Australian Government
Australian Institute of Health and Welfare

Authoritative information and statistics to promote better health and wellbeing

CANCER SERIES
Number 61

Cervical screening in Australia 2008–2009

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

October 2011

Australian Institute of Health and Welfare
Canberra
Cat. no. CAN 57

The Australian Institute of Health and Welfare is a major national agency which provides reliable, regular and relevant information and statistics on Australia's health and welfare. The Institute's mission is *authoritative information and statistics to promote better health and wellbeing*.

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 978-1-74249-216-2

Suggested citation
Australian Institute of Health and Welfare 2011. Cervical screening in Australia 2008–2009. Cancer series no. 61. Cat. no. CAN 57. 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
Printed by Bluestar Print

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

This report was prepared by Dr Alison Budd, Ms Chun Chen, and Ms Christine Sturrock. Valuable contributions were also made by Ms Melissa Goodwin, Mr Mark Cooper-Stanbury and Ms Lisa McGlynn, which are kindly acknowledged.

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 A/Prof. Marion Saville, A/Prof. 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 state and territory Registrars of Births, Deaths and Marriages, which are the source of data on cervical cancer mortality (through the National Mortality Database).

The financial support and professional assistance of the Screening Section of the Australian Government Department of Health and Ageing is gratefully acknowledged.

National Cervical Screening Program

New South Wales

Dr Robyn Godding
Ms Louise Cook
Ms Grace Kwaan
Ms Tara Kerr

Victoria

A/Prof. Dorota Gertig
Ms Louise Galloway
Ms Kate Wilkinson
Ms Cathryn May

Queensland

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

Western Australia

Ms Nerida Steel
Mr Jacek Gonsalves

South Australia

Ms Sarah Macdonald
Ms Bernadette Hurst
Ms Grace Miller

Tasmania

Ms Gail Ward
Ms Elizabeth Lamond
Ms Kimbra Nossiter

Australian Capital Territory

Ms Linda Halliday
Mr Peter Couvee

Northern Territory

Ms Chris Tyzack
Mr Guillermo Enciso
Dr Fiona Douglas

Australian Government Department of Health and Ageing

Dr Tracey Bessell
Ms Karla Lister
Ms Alison Lang

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
AIS	adenocarcinoma in situ
AMBS	Australian Modified Bethesda System
AS	age standardised
CI	confidence interval
CIN	cervical intraepithelial neoplasia
CIS	carcinoma in situ
HPV	human papillomavirus
IARC	International Agency for Research on Cancer
Guidelines	NHMRC *Screening to prevent cervical cancer: guidelines for the management of screen detected abnormalities in asymptomatic women*
HG	high-grade
LG	low-grade
NCSP	National Cervical Screening Program
NHMD	National Hospital Morbidity Database
NHMRC	National Health and Medical Research Council
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
SA	South Australia
SEIFA	Socio-Economic Indexes for Areas
Tas	Tasmania
Vic	Victoria
WA	Western Australia

Symbols

. .	not applicable
n.p.	not published

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. It achieves this through detecting and treating high-grade abnormalities before any possible progression to cervical cancer.

The NCSP operates as a joint program of the Australian and state and territory governments, targeting women aged 20–69 years.

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

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

In 2007, the incidence of cervical cancer remained at its historic low of 9 new cases per 100,000 women, with mortality at 2 deaths per 100,000 women. Incidence and mortality have both halved since the introduction of the NCSP in 1991.

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 the 2-year period 2008–2009, more than 3.6 million women participated in the NCSP. This was 59% of eligible women.

Participation was highest in *Major cities* and *Inner regional* areas and lower in more remote areas, though with less than 2.5 percentage points separating the highest participation of 59% in *Major cities* from the lowest of 57% in *Remote* areas.

Participation showed greater differences across socioeconomic status of residence, and a clear trend of increasing participation with increasing socioeconomic status from 53% of women residing in areas of lowest socioeconomic status to 64% of women 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 15% of women with a negative Pap test result rescreened earlier than recommended, indicating that relatively few women rescreen more often than required.

Of the women sent a 27-month reminder letter by a cervical cytology register in 2008, 32% rescreened within 3 months, indicating that this letter acts as a prompt for many women.

How many high-grade abnormalities were detected?

In 2009, for every 1,000 women screened, 8 women had a high-grade abnormality detected by histology, providing an opportunity for treatment before possible progression to cancer.

For women aged less than 20 years, this decreased between 2004 and 2009 from 15 to 9.

Data at a glance

The following table provides a comparison of national data for the NCSP for key performance indicators for women in the target age group, 20–69 years. 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 years, previous and latest data.

	Previous data		Latest data	
Performance indicator	**Reporting period**	**Statistic**	**Reporting period**	**Statistic**
Participation	2006–2007	59.3%	2008–2009	58.6%
Rescreening				
Early rescreening	2007 cohort	20.7%	2008 cohort	15.1%
Rescreening after reminder letter	. .	. .	Letters sent 2008	31.5%
Cytology				
Unsatisfactory	2008	2.1%	2009	2.1%
Negative	2008	92.1%	2009	92.6%
No endocervical component	2008	20.2%	2009	20.3%
Low-grade abnormalities	2008	4.5%	2009	4.0%
High-grade abnormalities	2008	1.4%	2009	1.3%
Histology				
Negative	2008	50.9%	2009	51.0%
Low-grade abnormalities	2008	18.4%	2009	17.6%
High-grade abnormalities	2008	25.2%	2009	25.4%
High-grade abnormality detection rate	2008	8.3	2009	8.1
Incidence	2006	8.9	2007	9.0
Mortality	2006	2.0	2007	1.9

Notes

1. All rates are age-standardised and for women aged 20–69 years.
2. Participation is the per cent of eligible women in population.
3. Early rescreening is the per cent of women with a negative cervical cytology test in February 2008 who rescreened within 21 months. Note that the 2008 cohort uses a different definition to the 2007 cohort.
4. Rescreening after reminder letter is the per cent of women sent a reminder letter who rescreened within 3 months.
5. Cytology is a per cent of all cytology tests.
6. Histology is the per cent of all histology tests except for the high-grade abnormality detection rate, which is the number of women with a high-grade abnormality detected by histology per 1,000 women screened.
7. 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

This report provides the most up-to-date national data available for the National Cervical Screening Program (NCSP).

The first section of the 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 NCSP. This section also introduces new performance indicators for monitoring the NCSP along with details of their development, 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 for the NCSP against these new performance indicators. The start of each performance indicator provides a summary of the indicator that includes the definition and rationale for each indicator, 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 the *Cervical screening in Australia 2008–2009: supplementary data tables*.

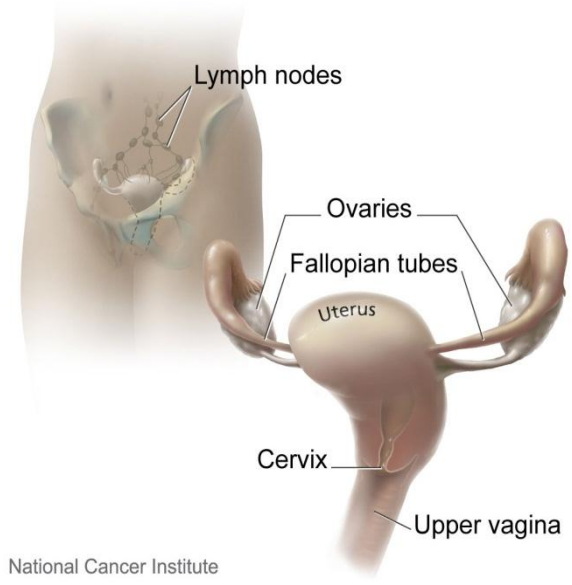
Overview of cervical cancer and cervical screening

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.

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 2007, 63% of cervical cancers were squamous cell carcinoma and 25% were adenocarcinoma (adenosquamous and other cervical cancers made up the rest).



Source: Reproduced with permission by the National Cancer Institute.

Illustration S1.1: Anatomy: The Female Reproductive System (Cervix, Ovaries, Uterus)

How common is cervical cancer in Australia?

Cervical cancer is the 13th most common cancer affecting Australia 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 2007. It is also the 18th most common cause of cancer-related death, with 2 deaths per 100,000 women in 2007 (AIHW & AACR 2010).

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 chapters 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).

At least 13 high-risk types of HPV are currently recognized. 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, HPV 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 may persist, which may then lead to changes (or 'abnormalities') to cells in the cervix. In a very small number of women, these changes may eventually lead to cervical cancer.

How do we screen for cervical cancer?

Cervical cells exhibit precancerous 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 cervix lining 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 further 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 of 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 allow 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 1200 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 (NCSP), Australia's cervical screening program operates as a joint program of the Australian Government and state and territory governments, targeting women aged 20–69 years. 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 pre-cancerous 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.' (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 years administered through schools; however, between 2007 and 2009, it also included a catch-up program for women aged 13–26 years (National HPV Vaccination Program Register 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—latest estimates are current as at 21 March 2011 (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 years. For girls aged 15 years in 2009 in Australia, this coverage was estimated at 70.8% by the NHVPR (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, and the HPV vaccine, by preventing the HPV infection that can lead to 70% to 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).

For instance, adenocarcinomas have not been reduced to the same degree as squamous cell carcinomas due to sampling and interpretation limitations of cervical screening, with this previously rare cancer now comprising around a quarter of all cervical cancers diagnosed (Blomfield & Saville 2008) (see Chapter 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 Chapter 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 13 high-risk types of HPV infection that 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 cancer 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, which make their debut in this report, were developed following a review of original indicators. This review considered changes to both the NCSP and the cervical screening environment, including the introduction of new *Screening to prevent cervical cancer: guidelines for the management of screen detected abnormalities in asymptomatic women* (NHMRC 2005), to ensure that the NCSP could continue 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. Full definitions, including data items, can be found in the *National Cervical Cancer Prevention Dataset* (AIHW 2011). Table S1.1 outlines original and new performance indicators.

Table S1.1: National Cervical Screening Program performance indicators

Original performance indicators	New performance indicators
1 Participation	1 Participation
2 Early rescreening	2 Rescreening
	2.1 Early rescreening[(a)]
	2.2 Rescreening after 27-month cervical cytology register reminder letter[(b)]
3 Low-grade abnormality detection[(c)]	3 Cytology[(b)]
4 High-grade abnormality detection	4 Histology[(b)(d)]
	5 Cytology-histology correlation[(b)]
5 Incidence	6 Incidence
6 Mortality	7 Mortality

(a) Modified from previously reported to accommodate changes in NHMRC *Screening to prevent cervical cancer: guidelines for the management of screen detected abnormalities in asymptomatic women* (NHMRC 2005).

(b) New national performance indicator.

(c) Removed.

(d) Incorporates the original Indicator 4 'High-grade abnormality detection'.

Standards

While there are no official standards for NCSP performance indicators, in places, NPAAC standards that appear in the *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 or data may exist.

Data considerations

Data sources

The main sources of data for 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 is the AIHW Australian Cancer Database, which is the source of cervical cancer incidence data (Indicator 6), and the National Mortality Database, which is the source of cervical cancer mortality data (Indicator 7). More detail on data sources and classifications is provided in Appendix C.

Aboriginal and Torres Strait Islander women

Of the performance indicators used to monitor the NCSP, only incidence and mortality—the two that do not have NCSP data as their source—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 cytology test 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 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. As such, the feasibility of identifying and excluding women with symptoms from the data presented in this report was explored.

In the National Cervical Cytology Coding Sheet introduced in July 2006, recommendation codes included the code *RS Symptomatic-Clinical management required* which allows women with symptoms who are identified as such at the time of their cervical cytology test to also be identified on the cervical cytology registers. 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 epochs

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

Age groups

The NCSP targets women aged 20–69 years, and while data are presented for women aged 20–69 years for all indicators, data for women aged <20 years and 70+ years are also shown. Crude and age-standardised rates for women aged 20–69 years and women of all ages are also presented in *Cervical screening in Australia 2008–2009: supplementary data tables*.

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. Although the approximate comparisons presented might understate the statistical significance of some differences, they are sufficiently accurate for the purposes of this report. For more information on the calculation and interpretation of confidence intervals, see Appendix D.

The confidence intervals presented in this report can be used as a guide as 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, overlapping confidence intervals represent 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.

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 data set, 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

Participation at a glance

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

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: Women aged 20–69 years are targeted by the NCSP, but data are also presented for women aged <20 years and 70+ years. Participation is measured over 2 years to align with the recommended screening interval of the NCSP. Participation is based on the number of women screened, and not the number of cervical cytology tests.

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 with their cervix removed. 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 2008–2009 reporting period.

Key results

2008–2009

- In the 2 years 2008–2009, a total of 3,802,203 women participated in the National Cervical Screening Program (NCSP)—3,638,941 of who were aged 20–69 years.
- This equates to 58.2% of eligible women, age-standardised to a participation rate of 58.6% for 2008–2009 to allow analysis of trends.

Trends

- Participation in the NCSP was steady at 59% of eligible women for all 2-year periods from 2004–2005 to 2008–2009, despite a 6.8% increase in the actual number of women participating over this time.

Differences across groups

- Participation was highest in *Major cities* and *Inner regional* areas and lower in more remote areas, though with less than 2.5 percentage points separating the highest participation of 58.9% in *Major cities* from the lowest of 56.5% in *Remote* areas.
- Participation showed greater differences across socioeconomic status of residence, and a clear trend of increasing participation with increasing socioeconomic status from 53.3% of women residing in areas of lowest socioeconomic status to 64.3% of women in areas of highest socioeconomic status.

Detailed analyses

Participation in 2008–2009

In the 2 years 2008–2009, there were 3,802,203 women in total who participated in the NCSP (that is, had at least one cervical cytology test over the 2-year period), 3,638,941 of these in the target age group 20–69 years.

This equates to 58.2% of eligible women, age-standardised to a participation rate of 58.6% for 2008–2009 to allow analysis of trends.

Participation trends

National participation trends for women in the target age group are shown in Table 1.1 from when reporting began in 1996–1997 to the most recent national data available in 2008–2009.

The rate of participation in the NCSP has varied little between 2004–2005 and 2008–2009, being 58.8% in 2004–2005 and 58.7% in 2005–2006, rising briefly to 59.3% in 2006–2007, before falling to 59.1% and 58.6% in 2007–2008 and 2008–2009, respectively (Table 1.1).

Table 1.1: Participation in the National Cervical Screening Program, women aged 20–69 years, 1996–1997 to 2008–2009

Reporting period	Participants[(b)]	Population[(c)]	Adjusted population[(d)]	AS rate[(e)]	95% CI
1996–1997[(a)]	2,563,107	4,769,763	. .	. .	. .
1997–1998[(a)]	2,653,504	4,823,334	. .	. .	. .
1998–1999[(a)]	2,716,364	4,874,748	. .	. .	. .
1999–2000	3,244,329	6,041,447	. .	. .	. .
2000–2001	3,262,931	6,122,480	. .	. .	. .
2001–2002	3,296,409	6,211,365	. .	. .	. .
2002–2003	3,318,354	6,307,398	. .	. .	. .
2003–2004	3,354,519	6,404,756	. .	. .	. .
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

(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 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 ABS estimated resident population for women aged 20–69 years for the two reporting years.

(d) Adjusted population is the number of ABS estimated resident population for women aged 20–69 years adjusted to include only women with an intact cervix using age-specific hysterectomy fractions derived from the AIHW National Hospitals Morbidity Database. Because these hysterectomy fractions are estimated to be correct for 2008–2009, these have only been used in the calculation of participation rates back to 2004–2005. Previous reports sourced hysterectomy fractions from the 2001 ABS National Health Survey.

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

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

The fall in rate between 2006–2007 (the previous non-overlapping reporting period) and 2008–2009 from 59.3% to 58.6% occurred despite a 2.5% increase in the number of women participating, since the concurrent 4.3% increase in the number of women in the population (adjusted to include only women with an intact cervix) is greater.

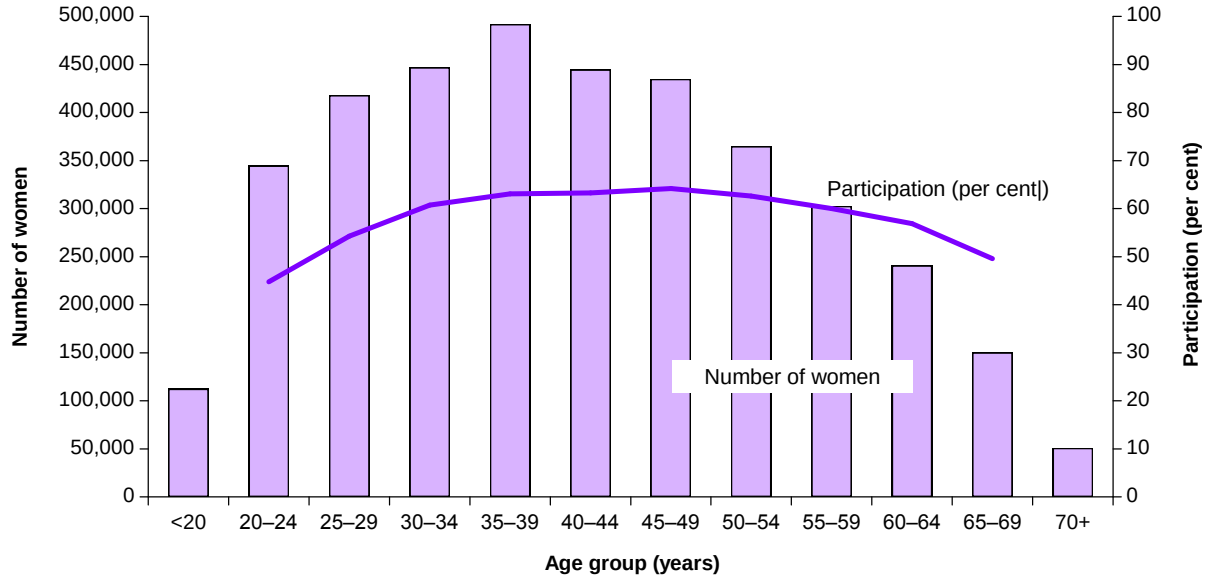
Analysis of historical trends is restricted to number of participants, since comparable denominators are not available for the calculation of participation rates. Table 1.1 shows that the number of women participating in the NCSP has increased for every 2-year reporting period from 1996–1997 to 2008–2009. Overall, this equates to a 42% increase in the number of women screened, from 2,563,107 women in 1996–1997 to 3,638,941 women in 2008–2009. The greatest apparent increase in participation over these reporting periods is a 19% increase between 1998–1999 and 1999–2000, but this reflects the addition of women screened in Queensland to the Australian total, rather than a true increase of this magnitude.

Participation by age

In 2008–2009, 95.7% of women participating in the NCSP were aged 20–69 years (the NCSP target age group) (Figure 1.1). Outside the target age group, 112,351 women aged less than 20 years and 50,867 women aged 70 years and over participated in 2008–2009, comprising 3.0% and 1.3% of all women screened, respectively.

In 2008–2009, within the target age group, participation was at or above 60% for all ages between 30–34 years and 55–59 years, with the highest participation of 64.2% in women aged 45–49 years. Participation was lower on either side of these ages, with 44.8% and 54.3% of 20–24 and 25–29 year olds respectively, and 56.9% and 49.6% of women aged 60–64 and 65–69 years respectively participating in 2008–2009 (Figure 1.1).

Note that, while participation in women aged 20–24 years is low (falling from 47.9% in 2006–2007 to 44.8% in 2008–2009), Australia is one of the few countries that screen this age group.



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

Figure 1.1: Participation in the National Cervical Screening Program, by age group, 2008–2009

Participation by state and territory

In 2008–2009, participation across all states and territories was within 2.8 percentage points of the national average of 58.6%, ranging from 56.1% to 61.3% (Table 1.2).

Table 1.2: Participation by state and territory, women aged 20–69 years, 2008–2009

State/territory	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
Women	1,155,461	951,735	710,850	365,172	275,711	80,258	63,321	36,433	3,638,941
AS rate	57.2	61.3	57.0	58.1	60.4	57.5	59.9	56.1	58.6
95% CI	57.1–57.3	61.2–61.4	56.9–57.2	58.0–58.3	60.2–60.6	57.1–57.9	59.4–60.3	55.5–56.7	58.5–58.6

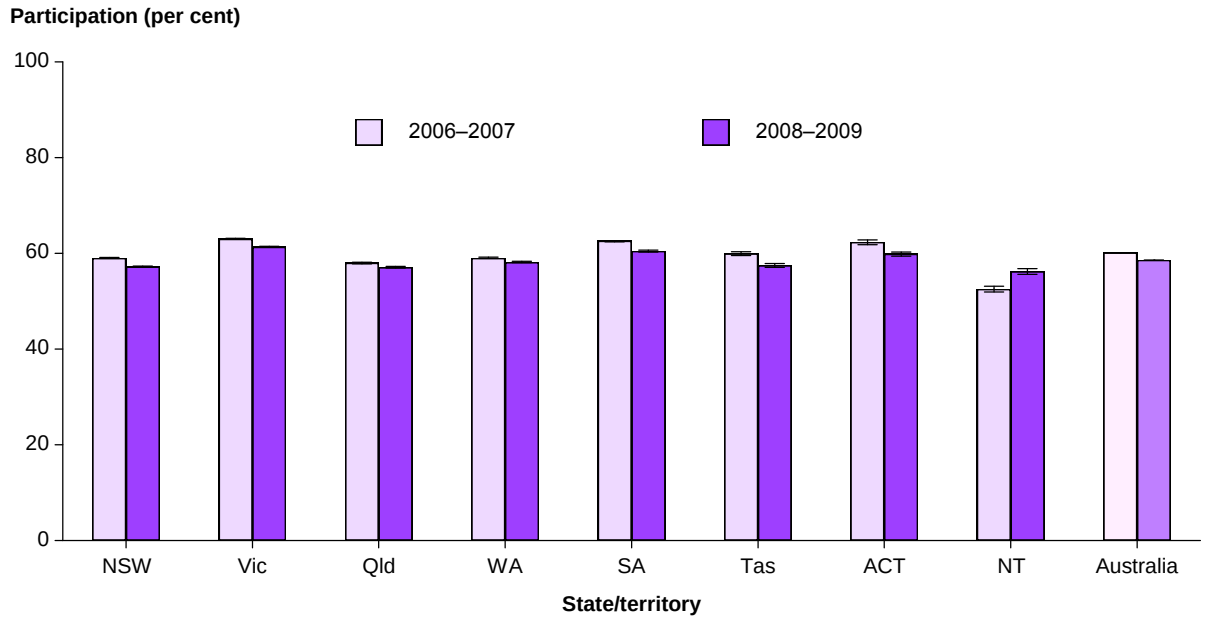
Notes

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) rates are the number of women screened in 2008–2009 as a percentage of the ABS estimated resident population for women aged 20–69 years, adjusted to include only women with an intact cervix using age-specific hysterectomy fractions derived from the AIHW National Hospitals Morbidity Database, and age-standardised to the to the Australian population at 30 June 2001.

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

State and territory and national trends are shown for 2006–2007 and 2008–2009 in Figure 1.2.

Despite the decrease in participation rate between 2006–2007 and 2008–2009 seen in most states and territories (Figure 1.2), almost every state and territory screened more women in 2008–2009 than in 2006–2007 (for data see *Cervical screening in Australia 2008–2009: supplementary data tables)*. Of note, Victoria, Queensland and Western Australia all demonstrated steady but substantial increases in the number of women screened between these reporting periods of 2.5%, 4.6% and 5.3%, respectively, while the Northern Territory showed the greatest change, with a 13.3% increase between 2006–2007 and 2008–2009.



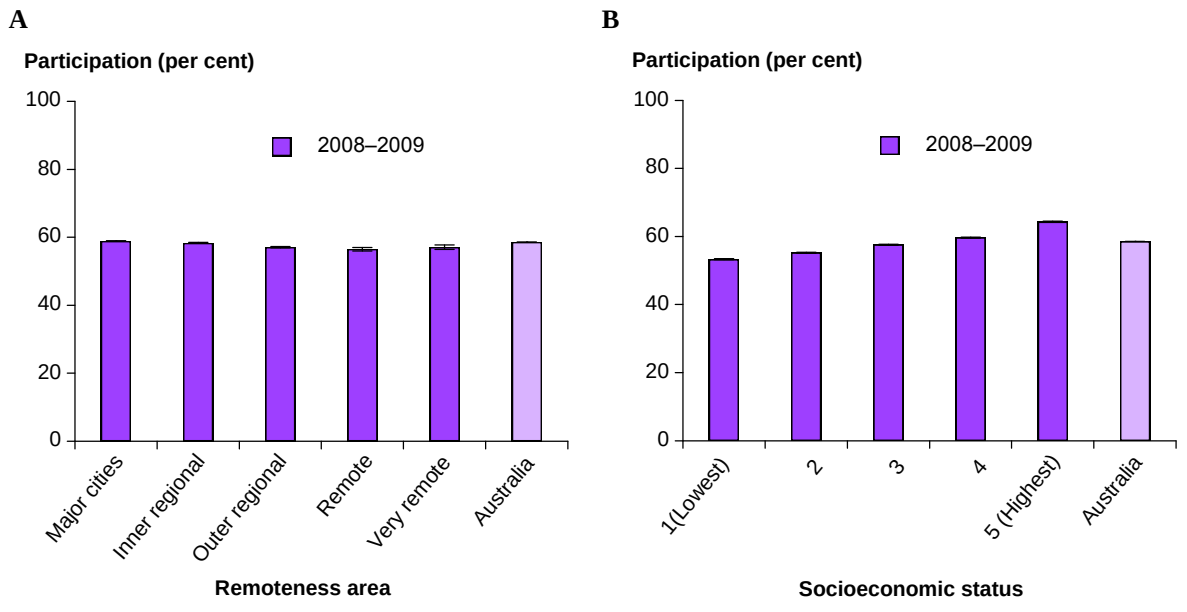
Note: Bars on columns represent 95% confidence intervals.

