	72.1	102,913	71.1
35-39	120,210	77.4	120,767	78.9	118,597	79.2	113,738	78.2	110,322	77.9
40-44	117,799	78.5	120,023	79.9	122,933	81.0	123,882	80.7	124,403	80.7
45-49	116,254	80.2	119,649	81.6	120,477	82.0	118,937	81.4	118,000	81.4
50-54	92,811	79.7	97,269	80.5	102,154	81.4	105,890	81.3	109,550	81.3
55-59	73,612	77.7	76,913	79.2	80,282	80.2	83,073	80.1	86,635	80.6
60-64	58,808	73.7	62,623	75.0	66,615	76.7	68,216	77.1	69,510	78.0
65-69	41,052	67.4	42,747	68.3	44,974	70.2	47,449	71.2	51,495	72.5

* 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 11 – Percentage of women* screened in the previous three years, 2008 to 2012, 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.

Regularity of Screening

Definition

Women aged 20-69 years are recommended to attend for cervical screening every three years, or more frequently if they have had a recent abnormality. In addition to coverage, regularity of screening is reported on in order to characterise other aspects of screening attendance, such as patterns of early re-screening, on-time screening, and late re-screening.

Target

None yet defined.

Calculation

In this report, regularity of screening focuses on attendance patterns in women in routine screening – that is, women whose most recent cytology test was negative and associated with a recommendation to return at the regular interval of three years. The cumulative proportion of women who return over time since their previous negative cytology result is presented.

A routine screening cohort was defined, which comprised women with a cytology sample taken between 1 January 2007 – 31 December 2007 (inclusive), who i) were aged 20 – 65 years at the time the sample was taken (and so remain in the target age range for screening throughout the five years of follow-up); and ii) were given a recommendation to return at the regular interval of three years as a result of their smear in 2007 (i.e. code B2B0 or NZ Modified Bethesda code R1). The recommendation code is used in conjunction with the cytology result when defining the cohort in order to exclude women who are being followed up more frequently in accordance with the Guidelines for Cervical Screening in New Zealand (for example, those with a recent report of an abnormality). The cumulative proportion of these women who return over five years of follow-up is calculated. Women are excluded from the count of those re-attending, however, if their first test is associated with a recommendation to be referred regardless of cytological findings due to abnormal clinical history provided (NZ Modified Bethesda code R14). This was done in order to exclude women re-attending due to symptoms.

A similar analysis was also performed for a routine screening cohort who had their negative index cytology test in 2001. This was done in order to examine screening attendance patterns over the longer term (up to ten years), and also to assess if there were any differences in screening patterns over time.

For the purposes of analysis by age group, a woman's age is defined as her age on 31st December 2007 for the 2007 routine screening cohort, or 31st December 2001 for the 2001 routine screening cohort.

Correcting for women who did not attend screening due to reasons other than non-compliance

Some women will not re-attend screening for reasons other than non-compliance with recommendations – for example, women may leave New Zealand, have a hysterectomy, or die. In order to take this into account in the estimates for regularity of screening, an approach was taken to estimate the extent of non-return due these kinds of reasons. This was done by considering a sub-cohort of women in each of the 2007 and 2001 cohorts who have a strong screening history (i.e. women with a history of good compliance with recommendations). We assumed that if these well-screened women did not return for a screening test, then it was due to reasons other than non-compliance. The proportion of women with a strong screening history who did not re-attend within five years of their previous test was then used as an estimate of the proportion of all women who did not re-attend for screening due to a reason other than non-compliance (for example, migration, hysterectomy, death). The rate of non-return in this well-screened cohort is referred to as the rate of censoring. Not taking the rate of censoring into account could result in underestimates of the rates of re-attending for screening. In order to test the validity of this approach, we also compared observed coverage in New Zealand with estimates made using the results of this analysis, with and without accounting for censoring, in order to see which set was more consistent with the observed data.

For the purposes of this estimate, women were regarded as having a strong screening history if they had been screened at least once every three years since their twentieth birthday. As the NCSP Register started in full in 1995, complete screening data are not available on the NCSP Register for women born prior to 1975. Therefore, for these women, a strong screening history was defined as having had five or more tests on the NCSP Register, with each test at most three years apart. We did not classify anyone aged less than 25 years of age as having a strong screening history because we considered that they had not spent long enough in the screening program to be accurately identified as a regular screener. We also did not consider women aged 65 years or older, because they may additionally have not returned because they had been discharged from the NCSP.

Results

There were 206,000 women aged 20-65 years who had a negative screening test result in 2007and a recommendation to return at the routine screening interval of three years (2007 routine screening cohort). A total of 114,000 of these women fit the definition of having a strong screening history (55% of all women in the routine screening cohort). Unadjusted estimates of the number and proportion of women re-attending over time are shown in Table 21 for the 2007 routine screening cohort, and also the well-screened sub-cohort (ie these figures do not take into account censoring, but are used to estimate censoring). Using estimates of rates of censoring from the well-screened sub-cohort produced estimates of coverage which more closely matched observed data than estimates of coverage which did not take into account censoring (see Figure 21, *Appendix A – Additional data tables*); therefore the following results all take into account censoring using the estimates from the well-screened sub-cohort.

Patterns in the regularity of screening by screening year

Figure 12 shows the cumulative probability of re-attending for screening for women in the 2007 and 2001 routine screening cohorts, after adjusting for censoring (ie women who do not return for other reasons). The pattern which would be seen if there were perfect compliance with a recommendation to return in three years is also shown on the chart, as a comparison.

In 2007, a lower proportion of women screened prior to the recommended three years when compared to 2001 (cumulative percentage of returning within two years was 28% in 2007 compared to 38% in 2001), indicating that early re-screening was less common in the 2007 routine screening cohort than the 2001 routine screening cohort. The cumulative probability of re-attending within five years was higher in the 2007 routine screening cohort than in the 2001 routine screening cohort (93% versus 89%). It took seven years for the cumulative probability of re-screening in the 2001 routine screening cohort to reach the level of re-attendance seen within five years for the 2007 routine screening cohort. Thus, compliance with the recommended interval of three years was higher for women in the 2007 routine screening cohort than in the 2001 routine screening cohort, including both higher on-time screening and less early re-screening. The plot for the 2007 routine screening cohort has moved closer to the theoretical pattern which would be seen if compliance were perfect.

Figure 13 shows the probability of re-attending for screening at each year (interval-specific probability of re-attending) since the woman had a negative screening test in 2001 or 2007. The peak time for re-attending was at three and four years after the woman's negative cytology test.

Age-specific patterns

The cumulative proportion of women re-attending over time is shown by broad age group in Figure 15, for the 2007 routine screening cohort. Women aged 50-64 years were more likely to attend within three years of their last negative test than women aged 20-29 years (an age-standardised cumulative probability of 72% in women aged 50-64 versus 65% in women aged 20-49). However, by five years after the negative cytology, the cumulative probabilities of re-attending for screening were similar in the two age groups (96% in women aged 50-64 versus 92% in women aged 20-49). The probability of re-attending was very similar in the two age groups in the first and second year after a negative cytology test, but older woman (50-64 years) were more likely to re-attend in years three and four than younger women (ages 20-49 years) (Figure 15). Re-attendance in the fifth year was again similar between the two age groups.

