National Screening Unit

National Cervical Screening Programme

Annual Report 2013

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Acknowledgments

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About the authors

The authors are based in the Cancer Research Division at Cancer Council NSW, Sydney, Australia. They are part of a research group (led by 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. 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 2013 there were 159 new diagnoses of cervical cancer, including 39 new diagnoses in Māori women.
- This is equivalent to an age-standardised rate (ASR) of 6.3 new diagnoses per 100,000 women in the population, and 12.7 per 100,000 for Māori women.
- Most cervical cancers were squamous cell carcinomas (118 cases; ASR of 4.7 per 100,000 women), with a smaller proportion comprising adenocarcinomas (28 cases; ASR of 1.2 per 100,000 women), adenosquamous (5 cases; ASR of 0.1 per 100,000 women) or other cervical cancers (8 cases; ASR of 0.2 per 100,000 women).
- Overall, between 1996 and 2013 cervical cancer incidence has declined from 10.5 to 6.3 per 100,000 for women of all ethnicities, and from 25.0 to 12.7 per 100,000 for Māori women.

Cancer mortality

- In 2012, there were 56 deaths due to cervical cancer, including 11 deaths in Māori women.
- This is equivalent to an age-standardised mortality rate of 1.8 per 100,000 women in the population, and 3.8 per 100,000 for Māori women.
- Overall, between 1998 and 2012 cervical cancer mortality has declined from 3.2 to 1.8 per 100,000 for women of all ethnicities, and from 10.3 to 3.8 per 100,000 for Māori women.

Coverage

- As of 31 December 2013, 76.5% of eligible women aged 25-69 years had been screened in the previous three years.
- Coverage varied by ethnicity, from 63.4% for Māori women to 81.7% for European/ Other women. Over the past five years, coverage has increased in Māori, Pacific and Asian women, and has decreased slightly for European/ Other women.
- The 80% target was met in four age groups in 2013 (the five-year age groups between 40-59 years). The target was not met for women in the age groups 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 20-39 years); there has been little change in recent years for women aged 20-24, 25-29 and 35-39 years, while for women aged 30-34 years coverage has been decreasing.

Regularity of screening

- In the last quarter of 2013, the proportions of women returning for routine screening who were re-attending more than six months early, more than six months late and on-time were 18.5%, 22.1% and 59.4% respectively. The corresponding proportions for women returning following a recommendation to return in 12 months who were more than three months early, more than three months late and on-time were 3.3%, 52.1% and 44.6% respectively.

- Among women re-attending for routine screening (3-year repeat recommendation), there was a shift from early (by more than six months) to on-time re-screening between the first quarter of 2009 and the last quarter of 2013, with comparatively little change in the proportion who were re-attending late (by more than six months). This pattern was seen for all age groups and most ethnicity groups. Among Pacific women there was additionally a decrease in the proportion of women attending late (5.3 percentage points), while this increased by 2.1 percentage points for Asian women.

- The proportion of women returning for routine screening who attended on-time was higher for European/ Other women and Asian women than for Māori and Pacific women, however this proportion increased over time in all four groups. Conversely, the proportion of women returning for routine screening who attended more than six months late was higher for Māori and Pacific women (between 27.3% and 35.1% for these two ethnic groups, compared with between 16.6% and 20.6% for Asian or European/ Other women).

- The proportion of women returning for routine screening who attended on-time was consistently highest for women aged 60-69 and lowest for women aged 20-29 (the age group most likely to return early). The proportion who were re-attending late was consistently highest among women aged 30-39 years (25.2% to 28.7% of attendances in this age group) and consistently lowest among women aged 60-69 (12.9% to 16.1% of attendances in this age group).

- There was comparatively little change over the period 2009-2013 in the proportion re-attending early, on-time or late following a 12-month repeat recommendation, but the tendency was a slight shift towards late re-attendance. Over the period 2009-2013, the proportion of women re-attending on-time after a 12-month repeat recommendation was consistently higher in European/ Other and Asian women than in Māori and Pacific women. There was a broad pattern of increasing on-time attendance following a 12-month repeat recommendation with increasing age.

Cytology reporting

- During 2013, 410,584 women had a cytology sample collected, including 404,114 women aged 20-69 years. The overwhelming majority had a negative cytology result (ASR of 909.3 per 1,000 women screened)

- Cytological abnormalities were most common in younger women. LSIL was the most common cytological abnormality in younger women (aged 20-49 years), while ASC-US was

the most common abnormality for 3 of the 4 five-year age groups for women aged 50-69 years.

- All laboratories reporting on cytology in 2013 achieved the minimum volume of 15,000 cytology samples processed.

Positive predictive value

- CIN2+ was subsequently confirmed in 81.8% 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 68.3% 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 2013, histology samples were collected from 23,280 women, including 22,554 aged 20-69 years.

- 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 or 25-29 years), but a majority of samples in older women (more than 60% in women aged between 40-69 years).

- High grade squamous abnormalities (CIN 2/3) fell in women aged 20-24 years in 2013 compared to 2012, both in terms of the rate per 1,000 women screened (by 13.7%) and the percentage of all women with histology who had a high grade squamous abnormality (by 8.5%).

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), 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), 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[a].

Calculation

Registrations of cancer cases (by age, ethnicity, and histological type) over the period 2006 to 2013 were obtained from the New Zealand Cancer Registry (data extracted March 2015). Cervical cancer mortality data for 2005-2012 were also obtained (by age and ethnicity).

Age-specific incidence and mortality rates were calculated for each calendar year, based on the estimated resident New Zealand female population in June of that year (mid-year estimates). The estimated resident female populations for 2006 to 2012 were based on projections from the 2006 Census, and for 2013 the estimated resident female population was based on the 2013 Census.

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. Five-year average rates were also calculated by five-year age group as the sum of all cases over the five-year period within that age group, divided by the sum of the estimated population within that age group in each of the five years 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 which are reported by ethnicity were calculated starting from 2006 (or later). Cancer incidence data is available to 2013, and therefore age-standardised incidence rates were calculated for each year over the period 2006 to 2013, and five-

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

year age-specific averages for incidence by ethnicity were calculated over the period 2009 to 2013. The most recent mortality data available relates to 2012, however, and therefore age-standardised mortality rates by ethnicity were calculated over the period 2006 to 2012 and five-year age-specific averages for mortality by ethnicity were calculated over the period 2008 to 2012.

Results

Incidence

In 2013, there were 159 new diagnoses of cervical cancer, or an age-standardised rate of 6.3 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 2013 cervical cancer incidence has declined from 10.5 to 6.3 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 wide for some ethnicities. 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 2006-2013.

Five-year average age-specific cervical cancer incidence rates (2009-2013), are shown in Figure 3 and Table 3. Overall there is a low incidence at younger ages, increasing by around the age of 30-34 years to reach a plateau. Five-year average age-specific incidence rates are shown by ethnicity in Figure 4 and Table 3. Confidence intervals are generally wide, so are not displayed on Figure 4, but are included in Table 3. There are small case numbers (five or less per year) in most age groups for Māori, Pacific and Asian women. Because of these factors age-specific incidence rates by ethnicity must be interpreted cautiously.

Five-year average age-specific cervical cancer incidence rates (2009-2013), 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 2012. In 2012, there were 56 deaths due to cervical cancer, or an age-standardised rate of 1.8 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 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 2012 cervical cancer mortality has declined from 3.2 to 1.8 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 (although 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 (2008-2012) 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 small for Māori, Pacific and Asian women (total deaths across all ages over the five year period were 54 for Māori women, 31 for Pacific women and nine for Asian women).

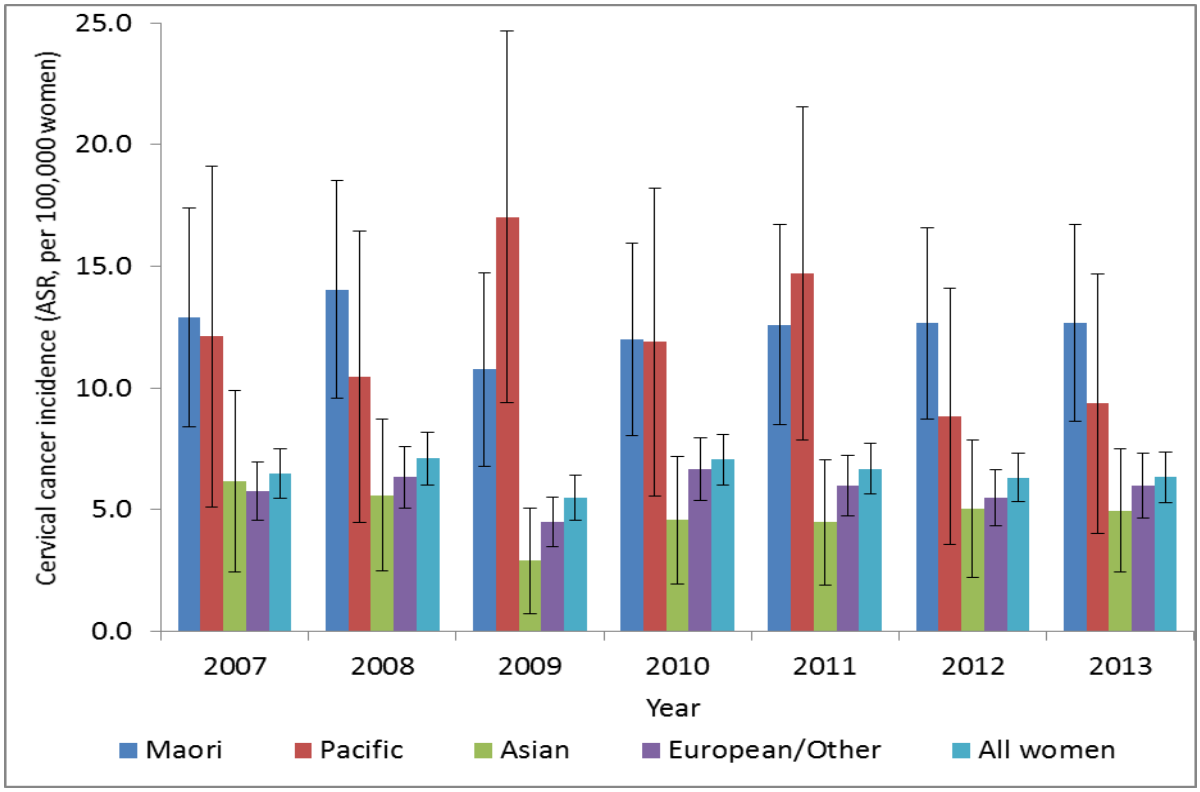
Comments

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.

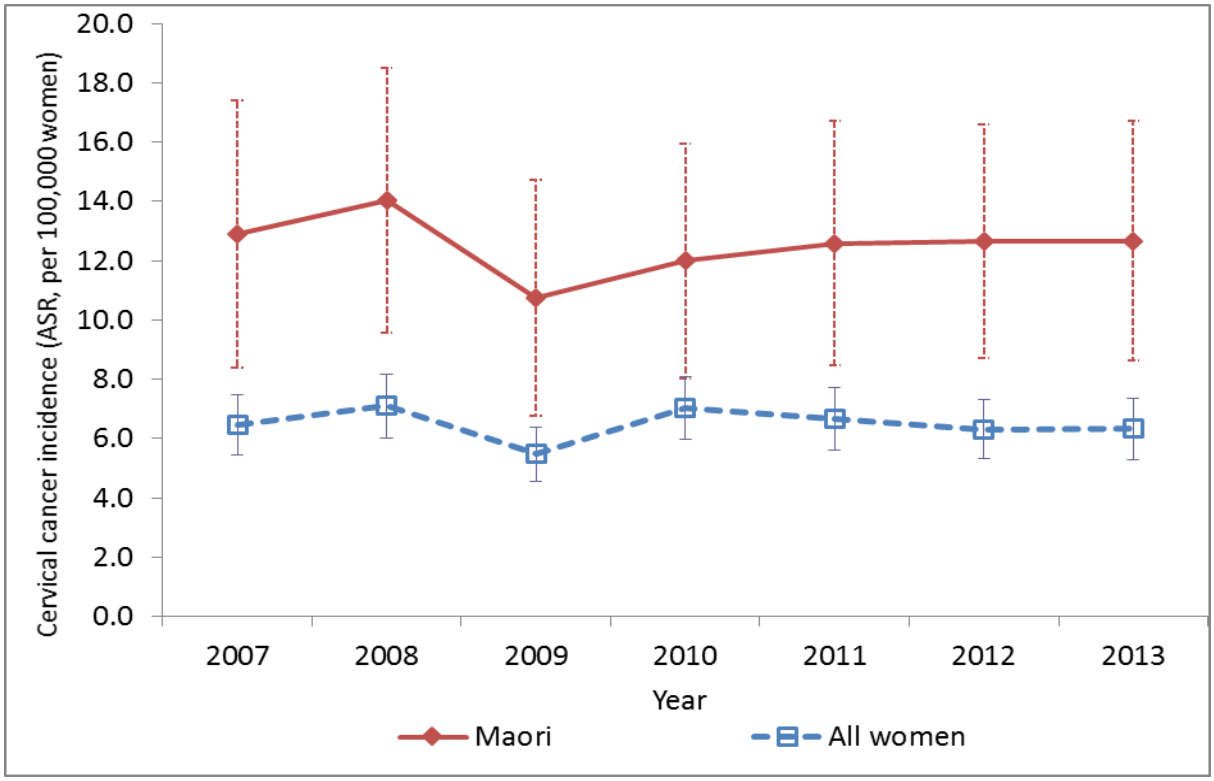
Figure 1 – Age-standardised cervical cancer incidence rates, 2007 to 2013, by ethnicity

a) All ethnic groups



Vertical bars represent 95% confidence intervals

b) Māori women, compared to All women



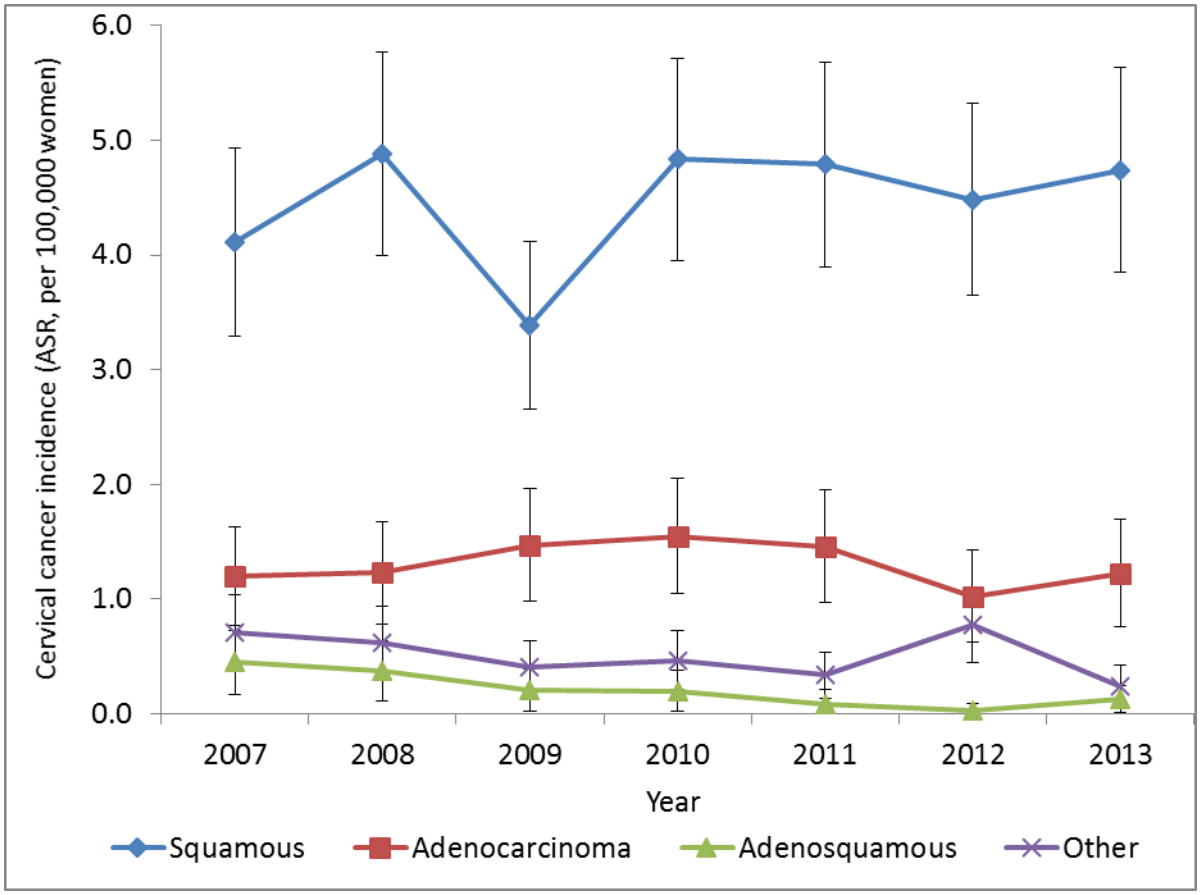
Vertical bars represent 95% confidence intervals