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

Figure 1.2: Participation, by state and territory, women aged 20–69 years, 2006–2007 and 2008–2009

However, with the population increasing between 2006–2007 and 2008–2009 in every state and territory (more than 5% in Queensland, Western Australia and the Northern Territory), each state and territory demonstrated a slight drop in participation in 2008–2009, except for the Northern Territory which showed an increase (Figure 1.2).

Participation by location of residence



Note: Bars represent 95% confidence intervals.

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

Figure 1.3: Participation by remoteness area (A) and by socioeconomic status (B), women aged 20–69 years, 2008–2009.

Participation in the NCSP was highest in Major cities and Inner regional areas and lower in more remote areas (Figure 1.3A), though with less than 2.5 percentage points separating the highest participation of 58.9% in Major cities from the lowest of 56.5%in Remote areas (Table 1.3).

Table 1.3: Participation by remoteness area, women aged 20–69 years, 2008–2009

Remoteness area	Major cities	Inner regional	Outer regional	Remote	Very remote	Australia
Women	2,564,180	681,296	314,081	50,325	26,864	3,638,941
AS rate	58.9	58.3	57.1	56.5	57.1	58.6
95% CI	58.9–59.0	58.2–58.5	56.9–57.3	56.0–57.0	56.4–57.8	58.5–58.6

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 and socioeconomic status (see Appendix C).
3. Age-standardised (AS) rates are the number of women screened in 2008–2009 as a percentage of the ABS estimated resident population for women aged 20–69 years, adjusted to include only women with an intact cervix using age-specific hysterectomy fractions derived from the AIHW National Hospitals Morbidity Database, and age-standardised to the Australian population at 30 June 2001.
4. Participation by remoteness area in 2008–2009 is not comparable with previous reporting periods.

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

Participation in cervical screening 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 53.3% of women residing in areas of lowest socioeconomic status to 64.3% of women residing in areas of highest socioeconomic status (a difference of 11.0 percentage points) (Table 1.4).

Table 1.4: Participation by socioeconomic status, women aged 20–69 years, 2008–2009

Socioeconomic status	1 (lowest)	2	3	4	5 (highest)	Australia
Women	621,439	671,631	723,622	769,760	827,690	3,638,941
AS rate	53.3	55.3	57.6	59.7	64.3	58.6
95% CI	53.2–53.4	55.1–55.4	57.5–57.8	59.6–59.8	64.2–64.5	58.5–58.6

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 remoteness area and socioeconomic status (see Appendix C).
3. Age-standardised (AS) rates are the number of women screened in 2008–2009 as a percentage of the ABS estimated resident population for women aged 20–69 years, adjusted to include only women with an intact cervix using age-specific hysterectomy fractions derived from the AIHW National Hospitals Morbidity Database, and age-standardised to the to the Australian population at 30 June 2001.
4. Participation by socioeconomic status in 2008–2009 is not comparable with previous reporting periods.

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

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 allow collection of 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

Participation measured over a 2-year period underestimates the number of women who participate in the NCSP regularly, but outside the recommended 2-year screening interval. Therefore participation is also measured over a 3-year and 5-year period.

These data show that, while 58.6% of the estimated eligible women aged 20–69 years had at least one cervical cytology test in the 2 years 2008–2009, 71.6% of the estimated eligible women had at least one cervical cytology test in the 3 years 2007–2009, and 84.0% of the eligible women participated in the NCSP in the 5 years 2005–2009 (Table 1.5).

Table 1.5: Two-year, three-year, and five-year participation in the National Cervical Screening Program, women aged 20–69 years, 2008–2009, 2007–2009 and 2005–2009

	Participants[(a)]	Population[(b)]	Adjusted population[(c)]	AS rate[(d)]	95% CI
2-year 2008–2009	3,638,941	7,028,243	6,247,210	58.6	58.5–58.6
3-year 2007–2009	4,412,672	6,952,169	6,180,746	71.6	71.5–71.6
5-year 2005–2009	5,105,464	6,816,737	6,064,292	84.0	83.9–84.1

(a) Participants are the number of women screened in each 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, where only residents of the jurisdiction (and in some cases some immediate border residents) are included.

(b) Population is the ABS estimated resident population for women aged 20–69 years averaged over the 2, 3 or 5 years.

(c) Adjusted population is the number of ABS estimated resident population for women aged 20–69 years adjusted to include only women with an intact cervix using age-specific hysterectomy fractions derived from the AIHW National Hospitals Morbidity Database.

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

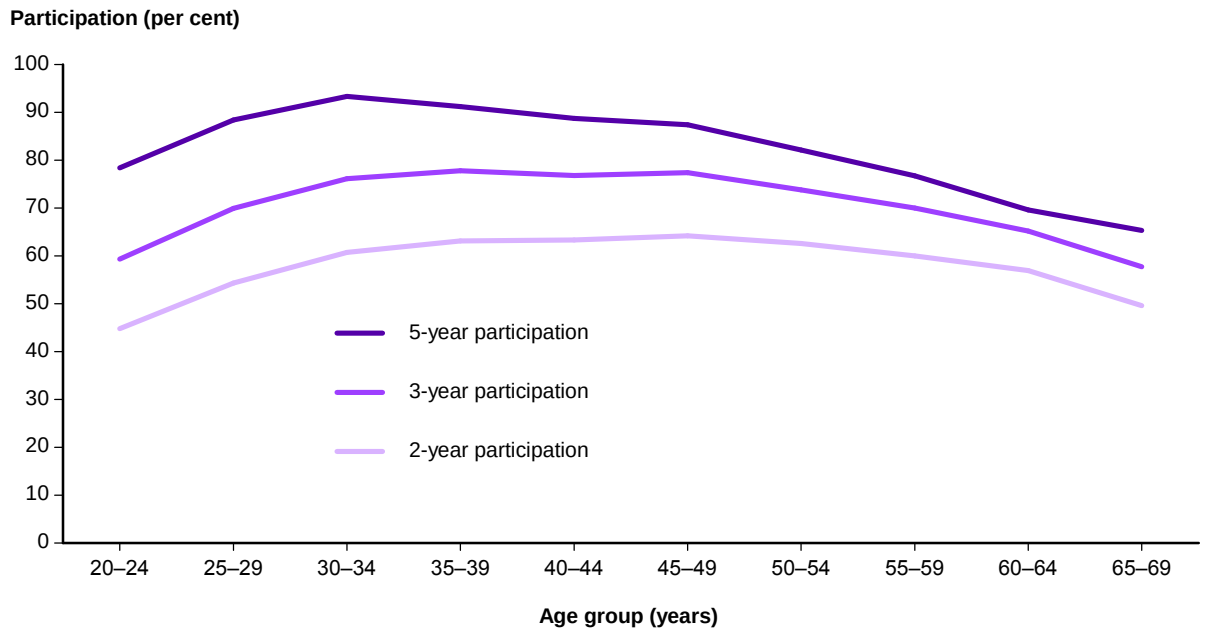
Source: AIHW analysis of state and territory cervical cytology register data.

Comparing participation in each of the 5-year age groups (Figure 1.4) reveals that the age-structure of participation differs when this is calculated over 3 or 5 years instead of 2 years.

The main effect of measuring participation over a 3-year or 5-year period is to include a proportionally greater number of women in the younger age groups. This shifts the peak participation from women aged 45–49 years in 2008–2009 to women aged 30–34 years for the 5-year period 2005–2009 (Figure 1.4).

The age group with the lowest participation also changes from women aged 20–24 years for 2008–2009 to women aged 65–69 years for the 5-year period 2005–2009 (Figure 1.4).

Women aged 20–69 years comprised 95.1% of all women participating in the NCSP in the 3 years 2007–2009, and 94.0% in the 5 years 2005–2009. Outside the target age group, women aged less than 20 years increased from 3.0% of all women screened in the 2 years 2008–2009, to 4.4% of women screened in the 5 years 2005–2009. In contrast, women aged 70 years and over comprised 1.3% of women screened in 2008–2009 and 1.6% in 2005–2009.



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

Figure 1.4: Two-year, three-year, and five-year participation, women aged 20–69 years, 2008–2009, 2007–2009 and 2005–2009

International comparisons

Participation in cervical screening in selected countries is shown in Table 1.6, measured over an interval of 3, 3.5 or 5 years in line with the longer screening interval inherent to cervical screening programs in many other countries. Participation in the NCSP over 2, 3 and 5 years is shown for comparison.

New Zealand's cervical screening program, like Australia's, has a target age group of women aged 20–69 years, but has a recommended screening interval of 3 years. New Zealand's most recent data estimate that 71.5% of women aged 20–69 years were screened in 2005–2007 (Centre for Public Health Research 2008), which is essentially the same as Australia's 3-year participation of 71.6%.

England's cervical screening program is a little more complex, in that women aged 25–49 years are invited to screen every 3 years, while women aged 50–64 years are invited to screen every 5 years. England's most recent data for 2009–10 estimate that 74.0% of women aged 25–49 years were screened in the previous 3.5 years, and that 78.9% of women aged 50–64 years were screened in the previous 5 years (The NHS Information Centre Public Health Indicators and Population Statistics team 2010). Again, these figures are very similar to Australia's estimated 3-year participation of 75.6% for women aged 25–49 years, and to the estimated 5-year participation of 77.1% for women aged 50–64 years.

Other international cervical screening programs with a variety of target age ranges include Wales, with 76.5% of women aged 20–64 years screened in the 3.5 years previous to 2009–10 (Cervical Screening Wales 2010) and Scotland, with 73.7% of women aged 20–60 years screened in the 3.5 years previous to 2009–10 (ISD Scotland 2010). Screening participation estimates from several European countries sourced from Anttila et al. (2009) were also included in Table 1.6, but these estimates are not directly comparable to each other or to

Australia's estimates due to variations, not only in different screening intervals and target age groups, but also whether opportunistic cytology is included or excluded from the estimates in some European countries (Anttila et al. 2009).

Table 1.6: Cervical screening participation by country, screening interval and target age group

Country	Screening interval	Age group	Participation (%)
Australia	2 years	20–69	58.6
Australia	3 years	20–69	71.6
New Zealand [1]	3 years	20–69	71.5
Wales [2]	3 years	20–64	76.5
Scotland [3]	3 years	20–60	73.7
Denmark [4]	3 years	23–59	69
Sweden [4]	3 or 5 years	23–60	73
England [5]	3 or 5 years	25–64	detailed separately below
Australia	5 years	20–69	84.0
Finland [4]	5 years	30–60	>70 (surveys suggest >90)
Netherlands [4]	5 years	30–60	77
Australia	3 years	25–49	75.6
England [5]	3 years	25–49	74.0
Australia	5 years	50–64	77.1
England [5]	5 years	50–64	78.9

Note: Caution is advised when making comparisons between Australia's cervical screening program and those from other countries due to inherent differences in program structure and operation, as well as differences in the target age group and recommended screening interval, and even inherent differences in the methodology used to calculate participation rates (including hysterectomy adjustments).

Sources: (1) Centre for Public Health Research 2008; (2) Cervical Screening Wales 2010; (3) ISD Scotland 2010; (4) Anttila et al. 2009; (5) The NHS Information Centre Public Health Indicators and Population Statistics team 2010.

Indicator 2.1 Early rescreening

Early rescreening at a glance

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

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 2008.

Key results

2008 cohort

- 15.1% of women aged 20–69 years with a negative cytology test in February 2008 rescreened early (within 21 months).

Trends

- The 15.1% of women in the 2008 cohort who rescreened early is lower than the 20.7% of women in the 2007 cohort who rescreened early, which is a positive trend. However, caution is advised when comparing these figures, since a change in definition of this indicator between the 2007 and 2008 cohorts would have contributed to this decrease.

Detailed analyses

Early rescreening in the 2008 cohort

Of the 161,779 women aged 20–69 years who had negative cytology in February 2008 with no abnormalities in the preceding 36 months, 24,455 women (15.1%) rescreened early, with the remaining 137,324 women (84.9%) having no repeat cytology tests within 21 months of this negative cytology test (Table 2.1).

This means that around 15% 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 rescreening early following a negative cervical cytology test, by number of early rescreens, women aged 20–69 years, 2008 cohort

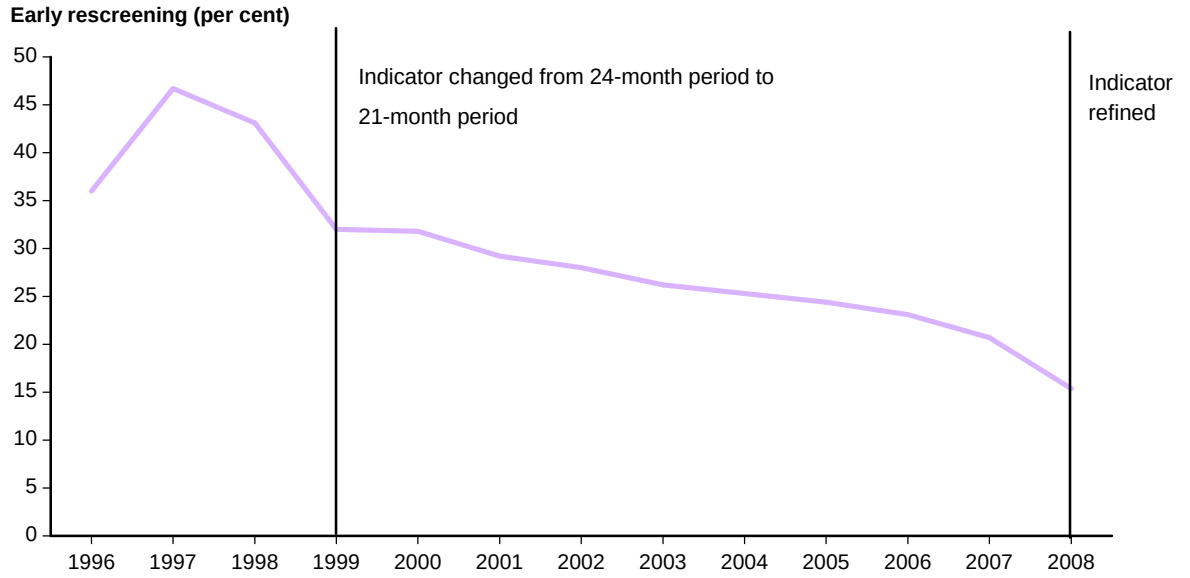
Early rescreens	Number of women	Per cent of women
0	137,324	84.9
1	23,692	14.6
2	698	0.4
3	59	0.0
4	5	0.0
5+	n.p.	n.p.

n.p. not published (numbers of 1 or 2 are not reported).

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



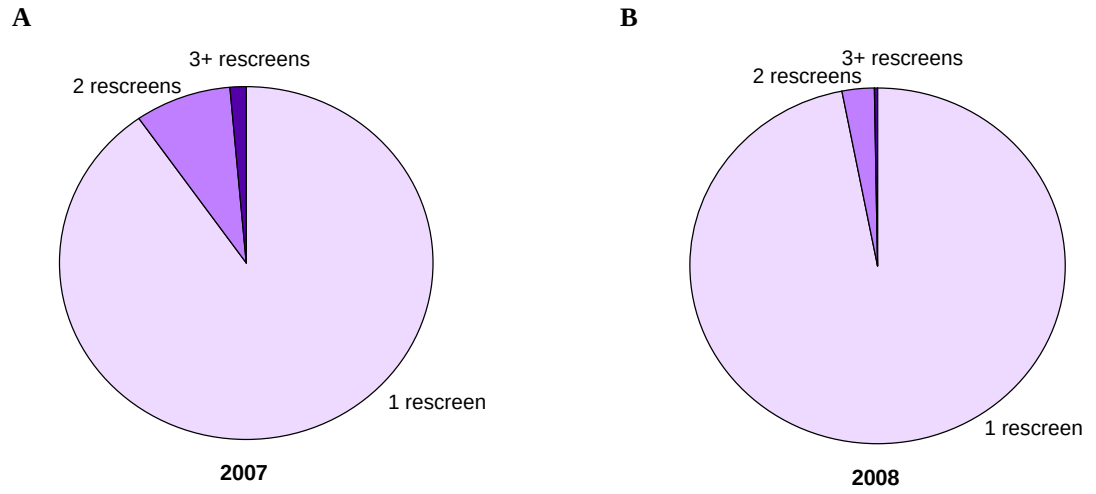
Source: AIHW analysis of state and territory cervical cytology register data.

Figure 2.1: Proportion of women rescreening early following a negative cervical cytology test, women aged 20–69 years, 1996 to 2008 cohorts

The definition of early rescreening for the 2008 cohort differs from previous years, in so far as women in the earlier cohorts with previous abnormalities (for whom annual screening may be appropriate) were not excluded from entering the cohort, and repeat cytology tests that are a valid repeat of an abnormal cytology test or unsatisfactory cytology test within the 21 months contributed to the total number of early rescreens.

Considering that the trend of early rescreens decreased steadily over time prior to the change in definition for the 2008 cohort, from 32.0% in the 1999 cohort to 20.7% in the 2007 cohort (Figure 2.1), it is likely that the change in definition has only contributed to what would have already been a further decrease, rather than being wholly responsible for this. 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).

For those women in the cohort who did rescreen early, the *number* of early rescreens was also affected by the change in definition. In 2007, of the 34,026 women in the cohort who rescreened early, 90.3% had only one rescreen, 8.3% had two rescreens, and 1.4% had three or more rescreens. In contrast, in 2008, of the 24,455 women in the cohort who rescreened early, 96.9% only had one rescreen, 2.9% had two rescreens, and just 0.3% had three or more rescreens within the 21 months (Figure 2.2). This trend is due to the removal of repeat cytology tests following abnormal or unsatisfactory cytology tests from the total counts for the 2008 cohort onwards, since both of these are valid reasons for an early rescreen.



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

Figure 2.2: Distribution of women rescreening early (one rescreen, two rescreens, and three or more rescreens), women aged 20–69 years, 2007 cohort (A) and 2008 cohort (B)

Early rescreening by state and territory

The proportion of women rescreening early varied across states and territories between 10.7% and 15.9% of the cohort (Table 2.2).

Table 2.2: Proportion of women rescreening early following a negative cervical cytology test, by state and territory, women aged 20–69 years, 2008 cohort

State/territory	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
Per cent	15.4	15.9	15.8	14.6	12.1	10.7	12.3	13.6	15.1

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

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

Rescreening after a reminder letter at a glance

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 years.

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 (not within 3 months of *receiving* a reminder letter).

The most recent (and only) rescreening after 27-month cervical cytology register reminder letter data are for the women sent a reminder letter in 2008.

Key results

Letter sent in 2008

- 31.5% of women sent a 27-month cervical cytology register reminder letter in 2008 rescreened within 3 months of being sent this letter, indicating that this letter acts as a prompt for many women.

Detailed analyses

Rescreening after 27-month cervical cytology register reminder letters sent in 2008

In 2008, 27-month cervical cytology register reminder letters were sent to 720,245 women. Of these, 226,754 women (31.5%) rescreened within 3 months (Table 2.3).

This indicates that the reminder letter acts as a prompt to rescreen (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).

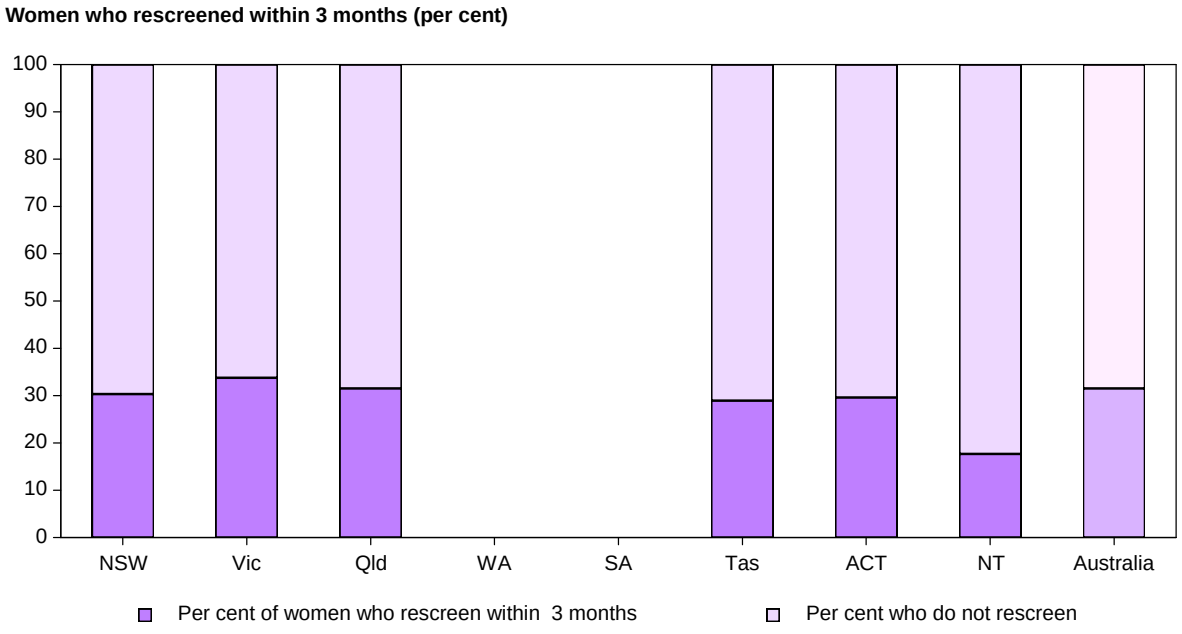
Table 2.3: Women aged 20–69 years rescreening within 3 months of 27-month cervical cytology register reminder letters sent in 2008

Year	Number sent letter	Number rescreened	Proportion rescreened
2008	720,245	226,754	31.5

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 close to 30% in all states and territories where this could be measured, except the Northern Territory (Figure 2.3).



Note: Data for women sent 27-month reminder letters in 2008 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 2.3: Proportion of women rescreening within 3 months of the 27-month cervical cytology register reminder letter, by state and territory, women aged 20–69 years, letters sent in 2008

Indicator 3 Cytology

Cytology at a glance

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

Rationale: 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 HPV vaccine introduced in 2007, which will be of relevance to the NCSP.

Guide to interpretation:

Several years of data are presented in this report—the first report in which cytology has been included—due to the need to establish patterns in cytology results prior to the introduction of the NHMRC Guidelines in July 2006 and the HPV vaccine in 2007, both of which have the potential to impact on cytology trends.

The most recent cytology data are for the years 2004, 2005, 2006, 2007, 2008 & 2009.

Key results

Cytology in 2009

- In 2009, there were over 2 million cytology tests performed (2,086,554 for women aged 20–69 years).
- 2.1% of cytology tests were unsatisfactory.
- 92.6% of cytology tests were negative.
- Younger women had a higher proportion of unsatisfactory tests and a lower proportion of negative tests.
- An endocervical component was present in 79.9% of cytology tests.

Abnormalities in 2009

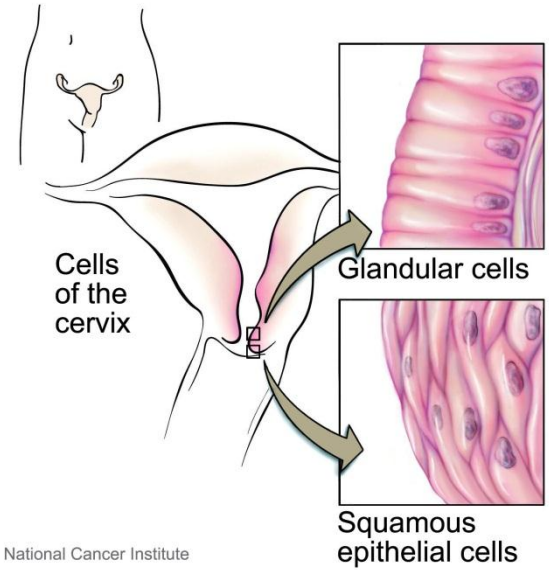
- 1.3% of cytology tests reported a definite or possible high-grade abnormality.
- 5.4% of cytology tests were reported as abnormal.

Abnormality trends

- The (age-standardised) detection of low-grade abnormalities decreased from 5.4% of cytology tests in 2004 to 4.0% in 2009 for women aged 20–69 years.
- The (age-standardised) detection of high-grade abnormalities was 1.3% of cytology tests for most years between 2004 and 2009 for women aged 20–69 years.

Background information

Cervical cytology using the conventional Papanicolaou smear (Pap test) is the primary screening tool of the National Cervical Screening Program (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.



Source: Reproduced with permission by the National Cancer Institute.

Illustration 3.1: Anatomy: Cells of the Cervix

Since most cervical abnormalities and cervical cancer are detected in 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) the objective of the Pap test is to collect a sample of cells from the transformation zone (CDHSH 1993). Sampling the transformation zone means that both squamous cells and glandular cells are likely to be collected during the Pap test. In fact, the presence of glandular cells from the endocervical canal provides an indication that the transformation zone has been sampled (CDHSH 1993).