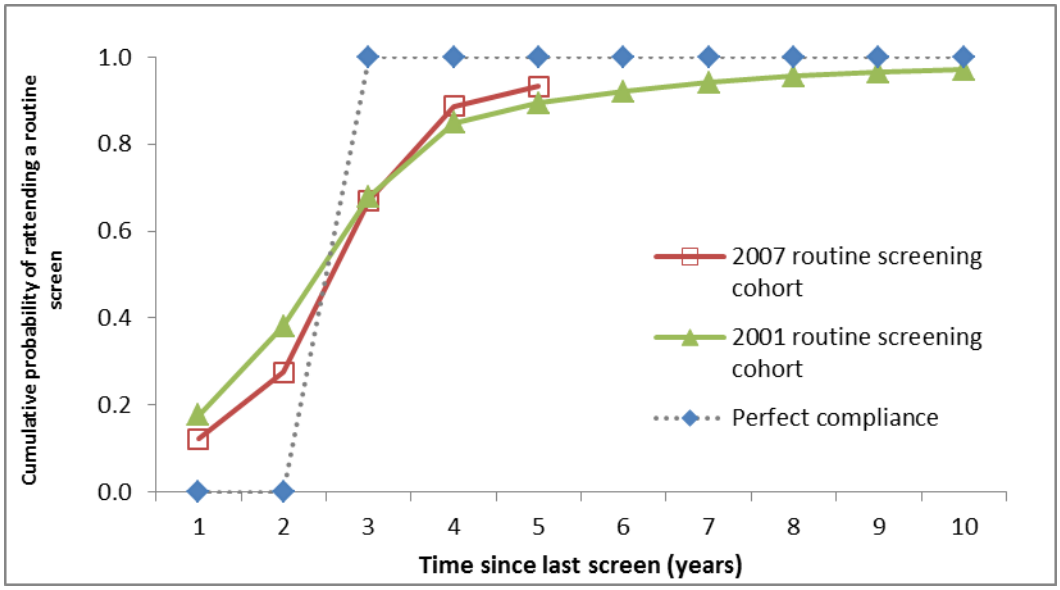
Similar age-related patterns between these two age-groups were observed in the 2001 routine screening cohort (data not shown).

More detailed age-specific data for the cumulative proportion of women re-attending over time are shown in Table 8 (for the 2007 routine screening cohort) and Table 9 (for the 2001 routine screening cohort, and for up to ten years after a negative cytology result).

Comments

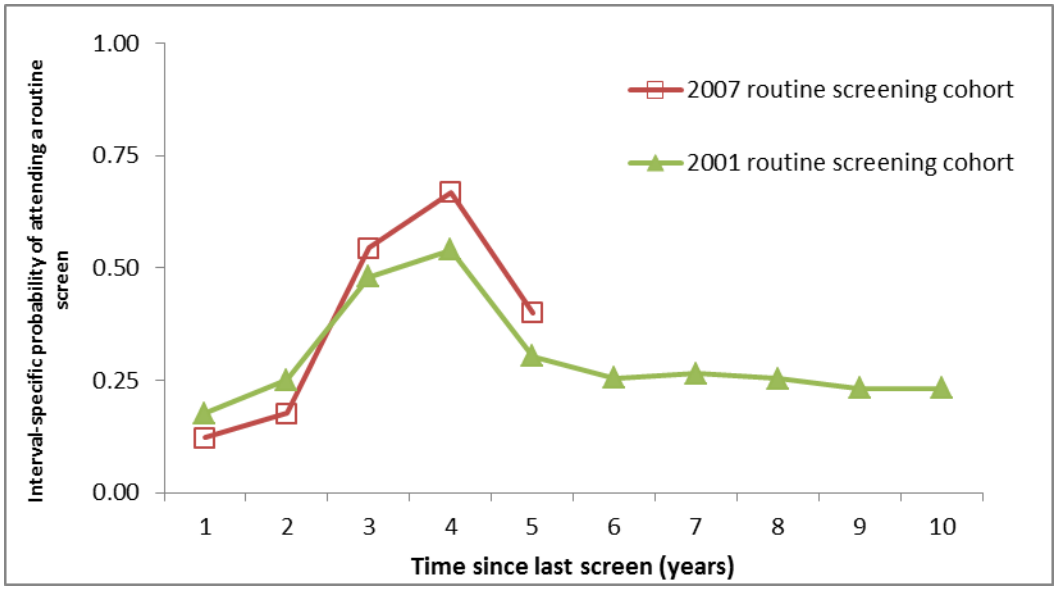
This analysis only includes women enrolled on NCSP Register and so represents screening behaviour in women who have attended cervical screening at least once.

Figure 12: Cumulative probability of re-attending for a routine screening test, by time since a negative cytology test (age-standardised)



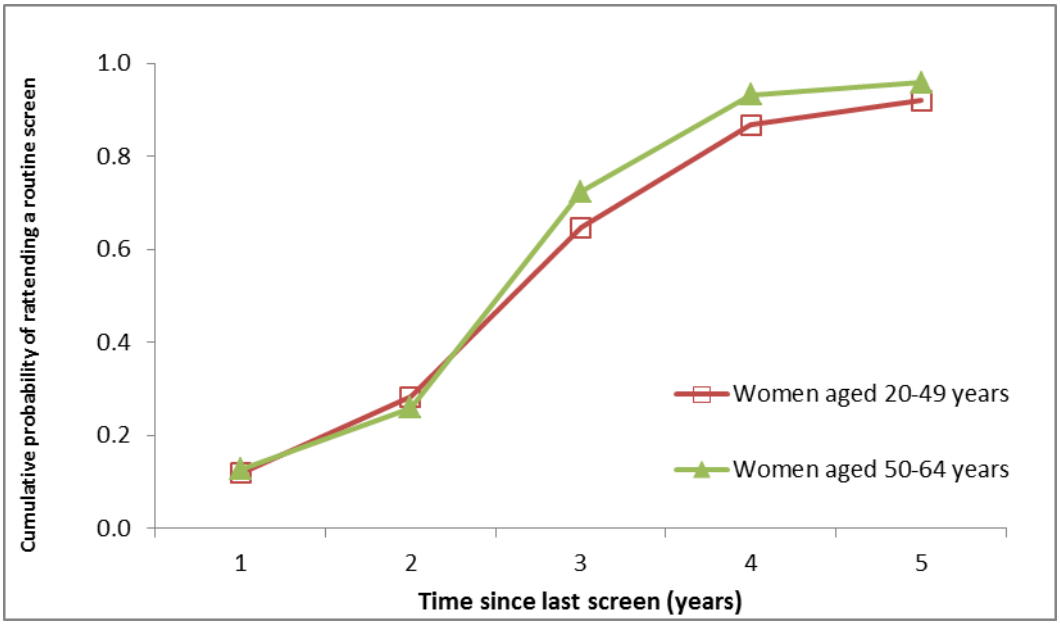
Age standardised, using 2012 New Zealand female population. Perfect compliance assumes that all women return at exactly three years; it is shown on this chart for comparative purposes.

