Australian Government
Australian Institute of Health and Welfare

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CANCER SERIES
Number 67

Cervical screening in Australia 2009–2010

The Australian Institute of Health and Welfare
and the Australian Government Department of Health and Ageing
for the National Cervical Screening Program

Australian Institute of Health and Welfare
Canberra
Cat. no. CAN 63

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This publication is part of the Australian Institute of Health and Welfare's Cancer series. A complete list of the Institute's publications is available from the Institute's website <www.aihw.gov.au>.

ISSN 1039-3307
ISBN 978-1-74249-292-6

Suggested citation
Australian Institute of Health and Welfare 2012. Cervical screening in Australia 2009–2010. Cancer series 67. Cat. no. CAN 63. Canberra: AIHW.

Any enquiries about or comments on this publication should be directed to:
Communications, Media and Marketing Unit
Australian Institute of Health and Welfare
GPO Box 570
Canberra ACT 2601
Tel: (02) 6244 1032
Email: info@aihw.gov.au

Published by the Australian Institute of Health and Welfare

Please note that there is the potential for minor revisions of data in this report. Please check the online version at <www.aihw.gov.au> for any amendments.

Contents

Acknowledgments

Dr Alison Budd, Ms Chun Chen, and Ms Christine Sturrock prepared this report under the direction of Ms Lisa McGlynn.

This report was produced in collaboration with the National Cervical Screening Program, and thanks are extended to the state and territory program and data managers listed below for providing the data, expertise and overall assistance in the production of this document.

Contribution of clinical expertise by Associate Professor Marion Saville, Associate Professor Dorota Gertig and Dr Julia Brotherton is also kindly acknowledged.

Thanks are also extended to all state and territory cancer registries, which are the source of data on cervical cancer incidence (through the Australian Cancer Database), and to the Australian Bureau of Statistics and state and territory Registrars of Births, Deaths and Marriages, which are the source of data on cervical cancer mortality (through the National Mortality Database).

Financial support and professional assistance provided by the Screening Section of the Australian Government Department of Health and Ageing are also gratefully acknowledged.

National Cervical Screening Program

New South Wales

Dr Robyn Godding
Ms Louise Cook
Ms Grace Kwaan
Ms Chehani Alles

Queensland

Ms Jennifer Muller
Ms Leane Christie
Mr Nathan Dunn
Ms Claire DeBats

South Australia

Ms Sarah Macdonald
Ms Bernadette Hurst
Ms Grace Miller

Australian Capital Territory

Ms Cathy Baker
Mr Peter Couvee

Australian Government Department of Health and Ageing

Dr Tracey Bessell
Ms Karla Lister
Ms Alison Lang

Victoria

A/Prof. Dorota Gertig
Ms Louise Galloway
Ms Kate Wilkinson
Ms Tanya O'Farrell

Western Australia

Ms Nerida Steel
Ms Aime Munro
Mr Jacek Gonsalves
Ms Chrissy Fletcher

Tasmania

Ms Gail Ward
Ms Elizabeth Lamond
Ms Kimbra Nossiter

Northern Territory

Ms Chris Tyzack
Mr Guillermo Enciso
Dr Fiona Douglas

Abbreviations

ABS	Australian Bureau of Statistics
ACD	Australian Cancer Database
ACT	Australian Capital Territory
AHMAC	Australian Health Ministers' Advisory Council
AIHW	Australian Institute of Health and Welfare
AMBS	Australian Modified Bethesda System
ARIA	Accessibility/Remoteness Index for Australia
AS	age-standardised
ASGC	Australian Standard Geographic Classification
CI	confidence interval
CIN	cervical intraepithelial neoplasia
Guidelines	National Health and Medical Research Council (NHMRC) *Screening to prevent cervical cancer: guidelines for the management of screen detected abnormalities in asymptomatic women*
HPV	human papillomavirus
IARC	International Agency for Research on Cancer
NCSP	National Cervical Screening Program
NHMD	National Hospital Morbidity Database
NHMRC	National Health and Medical Research Council
NHS	National Health Survey
NHVPR	National HPV Vaccination Program Register
NOS	not otherwise specified
NPAAC	National Pathology Accreditation Advisory Council
NSW	New South Wales
NT	Northern Territory
PPV	positive predictive value
Qld	Queensland
RA	remoteness area
SA	South Australia
SEIFA	Socio-Economic Indexes for Areas
Tas	Tasmania
Vic	Victoria
WA	Western Australia

Symbols

. .	not applicable

Summary

The National Cervical Screening Program (NCSP) aims to reduce cervical cancer cases, as well as illness and death resulting from cervical cancer in Australia, through an organised approach to cervical screening aimed at detecting and treating high-grade abnormalities before possible progression to cervical cancer. The target group is women aged 20–69.

This report is the latest in the *Cervical screening in Australia* series, which is published annually to provide regular monitoring of national participation and performance for the NCSP. While the previous report covered the 2008–2009 period of participation, this report provides data for the 2009–2010 period of participation in the NCSP, as well as the latest available cervical cancer incidence and mortality data (from sources outside the NCSP).

The following statistics refer to the latest data available for women aged 20–69.

How many women were diagnosed with, or died from, cervical cancer?

There were 637 new cases of cervical cancer diagnosed in 2008, and 131 women died from this in 2007. This is equivalent to 9 new cases and 2 deaths per 100,000 women, respectively.

Incidence and mortality have both halved since the NCSP was introduced in 1991, remaining at their historic lows of 9 new cases and 2 deaths per 100,000 women since 2002.

The incidence of cervical cancer in Aboriginal and Torres Strait Islander women was more than twice that of non-Indigenous women, and mortality of Aboriginal and Torres Strait Islander women was 5 times the non-Indigenous rate.

How many women participated in the National Cervical Screening Program?

In 2009–2010, more than 3.6 million women participated in the NCSP. This was 57% of women in the population (after adjustment to exclude those without a cervix).

Participation was similar across remoteness areas, with only 3 percentage points separating the highest participation of 58% in *Major cities* from the lowest of 55% in *Remote* areas.

Participation showed greater differences across socioeconomic status of residence, and a clear trend of increasing participation with increasing socioeconomic status from 52% of women residing in areas of lowest socioeconomic status to 63% of women residing in areas of highest socioeconomic status.

Participation by Aboriginal and Torres Strait Islander women is not available, although there is evidence that this population group is under-screened.

How many women rescreened early or after a reminder letter?

Only 14% of women with a negative Pap test in 2009 rescreened earlier than recommended.

Of the women sent a 27-month reminder letter by a cervical cytology register in 2009, 32% rescreened within 3 months, indicating that this letter acts as a prompt for many women.

How many high-grade abnormalities were detected?

In 2010, for every 1,000 women screened, 9 women had a high-grade abnormality detected by histology, providing an opportunity for treatment before possible progression to cancer.

Data at a glance

The following table provides a comparison of national data against key NCSP performance indicators for women in the target age group, 20–69. Summary statistics for the latest reporting period are compared with those from the previous reporting period.

Definitions for these performance indicators are given under each indicator in Section 2.

Summary table: Key performance indicators for the National Cervical Screening Program, women aged 20–69, previous and latest data

	Previous data		Latest data	
Performance indicator	**Reporting period**	**Statistic**	**Reporting period**	**Statistic**
Participation	2007–2008	59.1%	2009–2010	57.4%
Rescreening				
Early rescreening	2008 cohort	15.1%	2009 cohort	14.0%
Rescreening after reminder letter	Letters sent 2008	31.5%	Letters sent 2009	31.7%
Cytology				
Unsatisfactory	2009	2.1%	2010	2.1%
Negative	2009	92.6%	2010	92.6%
No endocervical component	2009	20.3%	2010	21.1%
Low-grade abnormalities	2009	4.0%	2010	3.9%
High-grade abnormalities	2009	1.3%	2010	1.4%
Histology				
Histology tests per 100 cytology tests	2009	3.5%	2010	3.6%
Low-grade abnormalities	2009	17.6%	2010	17.2%
High-grade abnormalities	2009	25.4%	2010	25.9%
High-grade abnormality detection rate	2009	8.1	2010	8.5
Correlation				
PPV of high-grade squamous cytology	2008	69.6%	2009	70.0%
PPV of high-grade endocervical cytology	2008	72.0%	2009	71.2%
Incidence	2007	9.1	2008	9.3
Mortality	2006	2.0	2007	1.9

Notes

1. All data are for women aged 20–69; age-standardised proportions and rates are shown where available (crude rates are shown otherwise).
2. Previous data refers to the previous *non-overlapping* reporting period, which for participation is 2007–2008, rather than 2008–2009.
3. Participation is the per cent of eligible women in population.
4. Early rescreening is the per cent of women with a negative cervical cytology test in February 2009 who rescreened within 21 months.
5. Rescreening after reminder letter is the per cent of women sent a reminder letter who rescreened within 3 months.
6. Cytology is per cent of all cytology tests.
7. Histology is the per cent of all histology tests.
8. High-grade abnormality detection rate is the number of women with a high-grade abnormality detected by histology per 1,000 women screened.
9. PPV is the positive predictive value, calculated as the proportion of cytology results of possible or definite high-grade that were confirmed on histology to be a high-grade abnormality or cervical cancer.
10. Incidence is the number of new cases per 100,000 women; mortality is the number of deaths per 100,000 women.

Section 1 Introductory material

Structure of this report

The first section of this report presents an overview of the natural history and burden of cervical cancer in Australia, and outlines the process of cervical screening and the development and management of the National Cervical Screening Program (NCSP). This section also details the performance indicators used for monitoring the NCSP, and provides a brief overview of technical issues that should be considered when interpreting information in this report.

The second section of this report presents the latest national data against the seven NCSP performance indicators. Data included in this report are for the 2009–2010 period of participation in the NCSP, supplemented by cervical cancer incidence and mortality data from national databases outside the NCSP, for which the latest data available are for 2008 and 2007, respectively. To aid in interpretation of these data, the start of each performance indicator delivers a summary that includes its definition and rationale, followed by key results to provide readers with an indication of the main findings. More detailed analyses, as well as background information where appropriate, follow this summary material.

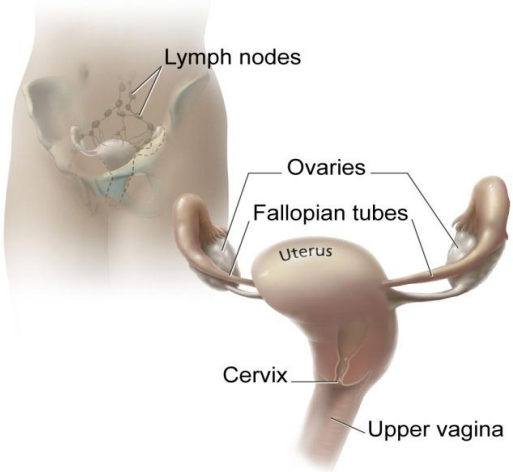
More detailed data than those shown within this report are available in *Cervical screening in Australia 2009–2010: supplementary data tables*.

Overview of cervical cancer and cervical screening

What is cervical cancer?

Cancer is a group of several hundred diseases in which abnormal cells are not destroyed naturally by the body but instead multiply and spread out of control. Cancers are distinguished from each other by the specific type of cell involved and the place in the body in which the disease began.

Cervical cancer affects the cells of the uterine cervix, which is the lower part (or 'neck') of the uterus where it joins the inner end of the vagina. Like other cancers, cervical cancer is a disease where normal cells change, begin to multiply out of control, and form a growth or tumour.



Source: Reproduced with permission by the National Cancer Institute.

Illustration S1.1: Anatomy: the female reproductive system (cervix, ovaries, uterus)

Cervical cancer may arise from the squamous cells that cover the outer surface of the cervix (known as squamous cell carcinoma) or from the glandular cells in the cervical canal (known as adenocarcinoma). In Australia in 2008, 65% of cervical cancers were squamous cell carcinoma and 26% were adenocarcinoma (adenosquamous and other cervical cancers made up the remainder).

How common is cervical cancer in Australia?

Cervical cancer is the 13th most common cancer affecting Australian women (excluding basal and squamous cell carcinoma of the skin), with 7 new cases of cervical cancer diagnosed per 100,000 women in the population in 2008. It is also the 18th most common cause of cancer-related death, with 2 deaths per 100,000 women in 2007.

Cervical cancer incidence and mortality are both higher in Aboriginal and Torres Strait Islander women, with incidence more than twice, and mortality five times, that of non-Indigenous women (AIHW & AACR 2010) (for more details see Indicators 6 and 7).

What causes cervical cancer?

During the last decade there has been a greater understanding of the natural history of cervical cancer. It is now recognised that cervical cancer is a rare outcome of persistent infection with human papillomavirus (HPV), and that infection with a *high-risk* HPV type is necessary, although not sufficient, for the development of cervical cancer (Bosch et al. 2002; Walboomers et al. 1999).

Currently 15 high-risk types of HPV are recognised. HPV types 16, 18, and 45 are most predominantly associated with cervical cancer, with HPV types 16 and 18 detected in 70–80% of cases of cervical cancer in Australia (Brotherton 2008).

However, infection with one or more of the 40 genital HPV types is extremely common, with infection rates of this sexually transmitted infection peaking in women in young adulthood (the period following sexual debut). Most HPV infection is asymptomatic and cleared by the immune system within a year; however, in up to 10% of women the infection can persist, and in a very small number of women, persistent infection with high-risk HPV may eventually lead to cervical cancer.

How do we screen for cervical cancer?

Cells in the cervix exhibit changes or 'abnormalities' before any progression to cancer occurs. These abnormalities are graded depending on how much of the lining of the cervix these abnormal cells occupy—low-grade abnormalities are contained in the top layer of the lining of the cervix while high-grade abnormalities occupy more layers.

Low-grade abnormalities are caused by acute infection with HPV and most will regress without treatment within a short period of time. High-grade abnormalities usually occur after persistent infection with HPV. The probability of a high-grade abnormality progressing to cancer increases with age and the extent of abnormality, but cancer is still a very rare outcome (NHMRC 2005)—studies suggest that only 12% of the precursor to squamous cell carcinoma of the cervix progresses to cancer (Ostor 1993). Cervical screening aims to detect and treat these precancerous abnormalities in cervical cells before their potential progression to cervical cancer, thereby reducing cervical cancer incidence as well as morbidity and mortality from this disease.

Cervical screening uses cytology from the Papanicolaou smear, or 'Pap test', as the screening tool. During a Pap test, cells are collected from the transformation zone of the cervix—the area of the cervix where the squamous cells from the outer opening of the cervix and glandular cells from the endocervical canal meet. This is the site where most cervical abnormalities and cancers are detected. These cells are then transferred onto a slide for conventional cytology (or into a liquid for liquid-based cytology), and sent to a pathology

laboratory for assessment. The cells collected are then examined under a microscope to look for abnormalities.

While cervical *cytology*, the examination of the cells collected from the cervix, is a very useful tool, it should be stressed that it is not diagnostic (unlike cervical *histology*, which is the examination of tissue collected from the cervix through a biopsy to confirm the presence of an abnormality). As a screening tool, the aim of cervical cytology is to identify those individuals who may have a cervical abnormality (as indicated by the presence of abnormal cells in the specimen collected) and therefore require further diagnostic testing. Since the Pap test collects an arbitrary sample of cells from the surface of the cervix at an arbitrary point in time, and requires a level of judgment in the interpretation of sampled cells, cervical cytology cannot accurately reveal all abnormalities that may exist in the cervical tissue *in situ* in a single sample.

Terminology

Incidence: the number of new cases of cervical cancer diagnosed per 100,000 women in a year.

Morbidity: illness.

Mortality: the number of deaths from cervical cancer per 100,000 women in a year.

Cytology: the examination of cells from the cervix (usually collected by a Pap test) through a microscope.

Histology: the examination of tissue from the cervix (usually collected by a biopsy) through a microscope. Histology is more accurate than cytology because it allows the examination of cells and other structures, as they would appear *in situ*.

While the ability of cervical cytology to accurately detect abnormalities with few false positives (that is, the specificity) is very high—estimates range from 62% to 98% in an International Agency for Research on Cancer (IARC) review—the ability to accurately predict negative results (that is, the sensitivity) of a single cervical cytology test is only moderate in contrast (40–86%), indicating a greater likelihood of false negatives (IARC 2005). The strength of cervical screening comes from repeating the cervical cytology test at agreed rescreening intervals, which allows the accurate detection of precancerous abnormalities over the long pre-invasive stage of squamous cervical cancers (Dickinson 2002). The recognition of cervical screening as a program of rescreening at regular intervals rather than as a single opportunistic test was an important distinction (Dickinson 2002).

Why screen for cervical cancer?

The initial aim of an organised approach to screening was to further reduce the incidence and mortality of cervical cancer beyond the reductions attributable to the opportunistic cervical screening available in Australia since the mid-1960s (Dickinson 2002). This aim has been realised, with an estimated 70% of squamous cell carcinomas of the cervix (around 1,200 cases) prevented in 1998 as a result of Australia's cervical screening program (Mitchell 2003), a finding supported by more recent analyses of incidence and mortality trends (Canfell 2006; Luke et al. 2007). Indeed the relatively low incidence and mortality of cervical cancer in Australia compared with other countries (Ferlay et al. 2010) has been largely attributed to Australia's cervical screening program and its successful implementation in 1991 (NHMRC 2005).

How is cervical screening managed in Australia?

In 1991 the Australian Health Ministers' Advisory Council (AHMAC) accepted recommendations made by the Screening Evaluation Steering Committee in the Australian Institute of Health report *Cervical cancer screening in Australia: options for change* (AHMAC 1991) that saw the establishment of the Organised Approach to Preventing Cancer of the Cervix, Australia's cervical screening program. Now known as the National Cervical Screening Program, Australia's cervical screening program operates as a joint program of the Australian Government and state and territory governments, targeting women aged 20–69. A statement of the current national policy for cervical screening in Australia appears in the box below, while contact details for the state and territory and Australian Government components of the NCSP are provided in Appendix B.

Key to Australia's cervical screening program are the cervical cytology registers that were established along with the cervical screening program in each state and territory. Cervical cytology registers fulfil many important roles, including sending reminder letters to women overdue for screening, providing a safety net for women who have not had follow-up of an abnormal result, and providing cytology laboratories and cervical cytology providers with previous results for a woman to allow a more detailed evaluation of present findings. State and territory cervical cytology registries also provide data on the epidemiology and natural history of precancerous lesions, as well as providing data for national monitoring of the NCSP.

Along with the noted reductions in incidence and mortality has been the development of high-quality cervical cytology in Australian pathology laboratories that is a key component of a successful cervical screening program, and has been facilitated through the development of National Pathology Accreditation Advisory Council (NPAAC) *Performance measures for Australian laboratories reporting cervical cytology* (NPAAC 2006).

National policy for Australia's National Cervical Screening Program

'Routine screening with Pap smears should be carried out every two years for women who have no symptoms or history suggestive of cervical pathology.

All women who have ever been sexually active should start having Pap smears between the ages of 18 and 20 years, or one or two years after first having sexual intercourse, whichever is later.

Pap smears may cease at the age of 70 years for women who have had two normal Pap smears within the last five years. Women over 70 years who have never had a Pap smear, or who request a Pap smear, should be screened.

This policy applies to women with no symptoms and normal Pap smear results who should be screened every two years. Women with abnormal smear results should be managed in accordance with the National Health and Medical Research Council (NHMRC) *Screening to prevent cervical cancer: guidelines for the management of asymptomatic women with screen detected abnormalities.*

Women, whether vaccinated or unvaccinated, should be screened for cervical cancer in accordance with the policy of the National Cervical Screening Program and the *NHMRC Screening to prevent cervical cancer: Guidelines for the management of asymptomatic women with screen detected abnormalities.*'

Source: DoHA 2011a.

What does the HPV vaccine mean for cervical screening?

What is the HPV vaccine?

Following the recognition that infection with HPV is necessary for the development of cervical cancer, the HPV vaccine *Gardasil*® was introduced in Australia in April 2007 as part of the National Immunisation Program. There are currently two vaccines listed on the National Immunisation program—*Gardasil*® and *Cervarix*® (DoHA 2011b), both of which are prophylactic vaccines, which means they need to be administered prior to HPV infection.

These HPV vaccines protect against high-risk HPV types 16 and 18. As noted earlier, HPV types 16 and 18 are the two main high-risk HPV types that can lead to cervical cancer, these detected in 70–80% of cervical cancers in Australia (Brotherton 2008).

Currently the National HPV Vaccination Program is an ongoing program for girls aged 12–13 administered through schools; however, between 2007 and 2009, it also included a catch-up program for women aged 13–26 (NHVPR 2011). Data on the vaccination coverage of participants in the National HPV Vaccination Program are collected and reported by the National HPV Vaccination Program Register (NHVPR), with vaccination coverage estimates reported for the ongoing and catch-up programs (DoHA 2011b).

Additionally, a standard indicator proposed to measure HPV vaccine coverage trends internationally (WHO 2010) is the proportion of girls vaccinated with three doses of HPV vaccine by age 15. The NHVPR estimated this to be 70.8% of Australian girls aged 15 in 2009 (DoHA 2011b).

What are the expected effects of the HPV vaccine?

The National HPV Vaccination Program, like the NCSP, aims to reduce incidence of cervical cancer in Australia. The HPV vaccine, by preventing the HPV infection that can lead to 70–80% of cervical cancer (Brotherton 2008), has the potential to reduce the incidence of cervical cancer below the already low levels cervical screening has achieved in Australia.

Importantly, there is potential for the HPV vaccine, through the National HPV Vaccination Program, to reduce the incidence of adenocarcinomas as well as cervical cancers in Aboriginal and Torres Strait Islander women in a way that cervical screening alone has not been able to achieve (Budd & Sturrock 2010).

This is because incidence of adenocarcinoma has not fallen to the same degree as incidence of squamous cell carcinoma, which is generally considered to be due to sampling and interpretation limitations of cervical screening for glandular lesions. As a result, this previously rare cancer now comprises around a quarter of all cervical cancers diagnosed (Blomfield & Saville 2008) (see Indicator 6). Aboriginal and Torres Strait Islander women also have a higher incidence of cervical cancer than non-Indigenous women, which is likely related to Aboriginal and Torres Strait Islander women participating to a lesser degree in cervical screening (Binns & Condon 2006; Coory 2002) (see Indicator 6).

It is important to note, however, that the HPV vaccine does not preclude the need for cervical screening. This is because the HPV vaccine only covers 2 of the high-risk HPV types, infection with which can lead to cervical cancer, and the HPV vaccine may not be effective in women exposed to HPV prior to being vaccinated. Thus cervical screening and the HPV vaccine should be seen as a two-pronged approach to the prevention of cervical cancer, and vaccinated women should either commence or continue participating in cervical screening according to the current NCSP policy (Budd & Sturrock 2010).

How do we monitor the National Cervical Screening Program?

Performance indicators

For a population-based screening program such as the NCSP, there is a need to assess its performance as this relates to the underlying aims of the program. This is achieved by reporting national data against a series of performance indicators to allow screening outcomes to be monitored, and positive and negative trends identified early.

The effectiveness of the NCSP has been monitored since 1996–1997 using performance indicators developed to monitor what were originally defined as essential aspects of the program. Full definitions of the original performance indicators can be found in *Breast and cervical cancer screening in Australia 1996–1997* (AIHW 1998). New performance indicators were developed following a review of the original indicators that considered changes to both the NCSP and the cervical screening environment, including the introduction of *Screening to prevent cervical cancer: guidelines for the management of screen detected abnormalities in asymptomatic women* (NHMRC 2005), to ensure the NCSP continued to be monitored optimally. These new performance indicators were officially endorsed in September 2009 by the Screening Subcommittee of the Australian Population Health Development Principal Committee for use by the NCSP, and appeared for the first time in *Cervical screening in Australia 2008–2009*.

Table S1.1 lists the current performance indicators for the NCSP (more information about each indicator is available in Section 2 of this report).

Table S1.1: National Cervical Screening Program performance indicators

Performance indicators for the National Cervical Screening Program	
1 Participation	The percentage of women aged 20–69 who have a Papanicolaou smear or 'Pap test' in a 2-year period
2 Rescreening	
2.1 Early rescreening	The proportion of women who have another Pap test within 21 months of a negative Pap test result
2.2 Rescreening after 27-month cervical cytology register reminder letter	The proportion of women who have a Pap test within 3 months of being sent a 27-month reminder letter
3 Cytology	The number of Pap test results in each result category
4 Histology	The number of histology results in each result category (including the number of women with a high-grade histology for every 1,000 women screened)
5 Cytology-histology correlation	A measure of how well cytology correlated with histology performed not more than 6 months after the cytology test
6 Incidence	The number of new cases of cervical cancer
7 Mortality	The number of deaths from cervical cancer

Standards

While there are no official standards for NCSP performance indicators, in places, NPAAC standards in *Performance measures for Australian laboratories reporting cervical cytology* (NPAAC 2006) have been used to provide a benchmark for the data presented. These are used as a guide to interpretation only, since this is a different purpose to that for which these standards were developed, and differences in definitions and data may exist.

Data considerations

Data sources

The main sources of data for the NCSP performance indicators are the state and territory cervical cytology registers. Analyses of these data allow monitoring of participation, rescreening, cytology, histology, and the cytology-histology correlation (indicators 1–5, Table S1.1).

Additional to these sources are the AIHW Australian Cancer Database, which is the source of cervical cancer incidence data (Indicator 6, Table S1.1), and the National Mortality Database, which is the source of cervical cancer mortality data (Indicator 7, Table S1.1). More details on data sources and classifications are provided in Appendix C.

Note that for each performance indicator, the latest available national data are used, which differ depending on both the data source and specifications of each performance indicator.

Aboriginal and Torres Strait Islander women

Of the performance indicators used to monitor the NCSP, only incidence and mortality can be disaggregated by Aboriginal and Torres Strait Islander status.

Cervical cytology registers receive data from pathology laboratories, which means that they are limited to those data available on the pathology form accompanying the cervical sample and result. Since there is currently no national mechanism for collection of Aboriginal and Torres Strait Islander status on pathology forms, state and territory cervical cytology registers are currently unable to collect Aboriginal and Torres Strait Islander status. Thus participation, rescreening, cytology and histology trends specific to Aboriginal and Torres Strait Islander women cannot be monitored, and the effects of initiatives to increase participation in Aboriginal and Torres Strait Islander women cannot be measured nationally.

Reporting women with symptoms

In principle, women who have symptoms that could indicate the presence of cervical cancer (such as abnormal bleeding) at the time of their cervical cytology test should be excluded from all performance indicators reported, since any testing of symptomatic women will be diagnostic in nature, rather than true screening.

In theory, a mechanism exists to remove symptomatic women from the data, as these women are able to be identified by the recommendation code *RS Symptomatic-Clinical management required* (included in the National Cervical Cytology Coding Sheet introduced in July 2006).

However, in 2008–2009, the proportion of women with the RS code was found to vary across states and territories from 0.02% through to 2.38% of women screened. These variations are too large to reflect any genuine differences in women with symptoms, and concluded to be due to inconsistent use of this code nationally. Thus, at this time, RS code is of insufficient quality to exclude symptomatic women at the national level.

All data presented in this report therefore include both symptomatic and asymptomatic women.

Terminology and concepts used in this report

Reporting periods

This report presents monitoring data over 1-year, 2-year, 3-year and 5-year reporting periods. Participation data are presented over a 2-year period in line with the recommended 2-year screening interval of the NCSP, as well as over a 3-year and 5-year period. Most other data are presented for a single calendar year, with the exception being some incidence and mortality data, which are presented over a 5-year period to improve stability and comparability of rates due to small numbers.

Age groups

Data are presented for women aged 20–69 who, as the target group of the NCSP, are the primary focus of this report. Detailed data for these, as well as women aged less than 20 and 70 and over be accessed in *Cervical screening in Australia 2009–2010: supplementary data tables*.

Crude versus age-standardised

This report presents crude and age-standardised rates. *Crude* is the 'true' proportion or rate, and is appropriate when a single year or reporting period is reported (for example, *crude* participation in 2009–2010 was found to be 57.0%). However, comparisons over time, or across states/territories or population subgroups require that crude rates are *age-standardised* to remove the underlying differences in age-structure over time or between groups. These allow analysis of trends and differentials, and are therefore preferentially reported in these situations (for example, *age-standardised* participation in 2009–2010 was 57.4%).

Statistical significance

Statistical analyses are useful tools that aid in the interpretation of data. In this report, 95% confidence intervals* were used to determine if a statistically significant difference exists between compared values: where the confidence intervals do not overlap, the difference between rates is greater than that which could be explained by chance and is regarded as statistically significant. Because overlapping confidence intervals does not imply that the difference between two rates is definitely due to chance, it can only be stated that no statistically significant differences were found, and not that no differences exist.

***The use of confidence intervals for non-sample data**

The AIHW is reviewing the provision of confidence intervals when data arise from sources that provide information on all subjects, rather than from a sample survey. This review will include analysis of the methods used to calculate confidence intervals, as well as the appropriateness of reporting confidence intervals for such data. It aims to ensure that statistical methods used in AIHW reports remain robust and appropriately inform understanding and decision making.

Differences that are described as 'significant' refer to a statistically significant difference. Judgment should, however, be exercised in deciding whether or not the difference is of any practical or clinical significance. This is particularly relevant to a national dataset, the analysis of which can result in statistically significant differences that may not be of any clinical significance or policy relevance.

Section 2 Performance indicators

Indicator 1 Participation

What do we mean by participation?

Definition: The percentage of women screened in a 2-year period for women aged 20–69.

Rationale: Through increased participation in cervical screening, more cervical abnormalities can be detected and treated that could otherwise develop into cervical cancer. Thus high participation is required for the National Cervical Screening Program (NCSP) to achieve its major objective of reducing cervical cancer incidence, morbidity and mortality.

Guide to interpretation: As the target group of the NCSP, data are predominantly reported for women aged 20–69, but some data are also shown for women aged less than 20 and 70 and over (although the definition of 'participation' strictly refers to women aged 20–69). Participation is measured over 2 years to align with the NCSP's recommended screening interval. Participation is based on the number of women screened, and not the number of cytology tests performed.

Participation rate calculations should, in principle, exclude women from the denominator who are unlikely to require screening. In practice, the only group that can be reliably removed are women who have had a hysterectomy. This is achieved using national 'hysterectomy fractions' that are based on hysterectomy incidence data derived from the AIHW National Hospitals Morbidity Database (see Appendix C).

The most recent participation data are for the 2009–2010 reporting period.

Key results

2009–2010

- In 2009–2010, a total of 3,792,517 women participated in the NCSP, of whom 3,635,929 were aged 20–69.
- This is 57.0% of women in the target age group, which, when age-standardised to allow analysis of trends and differentials, equates to a participation rate of 57.4% for 2009–2010.
- Participation in the NCSP was similar across remoteness areas, with only 2.9 percentage points separating the highest participation of 57.9% in *Major cities* from the lowest of 55.0% in *Remote* areas.
- Participation showed greater differences across socioeconomic status of location of residence, and a clear trend of increasing participation with increasing socioeconomic status, from 52.1% of women residing in areas of lowest socioeconomic status to 63.2% of women residing in areas of highest socioeconomic status.

Trends

- Participation in the NCSP was steady at 59% for all 2-year periods from 2004–2005 to 2008–2009, before a statistically significant decrease to 57% in the latest reporting period, 2009–2010.

Detailed analyses

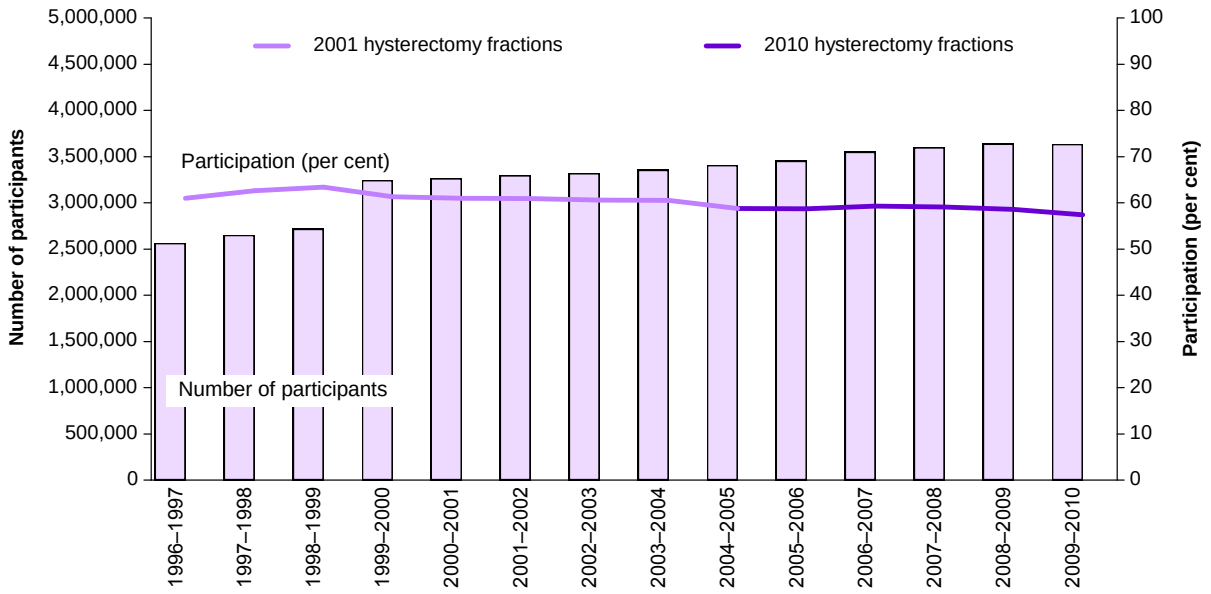
Participation in 2009–2010

In 2009–2010, 3,792,517 women participated in the NCSP (that is, had at least one cervical cytology test over the 2 years), of whom 3,635,929 were aged 20–69.

These 3,635,929 women represent 57.0% of those aged 20–69 in the population with an intact cervix (the target population), which, when age-standardised to allow analysis of trends and differentials, equates to a participation rate of 57.4%.

Participation trends

Figure 1.1 shows the trend in participation in the NCSP nationally, from 1996–1997, when reporting began, to 2009–2010, the most recent national data available. These data, and associated caveats, are provided in more detail in Table 1.1, below.



Note: Rates from before 2004–2005 should not be directly compared with those after this reporting period (see Table 1.1).

Source: AIHW analysis of state and territory cervical cytology register data.

Figure 1.1: Participation of women aged 20–69 in the National Cervical Screening Program, 1996–1997 to 2009–2010

Since the reporting of truly national data began in 1999–2000 (due to the inclusion of previously unreported Queensland data in this period), participation in the NCSP by women aged 20–69 with an intact cervix has remained remarkably steady—61% of these women participated between 1999–2000 and 2003–2004, and 59% participated between 2004–2005 and 2008–2009, with this apparent 2 percentage point drop in participation due to a different method of estimating the number of women in the population with an intact cervix, rather than representing a real decline (as indicated by the different shades of the line in Figure 1.1).

The age-standardised participation rate of 57.4% in 2009–2010 therefore represents the first true decline in participation in a decade.

This decline occurs despite a 1.0% increase in the number of women participating from 2007–2008 (the previous non-overlapping 2-year period) to 2009–2010, since the concurrent 4.4% increase in the adjusted population between these two periods is considerably greater (Table 1.1).

Of note, there is a small (less than 0.1%) decline in the number of women participating from the previous overlapping period of 2008–2009, which is the first time this has occurred since reporting began (Figure 1.1; Table 1.1).

Table 1.1: Number and age-standardised rate of women aged 20–69 participating in the National Cervical Screening Program, 1996–1997 to 2009–2010

Reporting period	Participants[(b)]	Population[(c)]	Adjusted population[(d)]	AS rate[(e)]	95% CI
1996–1997[(a)]	2,563,107	4,769,763	4,186,906	61.0	60.9–61.1
1997–1998[(a)]	2,653,504	4,823,334	4,227,203	62.6	62.5–62.6
1998–1999[(a)]	2,716,364	4,874,748	4,264,927	63.4	63.4–63.5
1999–2000	3,244,329	6,041,447	5,278,596	61.3	61.2–61.3
2000–2001	3,262,931	6,122,480	5,339,538	61.0	60.9–61.1
2001–2002	3,296,409	6,211,365	5,406,559	60.9	60.9–61.0
2002–2003	3,318,354	6,307,398	5,479,418	60.6	60.6–60.7
2003–2004	3,354,519	6,404,756	5,553,880	60.5	60.5–60.6
2004–2005	3,407,219	6,504,478	5,798,435	58.8	58.7–58.8
2005–2006	3,452,092	6,613,589	5,889,613	58.7	58.6–58.7
2006–2007	3,549,524	6,734,973	5,992,434	59.3	59.3–59.4
2007–2008	3,599,919	6,874,225	6,112,328	59.1	59.0–59.1
2008–2009	3,638,941	7,028,243	6,247,210	58.6	58.5–58.6
2009–2010	3,635,929	7,178,804	6,378,872	57.4	57.3–57.5

(a) Since the Queensland Health Pap Smear Register began operations in February 1999, Queensland data are excluded from both the participants and population data for the 1996–1997, 1997–1998 and 1998–1999 reporting periods.