The NCSP developed the National Cervical Cytology Coding Sheet based on the Australian Modified Bethesda System (AMBS) 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 but not an endocervical abnormality, an endocervical abnormality but not a squamous abnormality, or, more rarely, may indicate the presence of concurrent squamous and endocervical abnormalities within the cervical cytology sample.

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

Unsatisfactory and *Negative* cytology results are overall results that combine squamous and endocervical result categories, whereas *No endocervical component* presents the total number of tests for which no endocervical component was present in the sample collected (the absence of which does not make the overall cytology test result unsatisfactory).

Squamous abnormalities and endocervical abnormalities are presented separately as the total number of tests in each of the squamous and endocervical abnormality categories defined by the National Cervical Cytology Coding Sheet listed earlier.

Squamous abnormalities include *S2 Possible low-grade squamous intraepithelial lesion* to *S7 Squamous cell carcinoma*, while endocervical abnormalities include *E2 Atypical endocervical cells of uncertain significance* to *E6 Adenocarcinoma* (shaded 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 2009

In 2009, there were 2,175,383 cervical cytology tests performed, 2,086,554 (95.9%) of these for women aged 20–69 years (Table 3.2).

Cytology trends

There were over 2 million cervical cytology tests performed each year between 2004 and 2009, peaking at 2,191,238 cytology tests in 2007 (Table 3.2). Around 95% of cytology tests were for women aged 20–69 years for all years between 2004 and 2009.

Table 3.2: Number of cytology tests by age, 2004 to 2009

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

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

Overall, from 2004 to 2009, there was a 2.7% increase in the number of cytology tests performed on women of all ages and a 3.4% increase for women aged 20–69 years. Of note, while only two age groups within the target range saw a decrease in the number of cytology tests (women aged 30–34 years and 40–44 years), all age groups outside the target range saw a decrease in the number of cytology tests, with a 10.9% decrease in women aged less than 20 years and a 13.4% decrease in women aged 70 years and over. Within the target age group, the greatest increase in the number of cytology tests of 31.4% was for women aged 60–64 years (Table 3.2).

Cytology by age

In 2009, 95.9% of the 2,175,383 cytology tests performed that year were in women aged 20–69 years (Table 3.2). Women aged 35–39 years had the greatest number of tests of all age groups, with 281,300 tests in 2009, comprising 12.9% of all cervical cytology tests performed in 2009 (Table 3.2).

Only 4.1% of cytology tests were in women outside the target age group of 20–69 years, with 2.8% in women aged less than 20 years and the remaining 1.3% in women aged 70 years or over.

Cytology by state and territory

As expected, the number of cytology tests decreased with decreasing population size (and number of women screened—see Table 1.2) in each state and territory (Table 3.3).

Table 3.3: Number of cytology tests, by age, by state and territory, 2009

Age group (years)	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
<20	17,544	11,611	15,087	8,333	4,397	1,849	1,135	857	60,813
20–24	57,557	50,842	43,626	24,237	15,201	4,920	3,943	2,625	202,951
25–29	76,860	64,946	50,355	27,035	17,553	5,053	4,793	3,257	249,852
30–34	82,880	69,598	50,617	26,960	17,263	5,168	4,501	3,008	259,995
35–39	88,514	75,851	55,028	28,813	19,676	5,916	4,591	2,911	281,300
40–44	77,821	68,410	49,030	26,373	18,508	5,543	4,109	2,593	252,387
45–49	77,801	65,510	47,690	25,025	18,579	6,012	3,802	2,269	246,688
50–54	64,337	55,222	39,539	20,754	16,066	5,104	3,259	1,837	206,118
55–59	52,984	45,354	32,209	16,284	13,552	4,421	2,769	1,233	168,806
60–64	42,338	36,816	25,368	12,216	11,285	3,624	2,198	777	134,622
65–69	26,655	23,241	15,658	7,255	7,124	2,291	1,228	383	83,835
70+	9,640	7,007	4,948	2,472	2,923	570	350	95	28,005
All ages	**674,941**	**574,408**	**429,156**	**225,757**	**162,127**	**50,471**	**36,678**	**21,845**	**2,175,383**
Ages 20–69	**647,747**	**555,790**	**409,120**	**214,952**	**154,807**	**48,052**	**35,193**	**20,893**	**2,086,554**

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

Difference in age distribution of cytology tests between states and territories is likely influenced by the differing age structure of the underlying populations, with Tasmania being recognised as the 'oldest' jurisdiction of Australia at 30 June 2010 with a median age of 39.9

years, and the Northern Territory the 'youngest' jurisdiction with a median age of 31.3 years, followed by the Australian Capital Territory with a median age of 34.7 years (ABS 2010). Thus it is to be expected that Tasmania would have a greater proportion of cytology tests in older women, and that the Australian Capital Territory and the Northern Territory would have a greater proportion of cytology tests in younger women, as observed.

Unsatisfactory cytology in 2009

In 2009, of the 2,086,554 cytology tests performed for women aged 20–69 years, 43,104 (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 across the years 2004 to 2009 at between 2.0% and 2.2% of all cytology tests (Table 3.4).

Table 3.4: Unsatisfactory cytology tests, women aged 20–69 years, 2004 to 2009

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

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% of all specimens reported.

The proportion of cytology tests that were unsatisfactory, 2.1% in 2009 (Table 3.4), fall within these benchmark standards (Box 3.1) and would therefore be considered appropriate.

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

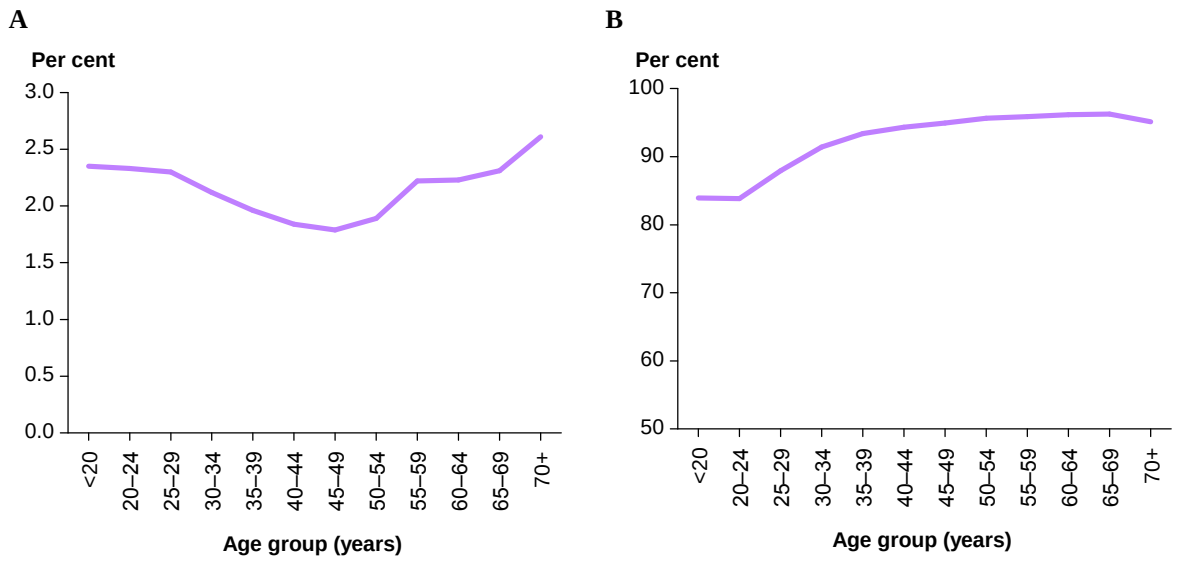
Between 0.5 per cent and 5 per cent of all specimens reported as unsatisfactory

Calculated value for 2009

2.1%

Unsatisfactory cytology by age

The proportion of cytology tests that were unsatisfactory differs by age. Both younger and older women have higher unsatisfactory rates (2.4% and 2.6%, respectively), with women aged 35–54 years experiencing the lowest proportion of unsatisfactory cytology tests of less than or equal to 2.0% (Figure 3.1A).



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

Figure 3.1: Proportion of cytology tests that were unsatisfactory (A) or negative (B), by age, 2009.

Unsatisfactory cytology by state and territory

In 2009, the majority of states and territories had unsatisfactory cytology tests comprising between 2.0% and 2.5% of all cytology tests (Table 3.5).

The exceptions to this were New South Wales, with a notably lower rate of 1.6% of all cytology tests (down from 2.6% in 2004 for this state), and Tasmania, with a notably higher unsatisfactory rate of 4.3% of all cytology tests (an increase from 2.2% in 2004).

Table 3.5: Unsatisfactory cytology tests, by state and territory, women aged 20–69 years, 2009

	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
Number	10,334	12521	7,963	5,391	3,612	2,043	746	494	43,104
Crude rate	1.6	2.3	1.9	2.5	2.3	4.3	2.1	2.4	2.1
AS rate	1.6	2.3	2.0	2.5	2.3	4.3	2.1	2.3	2.1
95% CI	1.6–1.6	2.2–2.3	1.9–2.0	2.4–2.6	2.3–2.4	4.1–4.4	2.0–2.3	2.1–2.6	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 2009

In 2009, of the 2,086,554 cytology tests performed for women aged 20–69 years, 1,931,682 (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

Most cervical cytology tests had a negative result. Between 2004 and 2009, the proportion of negative cytology tests rose slightly from 91.2% to 92.6% of all cytology tests performed for women aged 20–69 years (Table 3.6).

Table 3.6: Negative cytology tests, women aged 20–69 years, 2004 to 2009

	2004	2005	2006	2007	2008	2009
Number	1,839,464	1,872,910	1,857,552	1,922,592	1,891,705	1,931,682
Crude rate	91.2	91.2	91.5	91.8	92.0	92.6
AS rate	91.3	91.3	91.6	91.9	92.1	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

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 2009, the proportion of cytology tests that were negative was lowest for women less than 25 years, at just below 84% of cytology tests. From 25 years of age onwards, the proportion of cytology tests that were negative increased for each age group, peaking at 96.3% for women aged 65–69 years (Figure 3.1B).

Negative cytology by state and territory

There was very little variation in the proportion of cytology tests that were negative across states and territories, ranging between 90.0% and 93.9% for women aged 20–69 years in 2009 (Table 3.7).

Table 3.7: Negative cytology tests, by state and territory, women aged 20–69 years, 2009

	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
Number	608,464	507,331	382,356	195,058	143,726	43,250	32,361	19,136	1,931,682
Crude rate	93.9	91.3	93.5	90.7	92.8	90.0	92.0	91.6	92.6
AS rate	93.9	91.2	93.5	91.1	92.7	89.8	92.3	92.3	92.6
95% CI	93.6–94.1	91.0–91.5	93.3–93.8	90.7–91.5	92.3–93.2	89.0–90.7	91.2–93.3	90.9–93.7	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.

No endocervical component in 2009

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.

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

In 2009, of the 2,086,554 cytology tests performed for women aged 20–69 years, 418,527 (20.1%) 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 2009. While the number of cytology tests for women aged 20–69 years increased 3.4% from 2004 to 2009, the number of cytology tests with no endocervical component increased 19.4% from 350,670 in 2004 to 418,527 in 2009. This is reflected in the steady increase in the proportion of cytology tests with no endocervical component from 17.4% in 2004 to 20.1% in 2009 for women aged 20–69 years (Table 3.8). This trend holds after age-standardisation (Table 3.8).

While Australia has not developed a clear definition of a satisfactory specimen for cervical cytology purposes (NPAAC 2006), the 2007–2009 National Cancer Prevention Policy of the Australian Cancer Council states that 'presence of an endocervical component in 80% of Pap tests is generally considered acceptable' (The Cancer Council Australia 2007). In this context, the 2009 age-standardised rate of 20.3%, which indicates the presence of an endocervical component in 79.7% of cervical cytology tests, may be considered acceptable, although technically outside the desired range.

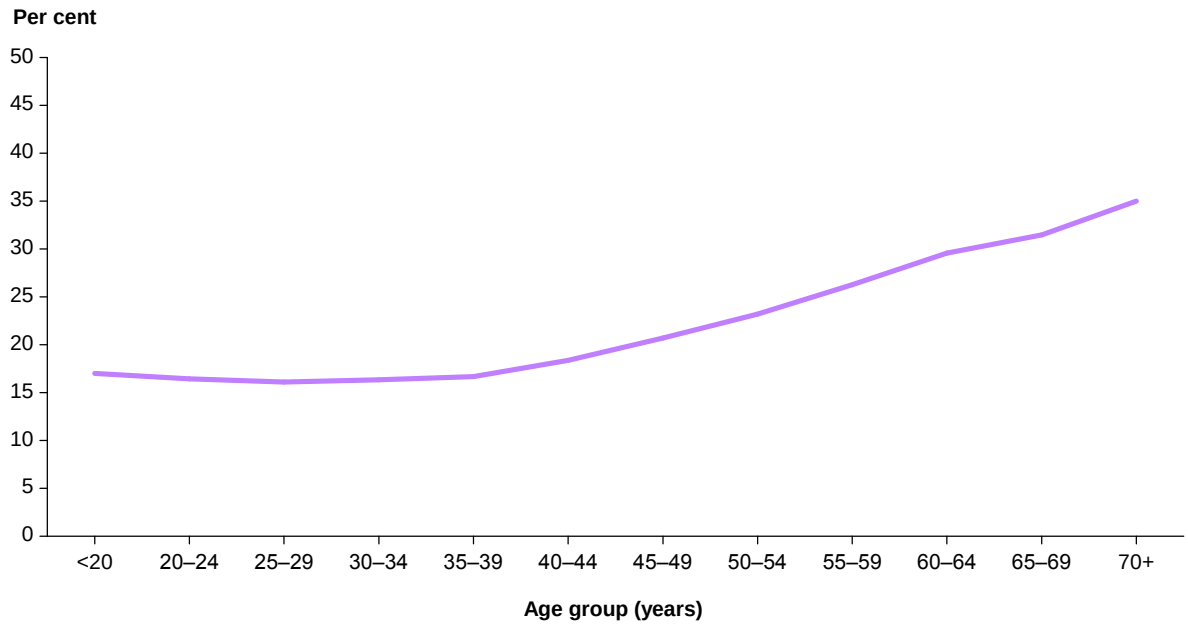
Table 3.8: Cytology tests with no endocervical component, women aged 20–69 years, 2004 to 2009

	2004	2005	2006	2007	2008	2009
Number	350,670	379,531	387,918	406,736	407,942	418,527
Crude rate	17.4	18.5	19.1	19.4	19.8	20.1
AS rate	17.9	19.0	19.5	19.8	20.2	20.3
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

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



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

Figure 3.2: Proportion of cytology tests with no endocervical component by age, 2009

Younger women had a lower proportion of cytology tests with no endocervical component, with just over 16% of all cytology tests performed in 2009 lacking endocervical cells for women aged between 20 and 39 years (Figure 3.2).

In contrast, an endocervical component was absent from more than 20% of cytology tests for women aged 50–54 years, from more than 30% of cytology tests for women aged 65–69 years, and from 35% of cytology tests performed in women aged 70 years and over (Figure 3.2).

This trend aligns with the movement of the transformation zone with age; the proportion of women with a transformation zone located on the exocervix 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 exocervix.

No endocervical component by state and territory

The proportion of cytology tests for which there was no endocervical component ranged between 17.4% and 28.7% across states and territories for women aged 20–69 years in 2009 (Table 3.9). Age-standardisation had little effect on these figures.

Table 3.9: Cytology tests with no endocervical component, by state and territory, women aged 20–69 years, 2009

	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
Number	112,529	130,865	72,029	47,919	29,245	13,767	7,272	4,901	418,527
Crude rate	17.4	23.5	17.6	22.3	18.9	28.7	20.7	23.5	20.1
AS rate	17.6	23.8	17.9	23.0	18.9	28.4	21.1	24.8	20.3
95% CI	17.5–17.7	23.6–23.9	17.7–18.0	22.7–23.2	18.7–19.1	27.9–28.9	20.6–21.6	24.1–25.6	20.3–20.4

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 2009

The majority of cytology tests do not detect an abnormality—either squamous or endocervical in origin.

In 2009, an abnormality (low-grade, high-grade or cancer) was detected in 112,188 (5.4%) of the 2,086,554 cytology tests for women aged 20–69 years. Of these, 74.8% were low-grade and 25.0% were high-grade, cancer making up the remainder (Table 3.10).

Abnormality trends

The detection of abnormalities decreased from 6.8% of cytology tests in 2004 to 5.4% in 2009 (from 6.7% to 5.4% age-standardised) (Table 3.10).

This equates to a decrease in abnormalities detected from 137,010 out of 2,018,022 cytology tests in 2004 to 112,188 out of 2,086,554 cytology tests in 2009, for women aged 20–69 years (Table 3.10). Thus, while the total number of cytology tests increased over this time, the total number of abnormalities detected decreased.

The proportion of cytology tests reported as abnormal was within the standard of less than 14% recommended by the National Pathology Accreditation Advisory Council (NPAAC) *Performance Measures for Australian Laboratories Reporting Cervical Cytology* (NPAAC 2006) (Box 3.3), which was not developed as a standard for these data, but which nonetheless provides a useful benchmark.

Box 3.2 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, 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, although 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.

Disaggregating cytology data into the broad categories of low-grade and high-grade abnormalities reveals quite different trends between the two.

Low-grade abnormalities detected by cytology decreased considerably between 2004 and 2009, from 5.4% of cytology tests down to 4.0% of cytology tests for women aged 20–69 years (Table 3.9, Figure 3.3A). This decrease occurred across all age groups (Figure 3.3B).

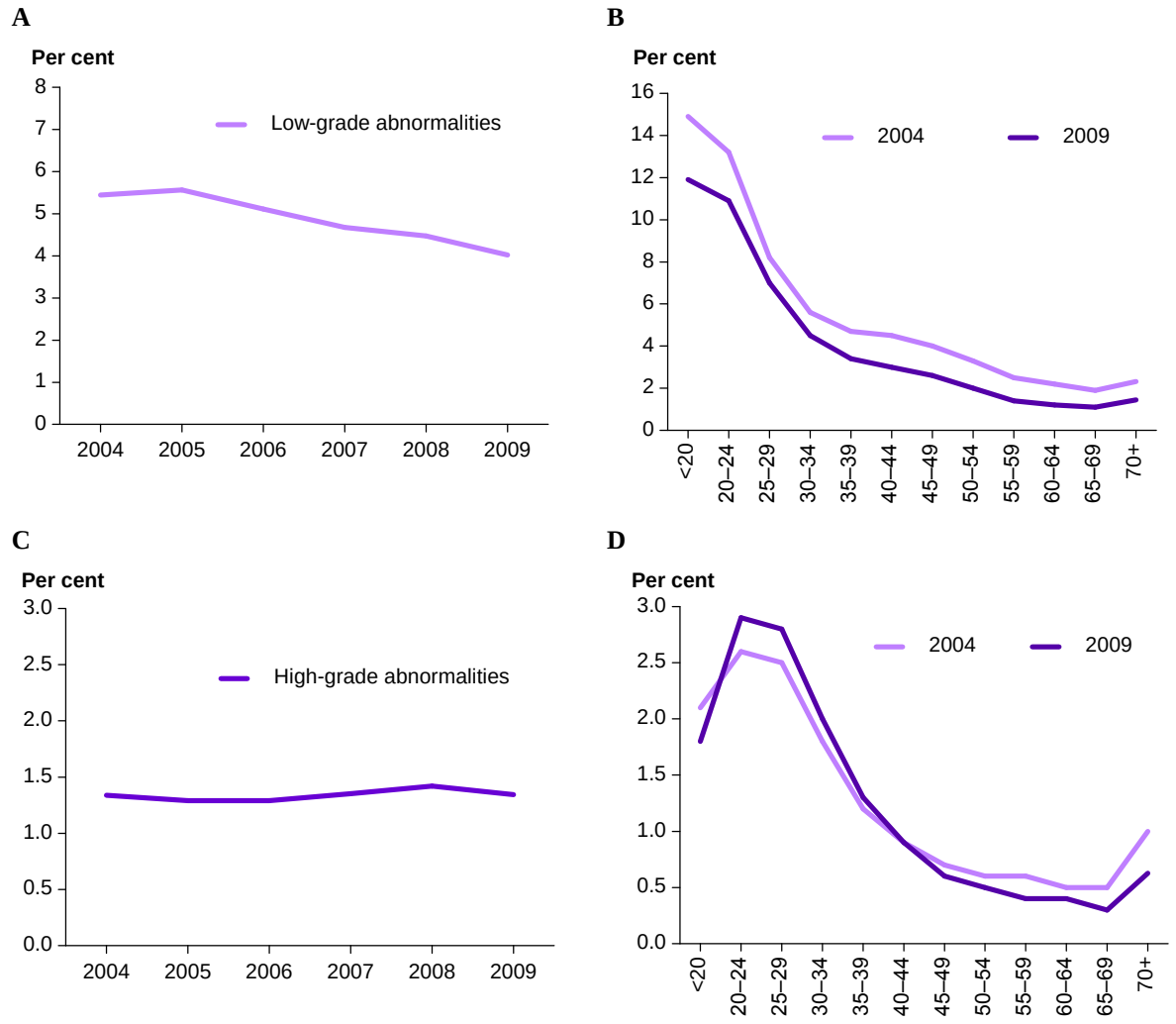
In contrast to low-grade abnormalities, the detection of high-grade abnormalities by cytology has remained stable at 1.3% of cytology tests for women aged 20–69 years for most years between 2004 and 2009 (Table 3.10, Figure 3.3C).

However, this was not a consistent trend for all age groups. Women aged less than 20 years, despite having a steady rate of high-grade abnormality detection between 2.1% and 2.4% of cytology tests between 2004 and 2008, fell to 1.8% in 2009 (Figure 3.3D). Data are needed from 2010 to know if this is the start of a downward trend for this age group.

For women aged 20–24 years, high-grade abnormalities showed a steady increase from 2.6% of cytology tests in 2004 to 3.3% of cytology tests in 2008, before decreasing to 2.9% in 2009. High-grade abnormalities decreased steadily from 2004 to 2009 for women aged between 50 and 69 years (Figure 3.3D). These age trends in the detection of low-grade and high-grade abnormalities by age group for 2004 to 2009 are available in the *Cervical screening in Australia 2008–2009: supplementary data tables*.

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 possible and high-grade abnormalities of at least 0.7%. It further recommends that the ratio of possible high-grade to definite high-grade abnormality to be less than 1.5:1. Again, although these were developed for a different purpose, they provide a useful benchmark for these data.

Calculation of these performance measures using cytology detection data for 2009 gave results of 1.3% and 0.7:1, respectively (Box 3.3), which would both be considered within the standards set for these measures.



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

Figure 3.3: Proportion of low-grade abnormalities detected by cytology, by year for 2004 to 2009 (A) and by age for 2004 and 2009 (B). Proportion of high-grade abnormalities detected by cytology, by year for 2004 to 2009 (C) and by age for 2004 and 2009 (D)

Box 3.3

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 per cent reported as definite or possible high-grade abnormality (age-standardised to the Australian 2001 Standard Population)

(ii) Not more than 14 per cent reported as abnormal

Calculated value for 2009

(i) 1.3%

(ii) 5.4%

Table 3.10: Abnormalities detected by cytology, women aged 20–69 years, 2004 to 2009

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

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.

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 or high-grade 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.

Squamous abnormalities detected in 2009

Squamous abnormalities are far more common than endocervical abnormalities, these comprising almost 99% of abnormalities detected in women aged 20–69 years in 2009.

In 2009, the 110,614 squamous abnormalities detected by cytology represent 5.3% of all cytology tests for women aged 20–69 years 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 detection of squamous abnormalities increased slightly over time, from 97.4% of abnormalities in 2004 (6.6% of all cytology tests in 2004), through to 98.6% in 2009 (5.3% of all cytology tests in 2009) (Figure 3.5A), with endocervical abnormalities decreasing correspondingly, from 2.6% of abnormalities in 2004 (0.2% of all cytology tests in 2004) to 1.4% of abnormalities detected in women aged 20–69 years in 2009 (0.1% of all cytology tests in 2009) (Figure 3.8A).

Table 3.11: Squamous abnormalities detected by cytology, by age, 2004 to 2009

Age group	2004	2005	2006	2007	2008	2009
			Per cent			
<20	16.9	17.6	17.4	16.3	15.7	13.7
20–24	15.7	16.3	16.0	15.2	15.1	13.8
25–29	10.6	10.9	10.9	10.4	10.5	9.7
30–34	7.2	7.3	6.9	6.7	6.8	6.4
35–39	5.7	5.7	5.4	5.0	5.0	4.6
40–44	5.2	5.2	4.7	4.3	4.2	3.8
45–49	4.5	4.5	4.0	3.8	3.6	3.2
50–54	3.7	3.6	3.2	2.9	2.8	2.4
55–59	3.0	3.0	2.5	2.2	2.0	1.8
60–64	2.7	2.6	2.1	1.8	1.7	1.6
65–69	2.4	2.4	1.9	1.7	1.7	1.4
70+	3.3	3.3	2.8	2.4	2.7	2.1
Ages 20–69 years						
Crude rate	6.6	6.7	6.3	5.9	5.8	5.3
AS rate	6.5	6.6	6.2	5.8	5.8	5.3
95% CI	6.5–6.5	6.6–6.6	6.2–6.2	5.8–5.9	5.7–5.8	5.3–5.3

Note: Crude rate is the number of squamous abnormalities (including squamous cell carcinoma) detected by cytology as a proportion of the total number of cytology tests; Age-standardised (AS) rate is the number of squamous abnormalities (including squamous cell carcinoma) 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 registry data.