Figure 13: Probability of re-attending for a routine screening test by time since a negative routine test (age-standardised)



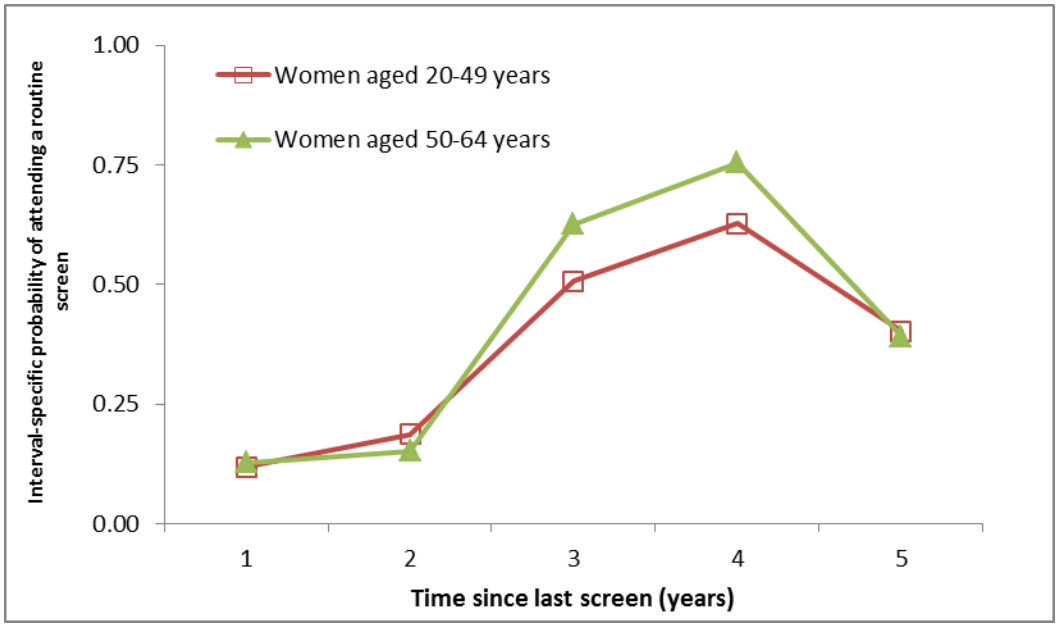
Age standardised, using 2012 New Zealand female population

Figure 14: Cumulative proportion of women re-attending for screening after a negative test in 2007, by age*



Age standardised within broader age groups, using 2012 New Zealand female population

Figure 15: Interval-specific probability of women re-attending for screening after a negative test in 2007, by age



Age standardised, using the 2012 New Zealand female population

Table 8 – Cumulative probability of re-attending for screening in the 2007 routine screening cohort of women, by age and time since last negative cytology

Age group	Time since last negative cytology (years)				
	1	**2**	**3**	**4**	**5**
20-24	14%	34%	67%	83%	88%
25-29	11%	27%	60%	83%	90%
30-34	10%	26%	61%	85%	92%
35-39	10%	26%	64%	88%	93%
40-44	12%	28%	67%	90%	94%
45-49	13%	28%	68%	91%	95%
50-54	14%	28%	71%	92%	95%
55-59	13%	26%	73%	93%	96%
60-64	11%	23%	74%	94%	96%
65-69	10%	20%	72%	92%	94%
ASR (20-64)	*12%*	*28%*	*67%*	*89%*	*93%*

Age standardised, using the 2012 New Zealand female population

Table 9 – Cumulative probability of the 2001 cohort of women re-attending for screening, by age and time since last screen

Age group	Time since last negative cytology (years)									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
20-24	20%	44%	65%	78%	84%	88%	93%	97%	99%	100%
25-29	17%	37%	61%	77%	82%	86%	88%	90%	92%	92%
30-34	17%	39%	65%	82%	88%	91%	93%	94%	95%	95%
35-39	17%	38%	67%	85%	90%	92%	95%	96%	97%	98%
40-44	17%	38%	68%	87%	91%	94%	95%	97%	97%	98%
45-49	19%	39%	70%	88%	92%	94%	96%	97%	98%	98%
50-54	20%	39%	72%	89%	93%	95%	96%	97%	98%	98%
55-59	17%	36%	72%	90%	93%	95%	96%	97%	97%	98%
60-64	14%	31%	72%	89%	92%	94%	95%	96%	96%	97%
65-69	12%	27%	68%	87%	89%	91%	92%	93%	94%	94%
ASR (20-64)	*18%*	*38%*	*68%*	*85%*	*89%*	*92%*	*94%*	*96%*	*97%*	*97%*

Age standardised, using the 2012 New Zealand female population

Programme statistics

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 2012 were retrieved from the NCSP Register.

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.

The number of cytology tests processed by each laboratory is based all cytology samples which were reported on during 2012.

Results

During 2012 there were 418,607 women who has a cytology sample collected, 408,768 of whom were aged 20-69 years at the end of 2012. Results for these women are shown in Table 7 (overall) and by five-year age group in Table 11.

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 23.0 per 1,000 women screened (women aged 40-44 years) to 104.3 per 1,000 women screened (women aged 20-24 years) in 2012. 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 11.1 per 1,000 women screened (women aged 65-69 years) to 19.8 per 1,000 women screened (women aged 45-49 years) in 2012.

In 2012 the rate of women with negative cytology ranged from 810.8 per 1,000 women screened (women aged 20-24 years) to 949.2 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.

In total, laboratories processed 434,785 cytology samples in 2012. The number of cytology tests reported on by each laboratory processing cytology tests is reported on in Table 12. Laboratories generally met the recommended minimum volume of at least 15,000 specimens processed each year. Medlab South Christchurch did not reach this volume in 2012 however it did not report on cytology for the full year (ceased reporting after June 2012).

Table 10 – Overall cytology case reporting and rates per 1,000 women screened, 2012

Cytology result	2012		
	Total cases (20-69 yrs)	Crude rate (20-69 yrs)	ASR (20-69 yrs)
Negative	378,430	910.6	905.8
ASC-US	9,455	22.8	23.7
LSIL	14,368	34.6	37.7
ASC-H	2,556	6.2	6.7
HSIL	3,555	8.6	9.5
Invasive SCC	21	0.1	<0.05
AGC/AIS	324	0.8	0.8
Adenocarcinoma	53	0.1	0.1
Malignant neoplasm	6	<0.05	<0.05
Total	**408,768**		

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

Table 11 - Age-specific cytology case reporting and rates, per 1,000 women screened (aged 20-69 years), 2012

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	39,600	810.8	37,922	865.7	40,694	908.4	43,578	924.1	48,902	929.4	45,980	930.8	42,646	938.8	33,679	944.4	26,432	949.2	18,997	948.9
ASC-US	2,111	43.2	1,401	32.0	1,072	23.9	975	20.7	1,039	19.7	979	19.8	809	17.8	525	14.7	322	11.6	222	11.1
LSIL	5,096	104.3	2,643	60.3	1,568	35.0	1,253	26.6	1,211	23.0	909	18.4	720	15.8	466	13.1	315	11.3	187	9.3
ASC-H	684	14.0	530	12.1	326	7.3	248	5.3	197	3.7	154	3.1	155	3.4	120	3.4	83	3.0	59	2.9
HSIL	875	17.9	846	19.3	614	13.7	420	8.9	280	5.3	192	3.9	136	3.0	96	2.7	64	2.3	32	1.6
Invasive SCC	1	<0.05	1	<0.05	1	<0.05	1	<0.05	2	<0.05	2	<0.05	3	0.1	5	0.1	3	0.1	2	0.1
AGC/AIS	18	0.4	32	0.7	28	0.6	39	0.8	37	0.7	32	0.6	42	0.9	41	1.1	32	1.1	23	1.1
Adenocarcinoma	-	-	2	<0.05	2	<0.05	2	<0.05	2	<0.05	2	<0.05	12	0.3	8	0.2	11	0.4	12	0.6
Malignant neoplasm	-	-	-	-	-	-	1	<0.05	1	<0.05	-	-	1	<0.05	-	-	2	0.1	1	<0.05
Total	**48,385**	**-**	**43,377**	**-**	**44,305**	**-**	**46,517**	**-**	**51,671**	**-**	**48,250**	**-**	**44,524**	**-**	**34,940**	**-**	**27,264**	**-**	**19,535**	**-**

Table 12 – Cytology tests processed by laboratory, 2012

Laboratory	Cytology tests processed* N
Aotea Pathology Ltd	43,916
Canterbury Health Laboratories	24,422
Diagnostic Medlab Ltd	110,541
LabPLUS	15,427
Medlab Central Ltd	35,422
Medlab South Christchurch†	14,399
Pathlab	43,359
Southern Community Labs Dunedin	147,299
TOTAL	**434,785**

Target : Total samples >15,000 per annum. * Includes satisfactory and unsatisfactory tests. † Medlab South Christchurch did not report on cytology for the whole year (ceased reporting after June 2012).