Table 1 – Cervical cancer incidence, 1996 to 2013, 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	158	6.4	28	11.0	10	8.4	15	7.6	105	6.0
2007	163	6.5	34	12.9	12	12.1	12	6.2	105	5.8
2008	175	7.1	39	14.0	12	10.5	13	5.6	111	6.3
2009	142	5.5	30	10.8	20	17.0	7	2.9	85	4.5
2010	180	7.0	36	12.0	14	11.9	12	4.6	118	6.6
2011	169	6.7	37	12.6	18	14.7	12	4.5	102	6.0
2012	168	6.3	40	12.7	11	8.8	13	5.0	104	5.5
2013	159	6.3	39	12.7	12	9.4	15	5.0	93	6.0

† 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) Cases and rates for 2005 sourced from a previous NCSP Annual Report (2008-2009) (5) § 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, 2007 to 2013, by histological type



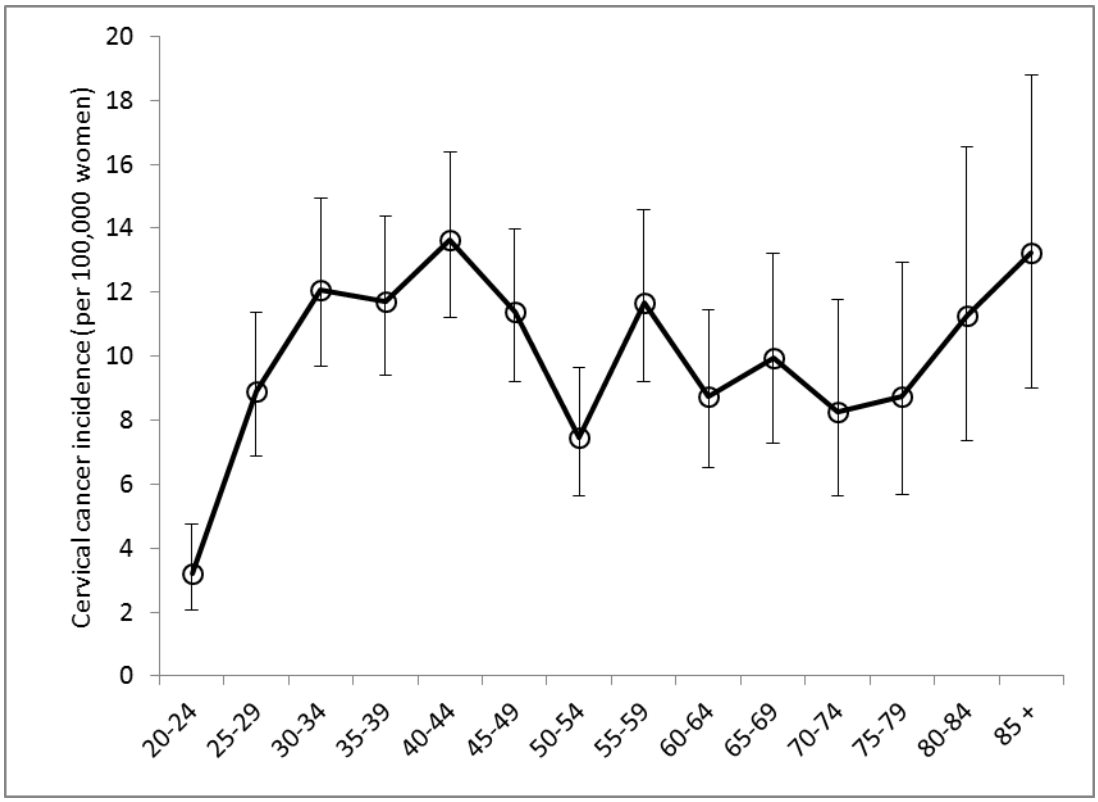
Vertical bars represent 95% confidence intervals

Table 2 – Cervical cancer incidence (per 100,000 women), 2006 to 2013, 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	15	0.5
2007	102	4.1	31	1.2	11	0.4	19	0.7
2008	121	4.9	30	1.2	8	0.4	16	0.6
2009	87	3.4	37	1.5	5	0.2	13	0.4
2010	123	4.8	38	1.5	5	0.2	14	0.5
2011	119	4.8	36	1.5	2	0.1	12	0.3
2012	117	4.5	27	1.0	1	<0.1	23	0.8
2013	118	4.7	28	1.2	5	0.1	8	0.2

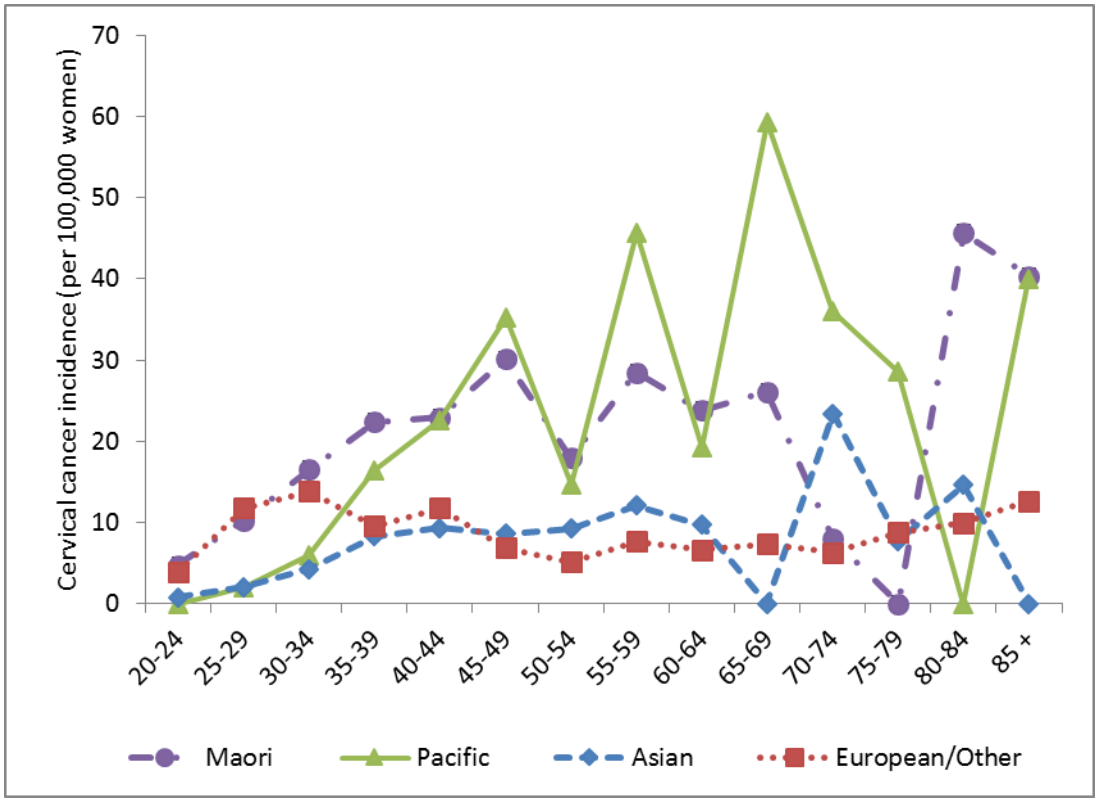
* Per 100,000 women, age-standardised to the WHO population (all ages)

Figure 3 – Five-year average cervical cancer incidence rates (2009-2013), by age



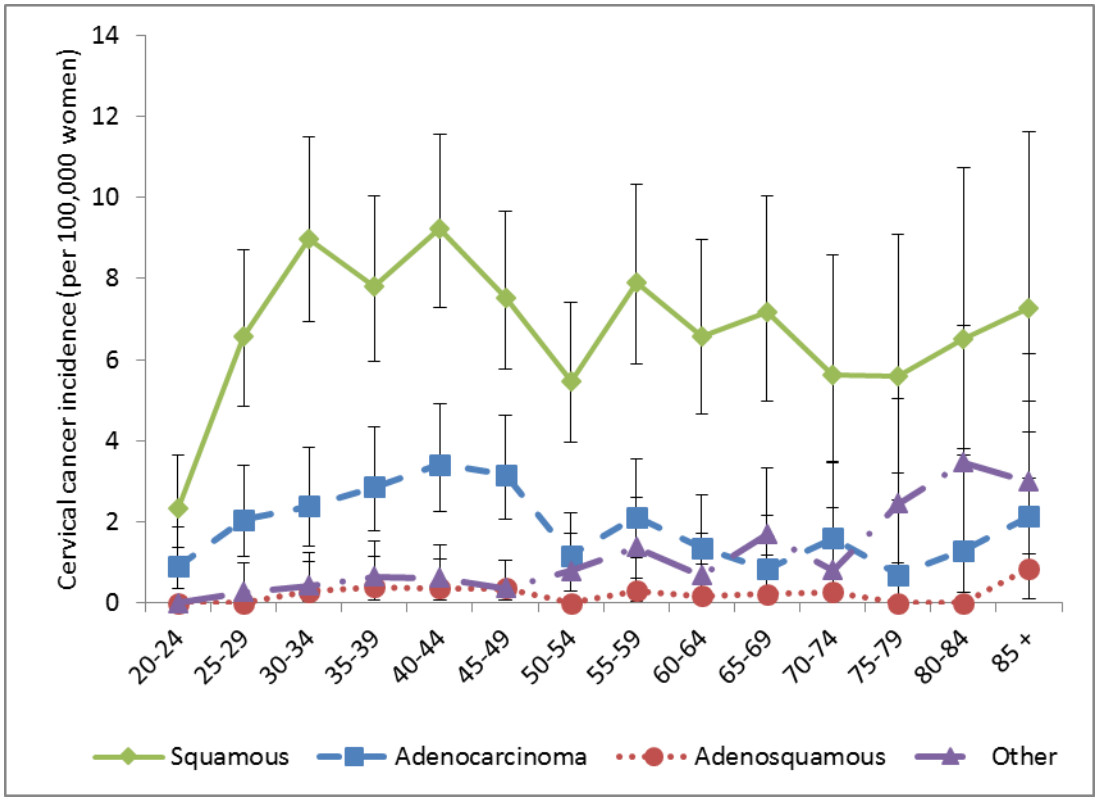
Vertical bars represent 95% confidence intervals

Figure 4 – Five-year average cervical cancer incidence rates (2009-2013), 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 (2009-2013), by age and histological type



Vertical bars represent 95% confidence intervals

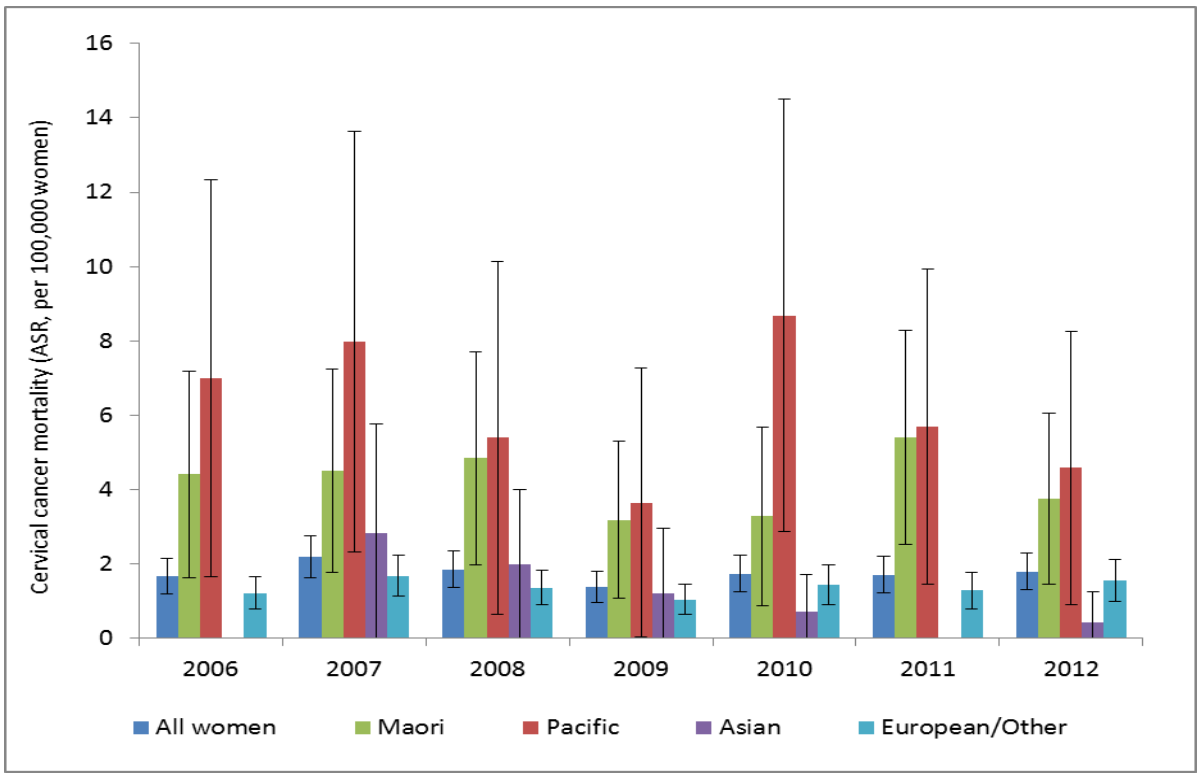
Table 3 – Five-year average cervical cancer incidence (2009-2013), by age and ethnicity

	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	(2.1 - 4.8)	4.7	(1.9 - 9.7)	-	-	0.8	(0.0 - 4.5)	3.9	(2.3 - 6.2)
25-29	8.9	(6.9 - 11.4)	10.3	(5.3 – 18.0)	1.9	(0.1 - 10.7)	2.1	(0.4 - 6.1)	11.8	(8.7 - 15.6)
30-34	12.1	(9.7 - 14.9)	16.5	(9.8 - 26.1)	5.9	(1.2 - 17.2)	4.2	(1.4 - 9.8)	13.9	(10.6 - 17.8)
35-39	11.7	(9.4 - 14.4)	22.4	(14.5 - 33.1)	16.5	(7.1 - 32.4)	8.3	(3.6 - 16.3)	9.6	(7.1 - 12.7)
40-44	13.6	(11.2 - 16.4)	22.9	(14.8 - 33.8)	22.6	(11.3 - 40.5)	9.3	(4.3 - 17.7)	11.8	(9.1 - 15)
45-49	11.4	(9.2 – 14.0)	30.1	(20.5 - 42.7)	35.2	(19.7 - 58.1)	8.6	(3.7 – 17.0)	6.8	(4.9 - 9.3)
50-54	7.4	(5.6 - 9.6)	17.9	(10.2 - 29.1)	14.7	(4.8 - 34.2)	9.3	(3.7 - 19.1)	5.1	(3.4 - 7.3)
55-59	11.7	(9.2 - 14.6)	28.5	(17.2 - 44.5)	45.7	(23.6 - 79.8)	12.1	(4.9 – 25.0)	7.7	(5.5 - 10.5)
60-64	8.8	(6.5 - 11.5)	23.8	(12.3 - 41.7)	19.2	(5.2 - 49.2)	9.7	(2.6 - 24.8)	6.6	(4.5 - 9.4)
65-69	9.9	(7.3 - 13.2)	26.1	(11.9 - 49.5)	59.3	(27.1 - 112.6)	-	-	7.3	(4.9 - 10.5)
70-74	8.3	(5.6 - 11.8)	8.0	(1.0 - 28.7)	36.1	(9.8 - 92.3)	23.4	(7.6 - 54.6)	6.3	(3.9 - 9.8)
75-79	8.8	(5.7 - 12.9)	-	-	28.5	(3.5 - 103.1)	7.8	(0.2 - 43.3)	8.8	(5.5 - 13.3)
80-84	11.3	(7.4 - 16.5)	45.7	(12.4 - 116.9)	-	-	14.6	(0.4 - 81.3)	10.0	(6.2 - 15.2)
85 +	13.2	(9.0 - 18.8)	40.3	(4.9 - 145.7)	39.9	(1.0 - 222.4)	-	-	12.6	(8.4 - 18.2)