(b) Participants are the number of women aged 20–69 screened in each 2-year reporting period. Number of women screened includes all women screened in each jurisdiction, not just those women resident in each jurisdiction, with the exception of Victoria and the Australian Capital Territory, for which only residents of the jurisdiction (and immediate border residents) are included.

(c) Population is the average of the Australian Bureau of Statistics (ABS) estimated resident population for women aged 20–69 for the two reporting years.

(d) Adjusted population is the average of the ABS estimated resident population for women aged 20–69 for the two years, adjusted to include only women with an intact cervix using age-specific hysterectomy fractions. Reporting periods 1996–1997 to 2003–2004 use hysterectomy fractions derived from the 2001 ABS National Health Survey; reporting periods 2004–2005 to 2009–2010 use hysterectomy fractions derived from the AIHW National Hospitals Morbidity Database

(e) Age-standardised (AS) rate is the number of women aged 20–69 screened in each 2-year reporting period as a percentage of the ABS estimated resident population for women aged 20–69, adjusted to include only women with an intact cervix as described above, age-standardised to the Australian population at 30 June 2001.

Note: Rates from 1996–1997 to 2003–2004 cannot be directly compared with rates from 2004–2005 onwards due to a different source of hysterectomy fractions used to adjust the population.

Source: AIHW analysis of state and territory cervical cytology register data.

Participation by age

In 2009–2010, 95.9% of women participating in the NCSP were aged 20–69 (the target age group), with 2.8% aged less than 20, and 1.3% aged 70 or over.

Participation was highest in women aged 45–49 at 63.4%, followed by women aged 40–44 and 50–54 at 62.3% (Table 1.2).

Note that, while participation in women aged 20–24 years is both low and decreasing (falling from 47.1% in 2007–2008 to 42.8% in 2009–2010), Australia is one of the few countries that screen this age group.

Table 1.2: Participation by age, 2009–2010

Age group	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	65–69
Women	337,779	418,495	438,861	480,342	442,089	432,082	370,765	306,598	251,215	157,703
Crude rate	42.8	52.2	58.6	61.4	62.3	63.4	62.3	59.8	57.2	49.8

Note: Crude rate is the number of women screened in 2009–2010 as a percentage of the ABS estimated resident population for women aged 20–69, adjusted to include only women with an intact cervix using age-specific hysterectomy fractions derived from the AIHW National Hospitals Morbidity Database.

Source: AIHW analysis of state and territory cervical cytology register data.

Participation by state and territory

In 2009–2010, participation across all states and territories was within 3.4 percentage points of the national average of 57.4%, ranging from 54.5% to 60.8% (Table 1.3).

Table 1.3: Participation of women aged 20–69, by state and territory, 2009–2010

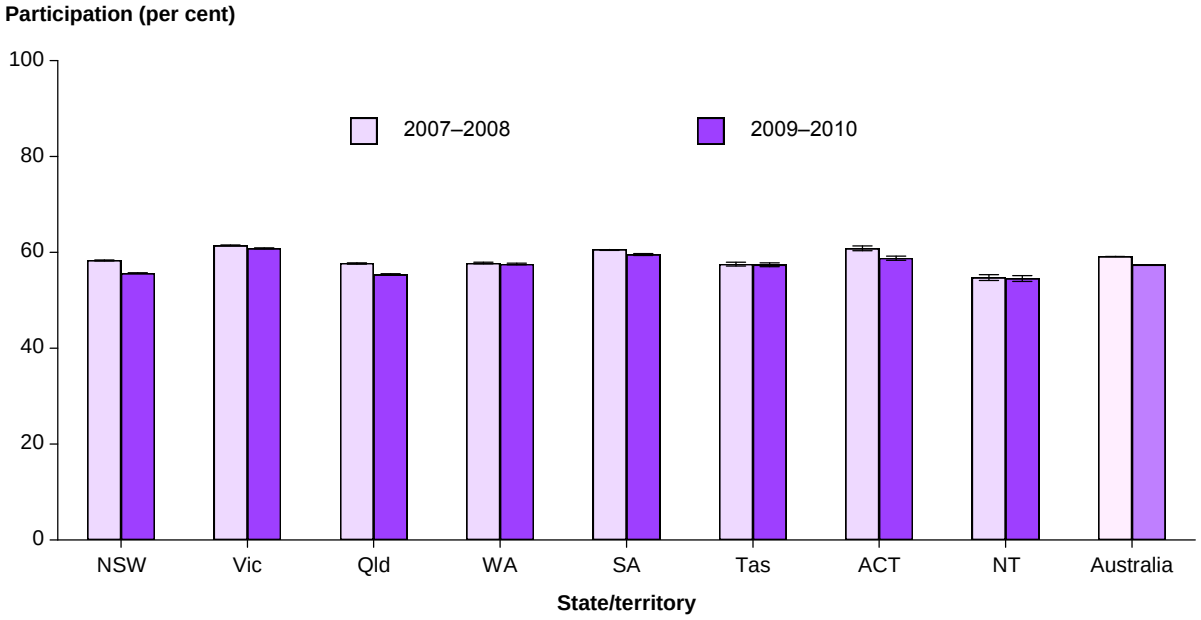
State/territory	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
Women	1,141,633	963,987	704,776	370,361	275,088	80,887	63,117	36,080	3,635,929
AS rate	55.6	60.8	55.3	57.5	59.5	57.4	58.8	54.5	57.4
95% CI	55.5–55.7	60.7–60.9	55.2–55.4	57.3–57.7	59.3–59.7	57.0–57.8	58.4–59.3	53.9–55.1	57.3–57.5

Notes

1. Direct comparisons between the states and territories of Australia are not advised due to the substantial differences that exist between the jurisdictions, including population, area, geographic structure, policies and other factors.
2. Age-standardised (AS) rate is the number of women screened in 2009–2010 as a percentage of the ABS estimated resident population for women aged 20–69, adjusted to include only women with an intact cervix using age-specific hysterectomy fractions derived from the AIHW National Hospitals Morbidity Database, age-standardised to the Australian population at 30 June 2001.

Source: AIHW analysis of state and territory cervical cytology register data.

All states and territories showed either a decrease or no change in participation rate between 2007–2008 and 2009–2010 (Figure 1.2). On the whole, this decrease in the participation rate across states and territories appears to be attributable to an increase in the number of women in the population (the denominator), rather than a decrease in the number of women participating (the numerator) over this time. This is particularly true for Queensland, Western Australia, and the Northern Territory, which all saw an increase in the population of more than 5% between 2007–2008 and 2009–2010.



Note: Bars on columns represent 95% confidence intervals.

Source: AIHW analysis of state and territory cervical cytology register data.

Figure 1.2: Participation of women aged 20–69, by state and territory, 2007–2008 and 2009–2010

Participation by location of residence

Participation in the NCSP was similar across remoteness areas (Figure 1.3A), with only 2.9 percentage points separating the highest participation of 57.9% in *Major cities* from the lowest of 55.0% in *Remote* areas (Table 1.4). The relatively high participation of 57.1% in *Very remote* areas is of note.

Table 1.4: Participation of women aged 20–69, by remoteness area, 2009–2010

Remoteness area	Major cities	Inner regional	Outer regional	Remote	Very remote	Australia
Women	2,568,785	678,299	309,567	49,415	27,126	3,635,929
AS rate	57.9	56.8	55.4	55.0	57.1	57.4
95% CI	57.8–58.0	56.7–57.0	55.2–55.6	54.5–55.5	56.4–57.8	57.3–57.5

Notes

1. Women were allocated to a remoteness area using their residential postcode according to the Australian Standard Geographic Classification for 2006.
2. Caution is required when examining differences across remoteness area (see Appendix C).
3. Age-standardised (AS) rate is the number of women screened in 2009–2010 as a percentage of the ABS estimated resident population for women aged 20–69, adjusted to include only women with an intact cervix using age-specific hysterectomy fractions derived from the AIHW National Hospitals Morbidity Database, age-standardised to the Australian population at 30 June 2001.
4. Participation by remoteness area in 2009–2010 is not comparable with previous reporting periods (see Appendix C).

Source: AIHW analysis of state and territory cervical cytology register data.

Participation showed greater differences across socioeconomic status of location of residence, and a clear trend of increasing participation with increasing socioeconomic status (Figure 1.3B), from 52.1% of women residing in areas of lowest socioeconomic status to 63.2% of women residing in areas of highest socioeconomic status (a difference of 11.1 percentage points) (Table 1.5).

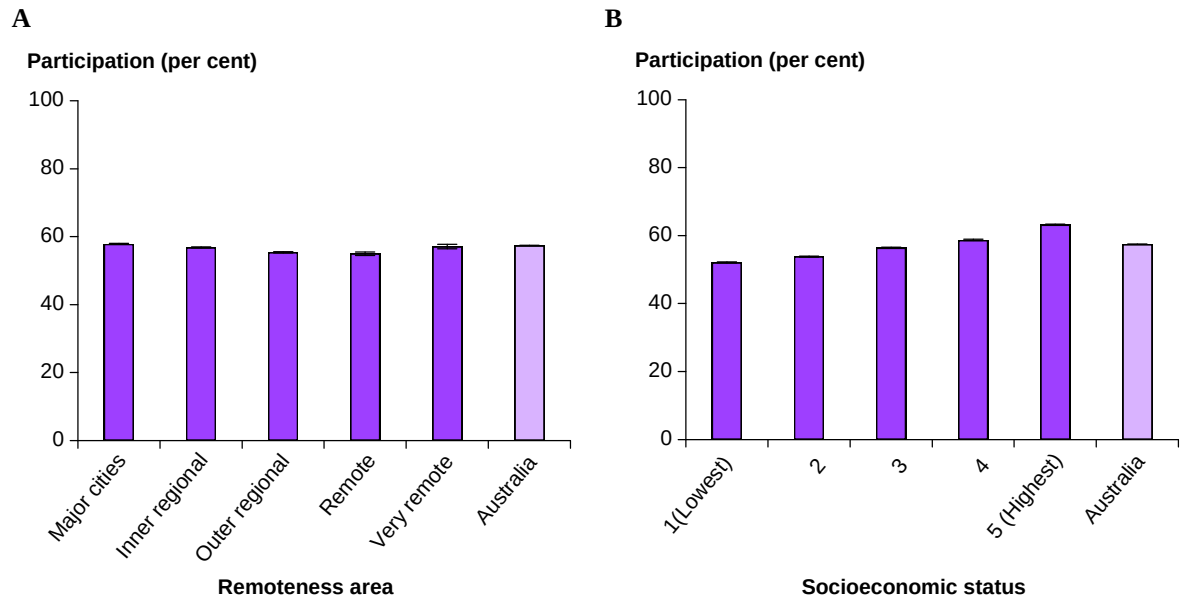
Table 1.5: Participation of women aged 20–69, by socioeconomic status, 2009–2010

Socioeconomic status	(lowest) 1	2	3	4	(highest) 5	Australia
Women	616,641	668,585	723,425	772,590	828,701	3,635,929
AS rate	52.1	53.9	56.4	58.7	63.2	57.4
95% CI	52.0–52.3	53.7–54.0	56.3–56.6	58.6–58.9	63.1–63.4	57.3–57.5

Notes

1. Women were allocated to a socioeconomic status using their residential postcode according to the Socio-Economic Indexes for Areas (SEIFA) Index of Relative Socio-Economic Disadvantage for 2006.
2. Caution is required when examining differences across socioeconomic status (see Appendix C).
3. Age-standardised (AS) rate is the number of women screened in 2009–2010 as a percentage of the ABS estimated resident population for women aged 20–69, adjusted to include only women with an intact cervix using age-specific hysterectomy fractions derived from the AIHW National Hospitals Morbidity Database, age-standardised to the Australian population at 30 June 2001.
4. Participation by socioeconomic status in 2009–2010 is not directly comparable with previous reporting periods (see Appendix C).

Source: AIHW analysis of state and territory cervical cytology register data.



Note: Bars on columns represent 95% confidence intervals.

Source: AIHW analysis of state and territory cervical cytology register data.

Figure 1.3: Participation of women aged 20–69, by remoteness area (A), and by socioeconomic status (B), 2009–2010

Participation of Aboriginal and Torres Strait Islander women

Participation in cervical screening cannot be measured nationally by Aboriginal and Torres Strait Islander status with cervical cytology register data at present since, as detailed in the introduction, these registers are dependent on, and limited to, information on pathology forms, which do not currently include Aboriginal and Torres Strait Islander status.

There is evidence, however, that Aboriginal and Torres Strait Islander women are under-screened. Coory et al. (2002) and Binns & Condon (2006) estimated participation of Aboriginal and Torres Strait Islander women in communities with high proportions of Aboriginal and Torres Strait Islander women in Queensland and the Northern Territory, respectively. These researchers found that, on average, participation by Aboriginal and

Torres Strait Islander women was close to 18 percentage points below that for the respective jurisdiction, with both studies showing considerable variation between communities or regions.

It has been recognised that Aboriginal and Torres Strait Islander women face cultural, linguistic and physical barriers to cervical screening (DoHA 2004). State and territory cervical screening programs have developed initiatives to increase participation in cervical screening by Aboriginal and Torres Strait Islander women such as the employment of Aboriginal and Torres Strait Islander Health Workers, with the Australian Government component of the NCSP supporting these through the development of principles, standards and guidelines for screening Aboriginal and Torres Strait Islander women (DoHA 2004). However, without being able to measure participation in cervical screening by Aboriginal and Torres Strait Islander status, it is not known to what extent initiatives are reaching their desired aim.

The study above illustrates the value of an evidence base. Binns and Condon (2006) demonstrated that Northern Territory cervical screening program initiatives resulted in very high rates of participation in cervical screening in some regions of this jurisdiction, providing an opportunity to adapt these successful initiatives to other regions and communities. Such an evidence base, not currently available nationally, is fundamental in assessing the current status of cervical screening in Aboriginal and Torres Strait Islander women nationally, as well as guiding further improvements in cervical screening participation in Aboriginal and Torres Strait Islander women in Australia.

Participation measured over greater lengths of time

Measuring participation over a 3-year and 5-year period, rather than a 2-year period, found that 70.2% of women aged 20–69 participated in the NCSP at least once in the 3-year period 2008–2010, and 83.3% had at least one Pap test in the 5-year period 2006–2010 (Table 1.6).

Table 1.6: Participation of women aged 20–69, by state and territory, over 2 years (2009–2010), 3 years (2008–2010) and 5 years (2006–2010)

State/territory	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
2009–2010	55.6	60.8	55.3	57.5	59.5	57.4	58.8	54.5	57.4
2008–2010	69.1	73.1	68.1	69.0	72.8	69.7	73.1	68.7	70.2
2006–2010	83.6	85.2	81.0	80.4	84.8	82.9	89.2	84.0	83.3

Notes

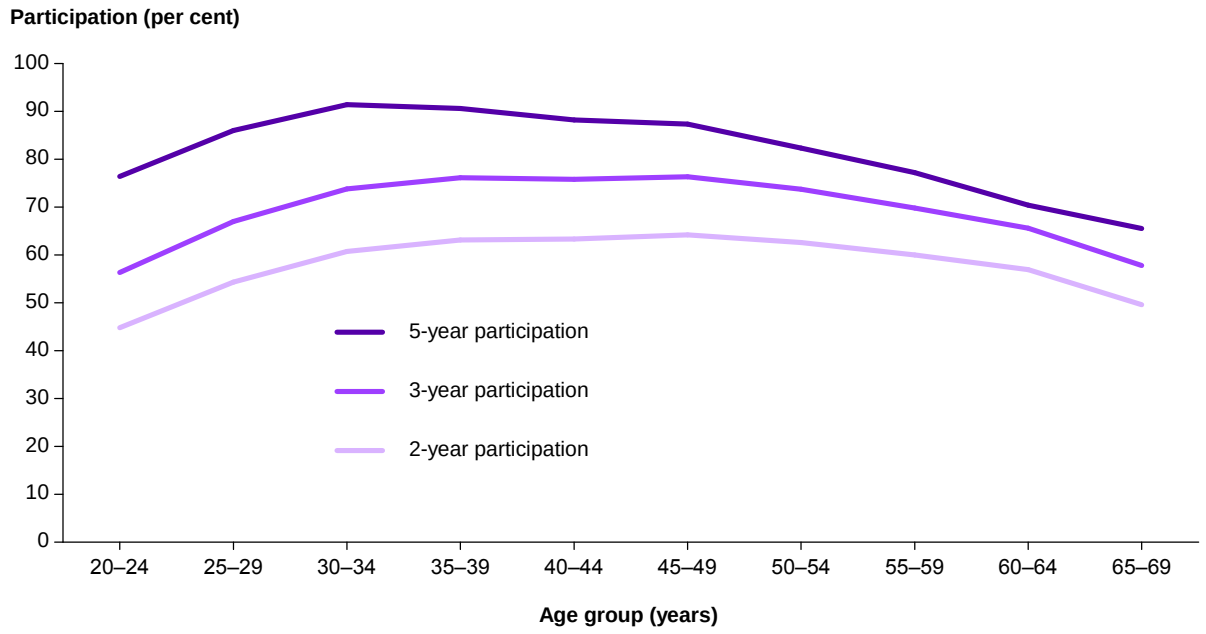
1. Direct comparisons between the states and territories of Australia are not advised due to the substantial differences that exist between the jurisdictions, including population, area, geographic structure, policies and other factors.
2. Age-standardised (AS) rate is the number of women screened as a percentage of the ABS estimated resident population for women aged 20–69, adjusted to include only women with an intact cervix using age-specific hysterectomy fractions derived from the AIHW National Hospitals Morbidity Database, age-standardised to the Australian population at 30 June 2001.
3. Confidence intervals are available in Cervical screening in 2009–2010: supplementary data tables.

Source: AIHW analysis of state and territory cervical cytology register data.

The increase from 2-year to 3-year participation may be, in part, due to state and territory cervical cytology registers reminding women to rescreen 27 months after a previously negative cytology test (see Indicator 2.2 for more information), since this reminder has the potential to increase the attendance of women within 3 years of their previous cytology test (Queensland Health 2012).

The age-structure of women participating changes when participation is measured over greater lengths of time, with a proportionally greater number of women in the younger age groups included when participation is measured over a 3-year or 5-year period, when compared to participation measured over a 2-year period (Figure 1.4).

Along with this change, the age group with the highest participation shifts from women aged 45–49 for the 2-year period 2009–2010 to women aged 30–34 for the 5-year period 2006–2010 (Figure 1.4). The age group with the lowest participation also changes from women aged 20–24 for the 2-year period 2009–2010 to women aged 65–69 for the 5-year period 2006–2010 (Figure 1.4).



Source: AIHW analysis of state and territory cervical cytology register data; data for figure are available in Table A1.

Figure 1.4: Participation of women aged 20–69, by age over 2 years (2009–2010), 3 years (2008–2010), and 5 years (2006–2010)

Indicator 2.1 Early rescreening

What do we mean by early rescreening?

Definition: The proportion of women rescreening, by number of rescreens, within 21 months of a negative cytology test, for women aged 20–69.

Rationale: A low proportion of women rescreening early is desirable, since compliance with the recommended screening interval is important in maintaining the cost effectiveness of the cervical screening program.

Guide to interpretation: This indicator is calculated as the proportion of a cohort of women with negative cytology in the index month of February who had a repeat cytology test of any result in the following 21 months. Women with an abnormality in the preceding 36 months are excluded, as are repeat cytology tests that are a valid repeat of an unsatisfactory cytology test.

The most recent early rescreening data are for the index month of February 2009. This small lag in data availability is because 21 months needs to have passed since a woman's last negative cytology test to know whether or not she has rescreened within this interval.

Key results

2009 cohort

- Of all women aged 20–69 with a negative cytology test in February 2009, 14.0% rescreened early (within 21 months).

Trends

- The proportion of women rescreening early decreased from 15.1% for the 2008 cohort to 14.0% for the 2009 cohort, which is a positive trend.

Detailed analyses

Early rescreening in the 2009 cohort

Of the 160,864 women aged 20–69 who had negative cytology in February 2009 with no abnormalities in the preceding 36 months, the majority did not rescreen early, with 138,374 women (86.0%) having no repeat cytology tests within 21 months of this negative cytology test. In comparison, 22,490 women (14.0%) did rescreen early—21,748 had one repeat cytology test, 698 had two repeat cytology tests, and 44 women had three or more repeat cytology tests within 21 months of this negative cytology test (Table 2.1).

This means that 14.0% of women are rescreening early unnecessarily (although a small number of these women may have symptoms or another clinically valid reason that would make early rescreening appropriate).

Table 2.1: Number and proportion of women aged 20–69 rescreening early following a negative cervical cytology test, by number of early rescreens, 2009 cohort

Early rescreens	Number of women	Per cent of women
0	138,374	86.0
1	21,748	13.5
2	698	0.4
3	37	0.0
4	5	0.0
5+	2	0.0

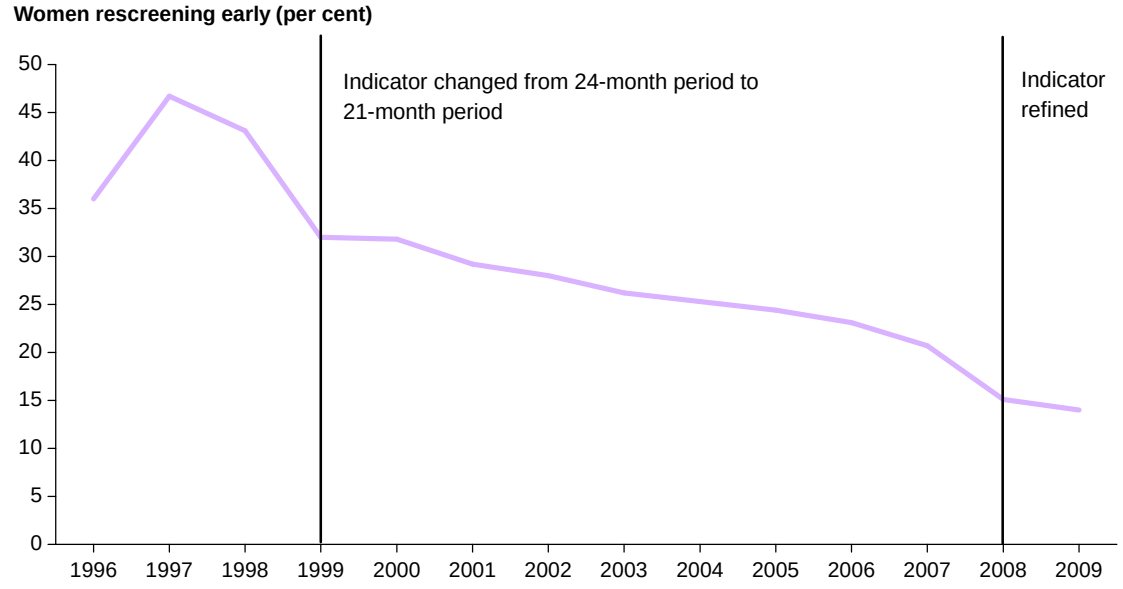
Note: Women with a cytological or histological abnormality in the preceding 36 months are excluded from entering the cohort; repeat cytology tests that are a valid repeat of an unsatisfactory cytology test are excluded from this count.

Source: AIHW analysis of state and territory cervical cytology register data.

Early rescreening trends

The proportion of women rescreening early has decreased every year from the 1997 cohort through to the 2009 cohort (Figure 2.1). While overall this decrease was from 46.7% to 14.0%, there have been two changes to the definition of early rescreening (one for the 1999 cohort onwards and one for the 2008 cohort onwards) that affect direct comparisons.

More recently (and directly comparable since the same definition of early rescreening has been applied) the proportion of women rescreening early decreased from 15.1% for the 2008 cohort to 14.0% for the 2009 cohort. A decrease in the proportion of women rescreening early is a positive finding, since modelling has shown that a decrease in early rescreening reduces the cost of a screening program without changing its effectiveness (Creighton et al. 2010).



Source: AIHW analysis of state and territory cervical cytology register data.

Figure 2.1: Proportion of women aged 20–69 rescreening early following a negative cervical cytology test, 1996 to 2009 cohorts

Early rescreening by state and territory

The proportion of women rescreening early varied across states and territories between 11.2% and 14.8% of the cohort (Table 2.2).

Table 2.2: Proportion of women aged 20–69 rescreening early following a negative cervical cytology test, by state and territory, 2009 cohort

State/territory	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
Per cent	14.8	14.5	14.2	12.8	11.6	11.2	11.2	11.5	14.0

Source: AIHW analysis of state and territory cervical cytology register data.

Indicator 2.2 Rescreening after 27-month cervical cytology register reminder letter

What does rescreening after a reminder letter mean?

Definition: The proportion of women who are sent a 27-month cervical cytology register reminder letter (sent when the register has no record of a woman having had repeat cytology within 27 months of a previously negative cytology test), who rescreen within 3 months, for women aged 20–69.

Rationale: This indicator measures the effectiveness of this reminder letter in prompting women to rescreen. Thus a high proportion of women rescreening within 3 months of the 27-month cervical cytology register reminder letter is desirable.

Guide to interpretation: Calculations are based on the number of women who are sent a letter, which is not necessarily the number of women who received a letter (for example, if a woman has changed address), which cannot be determined. To be counted as rescreened within 3 months, women need to have a cytology test within 3 months of being sent a reminder letter.

The most recent rescreening after 27-month cervical cytology register reminder letter data are for women sent a reminder letter in 2009. This small lag in data availability is because 3 months needs to have passed since a woman was sent a 27-month reminder letter in a particular calendar year to know whether or not she has rescreened within this interval.

Key results

Letters sent in 2009

- Nearly one-third (31.7%) of women sent a 27-month cervical cytology register reminder letter in 2009 rescreened within 3 months of being sent this letter, indicating that this letter acts as a prompt for many women.

Trends

- The proportion of women sent a letter and who rescreened within 3 months did not change between 2008 (31.5%) and 2009 (31.7%).

Detailed analyses

Rescreening after 27-month cervical cytology register reminder letters sent in 2009

In 2009, 27-month cervical cytology register reminder letters were sent to 806,122 women. Of these, 255,675 women (31.7%) rescreened within 3 months (Table 2.3).

This indicates that the reminder letter acts as a prompt to rescreen for many women (although it is not possible to know from these data if barriers exist that contributed to the proportion of women who did not rescreen within 3 months).

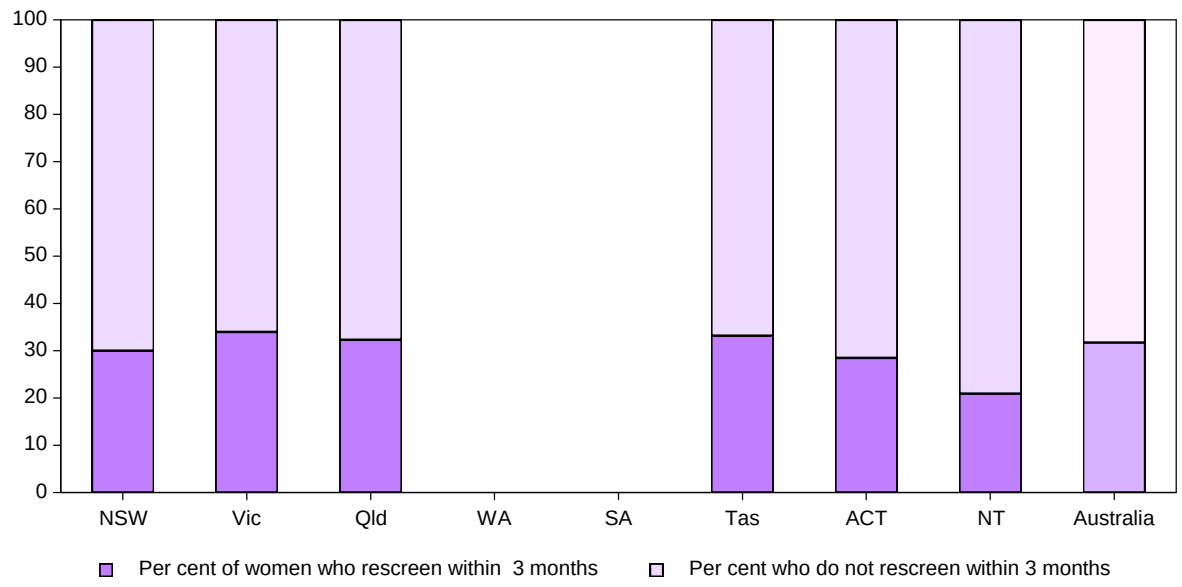
Table 2.3: Women aged 20–69 rescreening within 3 months of 27-month cervical cytology register reminder letters sent in 2009

Year	Number sent letter	Number rescreened	Proportion rescreened
2009	806,122	255,675	31.7%

Source: AIHW analysis of state and territory cervical cytology register data.

Rescreening after 27-month cervical cytology register reminder letter by state and territory

The proportion of women who rescreened within 3 months of being sent a reminder letter was around 30% in most states and territories, although was notably lower (20.9%) in the Northern Territory and notably higher (34.0%) in Victoria (Figure 2.2).



Note: Data for women sent 27-month reminder letters in 2009 are not available for Western Australia, who replaced the previous 30-month reminder letter with the 27-month reminder letter during 2009, and South Australia, who at present do not have a 27-month cervical cytology register reminder letter sent to women (these are sent to practitioners, with a 30-month reminder letter sent to women, neither of which are directly comparable).

Source: AIHW analysis of state and territory cervical cytology register data.

Figure 2.2: Proportion of women aged 20–69 rescreening within 3 months of the 27-month cervical cytology register reminder letter, by state and territory, letters sent in 2009

Indicator 3 Cytology

What do we mean by cytology?

Definition: The proportion of cytology test results in each result category in a 12-month period.

Rationale: Cytology means 'study of cells', and, in the context of cervical screening, refers to cells from the cervix that are collected and examined for abnormalities. Cervical cytology using the conventional Papanicolaou smear (Pap test) is the primary screening tool of the National Cervical Screening Program (NCSP).

Annual monitoring of cytology report categories by various stratifications may reveal emerging positive or negative trends that need to be addressed. In addition, it is anticipated that the ability to monitor national trends in squamous and endocervical component report categories will allow the earliest indications possible of any effects from the human papillomavirus (HPV) vaccine introduced in 2007, which will be of relevance to the NCSP.

Guide to interpretation:

The most recent cytology data are for the year 2010.

Key results

Cytology in 2010

- Over 2 million cytology tests were performed in 2010 (2,025,860 for women aged 20–69).
- For women aged 20–69:
    - 2.1% of cytology tests were unsatisfactory
    - 92.6% of cytology tests were negative
    - An endocervical component was present in 79.1% of cytology tests
- Younger women had a higher proportion of unsatisfactory tests and a lower proportion of negative tests.

Abnormalities in 2010

- A definite or possible high-grade abnormality was reported in 1.4% of cytology tests.
- An abnormality was reported in 5.3% of cytology tests.

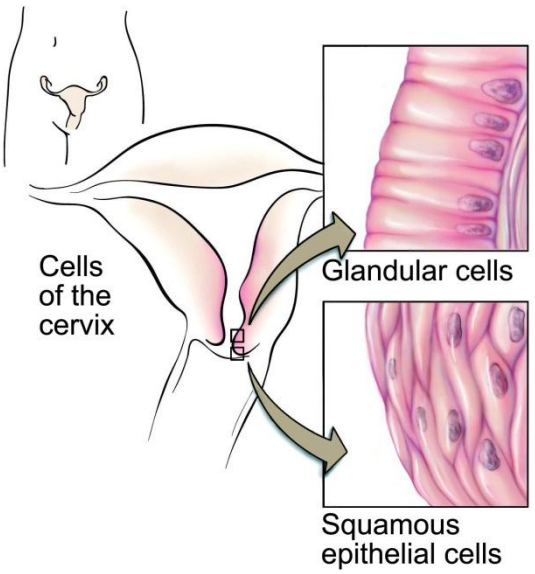
Trends

- While the proportion of unsatisfactory and negative cytology tests are unchanged from 2009, the proportion of cytology tests with an endocervical component present has decreased significantly each year from 82.1% in 2004 to 78.9% in 2010 (age-standardised).
- The proportion of cytology tests that reported a definite or possible high-grade abnormality remained at 1.3% or 1.4% for all years from 2004 to 2010.
- The proportion of cytology tests reported as abnormal, after decreasing from 6.7% in 2004, did not change significantly between 2009 and 2010 at 5.4% and 5.3% respectively.

Background information

Cervical cytology using the conventional Papanicolaou smear (Pap test) is the primary screening tool of the NCSP. Cytology means 'study of cells', and, in the context of cervical screening, refers to cells from the cervix that are collected and examined for abnormalities.

The objective of a Pap test is to sample cells from the transformation zone of the cervix (CDHSH 1993), which is the area of the cervix in which the squamous and endocervical cells meet (that is, between the 'original' and 'current' squamocolumnar junctions), and the site where cervical abnormalities and cancer are usually found.



Source: Reproduced with permission by the National Cancer Institute.

Illustration 3.1: Anatomy: cells of the cervix

The NCSP developed the National Cervical Cytology Coding Sheet based on the Australian Modified Bethesda System 2004 for reporting cervical cytology, introduced along with revised guidelines for the management of asymptomatic women with screen-detected abnormalities in July 2006 (NHMRC 2005). This coding sheet allows pathologists to report on both the squamous and endocervical components of the cervical cytology sample (as well as a third category for non-cervical abnormalities and a recommendation code that are not reported here), which together give an overall cervical cytology result for the sample. This overall cytology result may indicate a squamous abnormality, an endocervical abnormality, or (more rarely) concurrent squamous and endocervical abnormalities.

The squamous cell and endocervical component reporting categories of the National Cervical Cytology Coding Sheet are shown in Table 3.1.

Table 3.1: Cytology reporting categories of the National Cervical Screening Program

Squamous cell	Endocervical component
SU Unsatisfactory	EU Unsatisfactory
	E0 No endocervical component
S1 Negative	E1 Negative
S2 Possible low-grade squamous intraepithelial lesion	
S3 Low-grade squamous intraepithelial lesion	E2 Atypical endocervical cells of uncertain significance
S4 Possible high-grade squamous intraepithelial lesion	E3 Possible high-grade endocervical glandular lesion
S5 High-grade squamous intraepithelial lesion	E4 Adenocarcinoma *in situ*
S6 High-grade squamous intraepithelial lesion with possible microinvasion/ invasion	E5 Adenocarcinoma *in situ* with possible microinvasion/ invasion
S7 Squamous cell carcinoma	E6 Adenocarcinoma

Note: There is a further endocervical component result of E- that has been omitted since this code indicates a vaginal vault smear, which is not included in the cervical cytology results presented.

Detailed analyses

Cytology in 2010

In 2010, there were 2,109,131 cervical cytology tests performed, 2,025,860 (96.1%) of these for women aged 20–69 (Table 3.2).

Cytology trends

The number of cytology tests performed for women aged 20–69 decreased from 2,086,554 in 2009 to 2,025,860 in 2010. This decrease occurred across most age groups, with the largest of these for women aged less than 40. In contrast to this trend, the number of cytology tests increased for women aged 60–69 (Table 3.2).