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 C - *Positive predictive value calculations*, and the relative severity rankings used for SNOMED codes are provided in Appendix D – *SNOMED codes and ranking*. 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 30 June 2012. There were 3,355 women identified with HSIL or SC cytology; 3,106 (92.6%) of whom had histology within six months of their cytology test (Table 13). CIN2+ was identified in histology for 2,479 (79.8%) women (Figure 16; Table 13). The positive predictive value for HSIL+SC cytology was within the target range (79.8%) although somewhat lower than in previous years (82.4% in 2010; 82.9% in 2011).

There were 5,884 women identified with ASC-H, HSIL or SC cytology; 5,130 (87.2%) of whom had histology within six months of their cytology test (Table 13). CIN2+ was identified in histology for 3,415 (66.6%) women. The positive predictive value for ASC-H+HSIL+SC cytology (66.6%) also somewhat lower than in recent years (70.4% in 2010, 70.6% in 2011); there is no target for this measure (Figure 16; Table 13).

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

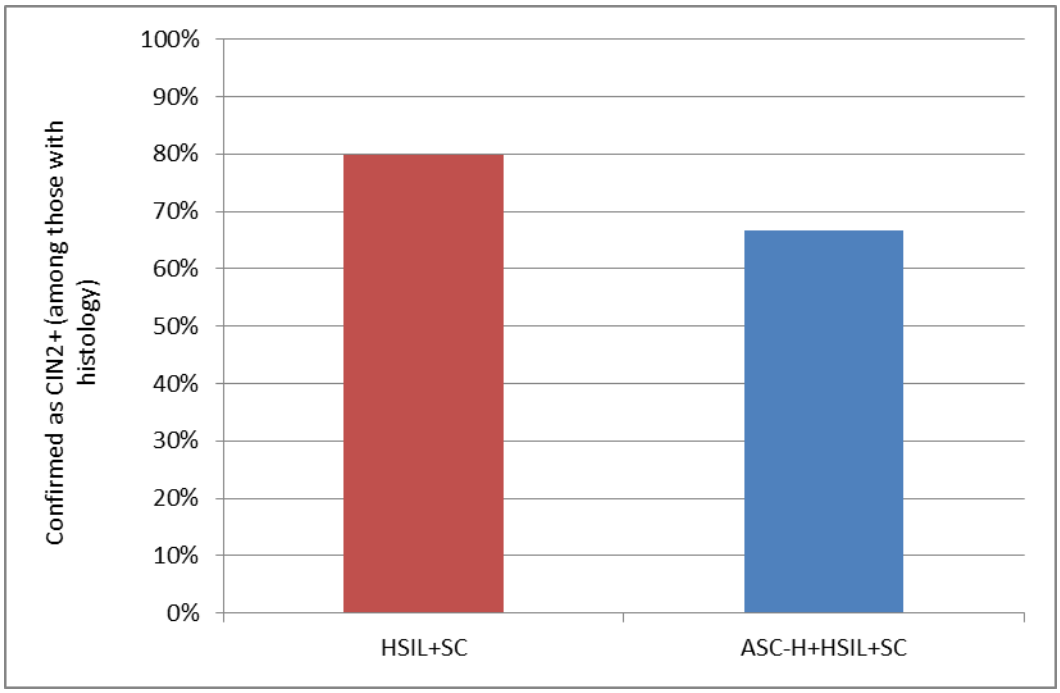


Table 13 – Positive predictive value, 2012, by cytology result group

Cytology result	Results	Histology available		%* confirmed as CIN2+
		N	%	
HSIL + SC	3,355	3,106	*92.6*	79.8
ASC-H + HSIL + SC +	5,884	5,130	*87.2*	66.6

† 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

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

All histology samples which were collected during 2012 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 D – *SNOMED codes and ranking* (Table 24).

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. Additionally, longer term trends in rates of high grade abnormalities are presented, both in terms of rates per 1,000 women screened, and as a proportion of all women with histology in 2012.

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

Results

In 2012, there were 29,453 histology samples collected, 28,543 of which were sufficient for diagnosis. These samples related to 22,864 women, 22,120 of whom were aged 20-69 years. Results relating to histology in these 22,120 women aged 20-69 years are summarised in Table 14 and Table 15. This was an increase in the number of women with histology compared to 2011, both

in women aged 20-69 years (6.6%) and women of any age (6.4%). It was also an increase in the overall number of women with histology per 1,000 women screened, which increased from 50.6 in 2011 to 53.2 in 2012 (5.2%).

The overall rate of women with histology samples taken per 1,000 women screened was highest among women aged 25-29 years (70.4 per 1,000 women screened; Table 15). This reflected more disease (CIN 2+) in women of this age, as the rates of women with CIN2/3, CIN 2+ and CIN 3+ per 1,000 women screened were also highest in this age group (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 (Table 17). In contrast, in the five-year age groups between 40-69 years generally over half of all women with histology had negative/ benign histology.

Histology reporting by ethnicity is shown in Table 18. Overall rates of histology per 1,000 women screened were lower for Pacific and Asian women (both 44.0 per 1,000 women screened) than for Māori and European/ Other women (both 56.9 per 1,000 women screened). Rates of negative/ benign histology were highest in European/ Other women, and lowest in Pacific women. Rates of high grade squamous histology (ie for each of CIN 2, CIN 3, HSIL not otherwise specified) were highest in Māori women, and generally lowest among Pacific and Asian women.

Trends in the age-standardised rate of high grade squamous (CIN 2/3) histology per 1,000 women screened are shown in Figure 17, and age-specific trends appear in Figure 18. There was an increase in these rates across age groups in 2012, however this reflects an increase in the rates of histology in general per 1,000 women screened. Therefore, trends in squamous high grade abnormalities are also presented as a percentage of all women with histology in Figure 19. Longer term trends (2003-2013) are shown in Table 19 and Figure 20 for squamous high grade abnormalities (CIN2/3), and Table 20 for all high grade abnormalities (CIN 2+) Similar trends were observed when considering CIN 2/3 and all high grade abnormalities (CIN 2+).

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

Histology result category	2012		
	Cases	Crude rate (20-69 yrs)	ASR (20-69 yrs)
Negative/benign (non neoplastic)	11,103	26.7	25.6
HPV	2,030	4.9	5.1
CIN1	3,755	9.0	9.7
CIN2	1,358	3.3	3.6
CIN3	2,144	5.2	5.7
HSIL not otherwise specified	1,375	3.3	3.7
Microinvasive	12	<0.05	<0.05
Invasive SCC	92	0.2	0.2
Glandular dysplasia	1	<0.05	<0.05
Adenocarcinoma in situ	138	0.3	0.4
Invasive adenocarcinoma*	49	0.1	0.1
Adenosquamous carcinoma	2	<0.05	<0.05
Other cancer	61	0.1	0.1
TOTAL	**22,120**	**53.2**	

Cells containing '–' indicate no cases. ASR = age-standardised rate (WHO population) ; HSIL not otherwise specified = CIN2/3, SNOMED code M67017 ; *SCC = squamous cell carcinoma * Includes one case of invasive adenocarcinoma (endocervical type; SNOMED code M83843) and 48 cases of Invasive adenocarcinoma (not endocervical type; SNOMED code M81403)*

Table 15 - Age-specific histology reporting rates per 1,000 women screened (ages 20-69 years), 2012