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 2009; the former from 133,392 to 110,614 squamous abnormalities, the latter was from 6.6 to 5.3 squamous abnormalities per 100 cytology tests for women aged 20–69 years (Table 3.11).

The decrease in the number of squamous abnormalities occurred across all age groups (Table 3.11).

Table 3.12: Squamous abnormalities detected by cytology, by squamous category, women aged 20–69 years, 2004 to 2009

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

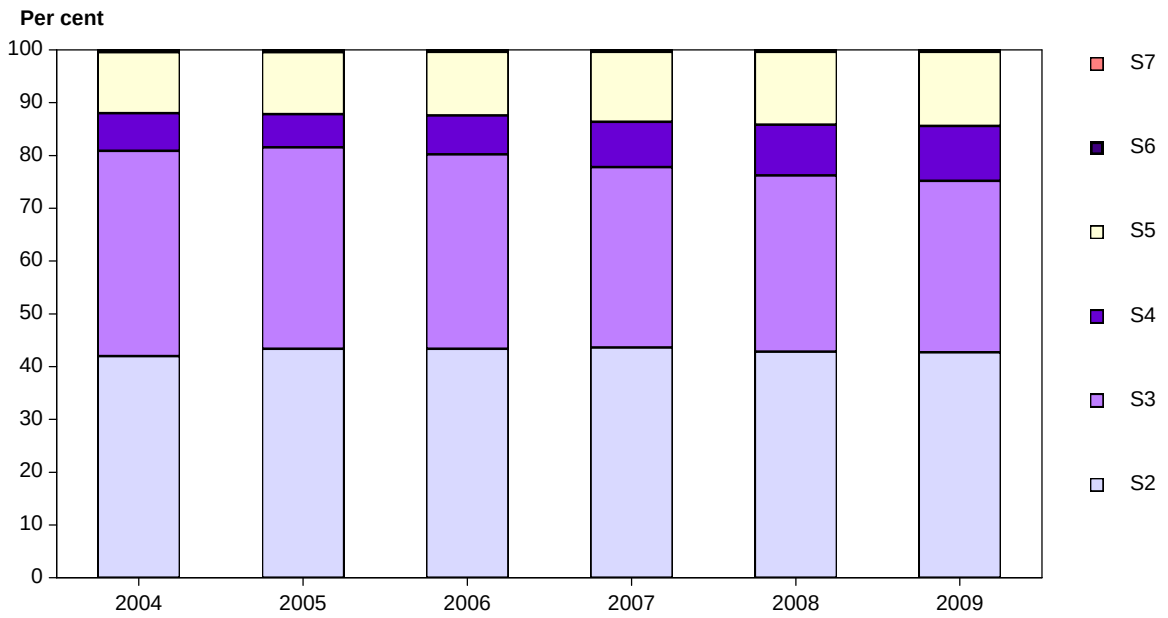
Note: Crude rate is the number of each squamous abnormality or of all squamous abnormalities combined detected by cytology as a proportion of the total number of cytology tests; Age-standardised (AS) rate is the number of all squamous abnormalities combined detected by cytology as a proportion of the 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 terms of the types of squamous abnormalities, two measures have been examined. First is the proportion of all cytology tests that each type of squamous abnormality comprises, and whether this follows the trend of decreasing squamous abnormalities over time as was found for all squamous abnormalities combined; second is the proportion of all squamous abnormalities that each type of squamous abnormality comprises, which will provide information as to the breakdown of squamous abnormalities, regardless of the total number of squamous abnormalities found. These are both shown in Table 3.12, with the latter also illustrated in Figure 3.4.

The proportion of cytology tests with the abnormality *S2 Possible low-grade squamous intraepithelial lesion* decreased over time from 2.8% in 2004 to 2.3% in 2009, consistent with the overall decrease in squamous abnormalities (Table 3.12). Possible low-grades comprised around 43% of squamous abnormalities over these years, making this the most frequently detected squamous abnormality (Figure 3.4).

The second most frequent squamous abnormality, *S3 Low-grade squamous intraepithelial lesion*, although comprising a similar proportion of cytology tests as possible low-grades in 2004 at 2.6% of all cytology tests, decreased notably to 1.7% of all cytology tests in 2009 for women aged 20–69 years (Table 3.12). The proportion of all squamous abnormalities that low-grades comprised also decreased over this time, from 38.9% in 2004 to 32.5% in 2009 (Figure 3.4).



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

Figure 3.4: Squamous abnormality categories (S2, S3, S4, S5, S6, and S7), as a proportion of all squamous abnormalities detected by cytology, women aged 20–69 years, by year, 2004 to 2009

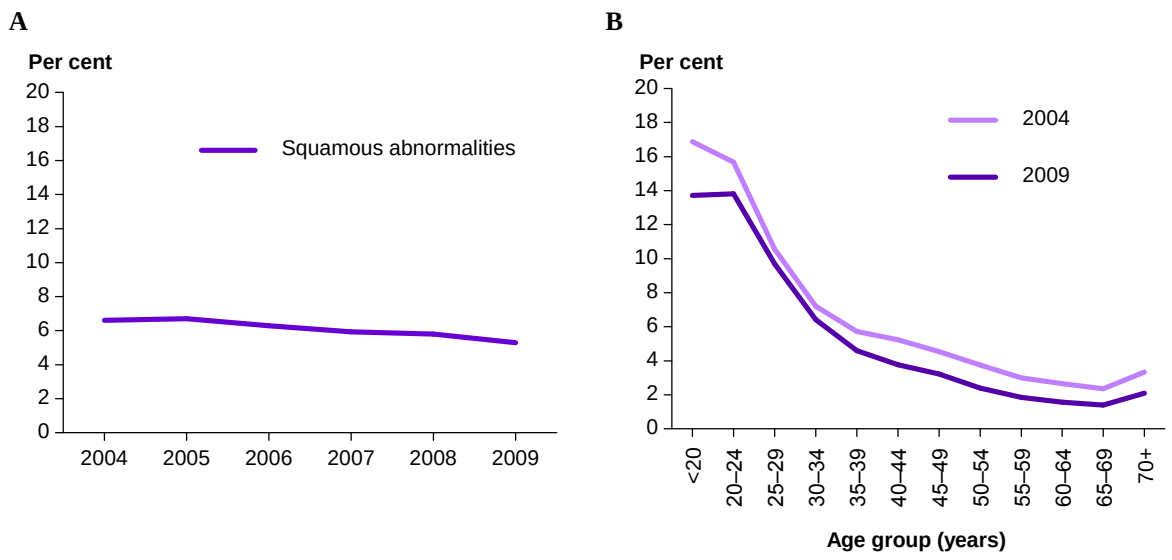
The squamous abnormality *S4 Possible high-grade squamous intraepithelial lesion* increased between 2004 and 2009, both as a proportion of all cytology tests (from 0.5% to 0.6%), and as a proportion of squamous abnormalities (from 7.1% to 10.4%) (Table 3.12, Figure 3.4). It is possible that the concurrent decrease in low-grades and increase in possible high-grades represents a shift in coding, with some abnormalities coded as possible high-grade in 2009 that may have previously been classified as low-grade.

S5 High-grade squamous intraepithelial lesion is the third most common squamous abnormality, being greater in number than possible high-grade abnormalities. As a proportion of all cytology tests, high-grades remained steady at 0.8% for all years between 2004 and 2009 (Table 3.12), although the proportion of squamous abnormalities that high-grades comprised increased slightly from 11.6% in 2004 to 14.0% in 2009 (Figure 3.4).

S6 High-grade intraepithelial lesion with possible microinvasion/invasion and *S7 Squamous cell carcinoma* are both very rare squamous abnormalities—of the 110,614 squamous abnormalities detected in women aged 20–69 years in 2009, 287 (0.01% of cytology tests and 0.3% of squamous abnormalities) were high-grades with possible invasion, and 141 (0.01% of cytology tests and 0.1% of squamous abnormalities) were squamous cell carcinoma. The trends for these two abnormalities appear to be constant for the years 2004 to 2009 (Table 3.12, Figure 3.4).

Squamous abnormalities by age

Squamous abnormalities are most commonly detected in younger women. In 2009, the greatest proportion of squamous abnormalities was found in women aged 24 years and under, at 14% of the total number of cytology tests. This fell to 10% for the 25–29 year age group, decreasing for every age group following to reach a low of 1.4% for women aged 64–69 years (Figure 3.5). There was an apparent small increase for women aged 70 years and over at 2% of all cytology tests performed in 2009.



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

Figure 3.5: Squamous abnormalities detected by cytology, as a proportion of all cytology tests, women aged 20–69 years, by year, 2004 to 2009 (A) and by age, 2004 and 2009 (B)

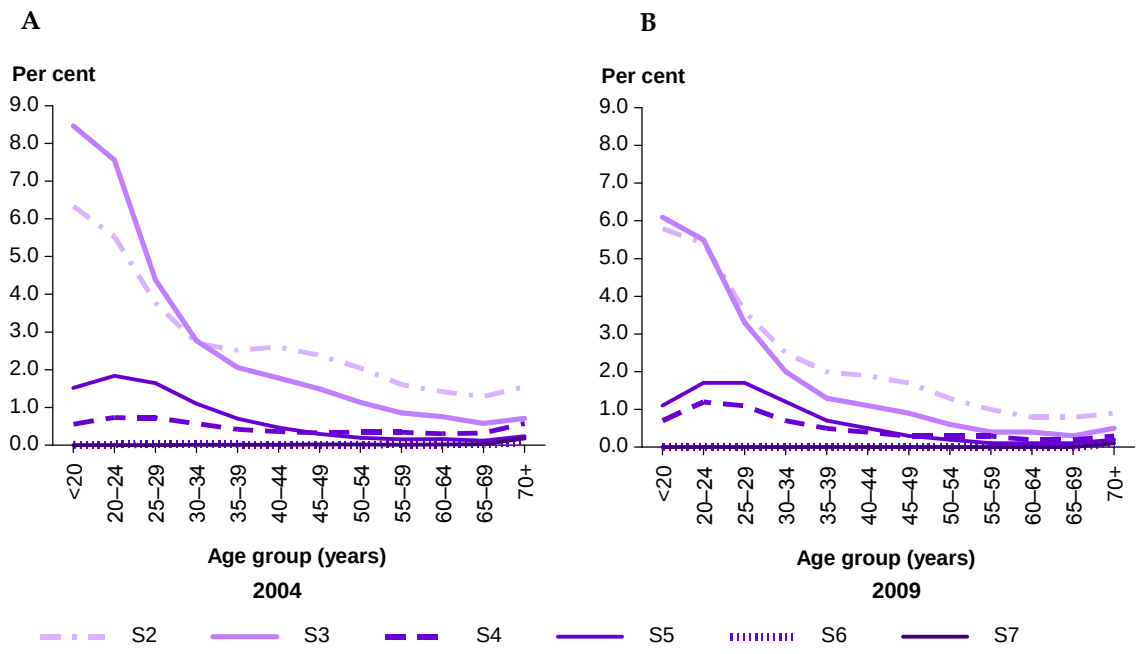
The age structure for all squamous abnormalities combined is, however, dictated by the two most common squamous abnormalities, with possible low-grades and low-grades together comprising 75% of all squamous abnormalities. Thus, while the trend in age structure described above for squamous abnormalities generally are true for the possible low-grade and low-grade squamous abnormalities, the less common squamous abnormalities reveal slightly different patterns.

While possible low-grades, low-grades, possible high-grades and high-grade squamous abnormalities all peak in younger women before decreasing sharply with increasing age, for possible low-grades and low-grades this peak occurs in women aged less than 20 years and in those aged 20–24 years (at 5% and 6% of cytology tests, respectively), whereas for possible high-grades and high-grades this peak occurs in women aged 20–24 years and 25–29 years, with lower rates seen in women aged less than 20 years (Figure 3.6). All four squamous abnormalities are at their lowest in women aged 64–69 years.

Of interest is the trend in detection of possible low-grades in women aged less than 20 years, which—despite being higher in this age group than the 20–24 years age group for all years from 2004 to 2008, was similar to that for women aged 20–24 years in 2009, at 5.8% compared with 5.4% of cytology tests. Data for 2010 are required to determine if this is the beginning of a trend.

Following the decrease with increasing age to 64–69 years, all squamous abnormalities show an apparent, albeit modest, increase in women aged 70 years and over (Figure 3.6). This includes high-grades with possible microinvasion and squamous cell carcinoma, whose numbers were too small to allow comparison across the younger age groups.

Data showing each squamous abnormality by age group from 2004 to 2009 are available in *Cervical screening in Australia 2008–2009: supplementary data tables*.



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

Figure 3.6: Squamous abnormality categories (S2, S3, S4, S5, S6 and S7) as a proportion of all cytology tests, by age, 2004 (A) and 2009 (B)

Squamous abnormalities by state and territory

Cytological abnormalities by state and territory focus on 2009 data since, prior to the introduction of new NHMRC Guidelines (NHMRC 2005) that included the introduction of nationally consistent cytology reporting across all states and territories in the form of the Australian Modified Bethesda System (AMBS) 2004 in July 2006, there were differences in

cytology codes used in each state and territory. Therefore any apparent trends are most likely due to coding changes that accompanied the introduction of the AMBS 2004 rather than a sudden change in underlying abnormality trends.

In 2009, possible low-grades and low-grades combined comprised between 68% and 79% of all squamous abnormalities, and possible high-grades and high-grades combined between 20% and 31%. High-grade abnormalities with possible invasion and squamous cell carcinoma combined represented less than 1% of all squamous abnormalities in all states and territories.

In 2009, the proportion of all squamous abnormalities was relatively consistent across states and territories, ranging between 4.4% and 6.7% of all cytology tests for women aged 20–69 years (Table 3.13).

Table 3.13: Squamous abnormalities detected by cytology, as a proportion of all cytology tests, by state and territory, women aged 20–69 years, 2009

	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
Number	28,681	35,590	18,602	14,349	7,334	2,736	2,070	1,252	110,614
Crude rate	4.4	6.4	4.5	6.7	4.7	5.7	5.9	6.0	5.3
AS rate	4.5	6.5	4.4	6.4	4.8	5.9	5.6	5.4	5.3
95% CI	4.4–4.5	6.4–6.5	4.4–4.5	6.3–6.5	4.7–4.9	5.6–6.1	5.3–5.8	5.1–5.7	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 2009

Endocervical abnormalities are very rare compared with squamous abnormalities, with the 1,574 endocervical abnormalities detected by cytology in 2009 comprising only 0.1% of all cytology tests and 1.4% of all abnormalities in women aged 20–69 years 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

Similar to squamous abnormalities, the number of endocervical abnormalities as well as the number of endocervical abnormalities as a per cent of all cytology tests decreased between 2004 and 2009. The number of endocervical abnormalities decreased from 3,618 in 2004 to 1,574 in 2009 (a 56.5% decrease). The number of endocervical abnormalities as a per cent of all cytology tests decreased accordingly from 0.2% to 0.1% for women aged 20–69 years (Table 3.14).

Large decreases occurred across all age groups, ranging from a 27.0% decrease for women aged 60–64 years to a 63.1% decrease for women aged 20–24 years. Outside the target age group, there was a 33.3% decrease for women 70 years and over, and a 78.2% decrease for women 20 years and under—the latter from 55 endocervical abnormalities in 2004 to 12 in

2009 (Table 3.14), which is disproportionate to the 10.9% decrease in the number of cytology tests performed for women aged less than 20 years over this same period (Table 3.2).

Table 3.14: Endocervical abnormalities detected by cytology, by age, 2004 to 2009

Age group	2004	2005	2006	2007	2008	2009
			Per cent			
<20	0.08	0.07	0.05	0.02	0.03	0.02
20–24	0.13	0.10	0.09	0.07	0.07	0.05
25–29	0.19	0.16	0.14	0.10	0.12	0.09
30–34	0.22	0.19	0.14	0.13	0.13	0.10
35–39	0.21	0.19	0.16	0.10	0.12	0.09
40–44	0.20	0.18	0.13	0.11	0.09	0.08
45–49	0.21	0.19	0.13	0.10	0.11	0.08
50–54	0.18	0.16	0.12	0.10	0.09	0.07
55–59	0.11	0.11	0.08	0.07	0.06	0.05
60–64	0.09	0.08	0.08	0.06	0.05	0.05
65–69	0.10	0.07	0.07	0.06	0.06	0.04
70+	0.23	0.21	0.23	0.22	0.27	0.18
Ages 20–69 years						
Crude rate	0.18	0.16	0.12	0.10	0.10	0.08
AS rate	0.17	0.15	0.12	0.10	0.10	0.07
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

Note: Crude rate is the number of endocervical abnormalities combined detected by cytology as a proportion of the total number of cytology tests; age-standardised (AS) rate is the number of endocervical 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 registry data.

Similar to squamous abnormalities, two measures have been examined for the different types of endocervical abnormalities. First is the proportion of all cytology tests that each type of endocervical abnormality comprises, although the very small number of endocervical abnormalities limits the usefulness of this measure; second is the proportion of all endocervical abnormalties that each type of endocervical abnormality comprises, which will provide information as to the breakdown of endocervical abnormalities, regardless of the total number of endocervical abnormalities found. These are both shown in Table 3.15, with the latter also illustrated in Figure 3.7.

E2 Endocervical cells of uncertain significance represent abnormal glandular cells in a cervical cytology sample that are not sufficient to be considered adenocarcinoma in situ (NHMRC 2005). The proportion of cytology tests with the abnormality endocervical cells of uncertain significance decreased over the period examined, from 0.09% of cytology tests in 2004 and 2005 to 0.04% of cytology tests in 2009 for women aged 20–69 years (Table 3.15). In terms of the number of abnormalities, this decrease was from 1,886 in 2004 to 746 in 2009.

Because this decrease began in 2006, it is possible that this is related to the new NHMRC Guidelines. These Guidelines recommend that *E2 Endocervical cells of uncertain significance* be managed as though a high-grade abnormality, whereas previous Guidelines recommended this be managed as though a low-grade abnormality.

Endocervical cells of uncertain significance comprise the greatest proportion of all endocervical abnormalities, at above 50% for all years except 2009, where it was 47.4% (Figure 3.7).

Table 3.15: Endocervical abnormalities detected by cytology, by endocervical category, women aged 20–69 years, 2004 to 2009

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

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.

The next most frequent endocervical abnormality was *E3 Possible high-grade endocervical glandular lesion*, comprising 29.3% of all endocervical abnormalities in 2009 (Figure 3.7). Like endocervical abnormalities of uncertain significance, both the number of possible high-grade glandular lesions and the proportion these comprise of all cytology tests decreased between 2004 and 2009. The former from 1,344 to 461, and the latter from 0.07% to 0.02% of cytology tests, for women aged 20–69 years (Table 3.15).

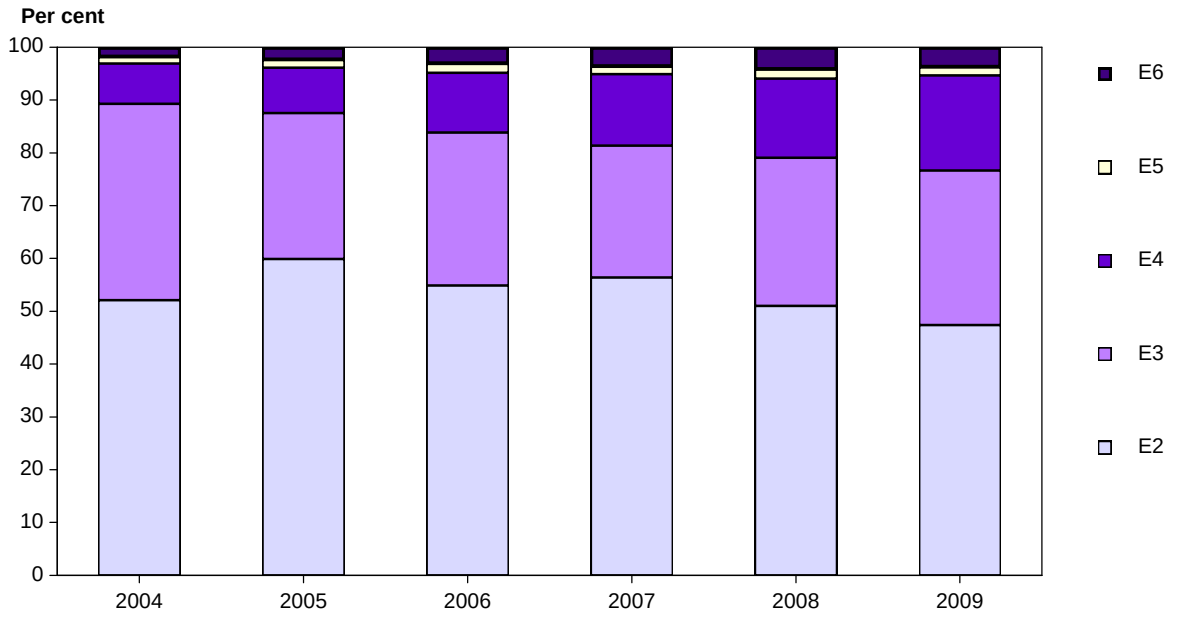
The number of endocervical abnormalities of the type *E4 Adenocarcinoma in situ* has remained stable over the period examined, ranging only between 274 and 299 over the period between

2004 and 2009 for women aged 20–69 years, comprising 0.01% of all cytology tests for all years (Table 3.15). Because the number of cytology tests and endocervical abnormalities have both fallen over this period, however, this stability in the number of adenocarcinoma in situ abnormalities means that the proportion of endocervical abnormalities comprised by adenocarcinoma in situ has increased steadily between 2004 and 2009, from 7.6% in 2004 to 18.0% in 2009 (Figure 3.7).

E5 Adenocarcinoma in situ with possible microinvasion/invasion make up a very small proportion of endocervical abnormalities (Figure 3.7), with the 24 abnormalities of this type in 2009 representing just 1.5% of endocervical abnormalities detected in this year (the proportion of all cytology results is too low to report).

E6 Adenocarcinoma occurs more frequently than adenocarcinoma in situ, with the 60 abnormalities of this type comprising 3.8% of glandular abnormalities in 2009, an increase from the 1.9% in 2004 from an almost identical number of abnormalities, with 67 detected in 2004 for women aged 20–69 years (Table 3.15).

Although far rarer than squamous abnormalities, of the endocervical abnormalities that do occur, cervical cancer makes up a far greater proportion, with *E6 Adenocarcinoma* comprising 3.8% of endocervical abnormalities in 2009 (Figure 3.7), compared with squamous cell carcinoma, which comprised just 0.1% of squamous abnormalities in that year (Figure 3.4).



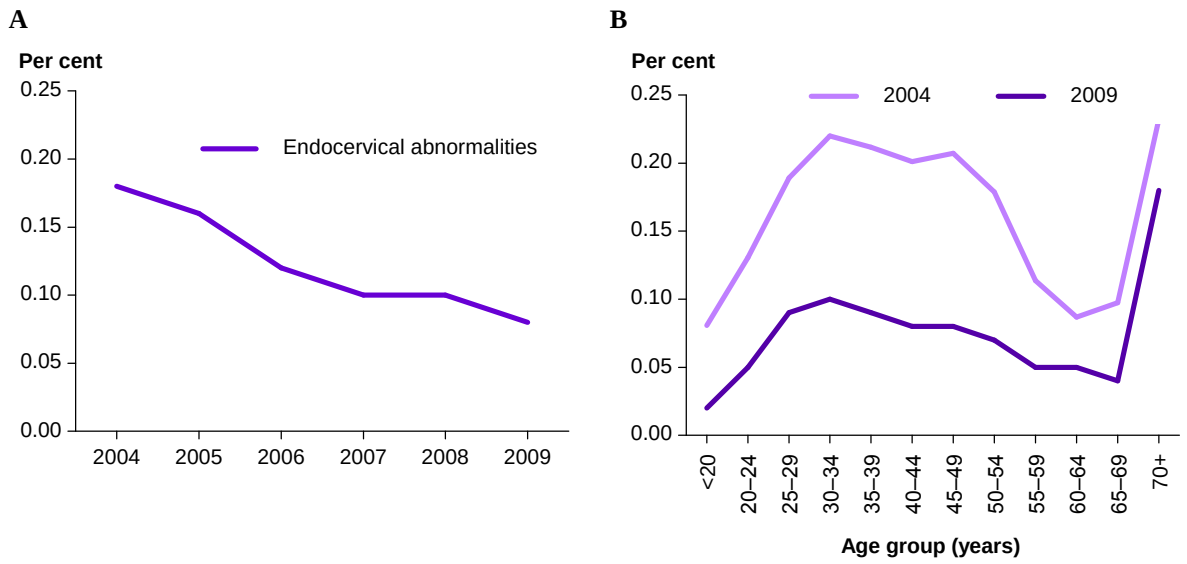
Source: AIHW analysis of state and territory cervical cytology register data.

Figure 3.7: Endocervical abnormalities (E2, E3, E4, E5, and E6) as a proportion of all endocervical abnormalities detected by cytology, by year, 2004 to 2009

Endocervical abnormalities by age

The age structure of endocervical abnormalities differs from that of squamous abnormalities. In 2009, women aged less than 20 years experienced the lowest proportion of endocervical abnormalities, at 0.02% of all cytology tests, increasing to 0.05% for women aged 20–24 years, before peaking at 0.10% of cytology tests for women aged 25–29 years (Figure 3.8). Endocervical abnormalities remained relatively high until the age of 50–54 years, before

falling to 0.05% of all cytology tests for women aged 55–69 years. Endocervical abnormalities appear to rise again for women aged 70 years and over (Figure 3.8).