Table 3.2: Number of cytology tests, by age, 2004 to 2010

Age group (years)	2004	2005	2006	2007	2008	2009	2010
<20	68,245	69,841	65,189	67,861	63,668	60,813	55,511
20–24	199,197	207,671	203,531	215,454	203,540	202,951	192,175
25–29	237,905	239,628	235,385	249,461	242,116	249,852	240,510
30–34	286,845	287,736	270,412	268,829	258,449	259,995	246,489
35–39	269,733	274,984	273,274	283,760	281,047	281,300	264,471
40–44	270,055	269,546	259,880	259,723	250,963	252,387	245,041
45–49	233,472	239,200	239,884	248,203	243,146	246,688	236,829
50–54	193,660	196,175	196,236	201,663	202,073	206,118	205,915
55–59	153,891	159,849	163,546	166,087	165,893	168,806	168,579
60–64	102,437	106,608	112,240	122,356	129,177	134,622	139,035
65–69	70,827	73,281	75,700	77,881	79,390	83,835	86,816
70+	32,321	31,075	30,188	29,925	28,353	28,005	27,750
All ages	**2,118,780**	**2,155,682**	**2,125,522**	**2,191,238**	**2,147,848**	**2,175,383**	**2,109,131**
Ages 20–69	**2,018,022**	**2,054,678**	**2,030,088**	**2,093,417**	**2,055,794**	**2,086,554**	**2,025,860**

Source: AIHW analysis of state and territory cervical cytology register data.

Cytology by age

In 2010, most cytology tests were performed for women aged 25–49, with a peak of 264,471 tests performed for women aged 35–39, this being 12.5% of all cytology tests performed in 2010 (Figure 3.1A).

Cytology by state and territory

The number of cytology tests performed for women aged 20–69 were in proportion to the number of women resident in each state and territory (Table 3.3).

Table 3.3: Cytology tests in women aged 20–69, by state and territory, 2010

	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
Number	633,761	546,519	390,418	204,031	152,813	43,485	35,031	19,802	2,025,860

Source: AIHW analysis of state and territory cervical cytology register data.

Unsatisfactory cytology in 2010

In 2010, of the 2,025,860 cytology tests performed for women aged 20–69, 42,096 (2.1%) were unsatisfactory (Table 3.4).

Unsatisfactory cytology is defined as a cervical cytology test where the squamous result is SU Unsatisfactory and the endocervical result is EU Unsatisfactory or where the squamous result is SU Unsatisfactory and the endocervical result is either E0 No endocervical component or E1 Negative.

While not a true result *per se*, unsatisfactory cytology means that due to the unsatisfactory nature of the cells sampled, the pathologist is unable to determine a clear result. This may be due to either too few or too many cells, or the presence of blood or other factors obscuring the cells, or to poor staining or preservation. The absence of an endocervical component is not considered sufficient grounds to deem a cervical cytology sample unsatisfactory (NPAAC 2006).

Unsatisfactory cytology trends

The proportion of cervical cytology tests considered unsatisfactory remained relatively constant, at 2.1% of all cytology tests for most years from 2004 to 2010 (Table 3.4).

Table 3.4: Unsatisfactory cytology tests in women aged 20–69, 2004 to 2010

	2004	2005	2006	2007	2008	2009	2010
Number	42,124	41,042	42,720	44,912	43,223	43,104	42,096
Crude rate	2.1	2.0	2.1	2.2	2.1	2.1	2.1
AS rate	2.1	2.0	2.1	2.2	2.1	2.1	2.1
95% CI	2.1–2.1	2.0–2.0	2.1–2.1	2.1–2.2	2.1–2.1	2.1–2.1	2.1–2.1

Note: Crude rate is the number of unsatisfactory cytology tests as a proportion of the total number of cytology tests; age-standardised (AS) rate is the number of unsatisfactory cytology tests as a proportion of the total number of cytology tests age-standardised to the Australian population at 30 June 2001.

Source: AIHW analysis of state and territory cervical cytology register data.

The National Pathology Accreditation Advisory Council (NPAAC) *Performance measures for Australian laboratories reporting cervical cytology* (NPAAC 2006) includes a recommended standard for the proportion of specimens reported as unsatisfactory as between 0.5% and 5.0% of all specimens reported.

Box 3.1: National Pathology Accreditation Advisory Council (NPAAC) Performance measures for Australian laboratories reporting cervical cytology

Performance measure 1

Proportion of specimens reported as unsatisfactory.

Recommended standard

Between 0.5% and 5.0% of all specimens reported as unsatisfactory.

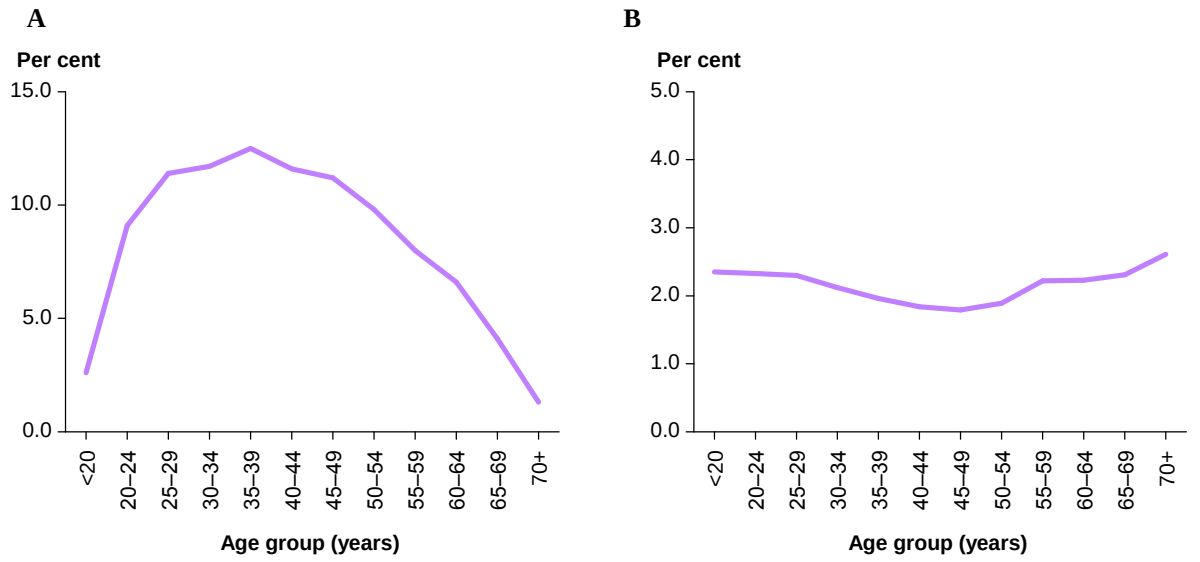
Calculated value for 2010

2.1%

The proportion of cytology tests that were unsatisfactory, 2.1% in 2010 (Table 3.4), falls within these benchmark standards (Box 3.1) and would therefore be considered appropriate.

Unsatisfactory cytology by age

The proportion of cytology tests that were unsatisfactory, high in younger women, decreases with increasing age until age 55, after which it increases (Figure 3.1B). It has been suggested that the increase in unsatisfactory tests in older women may be related to physiological changes in post-menopausal women resulting in atrophic epithelial cells in the sample (Bateson 2009).



Source: AIHW analysis of state and territory cervical cytology register data; data for figures are available in Table A1.

Figure 3.1: Proportion of cytology tests by age (A) and proportion of cytology tests that were unsatisfactory by age (B), 2010

Unsatisfactory cytology by state and territory

In 2010, the majority of states and territories had unsatisfactory cytology tests comprising between 2.1% and 2.4% of all cytology tests. The exceptions to this were New South Wales and the Australian Capital Territory, both having 1.7% of all cytology tests reported as unsatisfactory, and Tasmania, with 2.9% reported as unsatisfactory (Table 3.5).

Table 3.5: Unsatisfactory cytology tests in women aged 20–69, by state and territory, 2010

	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
Number	10,871	11,880	9,084	4,355	3,607	1,245	600	454	42,096
Crude rate	1.7	2.2	2.3	2.1	2.4	2.9	1.7	2.3	2.1
AS rate	1.7	2.2	2.3	2.1	2.4	2.9	1.7	2.3	2.1
95% CI	1.7–1.8	2.1–2.2	2.3–2.4	2.0–2.2	2.3–2.4	2.7–3.0	1.6–1.8	2.0–2.5	2.1–2.1

Note: Crude rate is the number of unsatisfactory cytology tests as a proportion of the total number of cytology tests; age-standardised (AS) rate is the number of unsatisfactory cytology tests as a proportion of the total number of cytology tests age-standardised to the Australian population at 30 June 2001.

Source: AIHW analysis of state and territory cervical cytology register data.

Negative cytology in 2010

Most cervical cytology tests performed have a negative result, indicating that no abnormalities were detected in the sample. In 2010, of the 2,025,860 cytology tests performed for women aged 20–69, 1,876,881 (92.6%) were negative (Table 3.6).

> **Negative cytology** is defined as a cervical cytology test where the squamous result is *S1 Negative* and the endocervical result is either *E0 No endocervical component* or *E1 Negative*.

Negative cytology trends

Between 2004 and 2010, the proportion of negative cytology tests rose slightly from just above 91% to 92.6% of all cytology tests performed for women aged 20–69 (Table 3.6).

Table 3.6: Negative cytology tests in women aged 20–69, 2004 to 2010

	2004	2005	2006	2007	2008	2009	2010
Number	1,839,464	1,872,910	1,857,552	1,922,592	1,891,705	1,931,682	1,876,881
Crude rate	91.2	91.2	91.5	91.8	92.0	92.6	92.6
AS rate	91.3	91.3	91.6	91.9	92.1	92.6	92.6
95% CI	91.1–91.4	91.1–91.4	91.4–91.7	91.8–92.1	91.9–92.2	92.5–92.7	92.5–92.7

Note: Crude rate is the number of negative cytology tests as a proportion of the total number of cytology tests; age-standardised (AS) rate is the number of negative cytology tests as a proportion of the total number of cytology tests age-standardised to the Australian population at 30 June 2001.

Source: AIHW analysis of state and territory cervical cytology register data.

Negative cytology by age

The proportion of cytology tests that are negative increases with increasing age. In 2010, the proportion of cytology tests that were negative was lowest for women aged less than 25, at just above 84% of cytology tests. From 25 onwards, the proportion of cytology tests that were negative increased for each age group, peaking at 96.5% for women aged 65–69 (Figure 3.2A).

Negative cytology by state and territory

The proportion of cytology tests that were negative was similar across states and territories, ranging between 91.4% and 93.7% (age-standardised) for women aged 20–69 in 2010 (Table 3.7).

Table 3.7: Negative cytology tests in women aged 20–69, by state and territory, 2010

	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
Number	594,337	500,343	363,193	186,666	141,851	39,934	32,431	18,126	1,876,881
Crude rate	93.8	91.6	93.0	91.5	92.8	91.8	92.6	91.5	92.6
AS rate	93.7	91.4	93.1	91.8	92.7	91.7	92.8	92.2	92.6
95% CI	93.4–93.9	91.2–91.7	92.8–93.4	91.3–92.2	92.2–93.1	90.8–92.6	91.8–93.8	90.8–93.6	92.5–92.7

Note: Crude rate is the number of negative cytology tests as a proportion of the total number of cytology tests; age-standardised (AS) rate is the number of negative cytology tests as a proportion of the total number of cytology tests age-standardised to the Australian population at 30 June 2001.

Source: AIHW analysis of state and territory cervical cytology register data.

No endocervical component in 2010

The presence of endocervical cells in a cervical cytology sample, while not required for a sample to be considered satisfactory (NPAAC 2006), indicates that the transformation zone is likely to have been sampled (the site where most cervical abnormalities and cancer are detected) (CDHSH 1993). Additionally, the presence of endocervical cells is necessary to detect endocervical abnormalities and adenocarcinoma where these are present.

In 2010, of the 2,025,860 cytology tests performed for women aged 20–69, 424,077 (20.9%) had no endocervical component (Table 3.8).

> A cytology test with **no endocervical component** is defined as a cervical cytology test with any squamous result and an endocervical result of *E0 No endocervical component,* meaning that no endocervical cells are present in the sample, and thus only the squamous cells in the sample can be assessed for the presence of abnormalities or cancer.

No endocervical component trends

The number of cervical cytology tests with no endocervical component increased disproportionately to the increase in the number of cytology tests between 2004 and 2010. While the *overall* increase in the number of cytology tests for women aged 20–69 from 2004 to 2010 was just 0.4%, the number of cytology tests with no endocervical component increased 20.9% from 350,670 in 2004 to 424,077 in 2010. This is reflected in the steady increase in the proportion of cytology tests with no endocervical component from 17.4% in 2004 to 20.9% in 2010 for women aged 20–69 (Table 3.8). This trend holds after age-standardisation—from 17.9% in 2004 to 21.1% of cytology tests in 2010 (Table 3.8).

The 2007–2009 National Cancer Prevention Policy of Cancer Council Australia (2007) states that 'presence of an endocervical component in 80% of Pap tests is generally considered acceptable'. In this context, the 2010 rate of 20.9%, which indicates the presence of an endocervical component in 79.1% of cervical cytology tests, may be considered as bordering on acceptability, as it is technically outside the desired range.

Table 3.8: Cytology tests with no endocervical component in women aged 20–69, 2004 to 2010

	2004	2005	2006	2007	2008	2009	2010
Number	350,670	379,531	387,918	406,736	407,942	418,527	424,077
Crude rate	17.4	18.5	19.1	19.4	19.8	20.1	20.9
AS rate	17.9	19.0	19.5	19.8	20.2	20.3	21.1
95% CI	17.8–17.9	18.9–19.0	19.5–19.6	19.8–19.9	20.1–20.2	20.3–20.4	21.0–21.1

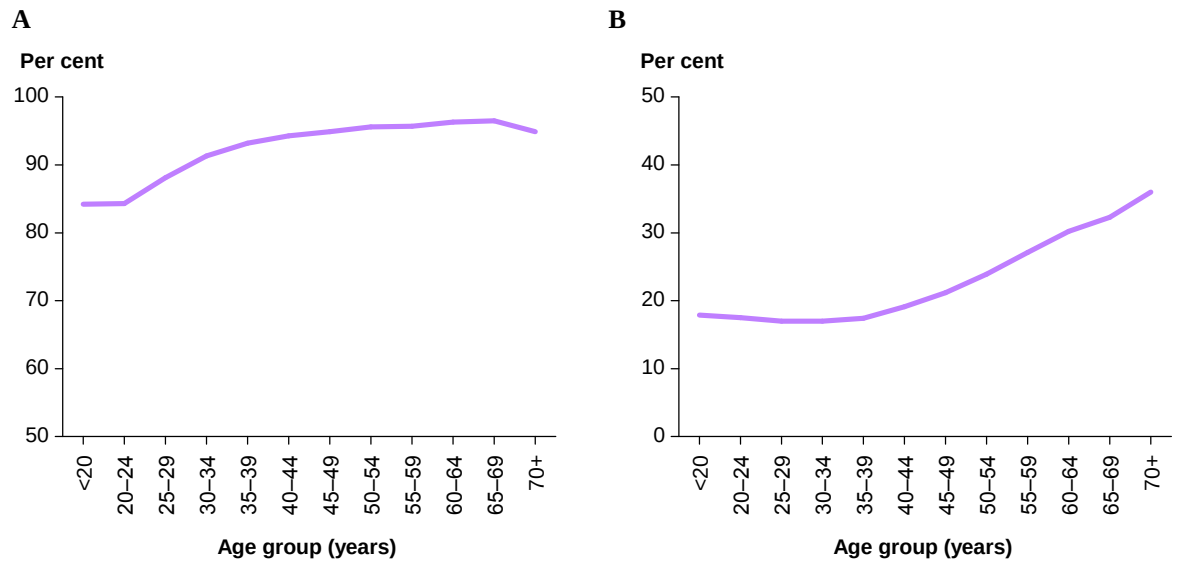
Note: Crude rate is the number of cytology tests with no endocervical component as a proportion of the total number of cytology tests; Age-standardised (AS) rate is the number of cytology tests with no endocervical component as a proportion of the total number of cytology tests age-standardised to the Australian population at 30 June 2001.

Source: AIHW analysis of state and territory cervical cytology register data.

No endocervical component by age

Younger women had a lower proportion of cytology tests with no endocervical component, with between 17.0% and 17.5% of all cytology tests performed for women aged between 20 and 39 lacking endocervical cells in 2010 (Figure 3.2B). In contrast, an endocervical component was absent from more than 20% of cytology tests for women aged 45–49, from

30% of cytology tests for women aged 60–64, and from 36% of cytology tests performed in women aged 70 years and over (Figure 3.2B).



Source: AIHW analysis of state and territory cervical cytology register data; data for figures are available in Table A1.

Figure 3.2: Proportion of cytology tests that were negative by age (A) and proportion of cytology tests with no endocervical component by age (B), 2010

This trend aligns with the movement of the transformation zone with age; the proportion of women with a transformation zone located on the ectocervix has been found to decrease from 94% of women under 25 years to just 2% of women greater than 64 years (Autier et al. 1996). These figures hold up well with the observed data, when it is considered that sampling of the transformation zone is required for endocervical cells to be present in a cervical cytology sample, and that a transformation zone high up in the endocervical canal is likely to be more difficult to sample that a transformation zone on the ectocervix.

No endocervical component by state and territory

In 2010, the proportion of cytology tests for which there was no endocervical component ranged between 18.5% and 30.0% (age-standardised) across states and territories for women aged 20–69 (Table 3.9).

Table 3.9: Cytology tests with no endocervical component in women aged 20–69, by state and territory, 2010

	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
Number	116,487	133,307	72,008	47,791	29,738	13,162	6,924	4,660	424,077
Crude rate	18.4	24.4	18.4	23.4	19.5	30.3	19.8	23.5	20.9
AS rate	18.5	24.5	18.6	24.0	19.3	30.0	20.2	24.9	21.1
95% CI	18.4–18.6	24.4–24.6	18.4–18.7	23.8–24.2	19.1–19.5	29.5–30.6	19.7–20.6	24.1–25.6	21.0–21.1

Note: Crude rate is the number of cytology tests with no endocervical component as a proportion of the total number of cytology tests; age-standardised (AS) rate is the number of cytology tests with no endocervical component as a proportion of the total number of cytology tests age-standardised to the Australian population at 30 June 2001.

Source: AIHW analysis of state and territory cervical cytology register data.

Abnormalities detected in 2010

In 2010, an abnormality (low-grade, high-grade or cancer) was detected in 107,261 (5.3%) of the 2,025,860 cytology tests for women aged 20–69. Of these, 78,510 (73.2%) were low-grade and 28,491 (26.6%) were high-grade, cancer making up the remainder (Table 3.10).

Abnormality trends

Low-grade abnormalities have decreased steadily from their peak of 114,257 in 2005 to 78,510 in 2010 for women aged 20–69 (a decrease from 5.5% to 3.9% of cytology tests, age-standardised). In contrast, high-grade abnormalities have remained at 1.3% or 1.4% of cytology tests for all years from 2004 to 2010 (Table 3.10).

Table 3.10: Abnormalities detected by cytology in women aged 20–69, 2004 to 2010

	2004	2005	2006	2007	2008	2009	2010
Low-grade abnormalities							
Number	109,814	114,257	103,841	97,916	92,013	83,933	78,510
Crude rate	5.4	5.6	5.1	4.7	4.5	4.0	3.9
AS rate	5.4	5.5	5.1	4.6	4.5	4.0	3.9
95% CI	5.3–5.4	5.4–5.5	5.0–5.1	4.6–4.6	4.4–4.5	4.0–4.0	3.9–3.9
High-grade abnormalities							
Number	26,975	26,534	26,165	28,297	29,176	28,054	28,491
Crude rate	1.3	1.3	1.3	1.4	1.4	1.3	1.4
AS rate	1.3	1.3	1.3	1.3	1.4	1.3	1.4
95% CI	1.3–1.3	1.2–1.3	1.2–1.3	1.3–1.3	1.4–1.4	1.3–1.3	1.4–1.4
All abnormalities (low-grade, high-grade, and cancer)							
Number	137,010	141,016	130,234	126,442	121,400	112,188	107,261
Crude rate	6.8	6.9	6.4	6.0	5.9	5.4	5.3
AS rate	6.7	6.7	6.3	5.9	5.9	5.4	5.3
95% CI	6.6–6.7	6.7–6.8	6.3–6.4	5.9–6.0	5.8–5.9	5.3–5.4	5.3–5.4

Notes

1. Low-grade abnormalities are cytology test results S2, S3 and E2; high-grade abnormalities are cytology results S4, S5, S6, E3, E4 and E5. All abnormalities are cytology results S2, S3, S4, S5, S6, S7, E2, E3, E4, E5 and E6 (see Table 3.1).
2. Crude rate is the number of low-grade, high-grade, or all abnormalities detected by cytology as a proportion of the total number of cytology tests; age-standardised (AS) rate is the number of low-grade, high-grade, or all abnormalities detected by cytology as a proportion of the total number of cytology tests age-standardised to the Australian population at 30 June 2001.

Source: AIHW analysis of state and territory cervical cytology register data.

The NPAAC *Performance measures for Australian laboratories reporting cervical cytology* (NPAAC 2006) includes recommended standards for the proportion of specimens reported as possible and definite high-grade abnormalities of at least 0.7%, and for the proportion of cytology tests reported as abnormal of less than 14.0%. It further recommends that the ratio of possible high-grade to definite high-grade abnormalities to be less than 1.5:1. Although these standards were developed for a different purpose, they nonetheless provide a useful benchmark for these data.

Calculation of these performance measures using cytology detection data for 2010 gave results of 1.4%, 5.3% and 0.8:1, respectively (Box 3.2), which would all be considered within the standards set for these measures.

Box 3.2: National Pathology Accreditation Advisory Council (NPAAC) Performance measures for Australian laboratories reporting cervical cytology

Performance measure 2b

(i) Proportion of specimens reported as definite and possible high-grade abnormality.

(ii) Proportion of specimens reported as abnormal.

Recommended standard

(i) Not less than 0.7% reported as definite or possible high-grade abnormality (age-standardised to the Australian 2001 Standard Population).

(ii) Not more than 14.0% reported as abnormal.

Calculated value for 2010

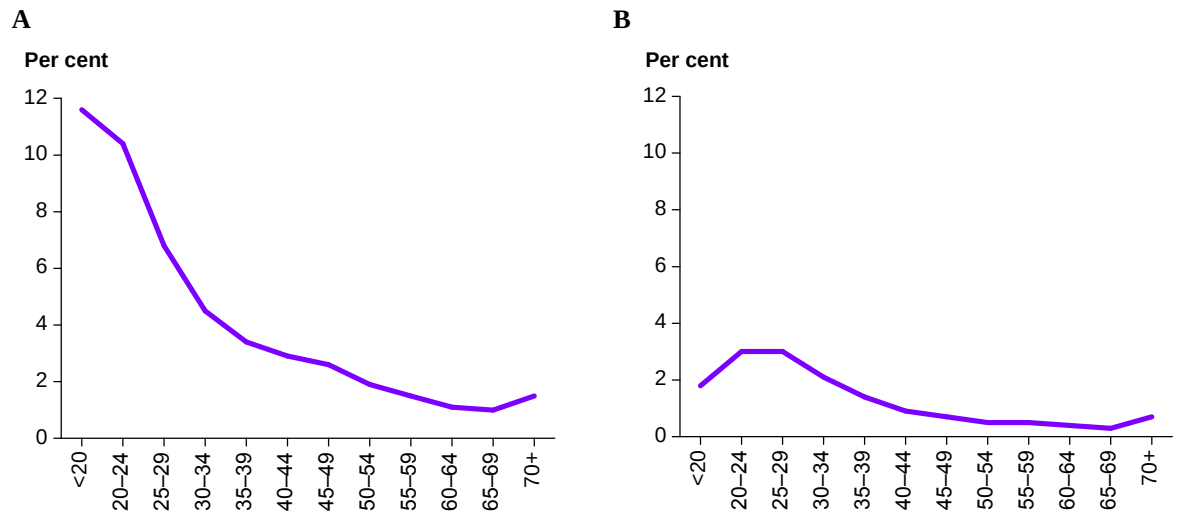
(i) 1.4%

(ii) 5.3%

Abnormalities by age

Figure 3.3A shows the age distribution of all low-grade abnormalities combined, and Figure 3.3B the age distribution of all high-grade abnormalities combined.

Abnormalities are most common in younger women, this being due to HPV infections that occur frequently after sexual debut. Low-grade abnormalities are highest in women aged less than 20 and in those aged 20–24 (Figure 3.3A), while high-grade abnormalities are relatively low in women aged less than 20 and peak in women aged 20–29 (Figure 3.3B). Detection of both low-grade and high-grade abnormalities then decreases rapidly with increasing age, only increasing again in women aged 70 or over (Figure 3.3).



Source: AIHW analysis of state and territory cervical cytology register data; data for figures are available in Table A1.

Figure 3.3: Low-grade (A) and high-grade (B) abnormalities detected by cytology, by age, 2010

Box 3.3: Interpretation of abnormality trends

The distinction between detection and incidence is important in the context of abnormality trends, since trends in the number and proportion of abnormalities detected by cervical cytology are influenced by many factors from which incidence is sheltered.

Trends in underlying prevalence of disease certainly play a role, but because we are looking only at abnormalities detected in screened women, the number of abnormalities detected is also a function of both the number of women screened, and how many times they screen. In this respect, the changes in management guidelines in 2006 may result in changes in the detection of abnormalities, especially low-grade abnormalities, even in the absence of concurrent changes to underlying prevalence. A further factor is the vaccine against HPV introduced in 2007, which ultimately is predicted to reduce abnormalities in the underlying population. It is unclear how many of the women screening have been vaccinated and when the vaccination program might be expected to effect changes to the detection of abnormalities in screened women. While effects due to HPV vaccination can be expected to be evident first in the younger age groups as vaccinated girls move into the screening population, it has been acknowledged that it may be difficult to distinguish HPV vaccination effects on abnormality detection from effects related to changes within cervical screening (WHO 2010).

Trends in the age structure of women participating in screening can also influence abnormality detection, since both low-grade and high-grade abnormalities differ considerably by age. Because younger women are far more likely to have an abnormality, a decrease in the number of cytology tests in younger women could lead to an apparent decrease in the detection of abnormalities simply because we would not be looking for them, and would not necessarily represent a decrease in the prevalence of abnormalities either in younger women or the population in general.

Squamous abnormalities detected in 2010

In 2010, there were 107,261 abnormalities detected by cytology in women aged 20–69. Of these 105,692 were squamous in origin—77,796 low-grade, 27,718 high-grade and 178 squamous cell carcinoma. These abnormalities combined represent 5.2% of all cytology tests in that year.

A **squamous abnormality** is defined as a cervical cytology test where the squamous result is *S2 Possible low-grade squamous intraepithelial lesion*, *S3 Low-grade squamous intraepithelial lesion*, *S4 Possible high-grade squamous intraepithelial lesion, S5 High-grade squamous intraepithelial lesion*, *S6 High-grade intraepithelial lesion with possible microinvasion/invasion* or *S7 Squamous cell carcinoma*, regardless of the corresponding endocervical result for that cytology test.

Squamous abnormality trends

The overall number of squamous abnormalities, as well as the number of squamous abnormalities as a per cent of all cytology tests, decreased between 2004 and 2010; the former from 133,392 to 105,692 squamous abnormalities, the latter from 6.5 to 5.3 squamous abnormalities (age-standardised) for every 100 cytology tests performed for women aged 20–69 (Table 3.11).

Table 3.11: Squamous abnormalities detected by cytology in women aged 20–69, by squamous category, 2004 to 2010

Squamous category	2004	2005	2006	2007	2008	2009	2010
S2 Possible low-grade squamous intraepithelial lesion							
Number	55,981	59,788	55,431	54,262	51,147	47,290	43,485
Per cent of cytology tests	2.8	2.9	2.7	2.6	2.5	2.3	2.1
Per cent of squamous abnormalities	42.0	43.4	43.4	43.6	42.8	42.8	41.1
S3 Low-grade squamous intraepithelial lesion							
Number	51,947	52,545	47,038	42,502	39,846	35,897	34,311
Per cent of cytology tests	2.6	2.6	2.3	2.0	1.9	1.7	1.7
Per cent of squamous abnormalities	38.9	38.1	36.8	34.2	33.4	32.5	32.5
S4 Possible high-grade squamous intraepithelial lesion							
Number	9,481	8,679	9,456	10,727	11,500	11,494	12,088
Per cent of cytology tests	0.5	0.4	0.5	0.5	0.6	0.6	0.6
Per cent of squamous abnormalities	7.1	6.3	7.4	8.6	9.6	10.4	11.4
S5 High-grade squamous intraepithelial lesion							
Number	15,407	16,199	15,342	16,438	16,491	15,505	15,317
Per cent of cytology tests	0.8	0.8	0.8	0.8	0.8	0.7	0.8
Per cent of squamous abnormalities	11.6	11.8	12.0	13.2	13.8	14.0	14.5
S6 High-grade squamous intraepithelial lesion with possible microinvasion/ invasion							
Number	422	447	318	316	290	287	313
Per cent of cytology tests	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Per cent of squamous abnormalities	0.3	0.3	0.2	0.3	0.2	0.3	0.3
S7 Squamous cell carcinoma							
Number	154	148	150	154	126	141	178
Per cent of cytology tests	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Per cent of squamous abnormalities	0.1	0.1	0.1	0.1	0.1	0.1	0.2
All squamous abnormalities							
Number	133,392	137,806	127,735	124,399	119,400	110,614	105,692
Crude rate	6.6	6.7	6.3	5.9	5.8	5.3	5.2
AS rate	6.5	6.6	6.2	5.8	5.8	5.3	5.3
95% CI	6.5–6.5	6.5–6.6	6.2–6.2	5.8–5.9	5.7–5.8	5.2–5.3	5.2–5.3

Note: Crude rate is the number of each squamous abnormality or of all squamous abnormalities combined detected by cytology as a proportion of the total number of cytology tests; age-standardised (AS) rate is the number of all squamous abnormalities combined detected by cytology as a proportion of the total number of cytology tests age-standardised to the Australian population at 30 June 2001.

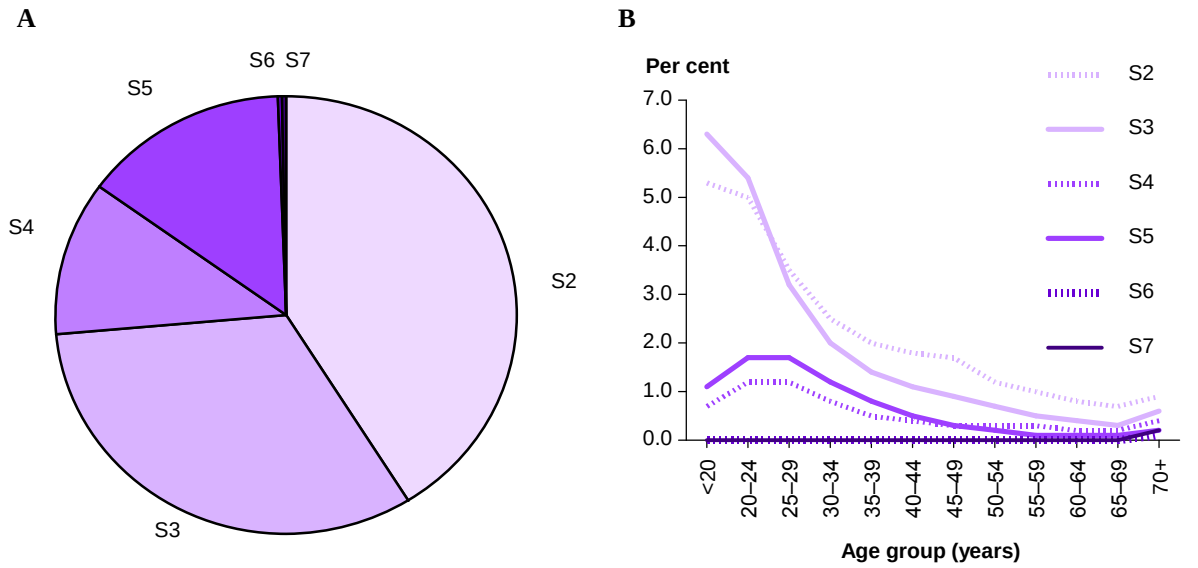
Source: AIHW analysis of state and territory cervical cytology register data.

In 2010, 41.1% of squamous abnormalities were possible low-grade (S2), followed by low-grade squamous intraepithelial lesions (S3) at 32.5% of squamous abnormalities. Possible high-grade (S4) and high-grade squamous intraepithelial lesions (S5) were the next most frequent, at 11.4% and 14.5% of squamous abnormalities, respectively. High-grade intraepithelial lesions with possible microinvasion/invasion (S6) and squamous cell carcinoma (S7) are both very rare squamous abnormalities at just 0.3% and 0.2% of squamous abnormalities, respectively, for women aged 20–69 (Table 3.11; Figure 3.4A).

Squamous abnormalities by age

While low-grade and high-grade squamous abnormalities (both possible and definite) all peak in younger women before decreasing sharply with increasing age, for low-grade squamous intraepithelial lesions this peak occurs in women aged less than 20 and in those aged 20–24, whereas for high-grade intraepithelial lesions this peak occurs in women aged 20–24 years and 25–29 years, with lower rates seen in women aged less than 20. These four squamous abnormalities are at their lowest in women aged 64–69 (Figure 3.4B).

In contrast, detection of high-grade squamous abnormalities with possible microinvasion/invasion (S6) and squamous cell carcinoma (S7) is very rare in younger women (to illustrate, from the 488,196 cytology tests performed for women aged less than 30, there were just 7 cases of squamous cell carcinoma detected).



Note: S2 = possible low-grade squamous intraepithelial lesion; S3 = low-grade squamous intraepithelial lesion; S4 = possible high-grade squamous intraepithelial lesion; S5 = high-grade squamous intraepithelial lesion; S6 = high-grade squamous intraepithelial lesion with possible microinvasion/invasion; S7 = squamous cell carcinoma.

Source: AIHW analysis of state and territory cervical cytology register data.

Figure 3.4: Squamous abnormalities detected by cytology in women aged 20–69 as a proportion of all squamous abnormalities (A), and squamous abnormalities by age (B), 2010

Squamous abnormalities by state and territory

Table 3.12: Squamous abnormalities detected by cytology in women aged 20–69, as a proportion of all cytology tests, by state and territory, 2010

	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
Number	28,198	33,998	17,931	12,842	7,229	2,285	1,994	1,215	105,692
Crude rate	4.4	6.2	4.6	6.3	4.7	5.3	5.7	6.1	5.2
AS rate	4.6	6.3	4.5	6.0	4.9	5.4	5.5	5.5	5.3
95% CI	4.5–4.6	6.3–6.4	4.5–4.6	5.9–6.2	4.8–5.0	5.1–5.6	5.2–5.7	5.2–5.8	5.2–5.3

Note: Crude rate is the number of cytology tests with a squamous abnormality as a proportion of the total number of cytology tests; age-standardised (AS) rate is the number of cytology tests with a squamous abnormality as a proportion of the total number of cytology tests age-standardised to the Australian population at 30 June 2001.

Source: AIHW analysis of state and territory cervical cytology register data.

Endocervical abnormalities detected in 2010

In 2010, of the 107,261 abnormalities detected by cytology in women aged 20–69, 1,569 were endocervical (glandular) in origin—714 atypical endocervical cells of uncertain significance, 773 high-grade, and 82 adenocarcinoma. These abnormalities combined represent 0.08% of all cytology tests in that year.

> An **endocervical abnormality** is defined as a cervical cytology test where the endocervical result is *E2 Atypical endocervical cells of uncertain significance*, *E3 Possible high-grade endocervical glandular lesion*, *E4 Adenocarcinoma in situ*, *E5 Adenocarcinoma in situ with possible microinvasion/invasion* or *E6 Adenocarcinoma*, regardless of the corresponding squamous result for that cytology test.

Endocervical abnormality trends

The overall number of endocervical abnormalities, as well as the number of endocervical abnormalities as a per cent of all cytology tests, decreased between 2004 and 2010; the former from 3,618 to 1,569 endocervical abnormalities, the latter from 0.17 to 0.08 endocervical abnormalities (age-standardised) for every 100 cytology tests performed for women aged 20–69 (Table 3.13). However, there was no significant difference between the number or proportion of endocervical abnormalities between 2009 and 2010, which suggests that the decreasing trend may have stabilised (2011 data are required to confirm or refute this).

In 2010, 45.5% of endocervical abnormalities were categorised as 'atypical endocervical cells of uncertain significance' (E2). This category represents abnormal glandular cells in a cervical cytology sample where the degree of abnormality is not sufficient for a diagnosis of adenocarcinoma *in situ* to be made (NHMRC 2005). The number of cytology tests that were categorised in this way decreased from 1,886 in 2004 to 714 in 2010, accompanied by a decrease from 0.09% of cytology tests in 2004 and 2005 to 0.04% of cytology tests in 2010 for women aged 20–69 (Table 3.13).