'-' indicates no cases recorded

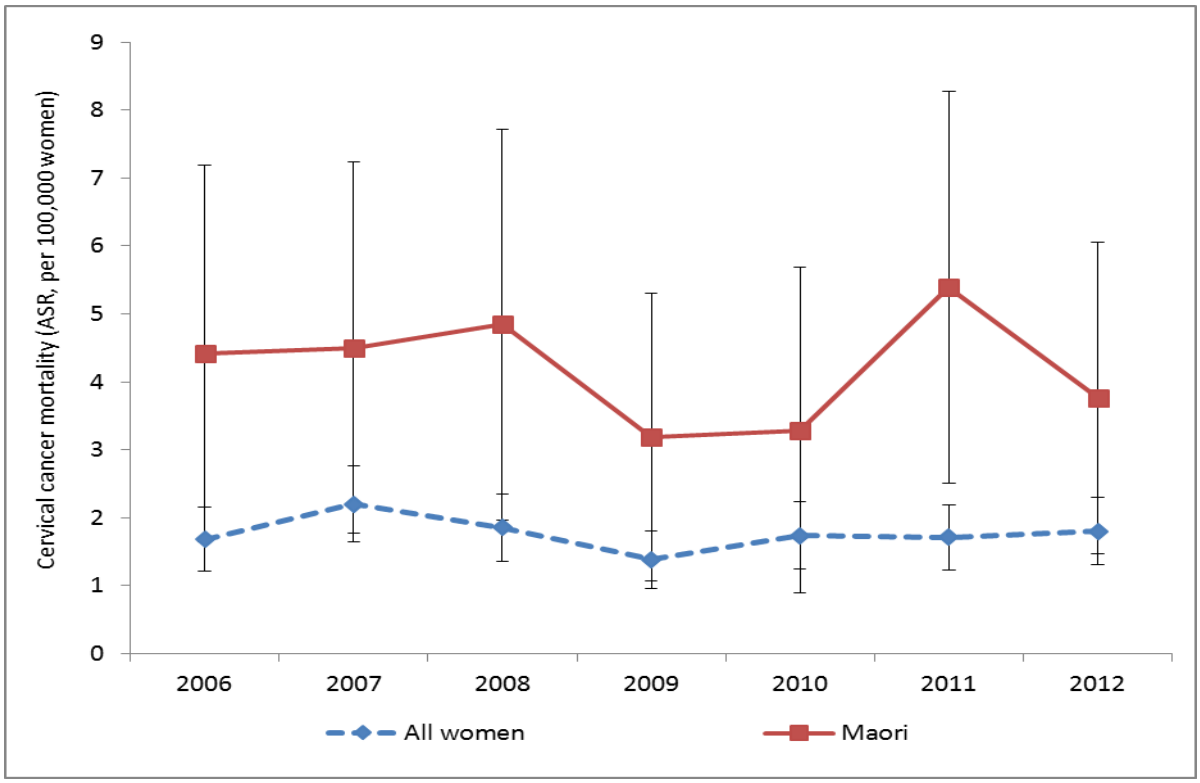
Figure 6 – Age-standardised cervical cancer mortality rates, 2006 to 2012, by ethnicity

a) All ethnic groups



Vertical bars represent 95% confidence intervals. Note: no deaths were recorded for Asian women in 2006 or 2011.

b) Māori women, compared to All women



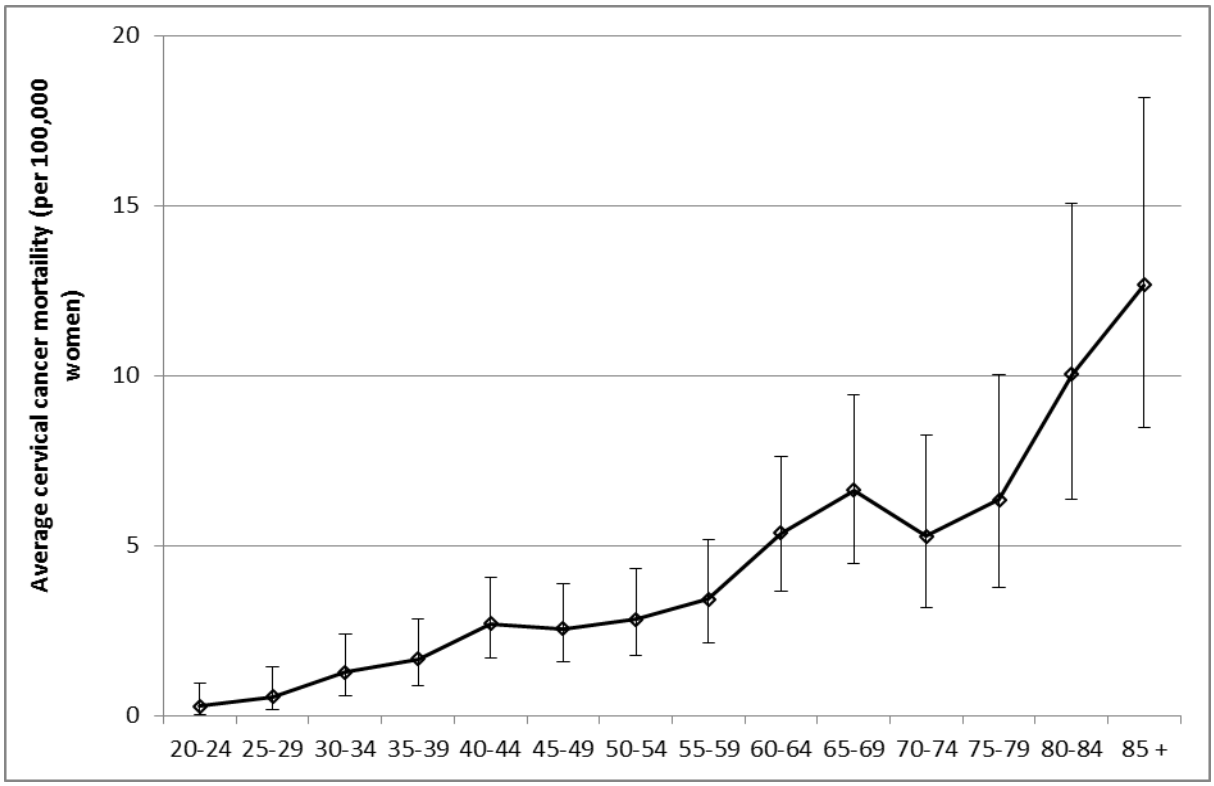
Vertical bars represent 95% confidence intervals

Table 4 – Cervical cancer mortality, 1998 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*
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	-	-	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
2011	53	1.7	14	5.4	7	5.7	-	-	32	1.3
2012	56	1.8	11	3.8	6	4.6	1	0.4	38	1.6

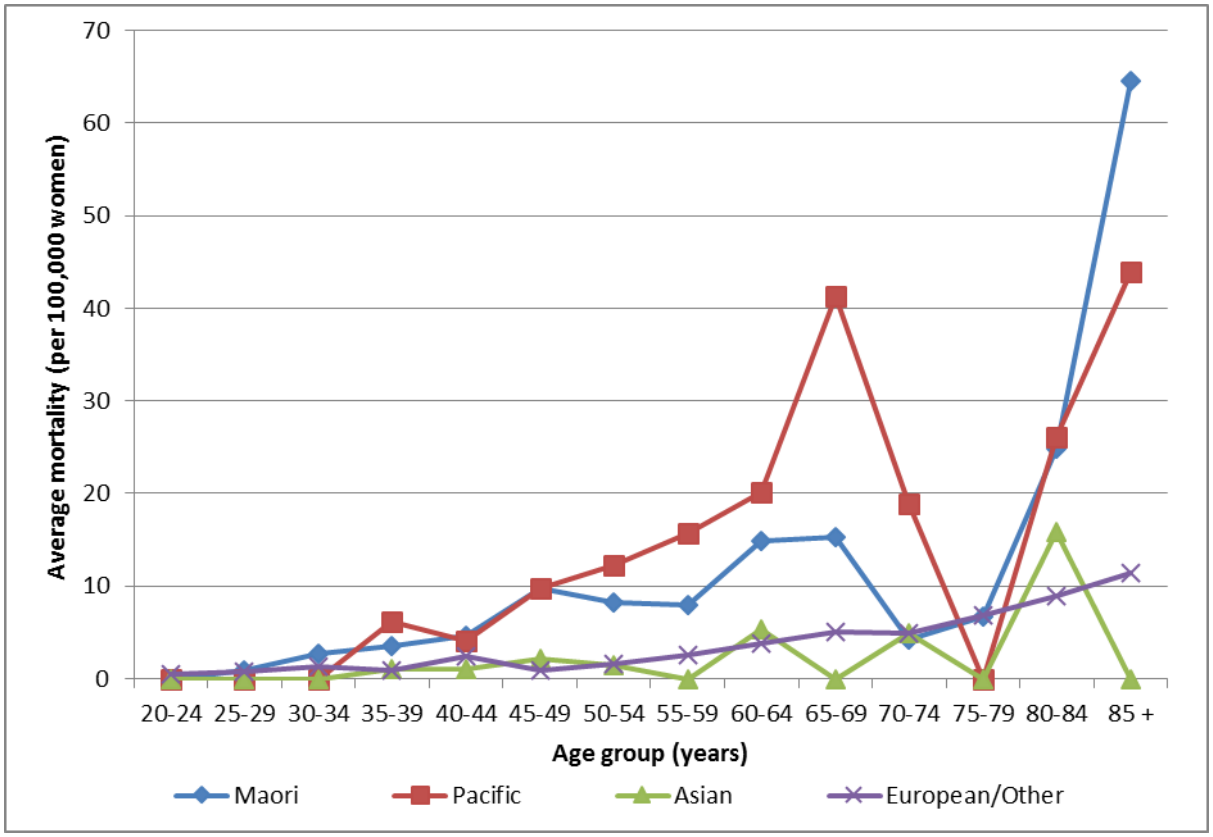
† Deaths and rates for 1998-2004 sourced from *Cancer: New Registrations and Deaths, 2007.(4)* Deaths and rates for 2005 sourced from *National Cervical Screening Programme Annual Monitoring Report 2008-2009.(5)* Separate data on deaths in Pacific women were sourced from *National Cervical Screening 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 – Five-year average cervical cancer mortality rates (2008-2012), by age



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

Figure 8 – Five-year average cervical cancer mortality rates (2008-2012), by age and ethnicity



Note that no deaths were recorded in Māori women aged 20-24 years, in Pacific women aged 20-34 or 75-79 years, in Asian women aged 20-34, 55-59, 65-69, 75-79 or 85 + years over this time period. See also Table 5.

Table 5 – Average cervical cancer mortality (2008-2012), by age

	All women		Māori women	
Age	**Rate**	**(95%CI)**	**Rate**	**(95%CI)**
20-24	0.3	(0.0 - 0.9)	-	(0.0 - 2.5)
25-29	0.6	(0.2 - 1.4)	0.9	(0.0 - 4.8)
30-34	1.3	(0.6 - 2.4)	2.7	(0.6 - 8)
35-39	1.7	(0.9 - 2.8)	3.5	(1.0 - 9.1)
40-44	2.7	(1.7 - 4.1)	4.7	(1.5 - 10.9)
45-49	2.5	(1.6 - 3.9)	9.8	(4.7 - 18)
50-54	2.8	(1.7 - 4.3)	8.3	(3.3 - 17.1)
55-59	3.4	(2.1 - 5.2)	7.9	(2.6 - 18.5)
60-64	5.4	(3.6 - 7.6)	14.8	(6.0 - 30.6)
65-69	6.6	(4.5 - 9.4)	15.2	(4.9 - 35.6)
70-74	5.3	(3.2 - 8.2)	4.2	(0.1 - 23.3)
75-79	6.3	(3.8 – 10.0)	6.7	(0.2 - 37.4)
80-84	10.0	(6.4 – 15.0)	24.8	(3.0 - 89.5)
85 +	12.7	(8.5 - 18.2)	64.5	(13.3 - 188.5)

'-' indicates no deaths recorded over the five-year period

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 the previous 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 (2009-2013). 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 2015) 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 2013 for women aged 25-29 years refers to women aged 25-29 years on 31 December 2013, with a screening event in the three-year period 1 January 2011 to 31 December 2013. Similarly, the hysterectomy adjustor used relates to the end of the three-year period over which coverage is measured (2013 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 838,603 in 2009, to 880,691 in 2013 (Table 6). As of 31 December 2013, 76.5% 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 (2009-2013), but was not met in any year during this period for Māori, Pacific, or Asian women, or nationally. Coverage has decreased slightly for European/ Other women (from 82.7% in 2009 to 81.7% in 2013; the ethnicity with the highest coverage in each year) but has increased for Māori, Pacific and Asian women over the five-year period (Figure 9, Table 6). The increase was greatest among Asian women (from 60.3% in 2009 to 65.0% in 2013; the ethnicity with the lowest coverage in each year). As a result, the disparity between the ethnicity groups with the highest and lowest coverage has narrowed from a difference of 22.4% in 2009 to a difference of 18.2% in 2013; (Figure 10, Table 6).

Estimated coverage also varied by age (Figure 11, Table 7). The 80% target was met in four age groups in 2013 (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 women aged less than 40 years however. In women aged 20-24, 25-29 and 35-39 years there has been little change in coverage over the five years, while in women aged 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 13.7% in 2009 (between women aged 25-29 years and women aged 45-49 years) to a difference of 15.2% in 2013 (between women aged 25-29 years and women aged 45-49 and 50-54 years).

Comments

In principle, 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) At that time, 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. While undercounting was estimated to be around 20% for each of the Māori, Pacific, and Asian groups in 2007, a comparison between ethnicity as recorded on the NHI and on the NCSP Register in February 2016 found that undercounting on the NCSP Register was comparatively small by that time. Among women aged 25-69 years, nationally there was a 1.7%, 1.2%, and 0.7% increase in coverage respectively for Māori, Pacific and Asian women, and a 0.5% decrease in coverage for European/Other women when ethnicity recorded on the NHI, rather than that recorded on the NCSP Register, was used to calculate coverage (10). While there are no direct estimates of the extent of underreporting at the time relevant to the results in this report (data extraction from the NCSP Register for the current report occurred in March 2015), these recently reported results suggest that underreporting in the NCSP Register reduced between 2007 and 2016.

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

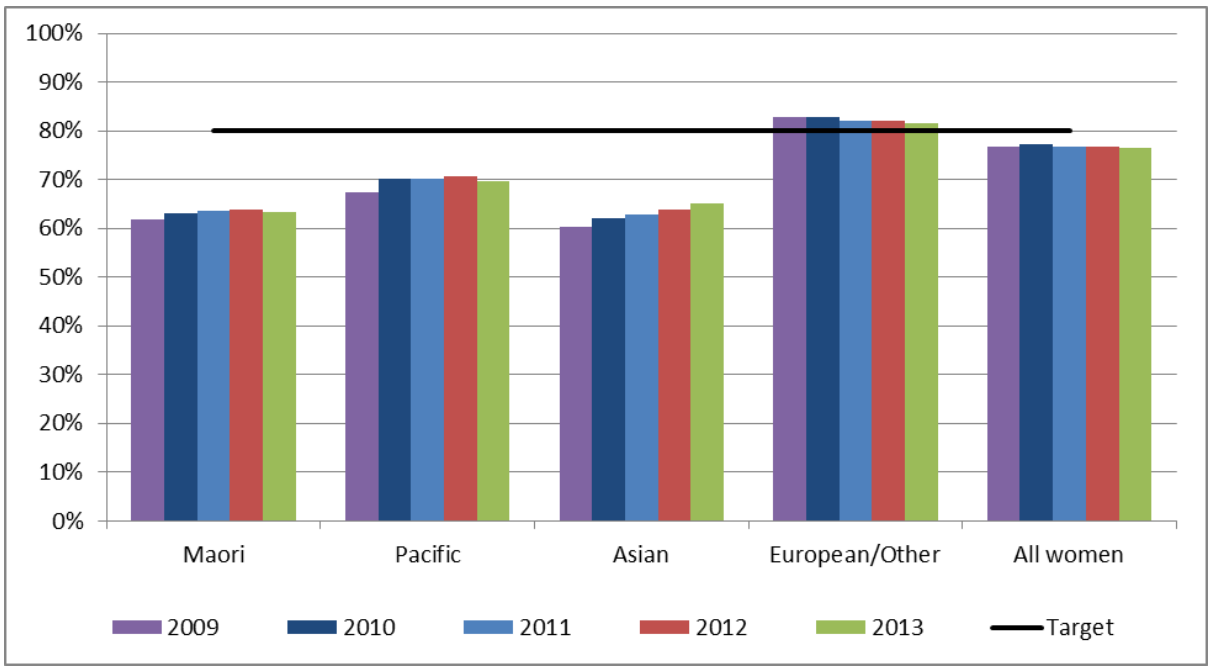
The methods developed for calculating the indicators used to monitor the NCSP are reviewed and revised approximately every three years, consistent with other international programmes. In addition, revisions to calculations are made in accordance with changes to New Zealand statistics, such as the population 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.