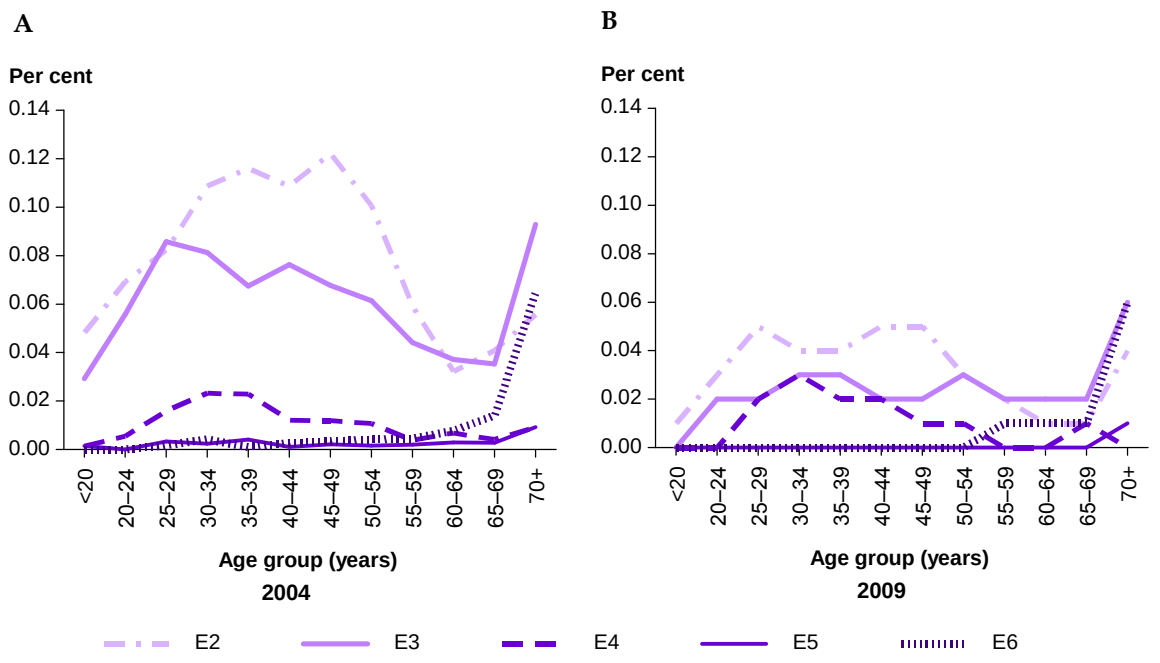
Source: AIHW analysis of state and territory cervical cytology register data.

Figure 3.8: Endocervical abnormalities detected by cytology, as a proportion of all cytology tests, women aged 20–69 years, by year, 2004 to 2009 (A) and by age, 2004 and 2009 (B)

Comprising 77% of all endocervical abnormalities detected in 2009, it is no surprise that endocervical cells of uncertain significance (E2) and possible high-grade glandular abnormalities (E3) dictate the age structure of endocervical abnormalities to a large degree. Both abnormalities are relatively high between the ages of 25–29 years and 50–54 years, with a further apparent increase in women aged 70 years and over.

Adenocarcinoma in situ (E4) peaks at the age of 30–34 years after which the detection of this abnormality falls, with no secondary peak outside the target age group. In contrast to these abnormalities, adenocarcinoma (E5) increases steadily with age, with no cases detected in the younger age groups, increasing until it peaks at the ages 55–59, 60–64 and 65–69 years. The detection of adenocarcinoma then continues to increase with age past the target age group, to be highest in women aged 70 years and over (Figure 3.9).

Data showing each endocervical abnormality by age group for 2004 to 2009 are available in *Cervical screening in Australia 2008–2009: supplementary data tables*.



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

Figure 3.9: Endocervical abnormalities (E2, E3, E4, E5, and E6) detected by cytology, as a proportion of all cytology tests, by age, 2004 (A) and 2009 (B)

Endocervical abnormalities by state and territory

As for squamous abnormalities, endocervical abnormalities by state and territory focus on 2009 due to the differences in cytology codes used in each state and territory prior to the introduction of the AMBS 2004.

In 2009 the proportion of endocervical abnormalities across states and territories ranged between of 0.06% and 0.11% of all cytology tests for women aged 20–69 years (Table 3.16).

Table 3.16: Endocervical abnormalities, as a proportion of all cytology tests, by state and territory, women aged 20–69 years, 2009

	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
Number	372	468	274	240	143	33	23	21	1,574
Crude rate	0.06	0.08	0.07	0.11	0.09	0.07	0.07	0.10	0.08
AS rate	0.06	0.08	0.07	0.11	0.09	0.07	0.06	0.09	0.07
95% CI	0.05–0.06	0.08–0.09	0.06–0.07	0.10–0.12	0.08–0.11	0.05–0.10	0.04–0.10	0.06–0.14	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

Histology at a glance

Definition: The proportion of histology test results in each result category in a 12-month period. The exception to this, the high-grade abnormality detection rate, is defined as the number of women with a high-grade abnormality detected by histology per 1,000 women screened in a 12-month period for women aged 20–69 years.

Rationale: The ability to monitor outcomes and trends in squamous and endocervical histology results at the national level by various stratifications is valuable, as well as allowing any effects from the HPV vaccine introduced in 2007 to be monitored.

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 1997, and it was important to preserve this important and historical measure. This appears within the abnormality section of the new, broader histology indicator. 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*, as elsewhere.

Several years of data are presented in this report due to the need to establish patterns in histology results prior to the introduction of the NHMRC Guidelines in July 2006 and the HPV vaccine in 2007, both of which have the potential to impact on histology trends.

The most recent histology data are for the years 2004, 2005, 2006, 2007, 2008 and 2009.

Key results

Histology in 2009

- In 2009, there were 75,904 cervical histology tests performed, 72,394 (95.4%) of these for women aged 20–69 years.

Abnormalities in 2009

- In 2009, around half (51.6%) of histology tests detected an abnormality.
- In 2009, for every 1,000 women screened aged 20–69 years, 8.1 women had a high-grade abnormality detected by histology, providing an opportunity for treatment before possible progression to cervical cancer. For women aged less than 20 years, this decreased from 14.5 to 8.9 between 2004 and 2009.

Abnormality trends

- The (age-standardised) detection of low-grade abnormalities decreased from 23.0% of histology tests in 2004 to 17.6% in 2009 for women aged 20–69 years, while detection of high-grade abnormalities increased from 21.2% of histology tests in 2004 to 25.4% in 2009.

Background information

Histology is the primary diagnostic tool of the National Cervical Screening Program (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, with far more women having histology following a cytology result of high-grade disease or cancer than for 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 which subsets of women 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 (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.

Histology codes differ from cytology codes to reflect that these are diagnostic rather than predictive (for instance 'possible' categories are not included for histology), and that more precise categories are possible (such as the distinction between microinvasive and invasive cancer).

Note that not all histology categories are used in all states and territories, and this has been pointed out in the data where appropriate. Data were also manipulated to increase consistency. For example, some jurisdictions combine squamous and endocervical results together to give an overall result of mixed high-grade. Histology results of this category are transcribed into both the high-grade squamous category and the high-grade endocervical category to replicate how this finding is reported by the other jurisdictions. Thus, while *HE03.3 Mixed carcinoma in situ (CIS)/adenocarcinoma in situ (AIS)* is used for collecting data, it is not reported as a separate category here.

Squamous abnormalities and endocervical abnormalities are presented separately as the total number of tests in each of the squamous and endocervical abnormality categories defined by the histology coding system—*HS02 Low-grade squamous abnormality* to *HS04.2 Squamous cell carcinoma, invasive* for squamous abnormalities, while endocervical abnormalities include *HE02 Endocervical atypia* to *HE04.4 Carcinoma of the cervix (other)* (shaded in Table 4.1).

High-grade abnormalities are also reported as the number of women with a high-grade abnormality detected by histology per 1,000 women screened, to allow the continuance of the important and historical 'high-grade abnormality detection rate'.

Detailed analyses

Histology in 2009

In 2009, there were 75,904 cervical histology tests performed, 72,394 (95.4%) of these for women aged 20–69 years (Table 4.2).

Histology trends

The number of cervical histology tests performed each year decreased from 81,448 in 2004 to 75,904 in 2009 for women of all ages (Table 4.2). Around 95% of histology tests were for women aged 20–69 years—the target age group of the NCSP—for all years between 2004 and 2009.

Table 4.2: Number of histology tests by year, 2004 to 2009

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

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

Overall, from 2004 and 2009, there was a 6.8% decrease in the number of histology tests performed for women of all ages, with a 5.1% decrease for women aged 20–69 years from 76,276 in 2004 to 72,394 in 2009. While the younger age groups saw a decline in the number of histology tests performed between 2004 and 2009, women aged 50 years and over experienced an increase in the number of histology tests, the largest of these being a 31.8% increase in the number of tests for women aged 60–64 years which mirrors the relatively large increase in cytology tests performed for this age group.

Of those women younger than 50 years, the greatest decrease in the number of histology tests was for women aged less than 25 years, with women aged 20–24 years seeing a 15.6% decrease, and women aged 20 years and less a 51.2% decrease from 3,462 histology tests in 2004 to 1,689 in 2009 (Table 4.2).

Histology by age

In 2009, 95.4% of the 75,904 histology tests performed that year were in women aged 20–69 years, with 78.3% in women aged 20–49 years. Women aged 25–29 years had the greatest proportion of tests, with 12,625 in 2009, comprising 16.6% of all cervical histology tests performed that year, with the number of histology tests decreasing with age thereafter.

Only 4.6% of histology tests were in women outside the target age group of 20–69 years, with 2.2% in women less than 20 years and the remaining 2.4% in women aged 70 years or over. This is down from the 6.3% of histology tests in women outside the target age group in 2004, to which women less than 20 years contributed 4.3%.

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 in isolation of cytology trends, the number of histology tests has been expressed per 100 cytology tests, here called the 'histology to cytology ratio'. Because this 'ratio' accounts for the number of cytology tests, if histology is simply a function of the cytology performed, then all ratios will be equal (since the number of histology tests will simply increase and decrease in direct proportion to the number of cytology tests). Thus any differences that do exist after this calculation allow insights into histology trends unrelated to cytology trends.

There is an overall trend of decreasing histology from 2004 to 2009 as indicated by the decrease in the histology to cytology ratio from 3.8 to 3.5 histology tests for every 100 cytology tests performed for women aged 20–69 years (Table 4.3).

Age trends are also apparent. The histology to cytology ratio was highest for women aged 20–24 years for all years between 2004 and 2009 indicating that, for every 100 cytology tests, women aged 20–24 years had the greatest number of histology tests performed (Table 4.3).

In 2009, this equated to 5.5 histology tests for every 100 cytology tests performed, halving to 2.7 histology tests for every 100 cytology tests by the time women reach 50–54 years, with only 1.8 histology tests for every 100 cytology tests for women aged 65–69 years (Table 4.3).

Table 4.3: Number of histology tests per 100 cytology tests by year, 2004 to 2009

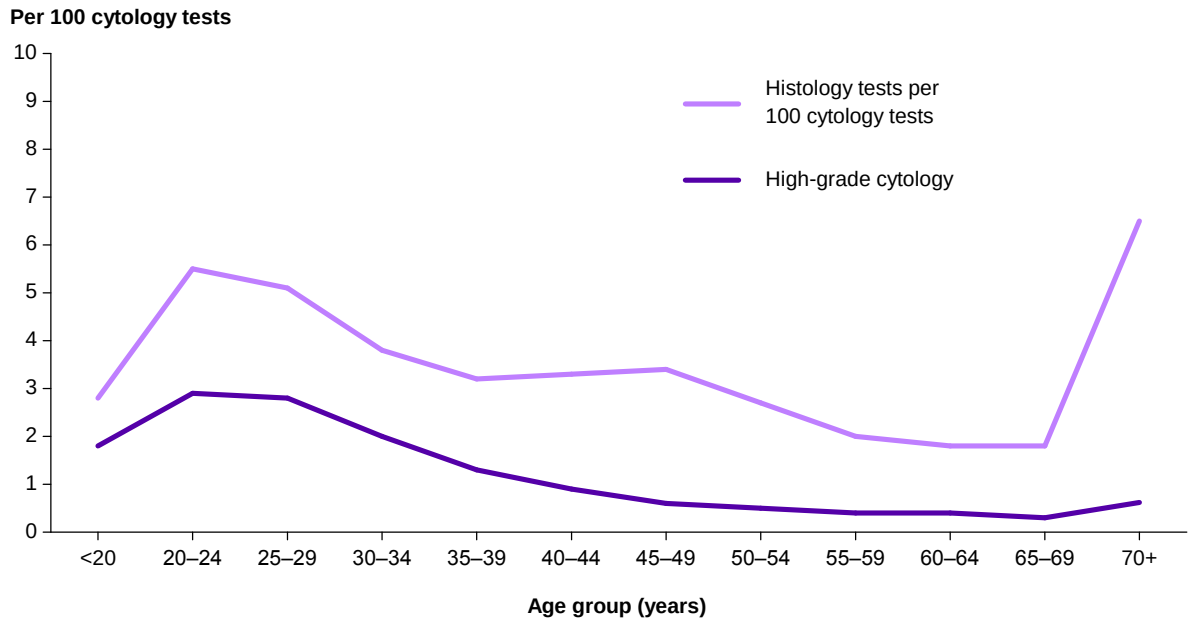
Age group (years)	2004	2005	2006	2007	2008	2009
<20	5.1	4.8	4.5	3.4	3.3	2.8
20–24	6.7	6.5	6.2	5.6	6.0	5.5
25–29	5.4	5.4	5.3	5.0	5.2	5.1
30–34	4.0	3.9	3.9	3.7	3.9	3.8
35–39	3.5	3.3	3.2	3.1	3.2	3.2
40–44	3.5	3.3	3.3	3.2	3.3	3.3
45–49	3.5	3.3	3.3	3.3	3.4	3.4
50–54	2.8	2.7	2.6	2.6	2.7	2.7
55–59	2.1	2.0	2.0	2.0	2.0	2.0
60–64	1.8	1.8	1.7	1.7	1.8	1.8
65–69	1.9	1.7	1.8	1.8	1.9	1.8
70+	5.3	5.5	5.1	5.1	6.1	6.5
All ages	**3.8**	**3.7**	**3.6**	**3.4**	**3.6**	**3.5**
Ages 20–69	**3.8**	**3.7**	**3.6**	**3.4**	**3.5**	**3.5**

Note: Calculated as the number of histology tests per 100 cytology tests for each 5-year age group.

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

As expected, the ratio of histology to cytology closely follows the detection of high-grade abnormalities by cytology (Figure 4.1).

Of particular interest are the two age groups for which the trend in the histology to cytology ratio deviates from the trend in high-grade cytology. These are women aged less than 20 years, who 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 who 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 (Figure 4.1).



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

Figure 4.1: Number of histology tests per 100 cytology tests and proportion of high-grade abnormalities detected by cytology, by age, 2009

Abnormalities detected in 2009

Just over half of all histology tests contain an abnormality–either squamous or endocervical in origin, reflecting that histology tests are diagnostic and therefore more likely to detect an abnormality (since histology is performed on a subset of women that are more likely to be positive for disease).

In 2009, an abnormality (low-grade, high-grade or cancer) was detected in 37,380 (51.6%, 44.4% age-standardised) of the 72,394 histology tests for women aged 20–69 years. Of these, 39.0% were low-grade and 58.9% were high-grade, with cancer making up the remainder (Table 4.4).

Table 4.4: Abnormalities detected by histology, women aged 20–69 years, 2004 to 2009

	2004	2005	2006	2007	2008	2009
Low-grade abnormalities						
Number	20,239	19,576	18,003	16,602	15,347	14,576
Crude rate	26.5	26.0	24.8	23.2	21.1	20.1
AS rate	23.0	22.2	21.4	20.2	18.4	17.6
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
High-grade abnormalities						
Number	19,681	20,200	20,063	21,067	22,102	22,031
Crude rate	25.8	26.8	27.7	29.4	30.4	30.4
AS rate	21.2	22.0	22.9	24.4	25.2	25.4
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
All abnormalities (low-grade, high-grade and cancer)						
Number	40,653	40,603	38,825	38,476	38,325	37,380
Crude rate	53.3	53.9	53.5	53.7	52.7	51.6
AS rate	45.5	45.8	45.8	46.2	45.1	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

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.
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 or high-grade 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.

Abnormality trends

An abnormality was detected in 53.3% of histology tests in 2004 and 51.6% in 2009 (45.5% and 44.4% respectively, age-standardised) (Table 4.4).

This remained stable for all years between 2004 and 2009 since, although the number of histology tests decreased over this time, the number of abnormalities detected by histology decreased to a similar degree, resulting in little change in the proportion of abnormalities detected by histology over time.

Disaggregating histology data into the broad categories of low-grade and high-grade abnormalities reveals quite different trends between the two.

Low-grade abnormalities detected by histology decreased between 2004 and 2009, from 26.5% of histology tests to 20.1% (from 23.0% to 17.6% age-standardised) for women aged 20–69 years (Table 4.4, Figure 4.2A). This decrease occurred across all age groups (Figure 4.2B). This is in line with expected changed to low-grade abnormalities following the introduction of the new NHMEC Guidelines in 2006 (Box 4.1).

In contrast to low-grade abnormalities, the detection of high-grade abnormalities by histology increased from 25.8% of histology tests in 2004 to 30.4% in 2009 (from 21.2% in 2004 to 25.4% in 2009 age-standardised) for women aged 20–69 years (Table 4.4, Figure 4.2C).

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 new NHMRC Guidelines, the recommended management for women with a low-grade abnormality detected by cytology was colposcopy, which often resulted in a biopsy. The new 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.

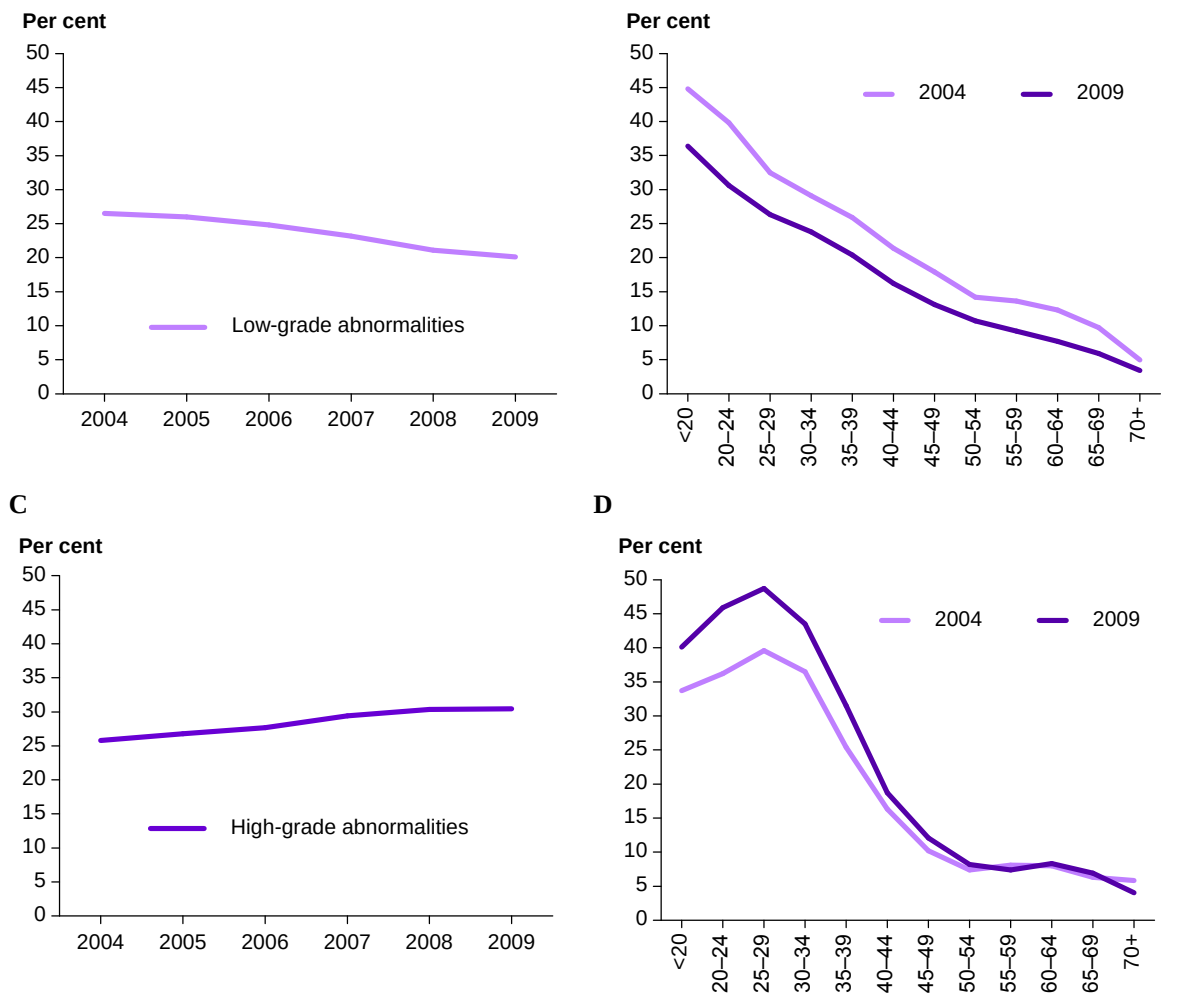
However, cervical screening is a complex and interrelated environment; factors do not exist in isolation, and pinpointing the precise cause of trends is difficult. The change in Guidelines is probably the main driving factor behind histology trends, but in addition to any apparent decrease in detection 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 the abnormalities by cytology and histology.

Different trends were apparent for different age groups. High-grade abnormality detection by histology for women less than 20 years, after increasing from 33.7% of histology tests in 2004 to a peak of 43.7% in 2007, decreased to 40.1% in 2009. In this way, the 2009 rate can be interpreted as a decrease, even though this was higher in 2009 than in 2004 (Figure 4.2D).

In contrast to this youngest age group, high-grade abnormalities detected by histology increased steadily each year between 2004 and 2009 for women aged between 20 and 34 years, the age groups with the highest detection rates of between 43.5% and 48.7% of histology tests in 2009 (Figure 4.2D).

High-grade abnormalities also increased between 2004 and 2007 for women aged 35–49 years, but then levelled out between the years 2007 and 2009, with no clear trend for women aged between 50 and 69 years (Figure 4.2D).

These age trends in the detection of low-grade and high-grade abnormalities by age group for 2004 to 2009 are available in *Cervical screening in Australia 2008–2009: supplementary data tables*.



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

Figure 4.2: Proportion of low-grade abnormalities detected by histology, by year for 2004 to 2009 (A) and by age for 2004 and 2009 (B). Proportion of high-grade abnormalities detected by histology, by year for 2004 to 2009 (C) and by age for 2004 and 2009 (D)

High-grade abnormality detection rate in 2009

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 data reported by the number of abnormalities above.

The high-grade abnormality detection rate is important to monitor, since high-grade abnormalities have a greater probability of progressing to invasive cancer than do low-grade abnormalities (although high-grade abnormalities do not always progress to invasive cervical cancer, with a recent study suggesting that at least 80% of high-grade abnormalities regress spontaneously (Raffle et al. 2003)). The NCSP aims to detect most of these abnormalities before they progress and become invasive, in line with its broader aim to reduce the incidence of cervical cancer, since detection of high-grade abnormalities provides an opportunity for treatment before cancer can develop.

In 2009, the high-grade abnormality rate was 8.1 for women aged 20–69 years (Table 4.5). This means that, in 2009, for every 1,000 women screened aged 20–69 years, 8.1 women had a high-grade abnormality detected by histology.

High-grade abnormality detection rate trends

The number of women aged 20–69 years 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 a peak of 8.3 in 2008. The rate for 2009 was slightly lower, but still high, at 8.1 women with high-grade histology per 1,000 women screened (Table 4.5).

Table 4.5: High-grade abnormality detection rate, by age, women aged 20–69 years, 2004 to 2009

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

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.