Because the largest decreases are from the year 2006 (Table 3.13), it is possible that this is related to the current National Health and Medical Research Council (NHMRC) Guidelines. These Guidelines recommend that atypical endocervical cells of uncertain significance be managed as a high-grade abnormality, whereas previous Guidelines recommended this category be managed as a low-grade abnormality.

Possible high-grade endocervical glandular lesions (E3) and adenocarcinoma *in situ* (E4) were the next most frequent endocervical abnormalities, at 27.7% and 19.4% of endocervical abnormalities, respectively. Adenocarcinoma *in situ* with possible microinvasion/invasion (E5) was rare at 2.1%, and adenocarcinoma (E6) slightly more frequent at 5.2% of endocervical abnormalities in 2010 for women aged 20–69 (Table 3.13; Figure 3.5A).

Of note, although endocervical abnormalities are far rarer than squamous abnormalities, of the endocervical abnormalities that *do* occur, cervical cancer makes up a far greater proportion, with adenocarcinoma comprising 5.2% of endocervical abnormalities in 2010, compared with squamous cell carcinoma, which comprised just 0.2% of squamous abnormalities in that year.

Table 3.13: Endocervical abnormalities detected by cytology in women aged 20–69, by endocervical category, 2004 to 2010

Endocervical category	2004	2005	2006	2007	2008	2009	2010
E2 Atypical endocervical cells of uncertain significance							
Number	1,886	1,924	1,372	1,152	1,020	746	714
Per cent of cytology tests	0.09	0.09	0.07	0.06	0.05	0.04	0.04
Per cent of endocervical abnormalities	52.1	59.9	54.9	56.4	51.0	47.4	45.5
E3 Possible high-grade endocervical glandular lesion							
Number	1,344	887	724	510	562	461	435
Per cent of cytology tests	0.07	0.04	0.04	0.02	0.03	0.02	0.02
Per cent of endocervical abnormalities	37.1	27.6	29.0	25.0	28.1	29.3	27.7
E4 Adenocarcinoma *in situ*							
Number	276	274	283	277	299	283	305
Per cent of cytology tests	0.01	0.01	0.01	0.01	0.01	0.01	0.02
Per cent of endocervical abnormalities	7.6	8.5	11.3	13.6	15.0	18.0	19.4
E5 Adenocarcinoma *in situ* with possible microinvasion/invasion							
Number	45	48	42	29	34	24	33
Per cent of cytology tests	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Per cent of endocervical abnormalities	1.2	1.5	1.7	1.4	1.7	1.5	2.1
E6 Adenocarcinoma							
Number	67	77	78	75	85	60	82
Per cent of cytology tests	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Per cent of endocervical abnormalities	1.9	2.4	3.1	3.7	4.3	3.8	5.2
All endocervical abnormalities							
Number	3,618	3,210	2,499	2,043	2,000	1,574	1,569
Crude rate	0.18	0.16	0.12	0.10	0.10	0.08	0.08
AS rate	0.17	0.15	0.12	0.10	0.10	0.07	0.08
95% CI	0.17–0.18	0.15–0.16	0.12–0.13	0.09–0.10	0.09–0.10	0.07–0.08	0.07–0.08

Note: Crude rate is the number of each endocervical abnormality or of all endocervical abnormalities combined detected by cytology as a proportion of the total number of cytology tests; age-standardised (AS) rate is the number of all endocervical abnormalities combined detected by cytology as a proportion of the total number of cytology tests age-standardised to the Australian population at 30 June 2001.

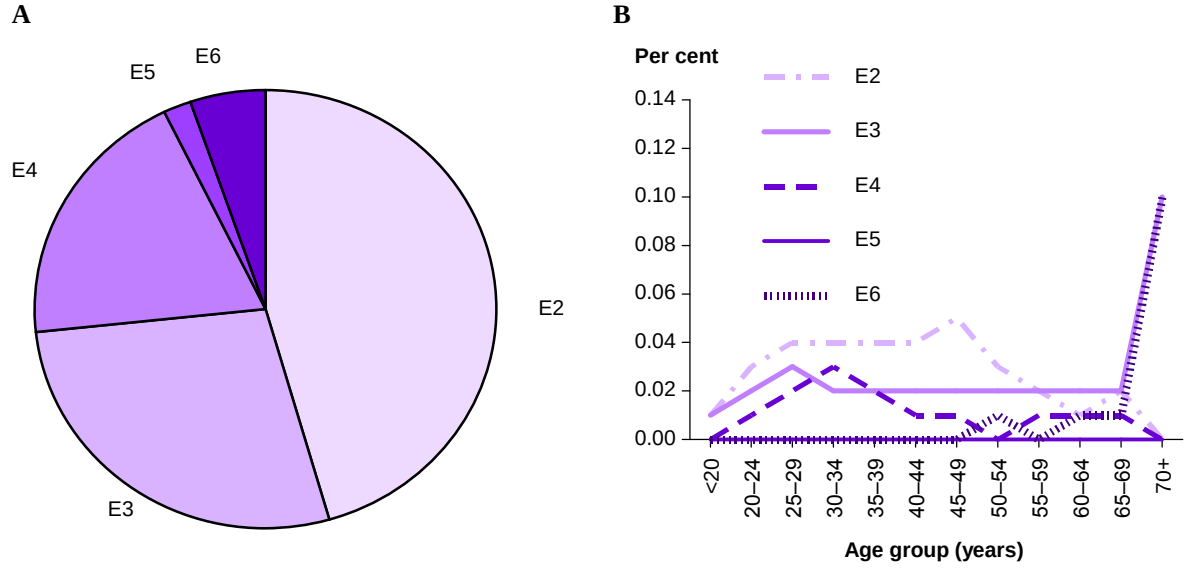
Source: AIHW analysis of state and territory cervical cytology register data.

Endocervical abnormalities by age

All endocervical abnormalities are rarely detected in women aged less than 20. Atypical endocervical cells of uncertain significance (E2) peak at age 25–29, with a second peak at age 45–49. Possible high-grade glandular abnormalities (E3) also peak at age 25–29, but thereafter remain at a slightly lower level of detection. Adenocarcinoma *in situ* (E4) peaks at age 30–34 but shows a further, smaller increase for ages from 55 and 69. Adenocarcinoma (E6) has a small peak at age 50–54 (Figure 3.5B).

While the detection of all other endocervical abnormalities is very low in women aged 70 or over, there is a relatively large increase apparent in the detection of both possible high-grade

(E3) and adenocarcinoma (E6) in this age group. However, these findings are based on a very small number of abnormalities, and so should be interpreted with caution.



Note: E2 = atypical endocervical cells of uncertain significance; E3 = possible high-grade endocervical glandular lesion; E4 = adenocarcinoma *in situ*; E5 = adenocarcinoma *in situ* with possible microinvasion/invasion; E6 = adenocarcinoma.

Source: AIHW analysis of state and territory cervical cytology register data.

Figure 3.5: Endocervical abnormalities detected by cytology in women aged 20–69 as a proportion of all endocervical abnormalities (A), and endocervical abnormalities by age (B), 2010

Endocervical abnormalities by state and territory

Table 3.14: Endocervical abnormalities detected by cytology in women aged 20–69, as a proportion of all cytology tests, by state and territory, 2010

	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
Number	493	413	263	210	131	31	12	16	1,569
Crude rate	0.08	0.08	0.07	0.10	0.09	0.07	0.03	0.08	0.08
AS rate	0.08	0.07	0.07	0.10	0.09	0.07	0.03	0.08	0.08
95% CI	0.07–0.08	0.07–0.08	0.06–0.08	0.09–0.12	0.07–0.10	0.05–0.10	0.02–0.06	0.05–0.14	0.07–0.08

Note: Crude rate is the number of cytology tests with an endocervical abnormality as a proportion of the total number of cytology tests; age-standardised (AS) rate is the number of cytology tests with an endocervical abnormality as a proportion of the total number of cytology tests age-standardised to the Australian population at 30 June 2001.

Source: AIHW analysis of state and territory cervical cytology register data.

Indicator 4 Histology

What do we mean by histology?

Definition: The proportion of histology test results in each result category in a 12-month period. The exception to this, high-grade abnormality detection, is defined as the number of women with a high-grade abnormality detected by histology per 1,000 women screened.

Rationale: Cervical histology is the examination of tissue from the cervix through a microscope, and is the primary diagnostic tool of the National Cervical Screening Program (NCSP).

Annual monitoring of histology report categories by various stratifications may reveal emerging positive or negative trends that need to be addressed, including effects from the human papillomavirus (HPV) vaccine introduced in 2007, of relevance to the NCSP.

In addition, the high-grade abnormality detection rate is an indicator of how well the NCSP detects high-grade abnormalities. Since high-grade abnormalities have a greater probability of progressing to invasive cancer than do low-grade abnormalities, one aim of the NCSP is to set a screening interval that detects most high-grade abnormalities before they progress.

Guide to interpretation: Prior to the introduction of new performance indicators, the high-grade abnormality detection rate had been reported annually as Indicator 4 since 199. This important and historical measure now appears within the abnormality section of the new, broader histology Indicator 4. This means that, while most rates presented for histology are a per cent of the total number of histology tests, the section that reports the high-grade abnormality detection rate is per 1,000 women screened because this measure is based on the number of *women*, not the number of *tests*.

The most recent histology data are for the year 2010.

Key results

Histology in 2010

- In 2010, there were 75,611 cervical histology tests performed (72,234 for women 20–69).

Abnormalities in 2010

- Just over half (51.1%) of histology tests detected an abnormality (low-grade, high-grade or cancer).
- For every 1,000 women screened aged 20–69, 8.4 women had a high-grade abnormality detected by histology, providing an opportunity for treatment before possible progression to cervical cancer.
- In 2010, for women aged 20–69 the ratio of high-grade squamous abnormalities to squamous cell carcinoma was 40.5:1 compared with the ratio of high-grade endocervical abnormalities to adenocarcinoma of 2.9:1.

Abnormality trends

- Between 2009 and 2010, the (age-standardised) detection of high-grade abnormalities in women aged 20–69 increased from 8.1 to 8.5 per 1,000 women screened. Despite this overall increase, detection in women aged less than 20 continued to decrease, from 8.9 to 7.8 per 1,000 women screened.

Background information

Histology is the primary diagnostic tool of the NCSP. Because cytology is only a screening tool, confirmation of disease is required before any treatment is initiated, both to ensure treatment is appropriate, and to avoid unnecessary treatment in women in which the cytology has predicted disease that is not present. While colposcopy is used as part of this process, in Australia it is considered best practice to confirm high-grade disease with histology prior to treatment (NHMRC 2005).

Because histology is used to diagnose disease, either as follow-up for screen-detected abnormalities in asymptomatic women as per the national guidelines, or because it is clinically indicated even in the absence of a cytological abnormality being detected, histology is performed for only a subset of screened women. Further, more women have histology following a cytology result of high-grade disease or cancer than following negative or low-grade cytology results. Thus, while histology can tell us much about true disease, it can only do so for the subset of women in which histology is performed.

Note that histology may also be performed for reasons other than to confirm or follow-up suspected cervical disease, and that the national guidelines introduced in July 2006 changed recommendations for the subsets of women that were recommended to have colposcopy and biopsy following a screen-detected abnormality.

Unlike cytology, which has nationally consistent reporting through the Australian Modified Bethesda System 2004 (AMBS 2004), state and territory cervical cytology registers have different coding systems for histology. In order to report histology in a way that is meaningful, states and territories have worked together with the Australian Institute of Health and Welfare (AIHW) to develop a national histology coding system for the NCSP, with the individual histology codes used in each state and territory mapped to these national codes.

The squamous and endocervical reporting categories of the NCSP national histology coding system are shown in Table 4.1.

Table 4.1: Histology reporting categories of the National Cervical Screening Program

Squamous	Endocervical
HSU Unsatisfactory	HEU Unsatisfactory
HS01 Negative	HE1 Negative
HS02 Low-grade squamous abnormality	HE02 Endocervical atypia
HS03.1 High-grade squamous abnormality, cervical intraepithelial neoplasia (CIN) not otherwise specified (NOS)	HE03.1 High-grade endocervical abnormality, endocervical dysplasia
HS03.2 High-grade squamous abnormality, CIN II	HE03.2 High-grade endocervical abnormality, adenocarcinoma *in situ*
HS03.3 High-grade squamous abnormality, CIN III	
HS04.1 Squamous cell carcinoma, microinvasive	HE04.1 Adenocarcinoma, microinvasive
HS04.2 Squamous cell carcinoma, invasive	HE04.2 Adenocarcinoma, invasive
	HE04.3 Adenosquamous carcinoma
	HE04.4 Carcinoma of the cervix (other)

Note: there is a further result of HE03.3 to allow the collection of mixed high-grade histology (carcinoma *in situ*/adenocarcinoma *in situ*) that has been omitted since this category is not included in the cervical histology results presented.

Detailed analyses

Histology in 2010

In 2010, there were 75,611 cervical histology tests performed, 72,234 (95.5%) of these for women aged 20–69 (Table 4.2).

Histology trends

The number of cervical histology tests performed for women aged 20–69 decreased from 72,394 in 2009 to 72,234 in 2010. Although the overall decrease is small, there were clear decreases in younger age groups—the largest being a 13.9% decrease in the number of histology tests performed for women aged less than 20 from 1,689 in 2009 to 1,454 in 2010 (Table 4.2).

Table 4.2: Number of histology tests by year, 2004 to 2010

Age group (years)	2004	2005	2006	2007	2008	2009	2010
<20	3,462	3,386	2,909	2,296	2,089	1,689	1,454
20–24	13,247	13,572	12,655	11,967	12,136	11,187	10,519
25–29	12,858	12,854	12,490	12,364	12,621	12,625	12,690
30–34	11,387	11,224	10,448	9,975	9,989	10,009	9,839
35–39	9,314	9,056	8,716	8,819	9,037	8,985	8,753
40–44	9,391	9,017	8,671	8,309	8,249	8,280	8,265
45–49	8,266	7,998	7,878	8,107	8,202	8,348	8,584
50–54	5,386	5,226	5,043	5,290	5,382	5,623	5,742
55–59	3,277	3,249	3,318	3,271	3,374	3,441	3,562
60–64	1,817	1,921	1,953	2,102	2,324	2,395	2,600
65–69	1,333	1,253	1,347	1,397	1,478	1,501	1,680
70+	1,705	1,708	1,533	1,523	1,728	1,817	1,915
All ages	**81,448**	**80,466**	**76,972**	**75,423**	**76,612**	**75,904**	**75,611**
Ages 20–69	**76,276**	**75,370**	**72,519**	**71,601**	**72,792**	**72,394**	**72,234**

Source: AIHW analysis of state and territory cervical cytology register data.

Histology by age

In 2010, most histology tests were performed for women aged 20–49, with a peak of 12,690 tests performed for women aged 25–29, this being 16.8% of all histology tests performed in 2010 (Figure 4.1A).

Histology by state and territory

The number of histology tests performed for women aged 20–69 was in proportion to the number of women resident in each state and territory (Table 4.3).

Table 4.3: Histology tests in women aged 20–69, by state and territory, 2010

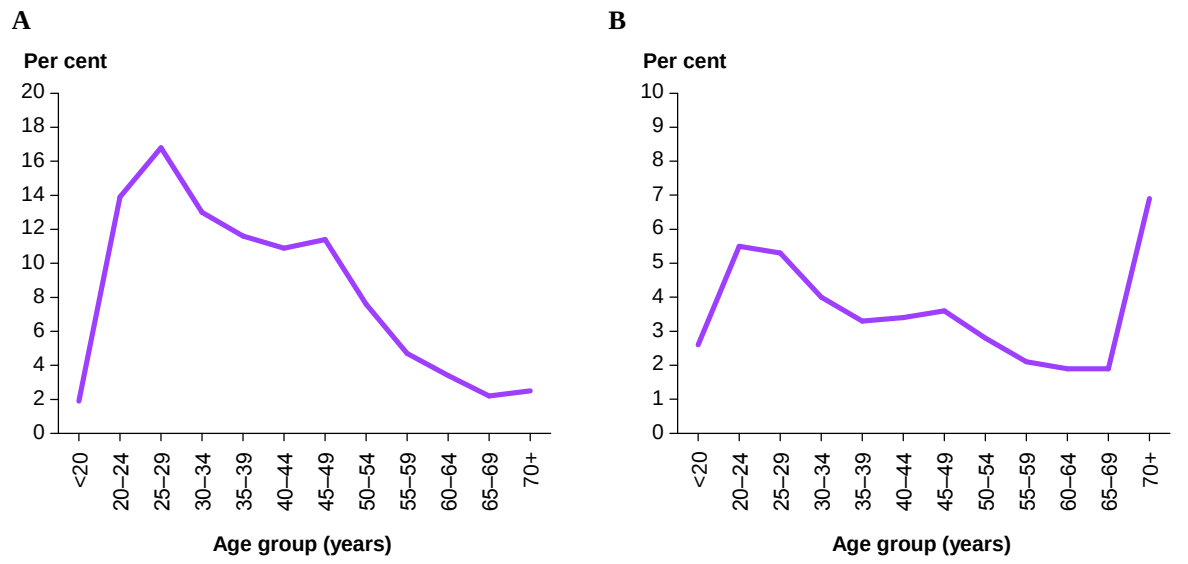
	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
Number	23,795	17,209	12,757	9,316	4,796	1,973	1,409	979	72,234

Source: AIHW analysis of state and territory cervical cytology register data.

Histology as a proportion of cytology

Trends in histology are heavily dependent on cytology trends, since histology is used to diagnose abnormalities predicted by cytology. In order to analyse histology trends independently of cytology trends, the number of histology tests per 100 cytology tests has been reported.

In 2010, this measure was highest for women aged 20–24 indicating that, for every 100 cytology tests, women aged 20–24 years had the greatest number of histology tests performed. This equated to 5.5 histology tests for every 100 cytology tests performed, halving to 2.8 histology tests for every 100 cytology tests by the time women reach 50–54, with only 1.9 histology tests for every 100 cytology tests for women aged 65–69 (Figure 4.1B).



Source: AIHW analysis of state and territory cervical cytology register data; data for figures are available in Table A1.

Figure 4.1: Proportion of histology tests by age (A) and histology tests per 100 cytology tests by age (B), 2010

Histology as a proportion of cytology closely follows the detection of high-grade abnormalities by cytology, with two exceptions: women aged less than 20 years appear to have fewer histology tests performed than would be expected by the number of high-grade cytology abnormalities detected, and women aged 40–54 years appear to have a greater number of histology tests performed than would be expected if these were solely due to follow-up of high-grade cytology. Hysterectomies for benign conditions may contribute to the latter.

Abnormalities detected in 2010

In 2010, an abnormality (low-grade, high-grade or cancer) was detected in 36,895 (51.1%) of the 72,234 histology tests for women aged 20–69. Of these, 14,018 (38.0%) were low-grade and 22,104 (59.9%) were high-grade, cancer making up the remainder (Table 4.4).

Abnormality trends

Low-grade abnormalities detected by histology decreased from 20,239 in 2004 to 14,018 in 2010 for women aged 20–69 (a decrease from 23.0% to 17.2% of histology tests,

age-standardised) (Table 4.4). This decrease, across all age groups, is in line with expected changes in detection of low-grade abnormalities resulting from changes to the recommended management of women with low-grade abnormalities as part of the current NHMRC Guidelines introduced in 2006 (Box 4.1).

In contrast, the detection of high-grade abnormalities by histology increased from 19,681 in 2004 to 22,104 in 2010 for women aged 20–69 (an increase from 21.2% to 25.9% of histology tests, age-standardised) (Table 4.4). This increase occurred across all ages from 20 to 34 years between 2009 and 2010. However, there has been a recent decrease in the number of high-grade abnormalities detected by histology in women aged less than 20, from 40.1% of histology tests in 2009 to 37.9% in 2010. Age-trend data, while not shown in this report, are available in associated supplementary data tables.

Table 4.4: Abnormalities detected by histology in women aged 20–69, 2004 to 2010

	2004	2005	2006	2007	2008	2009	2010
Low-grade abnormalities							
Number	20,239	19,576	18,003	16,602	15,347	14,576	14,018
Crude rate	26.5	26.0	24.8	23.2	21.1	20.1	19.4
AS rate	23.0	22.2	21.4	20.2	18.4	17.6	17.2
95% CI	22.7–23.4	21.9–22.6	21.1–21.8	19.9–20.6	18.1–18.7	17.3–17.9	16.9–17.5
High-grade abnormalities							
Number	19,681	20,200	20,063	21,067	22,102	22,031	22,104
Crude rate	25.8	26.8	27.7	29.4	30.4	30.4	30.6
AS rate	21.2	22.0	22.9	24.4	25.2	25.4	25.9
95% CI	20.9–21.5	21.6–22.3	22.6–23.3	24.1–24.8	24.8–25.5	25.0–25.7	25.6–26.3
All abnormalities (low-grade, high-grade and cancer)							
Number	40,653	40,603	38,825	38,476	38,325	37,380	36,895
Crude rate	53.3	53.9	53.5	53.7	52.7	51.6	51.1
AS rate	45.5	45.8	45.8	46.2	45.1	44.4	44.4
95% CI	45.0–46.0	45.3–46.2	45.3–46.3	45.7–46.7	44.7–45.6	43.9–44.9	44.0–44.9

Notes

1. Low-grade abnormalities are histology test results HS02 and HE02; high-grade abnormalities are histology results HS03 and HE03. All abnormalities are histology test results HS02, HS03, HS04, HE02, HE03 and HE04 (see Table 4.1).
2. Crude rate is the number of low-grade, high-grade, or all abnormalities detected by histology as a proportion of the total number of histology tests; age-standardised (AS) rate is the number of low-grade, high-grade, or all abnormalities detected by histology as a proportion of the total number of histology tests age-standardised to the Australian population at 30 June 2001.

Source: AIHW analysis of state and territory cervical cytology register data.

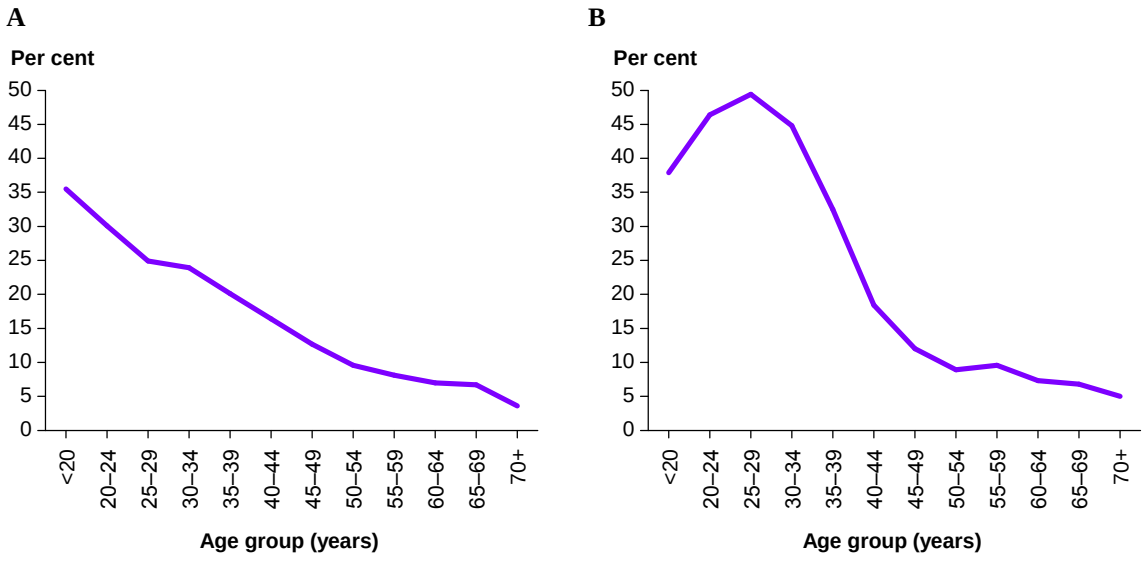
Abnormalities by age

Figure 4.2A shows the age distribution of all low-grade abnormalities combined, and Figure 4.2B the age distribution of all high-grade abnormalities combined.

Similar to abnormalities detected by cytology, abnormalities detected by histology are most common in younger women (HPV infections occur frequently after sexual debut). However, because low-grade cytology is not routinely followed-up with histology under the current NHMRC Guidelines (NHMRC 2005), low-grade histology occurs less frequently than high-grade histology. The age distribution of these detected abnormalities is a straight line, with

low-grade abnormalities highest in women aged less than 20, thereafter decreasing steadily with increasing age (Figure 4.2A).

The age-distribution of high-grade abnormalities is different, being highest in women aged 20–34, followed by women aged less than 20, then those aged 35–39, and thereafter decreasing sharply with increasing age (Figure 4.2B).



Source: AIHW analysis of state and territory cervical cytology register data; data for figures are available in Table A1.

Figure 4.2: Low-grade (A) and high-grade (B) abnormalities detected by histology, by age, 2010

Box 4.1: Interpretation of abnormality trends

The detection of abnormalities by histology is affected by the same factors as the detection of abnormalities by cytology, but is also influenced by the detection of abnormalities by cytology itself, since most histology occurs as a consequence of an abnormality being detected by cytology, and is thus expected to increase and decrease in line with cytological abnormality detection trends.

Prior to the introduction of the current NHMRC Guidelines, the recommended management for women with a low-grade abnormality detected by cytology was colposcopy, which often resulted in a biopsy. The current Guidelines no longer recommend colposcopy for the majority of women with a low-grade abnormality detected by cytology, which is expected to result in a decrease in both the number of histology tests, and the proportion of histology tests with a result of low-grade abnormality.

However, cervical screening is a complex environment; factors do not exist in isolation, and pinpointing the precise cause of trends is difficult. The change in Guidelines is probably the main driving factor behind histology trends, but in addition to any apparent decrease in detection of abnormalities in the screening population, there may also be a true decrease in prevalence in the broader population emerging in the coming years, since the introduction of the HPV vaccine in 2007 is expected to reduce the incidence of low-grade and high-grade abnormalities, which would be reflected in the detection of these abnormalities by cytology and histology.

High-grade abnormality detection rate in 2010

The number of women with a high-grade abnormality detected by histology per 1,000 women screened (the **high-grade abnormality detection rate**) is reported separately, since this is a historical rate that provides different information to the number of high-grade abnormalities detected, reported above.

High-grade abnormalities of the cervix include cervical intraepithelial neoplasia (CIN) that has been graded as moderate (CIN II) or severe (CIN III), or for which the grade has not been specified, as well as endocervical dysplasia and adenocarcinoma *in situ*. High-grade abnormalities have a greater probability of progressing to invasive cancer than do low-grade abnormalities (although it should be noted that high-grade abnormalities do not always progress, with one study suggesting that at least 80% of high-grade abnormalities regress spontaneously (Raffle et al. 2003)). Detection of high-grade abnormalities provides an opportunity for treatment before cancer can develop, thus the NCSP aims to detect high-grade abnormalities in line with its broader aim to reduce the incidence of cervical cancer.

In 2010, the high-grade abnormality rate was 8.4 (age-standardised to 8.5 for comparisons) for women aged 20–69 (Table 4.5). This means that, in 2010, for every 1,000 women screened aged 20–69, 8.4 women had a high-grade abnormality detected by histology.

High-grade abnormality detection rate trends

The number of women aged 20–69 with a high-grade abnormality detected by histology per 1,000 women screened, after remaining at approximately 7.7 for all years from 2004 to 2007, increased to 8.3 in 2008, 8.1 in 2009, and 8.5 in 2010 (Table 4.5).

Table 4.5: High-grade abnormality detection rate, by age, 2004 to 2010

	2004	2005	2006	2007	2008	2009	2010
<20	14.5	13.2	13.2	11.6	10.8	8.9	7.8
20–24	20.3	20.2	19.9	18.9	21.3	19.9	19.7
25–29	17.7	17.7	17.7	17.8	19.3	19.0	19.9
30–34	11.6	11.6	11.6	11.5	12.7	12.8	13.6
35–39	7.1	7.0	7.2	7.3	7.8	7.6	8.3
40–44	4.6	4.4	4.7	4.7	4.8	4.7	4.9
45–49	3.1	3.1	3.2	3.2	3.3	3.3	3.5
50–54	1.7	1.7	1.9	1.9	2.0	1.9	2.1
55–59	1.5	1.6	1.5	1.4	1.3	1.3	1.7
60–64	1.2	1.4	1.2	1.2	1.3	1.2	1.2
65–69	1.0	1.0	1.4	1.3	1.3	1.1	1.1
70+	3.1	3.0	2.8	2.4	2.6	2.6	3.4
Ages 20–69							
Crude rate	7.9	7.9	7.8	7.8	8.4	8.1	8.4
AS rate	7.7	7.7	7.8	7.7	8.3	8.1	8.5
95% CI	7.6–7.9	7.6–7.8	7.6–7.9	7.5–7.8	8.2–8.5	8.0–8.2	8.3–8.6

Note: Crude rate is the number of women with a high-grade abnormality detected by histology per 1,000 women screened; age-standardised (AS) rate is the number of women with a high-grade abnormality detected by histology per 1,000 women screened, age-standardised to the Australian population at 30 June 2001.

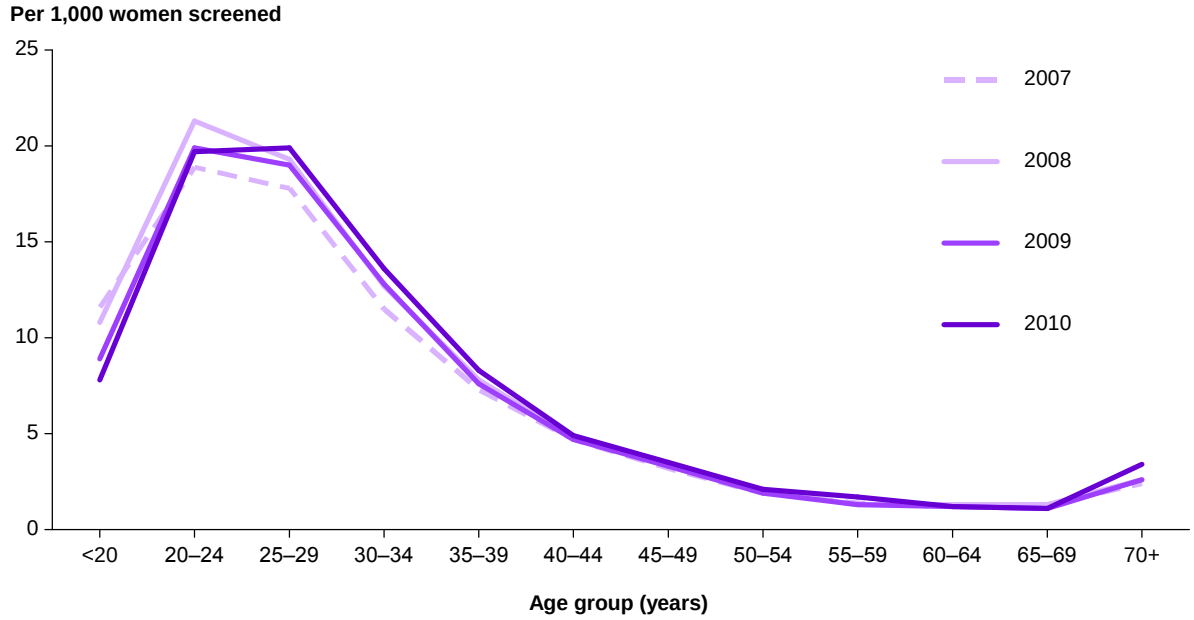
Source: AIHW analysis of state and territory cervical cytology register data.

However, in contrast to the overall trend of increasing detection over time, there has been a steady *decrease* in high-grade abnormality detection in women aged less than 20 years. Highest at 14.5 in 2004, this decreased to 7.8 women with high-grade histology per 1,000 women screened in 2010 (Table 4.5; Figure 4.3).

The increase in the overall high-grade abnormality rate from 2007 to 2010 appears to be due to an increase in the high-grade abnormality rate for women aged 25–39 over this time (Table 4.5; visible in Figure 4.3).

High-grade abnormality detection rate by age

In 2010, the high-grade abnormality detection rate was highest for women aged 20–24 and 25–29 at 19.7 and 19.9 women with high-grade histology per 1,000 women screened, respectively. The detection rate was lower at 13.6 for women aged 30–34, further decreasing with increasing age to be just 1.1 for women aged 65–69 (Table 4.5).



Source: AIHW analysis of state and territory cervical cytology register data.

Figure 4.3: High-grade abnormality detection rate, by age, 2007, 2008, 2009 and 2010

High-grade abnormality detection by state and territory

In 2010, the high-grade abnormality detection rate varied across states and territories between 6.8 and 13.0 per 1,000 women screened (Table 4.6).

Table 4.6: High-grade abnormality detection rate in women aged 20–69, by state and territory, 2010

	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
AS rate	8.5	7.4	9.4	8.9	8.1	9.4	6.8	13.0	8.5
95% CI	8.3–8.8	7.2–7.6	9.1–9.7	8.5–9.3	7.6–8.6	8.5–10.4	6.0–7.7	11.5–14.6	8.3–8.6

Note: Age-standardised (AS) rate is the number of women with a high-grade abnormality detected by histology per 1,000 women screened, age-standardised to the Australian population at 30 June 2001.

Source: AIHW analysis of state and territory cervical cytology register data.

Squamous abnormalities detected in 2010

In 2010, of the 36,895 abnormalities detected by histology in women aged 20–69, 35,881 were squamous in origin—13,964 low-grade, 21,389 high-grade, and 528 squamous cell carcinoma. These abnormalities combined represent 49.7% of all histology tests in that year.

A **squamous abnormality** is defined as a cervical histology test where the squamous result is *HS02 Low-grade squamous abnormality*, *HS03.1 Cervical intraepithelial neoplasia (CIN) not otherwise specified (NOS)*, *HS03.2 CIN II*, *HS03.3 CIN III*, *HS04.1 Microinvasive squamous cell carcinoma*, or *HS04.2 Invasive squamous cell carcinoma*, regardless of any endocervical result.

Squamous abnormality trends

The overall number of squamous abnormalities decreased from 39,786 in 2004 to 35,881 in 2010, with only a slight decrease in squamous abnormalities as a per cent of all histology tests in the latter years (Table 4.7).

Table 4.7: Squamous abnormalities detected by histology in women aged 20–69, by squamous category, 2004 to 2010

	Year						
Squamous category	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
HS02 Low-grade squamous abnormality							
Number	20,140	19,472	17,937	16,540	15,292	14,538	13,964
Per cent of histology tests	26.4	25.8	24.7	23.1	21.0	20.0	19.3
Per cent of squamous abnormalities	50.6	49.0	47.3	44.1	41.1	39.9	38.9
HS03 High-grade squamous abnormality							
Number	19,176	19,705	19,508	20,437	21,411	21,379	21,389
Per cent of histology tests	25.1	26.1	26.9	28.5	29.4	29.5	29.6
Per cent of squamous abnormalities	48.2	49.6	51.5	54.5	57.5	58.7	59.6
HS04 Squamous cell carcinoma							
Number	470	558	466	516	530	474	528
Per cent of histology tests	0.6	0.7	0.6	0.7	0.7	0.7	0.7
Per cent of squamous abnormalities	1.2	1.4	1.2	1.4	1.4	1.3	1.5
All squamous abnormalities							
Number	39,786	39,735	37,911	37,493	37,233	36,391	35,881
Crude rate	52.2	52.7	52.3	52.4	51.1	50.3	49.7
AS rate	44.3	44.5	44.5	44.7	43.5	43.0	43.0
95% CI	43.8–44.8	44.0–45.0	44.0–45.0	44.2–45.2	43.1–44.0	42.5–43.4	42.5–43.5

Notes

1. HS03 High-grade squamous abnormality combines cervical intraepithelial neoplasia (CIN) not otherwise specified (NOS), CIN II and CIN III.
2. Crude rate is the number of each squamous abnormality or all squamous abnormalities combined detected by histology as a proportion of the total number of histology tests; age-standardised (AS) rate is the number of all squamous abnormalities combined detected by histology as a proportion of the total number of histology tests age-standardised to the Australian population at 30 June 2001.

Source: AIHW analysis of state and territory cervical cytology register data.