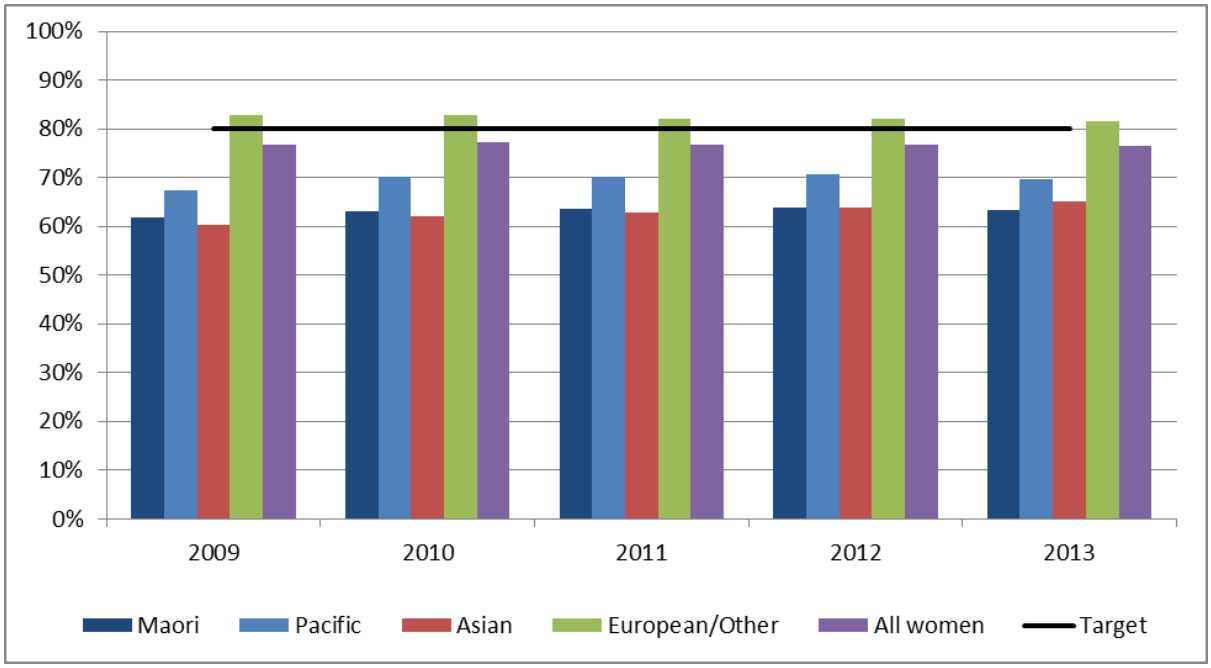
As with all indicators, coverage indicators and the statistics on which they are based continue to evolve and further changes in the construction of these indicators are to be expected in the future. Changes currently in progress include better methods for hysterectomy adjustment and ethnicity identifications.

Figure 9 – Percentage* of women aged 25-69 years screened in the previous three years, 2009 to 2013, 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, 2009 to 2013, by ethnicity

	2009		2010		2011		2012		2013	
Ethnicity	**N**	**%***	**N**	**%***	**N**	**%***	**N**	**%***	**N**	**%***
Māori	85,007	61.8	88,327	63.2	90,331	63.5	92,662	64.0	93,674	63.4
Pacific	40,080	67.4	42,719	70.3	43,548	70.1	44,861	70.6	45,286	69.7
Asian	76,636	60.3	82,385	62.0	86,881	62.8	91,586	63.8	96,712	65.0
European/ Other	636,880	82.7	643,598	82.9	641,877	82.2	643,832	82.0	645,019	81.7
All women	**838,603**	**76.7**	**857,029**	**77.2**	**862,637**	**76.8**	**872,941**	**76.8**	**880,691**	**76.5**

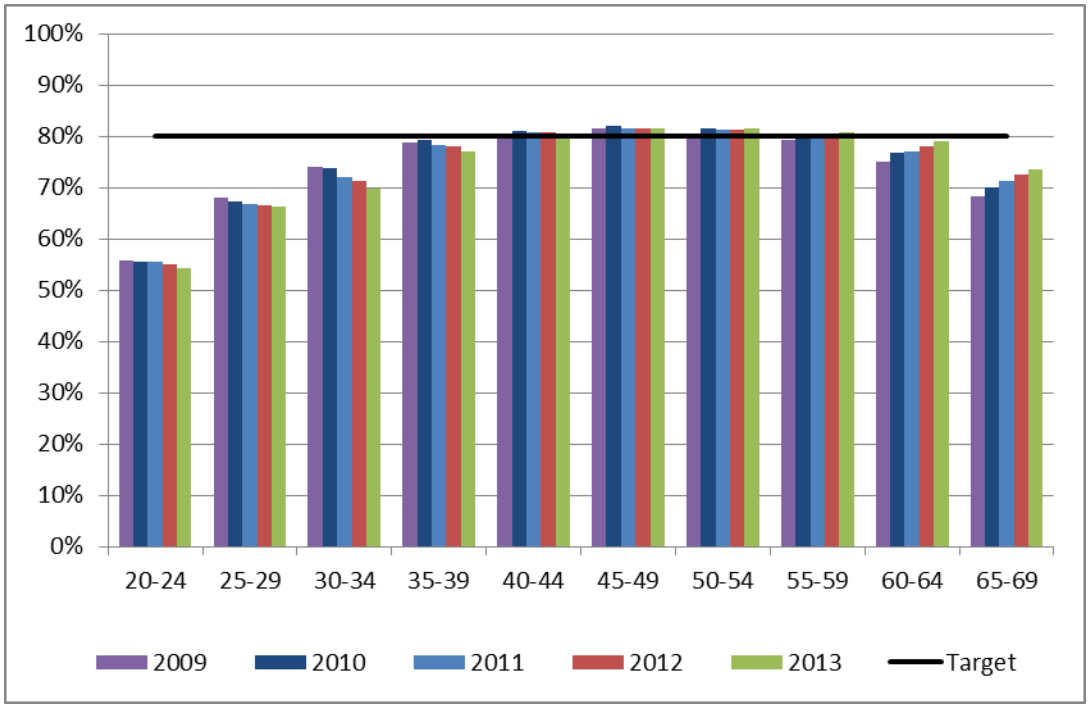
* As a percentage of the hysterectomy-adjusted population (ages 25-69 years) in that year, based on projections from 2006 census population to the end of the relevant calendar year and hysterectomy prevalence estimates relating to the end of the relevant calendar year.

Table 7 – Women screened in the previous three years, 2009 to 2013, by 5-year age group

	2009		2010		2011		2012		2013	
Age group	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
20-24	82,964	55.7	85,130	55.7	87,118	55.6	87,500	55.0	86,830	54.2
25-29	96,909	67.9	98,328	67.3	98,846	66.7	99,474	66.6	99,813	66.3
30-34	101,677	74.1	102,539	73.8	102,176	72.2	103,019	71.2	103,103	69.8
35-39	120,779	78.9	118,638	79.2	113,826	78.3	110,417	78.0	107,293	77.0
40-44	120,025	79.9	122,956	81.0	123,970	80.7	124,511	80.8	122,946	80.3
45-49	119,649	81.6	120,501	82.0	119,011	81.5	118,087	81.5	117,643	81.5
50-54	97,275	80.5	102,170	81.5	105,968	81.4	109,646	81.4	112,556	81.5
55-59	76,917	79.2	80,296	80.2	83,108	80.2	86,694	80.6	90,340	80.9
60-64	62,618	75.0	66,619	76.7	68,262	77.2	69,560	78.0	71,709	79.1
65-69	42,754	68.3	44,982	70.2	47,470	71.2	51,533	72.6	55,288	73.6

* 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, 2009 to 2013, 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 this section regularity of screening is reported on in order to characterise patterns of early, on-time, and late re-screening.

Target

None yet defined.

Calculation

A reference cohort consisting of satisfactory cytology samples collected from women aged 20-69 years between 2009-2013 was created.

The most recent satisfactory cytology sample from these women prior to the reference sample was identified on the NCSP register. The recommendation code of these prior samples was used to classify the reference samples as early, on-time, or late. Only reference samples where the prior sample indicated an expected screening interval or either 3 years (the routine screening interval) or 12 months were included for further analysis. A recommendation code of R1 (or equivalently B2B0) indicated an expected screening interval of 3 years, and recommendation codes R6, R7 or R8 (or equivalently B2B7, B2B7A, B2B7H) indicated an expected screening interval of 12 months.

Reference samples where no prior satisfactory cytology sample was identified on the register with a collection date of 1 January 2000 or later or where the prior sample had any other recommendation code were excluded from further analysis. These women were either under specialist management, had an expected screening interval of less than 12 months, or there was insufficient information to infer an expected screening interval. Reference samples collected at colposcopy were also excluded as these may have arisen in relation to symptoms or other clinical indications.

Reference samples with an expected screening interval of 3 years were classified as 'on-time' if they were collected at least 30 and no more than 42 months after the prior cytology test (ie within +/- 6 months of the recommended interval). 'Early' reference samples were those collected less than 30 months after the prior cytology sample, and 'late' samples were collected more than 42 months after. Reference samples with an expected screening interval of 12 months were classified as 'on time' if they were collected at least 9 and no more than 15 months after the previous cytology sample (ie within +/- 3 months of the recommended interval), with samples collected before this period classified as 'early', and those collected after this period classified as 'late'.

To give an indication of how regularity of screening has changed over time, results are presented based on the quarter of the year the reference cytology sample was collected, from the first quarter of 2009 to the final quarter of 2013. Therefore a result for the first quarter of 2013 reports the percentage of women who attended for screening within that quarter who were attending early, on-time or late in relation to the recommendation associated with their prior cytology test (ie the total of these three categories in each quarter sums to 100%).

For this measure age relates to the woman's age on the date of her reference cytology sample (ie the attendance which is classified as either early, on-time or late).

Results

In total over the period 2009-2013, satisfactory cytology samples were collected from 1,150,242 women aged 20-69 years (based on their age at the time of the sample). Of these, 1,016,209 women met all inclusion criteria and 1,718,622 cytology samples collected from these women are included as reference cytology samples for analysis in this section.

Routine screening (3-year recall)

In the first quarter of 2009, approximately half (49.7%) of women who were returning for routine screening attended on-time. This had risen to 59.4% by the last quarter of 2013 (Figure 12). The five-year period 2009-2013 saw a shift from early to on-time screening. The proportion of women attending early declined by 11.3 percentage points (from 29.8% in the first quarter of 2009 to 18.5% in the last quarter of 2013), while the proportion of women attending on-time for routine screening increased by the same amount (from 48.1% to 59.4%). The proportion of women attending later than recommended remained nearly unchanged (approximately 20-22%). This broad pattern of a shift from early to on-time screening, with comparatively little change to the proportion of women attending late was also seen for each of the ethnicity and 10-year age groups.

By ethnicity

A larger proportion of European/ Other women returned on-time for all quarters of the five-year period (between 50.0% and 61.2% of women attending for routine screening), followed by Asian women (between 42.9% and 59.8%)(Figure 14). The proportion of women returning for routine screening who attended on-time increased for all ethnicity groups over the five-year period, with the increase ranging 10.8 percentage points for European/ Other women to 17.7 percentage points for Pacific women. In most ethnic groups the increase in on-time rescreening reflected a corresponding reduction in early rescreening; in Pacific women it additionally reflected a 5.3 percentage point reduction in late rescreening. There was a small increase in late rescreening among Asian women over the five-year period (2.1%), but relatively little change in late rescreening by Māori and European/ Other women. The difference between European/ Other women and the other three ethnic groups in terms of the proportion of women returning who were attending on-time reduced over the five-year period, converging by 7 percentage points for Pacific women, 5 percentage points for Asian women, and 0.7% for Māori women (Figure 14, Table 19).

The proportion of women returning for routine screening who attended early was highest for Asian women for all quarters of the five-year period, but Asian women also had the largest reduction in women returning early (from 38.7% in the first quarter of 2009 to 20.9% in the final quarter of 2013). Early re-screening reduced by more than 10 percentage points in all ethnic groups.

The proportion of women screened who were re-attending later than recommended was highest for either Māori or Pacific women for all quarters of the five-year period; between 27.3% and 35.1% for these two ethnic groups, compared with between 16.6% and 20.6% for Asian or European/ Other women. The difference compared to European/ Other women did generally narrow over the five-year period, by 5.3 percentage points for Pacific women and by 0.6 percentage points for Māori women, however the difference widened by 2.2 percentage points for Asian women.

Details of the number of re-attendances in each category are shown in Table 19.

By age

The proportion of women screened who were re-attending on-time was highest for women aged 60-69 years for all quarters over the five-year period (ranging from 61.4% to 71.4% of women screened over this time period)(Figure 15). 20-29 year old women had the smallest proportion of women attending for routine re-screening who were on-time (ranging from 36.9% to 49.3% of women screened). The proportion of women screened who were attending on-time increased by more than nine percentage points in all age groups over the five-year period.

The proportion of women screened who were re-attending early was consistently highest over the five-year period among women aged 20-29 (39.0% in the first quarter of 2009, declining to 28.2% in the fourth quarter of 2013) and consistently lowest among women aged 60-69 (23.0% in the first quarter of 2009, declining to 12.8% in the fourth quarter of 2013). Declines of 10 percentage points or more in early re-screening were seen in all age groups across the five-year period.

The proportion of women screened who were re-attending late was consistently highest over the five-year period among women aged 30-39 years (between 25.2% and 28.7%) and consistently lowest among women aged 60-69 (between 12.9% and 16.1%). The proportion of women attending late was fairly similar in the last quarter of 2013 to what it was in the first quarter of 2009 (less than two percentage points difference in all age groups).

Over time – and as for the result by ethnicity – there was a shift from early screening to on-time screening in all age groups; with relatively little change in the proportion who attended late.

Details of the number of re-attendances in each category are shown in Table 20.

12-month re-screening

Overall

Women who were attending after a previous recommendation to return at 12 months most commonly returned on-time (ie between 9-15 months) or late (more than 15 months). Between 2009-2011the proportion of women returning on-time was fairly similar to the proportion returning late (between 45.0-48.9% on-time versus 43.8-47.3% late)(Figure 13). However over the period 2012-2013, the proportion of women returning late became somewhat greater than the proportion returning on-time (between 49.1-52.1% late versus between 43.8-47.3% on-time). The proportion of cases classified as late was greater for 14 of the 20 quarters in the years 2009-2013. In only a small proportion of cases were women re-attending earlier than recommended (between 3.3% and 6.2%). There was comparatively little change over the period 2009-2013 in the proportion re-attending early, on-time or late following a 12-month recall, but the tendency was a slight shift towards late re-attendance (which increased by 4.2 percentage points) and small decreases for both early and on-time screening (decreases of 2.7 and 1.6 percentage points respectively).

By ethnicity

A greater proportion of European/ Other and Asian women attended on-time compared with Māori and Pacific women (between 43.1% and 51.6% for European/ Other and Asian women, compared with between 31.1% and 39.8% for Māori and Pacific women)(Figure 16). There was little change between the first quarter of 2009 and the fourth quarter of 2013 in all ethnic groups, especially on-time attendance. There was a comparatively small shift from early to late re-screening for all groups (a 4.4 percentage point or smaller increase in the proportion returning late for all groups between the first quarter of 2009 and the fourth quarter of 2013).

Details of the number of re-attendances in each category are shown in Table 21.

By age

Age-specific patterns of re-attendance after a 12-month recall recommendation were similar to those for women recommended to return at the routine interval of three years. Early re-attendance was most common in women aged 20-29 years (between 3.8% and 8.3%); on-time re-attendance was most common in women aged 60-69 years (between 52.3% and 61.7%), and late re-attendance was most common in women aged 30-39 years (between 50.4% and 58.1%). There was a broad pattern of increasing on-time attendance with increasing age (Figure 17).

In most age groups (those between 30-69 years), there was a small shift from on-time towards late re-attendance. For the age groups between 30-69 years, and compared to the first quarter of 2009, on-time attendance in the last quarter of 2013 decreased by between 3.0 to 5.8 percentage points, and late re-attendance increased in by between 4.5 and 8.3 percentage points. However in women

aged 20-29 years, early re-attendance decreased by 4.4 percentage points, on-time re-attendance increased by 4.8 percentage points and late re-attendance decreased by 0.3 percentage points.

Details of the number of re-attendances in each category are shown in Table 22.