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)	713	14.6	782	17.9	902	20.1	1,188	25.2	1,752	33.3	1,976	40	1,606	35.4	1,016	28.5	648	23.3	520	
HPV	366	7.5	360	8.2	290	6.5	252	5.3	246	4.7	190	3.8	158	3.5	87	2.4	52	1.9	29	
CIN1	931	19.1	716	16.3	563	12.6	404	8.6	398	7.6	291	5.9	215	4.7	132	3.7	66	2.4	39	
CIN2	369	7.6	325	7.4	204	4.6	147	3.1	130	2.5	80	1.6	48	1.1	29	0.8	18	0.6	8	
CIN3	515	10.5	504	11.5	391	8.7	281	6	204	3.9	110	2.2	59	1.3	39	1.1	32	1.1	9	
HSIL nos	357	7.3	353	8.1	263	5.9	148	3.1	95	1.8	70	1.4	43	0.9	23	0.6	11	0.4	12	
Microinvasive	1	<0.05	1	<0.05	1	<0.05	0	<0.05	5	0.1	1	<0.05	1	<0.05	1	<0.05	0	<0.05	1	
Invasive SCC	3	0.1	3	0.1	6	0.1	13	0.3	15	0.3	13	0.3	8	0.2	10	0.3	11	0.4	10	
Glandular dysplasia	0	<0.05	0	<0.05	1	<0.05	0	<0.05	0	<0.05	0	<0.05	0	<0.05	0	<0.05	0	<0.05	0	
Adenocarcinoma in situ	14	0.3	33	0.8	28	0.6	30	0.6	15	0.3	8	0.2	4	0.1	3	0.1	1	<0.05	2	
Invasive adenocarcinoma*	3	0.1	3	0.1	1	<0.05	3	0.1	6	0.1	4	0.1	8	0.2	11	0.3	5	0.2	5	
Adenosquamous carcinoma	0	<0.05	0	<0.05	0	<0.05	0	<0.05	0	<0.05	0	<0.05	1	<0.05	0	<0.05	0	<0.05	1	
Other cancer	0	<0.05	2	<0.05	5	0.1	0	<0.05	4	0.1	9	0.2	11	0.2	10	0.3	8	0.3	12	
Total	**3,272**	**67.0**	**3,082**	**70.4**	**2,655**	**59.3**	**2,466**	**52.3**	**2,870**	**54.5**	**2,752**	**55.7**	**2,162**	**47.6**	**1,361**	**38.2**	**852**	**30.6**	**648**	

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), 2012

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	2012	14.6	17.9	20.1	25.2	33.3	40.0	35.4	28.5	23.3	26.0
HPV	2012	7.5	8.2	6.5	5.3	4.7	3.8	3.5	2.4	1.9	1.4
CIN1	2012	19.1	16.3	12.6	8.6	7.6	5.9	4.7	3.7	2.4	1.9
*CIN2/3**	*2012*	*25.4*	*27.0*	*19.2*	*12.2*	*8.2*	*5.3*	*3.3*	*2.6*	*2.2*	*1.4*
CIN2+	2012	25.8	27.9	20.1	13.2	9.0	6.0	4.0	3.5	3.1	3.0
CIN3+ †	*2012*	*18.3*	*20.5*	*15.5*	*10.1*	*6.5*	*4.4*	*3.0*	*2.7*	*2.4*	*2.6*

* 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 – Summarised age-specific histology reporting rates as a percent of all women with histology (ages 20-69 years), 2012

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	2012	21.8%	25.4%	34.0%	48.2%	61.0%	71.8%	74.3%	74.7%	76.1%	80.2%
HPV	2012	11.2%	11.7%	10.9%	10.2%	8.6%	6.9%	7.3%	6.4%	6.1%	4.5%
CIN1	2012	28.5%	23.2%	21.2%	16.4%	13.9%	10.6%	9.9%	9.7%	7.7%	6.0%
*CIN2/3**	*2012*	*37.9%*	*38.4%*	*32.3%*	*23.4%*	*14.9%*	*9.4%*	*6.9%*	*6.7%*	*7.2%*	*4.5%*
CIN2+	2012	27.5%	29.4%	26.4%	19.4%	12.1%	7.9%	6.3%	7.2%	8.1%	8.1%
CIN3+ †	*2012*	*27.3%*	*29.2%*	*26.2%*	*19.3%*	*12.0%*	*7.8%*	*6.2%*	*7.1%*	*8.0%*	*8.0%*

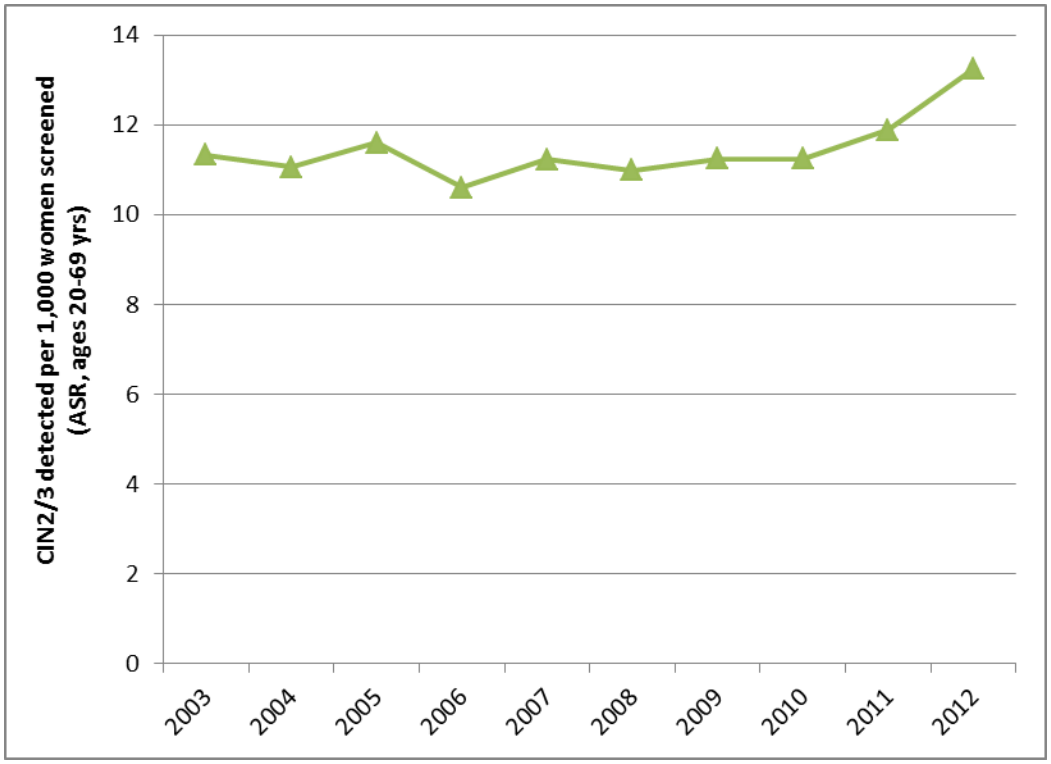
* Here CIN2/3 includes result categories for CIN2, CIN3, and also the combined category HSIL nos (SNOMED code M67017) † CIN3+ excludes SNOMED code M67017

Table 18 Histology cases and reporting rates per 1,000 women screened (20-69 years) by ethnicity, 2012