In 2010, 38.9% of squamous abnormalities were low-grade (HS02), with high-grade abnormalities (HS03)—incorporating CIN II and CIN III—the most frequent at 59.6%. Squamous cell carcinoma (HS04) was rarer at just 1.5% of all squamous abnormalities in 2010 for women aged 20–69 (Table 4.7; Figure 4.5A).

Compared with 2004, low-grade abnormalities have decreased substantially in 2010 from 26.4% to 19.3% of histology tests. This is likely a direct effect of the introduction of the current NHMRC Guidelines, which recommend repeat cytology rather than biopsy for a low-grade squamous intraepithelial lesion detected by cytology, a follow-on effect of which is likely to be a decrease in the proportion of histology tests detecting a low-grade abnormality—as observed.

High-grade abnormalities have increased concurrently with the decrease in low-grade abnormalities, although this may be simply an artefact since, with fewer low-grade abnormalities, high-grade abnormalities will necessarily comprise an increasing proportion of all histology tests performed.

The literature advocates that the distinction between the high-grade squamous abnormalities CIN II and CIN III is important to preserve. This is currently not possible nationally, as some states and territories receive data in a format that does not allow them to distinguish between the histology results of CIN II and CIN III. However, CIN II and CIN III have been analysed separately using data only from those states and territories where these abnormalities could be distinguished (Table 4.8).

In 2010, CIN II comprised 26.6% and CIN III 31.5% of the 16,282 squamous abnormalities in these states and territories, which equates to 12.2% and 14.4% of histology tests respectively, for women aged 20–69.

Consistent with the trend for all high-grade abnormalities combined, CIN II and CIN III both increased between 2004 and 2010 for women aged 20–69 —the former from 3,818 to 4,338, and the latter from 4,236 to 5,127. This increase was accompanied by an increase in the per cent of histology tests (from 10.5% to 12.2% for CIN II and from 11.6% to 14.4% for CIN III), as well as an increase in the per cent of squamous abnormalities (from 22.6% to 26.6% for CIN II and from 25.1% to 31.5% for CIN III) (Table 4.8).

Note that for all years, CIN III was more frequent than CIN II.

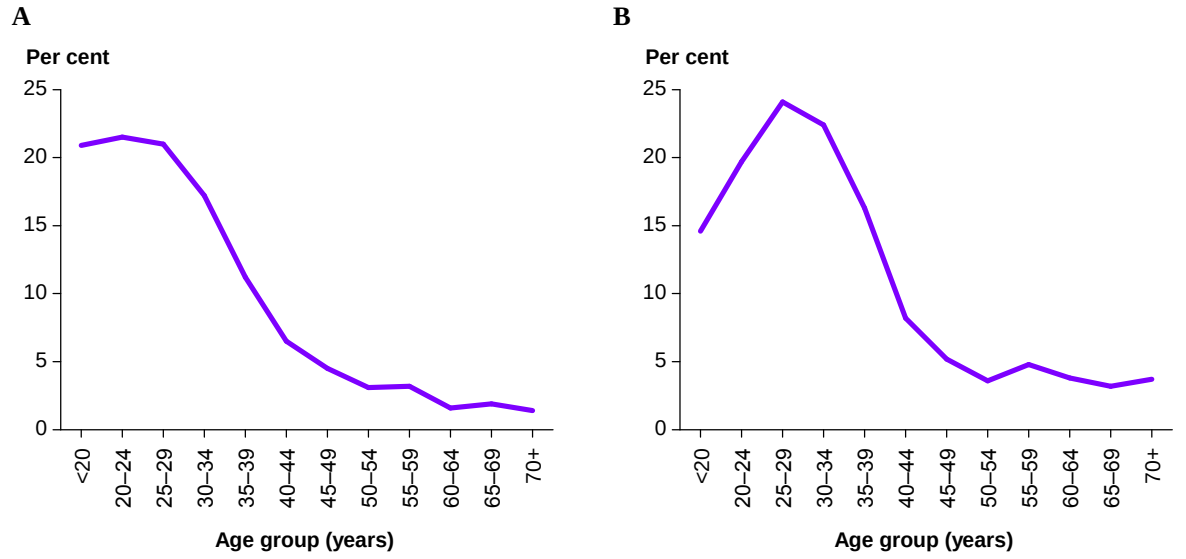
Table 4.8: CIN II and CIN III in women aged 20–69, 2004 to 2010

	Year						
Squamous category	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
HS03.2 CIN II							
Number	3,818	3,904	3,909	4,104	4,377	4,574	4,338
Per cent of histology tests	10.5	11.0	11.5	12.1	12.5	12.7	12.2
Per cent of squamous abnormalities	22.6	23.8	24.7	25.5	25.9	26.7	26.6
HS03.3 CIN III							
Number	4,236	4,314	4,350	4,753	5,340	5,373	5,127
Per cent of histology tests	11.6	12.2	12.8	14.0	15.3	14.9	14.4
Per cent of squamous abnormalities	25.1	26.3	27.5	29.6	31.6	31.3	31.5

Source: AIHW analysis of state and territory cervical cytology register data.

Comparing the age distribution of CIN II and CIN III reveals that these abnormalities share similar trends, the main difference being that CIN II is most frequent in women aged less than 25, while CIN III peaks in women aged 25–29, and is far less common in women aged less than 25 (Figure 4.4).

Consistent with the overall trend noted above, CIN III was the more frequent high-grade abnormality for all age groups, apart from women aged less than 20 and women aged 20–24, for which CIN II was more common (Figure 4.4).



Source: AIHW analysis of state and territory cervical cytology register data; data for figures are available in Table A1.

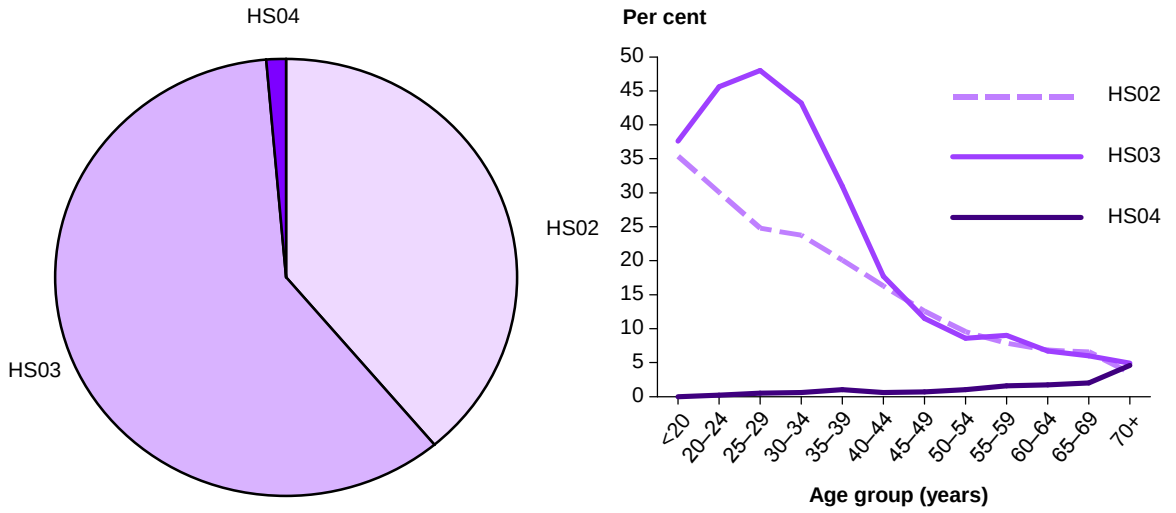
Figure 4.4: CIN II (A) and CIN III (B) detected by histology, by age, 2010

Squamous abnormalities by age

Similar to squamous abnormalities detected by cytology, low-grade and high-grade squamous abnormalities detected by histology all peak in younger women before decreasing with increasing age.

However, low-grade abnormalities peak in women aged less than 20, thereafter decreasing steadily with increasing age in an almost straight line, whereas high-grade abnormalities peak in women aged 25–59 years, remain high in the younger age groups (including less than 20) up to the age of 30–34, and thereafter fall away rapidly (although as noted above, CIN II and CIN III differ in the age at which they peak, so overall high-grade abnormalities will be a combination of these two) (Figure 4.5B).

Although having far fewer occurrences, squamous cell carcinoma, rare in younger women, increased with age with a small peak at ages 40–44 and 50–54, before increasing more sharply with age from 60–64 onwards (Figure 4.5B).



Note: HS02 = low-grade squamous abnormality; HS03 = high-grade squamous abnormality; HS04 = squamous cell carcinoma.

Source: AIHW analysis of state and territory cervical cytology register data.

Figure 4.5: Squamous abnormalities detected by histology in women aged 20–69 as a proportion of all squamous abnormalities (A), and squamous abnormalities by age (B), 2010

Squamous abnormalities by state and territory

Table 4.9: Squamous abnormalities detected by histology in women aged 20–69, as a proportion of all histology tests, by state and territory, 2010

	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
Number	11,834	7,736	7,765	3,976	2,673	663	627	607	35,881
Crude rate	49.7	45.0	60.9	42.7	55.7	33.6	44.5	62.0	49.7
AS rate	44.0	38.9	51.9	36.6	49.6	29.3	37.4	53.8	43.0
95% CI	43.2–44.8	38.0–39.8	50.6–53.2	35.4–37.7	47.6–51.5	27.1–31.7	34.3–40.7	49.3–58.5	42.5–43.5

Note: Crude rate is the number of histology tests with a squamous abnormality as a proportion of the total number of histology tests; age-standardised (AS) rate is the number of histology tests with a squamous abnormality as a proportion of the total number of histology tests age-standardised to the Australian population at 30 June 2001.

Source: AIHW analysis of state and territory cervical cytology register data.

Endocervical abnormalities detected in 2010

In 2010, of the 36,895 abnormalities detected by histology in women aged 20–69, 1,059 were endocervical in origin—54 atypia, 715 high-grade, 248 adenocarcinoma, 21 adenosquamous carcinoma, and 21 other carcinoma of the cervix. These abnormalities combined represent 1.5% of all histology tests in that year.

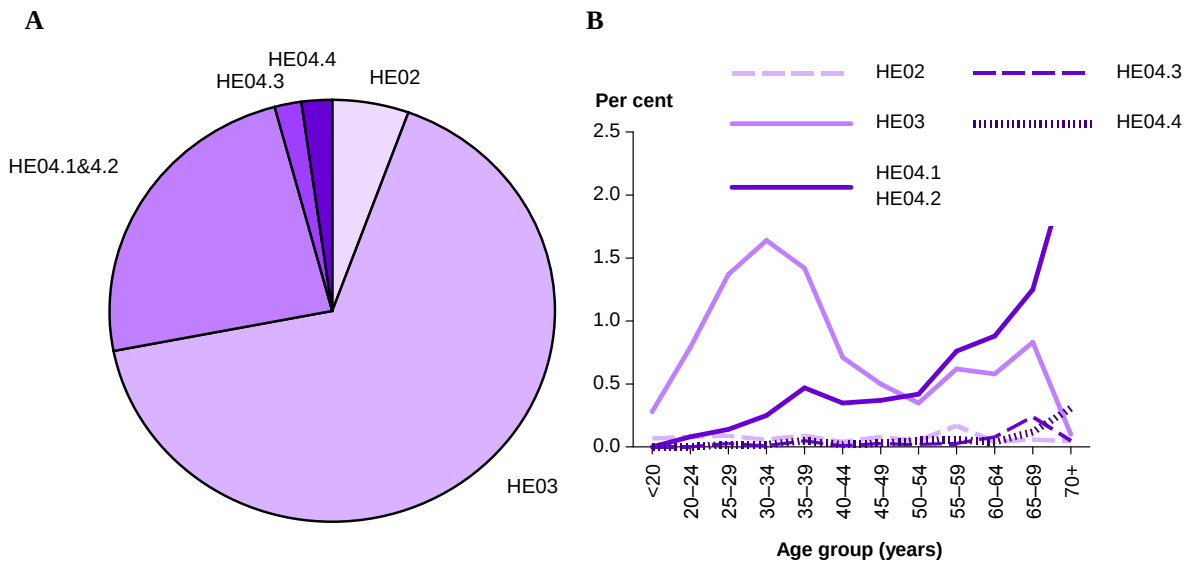
An **endocervical abnormality** is defined as a cervical histology test where the endocervical result is *HE02 Endocervical atypia*, *HE03.1 Endocervical dysplasia*, *HE03.2 Adenocarcinoma in situ*, *HE04.1 Microinvasive adenocarcinoma*, *HE04.2 Invasive adenocarcinoma*, *HE04.3 Adenosquamous carcinoma** or *HE04.4 Carcinoma of the cervix (other)** regardless of any squamous result.

**Note that HE04.3 Adenosquamous carcinoma and HE04.4 Carcinoma of the cervix (other) are included as endocervical abnormalities for data reporting purposes, but that the former is not solely of endocervical origin, and the latter category comprises rarer carcinomas of other epithelial origin.*

Endocervical abnormality trends

The overall number of endocervical abnormalities increased from 867 in 2004 to 1,059 in 2010, with a concurrent increase in endocervical abnormalities as a per cent of all histology tests from 1.23% to 1.50% (Table 4.10).

In 2010, 5.1% of endocervical abnormalities were atypia (HE02), 67.5% were high-grade abnormalities (HE03)—incorporating endocervical dysplasia and adenocarcinoma *in situ*, and 23.4% were adenocarcinoma. Adenosquamous carcinoma and other carcinoma of the cervix each comprised 2.0% of endocervical abnormalities in 2010 for women aged 20–69 (Table 4.10; Figure 4.6A).



Note: HE02 = endocervical atypia; HE03 = high-grade endocervical abnormality; HE04.1&4.2 = adenocarcinoma; HE04.3 = Adenosquamous carcinoma; HE04.4 = carcinoma of the cervix (other).

Source: AIHW analysis of state and territory cervical cytology register data.

Figure 4.6: Endocervical abnormalities detected by histology in women aged 20–69 as a proportion of all endocervical abnormalities (A), and endocervical abnormalities by age (B), 2010

Endocervical atypia allows atypical endocervical cells that fall short of a high-grade abnormality to be captured (since a low-grade category for endocervical abnormalities detected by histology is not valid). However, this category is rarely used. Compared with 2004, the proportion of histology tests with the abnormality endocervical atypia decreased in 2010 from 0.13% to 0.07% of histology tests (Table 4.10).

In contrast, high-grade endocervical abnormalities increased from 0.66% of histology tests in 2004 to 0.99% in 2010. Adenocarcinoma, adenosquamous carcinoma, and other carcinoma of the cervix all had similar detection levels between 2004 and 2010 for women aged 20–69.

Table 4.10: Endocervical abnormalities detected by histology in women aged 20–69, by endocervical category, 2004 to 2010

	Year						
Endocervical category	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
HE02 Endocervical atypia							
Number	99	104	66	62	55	38	54
Per cent of cytology tests	0.13	0.14	0.09	0.09	0.08	0.05	0.07
Per cent of endocervical abnormalities	11.4	12.0	7.2	6.3	5.0	3.8	5.1
HE03 High-grade endocervical abnormality							
Number	505	495	555	630	691	652	715
Per cent of cytology tests	0.66	0.66	0.77	0.88	0.95	0.90	0.99
Per cent of endocervical abnormalities	58.2	57.0	60.7	64.1	63.3	65.9	67.5
HE04.1 & 4.2 Adenocarcinoma							
Number	229	235	257	245	311	263	248
Per cent of cytology tests	0.30	0.31	0.35	0.34	0.43	0.36	0.34
Per cent of endocervical abnormalities	26.4	27.1	28.1	24.9	28.5	26.6	23.4
HE04.3 Adenosquamous carcinoma							
Number	22	19	15	25	21	20	21
Per cent of cytology tests	0.03	0.03	0.02	0.03	0.03	0.03	0.03
Per cent of endocervical abnormalities	2.5	2.2	1.6	2.5	1.9	2.0	2.0
HE04.4 Carcinoma of the cervix (other)							
Number	12	15	21	21	14	16	21
Per cent of cytology tests	0.02	0.02	0.03	0.03	0.02	0.02	0.03
Per cent of endocervical abnormalities	1.4	1.7	2.3	2.1	1.3	1.6	2.0
All endocervical abnormalities							
Number	867	868	914	983	1,092	989	1,059
Crude rate	1.14	1.15	1.26	1.37	1.50	1.37	1.47
AS rate	1.23	1.26	1.35	1.46	1.59	1.41	1.50
95% CI	1.14–1.32	1.17–1.36	1.26–1.46	1.36–1.56	1.49–1.70	1.32–1.51	1.40–1.60

Notes

1. HE03 High-grade endocervical abnormality combines endocervical dysplasia and adenocarcinoma *in situ*.
2. Crude rate is the number of each endocervical abnormality or of all endocervical abnormalities combined detected by histology as a proportion of the total number of histology tests; age-standardised (AS) rate is the number of all endocervical abnormalities combined detected by histology as a proportion of the total number of histology tests age-standardised to the Australian population at 30 June 2001.

Source: AIHW analysis of state and territory cervical cytology register data.

Endocervical abnormalities by age

Endocervical atypia, adenosquamous carcinoma and other carcinoma of the cervix are all very rare and contribute little to the overall trend in abnormalities.

High-grade endocervical abnormalities (endocervical dysplasia and adenocarcinoma *in situ* combined) peak in women aged 30–34, thereafter decreasing with increasing age until a second, lower peak in older women (Figure 4.6B).

Adenocarcinoma increases with age to a small peak in women aged 35–39, thereafter increasing with increasing age (Figure 4.6B).

Endocervical abnormalities by state and territory

Table 4.11: Endocervical abnormalities detected by histology in women aged 20–69, as a proportion of all histology tests, by state and territory, 2010

	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
Number	352	218	186	157	93	24	10	19	1,059
Crude rate	1.48	1.27	1.46	1.69	1.94	1.22	0.71	1.94	1.47
AS rate	1.51	1.26	1.73	1.71	1.90	1.25	0.62	1.95	1.50
95% CI	1.34–1.68	1.09–1.46	1.44–2.07	1.44–2.02	1.52–2.34	0.78–1.88	0.28–1.16	1.13–3.10	1.40–1.60

Note: Crude rate is the number of histology tests with an endocervical abnormality as a proportion of the total number of histology tests; age-standardised (AS) rate is the number of histology tests with an endocervical abnormality as a proportion of the total number of histology tests age-standardised to the Australian population at 30 June 2001.

Source: AIHW analysis of state and territory cervical cytology register data.

Indicator 5 Cytology-histology correlation

What is the cytology-histology correlation?

Definition: The correlation between a squamous or endocervical cytology prediction and the most serious squamous or endocervical histology finding, where this histology occurs in the 6-month period following the cytology.

Rationale: Some cytology results will be followed by histology. Where this histology occurs within 6 months of cytology, a correlation between the cytology and histology results for the woman is presented as a measure of the accuracy of cytological predictions.

Guide to interpretation: Correlation data are restricted to cytology tests for which a histology test is known to have occurred within 6 months. These do not include cytology tests not followed by histology, for which we cannot know the true disease state.

Histology after a low-grade or a negative cytology test is a relatively rare occurrence, and is unlikely to be representative of negative and low-grade cytology in general.

Colposcopy data are incomplete and therefore not reported, which means that some diagnostic information is missing from the correlation.

When interpreting the correlation between endocervical cytology and histology, it is important to realise that abnormalities preceding adenocarcinoma are less well understood than are the abnormalities preceding squamous cell carcinoma, and interpretation of endocervical cells is more difficult (as can be the adequate sampling of these cells), all of which affect the correlation between endocervical cytology and endocervical histology.

Interpretation of data should take into consideration the counts provided.

The most recent cytology-histology correlation data are for cytology tests performed in 2009. This small lag in data availability is because sufficient time needs to have passed to ascertain if histology was performed in the 6-month period after cytology tests performed in a particular calendar year.

Key results

Correlation between squamous cytology and squamous histology

- Of the cytology tests performed in 2009 that predicted a definite high-grade squamous intraepithelial lesion, 77.6% were confirmed to be high-grade disease on histology.
- The positive predictive value of all high-grade squamous cytology was 70.0%.

Correlation between endocervical cytology and endocervical histology

- Of the cytology tests performed in 2009 that predicted adenocarcinoma *in situ*, 70.4% were confirmed to be high-grade disease on histology.
- The positive predictive value of all high-grade endocervical cytology was 71.2%.

Correlation trends

- The positive predictive values of high-grade cytology performed in 2009 were similar to those for high-grade cytology performed in 2008—70.0% compared with 69.6% for high-grade squamous cytology, and 71.2% compared with 72.0% for high-grade endocervical cytology.

Background information

Follow-up of cytology tests should be according to the NHMRC *Screening to prevent cervical cancer: guidelines for the management of asymptomatic women with screen detected abnormalities* (NHMRC 2005), which means that most histology will occur after a cytology result of high-grade or cancer. There will be exceptions, however, and these Guidelines do not cover management of symptomatic women.

Where cytology is followed by histology (either to confirm the presence or absence of disease as predicted by the cytology sample, or for other clinical reasons such as to investigate symptoms even in the absence of predicted disease), correlation between the cytology 'prediction' and the histology 'finding' allows the accuracy of cytological predictions to be assessed, to allow a better understanding of the characteristics of the National Cervical Screening Program (NCSP) screening test.

Note that a complete assessment of cytology would require all cytology results (including negative) to be followed up by histology, but this is neither feasible nor desirable. Rather, this assessment is restricted to cytology and histology results available on cervical cytology registers, and is intended to provide key measures that can be monitored annually to inform the NCSP of any early indications of alterations to the predictive ability of cervical cytology.

Cautions

Under current management guidelines, negative and low-grade cytology is not routinely followed up by histology (unless the low-grade abnormality persists). Thus, histology after a low-grade or a negative cytology test result is a relatively rare occurrence, and it is likely that these are a unique subset of cytology tests and are not representative of negative and low-grade cytology as a rule, which means that these findings should not be extrapolated to low-grade and negative cytology in general.

In terms of completeness, a further consideration is the absence of colposcopy data. Colposcopy is an examination involving a special microscope that magnifies the cervix to allow the visualisation of an abnormality. A biopsy will often be taken at the time of colposcopy, which allows histological assessment. However, histology will not always result from a colposcopy—for instance if the colposcopy confirms a negative result, or if the woman is pregnant, a biopsy may not be performed. Colposcopy data are not systematically sent to cervical cytology registers in the same way as histology data, which means that some diagnostic information, particularly that for negative disease state, is missing from the correlation.

Accuracy of the histology 'finding' is also affected by the sample analysed; a biopsy may sample the wrong part of the cervix which may lead to an incorrect histology result, whereas a sample that allows the entire cervix to be assessed (for instance a hysterectomy that removes the entire cervix) is more likely to give an accurate result.

Finally, it should be noted that the results presented here are based on a single cytology test in isolation, and are not placed within the context of cervical screening. Cervical cytology, like other screening tests, is not intended to be diagnostic, but aims to identify people who are more likely to have a cervical abnormality or cervical cancer, and therefore require further investigation from diagnostic tests. Further, the NCSP is an organised program of regular screening tests, and while a single cervical cytology test is not able to predict presence or absence of disease with absolute accuracy, repeated cervical cytology tests over time generate a far greater degree of accuracy.

Detailed analyses

Proportion of squamous cytology that is followed by histology

To provide context for the squamous correlation results, the proportion of each squamous cytology result category for which a histology test is known to have occurred within 6 months is shown in Table 5.1.

The correlation data included in the analyses that follow are restricted to cytology tests for which a histology test is known to have occurred within 6 months. These do not include cytology tests not followed by histology, for which we cannot know the true disease state.

Table 5.1: Number of cytology tests performed in 2009, and number and proportion of cytology tests performed in 2009 followed by histology within 6 months, for women aged 20–69: squamous

Cytology prediction	Number of cytology tests	Number followed by histology	Proportion followed by histology (%)
S2 Possible low-grade	47,290	7,632	16.1
S3 Low-grade	35,897	8,394	23.4
S4 Possible high-grade	11,494	8,607	74.9
S5 High-grade	15,505	13,859	89.4
S6 High-grade plus	287	252	87.8
S7 Squamous cell carcinoma	141	115	81.6

Source: AIHW analysis of state and territory cervical cytology register data.

Correlation between squamous cytology and squamous histology

Shown in Table 5.2 is the correlation that exists between a squamous cytology prediction in 2009 and the squamous histology finding within 6 months for women aged 20–69.

Table 5.2: Correlation between squamous cytology and the most serious squamous histology within 6 months in women aged 20–69, cytology tests performed in 2009

	Histology finding		
Cytology prediction	HS02 Low-grade	HS03 High-grade	HS04 Squamous cell carcinoma
S1 Negative	3,387 (18.7%)	1,017 (5.6%)	23 (0.1%)
S2 Possible low-grade	3,437 (45.0%)	1,414 (18.5%)	7 (0.1%)
S3 Low-grade	4,422 (52.7%)	1,842 (21.9%)	4 (0.0%)
S4 Possible high-grade	1,978 (23.0%)	4,696 (54.6%)	52 (0.6%)
S5 High-grade	1,774 (12.8%)	10,748 (77.6%)	187 (1.3%)
S6 High-grade plus	8 (3.2%)	166 (65.9%)	62 (24.6%)
S7 Squamous cell carcinoma	0 (0.0%)	33 (28.7%)	73 (63.5%)

Notes

1. Numbers and per cent of each squamous cytology result category shown.
2. For national consistency, the histology results of cervical intraepithelial (CIN) not otherwise specified (NOS), CIN II and CIN III are grouped together to form a broad high-grade abnormality category, and those of microinvasive and invasive squamous cell carcinoma are grouped together to form a broad squamous cell carcinoma category.

Source: AIHW analysis of state and territory cervical cytology register data.

Low-grade squamous cytology

Under the current management guidelines, low-grade cytology is not routinely followed up by histology unless the abnormality persists—indeed only 16% of possible low-grade and 23% low-grade cytology tests were followed by histology (Table 5.1). This means the following results should not be extrapolated to all low-grade cytology, since there may have been clinical reasons for performing histology within 6 months of a low-grade squamous cytology, which could bias these results towards a more serious abnormality than would be present in the majority of women with a cytology prediction of a low-grade abnormality.

Of all cytology tests performed in 2009 that were followed by histology within 6 months, 16,062 predicted a low-grade squamous abnormality—7,632 possible low-grade (S2) and 8,394 low-grade (S3) (Table 5.1).

Of the 7,632 cytology tests that predicted a possible low-grade squamous abnormality (S2), 3,437 (45.0%) were found to be a low-grade squamous abnormality on histology; of the 8,394 cytology tests that predicted a low-grade squamous abnormality (S3), 4,422 (52.7%) were found to be a low-grade squamous abnormality on histology (Table 5.2).

Overall, 49.0% of cytology tests that predicted any low-grade squamous abnormality were found to be a true low-grade squamous abnormality on histology (the positive predictive value of low-grade squamous cytology). Further, *in these data* squamous cytology predicted just over half (52.4%) of the true cases of low-grade squamous disease identified.

Of particular note, almost no predictions of possible low-grade or low-grade cytology were found to be cancer on histology (Table 5.2).

High-grade squamous cytology

Of all cytology tests performed in 2009 that were followed by histology within 6 months, 22,718 predicted a high-grade squamous abnormality—8,607 possible high-grade (S4), 13,859 high-grade (S5) and 252 high-grade with possible microinvasion/invasion (S6) (Table 5.1).

Of the 8,607 cytology tests that predicted a possible high-grade squamous abnormality (S4), 4,696 (54.6%) were found to be a high-grade squamous abnormality on histology; of the 13,859 cytology tests that predicted a high-grade squamous abnormality (S5), 10,748 (77.6%) were found to be a high-grade squamous abnormality on histology; and of the 252 cytology tests that predicted a high-grade squamous abnormality with possible microinvasion/invasion (S6), 166 (65.9%) were found to be a high-grade squamous abnormality on histology (Table 5.2).

While the category *high-grade squamous abnormality with possible microinvasion/invasion* (S6) is classified as a high-grade squamous abnormality throughout this report, for the National Pathology Accreditation Advisory Council (NPAAC) performance measure calculations, this category is excluded from high-grades—a reflection that the majority of these are expected to be invasive malignancies, but are not coded definitively. Correlation data were considered when deciding the appropriate *reporting grade* for this category; with 65.9% found to be high-grade, and 24.6% found to be squamous cell carcinoma on histology, it was considered appropriate to continue to classify this category as high-grade *in this report*. Moving this category from high-grade to squamous cell carcinoma does not affect the overall positive predictive value of high-grade squamous cell abnormalities, but reduces the positive predictive value of squamous cell carcinoma cytology from 63.5% to 36.8%.

Overall, 70.0% of cytology tests that predicted any high-grade squamous abnormality were found to be a true high-grade squamous abnormality *or squamous cell carcinoma* on histology (the positive predictive value of high-grade squamous cytology—see Table 5.3), while 68.7% were found to be a true high-grade squamous abnormality. Further, *in these data* squamous cytology predicted 78.9% of the true cases of high-grade squamous disease identified.

Squamous cell carcinoma cytology

Of all cytology tests performed in 2009 that were followed by histology within 6 months, 115 predicted squamous cell carcinoma (S7) (Table 5.1). Of these, 73 (63.5%) were found to be squamous cell carcinoma on histology (Table 5.2).

There were 335 cases of squamous cell carcinoma found on histology within 6 months of cytology predictions other than squamous cell carcinoma, with 301 after high-grade squamous cytology, 11 after low-grade squamous cytology, and 23 cases after a negative squamous cytology result (false negatives) (Table 5.2).

Table 5.3: Positive predictive value (PPV) of high-grade squamous cytological abnormalities in women aged 20–69, most serious histology within 6 months of cytology performed in 2008 and 2009

	Cytology prediction			
	Possible high-grade S4	High-grade S5	High-grade plus S6	High-grade
2008	53.8% (4,415/8,212)	78.4% (11,111/14,165)	92.2% (237/257)	**69.6% (15,763/22,634)**
2009	55.2% (4,748/8,607)	78.9% (10,935/13,859)	90.5% (228/252)	**70.0% (15,911/22,718)**

Note: The positive predictive value is calculated as the proportion of squamous cytology results of possible or definite high-grade that were confirmed on histology to be a high-grade squamous abnormality or squamous cell carcinoma.

Source: AIHW analysis of state and territory cervical cytology register data.

Proportion of endocervical cytology that is followed by histology

To provide context for the endocervical correlation results, the proportion of each endocervical cytology result category for which a histology test is known to have occurred within 6 months is shown in Table 5.4.

The correlation data included in the analyses that follow are restricted to cytology tests for which a histology test is known to have occurred within 6 months. These do not include cytology tests not followed by histology, for which we cannot know the true disease state.

Table 5.4: Number of cytology tests performed in 2009, and number and proportion of cytology tests performed in 2009 followed by histology within 6 months, for women aged 20–69: endocervical

Cytology prediction	Number of cytology tests	Number followed by histology	Proportion followed by histology (%)
E2 Atypical endocervical cells of uncertain significance	746	231	31.0
E3 Possible high-grade	461	257	55.7
E4 Adenocarcinoma in situ	283	240	84.8
E5 Adenocarcinoma in situ plus	24	14	58.3
E6 Adenocarcinoma	60	34	56.7

Source: AIHW analysis of state and territory cervical cytology register data.

Correlation between endocervical cytology and endocervical histology

Shown in Table 5.5 is the correlation that exists between an endocervical cytology prediction in 2009 and the endocervical histology finding within 6 months for women aged 20–69. This correlation may be affected by the recognised difficulties in sampling and interpreting endocervical cytology samples.

Note that the majority (96.9%) of endocervical cytology that is followed by histology within 6 months is negative—a function of most abnormalities being squamous in origin with a concurrent negative endocervical component (since all cytology tests are allocated an 'S' and 'E' code). This means that in the majority of cases the histology will be investigating a cytology prediction of a squamous abnormality, and not the negative endocervical cytology.

Table 5.5: Correlation between endocervical cytology and the most serious endocervical histology within 6 months in women aged 20–69, cytology tests performed in 2009

	Histology finding		
Cytology prediction	**HE02 Endocervical atypia**	**HE03 High-grade**	**HE04.1&4.2 Adenocarcinoma**
E1 Negative	24 (0.1%)	255 (1.1%)	77 (0.3%)
E2 Atypical endocervical cells of uncertain significance	0 (0.0%)	45 (19.5%)	12 (5.2%)
E3 Possible high-grade	1 (0.4%)	102 (39.7%)	37 (14.4%)
E4 Adenocarcinoma in situ	0 (0.0%)	169 (70.4%)	45 (18.8%)
E5 Adenocarcinoma in situ plus	1 (7.1%)	5 (35.7%)	6 (42.9%)
E6 Adenocarcinoma	0 (0.0%)	5 (14.7%)	15 (44.1%)

Notes

1. Numbers and per cent of each endocervical cytology result category shown.
2. For national consistency, the histology results of endocervical dysplasia and adenocarcinoma *in situ* are grouped together to form a broad high-grade abnormality category, and microinvasive and invasive adenocarcinoma are grouped to form a broad adenocarcinoma category.
3. The histology results of adenosquamous carcinoma and carcinoma of the cervix (other) are excluded, since these are neither solely squamous or endocervical in origin, and thus would not necessarily be expected to correlate with cytology results of either cell type.

Source: AIHW analysis of state and territory cervical cytology register data.

Atypical endocervical cells of uncertain significance

The cytology category atypical endocervical cells of uncertain significance is classified as a low-grade cytology abnormality, but it is not appropriate to correlate this with endocervical atypia (the histology equivalent of a low-grade endocervical abnormality) since this cytology prediction is not used to indicate the predicted presence of a low-grade endocervical abnormality (which is not a valid histology category), but rather is used to indicate that abnormal endocervical cells were identified in the sample, but that the significance of these is uncertain (meaning that these could be indicative of a serious abnormality, or could be associated with a benign change such as inflammation).

There were 746 cytology tests performed in 2009 that identified abnormal endocervical cells where the pathologist was uncertain of their significance; 231 (31.0%) of these were followed by histology (Table 5.4). This means that the majority of cytology tests categorised as atypical endocervical cells of uncertain significance were not followed by histology.

Of the 231 that were followed by histology within 6 months, 45 (19.5%) were found to be a high-grade endocervical abnormality on histology, and 12 (5.2%) were found to be adenocarcinoma on histology, with the majority (75.3%) of atypical endocervical cells of uncertain significance identified in the absence of endocervical disease (Table 5.5).

High-grade endocervical cytology

Of all cytology tests performed in 2009 that were followed by histology within 6 months, 511 predicted a high-grade endocervical abnormality—257 possible high-grade (E3), 240 adenocarcinoma *in situ* (E4) and 14 adenocarcinoma *in situ* with possible microinvasion/ invasion (E5) (Table 5.4).

Of the 257 cytology tests that predicted a possible high-grade endocervical abnormality (E3), 102 (39.7%) were found to be a high-grade endocervical abnormality on histology. Of the 240 cytology tests that predicted adenocarcinoma *in situ* (E4), 169 (70.4%) were found to be a high-grade endocervical abnormality on histology. And of the 14 cytology tests that predicted adenocarcinoma *in situ* with possible microinvasion/invasion (E5), 5 (35.7%) were found to be a high-grade endocervical abnormality on histology (Table 5.5).

> The category *adenocarcinoma in situ with possible microinvasion/invasion* (E5) experiences similar disparity in classification to its squamous counterpart, however the very small numbers (5 found to be high-grade and 6 found to be adenocarcinoma) make qualification difficult, and thus this category will also continue to be classified as high-grade *in this report*. Moving this category from high-grade to adenocarcinoma does not have any great effect on the overall positive predictive values.

Overall, 71.2% of cytology tests that predicted any high-grade endocervical abnormality were found to be a true high-grade endocervical abnormality *or adenocarcinoma* on histology (the positive predictive value of a high-grade endocervical cytology result—see Table 5.6), while 57.3% were found to be a true high-grade endocervical abnormality. Further, *in these data* endocervical cytology predicted just under half (47.5%) of the true cases of high-grade endocervical disease identified.

Adenocarcinoma cytology

Of all cytology tests performed in 2009 that were followed by histology within 6 months, 34 predicted adenocarcinoma (E6) (Table 5.4). Of these, 15 (44.1%) were found to be adenocarcinoma on histology (Table 5.5).

There were 194 cases of adenocarcinoma found on histology within 6 months of cytology predictions other than adenocarcinoma, with 88 after high-grade endocervical cytology and 77 cases after a negative endocervical cytology result (false negatives) (Table 5.5).