Comments

Regularity of screening here reports on the timeliness of attendance among the women who do attend for screening within a given time period (a quarter of calendar year) and characterises each attendance as being early, on-time or late in relation to the recommendation associated with their prior cytology test (ie the total of these three categories in each quarter sums to 100%). That is, it only reports timeliness of screening in women who *do attend* in that given time period (and who have had at least one previous screening test recorded on the NCSP Register), and does not report on women who have *not* attended. This means that, for example, the proportion of women attending more than 42 months after a recommendation to return in three years does not correspond to the total proportion of women in the eligible population who have not been screened for more than 42 months. However, when these women in the eligible population who have not been screened for more than 42 months do re-attend, they would be included in this category. As a result, outreach activities which successfully encourage some underscreened women to re-attend would potentially cause a transient increase in the proportion of attendances which are classified as late. Therefore, it is important that the results of this measure are read in conjunction with the results for coverage, which report on screening attendance at the level of the entire eligible population (but in less detail in terms of timeliness).

Regularity of screening has been calculated using an updated method in the current report compared to the previous report, and so the results in the two reports are not directly comparable.

Figure 12 – Timeliness of re-attendance following a routine (3-year) repeat screening recommendation, 2009-2013

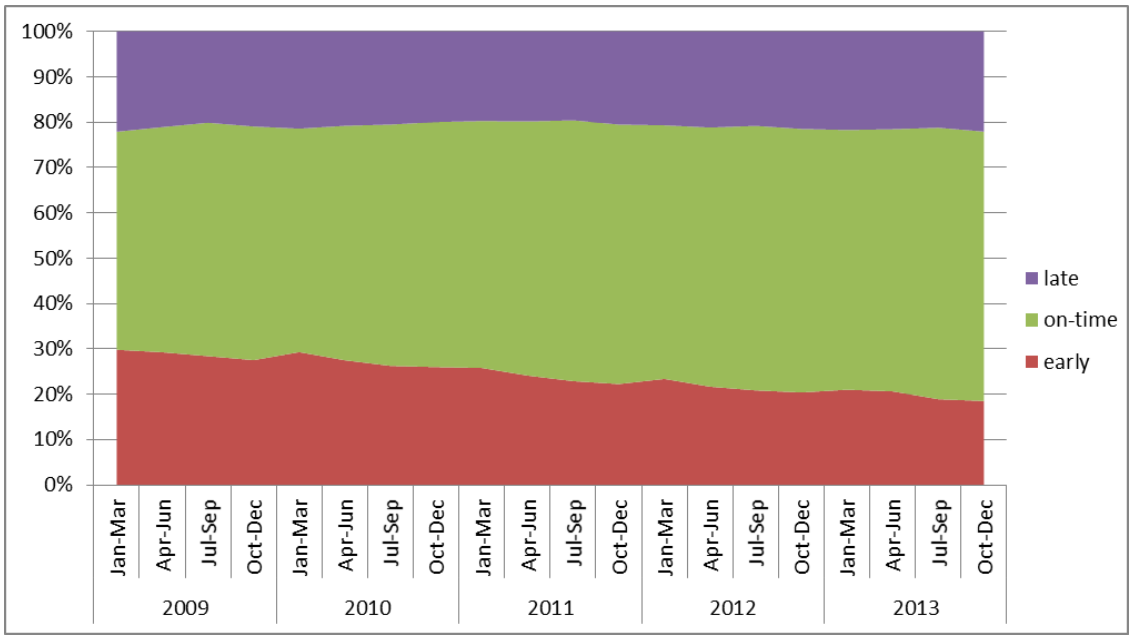


Figure 13 – Timeliness of re-attendance following a 12-month repeat screening recommendation, 2009-2013

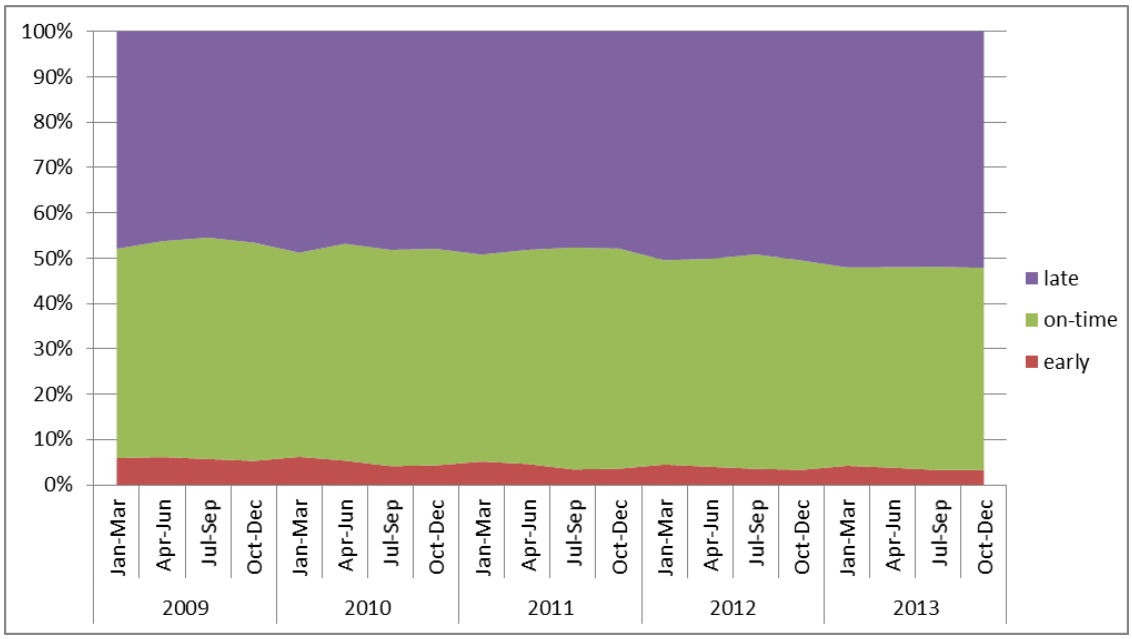


Figure 14 – Timeliness of re-attendance following a routine (3-year) repeat screening recommendation (percent), 2009-2013, by ethnicity

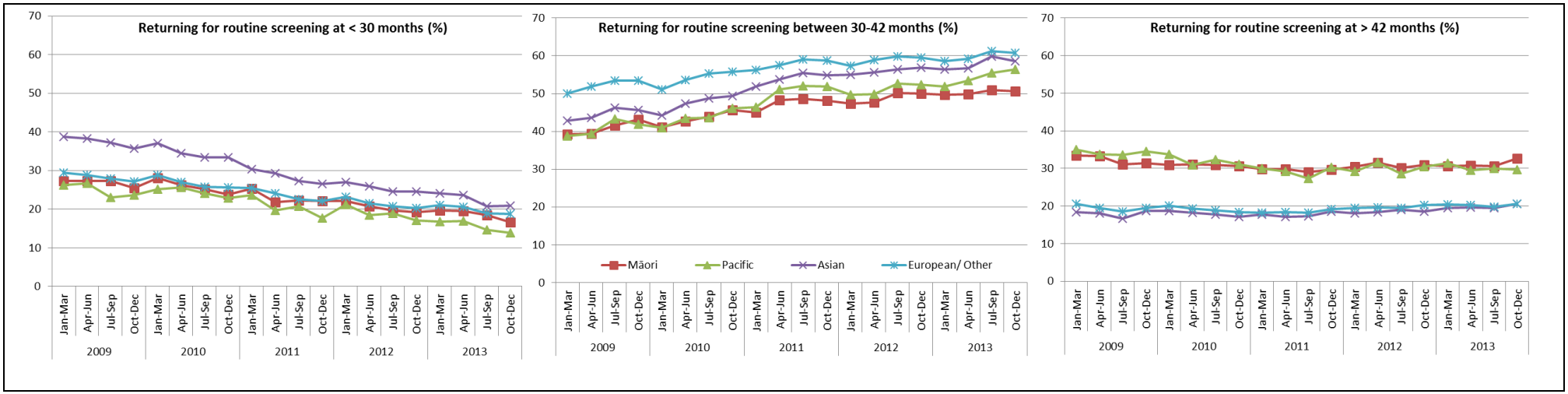


Figure 15 – Timeliness of re-attendance following a routine (3-year) repeat screening recommendation (percent), 2009-2013, by age

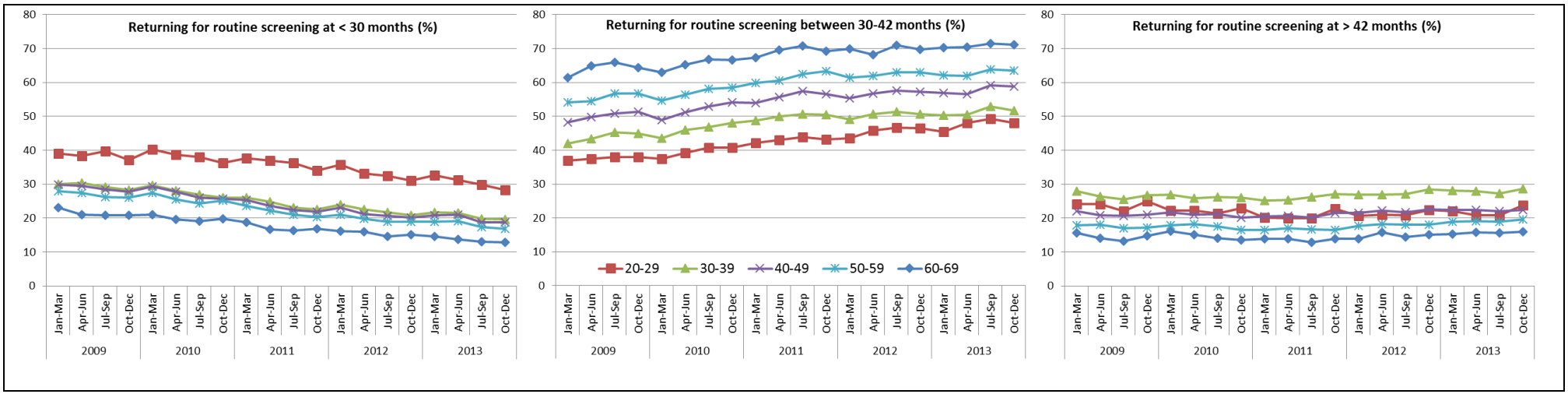


Figure 16 – Timeliness of re-attendance following a 12-month repeat screening recommendation (percent), 2009-2013, by ethnicity

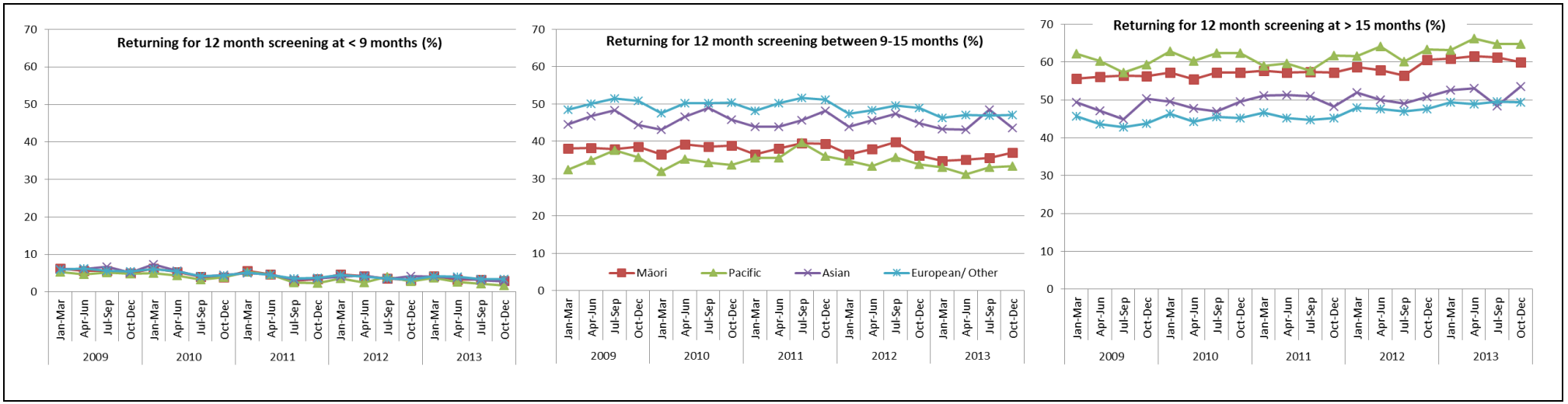
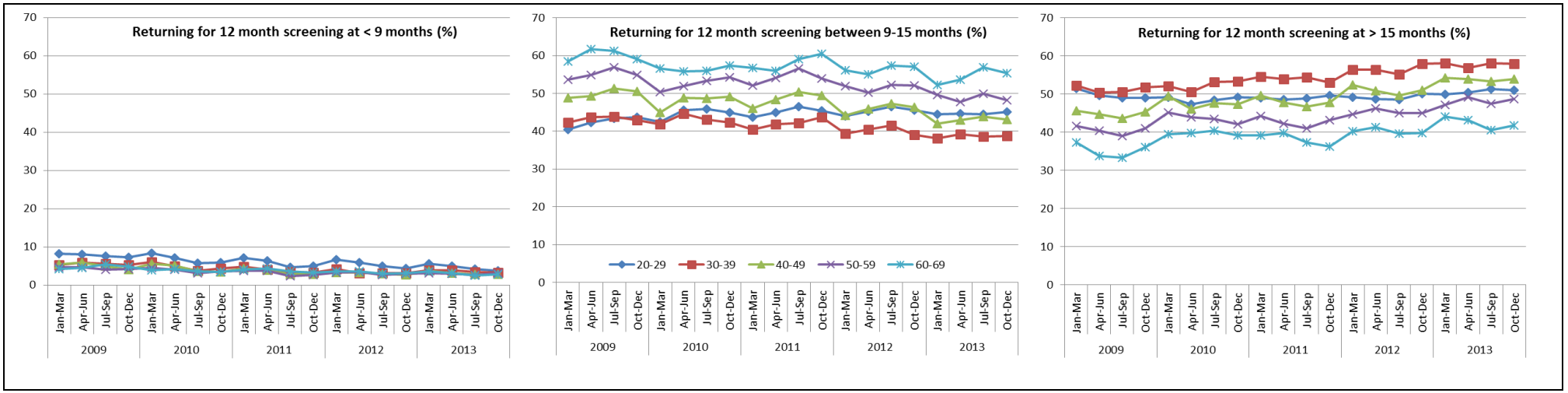


Figure 17 – Timeliness of re-attendance following a 12-month repeat screening recommendation (percent), 2009-2013, by age



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 for cytology reporting rates.

All fixed laboratory sites must process at least 15,000 gynaecological LBC samples per annum (Standard 504).

Calculation

Records for all cytology samples which were collected during 2013 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 screened in New Zealand 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 on cytology samples which were collected during 2013.

Results

During 2013 there were 410,584 women who has a cytology sample collected that was satisfactory for evaluation, 404,114 of whom were aged 20-69 years at the end of 2013. Results for these women are shown in Table 8 (overall) and by five-year age group in Table 9.

Abnormal cytology results were most common among women aged 20-24 years. Among women aged 20-49 years, LSIL was the most common type of cytological abnormality. LSIL reporting rates in women aged 20-49 years varied from 19.9 per 1,000 women screened (women aged 45-49 years) to 99.6 per 1,000 women screened (women aged 20-24 years) in 2013. LSIL was also the most common cytological abnormality for woman aged 55-59 years (14.8 per 1,000 women screened). ASC-US was the most common type of cytological abnormality for the remaining 3 age groups; 16.5, 13.0 and 10.6 per 1,000 women screened for women aged 50-54, 60-64 and 65-69 years, respectively.

In 2013 the rate of women with negative cytology ranged from 829.7 per 1,000 women screened (women aged 20-24 years) to 949.1 per 1,000 women screened (women aged 65-69 years).

Note that cytology results of AGC and adenocarcinoma 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 429,915 cytology samples in 2013. The number of cytology tests reported on by each laboratory processing cytology tests is reported on in Table 10. All laboratories met the recommended minimum volume of at least 15,000 specimens processed each year.