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)	1,151	25.3	25.5	451	21.8	21.7	1,001	23.5	22.2	8,500	27.7	26.5
HPV	223	4.9	4.8	100	4.8	4.8	199	4.7	4.5	1,508	4.9	5.4
CIN1	402	8.8	8.4	145	7.0	7.0	307	7.2	6.9	2,901	9.5	10.6
CIN2	195	4.3	4.1	76	3.7	3.6	119	2.8	2.8	968	3.2	3.7
CIN3	383	8.4	8.1	98	4.7	4.6	168	3.9	3.8	1,495	4.9	5.7
HSIL nos	222	4.9	4.7	22	1.1	1.0	47	1.1	1.1	1,084	3.5	4.2
Microinvasive	1	<0.05	<0.05	1	<0.05	<0.05	1	<0.05	<0.05	9	<0.05	<0.05
Invasive SCC	28	0.6	0.6	7	0.3	0.3	7	0.2	0.2	50	0.2	0.1
Glandular dysplasia	0	-	-	0	-	-	0	-	-	1	<0.05	<0.05
Adenocarcinoma in situ	14	0.3	0.3	4	0.2	0.2	13	0.3	0.3	107	0.3	0.4
Invasive adenocarcinoma	6	0.1	0.1	2	0.1	0.1	6	0.1	0.2	35	0.1	0.1
Adenosquamous carcinoma	0	-	-	0	-	-	0	-	-	2	<0.05	<0.05
Other cancer	8	0.2	0.2	4	0.2	0.2	4	0.1	0.1	45	0.1	0.1
Total	**2,633**	**57.8**	**56.9**	**910**	**44.0**	**43.7**	**1,872**	**44.0**	**42.1**	**16,705**	**54.4**	**56.9**

* 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 * Includes one case of endocervical type; 48 cases not endocervical type

Figure 17 – Age-standardised rates of histologically-confirmed CIN 2/3 per 1,000 women screened, 2003 to 2012



ASR = age-standardised rate, standardised to WHO population (ages 20-69 years)

Figure 18 – Age-specific rates of histologically-confirmed CIN 2/3 per 1,000 women screened, 2008 to 2012

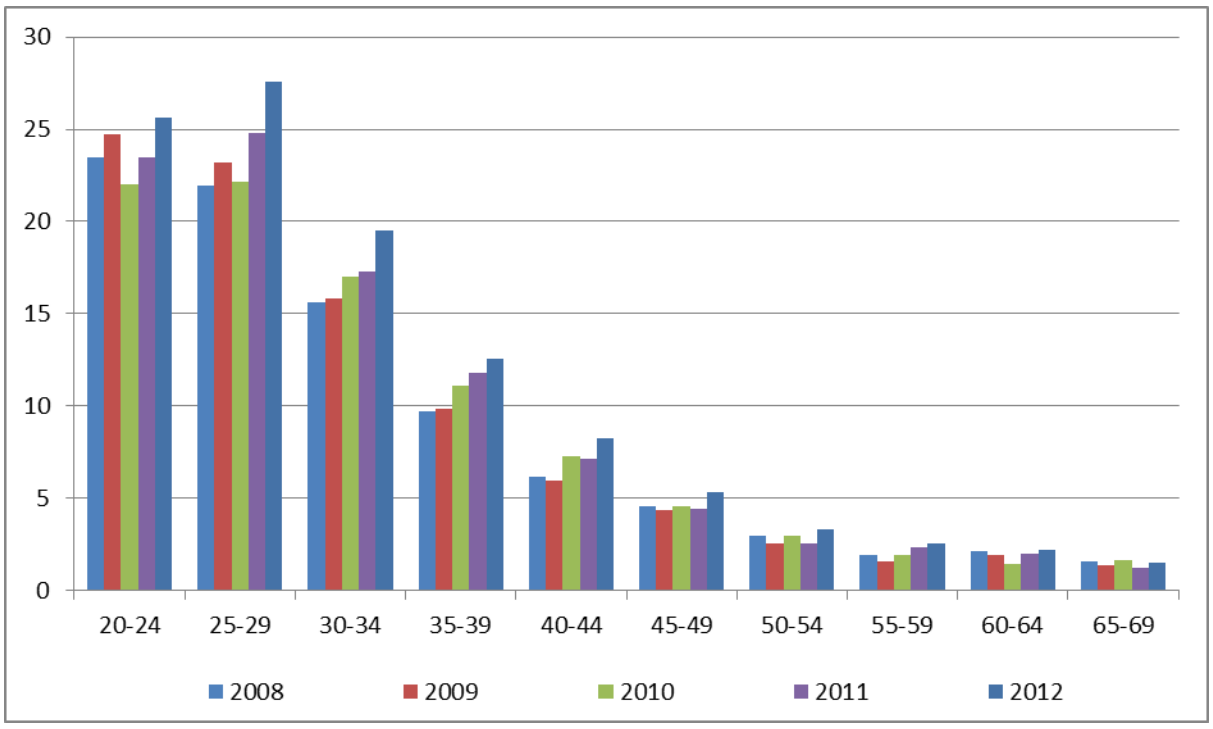


Figure 19 – Age-specific rates of histologically-confirmed CIN 2/3 as a percentage of all women with histology, 2008 to 2012

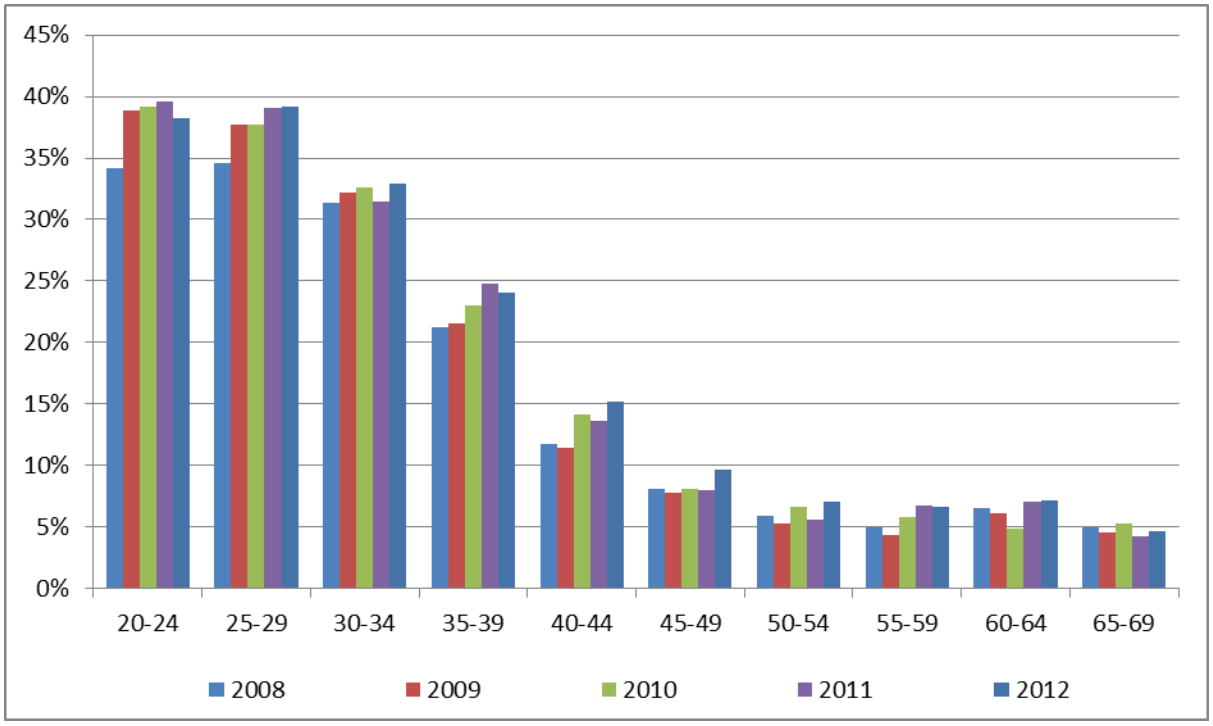


Figure 20 - Age-specific rates of histologically-confirmed CIN 2/3 as a percentage of all women with histology (2003, 2006, 2009, 2012)