Table 5.6: Positive predictive value (PPV) of high-grade endocervical cytological abnormalities in women aged 20–69, most serious histology within 6 months of cytology performed in 2008 and 2009

	Cytology prediction			
	Possible high-grade E3	Adenocarcinoma *in situ* E4	Adenocarcinoma *in situ* plus E5	**High-grade**
2008	49.3% (109/221)	92.2% (202/219)	96.0% (24/25)	**72.0% (335/465)**
2009	54.1% (139/257)	89.2% (214/240)	78.6% (11/14)	**71.2% (364/511)**

Note: The positive predictive value is calculated as the proportion of endocervical cytology results of possible or definite high-grade that were confirmed on histology to be a high-grade endocervical abnormality or adenocarcinoma (these are prone to variability due to small numbers).

Source: AIHW analysis of state and territory cervical cytology register data.

Additional analyses

Cytology predictions preceding adenosquamous and other carcinomas of the cervix

Adenosquamous and other carcinomas of the cervix were analysed separately, since—even though they are categorised as endocervical carcinomas for coding purposes—these do not fall into the category of either squamous or endocervical carcinoma.

The cytology prediction preceding the histology finding of adenosquamous carcinoma or other carcinoma of the cervix are shown in Table 5.7.

Table 5.7: Cytology prediction preceding a histology finding of adenosquamous carcinoma or other carcinoma of the cervix in women aged 20–69, cytology performed in 2009

Cytology prediction	Adenosquamous carcinoma	Carcinoma of the cervix (other)
S1 Negative	7	6
S2 Possible low-grade	0	0
S3 Low-grade	0	0
S4 Possible high-grade	1	2
S5 High-grade	5	0
S6 High-grade with possible invasion	4	1
S7 Squamous cell carcinoma	3	2
E1 Negative	11	7
E2 Atypical endocervical cells of uncertain significance	2	0
E3 Possible high-grade	1	0
E4 Adenocarcinoma *in situ*	1	0
E5 Adenocarcinoma with possible invasion	1	0
E6 Adenocarcinoma	2	2

Source: AIHW analysis of state and territory cervical cytology register data.

Cytology predictions preceding CIN II versus CIN III

The correlation between squamous cytology and squamous histology performed within 6 months has been replicated in Table 5.8, including only data from states and territories that are able to distinguish between CIN II and CIN III.

In these data, cytology that predicted a possible low-grade (S2) or low-grade squamous abnormality (S3), while both still more likely to be a low-grade squamous abnormality on histology, were thereafter more likely to be CIN II than CIN III (Table 5.8).

Cytology that predicted a possible high-grade squamous abnormality (S4) was equally likely to be low-grade squamous abnormality or CIN II on histology (22.5% and 22.4%, respectively), with a slightly higher 28.9% of these found to be CIN III on histology.

More than half (52.8%) of the cytology tests that predicted a high-grade squamous abnormality (S5) were found to be CIN III on histology, and 63.4% of cytology tests that predicted a high-grade squamous abnormality with possible microinvasion/invasion (S6) were found to be CIN III on histology.

All cytology that predicted squamous cell carcinoma (S7) (apart from the 7 cases that were found to be negative) was found on histology to be either CIN III or squamous cell carcinoma (Table 5.8).

Table 5.8: Correlation between squamous cytology and the most serious squamous histology within 6 months in women aged 20–69 showing CIN II and CIN III, cytology tests performed in 2009

	Histology finding			
Cytology prediction	HS02 Low-grade	HS03.2 CIN II	HS03.3 CIN III	HS04 Squamous cell carcinoma
S1 Negative	1,466 (19.2%)	250 (3.3%)	203 (2.7%)	5 (0.1%)
S2 Possible low-grade	1,976 (43.5%)	440 (9.7%)	307 (6.8%)	2 (0.0%)
S3 Low-grade	2,356 (52.1%)	628 (13.9%)	327 (7.2%)	3 (0.1%)
S4 Possible high-grade	1,144 (22.5%)	1,138 (22.4%)	1,469 (28.9%)	20 (0.4%)
S5 High-grade	985 (12.2%)	1,894 (23.5%)	4,259 (52.8%)	102 (1.3%)
S6 High-grade plus	7 (5.3%)	2 (1.5%)	83 (63.4%)	31 (23.7%)
S7 Squamous cell carcinoma	0 (0.0%)	0 (0.0%)	17 (25.8%)	42 (63.6%)

Notes

1. Numbers and per cent of each squamous cytology result category shown.
2. States and territories unable to distinguish between CIN II and CIN III were excluded from all data and calculations in this table.
3. The high-grade category CIN NOS has been excluded from this table, but is a rare histology finding.

Source: AIHW analysis of state and territory cervical cytology register data.

NPAAC performance indicators

The National Pathology Accreditation Advisory Council (NPAAC) *Performance measures for Australian laboratories reporting cervical cytology* (NPAAC 2006) includes recommended standards for the proportion of cytology specimens reported as definite high-grade (3a) and possible high-grade (3b) that are confirmed on histology within 6 months as high-grade abnormalities.

Note that '*S6 High-grade squamous intraepithelial lesion with possible microinvasion/invasion*' and '*E5 Adenocarcinoma in situ with possible microinvasion/invasion*' have been included as definite high-grade intraepithelial abnormalities in the calculations for NPAAC Performance Measure 3a. Positive predictive values for '*S5 High-grade squamous intraepithelial abnormality*' (Table 5.3) and '*E4 Adenocarcinoma in situ*' (Table 5.6) can be substituted for the below calculated values if it is desirable to exclude these from Performance measure 3a.

Calculation of these performance measures using cytology-histology correlation data revealed that the proportion of *definite* high-grade cytology confirmed to be high-grade or cancer on histology was 79.1% for squamous abnormalities and 88.6% for endocervical abnormalities, and that the proportion of *possible* high-grade cytology confirmed to be high-grade on histology was 55.2% for squamous abnormalities and 54.1% for endocervical abnormalities.

Even though these were reported separately for squamous an endocervical abnormalities, which differs from the intended use of these performance measures, all of these would fall within the respective standards set for these measures (Box 5.1).

Box 5.1: National Pathology Accreditation Advisory Council (NPAAC) Performance measures for Australian laboratories reporting cervical cytology

Performance measure 3a

Proportion of cytology specimens reported as a definite high-grade intraepithelial abnormality where cervical histology, taken within 6 months, confirms the abnormality as high-grade intraepithelial abnormality or malignancy.

Recommended standard

Not less than 65% of cytology specimens with a definite cytological prediction of a high-grade intraepithelial abnormality are confirmed on cervical histology, which is performed within 6 months, as having a high-grade intraepithelial abnormality or malignancy.

Calculated values for 2009

Squamous cytology and squamous histology	*Endocervical cytology and endocervical histology*
11,163/14,111 = 79.1%	225/254 = 88.6%

Performance measure 3b

Proportion of cytology specimens reported as a possible high-grade intraepithelial abnormality where cervical histology, taken within 6 months, confirms the abnormality as high-grade intraepithelial abnormality or malignancy.

Recommended standard

Not less than 33% of cytology specimens with a cytological prediction of a possible high-grade intraepithelial abnormality are confirmed on cervical histology, which is performed within 6 months, as having a high-grade intraepithelial abnormality or malignancy.

Calculated values for 2009

Squamous cytology and squamous histology	*Endocervical cytology and endocervical histology*
4,748/8,607 = 55.2%	139/257= 54.1%

Indicator 6 Incidence

What do we mean by incidence?

Definition: The number of new cases of cervical cancer per 100,000 estimated resident female population in a 12-month period.

Rationale: The National Cervical Screening Program (NCSP) aims to reduce the incidence of cervical cancer.

Guide to interpretation: These data include both screen-detected cervical cancers (through the NCSP) and cervical cancers detected outside the screening program.

Incidence of cervical cancer by state and territory, remoteness area, socioeconomic status and Aboriginal and Torres Strait Islander status is reported over a 5-year period instead of a 12-month period to improve the stability and comparability of rates due to the small number of new cases in less populated areas and in Aboriginal and Torres Strait Islander women.

The Australian Cancer Database is the source of cervical cancer incidence data.

The most recent cervical cancer incidence data are for new cases diagnosed in 2008.

Key results

Incidence in 2008

- In 2008 there were 637 new cases of cervical cancer in women aged 20–69, the target population of the NCSP, which equates to 9.3 new cases per 100,000 women (age-standardised). There were 778 new cases, or 7.0 new cases per 100,000 women (age-standardised) in women of all ages.
- In 2008, in women aged 20–69, squamous cell carcinoma comprised 65.1% of all cervical cancers, followed by adenocarcinoma at 25.7%, with adenosquamous and all other cervical cancers comprising 3.3% and 5.9% of all cervical cancers, respectively.

Incidence across remoteness areas and socioeconomic status groups

- In 2004–2008, the incidence of cervical cancer was higher for women residing in *Remote and very remote* areas, and lower in women residing in areas of highest socioeconomic status.

Incidence in Aboriginal and Torres Strait Islander women

- In 2004–2008, incidence of cervical cancer in Aboriginal and Torres Strait Islander women from New South Wales, Queensland, Western Australia and the Northern Territory was significantly higher than non-Indigenous women from these states and territories, at 22.3 new cases per 100,000 women compared with the non-Indigenous rate of 8.5 new cases per 100,000 women for women aged 20–69 (both age-standardised).

Incidence trends

- Incidence of cervical cancer, after halving from 17.2 new cases per 100,000 women in 1991, has remained at around 9 new cases per 100,000 women from 2002 to 2008, for women aged 20–69.

Background information

Registration of cancer cases is required by law in each state and territory. Data are collected by state and territory cancer registries and compiled in a national database, the Australian Cancer Database (ACD), which is held by the Australian Institute of Health and Welfare (AIHW). The data include clinical and demographic information about people with newly diagnosed cancer.

Incidence of cervical cancer measures the number of new cases of cervical cancer diagnosed each year, sourced from the ACD. Only primary cervical cancers are included—secondary cervical cancers and cervical cancers that are a reoccurrence of a primary cervical cancer are not counted. Note that incidence data refer to the number of new cases diagnosed and not number of women diagnosed (although it is rare for a woman to be diagnosed with more than one primary cervical cancer in the same year).

Detailed analyses

Incidence of cervical cancer in 2008

In 2008, there were 778 new cases of cervical cancer in Australian women. This is equivalent to 7.2 new cases for every 100,000 women in the population, which, when age-standardised to allow analysis of trends and differentials, equates to an incidence rate of 7.0 for 2008.

Of the 778 new cases, 637 were in women aged 20–69, the target population of the NCSP. These 637 new cases represent 81.9% of all cervical cancers diagnosed in that year, and 9.2 new cases for every 100,000 women in the population. When age-standardised to allow analysis of trends and differentials, this equates to an incidence rate of 9.3 for women aged 20–69.

In the broader context of cancers diagnosed in Australian women (and excluding basal cell and squamous cell carcinoma of the skin), cervical cancer was the 13th most commonly diagnosed cancer in Australian women in 2008.

When compared with other cancers diagnosed in 2007 (AIHW & AACR 2010), it was found that cervical cancer comprised 1.6% of all cancers diagnosed in women. Also in 2007, the mean age of diagnosis was 51.2 years, and the risk of diagnosis with cervical cancer was 1 in 197 by age 75 years and 1 in 158 by age 85 (AIHW & AACR 2010).

Incidence of cervical cancer trends

The incidence of cervical cancer has decreased over time. For women aged 20–69, while incidence had been slowly decreasing before the organised national screening program, this halved between 1991 and 2008 from 17.2 to 9.3 new cases per 100,000 women—this historic low of 9 new cases per 100,000 women stable since 2002 (Figure 6.1; Table 6.1).

> When interpreting cervical cancer incidence trends in relation to the NCSP, it is important to remember that opportunistic cervical screening occurred in Australia prior to the commencement of the national screening program in 1991, with some states trialling organised screening in the years leading up to 1991. Therefore it would be expected that some decreases in cervical cancer incidence would be apparent before 1991, particularly from the late 1980s onwards.

For women aged 20–69, the overall decrease in the number of new cases was from 895 in 1991 to 637 in 2008, a decrease of 28.8% (Table 6.1).

Table 6.1: New cases and incidence of cervical cancer, 1982 to 2008

	New cases		AS rate	
Year of diagnosis	20–69	All ages	20–69	All ages
1982	828	965	19.0	14.2
1983	841	994	19.0	14.3
1984	836	1,008	18.4	14.2
1985	896	1,058	19.5	14.6
1986	862	1,020	18.6	14.0
1987	905	1,099	18.7	14.4
1988	898	1,063	18.0	13.6
1989	910	1,075	18.1	13.5
1990	917	1,087	17.9	13.5
1991	895	1,094	17.2	13.3
1992	846	1,025	16.0	12.2
1993	847	1,015	15.8	11.9
1994	937	1,145	17.1	13.1
1995	777	962	13.9	10.7
1996	761	941	13.4	10.4
1997	659	811	11.4	8.7
1998	700	873	11.9	9.2
1999	662	801	11.1	8.3
2000	600	770	9.9	7.8
2001	588	741	9.5	7.4
2002	559	691	8.9	6.8
2003	578	728	9.1	7.0
2004	584	726	9.0	6.9
2005	606	736	9.2	6.9
2006	589	720	8.8	6.7
2007	618	745	9.1	6.8
2008	637	778	9.3	7.0

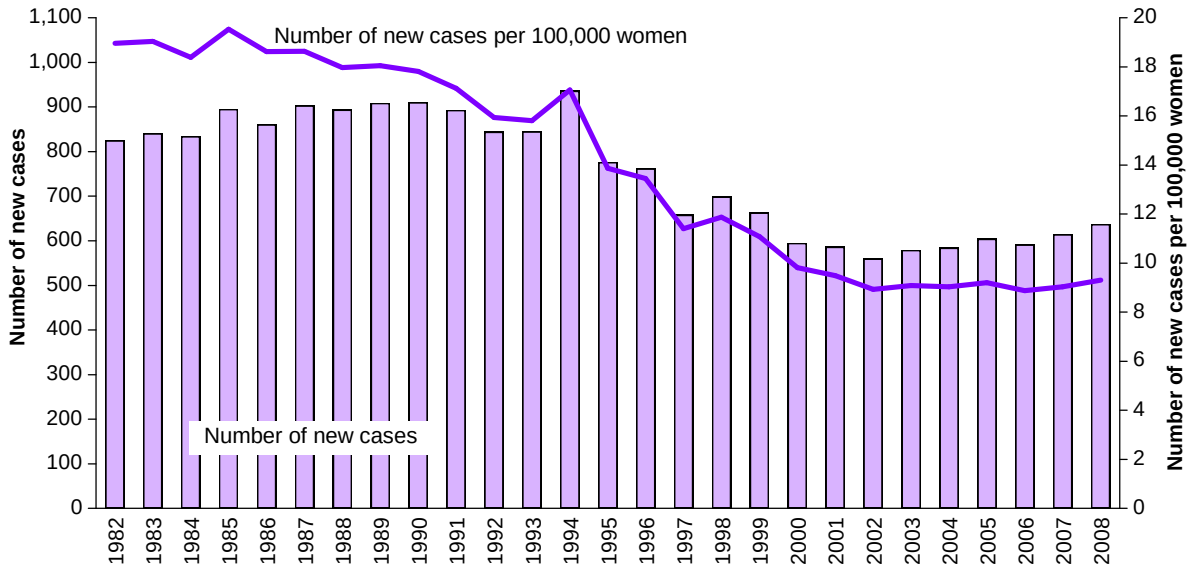
Note: Age-standardised rate is the number of new cases of cervical cancer per 100,000 women, age-standardised to the Australian population at 30 June 2001.

Source: AIHW Australian Cancer Database.

In addition to all invasive cervical cancers, microinvasive squamous cell carcinomas are also monitored, since if invasive cervical cancer does develop, the aim is to detect this as early as possible—ideally when it is still at the microinvasive stage. Overall, incidence of microinvasive squamous cell carcinoma decreased from 2.9 new cases per 100,000 women in 1991 to 1.3 in 2008 for women aged 20–69.

Microinvasive squamous cell carcinomas make up a small proportion of all cervical cancers diagnosed, at between 14% and 19% for most years between 1991 and 2008. The exceptions

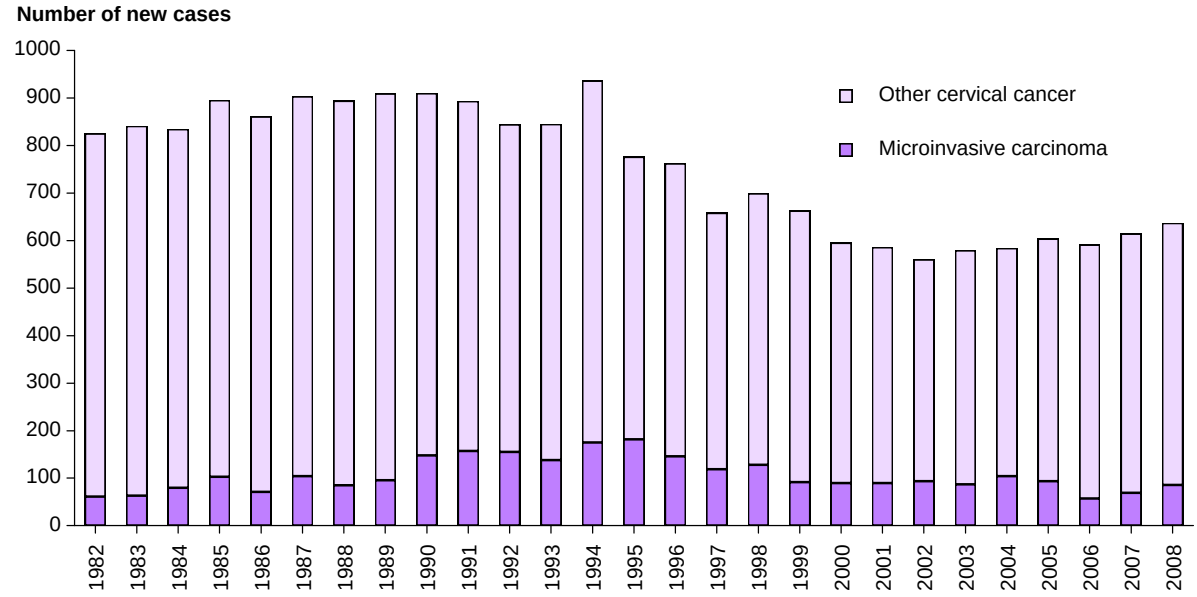
to this are 1995 when this was high at 23%, and 2006 and 2007 when this was lower at 9.8% and 11.2% of cervical cancer cases respectively (Figure 6.2).



Note: Rates age-standardised to the Australian population as at 30 June 2001.

Source: AIHW Australian Cancer Database.

Figure 6.1: Incidence of cervical cancer in women aged 20–69, by year, 1982 to 2008



Source: AIHW Australian Cancer Database.

Figure 6.2: Number of new cases of microinvasive squamous cell carcinoma and other cervical cancer in women aged 20–69, by year, 1982 to 2008

Incidence of cervical cancer by age

In 2008, the number of new cases of cervical cancer diagnosed in women aged 20–69 comprised 81.9% of all cervical cancers. This is slightly higher than 80.2% in 1998, but lower than 84.5% in 1988.

Analysis of 5-year age groups between 20 and 69 reveals that, in 2008, the highest incidence of cervical cancer was in women aged 40–44, at 12.3 new cases per 100,000 women (Table 6.2). There is a second peak (not shown) of 15.5 new cases per 100,000 women for those aged 85+.

Table 6.2: Incidence of cervical cancer, by age, 2008

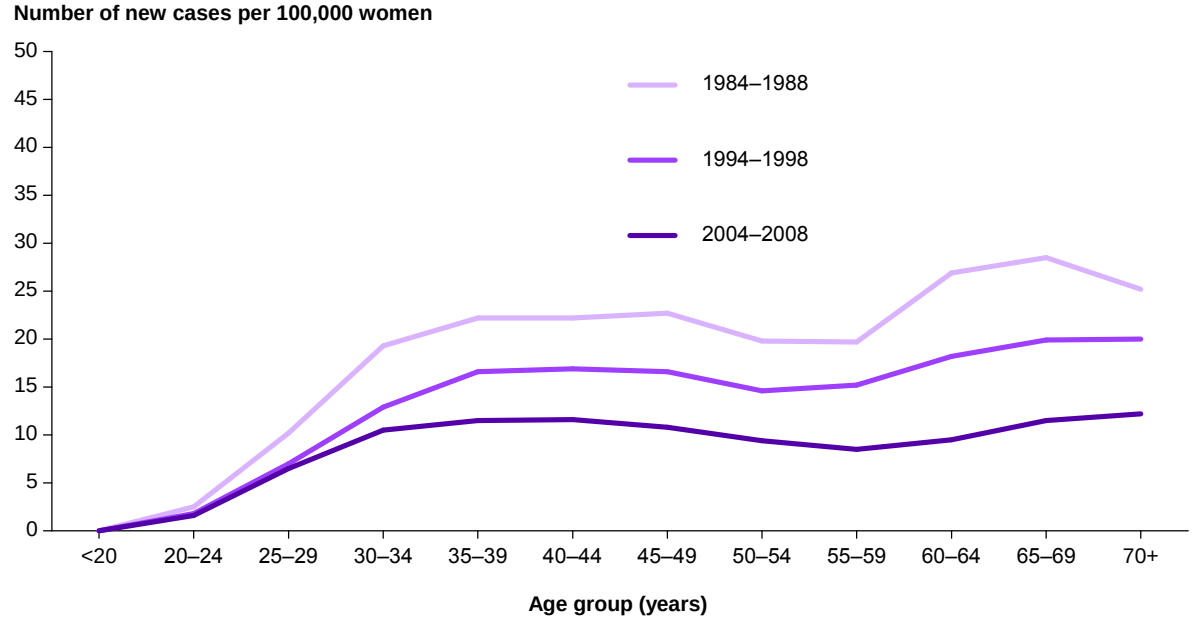
	Age group (years)									
	20–24	**25–29**	**30–34**	**35–39**	**40–44**	**45–49**	**50–54**	**55–59**	**60–64**	**65–69**
New cases	11	66	79	96	94	68	70	61	42	50
Crude rate	1.5	8.8	10.7	11.9	12.3	8.7	9.8	9.4	7.5	11.9

Note: Crude rate is the number of new cases of cervical cancer per 100,000 women; rates based on less than 20 new cases should be interpreted with caution.

Source: AIHW Australian Cancer Database.

Historical age-specific trends reveal the effect of the cervical screening program on incidence. Calculated over a 5-year period to increase stability and comparability of rates, age-specific incidence is shown for 1984–1988, 1994–1998 and 2004–2008 in Figure 6.3 below.

It was found that incidence was reduced across all age groups from 1984–1988 to 2004–2008. Further, in 1984–1988, before the NCSP was introduced, there was a clear second (and higher) peak in incidence in women from 60 years onwards, which has reduced (Figure 6.3).



Source: AIHW Australian Cancer Database.

Figure 6.3: Incidence of cervical cancer in women, by age, 1984–1988, 1994–1998 and 2004–2008

Incidence of cervical cancer by histological type

While all cervical cancers share the same site code (C53 under ICD 10), there are a number of histological subtypes within the category of cervical cancer, with clear differences in clinical behaviour (Blomfield & Saville 2008). Histology codes for cancers are collected on the ACD, which allows the analysis of trends in cervical cancer incidence for different histological types. The histological types presented are based on the histological groupings for cervical cancer set out in Chapter 4 of *Cancer incidence in five continents volume IX* (Curado et al. 2007), with histological types characterised by the type of cell in which the cancer originates. Thus cervical cancer has been disaggregated into the broad histological types of carcinoma (cancers of epithelial origin), sarcoma (cancers originating in other cell types such as bone, muscle, or haematopoietic cells), and other specified and unknown malignant neoplasms (unusual cancers and cancers too poorly differentiated to be classified). Carcinoma has been further split into squamous cell carcinoma (which arise from the squamous cells that cover the outer surface of the cervix), adenocarcinoma (which arise from the glandular (columnar) cells in the cervical canal), adenosquamous carcinoma (which contains malignant squamous and glandular cells), and other carcinoma.

This table differs slightly from that presented in *Cancer incidence in five continents volume IX* (Curado et al. 2007), with other specified and unspecified carcinomas grouped together, as are other specified and unspecified malignant neoplasms. Further, adenosquamous carcinoma has been listed as a separate group under carcinoma rather than included in 'other specified carcinoma' as specified in *Cancer incidence in five continents volume IX* (Curado et al. 2007). The latter change is to allow the carcinoma histological groupings to match the cervical cancer types collected by the cervical cytology registries and reported under the *Histology* indicator.

Table 6.3: Incidence of cervical cancer in women aged 20–69, by histological type, 2008

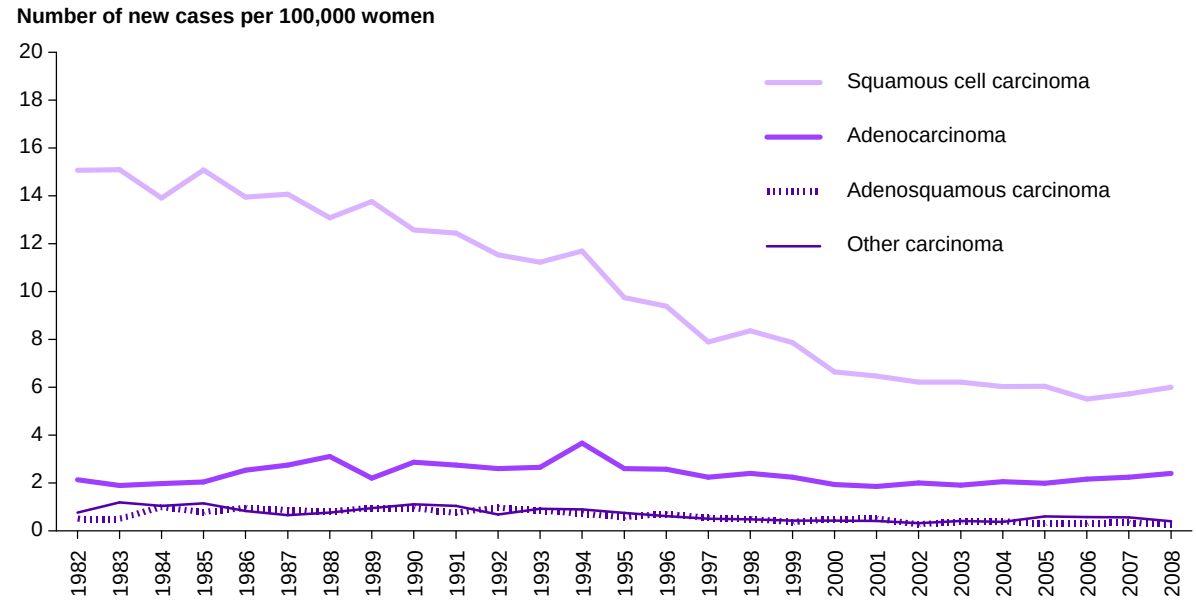
Type of cervical cancer	New cases	AS rate	% of cervical cancers	(% of carcinomas)
1: Carcinoma	626	9.1	98.3	(100.0)
1.1: Squamous cell carcinoma	*415*	*6.0*	*65.1*	*(66.3)*
1.2: Adenocarcinoma	*164*	*2.4*	*25.7*	*(26.2)*
1.3: Adenosquamous carcinoma	*21*	*0.3*	*3.3*	*(3.4)*
1.4: Other specified and unspecified carcinoma	*26*	*0.4*	*4.1*	*(4.2)*
2: Sarcoma	3	0.0	0.5	. .
3: Other specified and unspecified malignant neoplasm	8	0.1	1.3	. .
Total	**637**	**9.3**	**100.0**	**. .**

Note: Age-standardised (AS) rate is the number of new cases per 100,000 women, age-standardised to the Australian population at 30 June 2001; rates based on less than 20 new cases should be interpreted with caution.

Source: AIHW Australian Cancer Database.

In 2008, of the 637 cervical cancers diagnosed in women aged 20–69, 626 (98.3%) were carcinomas, 3 (0.5%) were sarcomas, and 8 (1.3%) were classified as other and unspecified malignant neoplasms (Table 6.3). Within the carcinomas, squamous cell carcinoma comprised the greatest proportion at 65.1% of all cervical cancers, followed by adenocarcinomas at 25.7% of cervical cancers, and adenosquamous carcinomas at 3.3%, with other and unspecified carcinomas comprising 4.1% of all cervical cancers in 2008 in women aged 20–69 (Table 6.3).

Trends in age-standardised incidence for women aged 20–69 for squamous cell carcinoma, adenocarcinoma, adenosquamous carcinoma and other carcinomas are shown in Figure 6.4.



Note: Rates age-standardised to the Australian population as at 30 June 2001.

Source: AIHW Australian Cancer Database.

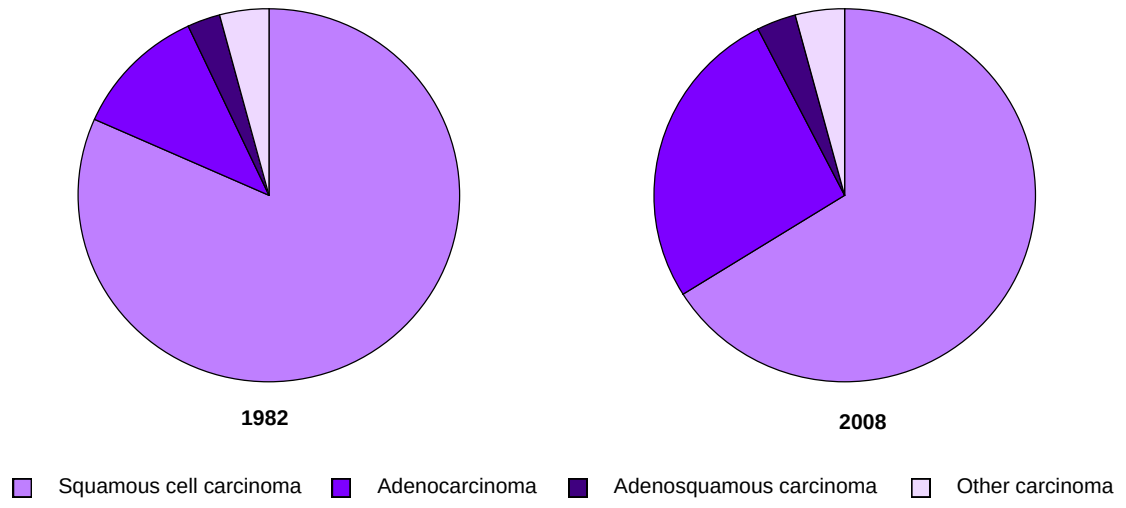
Figure 6.4: Incidence of carcinoma of the cervix (squamous cell carcinoma, adenocarcinoma, adenosquamous carcinoma and other carcinoma) in women aged 20–69, by year, 1982 to 2008

Squamous cell carcinoma has shown the most dramatic change over this time, decreasing from 15.1 new cases per 100,000 women in 1982 to 12.4 in 1991, thereafter halving to 6.0 new cases per 100,000 women in 2008 (Figure 6.4).

Incidence of adenocarcinoma appears to have increased in the late 1980s to around 3 new cases per 100,000 women, where it remained until a peak of 3.7 new cases per 100,000 women in 1994. This is consistent with documented trends in Canada, the United States and the United Kingdom of increased incidence of adenocarcinoma from 1970 through to the mid-1990s, thought to represent a cohort effect as a result of increased risk of adenocarcinoma for women born in the early 1960s (Blomfield & Saville 2008). Incidence of adenocarcinoma was then found to decrease from the mid-1990s in countries with organised cervical screening programs (reviewed in Blomfield & Saville 2008), a trend mirrored in these data, with incidence of adenocarcinoma decreasing from 2.8 new cases per 100,000 women in 1991 to 2.4 new cases per 100,000 women in 2008 (Figure 6.4).

Incidence trends of adenosquamous and other carcinomas are more difficult to ascertain due to small numbers, but appear to increase around the introduction of the NCSP, thereafter decreasing to rates below these by 2008.

As a result of these changes in incidence, the proportion of all carcinomas that each histological type comprises has changed over time. The proportion of carcinomas that are squamous in origin has decreased over time, from 81.5% in 1982 to 66.3% in 2008. In contrast, adenocarcinomas have comprised an increasingly large proportion since cervical screening, from 11.4% in 1982 to 26.2% in 2008. Adenosquamous, other specified and unspecified carcinomas between them comprise the remaining carcinomas (Figure 6.5).



Source: AIHW Australian Cancer Database.

Figure 6.5: Squamous cell carcinoma, adenocarcinoma, adenosquamous carcinoma and other carcinoma in women aged 20–69, as a proportion of all carcinoma of the cervix, 1982 and 2008

From these data it is clear that the observed decrease in cervical cancer incidence since the introduction of the NCSP in 1991 does not apply equally to all histological types of cervical cancer.

The trend in squamous cell carcinomas illustrates the success of the NCSP in preventing these histological subtypes of cervical cancer through the detection of high-grade squamous abnormalities, with these readily identified by repeated cervical cytology (Blomfield & Saville 2008). As a result, squamous cell carcinomas now comprise 65% of cervical cancers, much reduced from its historical proportion of 95% (Blomfield & Saville 2008).

In contrast, adenocarcinomas have not been reduced to the same degree as squamous cell carcinomas by cervical screening, with these glandular carcinomas now comprising a quarter of all cervical cancers—previously this was proportionately a rarer disease. The inability of cervical screening to reduce glandular cancers below the level reached a decade ago is recognised as a reflection of the difficulties in sampling glandular cells (Sasieni et al. 2009), with cervical cytology less effective at identifying glandular abnormalities (Blomfield & Saville 2008). Further, the cytological interpretation of abnormal glandular cells that are sampled (which occur much more infrequently than squamous abnormalities) is more difficult, and the progression from glandular abnormality to adenocarcinoma not well characterised (Sasieni et al. 2009; Wang et al. 2006).

Table 6.4: New cases and incidence of carcinoma of the cervix (squamous cell carcinoma, adenocarcinoma, adenosquamous carcinoma and other carcinoma) in women aged 20–69, 1982 to 2008

Year of diagnosis	New cases				AS rate			
	SSC[(a)]	AC[(b)]	ASC[(c)]	Other[(d)]	SSC[(a)]	AC[(b)]	ASC[(c)]	Other[(d)]
1982	658	92	22	35	15.1	2.1	0.5	0.8
1983	663	83	23	56	15.1	1.9	0.5	1.2
1984	633	87	45	50	13.9	1.9	1.0	1.1
1985	689	95	35	54	15.1	2.0	0.8	1.1
1986	646	117	42	40	13.9	2.5	1.0	0.8
1987	684	132	41	33	14.1	2.7	0.9	0.7
1988	650	156	40	40	13.1	3.1	0.8	0.8
1989	692	112	50	48	13.8	2.2	1.0	0.9
1990	642	147	49	62	12.6	2.9	1.0	1.2
1991	648	143	41	56	12.4	2.8	0.8	1.1
1992	613	137	51	37	11.6	2.6	1.0	0.7
1993	595	144	47	51	11.2	2.7	0.9	0.9
1994	640	204	40	49	11.7	3.7	0.7	0.9
1995	545	146	34	42	9.8	2.6	0.6	0.8
1996	529	148	40	34	9.4	2.6	0.7	0.6
1997	455	130	33	31	7.9	2.2	0.6	0.5
1998	492	141	30	29	8.4	2.4	0.5	0.5
1999	470	135	23	26	7.9	2.2	0.4	0.4
2000	403	119	30	27	6.7	2.0	0.5	0.4
2001	400	115	32	27	6.5	1.9	0.5	0.4
2002	387	126	18	21	6.2	2.0	0.3	0.3
2003	396	121	25	27	6.2	1.9	0.4	0.4
2004	390	133	27	24	6.0	2.1	0.4	0.4
2005	398	131	20	40	6.1	2.0	0.3	0.6
2006	365	143	22	39	5.5	2.1	0.3	0.6
2007	391	155	24	38	5.8	2.3	0.4	0.6
2008	415	164	21	26	6.0	2.4	0.3	0.4

(a) SSC = squamous cell carcinoma

(b) AC = adenocarcinoma

(c) ASC = adenosquamous carcinoma

(d) Other = other and unspecified carcinoma

Note: Age-standardised (AS) rate is the number of new cases of squamous cell carcinoma, adenocarcinoma, adenosquamous carcinoma and other carcinomas per 100,000 women age-standardised to the Australian population at 30 June 2001; rates based on less than 20 new cases should be interpreted with caution.