Table 8 – Overall cytology case reporting and rates per 1,000 women screened, 2013

Cytology result	2013		
	Total cases (20-69 yrs)	Crude rate (20-69 yrs)	ASR (20-69 yrs)
Negative	375,553	913.6	909.3
ASC-US	8,569	20.8	21.7
LSIL	14,099	34.3	37.3
ASC-H	2,069	5.0	5.4
HSIL	3,399	8.3	9.1
Invasive SCC	27	0.1	0.1
AGC/AIS	336	0.8	0.8
Adenocarcinoma	56	0.1	0.1
Malignant neoplasm	6	<0.05	<0.05
Total	**404,114**		

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), 2013

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	40,289	829.7	38,365	869.2	40,496	909.3	41,453	928.4	47,117	930.8	44,430	929.0	42,522	937.9	34,044	944.8	26,797	948.1	20,040	949.1
ASC-US	1,763	36.3	1,306	29.6	1,002	22.5	852	19.1	900	17.8	904	18.9	750	16.5	500	13.9	368	13.0	224	10.6
LSIL	4,835	99.6	2,661	60.3	1,621	36.4	1,133	25.4	1,088	21.5	952	19.9	741	16.3	535	14.8	332	11.7	201	9.5
ASC-H	493	10.2	463	10.5	287	6.4	205	4.6	160	3.2	142	3.0	129	2.8	82	2.3	62	2.2	46	2.2
HSIL	771	15.9	871	19.7	587	13.2	362	8.1	313	6.2	174	3.6	122	2.7	91	2.5	58	2.1	50	2.4
Invasive SCC	-	-	1	<0.05	2	<0.05	3	0.1	4	0.1	3	0.1	2	<0.05	3	0.1	5	0.2	4	0.2
AGC/AIS	10	0.2	31	0.7	31	0.7	43	1.0	35	0.7	37	0.8	60	1.3	28	0.8	33	1.2	28	1.3
Adenocarcinoma	-	-	-	-	2	<0.05	-	-	1	<0.05	2	<0.05	9	0.2	15	0.4	12	0.4	15	0.7
Malignant neoplasm	-	-	-	-	1	<0.05	-	-	-	-	-	-	2	<0.05	-	-	3	0.1	-	-
Total	**48,161**	**-**	**43,698**	**-**	**44,029**	**-**	**44,051**	**-**	**49,618**	**-**	**46,644**	**-**	**44,337**	**-**	**35,298**	**-**	**27,670**	**-**	**20,608**	**-**

Table 10 – Cytology tests processed by laboratory, 2013

Laboratory	Cytology tests processed* N
Aotea Pathology Ltd	42,800
Canterbury Health Laboratories	23,678
Diagnostic Medlab Ltd	111,416
LabPLUS	15,177
Medlab Central Ltd	34,717
Pathlab	43,526
Southern Community Labs Dunedin	158,601
TOTAL	**429,915**

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

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 also 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 that met these 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 high grade 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 2013. There were 3,653 women identified with HSIL or SC cytology; 3,393 (92.9%) of whom had histology within six months of their cytology test (Table 11). CIN2+ was identified in histology for 2,774 (81.8%) of these women with histology available within six months (Table 11). The positive predictive value for HSIL+SC cytology was within the target range of 65% to 85%, and was similar to the values seen for previous years (79.8% in 2012, 82.9% in 2011, 82.4% in 2010).

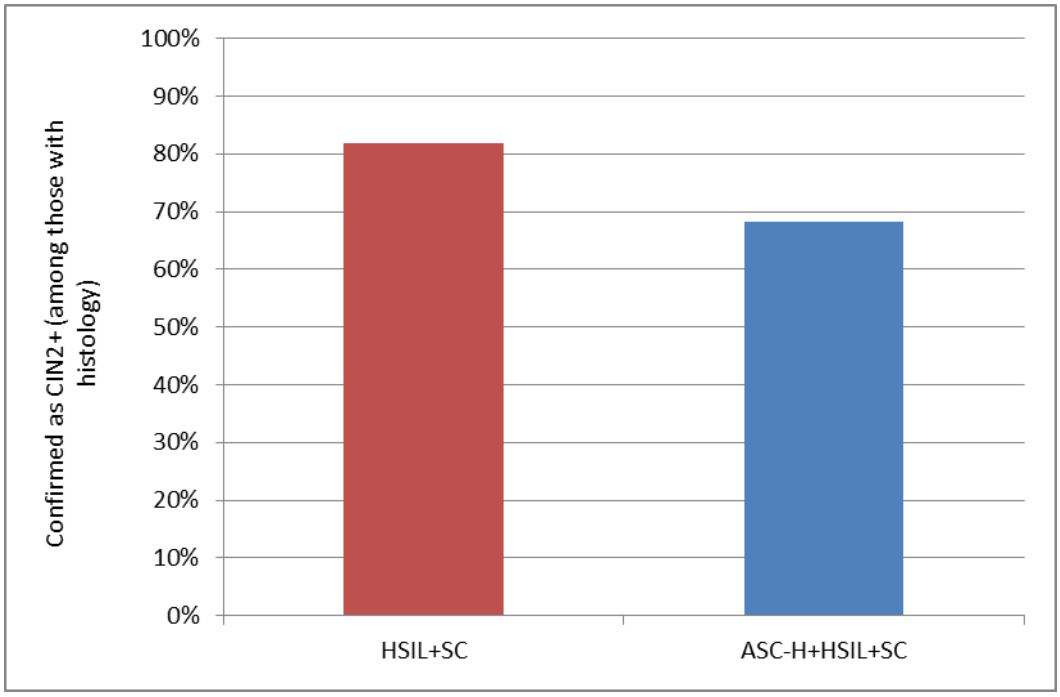
There were 6,042 women identified with ASC-H, HSIL or SC cytology; 5,334 (88.3%) of whom had histology within six months of their cytology test (Table 11). CIN2+ was identified by histology for 3,644 (68.3%) of these women with histology available within six months. The positive predictive value for ASC-H+HSIL+SC cytology was also similar to the values seen in recent years (66.6% in 2012, 70.6% in 2011, 70.4% in 2010,); there is no target for this measure (Table 11).

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 18 – Positive predictive value, 2013, by cytology result group



Target for percentage of women with HSIL+SC cytology and histology available who are confirmed as CIN2+: Not less than 65%, and not greater than 85% (no target for ASC-H+HSIL+SC)

Table 11 – Positive predictive value, 2013, by cytology result group

Cytology result	Results	Histology available†		%* confirmed as CIN2+
		N	%	
HSIL + SC	3,653	3,393	92.9	81.8
ASC-H + HSIL + SC +	6,042	5,334	88.3	68.3

† 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 2013 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 25).

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 2013.

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

Results

In 2013, there were 29,700 histology samples collected, 28,809 of which were sufficient for diagnosis. These samples related to 23,280 women, 22,554 of whom were aged 20-69 years. Results relating to histology in these 22,554 women aged 20-69 years are summarised in Table 12.

The overall rate of women with histology samples taken per 1,000 women screened was highest among women aged 25-29 years (73.5 per 1,000 women screened; Table 13). 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 14). 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 15). In contrast, in the five-year age groups between 40-69 years over 60% of women with histology had negative/ benign histology.

Histology reporting by ethnicity is shown in Table 16. Overall rates of histology per 1,000 women screened were lower for Pacific and Asian women (44.9 and 42.9 per 1,000 women screened, respectively) than for Māori and European/ Other women (58.4 and 56.9 per 1,000 women screened, respectively). Rates of negative/ benign histology were highest in European/ Other women, and lowest in Asian 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 Asian women.

Overall, the age-standardised rate of high grade squamous (CIN 2/3) abnormalities has increased from 10.9 per 1,000 women screened in 2004 to 12.6 per 1,000 women screened in 2013. By ethnicity, the highest rate was seen for Māori women (rising from 14.2 per 1,000 women screened in 2004 to 16.4 in 2013; Figure 19). The rate for European/ Other women increased from 11.3 per 1,000 women screened in 2004 to 13.3 in 2013. Compared to Māori women and European/ Other women, lower rates of high grade squamous (CIN 2/3) abnormalities were seen for Pacific and Asian women (between 6 and 8 per 1,000 women screened in 2004, rising to between 7 and 8 in 2013). However these increases have predominantly occurred since 2009, and overall rates of histology per 1,000 women screened have increased over this time period (Figure 20).

Age-specific trends in the rate of high grade squamous histology are shown in Figure 18. In keeping with the trend seen for the age-standardised rate, the age-specific rates of high grade squamous (CIN 2/3) abnormalities per 1,000 women screened have increased from 2009 to 2013 for each of the five-year age groups between 25-59 years (Figure 21). However as for the results by ethnicity, overall rates of histology per 1,000 women screened have also increased in many age groups over this time period (Figure 22). As the observed increase in high grade squamous abnormalities per 1,000 women screened may to some extent reflect the observed increase in histology collected per 1,000 women screened, trends in high grade squamous abnormalities are also presented as a percentage of all women with histology in Table 17 and Figure 23 and Figure 24. Some of the apparent increases in high grade squamous abnormalities per 1,000 women screened may have been due to histology samples being collected from more women, as the percentage of all women with histology who have a high grade squamous abnormality did not increase. For example higher rates of high grade squamous abnormalities per 1,000 women screened were observed in 2012 and 2013 compared to 2011 in women aged 25-29 and 35-39 years, however relative decreases were observed in these years and age groups when considering the percentage of all women with histology who had a high grade squamous abnormality. High grade squamous abnormalities fell in women aged 20-24 years 2013, both in terms of the rate per 1,000 women screened (from 25.4 in 2012 to 22.0 in 2013; a relative reduction of 13.7%) and the percentage of all women with histology who had a high grade squamous abnormality (from 39.7% to 34.7%; a relative reduction of 8.5%

compared to 2012). While there was also a drop in the overall rate of women with histology per 1,000 women screened in this age group since 2012 (5.7%), this was smaller than the observed drop in high grade squamous abnormalities per 1,000 women screened (13.7%).

Table 18 presents trend data 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 12 – Histology cases and reporting rates per 1,000 women screened (ages 20-69 years), 2013

Histology result category	2013		
	Cases	Crude rate (20-69 yrs)	ASR (20-69 yrs)
Negative/benign (non neoplastic)	11,770	28.6	27.4
HPV	1,832	4.5	4.7
CIN1	3,915	9.5	10.2
CIN2	1,590	3.9	4.3
CIN3	2,560	6.2	6.9
HSIL not otherwise specified	516	1.3	1.4
Microinvasive	13	<0.05	<0.05
Invasive SCC	86	0.2	0.2
Glandular dysplasia	-	-	-
Adenocarcinoma in situ	156	0.4	0.4
Invasive adenocarcinoma*	59	0.1	0.1
Adenosquamous carcinoma	2	<0.05	<0.05
Other cancer	55	0.1	0.1
TOTAL	**22,554**	**54.9**	

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 8 cases of invasive adenocarcinoma (endocervical type; SNOMED code M83843) and 51 cases of Invasive adenocarcinoma (not endocervical type; SNOMED code M81403)

Table 13 - Age-specific histology reporting rates per 1,000 women screened (ages 20-69 years), 2013

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)	763	15.7	863	19.6	933	21.0	1,151	25.8	1,844	36.4	2,114	44.2	1,783	39.3	1,116	31.0	698	24.7	505	23.9
HPV	333	6.9	346	7.8	281	6.3	227	5.1	178	3.5	187	3.9	142	3.1	69	1.9	42	1.5	27	1.3
CIN1	890	18.3	779	17.6	542	12.2	442	9.9	419	8.3	318	6.6	257	5.7	152	4.2	68	2.4	48	2.3
CIN2	437	9.0	386	8.7	261	5.9	155	3.5	152	3.0	98	2.0	61	1.3	19	0.5	15	0.5	6	0.3
CIN3	509	10.5	652	14.8	507	11.4	313	7.0	241	4.8	146	3.1	86	1.9	47	1.3	35	1.2	24	1.1
HSIL nos	120	2.5	150	3.4	102	2.3	61	1.4	36	0.7	19	0.4	12	0.3	10	0.3	3	0.1	3	0.1
Microinvasive	2	<0.05	1	<0.05	1	<0.05	2	<0.05	3	0.1	1	<0.05	-	-	3	0.1	-	-	-	-
Invasive SCC	-	-	13	0.3	11	0.2	8	0.2	13	0.3	12	0.3	4	0.1	9	0.2	7	0.2	9	0.4
Glandular dysplasia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Adenocarcinoma in situ	14	0.3	45	1.0	23	0.5	20	0.4	20	0.4	14	0.3	11	0.2	3	0.1	4	0.1	2	0.1
Invasive adenocarcinoma	1	<0.05	5	0.1	8	0.2	7	0.2	3	0.1	4	0.1	7	0.2	10	0.3	6	0.2	8	0.4
Adenosquamous carcinoma	-	-	-	-	-	-	-	-	1	<0.05	-	-	-	-	1	<0.05	-	-	-	-
Other cancer	-	-	4	0.1	2	<0.05	1	<0.05	3	0.1	3	0.1	10	0.2	11	0.3	13	0.5	8	0.4
Total	3,069	63.2	3,244	73.5	2,671	60.0	2,387	53.5	2,913	57.5	2,916	61.0	2,373	52.3	1,450	40.2	891	31.5	640	30.3

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

Table 14 – Summarised age-specific histology reporting rates per 1,000 women screened (ages 20-69 years), 2013

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**
Negative/ benign	15.7	19.6	21.0	25.8	36.4	44.2	39.3	31.0	24.7	23.9
HPV	6.9	7.8	6.3	5.1	3.5	3.9	3.1	1.9	1.5	1.3
CIN1	18.3	17.6	12.2	9.9	8.3	6.6	5.7	4.2	2.4	2.3
*CIN2/3**	22.0	26.9	19.5	11.8	8.5	5.5	3.5	2.1	1.9	1.6
CIN2+	22.3	28.5	20.5	12.7	9.3	6.2	4.2	3.1	2.9	2.8
CIN3+ †	10.8	16.3	12.4	7.9	5.6	3.8	2.6	2.3	2.3	2.4

* 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 15 – Summarised age-specific histology reporting rates as a percent of all women with histology (ages 20-69 years), 2013

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**
Negative/ benign	24.9%	26.6%	34.9%	48.2%	63.3%	72.5%	75.1%	77.0%	78.3%	78.9%
HPV	10.9%	10.7%	10.5%	9.5%	6.1%	6.4%	6.0%	4.8%	4.7%	4.2%
CIN1	29.0%	24.0%	20.3%	18.5%	14.4%	10.9%	10.8%	10.5%	7.6%	7.5%
*CIN2/3**	34.7%	36.6%	32.6%	22.2%	14.7%	9.0%	6.7%	5.2%	5.9%	5.2%
CIN2+	35.3%	38.7%	34.3%	23.8%	16.2%	10.2%	8.0%	7.8%	9.3%	9.4%
CIN3+ †	17.1%	22.2%	20.7%	14.7%	9.7%	6.2%	5.0%	5.8%	7.3%	8.0%

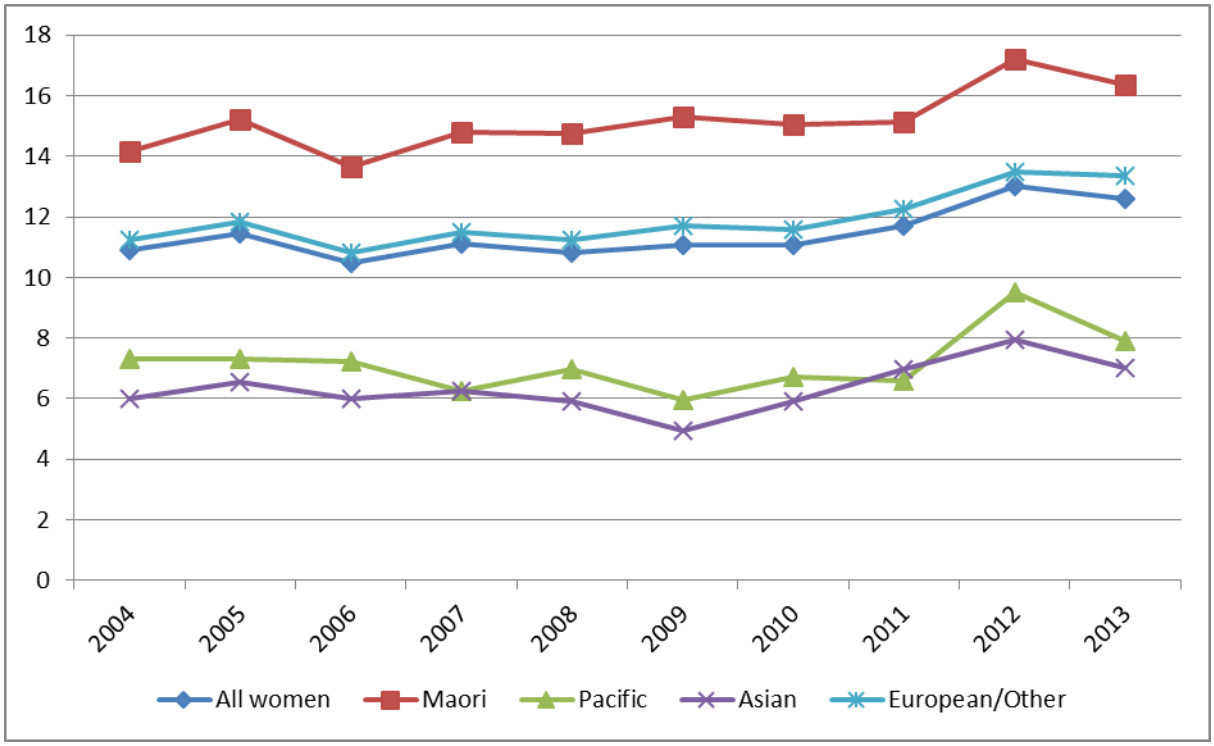
* Here CIN2/3 includes result categories for CIN2, CIN3, and also the combined category HSIL nos (SNOMED code M67017) † CIN3+ excludes SNOMED code M67017