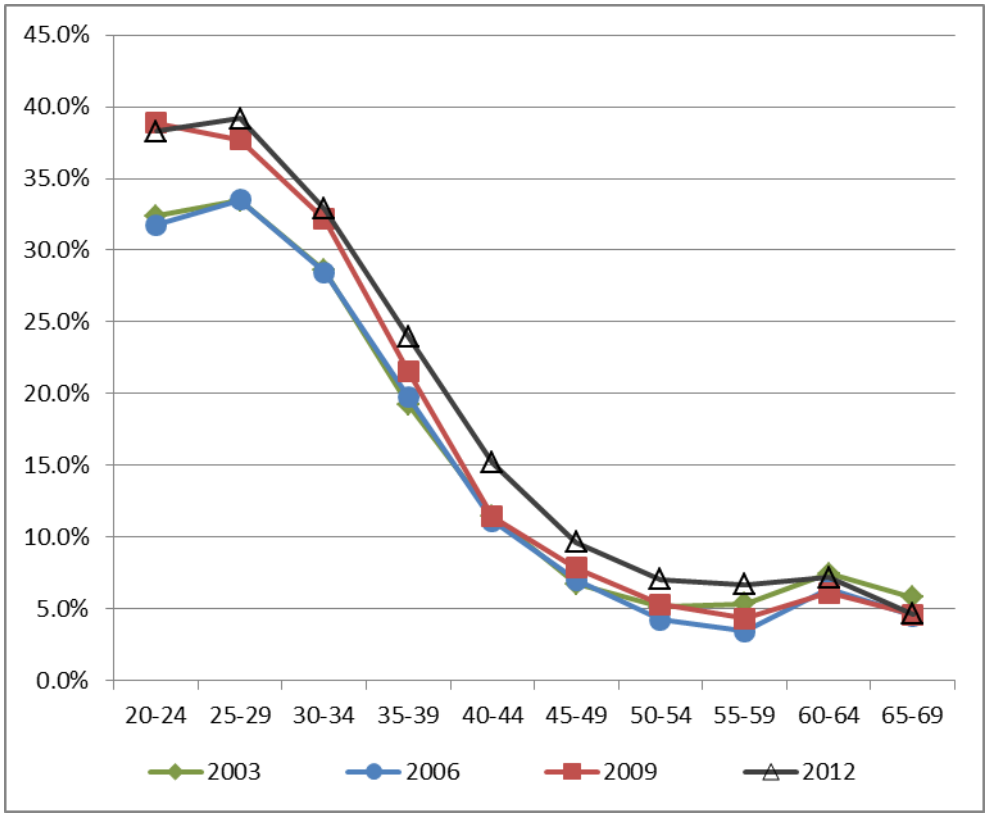


Table 19- Age-specific rates of histologically-confirmed CIN 2/3 as a percentage of all women with histology, 2003 to 2012

Year	Age group										*ASR*
	20-24	**25-29**	**30-34**	**35-39**	**40-44**	**45-49**	**50-54**	**55-59**	**60-64**	**65-69**	***(20-69 yrs)***
2003	32.4%	33.5%	28.6%	19.2%	11.5%	6.7%	5.1%	5.4%	7.4%	5.8%	*18.3%*
2004	30.5%	32.6%	28.4%	18.6%	11.0%	6.3%	3.7%	4.2%	5.9%	4.7%	*17.4%*
2005	32.4%	36.1%	30.7%	20.0%	11.0%	6.5%	4.6%	5.8%	5.1%	5.8%	*18.8%*
2006	31.8%	33.5%	28.4%	19.8%	11.1%	7.0%	4.2%	3.4%	6.4%	4.5%	*17.9%*
2007	33.9%	34.5%	28.8%	21.6%	11.8%	7.5%	4.9%	5.3%	4.8%	6.5%	*18.9%*
2008	34.2%	34.6%	31.4%	21.3%	11.7%	8.1%	5.9%	5.0%	6.6%	5.0%	*19.4%*
2009	38.9%	37.7%	32.2%	21.6%	11.4%	7.8%	5.3%	4.3%	6.1%	4.6%	*20.4%*
2010	39.2%	37.7%	32.6%	23.0%	14.1%	8.1%	6.7%	5.8%	4.9%	5.3%	*21.1%*
2011	39.5%	39.0%	31.4%	24.8%	13.6%	8.0%	5.6%	6.8%	7.0%	4.2%	*21.4%*
2012	38.3%	39.2%	32.9%	24.0%	15.2%	9.6%	7.0%	6.7%	7.2%	4.6%	*21.8%*

ASR = age-standardised rate, standardised to WHO population (ages 20-69 years)

Table 20- Age-specific rates of histologically-confirmed CIN 2+ as a percentage of all women with histology, 2003 to 2012

Year	Age group										*ASR*
	20-24	**25-29**	**30-34**	**35-39**	**40-44**	**45-49**	**50-54**	**55-59**	**60-64**	**65-69**	***(20-69 yrs)***
2003	32.4%	33.8%	29.4%	20.0%	12.3%	7.5%	6.6%	7.1%	11.6%	9.8%	*19.4%*
2004	30.6%	32.9%	29.1%	19.0%	11.8%	7.1%	5.1%	6.3%	10.6%	9.0%	*18.5%*
2005	32.4%	36.5%	31.3%	21.0%	11.5%	7.3%	5.6%	7.7%	8.2%	11.9%	*19.9%*
2006	31.9%	33.8%	29.4%	20.5%	12.1%	7.8%	5.1%	5.4%	9.3%	9.2%	*19.0%*
2007	34.1%	34.9%	29.3%	22.4%	12.9%	8.2%	5.9%	7.6%	8.7%	10.4%	*20.0%*
2008	34.4%	34.9%	32.2%	22.5%	12.7%	8.8%	7.2%	8.0%	9.5%	9.4%	*20.6%*
2009	38.9%	37.9%	32.8%	22.3%	12.5%	8.9%	6.6%	6.7%	9.0%	7.3%	*21.4%*
2010	39.4%	38.0%	33.6%	23.8%	15.1%	9.2%	8.1%	8.2%	9.3%	11.0%	*22.5%*
2011	39.6%	39.6%	32.6%	25.8%	14.2%	8.9%	6.6%	9.4%	10.2%	10.2%	*22.7%*
2012	38.5%	39.5%	33.4%	24.7%	16.2%	10.6%	8.4%	9.0%	10.0%	9.1%	*23.0%*

ASR = age-standardised rate, standardised to WHO population (ages 20-69 years)

Appendix A – Additional data tables

Regularity of screening

The number of women in the 2007 routine screening cohort, and the number of well-screened women in the 2007 routine screening cohort are shown in Table 21. The proportion of women who do not re-attend for another test in the following five years is also shown in this table. As expected, the proportion of women who do not re-attend within five years is lower in the cohort of women who have a strong screening history; however, the proportion of women with a strong screening history who do not re-attend within five years represent a high proportion (over 70% across all age-groups) of the overall rate on non-attendance observed in the entire 2007 cohort.