Source: AIHW Australian Cancer Database.

Incidence of cervical cancer by state and territory

In 2004–2008, incidence of cervical cancer for women aged 20–69 was relatively stable across states and territories, ranging between 7.9 and 14.0 new cases per 100,000 women (Table 6.5).

Trends in state and territory incidence are shown in Figure 6.6.

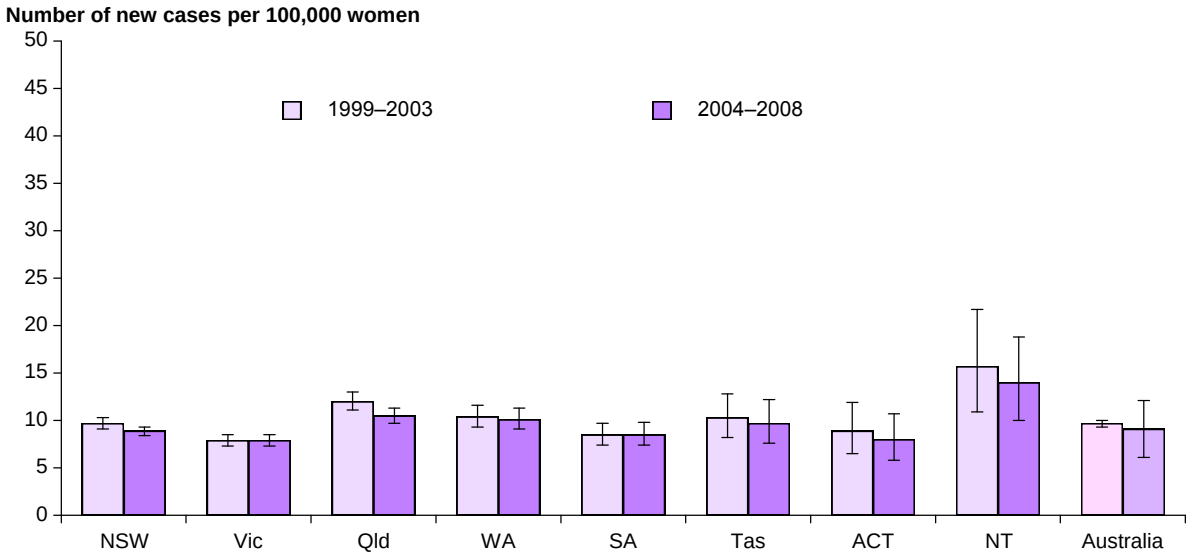
It should be noted that data for the least-populated jurisdictions are open to variation due to smaller numbers, even with 5 years of data combined.

Table 6.5: Incidence of cervical cancer in women aged 20–69, by state and territory, 2004–2008

	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
New cases	982	657	688	332	210	76	44	45	3,034
AS rate	8.9	7.9	10.5	10.1	8.5	9.7	8.0	14.0	9.1
95% CI	8.4–9.5	7.3–8.5	9.7–11.3	9.1–11.3	7.4–9.8	7.6–12.2	5.8–10.7	10.0–18.8	8.8–9.4

Note: Age-standardised (AS) rate is the number of new cases of cervical cancer per 100,000 women age-standardised to the Australian population at 30 June 2001.

Source: AIHW Australian Cancer Database.



Notes

1. Rates age-standardised to the Australian population as at 30 June 2001.
2. Bars on columns represent 95% confidence intervals.

Source: AIHW Australian Cancer Database.

Figure 6.6: Incidence of cervical cancer in women aged 20–69, by state and territory, 1999–2003 and 2004–2008

Incidence of cervical cancer by location of residence

Incidence of cervical cancer is measured across remoteness areas and socioeconomic status of location of residence to assess any apparent differences. To increase comparison across remoteness areas, incidence for *Inner regional* and *Outer regional* areas are reported together, as are *Remote* and *Very remote* areas.

Incidence of cervical cancer in 2004–2008 did not differ between *Major cities* and *Inner and outer regional* areas, these being 9.0 and 8.9 new cases per 100,000 women, respectively. Incidence in *Remote and very remote* areas, although appearing higher at 11.8 new cases per 100,000 women, was also not found to differ significantly from either *Major cities* or *Inner and outer regional* areas (Table 6.6; Figure 6.7A).

Table 6.6: Incidence of cervical cancer in women aged 20–69, by remoteness area, 2004–2008

	Major cities	Inner and outer regional	Remote and very remote	Australia
New cases	2,085	848	86	3,034
Rate	9.0	8.9	11.8	9.1
95% CI	8.6–9.4	8.3–9.5	9.4–14.6	8.8–9.4

Notes

1. Women were allocated to a remoteness area using residential postcodes according to the 2006 Australian Standard Geographic Classifications.
2. Age-standardised (AS) rate is the number of new cases of cervical cancers per 100,000 women age-standardised to the Australian population at 30 June 2001.

Source: AIHW Australian Cancer Database.

In 2004–2008, incidence was found to decrease with increasing socioeconomic status of residence, from 10.6 new cases per 100,000 women for women residing in areas of lowest socioeconomic status to 7.8 new cases per 100,000 women for women residing in areas of highest socioeconomic status (Table 6.7, Figure 6.7B).

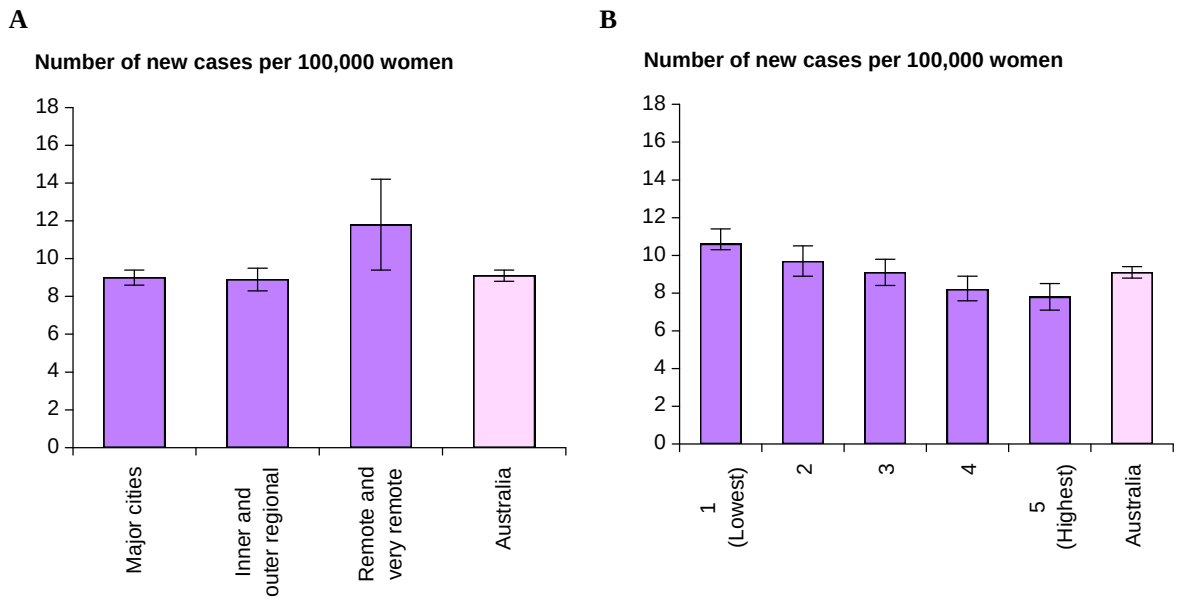
Table 6.7: Incidence of cervical cancer in women aged 20–69, by socioeconomic status, 2004–2008

	(lowest) 1	2	3	4	(highest) 5	Australia
New cases	682	632	609	561	534	3,034
Rate	10.6	9.7	9.1	8.2	7.8	9.1
95% CI	9.8–11.4	8.9–10.5	8.4–9.8	7.6–8.9	7.1–8.5	8.8–9.4

Notes

1. Women were allocated to a socioeconomic status using residential postcode according to the Australian Standard Geographic Classifications for 2006.
2. Age-standardised (AS) rate is the number of new cases of cervical cancers per 100,000 women age-standardised to the Australian population at 30 June 2001.

Source: AIHW Australian Cancer Database.



Note: Bars on columns represent 95% confidence intervals.

Source: AIHW Australian Cancer Database.

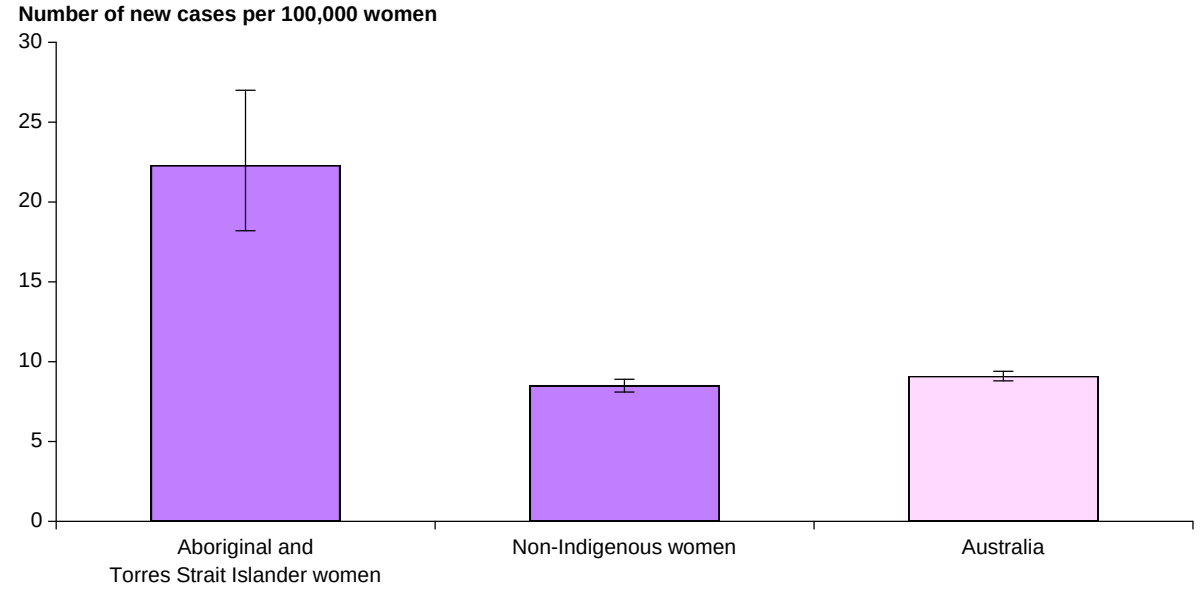
Figure 6.7: Incidence of cervical cancer in women aged 20–69, by geographic region (A) and by socioeconomic status (B), 2004–2008

Incidence of cervical cancer by Aboriginal and Torres Strait Islander status

The collection of reliable information by the state and territory cancer registries on the Aboriginal and Torres Strait Islander status of individuals diagnosed with cancer is problematic, since primary cancer diagnosis information is sourced from pathology forms that do not have the capacity to record this information. The registries collect this information from additional sources such as hospital records and death records, which affect the completeness and correctness of these data.

This means that reliable national data on the incidence of cancer for Aboriginal and Torres Strait Islander Australians are not available, because in some jurisdictions the level of identification of Aboriginal and Torres Strait Islander status is not considered sufficient to enable analysis. In this report, data for four states and territories—New South Wales, Queensland, Western Australia and the Northern Territory—are considered of sufficient quality, and were used to examine the incidence of cervical cancer by Aboriginal and Torres Strait Islander status. While the majority (around 85%) of Australian Aboriginal and Torres Strait Islander people reside in these four jurisdictions (ABS 2009), the degree to which data for these jurisdictions are representative of data for all Aboriginal and Torres Strait Islander people is unknown.

It was found that, over the 5-year period 2004–2008, Aboriginal and Torres Strait Islander women in New South Wales, Queensland, Western Australia and the Northern Territory aged 20–69 had a significantly higher incidence rate of cervical cancer compared with non-Indigenous women from these states and territories at 22.3 new cases per 100,000 women compared with the non-Indigenous rate of 8.5 new cases per 100,000 women (Table 6.8; Figure 6.8).



Notes

1. Rates age-standardised to the Australian population as at 30 June 2001.
2. Bars on the columns represent 95% confidence intervals.

Source: AIHW Australian Cancer Database.

Figure 6.8: Incidence of cervical cancer in women aged 20–69 (New South Wales, Queensland, Western Australia, and Northern Territory), by Aboriginal and Torres Strait Islander status, 2004–2008

Table 6.8: Incidence of cervical cancer in women aged 20–69 (New South Wales, Queensland, Western Australia, and Northern Territory), by Aboriginal and Torres Strait Islander status, 2004–2008

	New South Wales, Queensland, Western Australia, and the Northern Territory[a]			Australia[c]
	Aboriginal and Torres Strait Islander	Non-Indigenous	Total[b]	
New cases	111	1,760	2,047	3,034
Crude rate	20.0	8.5	9.7	9.1
AS rate	22.3	8.5	9.7	9.1
95% CI	18.2–27.0	8.1–8.9	9.3–10.1	8.8–9.4

(a) Data shown for 'Aboriginal and Torres Strait Islander', 'Non-Indigenous' and 'Total' are for New South Wales, Queensland, Western Australia and the Northern Territory only; data from these jurisdictions were considered to have adequate levels of Indigenous identification in cancer registration data at the time this report was prepared.

(b) 'Total' may not equal the sum of 'Aboriginal and Torres Strait Islander 'and 'Non-Indigenous' due to the inclusion of the 'not stated' category.

(c) Data shown for 'Australia' are for New South Wales, Victoria, Queensland, Western Australia, South Australia, Tasmania, the Australian Capital Territory and the Northern Territory.

Notes

1. Crude rate is the number of new cases of cervical cancer per 100,000 women; age-standardised rates are the number of cervical cancers detected per 100,000 women age-standardised to the Australian population at 30 June 2001.
2. Some states and territories use an imputation method for determining Indigenous cancers, which may lead to differences between these data and those shown in jurisdictional cancer incidence reports.

Source: Australian Cancer Database, AIHW.

Indicator 7 Mortality

What do we mean by mortality?

Definition: The number of deaths from cervical cancer per 100,000 estimated resident female population in a 12-month period.

Rationale: The National Cervical Screening Program (NCSP) aims to reduce mortality from cervical cancer.

Guide to interpretation: These data include mortality from all cervical cancers, whether or not they were detected through the NCSP.

Mortality from cervical cancer by state and territory, remoteness area, socioeconomic status and Aboriginal and Torres Strait Islander status is reported over a 5-year period to improve the stability and comparability of rates due to the small number of deaths in less populated areas and in Aboriginal and Torres Strait Islander women.

The National Mortality Database is the source of cervical cancer mortality data.

The most recent cervical cancer mortality data are for deaths in 2007 (preliminary).

Key results

Mortality in 2007

- In 2007 there were 131 deaths from cervical cancer in women aged 20–69, the target population of the NCSP, which equates to 1.9 deaths per 100,000 women (age-standardised). There were 208 deaths, or 1.8 deaths per 100,000 women (age-standardised) in women of all ages.

Mortality in Aboriginal and Torres Strait Islander women

- In 2003–2007, mortality where cervical cancer was the underlying cause was significantly higher in Aboriginal and Torres Strait Islander women from New South Wales, Queensland, South Australia and the Northern Territory compared with non-Indigenous women from these states and territories at 9.7 deaths per 100,000 women compared with the non-Indigenous rate of 1.9 deaths per 100,000 women.

Mortality trends

- Mortality from cervical cancer, after halving from 4.0 new cases per 100,000 women in 1991, has remained at around 2 new cases per 100,000 women from 2002 to 2007, for women aged 20–69.

Background information

Mortality statistics are one of the most comprehensively collected national data sets. Registration of death is a legal requirement in Australia and, as a result, the data set is virtually complete. Registration of deaths is the responsibility of the Registrar of Births, Deaths and Marriages in each state and territory. The registrars provide the mortality data to the Australian Bureau of Statistics (ABS) for coding the cause of death and compilation into national statistics. The Australian Institute of Health and Welfare (AIHW) also holds these data (to 2007) in the AIHW National Mortality Database, from which the data presented here are sourced.

Mortality from cervical cancer measures the number of deaths each year for which cervical cancer was the underlying cause of death. Analyses are based on the year of death, except for 2007 (the latest year for which mortality data are available), which is based on the year of registration of death. Note that about 5% of deaths are not registered until the year following the death (ABS 2007). Further, as noted in Appendix C, 2007 mortality data are preliminary and subject to revision.

Detailed analyses

Mortality from cervical cancer in 2007

In 2007, there were 208 deaths from cervical cancer in Australian women. This is equivalent to 2.0 deaths for every 100,000 women in the population, which, when age-standardised to allow analysis of trends and differentials, equates to a mortality rate of 1.8 for 2007.

Of the 208 deaths, 131 were in women aged 20–69, the target population of the NCSP. These 131 deaths represent 63.0% of all cervical cancer deaths in that year, and 1.9 deaths for every 100,000 women (crude and age-standardised).

When compared with other cancers diagnosed in 2007, it was found that deaths from cervical cancer comprised 1.2% of all cancer deaths in women. Also in 2007, the mean age of death was 62.6 years, and the risk of dying from cervical cancer was 1 in 817 by age 75 and 1 in 502 by age 85 (AIHW & AACR 2010).

Mortality from cervical cancer trends

Mortality from cervical cancer decreased over time.

This decrease was evident prior to the introduction of the NCSP in 1991, being 5.5 deaths per 100,000 women in 1982 and 4.8 deaths per 100,000 women in 1990. With opportunistic cervical screening occurring in Australia since the 1960s, some decreases in mortality are to be expected prior to the commencement of the NCSP.

Mortality then halved between 1991 and 2007, from 4.0 to 1.9 deaths per 100,000 women for women aged 20–69. This historic low of 2 deaths per 100,000 women has been stable since 2002 (Figure 7.1; Table 7.1).

This decrease in rate was accompanied by a decrease in the number of deaths from 204 in 1991 to 131 in 2007 for women aged 20–69 (Table 7.1).

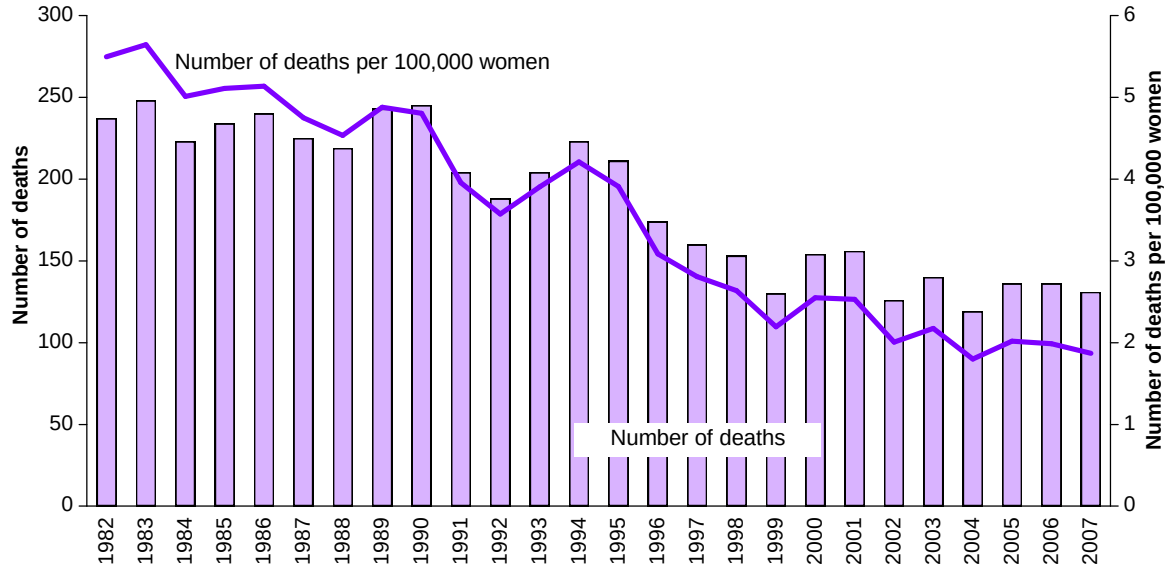
Table 7.1: Deaths and mortality from cervical cancer, 1982 to 2007

	Deaths		AS rate	
Year	20–69	All ages	20–69	All ages
1982	237	346	5.5	5.2
1983	248	343	5.6	5.0
1984	223	339	5.0	4.9
1985	234	363	5.1	5.1
1986	240	341	5.1	4.6
1987	225	348	4.8	4.6
1988	219	345	4.5	4.5
1989	243	369	4.9	4.7
1990	245	339	4.8	4.2
1991	204	331	4.0	4.0
1992	188	322	3.6	3.8
1993	204	318	3.9	3.7
1994	223	341	4.2	3.9
1995	211	334	3.9	3.8
1996	174	301	3.1	3.3
1997	160	285	2.8	3.0
1998	153	260	2.6	2.7
1999	130	226	2.2	2.3
2000	154	265	2.5	2.6
2001	156	271	2.5	2.6
2002	126	217	2.0	2.0
2003	140	239	2.2	2.2
2004	119	210	1.8	1.9
2005	136	221	2.0	2.0
2006	136	227	2.0	2.0
2007	131	208	1.9	1.8

Notes

1. Deaths between 1982 and 2006 were derived by year of death; deaths in 2007 were derived by year of registration of death. Mortality data for 2007 are preliminary. These data have been revised by the ABS but not made available for analysis.
2. Age-standardised rate is number of deaths from cervical cancer per 100,000 women age-standardised to the Australian population at 30 June 2001.

Source: AIHW National Mortality Database.



Note: Rates age-standardised to the Australian population as at 30 June 2001.

Source: AIHW National Mortality Database.

Figure 7.1: Mortality for cervical cancer, women aged 20–69, 1982 to 2007

Mortality from cervical cancer by age

Analysis of 5-year age groups reveals that, in 2007, mortality increased with age, from less than 1 death per 100,000 women for women aged 20–24 to 10.5 deaths per 100,000 women for those aged 85 and over. Within the target age group, the highest mortality in 2007 was in women aged 60–64, with 28 deaths, and a mortality rate of 5.3 deaths per 100,000 women (Table 7.2).

Table 7.2: Mortality from cervical cancer by age, 2007

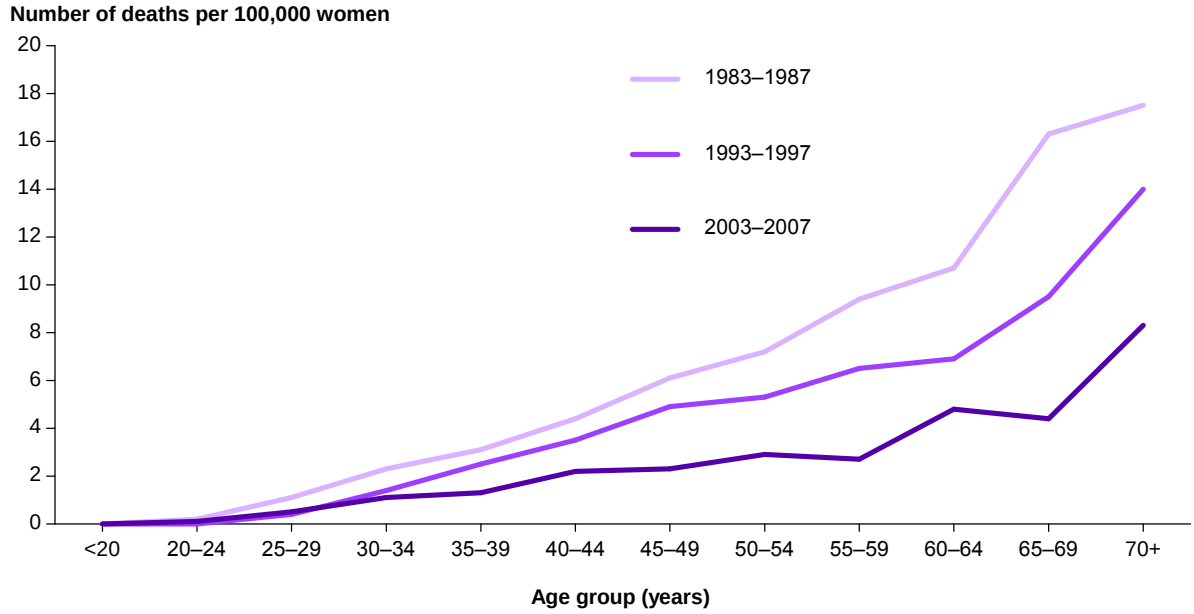
	Age group (years)									
	20–24	**25–29**	**30–34**	**35–39**	**40–44**	**45–49**	**50–54**	**55–59**	**60–64**	**65–69**
Deaths	1	1	7	12	17	14	26	11	28	14
Crude rate	0.1	0.1	0.9	1.5	2.2	1.8	3.7	1.7	5.3	3.4

Notes

1. Mortality data for 2007 are preliminary. These data have been revised by the ABS but not made available for analysis.
2. Crude rate is the number of deaths from cervical cancer per 100,000 women; age-specific rates based on less than 20 deaths should be interpreted with caution.

Source: AIHW National Mortality Database.

Historical age-specific trends in cervical cancer mortality, calculated over a 5-year period to increase stability and comparability of rates, show that mortality from cervical cancer has decreased across all age groups from 1983–1987 (prior to the introduction of the NCSP) to 1993–1997 (just after its introduction), with the trend continuing through to 2003–2007 (Figure 7.2).



Source: AIHW National Mortality Database.

Figure 7.2: Mortality from cervical cancer by age, 1983–1987, 1993–1997 and 2003–2007

Mortality from cervical cancer by state and territory

In 2003–2007, mortality from cervical cancer for women aged 20–69 was relatively similar to the national rate of 2.0 deaths per 100,000 women across states and territories (Table 7.3). Trends in state and territory mortality are shown in Figure 7.3.

Table 7.3: Mortality from cervical cancer in women aged 20–69, by state and territory, 2003–2007

	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
Deaths	225	125	143	71	54	26	10	8	662
AS rate	2.0	1.5	2.2	2.2	2.0	3.1	1.9	2.8	2.0
95% CI	1.8–2.3	1.2–1.8	1.8–2.6	1.7–2.7	1.5–2.7	2.0–4.6	0.9–3.4	1.2–5.5	1.8–2.1

Notes

1. Mortality data for 2007 are preliminary. These data have been revised by the ABS but not made available for analysis.
2. Age-standardised (AS) rate is the number of deaths from cervical cancer per 100,000 women, age-standardised to the Australian population at 30 June 2001; rates based on less than 20 deaths should be interpreted with caution.

Source: AIHW National Mortality Database.

Notes

1. Rates age-standardised to the Australian population as at 30 June 2001.
2. Bars on columns represent 95% confidence intervals.

Source: AIHW National Mortality Database.

Figure 7.3: Mortality from cervical cancer in women aged 20–69, by state and territory, 1998–2002 and 2003–2007

Mortality from cervical cancer by location of residence

Mortality from cervical cancer is measured across remoteness areas and socioeconomic status of location of residence. To increase stability and comparability, mortality for *Inner regional* and *Outer regional* areas are reported together, as are *Remote* and *Very remote* areas.

Although mortality appeared to increase with increasing remoteness, mortality in *Major cities* did not differ significantly from that in *Inner and outer regional* areas (1.8 compared with 2.2 deaths per 100,000 women). Mortality in *Remote and very remote* areas was, in contrast, significantly higher than mortality in both *Major cities* and *Inner and outer regional* areas, at 4.1 deaths per 100,000 women (Table 7.4; Figure 7.4A).

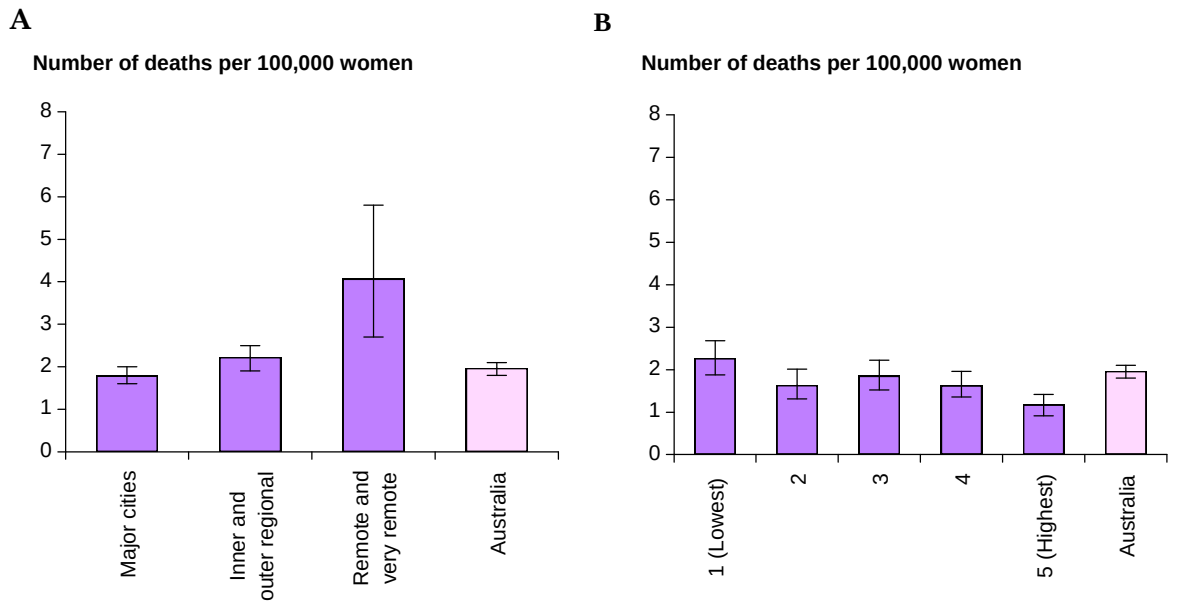
Table 7.4: Mortality from cervical cancer in women aged 20–69, by remoteness area, 2003–2007

	Major cities	Inner and outer regional	Remote and very remote	Australia
Deaths	409	224	28	662
AS rate	1.8	2.2	4.1	2.0
95% CI	1.6–2.0	1.9–2.5	2.7–5.8	1.8–2.1

Notes

1. Women were allocated to a remoteness area using residential postcode according to the Australian Standard Geographic Classifications for 2006.
2. Mortality data for 2007 are preliminary. These data have been revised by the ABS but not made available for analysis.
3. Age-standardised (AS) rate is the number of deaths from cervical cancers per 100,000 women age-standardised to the Australian population at 30 June 2001.

Source: AIHW National Mortality Database.



Note: Bars on columns represent 95% confidence intervals.

Source: AIHW National Mortality Database.

Figure 7.4: Mortality from cervical cancer in women aged 20–69, by remoteness area (A) and by socioeconomic status (B), 2003–2007

In 2003–2007, mortality was higher in women residing in areas of lowest socioeconomic status with 2.4 deaths per 100,000 women and lower in women residing in areas of highest socioeconomic status at just over 1 death per 100,000 women (Table 7.5, Figure 7.4B).

Table 7.5: Mortality from cervical cancer in women aged 20–69, by socioeconomic status, 2003–2007

	1 (lowest)	2	3	4	5 (highest)	Australia
Deaths	155	115	134	106	74	662
Rate	2.4	1.7	2.0	1.6	1.1	2.0
95% CI	2.0–2.8	1.4–2.1	1.7–2.4	1.3–1.9	0.8–1.3	1.8–2.1

Notes

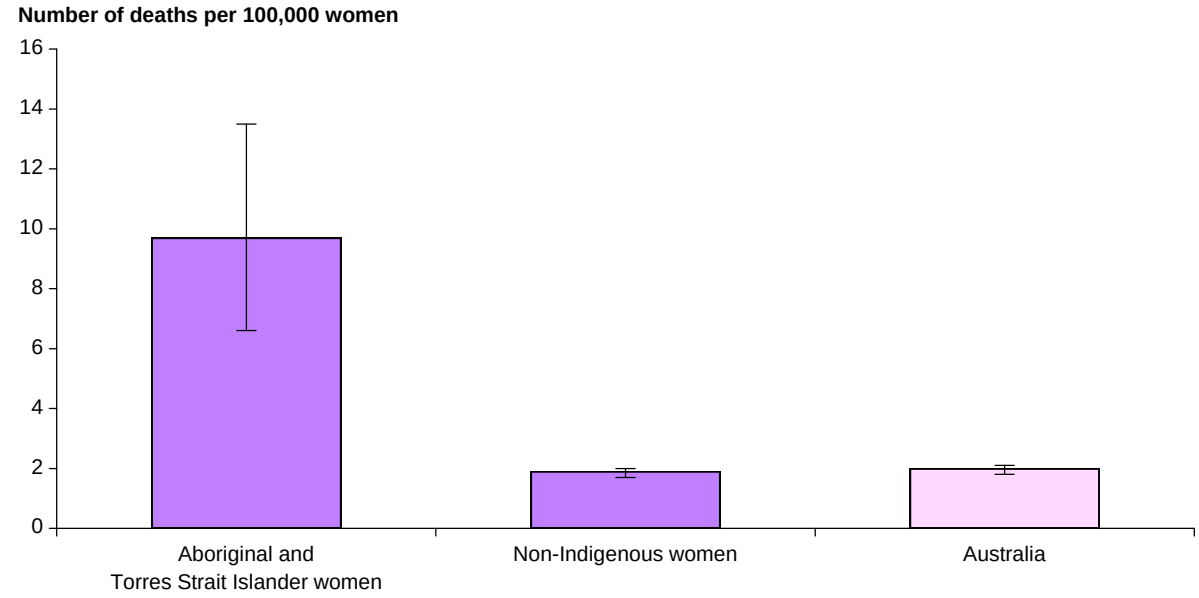
1. Women were allocated to a socioeconomic status using residential postcode according to the Australian Bureau of Statistics Socio-Economic Indexes for Areas (SEIFA) Index of Relative Socio-Economic Disadvantage for 2006.
2. Mortality data for 2007 are preliminary. These data have been revised by the ABS but not made available for analysis.
3. Age-standardised (AS) rate is the number of deaths due to cervical cancers per 100,000 women age-standardised to the Australian population at 30 June 2001.

Source: AIHW National Mortality Database.

Mortality from cervical cancer by Aboriginal and Torres Strait Islander status

Information on Aboriginal and Torres Strait Islander status on the National Mortality Database is considered of sufficient quality for the years 2003–2007 for four jurisdictions—New South Wales, Queensland, South Australia and the Northern Territory. The majority (around 75%) of Aboriginal and Torres Strait Islander people reside in these four jurisdictions (ABS 2009).

Over the 5-year period 2003–2007, mortality where cervical cancer was the underlying cause was found to be significantly higher in Aboriginal and Torres Strait Islander women in New South Wales, Queensland, South Australia and the Northern Territory compared with non-Indigenous women from these states and territories—9.7 deaths per 100,000 women compared with the non-Indigenous rate of 1.9 deaths per 100,000 women (Table 7.6, Figure 7.5). This was true for women aged 20–69, and for women of all ages (with an age-standardised mortality rate of 9.0 deaths per 100,000 women compared with the non-Indigenous rate of 1.9). This mirrors the incidence results for Aboriginal and Torres Strait Islander women in Indicator 6.



Notes

1. Rates age-standardised to the Australian population as at 30 June 2001.
2. Bars on columns represent 95% confidence intervals.

Source: AIHW National Mortality Database.

Figure 7.5: Mortality from cervical cancer in women aged 20–69 (New South Wales, Queensland, South Australia and Northern Territory), by Aboriginal and Torres Strait Islander status, 2003–2007

Table 7.6: Mortality from cervical cancer in women aged 20–69 (New South Wales, Queensland, South Australia and Northern Territory) by Aboriginal and Torres Strait Islander status, 2003–2007

	New South Wales, Queensland, South Australia and the Northern Territory[a]			Australia[c]
	Aboriginal and Torres Strait Islander	Non-Indigenous	Total[b]	
Deaths	37	389	430	662
Crude rate	7.6	2.0	2.1	2.0
AS rate	9.7	1.9	2.1	2.0
95% CI	6.6–13.5	1.7–2.1	1.9–2.3	1.8–2.1

(a) Data shown for 'Aboriginal and Torres Strait Islander', 'Non-Indigenous' and 'Total' are for New South Wales, Queensland, South Australia and the Northern Territory only; data from these jurisdictions were considered to have adequate levels of Indigenous identification in cancer mortality data at the time this report was prepared.