Table 16 Histology cases and reporting rates per 1,000 women screened (20-69 years) by ethnicity, 2013

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)	1,179	26.1	26.2	516	24.3	24.0	1,070	23.7	22.2	9,005	30.1	28.8
HPV	226	5.0	4.9	75	3.5	3.5	163	3.6	3.5	1,368	4.6	5.0
CIN1	406	9.0	8.6	170	8.0	8.0	357	7.9	7.8	2,982	10.0	11.1
CIN2	282	6.2	5.9	56	2.6	2.6	95	2.1	2.1	1,157	3.9	4.5
CIN3	409	9.0	8.8	103	4.9	4.8	201	4.5	4.4	1,847	6.2	7.2
HSIL nos	76	1.7	1.7	9	0.4	0.4	21	0.5	0.5	410	1.4	1.6
Microinvasive	4	0.1	0.1	2	0.1	0.1	3	0.1	0.1	4	<0.05	<0.05
Invasive SCC	23	0.5	0.6	4	0.2	0.2	11	0.2	0.2	48	0.2	0.2
Glandular dysplasia	-	-	-	-	-	-	-	-	-	-	-	-
Adenocarcinoma in situ	17	0.4	0.4	6	0.3	0.3	9	0.2	0.2	124	0.4	0.5
Invasive adenocarcinoma*	5	0.1	0.1	7	0.3	0.3	4	0.1	0.1	43	0.1	0.1
Adenosquamous carcinoma	2	<0.05	<0.05	-	-	-	-	-	-	-	-	-
Other cancer	10	0.2	0.3	5	0.2	0.3	3	0.1	0.1	37	0.1	0.1
Total	**2,639**	**58.4**	**57.6**	**953**	**44.9**	**44.6**	**1,937**	**42.9**	**41.2**	**17,025**	**56.9**	**59.2**

* 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 8 cases of endocervical type; 51 cases not endocervical type

Figure 19 – Age-standardised rates of histologically-confirmed CIN 2/3 per 1,000 women screened by ethnicity, 2004 to 2013



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

Figure 20 – Age-standardised rates of any histology collected per 1,000 women screened by ethnicity, 2010 to 2013

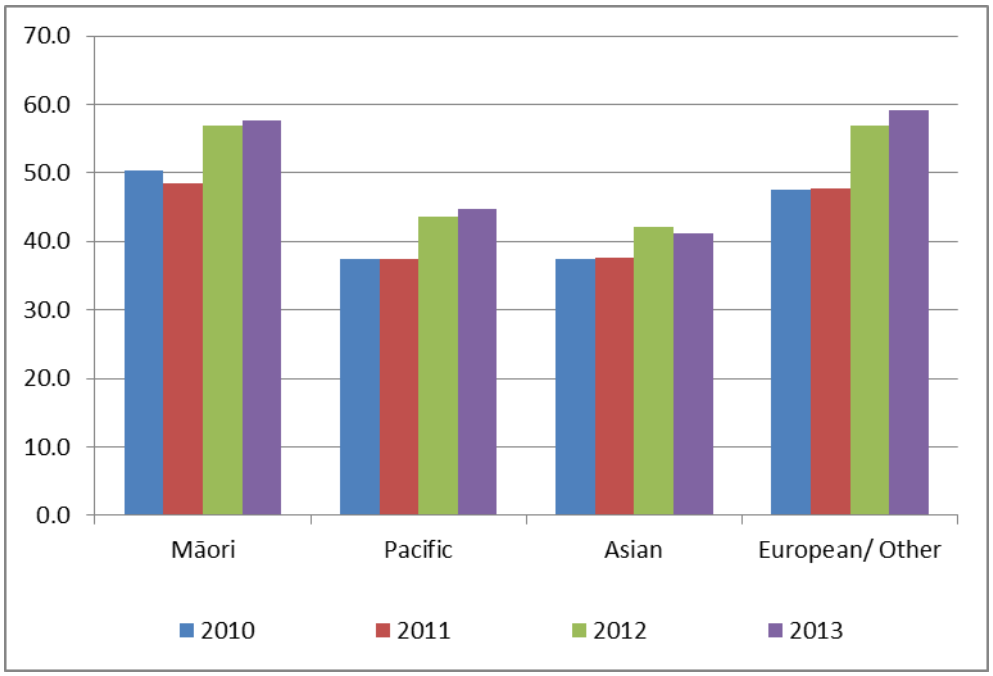


Figure 21 – Age-specific rates of histologically-confirmed CIN 2/3 per 1,000 women screened, 2009 to 2013

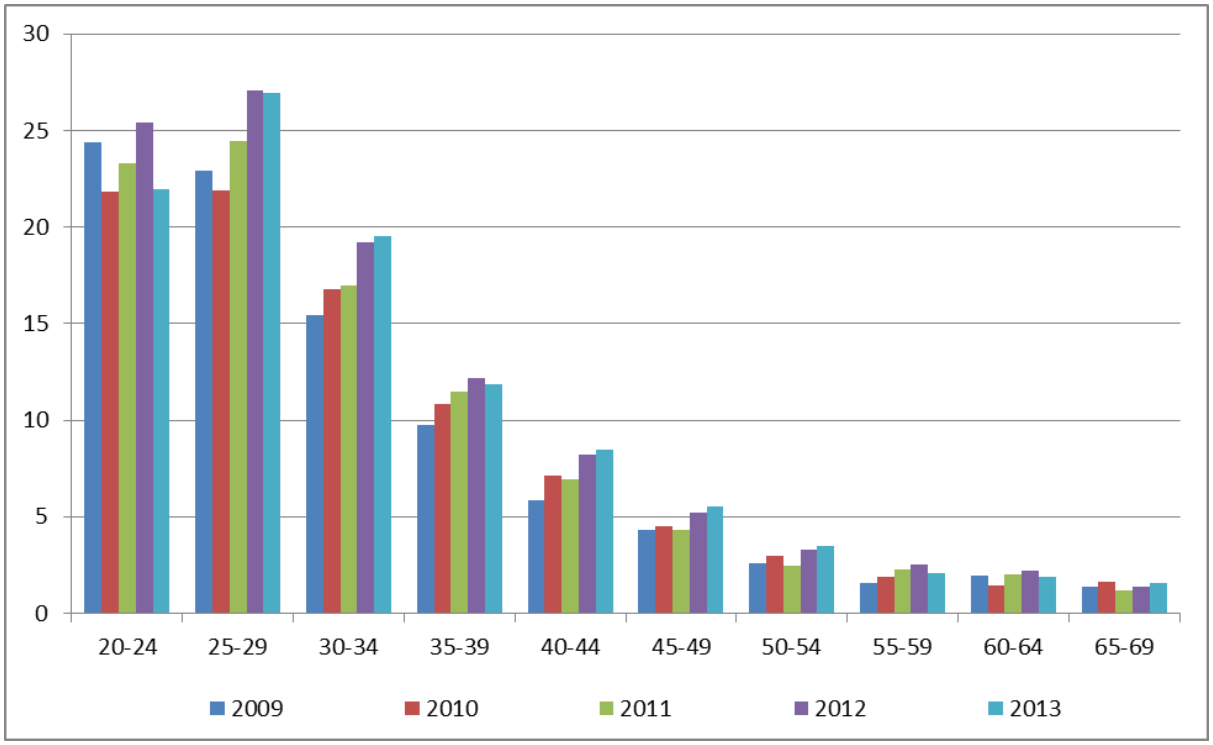


Figure 22 – Age-specific rates of any histology collected per 1,000 women screened, 2010 to 2013

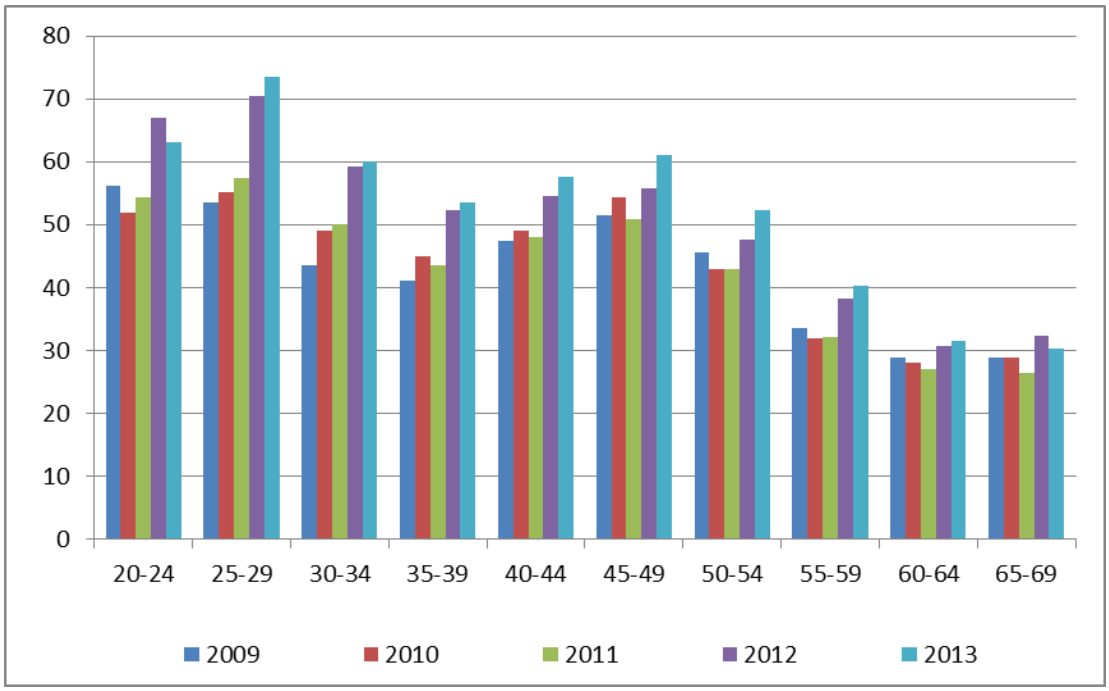


Figure 23 – Age-specific rates of histologically-confirmed CIN 2/3 as a percentage of all women with histology, 2009 to 2013

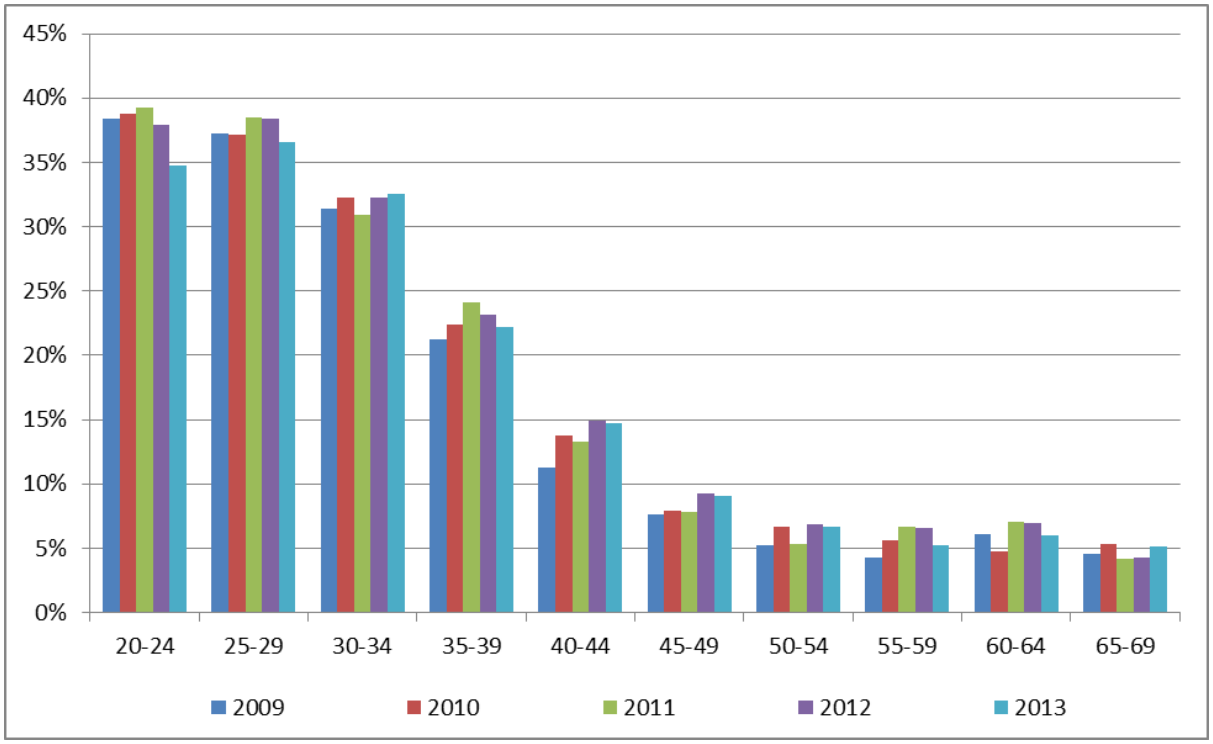


Figure 24 - Age-specific rates of histologically-confirmed CIN 2/3 as a percentage of all women with histology (2004, 2007, 2010, 2013)

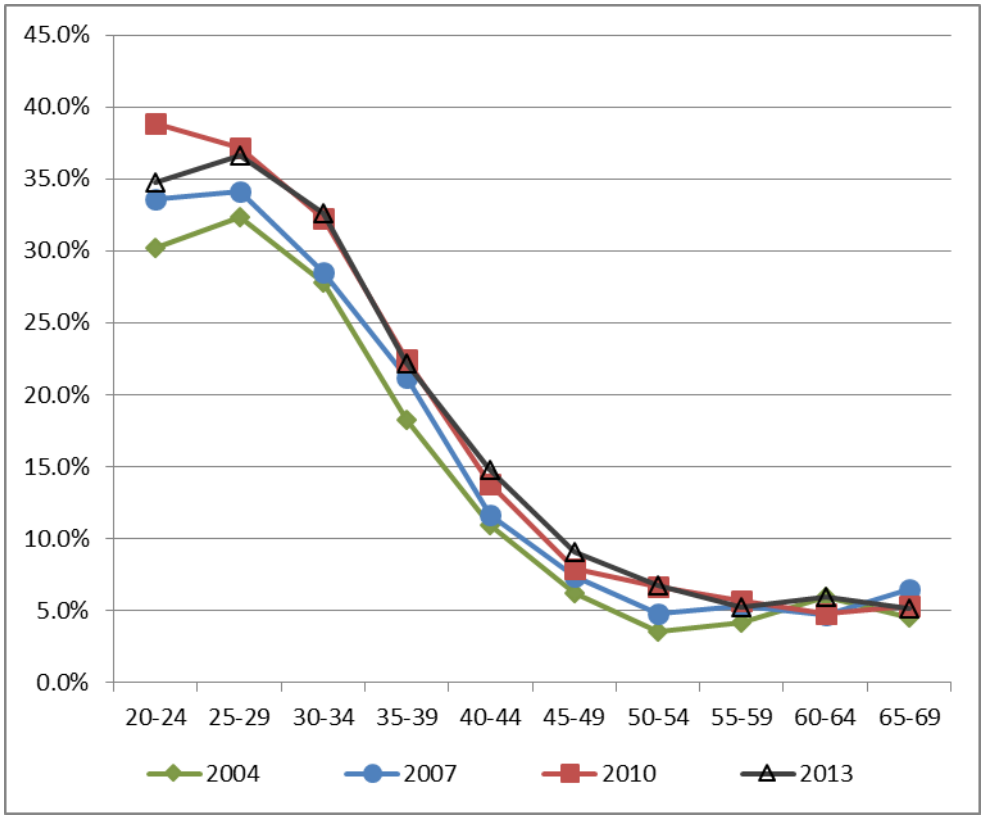


Table 17- Age-specific rates of histologically-confirmed CIN 2/3 as a percentage of all women with histology, 2004 to 2013