Table 21 - The number and proportion of women who did not return for another routine test in the next 5 years for all women in the 2007 routine screening cohort* and in the sub-cohort of women with a strong screening history

Age (years)	Number (percentage) of women who had not re-attended within 5 years	
	All women in 2007 routine screening cohort*	Only women who have a strong screening history
20-24	18,000 (14%)	-
25-29	22,000 (14%)	18,000 (12%)
30-34	27,000 (10%)	17,000 (8%)
35-39	32,000 (8%)	15,000 (6%)
40-44	33,000 (7%)	16,000 (5%)
45-49	31,000 (7%)	16,000 (5%)
50-54	25,000 (7%)	13,000 (5%)
55-59	21,000 (7%)	11,000 (5%)
60-64	15,000 (8%)	8,000 (5%)

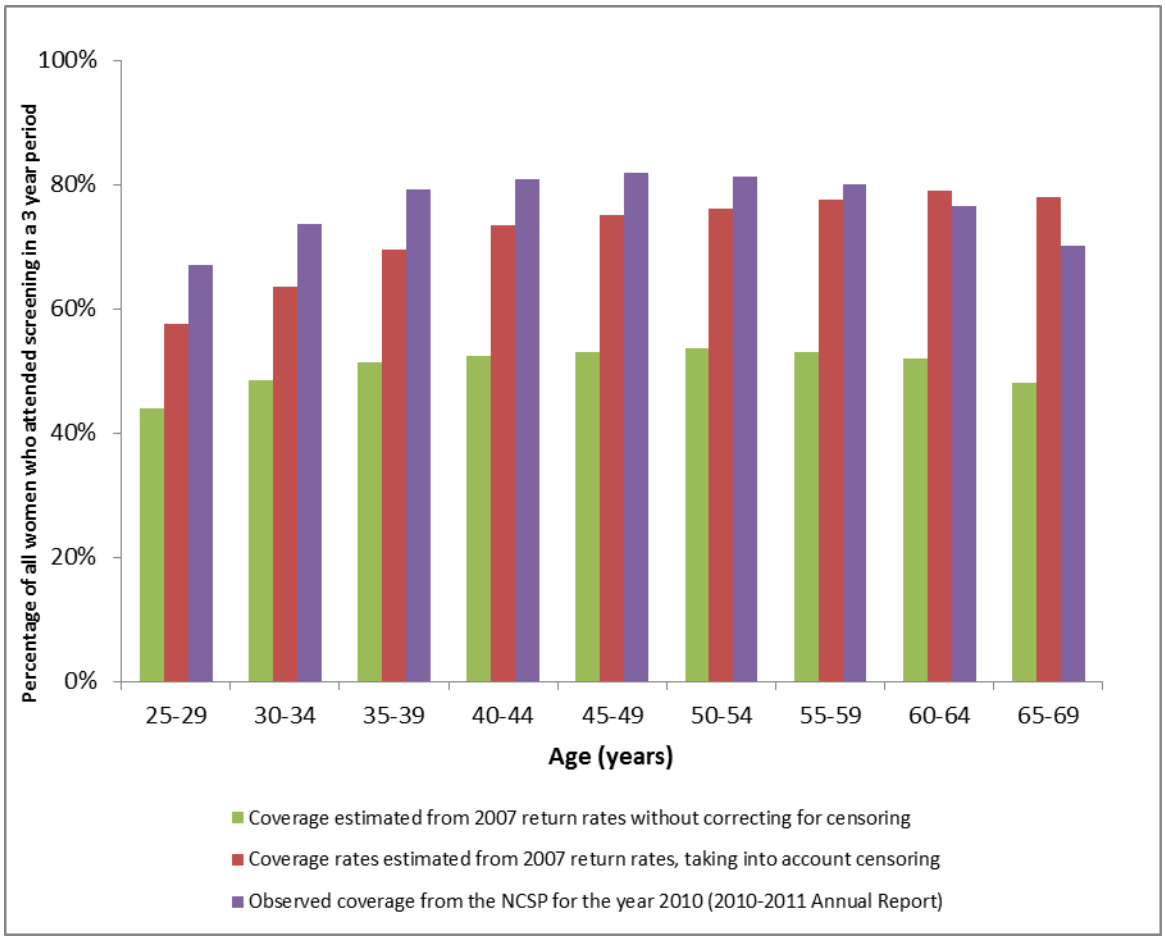
** Routine screening cohort is defined as women aged 20-65 years and with a negative cytology test in 2007 who were recommended to return at the routine interval of three years.*

Notes on the effect of censoring

Three year coverage rates were calculated using the derived probabilities of re-attending for screening for the 2007 routine screening cohort. Specifically, we apply these rates of return to a cohort of women for a period of time, and then calculate the proportion of women in each age-group who have had a routine screening test in the last three years. Note that the calculated three year coverage is an estimate based on rates of return observed in 2007, and to get the true three year coverage rates, rates of return in 2008 and 2009 would also be required. The coverage rates are compared with three year observed coverage rates observed in New Zealand in the year 2010 (ie women screened in the three years to the end of 2010), and are shown in Figure 21. The coverage rates that would have been produced had censoring not been taken into account are also shown for comparison, highlighting the importance of incorporating censoring.

The predicted three-year coverage using return rates from the 2007 cohort is generally lower than observed coverage rates in New Zealand, even taking into account censoring. This is expected, however, as the observed coverage rates from the NCSP 2010-2011 Annual Report represent screening coverage for all women in New Zealand, including both women in routine screening and women under follow-up management. As our analysis only included women in routine screening, it would be an underestimate relative to observed data; however the impact of this is expected to be small as the proportion of women under follow-up management is small compared to the general female population.

Figure 21: Three year coverage estimates using the rates of return calculated from the 2007 routine screening cohort* of women, compared to observed data (women screened in the three years 2008-2010).



** 2007 routine screening cohort is defined as the cohort of women who with a negative cytology test in 2007 who were recommended to re-attend for a routine screening test in three years*

Appendix B – 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 22.

Table 22 – 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 C - Positive predictive value calculations

Table 23 – 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 D – SNOMED codes and ranking

Table 24 – 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
Polyp		M76800	M76800	Negative/benign	5
Other (Morphologic abnormality, not dysplastic or malignant)		M01000	M01000	Negative/benign	6
Atypia		M69700	M67000	CIN 1	7
Benign glandular atypia		M81400	M67030	Negative/benign	8
HPV, koilocytosis, condyloma (NOS) Condyloma acuminatum	M76700	M76700 M76720	M76700 M76720	HPV	9
CIN I (LSIL) (VAIN I when used with T81/ T82000)		M74006	M67016	CIN 1	10
Dysplasia / CIN NOS		M74000	M67015	CIN 1	11
Glandular dysplasia		M81401	M67031	Glandular dysplasia	12
CIN II (HSIL) (VAIN II when used with T81/ T82000)		M74007		CIN 2	13
HSIL NOS		M67017	M67017	HSIL	14
CIN III (HSIL) (VAIN III when used with T81/ T82000) Carcinoma in situ		M74008 M80102 M80702	 M80102 M80702	CIN 3	17 15 16
Adenocarcinoma in situ		M81402	M81402	Adenocarc. in situ	18
Microinvasive squamous cell carcinoma		M80765	M80763	Micro-invasive	19
Invasive squamous cell carcinoma		M80703	M80703	Invasive SCC	20
Adenocarcinoma (endocervical type)		M83843	M83843	Invasive adenocarcinoma	21
Adenosquamous carcinoma		M85603	M85603	Adenosquamous carcinoma	22
Invasive adenocarcinoma (not endocervical type)		M81403	M81403	Invasive adenocarcinoma	23
Metastatic tumour		M80006	M80006	Other cancer	29
Undifferentiated carcinoma		M80203	M80203	Other cancer	24
Sarcoma		M88003	M88003	Other cancer	25
Other codes accepted	**Code stored on register**	**1986 Code**	**1993 Code**	**Diagnostic category**	**Rank**
Carcinosarcoma	M88003	M89803	M89803	Other cancer	26
Choriocarcinoma	M80003	M91003	M91003	Other cancer	27
Miscellaneous primary tumour	M80003	M80003	M80003	Other cancer	28
Small cell carcinoma	M80003	M80413	M80413	Other cancer	30
Malignant tumour, Small cell type	M80003	M80023	M80023	Other cancer	31
Melanoma	M80003	M87203	M87203	Other cancer	32
Other primary epithelial malignancy	M80003	M80103	M80103	Other cancer	33

* ranking based on advice from NSU.

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