(b) 'Total' may not equal the sum of 'Aboriginal and Torres Strait Islander 'and 'Non-Indigenous' due to the inclusion of the 'not stated' category.

(c) Data shown for 'Australia' are for New South Wales, Victoria, Queensland, Western Australia, South Australia, Tasmania, the Australian Capital Territory and the Northern Territory.

Notes

1. Crude rate is the number of deaths from cervical cancer per 100,000 women; age-standardised rate is the number of deaths from cervical cancer per 100,000 women age-standardised to the Australian population at 30 June 2001.
2. Mortality data for 2007 are preliminary. These data have been revised by the ABS but not made available for analysis.

Source: AIHW National Mortality Database.

Appendix A Additional data

Notes

1. All symbols represent the average of the ABS estimated resident population for women aged 20–69 in 2009–2010 adjusted to include only women with an intact cervix using hysterectomy fractions derived from the AIHW National Hospital Morbidity Database.
2. Highlighted symbols represent the proportion of women screened in 2009–2010.
3. The single darker highlighted symbol represents the proportion of women with a high-grade abnormality detected by histology.

Source: AIHW analysis of state and territory cervical cytology register data.

Figure A1: Women in the National Cervical Screening Program, 2009–2010

Table A1: Data for performance indicators by age (to support figures in report body)

		Age group (years)											
Figure	**Data shown**	<20	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	65–69	70+
Figure 1.4	2-year participation 2009–2010[(a)]	. .	42.8	52.2	58.6	61.4	62.3	63.4	62.3	59.8	57.2	49.8	. .
Figure 1.4	3-year participation 2008–2010[(a)]	. .	56.3	67.0	73.8	76.1	75.8	76.3	73.7	69.8	65.6	57.8	. .
Figure 1.4	5-year participation 2006–2010[(a)]	. .	76.4	86.0	91.4	90.6	88.2	87.3	82.3	77.2	70.4	65.5	. .
Figure 3.1A	Proportion of cytology tests	2.6	9.1	11.4	11.7	12.5	11.6	11.2	9.8	8.0	6.6	4.1	1.3
Figure 3.1B	Unsatisfactory cytology 2010[(b)]	2.4	2.4	2.3	2.1	2.0	1.9	1.8	1.9	2.3	2.2	2.1	2.6
Figure 3.2A	Negative cytology 2010[(c)]	84.2	84.3	88.1	91.3	93.2	94.3	94.9	95.6	95.7	96.3	96.5	94.9
Figure 3.2B	No endocervical component 2010[(d)]	17.9	17.5	17.0	17.0	17.4	19.1	21.2	23.9	27.1	30.2	32.3	36.0
Figure 3.3A	Low-grade abnormalities detected by cytology 2010[(e)]	11.6	10.4	6.8	4.5	3.4	2.9	2.6	1.9	1.5	1.1	1.0	1.5
Figure 3.3B	High-grade abnormalities detected by cytology 2010[(f)]	1.8	3.0	3.0	2.1	1.4	0.9	0.7	0.5	0.5	0.4	0.3	0.7
Figure 4.1A	Proportion of histology tests 2010	1.9	13.9	16.8	13.0	11.6	10.9	11.4	7.6	4.7	3.4	2.2	2.5
Figure 4.1B	Histology tests per 100 cytology tests 2010	2.6	5.5	5.3	4.0	3.3	3.4	3.6	2.8	2.1	1.9	1.9	6.9
Figure 4.2A	Low-grade abnormalities detected by histology 2010[(g)]	35.5	30.1	24.9	23.9	20.1	16.4	12.7	9.6	8.1	7.0	6.7	3.6
Figure 4.2B	High-grade abnormalities detected by histology 2010[(h)]	37.9	46.4	49.4	44.8	32.5	18.4	12.0	8.9	9.6	7.3	6.8	5.0
Figure 4.4A	CIN II detected by histology 2010	20.9	21.5	21.0	17.2	11.2	6.5	4.5	3.1	3.2	1.6	1.9	1.4
Figure 4.4B	CIN III detected by histology 2010	14.6	19.8	24.3	22.6	16.4	8.3	5.3	3.6	4.8	3.9	3.5	3.7

(a) Number of women participating as a per cent of the population, adjusted to include only women with an intact cervix.

(b) Number of unsatisfactory cytology tests as a per cent of all cytology tests.

(c) Number of negative cytology tests as a per cent of all cytology tests.

(d) Number of cytology tests with no endocervical component as a per cent of all cytology tests.

(e) Number of low-grade (S2, S3 and E2) cytology tests as a per cent of all cytology tests.

(f) Number of high-grade (S4, S5, S6, E3, E4 and E5) cytology tests as a per cent of all cytology tests.

(g) Number of low-grade (HS02 and HE02) histology tests as a per cent of all cytology tests.

(h) Number of high-grade (HS03 and HE03) histology tests as a per cent of all cytology tests.

Source: AIHW analysis of state and territory cervical cytology register data.

Appendix B National Cervical Screening Program information

Table B1: Contacts and links for the state and territory and Australian Government components of the National Cervical Screening Program

NSW Cervical Screening Program	
Tel: (02) 8374 5757 Fax: (02) 8374 5700 Email: cervicalscreening@cancerinstitute.org.au	http://www.csp.nsw.gov.au/
PapScreen Victoria	
Tel: (03) 9635 5000 Fax: (03) 9635 5360 Email: papscreen@cancervic.org.au	http://www.papscreen.org.au
QLD Cervical Screening Program	
Tel: (07) 3328 9467 Fax: (07) 3328 9487 Email: cssb@health.gov.au	http://www.health.qld.gov.au/cervicalscreening/
WA Cervical Cancer Prevention Program	
Tel: (08) 9323 6788 Fax: (08) 9323 6711 Email: cervicalcancer@health.wa.gov.au	http://www.health.wa.gov.au/cervical/home/
SA Cervix Screening Program	
Tel: (08) 8226 8181 Fax: (08) 8226 8190 Email: cervixscreening@health.sa.gov.au	http://www.sahealth.sa.gov.au/wps/wcm/connect/public+content/sa+health+internet/health+information/health+information+for+the+consumer/pap+smears
Tasmanian Cervical Cancer Prevention Program	
Tel: (03) 6216 4300 Fax: (03) 6216 4308 Email: canscreen@dhhs.tas.gov.au	http://www.dhhs.tas.gov.au/cancerscreening/cervical_screening_register
ACT Cervical Screening Program	
Tel: (02) 6205 1545 Fax: (02) 6205 5035 Email: pap.register@act.gov.au	http://www.health.act.gov.au/paptest
Cervical Screen NT	
Tel: (08) 8922 6444 Fax: (08) 8922 6455 Email: wcpp.ths@nt.gov.au	http://www.health.nt.gov.au/Womens_Health/Well_Womens_Cancer_Screening/index.aspx
Australian Government Department of Health and Ageing	
cancerscreening@health.gov.au	http://www.cancerscreening.gov.au/internet/screening/publishing.nsf/Content/cervical-about
Australian Institute of Health and Welfare	
screening@aihw.gov.au	http://www.aihw.gov.au/cervical-cancer-screening/

Appendix C Data sources and classifications

Data sources

Data used in this report are derived from multiple sources and are summarised below. All data are based on calendar years.

Table C1: Data sources for performance indicators in the *Cervical screening in Australia* report series

Indicator	Description	Data source
1	Participation in cervical screening	State and territory cervical cytology registers
2	Rescreening	State and territory cervical cytology registers
3	Cytology	State and territory cervical cytology registers
4	Histology	State and territory cervical cytology registers
5	Cytology-histology correlation	State and territory cervical cytology registers
6	Incidence of cervical cancer	Australian Cancer Database, AIHW
7	Mortality from cervical cancer	National Mortality Database, AIHW

National Cervical Screening Program data

The National Cervical Screening Program (NCSP) has both national and state and territory components. Although policy is usually decided at a national level, coordination of screening activity is the responsibility of the individual state or territory. Data for participation, rescreening, cytology, histology and the cytology-histology correlation are sourced from the cervical cytology register in each state and territory and then compiled into national figures to allow national monitoring of the NCSP. These data include all women screened in each jurisdiction, except for Victoria and the Australian Capital Territory, for which immediate border residents are also included.

See data quality statement for cervical screening data in Appendix D for further information.

Incidence data

Incidence data in this report come from the Australian Cancer Database (formerly the National Cancer Statistics Clearing House)—a national collection of cancer statistics held and operated by the Australian Institute of Health and Welfare (AIHW). The Australian Cancer Database receives data from individual state and territory cancer registries on cancers diagnosed in residents of Australia and produces reports on national incidence.

Data have been analysed using the year of diagnosis of cancer. This is because incidence data by year of diagnosis of cancer is a more accurate reflection of incidence during a particular year than year of registration data.

Mortality data

Mortality data in this report come from the AIHW's National Mortality Database, which is a national collection of de-identified information for all deaths in Australia maintained by the AIHW. Information on the characteristics and causes of death of the deceased is provided by

the Registrars of Births, Deaths and Marriages and coded nationally by the Australian Bureau of Statistics (ABS). Information on the cause of death is supplied by the medical practitioner certifying the death, or by a coroner. The data are updated each calendar year.

Analyses are based on the year of death, except for 2007 (the latest year for which mortality data are available), which is based on year of registration of death. Note that about 5% of deaths are not registered until the year following the death (ABS 2007).

Mortality data for 2007 are preliminary and subject to revision. These data have been revised by the ABS but not made available for analysis. For more information about revisions to mortality data, refer to ABS (2010) Causes of death 2008 (Catalogue number 3303.0).

Population data

The ABS estimated resident female population was used to calculate participation, incidence and mortality rates in this report.

Participation rates were calculated using the average of the estimated resident female population for the 2-year, 3-year or 5-year reporting period. In this report, denominators for participation rates were calculated using the average of the ABS estimated resident population for 2009 and 2010 (2-year participation) the average for 2008, 2009 and 2010 (3-year participation), and the average of the ABS estimated resident population for 2006, 2007, 2008, 2009 and 2010 (5-year participation). These average populations were adjusted for the estimated proportion of women who have had a hysterectomy using national hysterectomy fractions derived from the AIHW National Hospital Morbidity Database (NHMD).

There may be some variation in published participation rates because of different sources of estimated resident population data between national reports and state and territory reports. Further, national denominators are adjusted for the estimated proportion of women who have had a hysterectomy using national hysterectomy fractions derived from the AIHW NHMD, whereas state and territory reports may use hysterectomy fractions derived from ABS National Health Surveys, or derived from health surveys conducted in their state or territory which will give more reliable figures at the jurisdictional level.

The age-standardised rates in this publication were calculated using the total estimated resident Australian population at June 2001.

Hysterectomy fractions

Hysterectomy fractions represent the proportion of women with an intact uterus (and cervix) at a particular age, and are the tool used to adjust the population for participation calculations. This is because women that have had a hysterectomy with their cervix removed are not at risk of cervical cancer and thus do not require screening, and since substantial proportions (20–30%) of middle-aged and older women in Australia do not have an intact cervix, the population is adjusted to remove these women so that true participation in cervical screening can be more accurately estimated.

Previously, the AIHW used hysterectomy fractions derived from self-reported information on hysterectomies collected in the 2001 National Health Survey (NHS) conducted by the ABS. However, hysterectomy incidence has fallen since 2001, which means the 2001 NHS hysterectomy fractions no longer allow accurate estimates. Thus the introduction of new performance indicators in the AIHW annual monitoring report, *Cervical screening in Australia 2008–2009* provides an appropriate opportunity to update hysterectomy fractions.

Simply updating hysterectomy fractions based on the newest NHS is not possible, since participants in the 2011 will not be asked whether they have had a hysterectomy. However, for the first time we have adequate historical hysterectomy incidence data available, which allows us to calculate hysterectomy fractions based on national hysterectomy incidence.

The National Hospital Morbidity Database (NHMD) is based on summary records of patient separations, referring to episodes of care in public and private hospitals, and allows us to view relatively complete hysterectomy numbers and rates for financial years from the mid-1990s. These data were used, with projections forward and backward where required, to generate estimates of current hysterectomy prevalence for women aged 20–69. Published hysterectomy incidence trends as well as data from the 1995, 2001 and 2004–05 NHS were drawn on to ensure accuracy in assumptions.

The difficulty in calculating hysterectomy prevalence from incidence data rather than survey data is that information on historical trends is required, as current hysterectomy prevalence reflects the previous incidence of the procedure (that is, women who have previously had a hysterectomy remain without an intact cervix for their lifetime, and this needs to be reflected in current data). The following summarises the methodology and assumptions used.

First, hysterectomy prevalence for girls younger than 15 years of age was set at zero, since hysterectomy is rare in these ages.

Second, hysterectomy prevalence for the younger age groups (that is, for women aged 15–29 years) was based on hysterectomy incidence from observed hospital morbidity data and represent robust estimates for these women. Hysterectomy incidence for the earlier birth cohorts (women aged 30–69 years, who are likely to have had hysterectomies in the years not covered in the NHMD) was also based on observed hospital morbidity data, but required back-projection of these data to obtain estimates of current hysterectomy prevalence.

Briefly, procedure data for hysterectomies for the 15-year period from 1994–95 to 2008–09 were divided into 5-year age groups. The number of procedures for each group were divided by the mid-financial-year populations to obtain age-specific incidence rates. Least squares linear regression was used to find the straight line of best fit through the 1994–95 to 2008–09 age-specific incidence rates. A 5% level of significance was used to test the hypothesis that the slope was different from zero. If the slope was not found to be different from zero, the mean of the rates was used for the projection. Average age-specific rates for 5-year periods were calculated using the modelled and observed data and applied to each period. We have assumed that the incidence rates before 1979 (a known peak in hysterectomy incidence) would have been similar to rates estimated for 1979 and have calculated the cumulative rate as though they had been constant in the preceding period.

The results of these combined approaches are robust hysterectomy fractions that reflect both historical and current hysterectomy trends, which can be used in the calculation of participation in cervical screening for the most recent participation data.

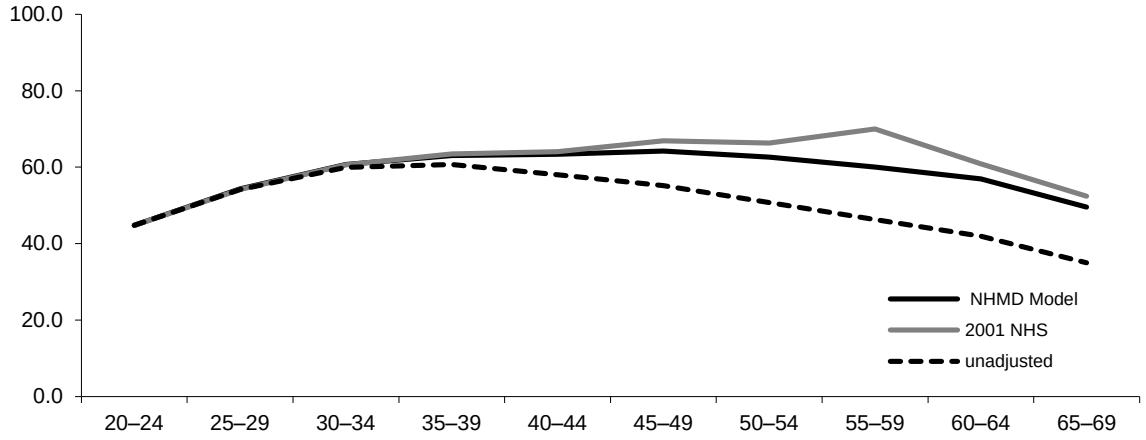
The fractions themselves are similar to previous estimates taken from population health surveys with the proportion of women with an intact cervix remaining comparatively higher in most age groups—a reflection of the national trend of decreasing incidence of hysterectomies over time. These are shown next to the previously adopted hysterectomy fractions based on the 2001 NHS in Table C3, below.

Table C2: National hysterectomy fractions, 2011

	Percentage of women who have not had a hysterectomy	
Age group (years)	Derived from NHS 2001	Modelled on NHMD
20–24	100.0	100.0
25–29	100.0	99.7
30–34	98.9	98.8
35–39	95.6	96.2
40–44	90.6	91.6
45–49	82.5	85.9
50–54	76.5	81.0
55–59	66.2	77.2
60–64	68.9	73.6
65–69	66.8	70.6

Source: AIHW analysis of the National Hospital Morbidity Database.

The incorporation of these new hysterectomy fractions, based on lower prevalence of hysterectomy procedures, into cervical screening participation calculations results in a slight decrease in the participation rate, as would be expected, since the population at risk (and therefore eligible for cervical screening) is larger. The effect of introducing and changing hysterectomy fractions on the particpation rate for 2008–2009 is illustrated in Figure C1.



Source: AIHW analysis of state and territory cervical cytology register data using hysterectomy fractions derived from the National Hospital Morbidity Database and 2001 National Health Survey.

Figure C1: Participation of women aged 20–69 in the NCSP, 2008–2009

Classifications

Age

The data in this report are stratified by the age of the woman at the time of the specified test (for the screening data), at the time of diagnosis (for the cancer incidence data) or at the time of death (for the cancer mortality data).

State or territory

The state or territory reported is the one where screening took place (for the screening data), where the diagnosis was made (for the cancer incidence data) or the place of usual residence (for the cancer mortality data).

This means that it is possible for a woman to be double-counted in the screening data. If she was screened in one jurisdiction and then screened again less than 2 years later in another jurisdiction, both screens may be included in participation. This should, however, have a negligible effect on the reported participation.

Remoteness area

Remoteness areas are classified according to the ABS's Australian Standard Geographic Classification (ASGC) Remoteness Structure (ABS 2006), which groups geographic areas into six categories. These categories, called Remoteness Areas (RAs), are based on Census Collection Districts and defined using the Accessibility/Remoteness Index for Australia (ARIA). ARIA is a measure of the remoteness of a location from the services provided by large towns or cities. Accessibility is judged purely on distance to one of the metropolitan centres. A higher ARIA score denotes a more remote location. The six RAs of the ASGC Remoteness Structure are listed in the table below (Table C4); the sixth 'migratory' area is not used in this report.

Table C3: Remoteness areas for the ASGC

Remoteness area	Collection districts within region
Major cities of Australia	CDs with an average ARIA index value of 0 to 0.2
Inner regional Australia	CDs with an average ARIA index value greater than 0.2 and less than or equal to 2.4
Outer regional Australia	CDs with an average ARIA index value greater than 2.4 and less than or equal to 5.92
Remote Australia	CDs with an average ARIA index value greater than 5.92 and less than or equal to 10.53
Very remote Australia	CDs with an average ARIA index value greater than 10.53
Migratory	Areas composed of offshore, shipping and migratory CDs

Women were allocated to a remoteness area using their residential postcode supplied at the time of screening. Caution is required when examining differences across remoteness areas. First, postcodes used to allocate women may not represent their location of residence. Second, because these are based on the 2006 census, the accuracy of remoteness area classifications diminishes due to subsequent changes in demographics. Third, some postcodes (and hence women) are unable to be allocated to a remoteness area.

Note that the methodology used to allocate women to numerators and denominators has been refined for 2009–2010 participation data, and for this reason, 2009–2010 participation by remoteness area should not be directly compared with these data in previous reports.

Socioeconomic status

Socioeconomic status classifications are based on the ABS Index of Relative Socioeconomic Disadvantage (ABS 2008). Postal areas are assigned a score based on attributes such as low income, low educational attainment, high unemployment and jobs in relatively unskilled occupations. The score does not refer to the socioeconomic situation of a particular individual but instead refers to the postal area in which a person lives. A low score means a postal areas has many low-income families, people with little training and high unemployment, and may be considered disadvantaged relative to other areas. Postal areas with high index scores may be considered less disadvantaged relative to other areas.

Socioeconomic status groups based on the level of the index are used for analysis where 1 (lowest) represents the most disadvantaged and 5 (highest) the least disadvantaged.

Women were allocated to a socioeconomic status using their residential postcode supplied at the time of screening. Caution is required when examining differences across socioeconomic status for several reasons. First, postcodes used to allocate women may not represent their location of residence. Second, because these are based on the 2006 census, the accuracy of socioeconomic status classifications diminishes due to subsequent changes in demographics. Third, many postcodes (and hence women) are unable to be allocated to a socioeconomic status group.

Note that the methodology used to allocate women to numerators and denominators has been refined for 2009–2010 participation data, and for this reason, 2009–2010 participation by socioeconomic status should not be directly compared with these data in previous reports.

Appendix D Data quality statement

Data Quality Statement: Cervical screening data 2009–2010

Summary of key issues

- All states and territories maintain a population-based cervical cytology register (also referred to as 'Pap test registers' or 'Pap smear registers') to which all cervical cytology, histology, and human papillomavirus (HPV) DNA tests are reported.
- State and territory cervical cytology registers were established to support the National Cervical Screening Program (NCSP) that commenced in 1991.
- The AIHW compiles cervical screening data using aggregate data supplied from state and territory cervical cytology registers in order to monitor the NCSP annually.
- Some duplication may occur where the same test is reported to the cervical cytology data in two or more jurisdictions. AIHW is unable to identify or resolve these instances, and the level of duplication is unknown, but believed to be small.
- Cervical cytology register databases change every day, adding new records and improving the quality of existing records as new information becomes available.

Description

All states and territories have legislation that requires pathology laboratories to send all cervical tests to the relevant state or territory population-based cervical cytology register.

Cervical screening programs in each state and territory interrogate their own cervical cytology register in accordance with detailed data specifications to supply aggregate data annually to the AIHW. These data are compiled into the only repository of national cervical screening data, although because these are aggregate and not unit record data, these data do not exist in a database *per se*, and cannot be interrogated further.

Institutional environment

The Australian Institute of Health and Welfare (AIHW) is a major national agency set up by the Australian Government under the *Australian Institute of Health and Welfare Act* 1987 to provide reliable, regular and relevant information and statistics on Australia's health and welfare. It is an independent statutory authority established in 1987, governed by a management Board, and accountable to the Australian Parliament through the Health and Ageing portfolio.

The AIHW aims to improve the health and wellbeing of Australians through better health and welfare information and statistics. It collects and reports information on a wide range of topics and issues, ranging from health and welfare expenditure, hospitals, disease and injury, and mental health, to ageing, homelessness, disability and child protection.

The Institute also plays a role in developing and maintaining national metadata standards. This work contributes to improving the quality and consistency of national health and welfare statistics. The Institute works closely with governments and non-government organisations to achieve greater adherence to these standards in administrative data collections to promote national consistency and comparability of data and reporting.

One of the main functions of the AIHW is to work with the states and territories to improve the quality of administrative data and, where possible, to compile national datasets based on data from each jurisdiction, to analyse these datasets and disseminate information and statistics.

The *Australian Institute of Health and Welfare Act* 1987, in conjunction with compliance to the *Privacy Act* 1988 (Cwth), ensures that the data collections managed by the AIHW are kept securely and under the strictest conditions with respect to privacy and confidentiality.

For further information see the AIHW website <www.aihw.gov.au>.

The AIHW has been receiving cervical screening data since 1989.

Timeliness

Cervical cytology data are available within about 6 months (there can be a lag of up to 6 months in the transmission of test results from pathology laboratories to cervical cytology registers), and data for the previous calendar year are supplied in July each year (rescreening and correlation data lag behind, as the specifications for these require a specified period of time to pass before this can be accurately calculated).

The current cervical screening data contains all cytology and histology tests performed in 2010.

Accessibility

Cervical screening data are published annually in the report *Cervical screening in Australia*, available on the AIHW website http://www.aihw.gov.au/cervical-cancer-screening/ where they can be downloaded without charge. Supplementary data tables that provide more detailed data are also provided to accompany each report, and these, too, are available on the AIHW website where they can be downloaded without charge.

General enquiries about AIHW publications can be made to the Communications, Media and Marketing Unit on (02) 6244 1032 or via email to info@aihw.gov.au.

Interpretability

While many concepts in the report Cervical screening in Australia are easy to interpret, other concepts and statistical calculations are more complex and may be confusing to some users. All concepts are explained within the body of the report presenting these data, along with footnotes to provide further details and caveats. Appendix C provides additional detail on the data sources and classifications, and Appendix E provides details on the statistical methods used.

Relevance

Cervical screening data are highly relevant for monitoring trends in cervical screening participation and abnormality detection trends. The data are used for many purposes by policy-makers and researchers, but are supplied and analysed specifically to monitor and inform the NCSP.

Accuracy

All data provided by state and territory cervical screening programs, once analysed, are supplied back for verification.

Further, National Pathology Accreditation Advisory Council (NPAAC) *Performance measures for Australian laboratories reporting cervical cytology* exist which allow some cervical screening data compiled and reported by the AIHW to be compared with data that are also sourced from state and territory cervical cytology registers for a different purpose.

Coherence

Cervical screening data are reported and published annually by the AIHW. Changes in reporting practices over time are clearly noted throughout the reports.

Appendix E Statistical methods

Comparisons and tests of statistical significance

This report includes statistical tests of the significance of comparisons of rates between population groups. Any statistical comparison applied to one variable must take account of any other potentially relevant variables. For example, any comparison of participation by state must also take account of differences in the distribution of age and sex between the states. These other variables are known as 'confounding' variables.

Crude rates

A crude rate is defined as the number of events over a specified period of time (for example, a year) divided by the total population. For example, a crude cancer incidence rate is similarly defined as the number of new cases of cancer in a specified period of time divided by the population at risk. Crude mortality rates and cancer incidence rates are expressed in this report as number of deaths or new cases per 100,000 population. Crude participation rate is expressed as a percentage.

Age-specific rates

Age-specific rates are calculated by dividing the number of cases occurring in each specified age group by the corresponding population in the same age group expressed as a percentage or a number per 1,000 or 100,000 population. This rate may be calculated for particular age and sex groupings. For example:

Age-specific cervical cancer incidence rate in females aged 50–54 years

= (*New cases* aged 50–54 over *Female population* aged 50–54) times 100,000

= (75 over 698,700) times 100,000

= 10.7 per 100,000

Age-standardised rates (AS rates)

Rates are adjusted for age to facilitate comparisons between populations that have different age structures, for example, between youthful and ageing communities. There are two different methods commonly used to adjust for age. This publication uses direct standardisation, in which the age-specific rates are multiplied by a constant population (the 2001 Australian Standard Population unless otherwise specified). This effectively removes the influence of the age structure on the summary rate.

It important to be aware that for some data presented in this report, indirect age standardisation would be more appropriate due to small numbers (most commonly for the Australian Capital Territory and the Northern Territory), but direct age standardisation has been used for consistency. This can result in relatively large differences between crude and age-standardised rates. In these cases, crude rates should also be considered when interpreting data.

The method used for this calculation comprises that first, the age-specific rate is calculated (as shown above) for each age group. Second, the expected number of cases in each 5-year

age group is calculated by multiplying the age-specific rates by the corresponding standard population and dividing by the appropriate factor (that is, 100,000 for mortality and incidence rates, and 100 for participation). Third, to give the age-standardised rate, the expected number of cases in each group are summed, divided by the total of the standard population and multiplied by the appropriate factor (for example 100,000 for mortality and incidence rate, and 100 for participation).

Confidence intervals

Population numbers for incidence and mortality and screening have a natural level of variability for a single year above and below what might be expected in the mean over many years. The percentage variability is small for large population numbers but high for small numbers such as mortality in a young age group. One measure of the likely difference is that of standard error, which indicates the extent to which a population number might have varied by chance in only 1 year of data. In the 95% confidence interval, there are about 19 chances in 20 that the difference will be less than two standard errors.

There are several methods for calculating confidence intervals. The 95% confidence intervals (CIs) in this report were calculated using a method developed by Dobson et al. (1991). This method calculates approximate confidence intervals for a weighted sum of Poisson parameters.

Interpretation of confidence intervals

Where indicators include a comparison (such as between states and territories), a 95% confidence interval is presented along with the rates. This is because the observed value of a rate may vary due to chance, even where there is no variation in underlying value of the rate. The 95% confidence interval represents a range (interval) over which variation in the observed rate is consistent with this chance variation. In other words, there is a 95% confidence that the true value of the rate is somewhere within this range.

These confidence intervals can be used as a guide to whether differences in a particular rate are consistent with chance variation. Where the confidence intervals do not overlap, the difference between rates is greater than that which could be explained by chance and is regarded as statistically significant.

It is important to note that overlapping confidence intervals does not imply that the difference between two rates is definitely due to chance. Instead, an overlapping confidence interval represents a difference in rates that is too small to allow differentiation between a real difference and one that is due to chance variation. It can therefore only be stated that no statistically significant differences were found, and not that no differences exist.

The approximate comparisons presented might understate the statistical significance of some differences, but they are sufficiently accurate for the purposes of this report.

As with all statistical comparisons, care should be exercised in interpreting the results of the comparison. If two rates are statistically significantly different from each other, this means that the difference is unlikely to have arisen by chance. Judgment should, however, be exercised in deciding whether or not the difference is of any clinical significance.

Glossary

Aboriginal: a person of Aboriginal descent who identifies as an Aboriginal and is accepted as such by the community in which he or she lives.

Adenocarcinoma: a carcinoma arising from the glandular cells of the endocervical canal.

Adenosquamous carcinoma: a carcinoma made up of *malignant* glandular cells and *malignant* squamous cells.

Age-standardised rate: a method of removing the influence of age when comparing populations with different age structures. This is usually necessary because the rates of many diseases vary strongly (usually increasing) with age. The age structures of the different populations are converted to the same 'standard' structure, which allows comparison of disease rates.

Atypia: abnormality in a cell (to a lower degree than *dysplasia*).

Benign: not *malignant*.

Biopsy: small sample of tissue that is taken to obtain a definitive diagnosis of an abnormality.

Cancer death: a death where the *underlying cause of death* is indicated as cancer. Persons with cancer who die of other causes are not counted in the *mortality* statistics in this publication.

Cancer (malignant neoplasm): a large range of diseases in which some of the body's cells become defective, and begin to multiply out of control. These cells can invade and damage the area around them, and can also spread to other parts of the body to cause further damage.

Carcinoma: a cancer of cells forming part of a surface or lining of an organ of the body.

Cervical cancer: this term covers all cancers specific to the uterine cervix, including *micro-invasive* cervical cancer. Types of cervical cancers include *squamous cell carcinoma*, *adenocarcinoma* (including mucoepidermoid and adenoid carcinomas), *adenosquamous*, and other and unspecified carcinomas. Other malignant neoplasms of the uterine cervix are also included in the incidence of cervical cancer data.

Cervical cytology: Microscope examination of *exfoliated* cervical *epithelial* cells.

Cervical cytology register: a database that stores *cervical cytology* results and related test results for women in each state and territory of Australia. The term cervical cytology register is often used interchangeably with the terms *Pap test* register and *Pap smear* register.

Cervical cytology registry: the component of each state and territory cervical screening program that maintains the *cervical cytology register*. The term cervical cytology registry is often used interchangeably with the terms *Pap test* registry and *Pap smear* registry.

Cervical intraepithelial neoplasia (CIN): squamous cell carcinoma of the cervix is mostly preceded, over a period of years, by a spectrum of asymptomatic abnormalities known as cervical *neoplasia* (CIN) graded as CIN 1 (I) (mild *dysplasia*), CIN 2 (II) (moderate *dysplasia*) and CIN 3 (III) (severe *dysplasia* and carcinoma *in situ*).

CIN: (see *Cervical intraepithelial neoplasia*).

Colposcopy: a detailed examination of the lower genital tract with a magnifying instrument called a colposcope. This method of non-invasive evaluation allows the clinician to more accurately assess a cytologic abnormality by focusing on the areas of greatest abnormality and by sampling them with a *biopsy* to obtain a tissue diagnosis.

Confidence interval (CI): a range determined by variability in data, within which there is a specified (usually 95%) chance that the true value of a calculated parameter lies.

Cytology: the microscope evaluation of a sample of cells obtained from a tissue (or body fluid). The sample does not permit evaluation of the underlying structure of the tissue of origin (*cf. histology*).

Dysplasia: abnormal appearance, development or growth patterns of cells.

Ectocervix: outer surface of the cervix and its covering epithelium, visible on inspection of the cervix.

Endocervix: internal canal of the uterine cervix and its epithelium, not usually visible on inspection of the cervix.

Epithelium: tissue lining the outer layer of a body or lining a cavity (for example, vagina or mouth).

Exfoliate: to break away or remove (shed) cells. In the context of this report it refers to the removal of cells from a person for the purpose of *cervical cytology*.

High-grade abnormalities: in this report high-grade abnormalities are defined as CIN I/II, CIN II, CIN III (see *CIN)*, endocervical *dysplasia*, and adenocarcinoma *in situ*.

Histology: the microscope study of the minute and detailed structure and composition of tissues.

Human papillomavirus (HPV): the virus that causes genital warts and which is linked in some cases to the development of more serious cervical cell abnormalities.

Hysterectomy: refers to the surgical procedure whereby all or part of the uterus is removed.

Hysterectomy fraction: the proportion of women who have not had their uterus removed by *hysterectomy*.

ICD-10: International Classification of Diseases—a coding system used to identify the primary site of the malignancy. This classification is in its 10th revision.

***in situ*:** a Latin term meaning in place or position; undisturbed.

Incidence: the number of new cases (for example, of an illness or event) occurring during a given period.

Intraepithelial: the area within the layer of cell tissues forming the epidermis of a body cavity. These cells comprise contiguous cells having minimum intercellular substance.

Invasive cancer: a *tumour* whose cells have the potential to spread to nearby healthy or normal tissue or to more distant parts of the body.

Low-grade abnormalities: in this report low-grade abnormalities are defined as *atypia*, warty *atypia* (*HPV* effect), possible *CIN*, equivocal *CIN*, and *CIN* 1.

Malignant: abnormalities in cells or tissues consistent with *cancer*.

Metastasis: the process by which cancerous cells are transferred from one part of the body to another, for example, via the lymphatic system or the bloodstream.

Micro-invasive squamous cell carcinoma (micro-invasive cancer): a lesion in which the cancer cells can be visualised with the microscope (only) to have invaded just beyond the tissue layer they arose from, for example, the *epithelium* of the cervix, but they have not yet spread to other layers or tissues.

Mortality: see *Cancer death*.

Neoplasia: the new and abnormal development of cells that may be harmless (*benign*) or cancerous (*malignant*).

New cancer case: a person who has a new cancer diagnosed for the first time. One person may have more than once cancer and therefore may be counted twice in *incidence* statistics if it is decided that the two cancers are not of the same origin. This decision is based on a series of principles set out in more detail in a publication by Jensen et al. (1991).

Pap smear: a sample prepared for the study of *exfoliated* cells from the cervix. The terms Pap smear and *Pap test* are often used interchangeably.

Pap test: a sample prepared for the study of *exfoliated* cells from the cervix. The terms Pap test and *Pap smear* are often used interchangeably.

Screening: the performance of tests on apparently well people in order to detect a medical condition at an earlier stage than would otherwise be the case.

Significant difference: where rates are referred to as significantly different, or one rate is deemed significantly higher or lower than another, these differences are statistically significant. Rates are deemed statistically significantly different when their *confidence intervals* do not overlap, since their difference is greater than what could be explained by chance. See 'confidence intervals' in Appendix E for more information.

Squamous cells: thin and flat cells, shaped like soft fish scales. They line the outer surface of the cervix (ectocervix). They meet with columnar cells in the squamo-columnar junction. Abnormalities associated with squamous cells are the most likely abnormalities to be picked up by *Pap test*s.

Squamous cell carcinoma: a *carcinoma* arising from the *squamous cells* of the cervix.

Stroma: the supporting framework of on organ.

The Institute: the Australian Institute of Health and Welfare.

Tumour: an abnormal growth of tissue. Can be *benign* (not a cancer) or *malignant* (a cancer).

Underlying cause of death: the condition, disease or injury initiating the sequence of events leading directly to death; that is, the primary, chief, main or principal cause.

Note: terms in italics are defined elsewhere in the glossary.

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Related publications

Cervical screening in Australia 2009–2010 is part of an annual series. Earlier editions and any published subsequently can be downloaded for free from the AIHW website <http://www.aihw.gov.au/publications>. The website also includes information on ordering printed copies.

For those requiring further detail, complete data tables are available in the *Cervical screening Australia 2009–2010: supplementary data tables*. These can also be downloaded for free from the AIHW website <http://www.aihw.gov.au/publications>.