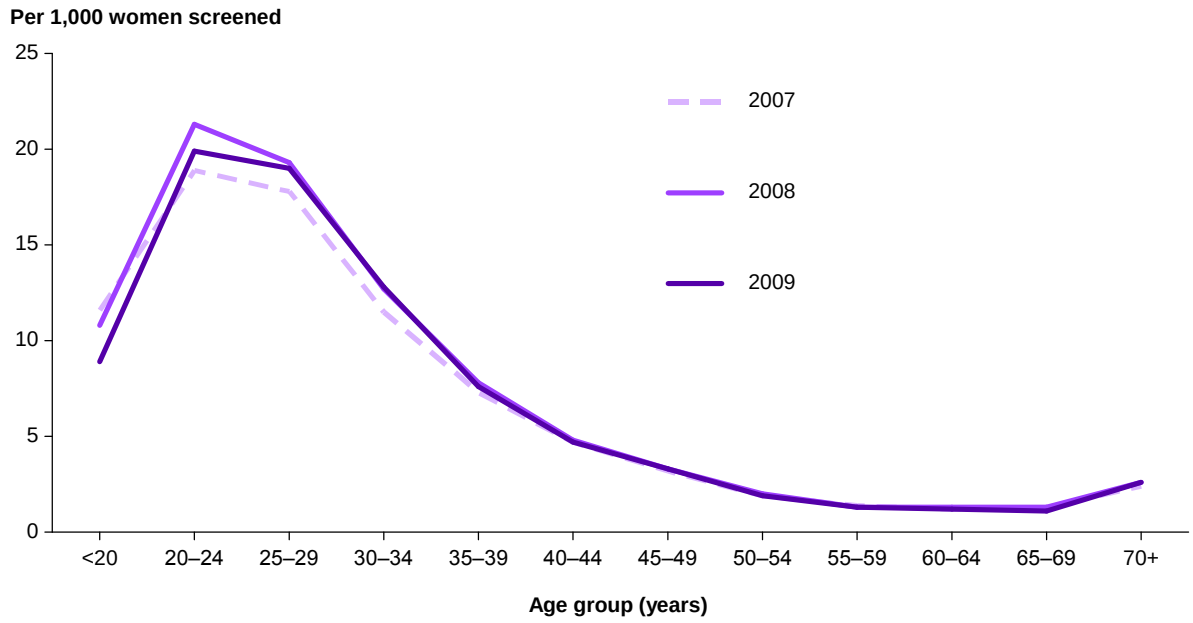
Source: AIHW analysis of state and territory cervical cytology register data.

High-grade abnormality detection rate by age

In 2009, the high-grade abnormality detection rate was highest for women aged 20–24 years at 19.9 women with high-grade histology per 1,000 women screened, decreasing to 12.8 for women aged 30–34 years, and to less than 2.0 for women aged 50 to 69 years (Table 4.5). The rate for women aged less than 20 years was 8.9 women with high-grade histology per 1,000 women screened in 2009 (Table 4.5).

Between 2004 and 2009, the high-grade abnormality detection rate decreased for women aged less than 20 years from 14.5 to 8.9 (Table 4.5). In contrast, the high-grade abnormality detection rate increased for women aged 25 to 39 years between 2004 and 2009, with most of this increase occurring in 2008 and 2009 (Table 4.5; Figure 4.3).

No change in the rate was apparent for women aged 40 years and over (Table 4.5; Figure 4.3).



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

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

High-grade abnormality detection by state and territory

In 2009, the high-grade abnormality detection rate varied across states and territories, between 7.4 and 15.1 women aged 20–69 years per 1,000 women screened (Table 4.6).

Table 4.6: High-grade abnormality detection rate, by state and territory, women aged 20–69 years, 2009

	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
AS rate	8.3	7.5	7.5	9.3	7.7	10.4	7.4	15.1	8.1
95% CI	8.0–8.5	7.3–7.8	7.2–7.8	8.9–9.7	7.2–8.2	9.4–11.4	6.5–8.3	13.5–16.8	8.0–8.2

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 2009

In 2009, squamous abnormalities comprised 50.3% of all histology tests, with endocervical abnormalities comprising a much lower 1.4%.

> 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 36,391 in 2009, but squamous abnormalities as a per cent of all histology tests changed little over this period (Table 4.7).

Table 4.7: Squamous abnormalities detected by histology, by age, 2004 to 2009

	Year					
	2004	**2005**	**2006**	**2007**	**2008**	**2009**
			Per cent			
<20	78.0	77.5	76.3	79.6	77.8	76.1
20–24	75.7	76.0	75.8	76.3	76.4	75.9
25–29	71.7	72.6	72.7	74.4	73.1	73.9
30–34	64.8	65.3	64.8	66.1	65.7	66.3
35–39	50.9	51.3	50.8	54.0	52.0	51.3
40–44	37.6	37.3	38.1	37.9	35.9	34.8
45–49	28.5	27.9	28.4	27.4	25.8	25.3
50–54	22.0	21.3	22.5	21.6	20.3	19.7
55–59	22.6	23.3	20.4	19.8	18.9	17.2
60–64	21.2	21.0	20.7	18.8	18.0	16.9
65–69	17.6	19.0	20.6	18.4	17.3	14.9
70+	16.7	16.6	15.1	14.4	14.9	11.4
Ages 20–69 years						
Crude rate	52.2	52.7	52.3	52.4	51.1	50.3
AS rate	44.3	44.5	44.5	44.7	43.5	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

Note: Crude rate is the number of squamous abnormalities (including squamous cell carcinoma) detected by cytology as a proportion of the total number of cytology tests; age-standardised (AS) rate is the number of squamous abnormalities (including squamous cell carcinoma) 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.

Considerable differences exist across states and territories in the histology results that are collected, which necessitates that abnormality categories are grouped to permit meaningful comparisons at the national level. These groups are low-grade, high-grade (which combines

CIN, NOS, CIN II and CIN III) and squamous cell carcinoma (microinvasive and invasive combined).

In terms of the types of squamous abnormalities, two measures have been examined. First is the proportion of all histology tests that each type of squamous abnormality comprises, and second is the proportion of all squamous abnormalities that each type of squamous abnormality comprises. These are both shown in Table 4.8, and the second illustrated in Figure 4.4.

Table 4.8: Squamous abnormalities detected by histology, by squamous category, women aged 20–69 years, 2004 to 2009

	Year					
Squamous category	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
HS02 Low-grade squamous abnormality						
Number	20,140	19,472	17,937	16,540	15,292	14,538
Per cent of histology tests	26.4	25.8	24.7	23.1	21.0	20.0
Per cent of squamous abnormalities	50.6	49.0	47.3	44.1	41.1	39.9
HS03 High-grade squamous abnormality						
Number	19,176	19,705	19,508	20,437	21,411	21,379
Per cent of histology tests	25.1	26.1	26.9	28.5	29.4	29.5
Per cent of squamous abnormalities	48.2	49.6	51.5	54.5	57.5	58.7
HS04 Squamous cell carcinoma						
Number	470	558	466	516	530	474
Per cent of histology tests	0.6	0.7	0.6	0.7	0.7	0.7
Per cent of squamous abnormalities	1.2	1.4	1.2	1.4	1.4	1.3
All squamous abnormalities						
Number	39,786	39,735	37,911	37,493	37,233	36,391
Crude rate	52.2	52.7	52.3	52.4	51.1	50.3
AS rate	44.3	44.5	44.5	44.7	43.5	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

Notes

1. HS03 High-grade abnormality combines cervical intraepithelial neoplasia (CIN) not otherwise specified (NOS), CIN II and CIN III. Cervical cancers are included in 'all squamous abnormalities'.
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.

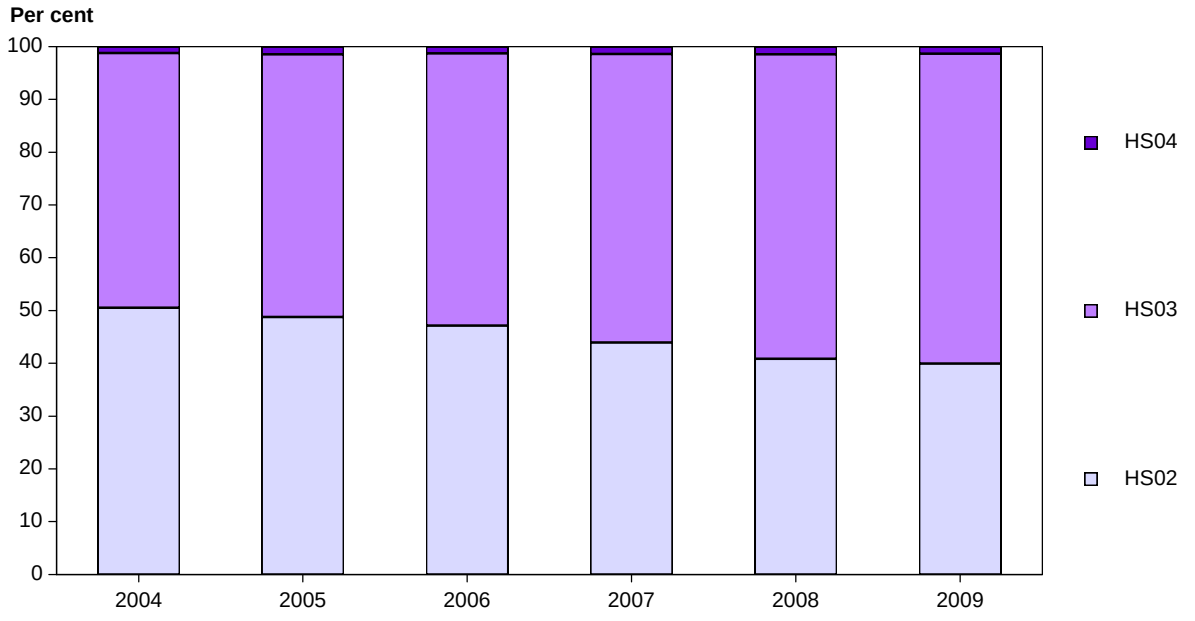
Source: AIHW analysis of state and territory cervical cytology register data.

The proportion of histology tests with the abnormality *HS02 Low-grade squamous abnormality* decreased over time from 26.4% in 2004 to 20.0% in 2009—a 28% decrease (Table 4.8). Thus, although in 2004 low-grade abnormalities were the most frequently detected squamous abnormality, comprising 50.6% of all squamous abnormalities, by 2009 low-grades comprised just 39.9% of squamous abnormalities, becoming the second most frequently detected squamous abnormality behind high-grades (Figure 4.4). This is likely a direct effect of the introduction of the new NHMRC Guidelines which recommend repeat cytology rather than biopsy for a low-grade cytological abnormality, which is expected to result in a decrease in the proportion of histology tests with a result of low-grade abnormality, as observed.

HS03 High-grade squamous abnormality overtook low-grades in comprising the greatest proportion of histology tests, increasing from 25.1% in 2004 to 29.5% of cytology tests in 2009 for women aged 20–69 years (Table 4.8). In terms of the number of abnormalities, this was an 11% increase from 19,176 in 2004 (lower than the number of low-grade abnormalities in this year) to 21,379 in 2009, following a peak of 21,441 in 2008. Thus high-grade abnormalities as a group comprised the greatest proportion of squamous abnormalities detected by histology for all years except 2004 in which low-grade abnormalities held this position, increasing from 48.2% in 2004 to 58.7% of squamous abnormalities in 2009 for women aged 20–69 years (Figure 4.4).

Literature suggests that the distinction between the high-grade squamous abnormalities CIN II and CIN III is important to preserve, so data were also calculated for the high-grade squamous abnormality categories *HS03.2 CIN II* and *HS03.3 CIN III* separately, following the removal of data that couldn't distinguish between these abnormalities. In 2009, for those states and territories that could distinguish between these, CIN II comprised 12.7% of histology tests and 26.7% of squamous abnormalities, while CIN III comprised 14.9% of histology tests and 31.3% of squamous abnormalities for women aged 20–69 years.

HS04 Squamous cell carcinoma (microinvasive and invasive combined) is a very rare squamous finding, even by histology. Of the 36,391 squamous abnormalities detected in women aged 20–69 years in 2009, 474 (0.7% of cytology tests and 1.3% of squamous abnormalities) were squamous cell carcinoma, with no apparent trend of increasing or decreasing detection over the years 2004 to 2009 (Table 4.8).



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

Figure 4.4: Squamous abnormalities (HS02, HS03, and HS04) as a proportion of all squamous abnormalities detected by histology, by year, 2004 to 2009

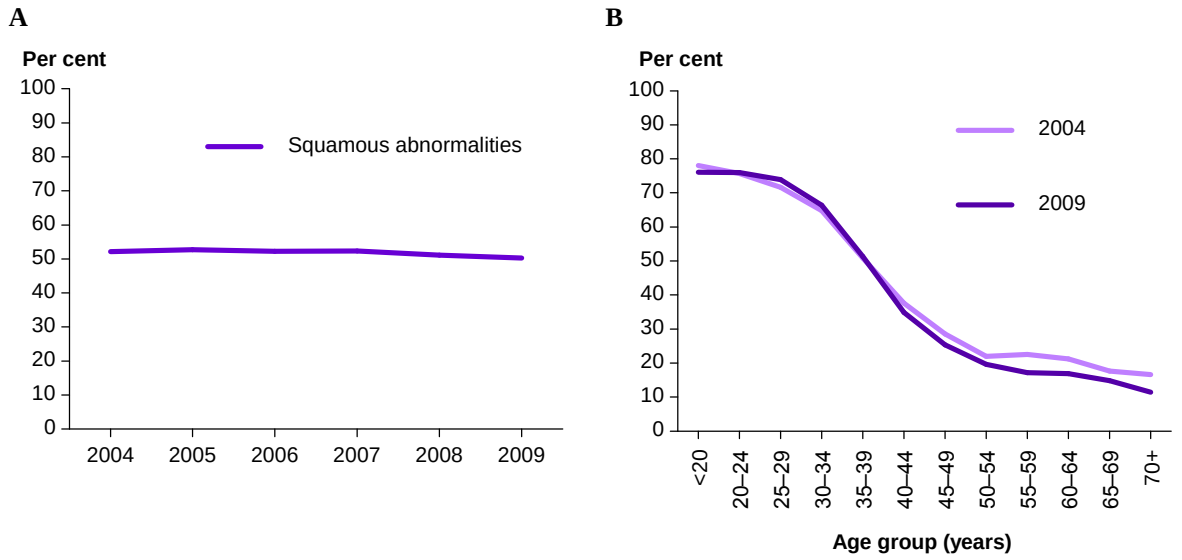
In 2009 the ratio of high-grade squamous abnormalities to squamous cell carcinoma was 45:1 for women aged 20–69 years.

Squamous abnormalities by age

Similar to squamous abnormalities detected by cytology, squamous abnormalities detected by histology are most commonly detected in younger women.

In 2009, some 76% of histology tests performed for women aged less than 25 years, and 74% of histology tests performed for women aged 25–29 years, detected a squamous abnormality (Figure 4.5).

Thereafter, the proportion of histology tests that detected a squamous abnormality decreased with increasing age, to just under 20% of histology tests performed for women aged 50–54 years, and 14.9% of histology tests performed for women aged 65–69 years (Figure 4.5).



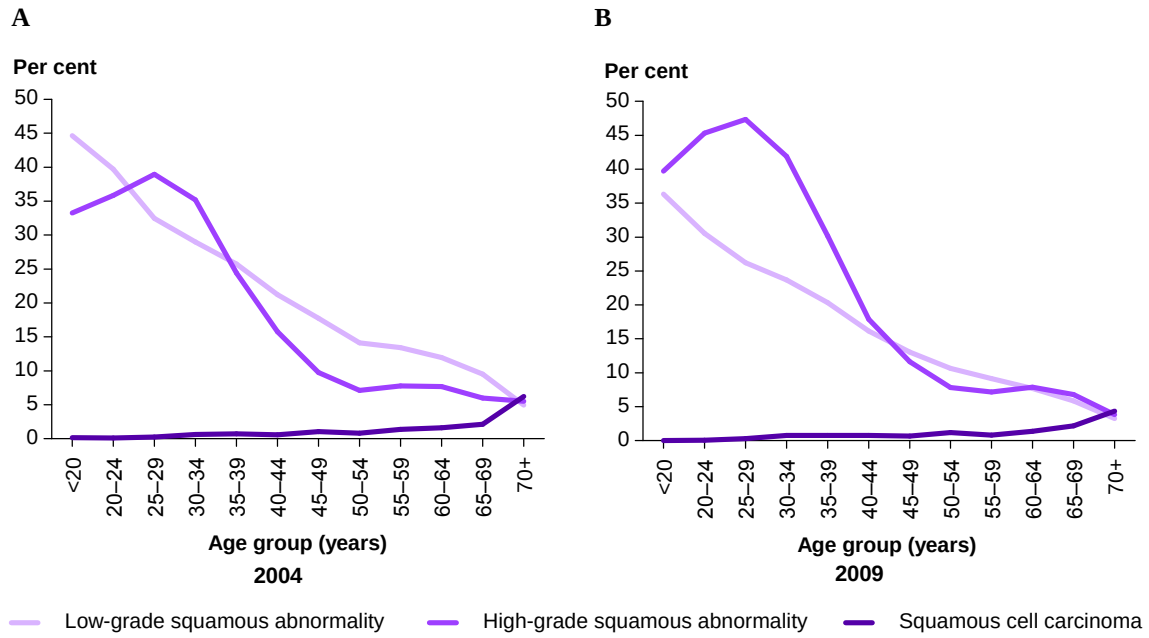
Source: AIHW analysis of state and territory cervical cytology registry data.

Figure 4.5: Squamous abnormalities detected by histology, as a proportion of all histology tests, women aged 20–69 years, by year, 2004 to 2009 (A) and by age, 2004 and 2009 (B)

Trends were also analysed for each squamous abnormality category.

In 2009, low-grade squamous abnormalities (HS02) decreased steadily with age in an almost straight line, from their peak of 36.4% of histology tests in women aged less than 20 years, to 30.5% in women aged 20–24 years, with low-grades detected in less than 6% of histology tests in women aged 64–69 years.

High-grade squamous abnormalities (HS03) peaked a little later at the age of 25–29 years at 47.4% of histology tests, but stayed high in the younger age groups (including less than 20 years) up to the age of 30–34 years, thereafter falling away rapidly. Although having far fewer occurrences, squamous cell carcinoma (HS04) increased with age, appearing to have a small peak at ages 40–44 and 50–54 years, before increasing more sharply with age from 60–64 years onwards (Figure 4.6B).



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

Figure 4.6: Squamous abnormalities detected by histology, as a proportion of all histology tests, by age, 2004 (A) and 2009 (B)

However, while the age structure for low-grade abnormalities and squamous cell carcinoma was relatively consistent over time—the former decreasing more-or-less equally across all age groups between 2004 and 2009, changes to high-grade abnormalities differed across age groups. Detection of high-grades squamous abnormalities increased notably for the age groups less than 40 years between 2004 and 2009, with far more modest increases in the older age groups. Comparison with the 2004 trend (Figure 4.6A) in which high-grade detection was greater than low-grade detection only in the 25–29 and 30–34 year age groups reveals a swelling in the younger age groups, such that by the year 2009 (Figure 4.6B) detection of high-grade abnormalities was higher than the detection of low-grade squamous abnormalities for all ages less than 40 years.

Data showing each squamous abnormality by age group for 2004 to 2009 are available in *Cervical screening in Australia 2008–2009: supplementary data tables*.

Squamous abnormalities by state and territory

In 2009, low-grade abnormalities comprised 40% and high-grade abnormalities 60% of squamous abnormalities in almost all states and territories. Squamous cell carcinoma comprised less than 1% of histology tests and less than 2% of squamous abnormalities in all states and territories in 2009. These data are available in *Cervical screening in Australia 2008–2009: supplementary data tables*.

Endocervical abnormalities detected in 2009

In 2009, endocervical abnormalities comprised only 1.4% of all histology tests in women aged 20–69 years, in contrast to 50.3% for squamous abnormalities.

> 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 many rates for endocervical abnormalities are shown to 2 decimal places to illustrate differences between small numbers (which may otherwise be rounded to 0.0).

Endocervical abnormality trends

Table 4.9: Endocervical abnormalities detected by histology, by age, 2004 to 2009

	2004	2005	2006	2007	2008	2009
			Per cent			
<20	0.58	0.47	0.31	0.74	0.53	0.47
20–24	0.54	0.59	0.74	0.91	0.89	0.64
25–29	0.86	1.09	1.24	1.20	1.49	1.48
30–34	1.72	1.40	1.42	1.93	2.20	2.12
35–39	1.57	1.50	1.80	1.75	1.94	1.85
40–44	1.15	1.15	0.97	1.34	1.20	1.16
45–49	1.09	1.18	1.36	0.99	1.07	0.93
50–54	0.80	0.94	0.99	1.19	1.08	1.01
55–59	1.40	1.17	1.51	1.50	1.87	1.08
60–64	1.76	2.34	2.25	2.14	2.15	2.30
65–69	1.88	2.00	1.86	2.22	2.91	1.93
70+	3.81	3.51	3.39	4.01	5.09	3.41
Ages 20–69 years						
Crude rate	1.14	1.15	1.26	1.37	1.50	1.37
AS rate	1.23	1.26	1.35	1.46	1.59	1.41
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

Note: Crude rate is the number of endocervical abnormalities (including adenocarcinoma) detected by histology as a proportion of the total number of histology tests; age-standardised (AS) rate is the number of squamous abnormalities (including squamous cell carcinoma) 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 registry data.

The overall number of endocervical abnormalities increased from 867 in 2004 to 989 in 2009 for women aged 20–69 years (a 14.1% increase in the number of endocervical abnormalities), as did endocervical abnormalities as a per cent of all histology tests, from 1.14% in 2004 to 1.37% of histology tests in 2009 (from 1.23% to 1.41% age-standardised) (Table 4.9).

Similar to squamous abnormalities, differences across states and territories in the endocervical abnormality histology results that are collected necessitates the grouping of some categories to permit meaningful comparisons at the national level. These groups are

atypia, high-grade (which combines endocervical dysplasia and adenocarcinoma in situ) and adenocarcinoma (microinvasive and invasive combined). Although very rare, adenosquamous carcinoma and carcinoma of the cervix (other) have been retained as separate categories.

Two measures have been examined for the different types of endocervical abnormalities. First is the proportion of all histology tests that each type of endocervical abnormality comprises, and second is the proportion of all endocervical abnormalties that each type of endocervical abnormality comprises. These are both shown in Table 4.10, and the second also illustrated in Figure 4.7.

Table 4.10: Endocervical abnormalities detected by histology, by endocervical category, women aged 20–69 years, 2004 to 2009

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

Notes

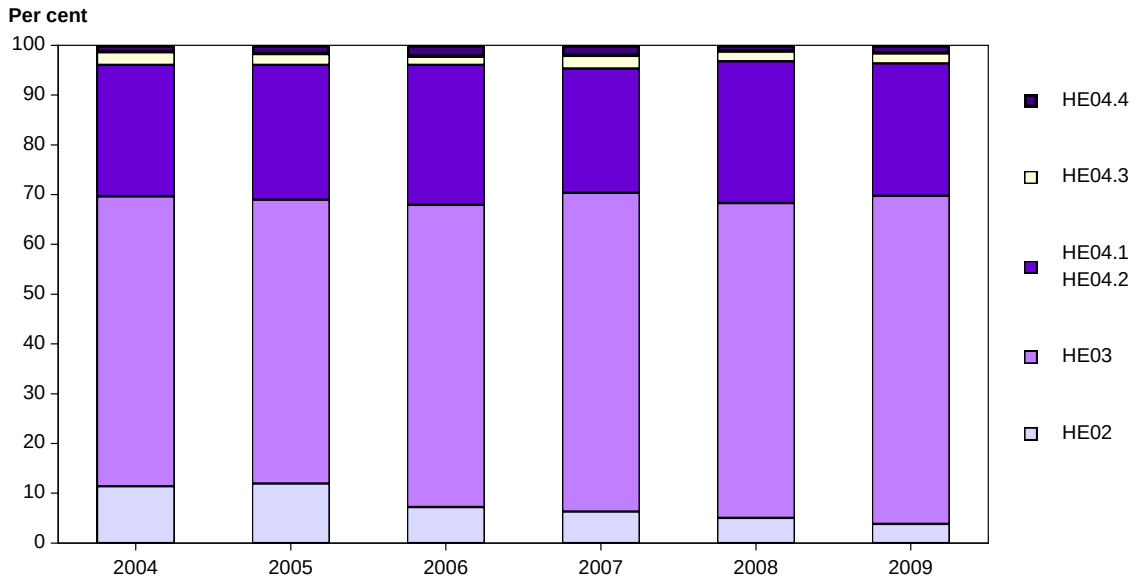
1. HE03 High-grade endocervical abnormality combines endocervical dysplasia and adenocarcinoma in situ. Cervical cancers are included in 'all edocervical abnormalities'.
2. Crude rate is the number of each endocervical abnormality or of all endocervical abnormalities combined detected by histology as 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.

HE02 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. The proportion of histology tests with the abnormality *HE02 Endocervical atypia* decreased over time from 0.13% in 2004 to 0.05% in 2009 (Table 4.10). With a decrease from 99 to 38 abnormalities over these years, the proportion of endocervical abnormalities this abnormality comprised also decreased from 11.4% of endocervical abnormalities in 2004 to 3.8% in 2009 (Figure 4.7).

HE03 High-grade endocervical abnormalities comprised the greatest proportion of endocervical abnormalities detected, and, further, increased over time from 58.3% of endocervical abnormalities in 2004 to 65.9% in 2009 for women aged 20–69 years (Figure 4.7). This represents an increase in the number of high-grade endocervical abnormalities from 505 in 2004 to 652 in 2009 in the target age group. As a proportion of histology tests, this increase was from 0.66% in 2004 to 0.90% in 2009 (Table 4.10).

As opposed to squamous abnormalities, for which cancer comprised less than 1% of histology tests, *Adenocarcinoma* (*HE04.1* and *HE04.2*) is the second most frequent endocervical abnormality, with the 263 adenocarcinomas detected by histology in 2009 comprising 0.36% of histology tests and 26.6% of endocervical abnormalities in 2009 (Figure 4.7). *HE04.3 Adenosquamous carcinoma* and *HE04.4 Carcinoma of the cervix (other)* are both very rare, in 2009 only 20 and 16 respectively were detected, comprising 2.0% and 1.6% of endocervical abnormalities and 0.03% and 0.02% of histology tests, respectively.