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)***
2004	30.2%	32.3%	27.8%	18.2%	10.9%	6.2%	3.5%	4.2%	5.9%	4.5%	17.1%
2005	32.2%	35.6%	30.1%	19.7%	10.8%	6.4%	4.4%	5.7%	5.1%	5.6%	18.5%
2006	31.3%	33.2%	27.9%	19.4%	11.0%	6.9%	4.2%	3.4%	6.4%	4.3%	17.6%
2007	33.6%	34.1%	28.5%	21.2%	11.6%	7.4%	4.8%	5.3%	4.7%	6.5%	18.7%
2008	33.8%	34.0%	30.8%	20.9%	11.5%	8.1%	5.8%	5.0%	6.4%	4.8%	19.1%
2009	38.4%	37.3%	31.4%	21.3%	11.2%	7.7%	5.3%	4.2%	6.1%	4.6%	20.1%
2010	38.8%	37.2%	32.2%	22.4%	13.7%	7.9%	6.6%	5.6%	4.8%	5.3%	20.8%
2011	39.2%	38.5%	30.9%	24.1%	13.2%	7.8%	5.4%	6.6%	7.0%	4.2%	21.1%
2012	37.9%	38.4%	32.3%	23.1%	14.9%	9.3%	6.8%	6.6%	7.0%	4.3%	21.4%
2013	34.7%	36.6%	32.6%	22.2%	14.7%	9.0%	6.7%	5.2%	5.9%	5.2%	20.5%

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

Table 18- Age-specific rates of histologically-confirmed CIN 2+ as a percentage of all women with histology, 2004 to 2013

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)***
2004	30.6%	33.1%	29.3%	19.4%	12.1%	7.2%	5.2%	6.5%	10.6%	9.4%	18.7%
2005	32.5%	36.7%	32.0%	21.3%	11.7%	7.5%	5.7%	7.9%	8.2%	12.1%	20.1%
2006	32.0%	33.9%	29.6%	20.9%	12.3%	7.9%	5.2%	5.5%	9.6%	9.2%	19.1%
2007	34.2%	35.0%	29.8%	22.8%	13.2%	8.3%	6.2%	7.9%	8.8%	11.2%	20.3%
2008	34.6%	35.1%	32.5%	22.7%	13.1%	8.9%	7.4%	8.3%	10.3%	9.7%	20.9%
2009	39.0%	38.0%	33.2%	22.7%	12.6%	9.2%	6.7%	6.7%	9.3%	7.4%	21.6%
2010	39.6%	38.3%	33.8%	24.1%	15.2%	9.4%	8.1%	8.4%	9.9%	11.0%	22.7%
2011	39.9%	39.8%	32.9%	25.9%	14.3%	8.9%	6.8%	9.9%	10.3%	10.1%	22.9%
2012	38.6%	39.7%	33.8%	25.0%	16.5%	10.5%	8.3%	9.1%	9.9%	9.2%	23.1%
2013	35.3%	38.7%	34.3%	23.8%	16.2%	10.2%	8.0%	7.8%	9.3%	9.4%	22.2%

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

Appendix A – Additional data tables

Regularity of screening

Table 19 – Re-attendance following a previous routine (3-yearly) repeat screening recommendation (number of cytology tests in each category), by ethnicity, 2009-2013

	Māori women			Pacific women			Asian women			European/Other women		
Quarter	Early	On-time	Late	Early	On-time	Late	Early	On-time	Late	Early	On-time	Late
Jan-Mar 2009	1,278	1,835	1,560	493	727	659	1,448	1,602	688	12,390	21,014	8,660
Apr-Jun 2009	1,346	1,938	1,642	490	723	620	1,523	1,730	721	12,613	22,723	8,529
Jul-Sep 2009	1,361	2,082	1,556	454	854	664	1,576	1,960	706	12,080	23,137	8,031
Oct-Dec 2009	1,186	2,010	1,459	405	719	592	1,412	1,807	744	11,320	22,276	8,108
Jan-Mar 2010	1,341	1,966	1,484	455	740	610	1,482	1,772	747	11,954	21,156	8,302
Apr-Jun 2010	1,328	2,161	1,573	548	931	663	1,510	2,078	797	12,054	23,876	8,649
Jul-Sep 2010	1,334	2,331	1,646	577	1,044	776	1,481	2,164	790	11,335	24,316	8,291
Oct-Dec 2010	1,138	2,188	1,465	431	871	588	1,319	1,947	678	10,480	22,784	7,537
Jan-Mar 2011	1,215	2,162	1,433	447	878	567	1,243	2,128	730	9,954	21,981	7,103
Apr-Jun 2011	1,212	2,693	1,665	439	1,146	655	1,425	2,621	833	10,681	25,506	8,154
Jul-Sep 2011	1,176	2,566	1,530	472	1,182	620	1,308	2,662	832	9,961	26,053	8,062
Oct-Dec 2011	1,009	2,194	1,352	349	1,019	597	1,067	2,200	746	8,789	23,443	7,652
Jan-Mar 2012	1,048	2,239	1,440	443	1,038	611	1,212	2,475	812	9,631	23,749	8,049
Apr-Jun 2012	1,067	2,454	1,621	424	1,145	726	1,284	2,756	914	9,230	25,306	8,472
Jul-Sep 2012	1,031	2,625	1,582	419	1,170	635	1,182	2,714	919	8,860	25,653	8,329
Oct-Dec 2012	931	2,429	1,504	335	1,022	596	1,051	2,435	794	8,273	24,295	8,258
Jan-Mar 2013	947	2,387	1,475	346	1,075	651	1,108	2,585	893	8,281	23,081	8,026
Apr-Jun 2013	1,024	2,619	1,617	386	1,215	671	1,227	2,945	1,019	8,976	25,770	8,819
Jul-Sep 2013	981	2,705	1,632	376	1,428	774	1,149	3,307	1,074	8,373	27,009	8,732
Oct-Dec 2013	797	2,435	1,572	297	1,214	640	979	2,749	964	7,632	24,775	8,395

Table 20 – Re-attendance following a previous routine (3-yearly) repeat screening recommendation (number of cytology tests in each category), by age, 2009-2013

	20-29			30-39			40-49			50-59			60-69		
Quarter	Early	On-time	Late	Early	On-time	Late	Early	On-time	Late	Early	On-time	Late	Early	On-time	Late
Jan-Mar 2009	2,651	2,505	1,637	3,911	5,443	3,637	4,442	7,197	3,284	3,083	5,977	1,977	1,522	4,056	1,032
Apr-Jun 2009	2,618	2,556	1,643	4,033	5,756	3,504	4,595	7,755	3,241	3,196	6,341	2,104	1,530	4,706	1,020
Jul-Sep 2009	2,557	2,444	1,421	3,681	5,726	3,226	4,459	7,977	3,238	3,223	6,989	2,096	1,551	4,897	976
Oct-Dec 2009	2,186	2,229	1,466	3,301	5,253	3,124	4,142	7,662	3,129	3,128	6,843	2,077	1,566	4,825	1,107
Jan-Mar 2010	2,722	2,532	1,494	3,712	5,455	3,365	4,254	7,083	3,141	3,080	6,157	2,019	1,464	4,407	1,124
Apr-Jun 2010	2,589	2,626	1,490	3,611	5,915	3,334	4,446	8,172	3,345	3,227	7,127	2,304	1,567	5,206	1,209
Jul-Sep 2010	2,501	2,679	1,400	3,446	6,003	3,361	4,178	8,511	3,399	3,129	7,501	2,259	1,473	5,161	1,084
Oct-Dec 2010	2,142	2,412	1,356	2,987	5,511	2,989	3,786	7,991	2,971	2,966	6,887	1,935	1,487	4,989	1,017
Jan-Mar 2011	2,387	2,672	1,269	2,999	5,619	2,896	3,546	7,536	2,869	2,622	6,645	1,829	1,305	4,677	970
Apr-Jun 2011	2,407	2,800	1,304	3,214	6,446	3,264	3,823	9,015	3,346	2,953	8,035	2,266	1,360	5,670	1,127
Jul-Sep 2011	2,319	2,810	1,273	2,889	6,366	3,294	3,594	9,191	3,208	2,787	8,304	2,216	1,328	5,792	1,053
Oct-Dec 2011	1,918	2,440	1,284	2,482	5,567	2,992	3,096	7,977	3,028	2,445	7,641	1,989	1,273	5,231	1,054
Jan-Mar 2012	2,297	2,804	1,329	2,897	5,912	3,248	3,378	8,125	3,158	2,564	7,476	2,150	1,198	5,184	1,027
Apr-Jun 2012	2,028	2,795	1,280	2,722	6,117	3,256	3,309	8,857	3,465	2,625	8,236	2,419	1,321	5,656	1,313
Jul-Sep 2012	1,917	2,762	1,235	2,586	6,134	3,243	3,258	9,054	3,397	2,537	8,442	2,415	1,194	5,770	1,175
Oct-Dec 2012	1,741	2,603	1,257	2,285	5,552	3,108	2,923	8,282	3,255	2,401	8,015	2,295	1,240	5,729	1,237
Jan-Mar 2013	1,952	2,720	1,320	2,453	5,691	3,183	2,878	7,884	3,091	2,295	7,504	2,296	1,104	5,329	1,155
Apr-Jun 2013	1,849	2,841	1,229	2,599	6,076	3,362	3,352	9,000	3,555	2,606	8,431	2,594	1,207	6,201	1,386
Jul-Sep 2013	1,827	3,022	1,281	2,383	6,378	3,291	3,040	9,579	3,562	2,468	9,113	2,694	1,161	6,357	1,384
Oct-Dec 2013	1,539	2,620	1,297	2,138	5,618	3,116	2,710	8,482	3,216	2,226	8,401	2,587	1,092	6,052	1,355

Table 21 – Re-attendance following a previous 12-month repeat screening recommendation (number of cytology tests in each category), by ethnicity, 2009-2013

	Māori women			Pacific women			Asian women			European/Other women		
Quarter	Early	On-time	Late	Early	On-time	Late	Early	On-time	Late	Early	On-time	Late
Jan-Mar 2009	205	1,246	1,819	73	442	847	142	1,047	1,161	1,280	10,535	9,939
Apr-Jun 2009	203	1,381	2,028	70	515	888	148	1,140	1,146	1,427	11,281	9,835
Jul-Sep 2009	215	1,466	2,185	82	604	922	182	1,299	1,204	1,313	11,925	9,929
Oct-Dec 2009	176	1,358	1,982	73	544	902	139	1,187	1,349	1,220	11,507	9,883
Jan-Mar 2010	241	1,410	2,215	83	525	1,032	201	1,188	1,362	1,445	11,182	10,893
Apr-Jun 2010	224	1,650	2,338	81	656	1,123	166	1,392	1,431	1,377	12,734	11,202
Jul-Sep 2010	185	1,739	2,581	62	661	1,199	125	1,536	1,475	1,079	12,768	11,604
Oct-Dec 2010	158	1,606	2,365	64	546	1,011	127	1,296	1,401	1,060	12,137	10,873
Jan-Mar 2011	228	1,464	2,313	85	562	934	132	1,175	1,368	1,151	10,898	10,580
Apr-Jun 2011	218	1,792	2,685	89	668	1,121	152	1,426	1,664	1,167	12,748	11,487
Jul-Sep 2011	138	1,806	2,618	44	686	999	110	1,519	1,696	927	13,399	11,634
Oct-Dec 2011	144	1,688	2,449	38	596	1,021	101	1,343	1,344	886	12,267	10,848
Jan-Mar 2012	197	1,531	2,458	62	609	1,077	118	1,259	1,488	1,100	11,398	11,540
Apr-Jun 2012	181	1,654	2,526	46	608	1,171	141	1,453	1,593	939	11,290	11,103
Jul-Sep 2012	168	1,851	2,626	71	621	1,048	118	1,625	1,682	853	11,965	11,338
Oct-Dec 2012	128	1,461	2,451	45	548	1,027	125	1,340	1,518	744	11,081	10,776
Jan-Mar 2013	170	1,397	2,447	63	557	1,062	119	1,284	1,560	917	9,945	10,608
Apr-Jun 2013	136	1,449	2,544	47	557	1,186	123	1,424	1,755	917	10,759	11,197
Jul-Sep 2013	137	1,522	2,620	40	619	1,216	108	1,687	1,688	773	10,637	11,227
Oct-Dec 2013	117	1,437	2,334	28	539	1,045	85	1,325	1,628	734	9,877	10,392

Table 22 – Re-attendance following a previous 12-month repeat screening recommendation (number of cytology tests in each category), by age, 2009-2013

	20-29			30-39			40-49			50-59			60-69		
Quarter	Early	On-time	Late	Early	On-time	Late	Early	On-time	Late	Early	On-time	Late	Early	On-time	Late
Jan-Mar 2009	620	3,062	3,901	426	3,401	4,195	383	3,465	3,236	187	2,190	1,699	84	1,152	735
Apr-Jun 2009	633	3,363	3,942	486	3,615	4,168	432	3,639	3,300	206	2,433	1,793	91	1,267	694
Jul-Sep 2009	622	3,529	3,993	462	3,649	4,203	392	4,043	3,443	195	2,713	1,862	121	1,360	739
Oct-Dec 2009	571	3,414	3,826	414	3,332	4,026	314	3,864	3,474	197	2,612	1,952	112	1,374	838
Jan-Mar 2010	739	3,784	4,381	517	3,552	4,427	423	3,403	3,753	203	2,298	2,058	88	1,268	883
Apr-Jun 2010	668	4,243	4,407	439	3,997	4,528	424	4,110	3,890	212	2,705	2,286	105	1,377	983
Jul-Sep 2010	546	4,432	4,685	342	3,894	4,812	308	4,119	4,023	162	2,832	2,308	93	1,427	1,031
Oct-Dec 2010	519	3,993	4,359	354	3,499	4,410	274	3,909	3,760	182	2,812	2,185	80	1,372	936
Jan-Mar 2011	634	3,870	4,342	384	3,191	4,307	316	3,348	3,613	173	2,442	2,072	89	1,248	861
Apr-Jun 2011	625	4,411	4,769	360	3,683	4,755	330	4,146	4,101	198	2,922	2,286	113	1,472	1,046
Jul-Sep 2011	451	4,582	4,825	304	3,722	4,801	237	4,326	4,009	132	3,195	2,310	95	1,585	1,002
Oct-Dec 2011	458	4,164	4,556	253	3,332	4,039	230	3,967	3,834	144	2,864	2,291	84	1,567	942
Jan-Mar 2012	621	4,086	4,563	348	3,241	4,638	256	3,452	4,091	167	2,663	2,298	85	1,355	973
Apr-Jun 2012	544	4,209	4,529	237	3,147	4,380	257	3,566	3,959	179	2,677	2,467	90	1,406	1,058
Jul-Sep 2012	487	4,529	4,731	255	3,357	4,455	242	3,801	4,000	146	2,840	2,448	80	1,535	1,060
Oct-Dec 2012	388	4,066	4,466	229	2,892	4,294	194	3,376	3,716	151	2,634	2,277	80	1,462	1,019
Jan-Mar 2013	510	4,095	4,596	277	2,772	4,232	256	2,836	3,671	143	2,256	2,145	83	1,224	1,033
Apr-Jun 2013	471	4,207	4,750	294	3,009	4,362	225	3,134	3,931	152	2,449	2,521	81	1,390	1,118
Jul-Sep 2013	409	4,366	5,035	253	2,903	4,381	200	3,177	3,857	133	2,545	2,425	63	1,474	1,053
Oct-Dec 2013	336	4,037	4,570	222	2,601	3,883	187	2,871	3,594	148	2,279	2,304	71	1,390	1,048

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 23.

Table 23 – 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. Population figures for cancer incidence and mortality used mid-year estimates; for 2006-2012 these were based on projections from 2006 Census data, and for 2013 mid-year estimates based on projections from 2013 Census data were used. Population figures used in the Coverage section of this report for 2006-2013 inclusive all used projections based on the 2006 census, and are end-of-year estimates. 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 24 – 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 25 – SNOMED codes and ranking for histology samples

Adequacy of specimen		**1986 Code**	**1993 Code**	**Diagnostic category**	**Rank***
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	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		M67000 M69700	M67000 M69700	CIN 1	7
Benign glandular atypia		M67030 M81400	M67030 M81400	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	M74006 M67016	CIN 1	10
Dysplasia / CIN NOS		M67015 M74000	M67015 M74000	CIN 1	11
Glandular dysplasia		M67031 M81401	M67031 M81401	Glandular dysplasia	12
CIN II (HSIL) (VAIN II when used with T81/ T82000)		M74007	M74007	CIN 2	13
HSIL NOS		M67017	M67017	HSIL	14
(VAIN III when used with T81/ T82000) Carcinoma in situ		M80102 M80702	M80102 M80702		15 16
CIN III (HSIL)		M74008	M74008	CIN 3	17
Adenocarcinoma in situ		M81402	M81402	Adenocarcinoma. in situ	18
Microinvasive squamous cell carcinoma		M80763 M80765	M80763 M80765	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
Undifferentiated carcinoma		M80203	M80203	Other cancer	24
Sarcoma		M88003	M88003	Other cancer	25
Metastatic tumour		M80006	M80006	Other cancer	29
Other codes accepted	**Code stored on register**	**1986 Code**	**1993 Code**	**Diagnostic category**	**Rank**

Adequacy of specimen		**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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