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

Figure 4.7: Endocervical abnormalities (HE02, HE03, HE04.1 and HE04.2, HE04.3, and HE04.4), as a proportion of all endocervical abnormalities detected by histology, by year, 2004 to 2009

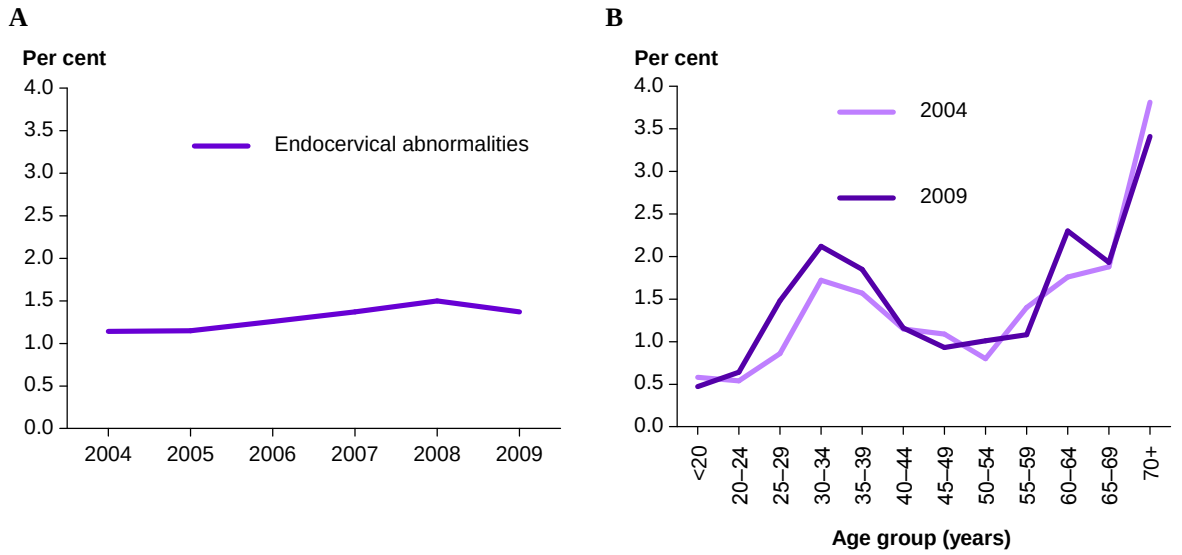
In 2009 the ratio of high-grade endocervical abnormalities to adenocarcinoma was 2.5:1 for women aged 20–69 years.

Endocervical abnormalities by age

Similar to endocervical abnormalities detected by cytology, endocervical abnormalities detected by histology were lowest in women aged less than 20 years, but thereafter deviated from the age structure set by cytology for the older age groups (Figure 4.8).

The peak age for detection of endocervical abnormalities by histology was 30–34 years, with 2.12% of histology tests detecting an endocervical abnormality in 2009 in this age group. Detection of endocervical abnormalities then fell to 0.93% of histology tests for women aged 45–49 years (Figure 4.8B). A second peak for the detection of endocervical abnormalities by histology was evident, with endocervical abnormalities detected in 2.30% of histology tests performed for women aged 60–64 years (Figure 4.8B).

The trend in the detection of endocervical abnormalities by age changed little between 2004 and 2009 (Figure 4.8 A and B).



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

Figure 4.8: Endocervical abnormalities detected by histology, as a proportion of all histology tests, women aged 20–69 years, by year 2004 to 2009 (A) and by age, 2004 and 2009 (B)

Analysis of each endocervical abnormality category illustrates the reasons for the double-peak in endocervical abnormality detection apparent in Figure 4.8B.

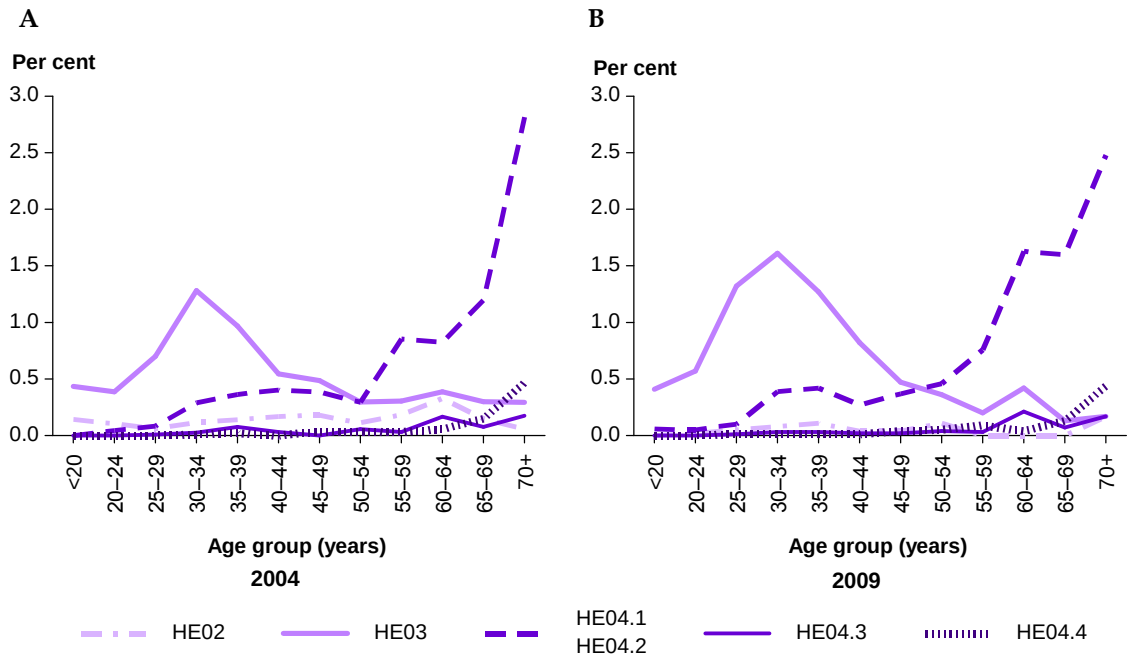
Endocervical atypia, adenosquamous carcinoma and other carcinomas of the cervix are all very rare and contribute little to the overall trend in abnormalities.

High-grade endocervical abnormalities (endocervical dysplasia and adenocarcinoma *in situ* combined) are almost entirely responsible for the first peak in endocervical abnormalities experienced by women aged 30–34 years, with some contribution from adenocarcinoma between the ages of 30 and 39 years (Figure 4.9).

The second peak which begins with women aged 60–64 years can be attributed almost entirely to a rapid increase in the detection of adenocarcinoma in this age group, with a small rise in high-grade abnormalities also experienced in this age group onwards (Figure 4.9).

Comparison with the 2004 trend reveals a similar pattern for high-grade endocervical abnormalities and adenocarcinoma in 2009, but a greater contribution of the endocervical atypia category across all age groups (Figure 4.9).

Data showing each endocervical abnormality by age group for 2004 to 2009 are available in *Cervical screening in Australia 2008–2009: supplementary data tables*.



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

Figure 4.9: Endocervical abnormalities (HE02, HE03, HE04.1 and HE04.2, HE04.3, and HE04.4) detected by histology, as a proportion of all histology tests, by age, 2004 and 2009

Endocervical abnormalities by state and territory

In general, states and territories follow the same trends as described for national histology data, although the very small numbers—particularly in the smaller states and territories—make describing trends difficult. These data are available in *Cervical screening in Australia 2008–2009: supplementary data tables*.

Indicator 5 Cytology-histology correlation

The cytology-histology correlation at a glance

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 up by histology. Where this histology occurs within 6 months of cytology, a correlation between the cytology and histology results for the woman is presented to allow a measure of the accuracy of cytological predictions.

Guide to interpretation: 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, which means that these findings should not be extrapolated to all low-grade and negative cytology.

Colposcopy data are incomplete and therefore not reported, which means that some diagnostic information is missing from the correlation. This affects measures of cytology test performance such as positive and negative predictive values, sensitivity, and specificity.

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.

While it is important to show calculations based on small numbers in this indicator, interpretation of data should take into consideration the counts provided.

The most recent cytology-histology correlation data are for cytology tests performed in 2008. Data presented are for women aged 20–69 years.

Key results

Correlation between squamous cytology and squamous histology

- 75.2% of negative cytology was confirmed to be negative on histology; 44.0% of possible low-grade and 51.0% of low-grade cytology was confirmed to be low-grade on histology; 53.1% of possible high-grade and 77.2% of high-grade cytology was confirmed to be high-grade on histology, and 64.6% of cytology that predicted squamous cell carcinoma was found to be squamous cell carcinoma on histology.

Correlation between endocervical cytology and endocervical histology

- 97.3% of negative cytology was confirmed to be negative on histology; 38.0% of possible high-grade and 76.3% of adenocarcinoma *in situ* was confirmed to be high-grade on histology, and 56.8% of cytology that predicted adenocarcinoma was found to be adenocarcinoma on histology.

Positive predictive values

- The positive predictive value of high-grade squamous cytology was 69.6%, and the positive predictive value of high-grade endocervical cytology was 72.0%.

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 up 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 to be followed up by histology, but this is neither feasible nor desirable.

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 is missing from the correlation. This affects measures of cytology test performance such as positive and negative predictive values, sensitivity, and specificity.

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 not a single screening test, but an organised program of regular screening tests. Thus, while a single cervical cytology test is not able to diagnose with absolute accuracy, repeated cervical cytology tests over time generate a far greater degree of accuracy, and can therefore realise the benefits of cervical screening.

Detailed analyses

Correlation between squamous cytology and squamous histology

Shown in Table 5.1 (illustrated in Figure 5.1) is the correlation that exists between a squamous cytology prediction in 2008 and the squamous histology finding within 6 months for women aged 20–69 years.

> As noted in *Indicator 4 Histology*, not all histology result categories are used by all states and territories, thus for correlation of squamous cytology with squamous histology, cervical intraepithelial (CIN) not otherwise specified (NOS), CIN II and CIN III are grouped together to form a broad high-grade abnormality category, and microinvasive and invasive squamous cell carcinoma are grouped together to form a broad squamous cell carcinoma category.

Table 5.1: Correlation between squamous cytology and the most serious squamous histology within 6 months, women aged 20–69 years, cytology tests performed in 2008

	Histology finding			
Cytology prediction	**HS01 Negative**	**HS02 Low-grade**	**HS03 High-grade**	**HS04 Squamous cell carcinoma**
S1 Negative	13,215 (75.2%)	3,323 (18.9%)	1,002 (5.7%)	25 (0.1%)
S2 Possible low-grade LG	3,093 (38.9%)	3,497 (44.0%)	1,352 (17.0%)	11 (0.1%)
S3 Low-grade	2,525 (26.9%)	4,795 (51.0%)	2,073 (22.1%)	7 (0.1%)
S4 Possible high-grade	1,886 (23.0%)	1,911 (23.3%)	4,362 (53.1%)	53 (0.6%)
S5 High-grade	1,142 (8.1%)	1,912 (13.5%)	10,939 (77.2%)	172 (1.2%)
S6 High-grade plus	13 (5.1%)	7 (2.7%)	161 (62.6%)	76 (29.6%)
S7 Squamous cell carcinoma	4 (4.0%)	1 (1.0%)	30 (30.3%)	64 (64.6%)

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

In summary, 75.2% of negative cytology was confirmed to be negative; 44.0% of possible low-grade and 51.0% of low-grade cytology were confirmed to be low-grade on histology; 53.1% of possible high-grade, 77.2% of high-grade and 62.6% of high-grade with possible invasion were confirmed to be high-grade on histology, and 64.6% of cytology that predicted squamous cell carcinoma was found to be squamous cell carcinoma by histology (Table 5.1).

Further, even in cases where the grade of the histology finding did not match the cytology prediction, this was usually due to the cytology prediction falling one side or the other of the true grade of disease, such as a cytology prediction of high-grade being squamous cell carcinoma on histology, for instance (Figure 5.1).

Correlation for the different squamous result categories are provided in detail below.

Negative

Cytology predicted 17,565 negative results, whereas histology found there to be 21,878.

Of the 17,565 predicted negative results followed by a histology test for whatever clinical reason (generally a negative cytology test is not an indication for biopsy), 13,215 (75.2%) were confirmed to be negative on histology. A total of 8,663 cytology tests predicted an abnormality when no disease was present, although these false positive results were less common for more serious abnormalities, with only 4 cytology tests results predicting

squamous cell carcinoma when no disease was present (false positive cancer result). However, negative cytology is not usually followed up by histology, so it is possible that some predictions of a squamous abnormality, while yielding a negative squamous result on histology, may have instead revealed an endocervical abnormality, with data showing that 483 cytology predictions of a squamous abnormality revealed an endocervical abnormality (this may be either in addition to or instead of a squamous abnormality—this is not possible to ascertain from the data).

Low-grade abnormalities

Cytology predicted 17,353 low-grade squamous abnormalities, while histology found 15,446.

Of the 17,353 predicted low-grades, 8,292 (47.8%) were confirmed to be low-grade on histology (the positive predictive value of a low-grade abnormality). The sensitivity of a low-grade abnormality was also low at 53.7%, which is the proportion of the 15,446 cases of true low-grade disease that cytology correctly predicted (8,292). However, under the current management guidelines, low-grade cytology is not routinely followed up by histology unless the abnormality persists, which means these results should be interpreted with caution and not 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.

High-grade squamous abnormalities, in contrast, are routinely followed up with histology under the recommended management guidelines, and so these cytology results allow more meaningful assessment of cytology predictions.

High-grade squamous abnormalities

Cytology predicted 22,634 high-grade squamous abnormalities, whereas histology found there to be 19,919.

Of the 22,634 predicted high-grade squamous abnormalities, 15,462 (68.3%) were confirmed to be high-grade on histology, whereas 15,763 (69.6%) of the 22,634 predicted high-grade squamous abnormalities were found to be high-grade disease or greater, this latter value commonly interpreted as the positive predictive value (PPV) of a high-grade abnormality. The sensitivity of a high-grade abnormality is also high at 77.6% (15,462/19,919) of true high-grade disease being correctly predicted as such by cytology. However, while the sensitivity of a high-grade squamous abnormality is high for all age groups, the PPV of a high-grade squamous abnormality decreases to 49.0% in women aged 50–69 years (Table 5.2), indicating that fewer of the predicted high-grades were found to be true high-grade disease in older women, with a greater proportion being either negative or low-grade on histology.

Terminology

Sensitivity: the probability that an individual with a specific grade of disease will test positive for that grade of disease or higher with the screening test.

Complete sensitivity: the probability that an individual with a specific grade of disease will test positive for disease with the screening test.

Complete sensitivity for 'high-grade and above' is more relevant to squamous abnormalities, for which only high-grade abnormalities are routinely followed up; whereas complete sensitivity for any abnormality is more relevant to endocervical abnormalities, since any endocervical abnormality will be followed up.

PPV: the positive predictive value (PPV) is the proportion of those individuals with a positive screening test who were found to truly have the disease (by histology).

Squamous cell carcinoma

Cytology predicted 99 cases of squamous cell carcinoma, whereas histology found there to be 408.

Of the 99 predicted cases of squamous cell carcinoma, 64 (64.6%) were confirmed to be squamous cell carcinoma on histology, which is equivalent to the PPV of this cytology prediction. The remaining 344 cases of squamous cell carcinoma found on histology occurred as follow up to cytology predictions other than squamous cell carcinoma, with 301 after a high-grade cytology, 18 after a low-grade cytology, and 25 cases after a negative squamous cell cytology result (false negatives).

While the sensitivity of squamous cell carcinoma was low at 15.7%, the majority of those with squamous cell carcinoma had a cytology test result of possible high-grade or above, which means that the cytology test was good at positively identifying disease, just not necessarily the correct grade of disease. This is reflected in the complete sensitivity of a cytology result of squamous cell carcinoma of 93.9% for any abnormality and 89.5% for an abnormality of high-grade or above (Table 5.2).

Table 5.2: Sensitivity and positive predictive value (PPV) of squamous abnormalities in women aged 20–69 years, most serious histology within 6 months of cytology performed in 2008

	High-grade		Cancer	
Sensitivity				
20–69 years	**77.6**	(15,462/19,919)	**15.7**	(64/408)
20–29 years	*76.5*	*(7,968/10,422)*	*3.3*	*(2/61)*
30–49 years	*79.3*	*(6,766/8,531)*	*9.9*	*(23/233)*
50–69 years	*75.4*	*(728/966)*	*34.2*	*(39/114)*
Complete sensitivity (abnormal)	. .		**93.9**	(383/408)
Complete sensitivity (high-grade)	. .		**89.5**	(365/408)
Positive Predictive Value				
20–69 years	**69.6**	(15,763/22,634)	**64.6**	(64/99)
20–29 years	*72.5*	*(8,024/11,060)*	*66.7*	*(2/3)*
30–49 years	*69.7*	*(6,959/9,981)*	*54.8*	*(23/42)*
50–69 years	*49.0*	*(780/1,593)*	*72.2*	*(39/54)*

Notes

1. Sensitivity is defined as the proportion of histology tests finding disease (high-grade or cancer) that the cytology test correctly identifies as positive for the disease (high-grade or cancer).
2. Complete sensitivity (abnormal) is defined as the proportion of histology tests finding cancer where the cytology test predicted an abnormality (low-grade, high-grade or cancer); complete sensitivity (high-grade) is defined as the proportion of histology tests finding cancer where the cytology test predicted a high-grade abnormality or cancer.
3. PPV for high-grade is 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 squamous cell carcinoma; PPV for cancer is calculated as the proportion of cytology results of squamous cell carcinoma that were confirmed on histology to be squamous cell carcinoma.

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

Correlation between endocervical cytology and endocervical histology

Shown in Table 5.3 (and illustrated in Figure 5.1) is the correlation that exists between an endocervical cytology prediction in 2008 and the endocervical histology finding within 6 months for women aged 20–69 years.

As for squamous histology, some endocervical histology abnormality categories are grouped up to permit meaningful comparisons at the national level. For correlation of endocervical cytology with endocervical histology, endocervical dysplasia and adenocarcinoma *in situ* are grouped together to form a broad high-grade abnormality category, and microinvasive and invasive adenocarcinoma are grouped together to form a broad adenocarcinoma category. Unlike the histology indicator, however, the histology results of adenosquamous carcinoma and carcinoma of the cervix (other) are not included with the adenocarcinomas, but are kept separate, since these carcinomas are neither solely squamous cell or endocervical in origin, and thus would not necessarily be expected to correlate with cytology results of either cell type.

Table 5.3: Correlation between endocervical cytology and the most serious endocervical histology within 6 months, women aged 20–69 years, cytology tests performed in 2008

	Histology finding			
Cytology prediction	**HE01 Negative**	**HE02 Atypia**	**HE03 High-grade**	**HE04.1 & 4.2 Adenocarcinoma**
E1 Negative	15,422 (97.3%)	32 (0.2%)	307 (1.9%)	92 (0.6%)
E2 AECUS	146 (70.2%)	4 (1.9%)	45 (21.6%)	13 (6.3%)
E3 Possible HG	110 (49.8%)	2 (0.9%)	84 (38.0%)	25 (11.3%)
E4 AIS	14 (6.4%)	3 (1.4%)	167 (76.3%)	35 (16.0%)
E5 AIS plus	1 (4.0%)	0 (0.0%)	11 (44.0%)	13 (52.0%)
E6 Adenocarcinoma	12 (27.3%)	0 (0.0%)	7 (15.9%)	25 (56.8%)

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

In summary, 97.3% of negative cytology was confirmed to be negative; 38.0% of possible high-grade, 76.3% of adenocarcinoma in situ and 44.0% of adenocarcinoma with possible invasion were confirmed to be high-grade on histology, and 56.8% of cytology that predicted adenocarcinoma was found to be adenocarcinoma by histology (Table 5.3).

Very little correlated with the histology finding of endocervical atypia, which is a function of this being a very rarely used histology category in recognition of 'low-grade endocervical abnormality' not being a valid histology category.

There appears to be more cases where the cytology prediction was incorrect when compared with the squamous correlation, which may be related to the difficulties in sampling and interpreting endocervical cytology samples.

Correlation for the different endocervical result categories are provided in detail below.

The following results exclude endocervical cytology of 'no endocervical component', since no prediction of endocervical cells is made, and so accuracy against histology cannot be assessed. These also exclude all results where the histology was adenosquamous carcinoma or other carcinomas of the cervix.

Negative

Cytology predicted 15,853 negative results, whereas histology found there to be 15,705.

Of the 15,853 predicted negative results, 15,422 (97.3%) were confirmed to be negative on histology. The high correlation of negative endocervical cytology and histology is probably a function of the rarity of endocervical abnormalities, and thus relatively high number of both

cytology and histology tests where no endocervical abnormality was found, but where a squamous abnormality prompted the histological follow up.

A total of 283 cytology tests predicted an abnormality when no disease was present, although these false positive results were less common for more serious abnormalities, with 12 cytology tests results predicting adenocarcinoma when no disease was present (false positive cancer result). However, negative cytology is not usually followed up by histology, so it is possible that some predictions of an endocervical abnormality, while yielding a negative endocervical result on histology, may have instead revealed a squamous abnormality, with data showing that 599 cytology predictions of an endocervical abnormality revealed a squamous abnormality (either in addition to or instead of an endocervical abnormality).

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 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, as described earlier, 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 208 cytology tests that identified abnormal endocervical cells, but where the pathologist was uncertain of their significance. Of these 208 cytology results, 146 (70.2%) were found to be negative on histology, 45 (21.6%) were found to be high-grade on histology, and 13 (6.3%) were found to be adenocarcinoma (only 1.9% were identified as endocervical atypia). Thus, while the majority of atypical endocervical cells of uncertain significance are found to be negative for disease, a large enough proportion are found to be indicative of severe pathology to warrant that this cytology result be followed up as though a high-grade cytology result as indicated in the *Guidelines for the management of screen detected abnormalities* (NHMRC 2005).

There appears to be an age effect as to whether a cytology result of atypical endocervical cells of uncertain significance was found on histology to be negative, adenocarcinoma *in situ*, or adenocarcinoma (the three main histology results to which atypical endocervical cells of uncertain significance correlate). As shown in Table 5.4, a cytology result of atypical endocervical cells of uncertain significance was more likely to be an abnormality in younger women, with 60.0% of these tests in women aged 20–29 years found to be negative on histology, and 33.3% and 5.0% found to be adenocarcinoma in situ and adenocarcinoma, respectively.

Table 5.4: Histology findings within 6 months of a cytology result of atypical endocervical cells of uncertain significance by age, women aged 20–69 years, cytology tests performed in 2008

	Histology finding					
Age group (years)	Negative		Adenocarcinoma in situ		Adenocarcinoma	
20–29	60.0	(36/60)	33.3	(20/60)	5.0	(3/60)
30–49	70.7	(82/116)	20.7	(24/116)	5.2	(6/116)
50–69	87.5	(28/32)	0.0	(0/32)	12.5	(4/32)

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

The proportion of cytology test results in this category that were found to be negative on histology increased to 70.7% in women aged 30–49 years, and to 87.5% in women aged 50–69 years. However, while older women were more likely to not have an abnormality, where an abnormality was found on histology it was more likely to be malignant, with women aged 30–49 years finding adenocarcinoma in situ in 20.7% and adenocarcinoma in 5.2% of cytology tests with the result atypical endocervical cells of uncertain significance, and all 12.5% of abnormalities in women aged 50–69 years identified as adenocarcinoma in women aged 50–69 years (Table 5.4).

High-grade endocervical abnormalities

Cytology predicted 465 high-grade endocervical abnormalities, whereas histology found there to be 621—with adenocarcinoma in situ found to be a far more common finding than endocervical dysplasia, regardless of the predicted abnormality.

Of the 465 predicted high-grade endocervical abnormalities, 262 (56.3%) were confirmed as high-grade on histology, whereas 335 (72.0%) of the predicted high-grade abnormalities were found to be high-grade disease or greater, this being the positive predictive value (PPV) of a high-grade abnormality (Table 5.5).

The sensitivity of high-grade endocervical abnormalities was lower than the PPV, with 42.2% (262/621) of true high-grade disease being correctly predicted as such by cytology (Table 5.5). Including the cytology result of atypical endocervical cells of uncertain significance as a high-grade prediction (since this cytology result is followed up as a high-grade abnormality) increases high-grade sensitivity slightly from 42.2% to 49.4%. Sensitivity increased with age from 35.4% for women aged 20–29 years to 60.7% for women aged 50–69 years, indicating that fewer cases of the high-grade disease present were accurately predicted as such by cytology in younger women, and—as found for high-grade squamous abnormalities—the PPV for high-grade endocervical abnormalities was lower for women aged 50–69 years (Table 5.5), indicating that fewer of the predicted high-grades were found to be true high-grade disease in these women.

Adenocarcinoma

Cytology predicted 44 cases of adenocarcinoma, whereas histology found there to be 203. Of the 44 predicted cases of adenocarcinoma, 25 (56.8%) were confirmed to be adenocarcinoma on histology. The remaining 178 cases of adenocarcinoma found on histology occurred as follow-up to cytology predictions other than adenocarcinoma, with 73 after a high-grade endocervical cytology, 13 after a cytology result of atypical endocervical cells of uncertain significance, and 92 cases after a negative endocervical cytology result (false negatives).

The sensitivity of a cytology result of adenocarcinoma, like the squamous equivalent, was low at only 11.4%. Unlike the squamous finding, however, there was high proportion of adenocarcinoma cases where cytology was negative (presumably in these cases the histology was conducted due to either symptoms or a high-grade squamous abnormality being detected on cytology test). This is reflected in the lower complete sensitivity of a cytology result of adenocarcinoma of 54.7% for any abnormality and 48.3% for an abnormality of high-grade or above (Table 5.5).

Table 5.5: Sensitivity and positive predictive value (PPV) of endocervical abnormalities for women aged 20–69 years, most serious histology performed within 6 months of cytology performed in 2008

	High-grade		Cancer	
Sensitivity				
20–69 years	**42.2**	(262/621)	**11.4**	(25/220)
20–29 years	*35.4*	*(92/260)*	*11.1*	*(3/27)*
30–49 years	*45.9*	*(153/333)*	*6.9*	*(7/102)*
50–69 years	*60.7*	*(17/28)*	*16.5*	*(15/91)*
Complete sensitivity (abnormal)	. .		**54.7**	(111/203)
Complete sensitivity (high-grade or above)	. .		**48.3**	(98/203)
Positive Predictive Value				
20–69 years	**72.0**	(335/465)	**56.8**	(25/44)
20–29 years	*74.8*	*(101/135)*	*75.0*	*(3/4)*
30–49 years	*74.9*	*(203/271)*	*46.7*	*(7/15)*
50–69 years	*52.5*	*(31/59)*	*60.0*	*(15/25)*

Notes

1. Sensitivity is defined as the proportion of histology tests finding disease (high-grade or cancer) that the cytology test correctly identifies as positive for the disease (high-grade or cancer).
2. Complete sensitivity (abnormal) is defined as the proportion of histology tests finding cancer where the cytology test predicted an abnormality (low-grade, high-grade or cancer); complete sensitivity (high-grade) is defined as the proportion of histology tests finding cancer where the cytology test predicted a high-grade abnormality or cancer.
3. PPV for high-grade is 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 adenocarcinoma; PPV for cancer is calculated as the proportion of cytology results of adenocarcinoma that were confirmed on histology to be adenocarcinoma.
4. Cytology indicating 'no endocervical component' and histology finding adenosquamous carcinoma and carcinoma of the cervix (other) are excluded from all calculations

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.

It was found that most cases of adenosquamous carcinoma and other carcinoma of the cervix were detected by histology within 6 months of a negative cytology result—6 and 7 following a negative squamous result, and 6 and 4 following a negative endocervical result, respectively (Table 5.6).

Table 5.6: Cytology prediction preceding a histology finding of adenosquamous carcinoma or other carcinoma of the cervix, women aged 20–69 years, cytology performed in 2008

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

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

Cytology predictions preceding CIN II versus CIN III

There is interest in how cytology predictions correlate with the squamous high-grade categories of cervical intraepithelial neoplasia (CIN) II and CIN III.

It was found that, for those states and territories that could distinguish between CIN II and CIN III, cytology predictions of possible low-grade and low-grade squamous abnormalities were more likely to be CIN II on histology, whereas cytology predictions of possible high-grade, high-grade, high-grade with possible invasion, and squamous cell carcinoma were all more likely to be CIN III than CIN II on histology (Table 5.7).

Table 5.7: Squamous cytology predictions preceding high-grade squamous findings of CIN II and CIN III, women aged 20–69 years, cytology performed in 2008

Cytology prediction	CIN II	CIN III
Possible LSIL	401	301
LSIL	661	375
Possible HSIL	1,029	1,371
HSIL	1,785	3,891
HSIL possible microinvasion/invasion	6	75
Squamous cell carcinoma	0	20

Note: LSIL is low-grade squamous intraepithelial lesion; HSIL is high-grade squamous intraepithelial lesion.

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 being high-grade abnormalities.

Calculation of these performance measures using cytology-histology correlation data revealed that the proportion of *definite* high-grade cytology confirmed to be high-grade on histology was 78.7% for squamous abnormalities and 92.6% for endocervical abnormalities, and that the proportion of *possible* high-grade cytology confirmed to be high-grade on histology was 53.8% for squamous abnormalities and 49.3% 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).

These calculations further reveal that the relatively high PPV calculated for endocervical high-grade cytology that combined both possible and definite high-grade cytology (Table 5.5) is due to the high predictive value of a cytology prediction of adenocarcinoma *in situ*.

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 2008

Squamous cytology and squamous histology	*Endocervical cytology and endocervical histology*
11,348/14,422 = 78.7%	226/244 = 92.6%

Performance measure 3b

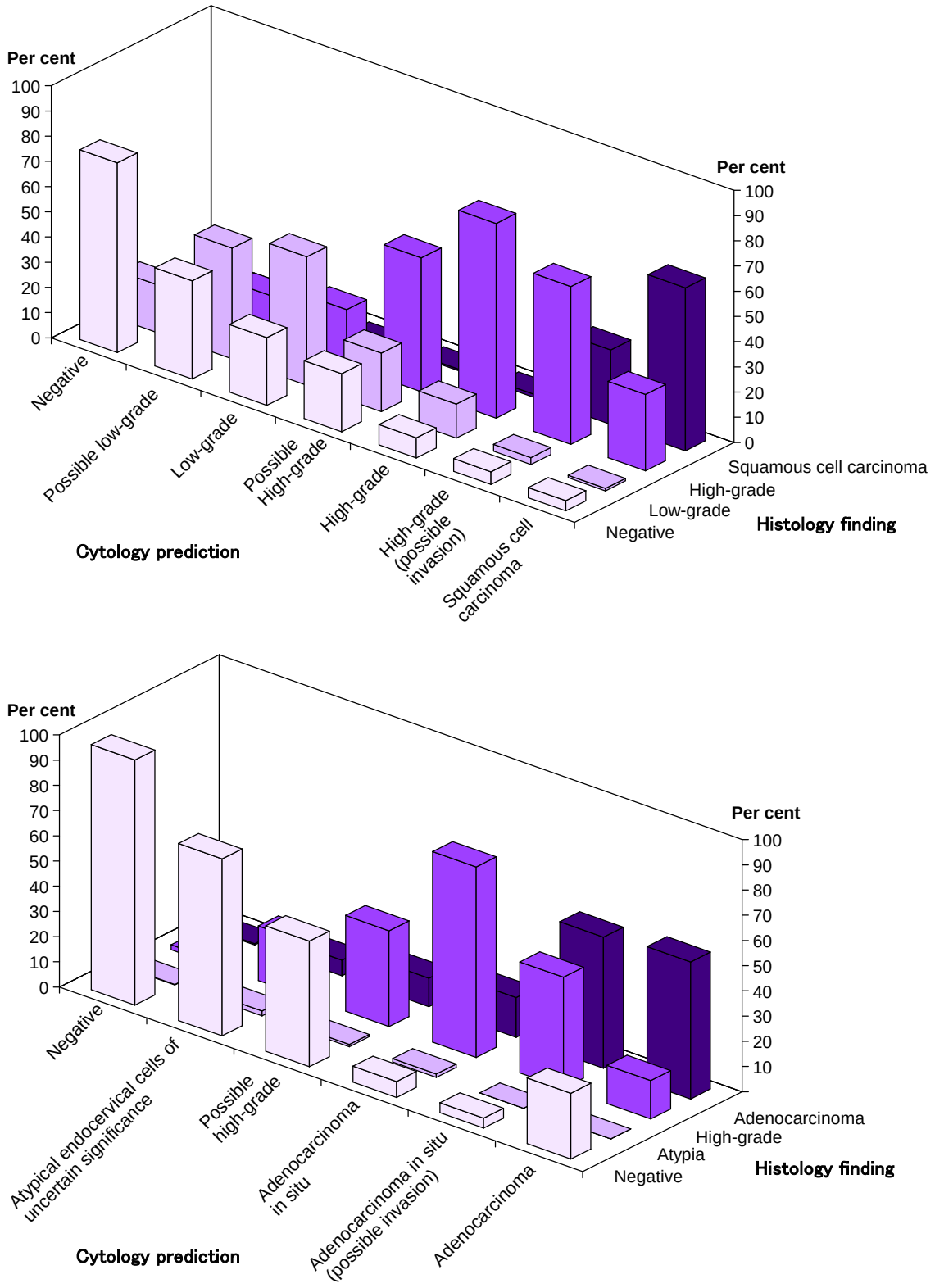
Proportion of cytology specimens reported as a possible high-grade intraepithelial abnormality where cervical histology, taken within 6 months, confirms the abnormality as high-grade intraepithelial abnormality or malignancy.

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 2008

Squamous cytology and squamous histology	*Endocervical cytology and endocervical histology*
4,415/8,212 = 53.8%	109/221= 49.3%



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

Figure 5.1: Correlation between squamous (top) or endocervical (bottom) cytology prediction and most serious squamous or endocervical histology finding within 6 months, women aged 20–69 years, cytology performed in 2008

Indicator 6 Incidence

Incidence at a glance

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

Rationale: 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 most recent incidence of cervical cancer data are for 2007.

Key results

Incidence in 2007

- In 2007 there were 9.0 new cases of cervical cancer per 100,000 women aged 20–69 years.
- In 2007, squamous cell carcinoma comprised 63.4% of all cervical cancers, followed by adenocarcinoma at 24.9%, with adenosquamous and all other cervical cancers comprising 3.9% and 7.8% of all cervical cancers, respectively.

Incidence across remoteness areas and socioeconomic status groups

- In 2003–2007, 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 2003–2007, incidence of cervical cancer in Aboriginal and Torres Strait Islander women from Queensland, Western Australia, South Australia and the Northern Territory was significantly higher than non-Indigenous women from these states and territories, at 20.6 new cases per 100,000 women compared with the non-Indigenous rate of 8.6 new cases per 100,000 women for women aged 20–69 years.

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, formerly the National Cancer Statistics Clearing House), which is held by the AIHW. The data include clinical and demographic information about people with newly diagnosed cancer.

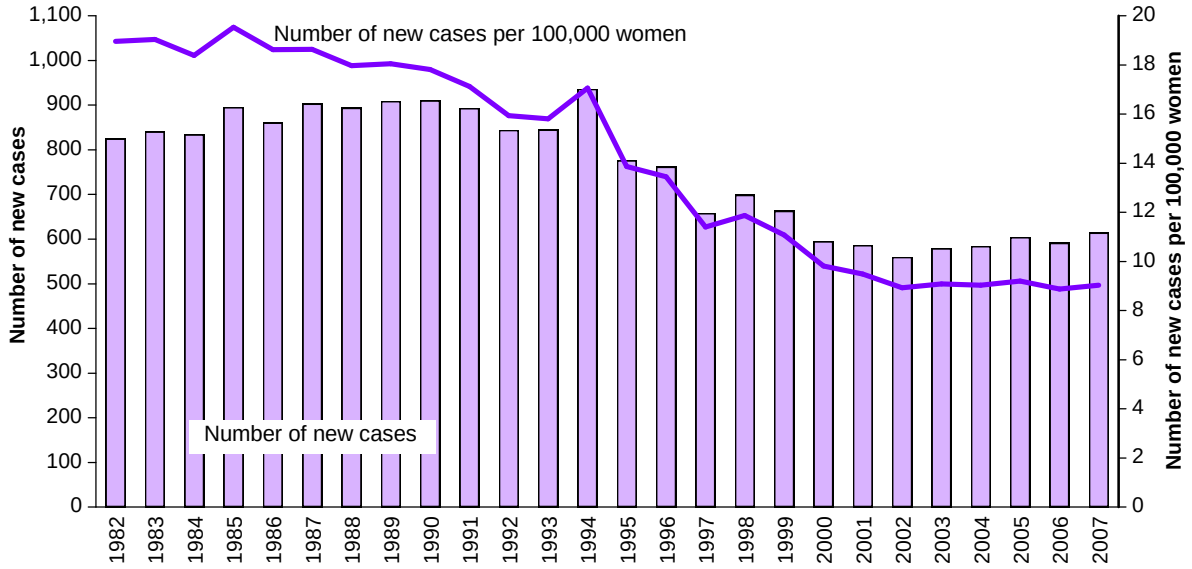
Incidence of cervical cancer measures the number of new cases of cervical cancer diagnosed each year, sourced from the ACD. Only primary cervical cancers are included—secondary cervical cancers and cervical cancers that are a reoccurrence of a primary cervical cancer are not counted. Note that incidence 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

Cervical cancer incidence in 2007

In 2007, cervical cancer comprised 1.6% of all cancers diagnosed in women, with a mean age of diagnosis of 51.2 years. Risk of diagnosis with cervical cancer was 1 in 197 by age 75 years and 1 in 158 by age 85 years (AIHW & AACR 2010).

Incidence of cervical cancer trends



Note: The rates were age-standardised to the Australian population as at 30 June 2001.

Source: AIHW Australian Cancer Database.

Figure 6.1: Incidence of cervical cancer, women aged 20–69 years, by year, 1982 to 2007

The incidence of cervical cancer has decreased over time. For women aged 20–69 years, while incidence had been slowly decreasing before the organised national screening program, from 19.0 new cases per 100,000 women in 1982 (the first year for which data are available) to 17.8 in 1990, incidence decreased more sharply after that year to reach a plateau of 9 new cases per 100,000 women between 2002 and 2007 (Figure 6.1). In 2007, the latest year for which

data are available, incidence of cervical cancer was 9.0 new cases per 100,000 women for women aged 20–69 years (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.

Table 6.1: New cases and incidence of cervical cancer in women, 1982 to 2007

	New cases		AS rate	
Year of diagnosis	20–69 years	All ages	20–69 years	All ages
1982	825	963	19.0	14.2
1983	841	994	19.0	14.3
1984	834	1,006	18.4	14.2
1985	895	1,057	19.5	14.6
1986	861	1,019	18.6	13.9
1987	903	1,096	18.6	14.3
1988	894	1,059	18.0	13.5
1989	909	1,073	18.0	13.5
1990	910	1,080	17.8	13.4
1991	893	1,092	17.1	13.2
1992	844	1,023	15.9	12.2
1993	845	1,013	15.8	11.9
1994	936	1,144	17.1	13.1
1995	776	961	13.9	10.7
1996	762	942	13.5	10.4
1997	658	811	11.4	8.7
1998	699	872	11.9	9.2
1999	663	802	11.1	8.3
2000	595	764	9.8	7.8
2001	586	739	9.5	7.4
2002	560	692	8.9	6.8
2003	579	729	9.1	7.0
2004	584	726	9.0	6.9
2005	604	734	9.2	6.9
2006	591	721	8.9	6.7
2007	614	739	9.0	6.8

Note: Rates are the number of cervical cancers detected per 100,000 women and age standardised to the Australian population at 30 June 2001.

Source: AIHW Australian Cancer Database.

Although the incidence rate was decreasing slowly between 1982 and 1990, prior to the introduction of the NCSP, the number of new cases in women aged 20–69 years increased

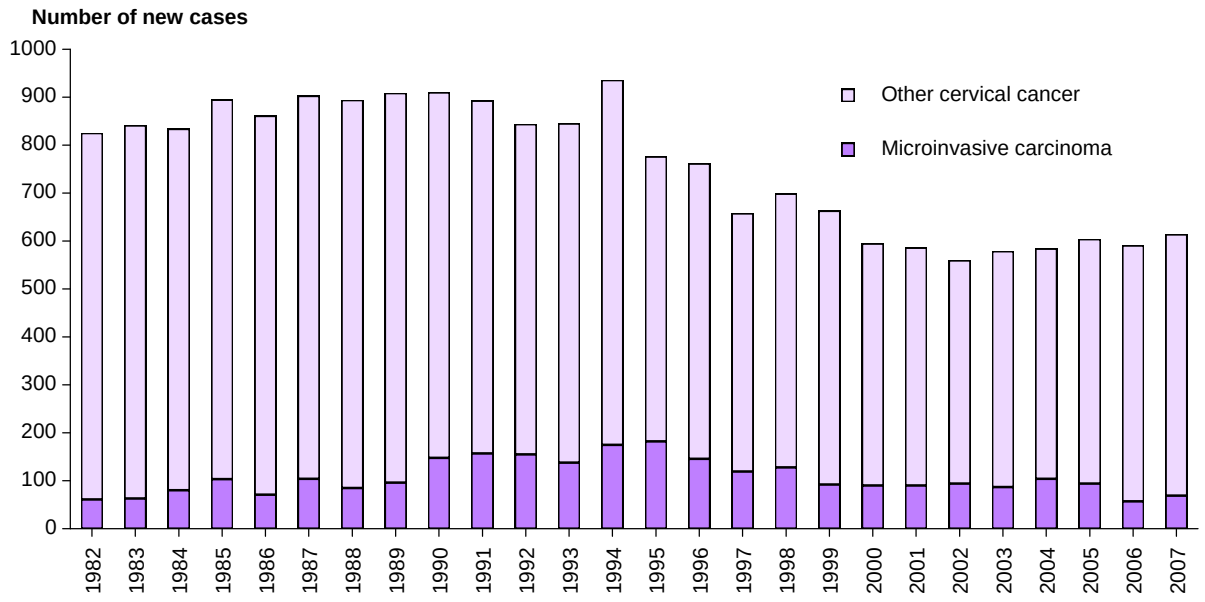
slightly over this period from 825 new cases in 1982 to 910 in 1990 (a 10.3% increase). After this year the number of new cases decreased more or less steadily to a low of 560 new cases in 2002, after which this remained between around 580 and 600 new cases until 2007, when there were 614 new cases of cervical cancer in women aged 20–69 years. Thus the majority of the 32.5% decrease in number of new cases between 1990, the year before the NCSP commenced, and 2007 was the immediate fall in numbers from 1990 to 2002 (a 38.5% decrease) (Table 6.1).

With women aged 20–69 years comprising between 78% and 86% of women of all ages diagnosed with cervical cancer, it is no surprise that the trends in incidence and number of new cases for women of all ages is driven by this age group (Table 6.1).

Interestingly, the proportion of all cervical cancers that occur in women aged 20–69 years has changed over time in line with incidence trends. In 1982, 85.7% of cervical cancers were diagnosed in women aged 20–69 years. This remained at 85%, before decreasing from 84.3% in 1990 to a low of 77.9% in 2000, thereafter remaining at around 80%, increasing to 83.1% in 2007—a level not seen since 1982. It could be expected that the number and hence proportion of cervical cancers in the NCSP target age group could decrease out of proportion to the total number of cervical cancers, since the detection of potentially pre-cancerous abnormalities to decrease cervical cancer incidence occurs preferentially in this target age group. However, the possible reasons for the increase in the proportion of cervical cancers diagnosed in women aged 20–69 years in the latest years of data are not clear.

In addition to all invasive cervical cancers, microinvasive squamous cell carcinomas are also monitored, since if 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.

Microinvasive squamous cell carcinomas make up a small proportion of all cervical cancers diagnosed.



Source: AIHW Australian Cancer Database.

Figure 6.2: Incidence of microinvasive squamous cell carcinoma and other cervical cancer, women aged 20–69 years, by year, 1982 to 2007

Although jumping between 7.4% and 16.3% in the years prior to the commencement of the NCSP in 1991, the proportion of cervical cancers that were microinvasive squamous cell carcinoma remained between 15% and 19% for most years between 1991 and 2007. The exceptions to this are the most recent years of 2006 and 2007, in which microinvasive squamous cell carcinoma comprised just 9.6% and 11.2% of cervical cancer cases, respectively (Figure 6.2).

Incidence of microinvasive squamous cell carcinoma increased from 1.3 new cases per 100,000 women in 1982 to a peak of 3.2 new cases per 100,000 women in 1995, before falling to a stable 1.5 new cases per 100,000 women between 1999 and 2005. This decreased sharply to less than 1.0 new case per 100,000 women in 2006, and in 2007 there were 69 new cases of microinvasive squamous cell carcinoma diagnosed, equivalent to 1.1 new cases per 100,000 women. The reason for this sudden decrease after being stable for 7 years is not clear.

Incidence of cervical cancer by age

In 2007, cervical cancer incidence was found to be very low in women aged 20–24 years at less than 1 new case per 100,000 women, increasing with increasing age to a peak of 12.5 new cases per 100,000 women for women aged 35–39 years, thereafter decreasing to a relatively level rate of 10 to 11 new cases until age 80–84 years when the incidence increases again (to 14.0 in 2007).

With less than 1,000 new cases in women aged 20–69 years each year, incidence rates can show some instability between years, so the 2007 age-specific rates are compared with those over the previous 5 years to better gauge recent trends in age-specific cervical cancer incidence. This revealed that the trend seen is 2007 appears typical of recent years (Table 6.2), with cervical cancer incidence usually highest in with women aged 40 to 49 years, or in those aged 65–69 years. 2007 is the first year in which the peak incidence has been in an age group as young as 35–39 years, but the significance of this is unclear, since 2008 data may well reveal this to be peculiar to 2007 alone.

Table 6.2: Incidence of cervical cancer in women, 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
New cases	6	41	68	99	85	84	75	58	54	44
Rate	0.8	5.7	9.2	12.5	11.1	10.9	10.7	9.1	10.2	10.8

Note: 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.

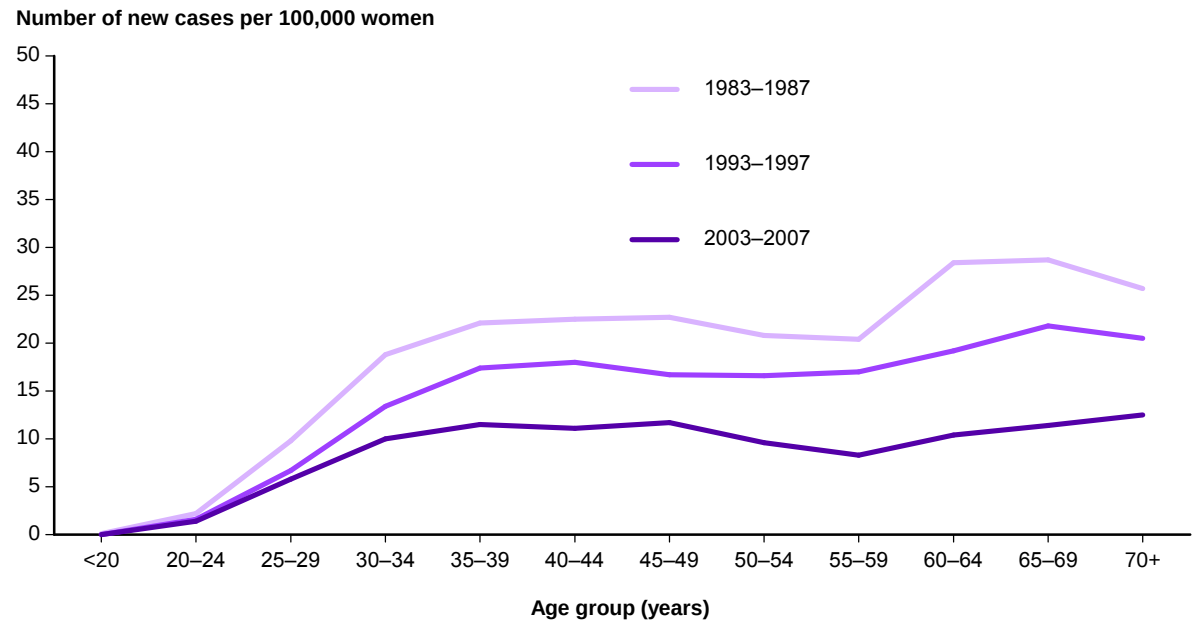
Source: AIHW Australian Cancer Database.

As a subset of all cervical cancers, the incidence of microinvasive squamous cell carcinoma showed a different age structure, generally being highest in women aged 30–34 years, and decreasing to very low levels from age 49 years onwards. In 2007, 69 new cases of microinvasive squamous cell carcinoma were diagnosed in women aged 20–69 years, of which 21 were in women aged 30–34 years. This equated to 2.8 new cases per 100,000 women aged 30–34 years, which was the highest age-specific incidence of microinvasive squamous cell carcinoma in 2007.

Historical age-specific trends in incidence of all cervical cancers 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 1983–1987, 1993–1997 and 2003–2007 in Figure 6.3 below.

It was found that incidence was reduced across all age groups from 1983–1987 to 2003–2007. Interestingly in 1983–1987, 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, 1983–1987, 1993–1997 and 2003–2007

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. These are set out in Table 6.3, below.

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: Histological groupings for cervical cancer, based on Curado (with modifications)

Types of cervical cancer
1: Carcinoma
1.1: Squamous cell carcinoma
1.2: Adenocarcinoma
1.3: Adenosquamous carcinoma
1.4: Other specified and unspecified carcinoma
2: Sarcoma
3: Other specified and unspecified malignant neoplasm

Source: adapted from Curado et al. (2007).

This also differs from incidence of cervical cancer by histological type presented in previous *Cervical screening in Australia* reports, which grouped other specified and unspecified carcinoma with sarcoma and other and unspecified malignant neoplasms into a single 'other' category. While the numbers of cases are very small for these histological types, it is still preferable to separating other carcinomas from other malignant neoplasms when analysing trends in histological type.

In 2007, of the 614 cervical cancers diagnosed in women aged 20–69 years, 604 (98.4%) were carcinomas, none were sarcomas, and 10 (1.6%) were classified as other and unspecified malignant neoplasms (Table 6.4). Within the carcinomas, squamous cell carcinoma comprised the greatest proportion at 63.4% of all cervical cancers, followed by adenocarcinomas at 24.9% of cervical cancers, and adenosquamous carcinomas at 3.9%, with other and unspecified carcinomas comprising 6.2% of all cervical cancers in 2007 in women aged 20–69 years (Table 6.4).

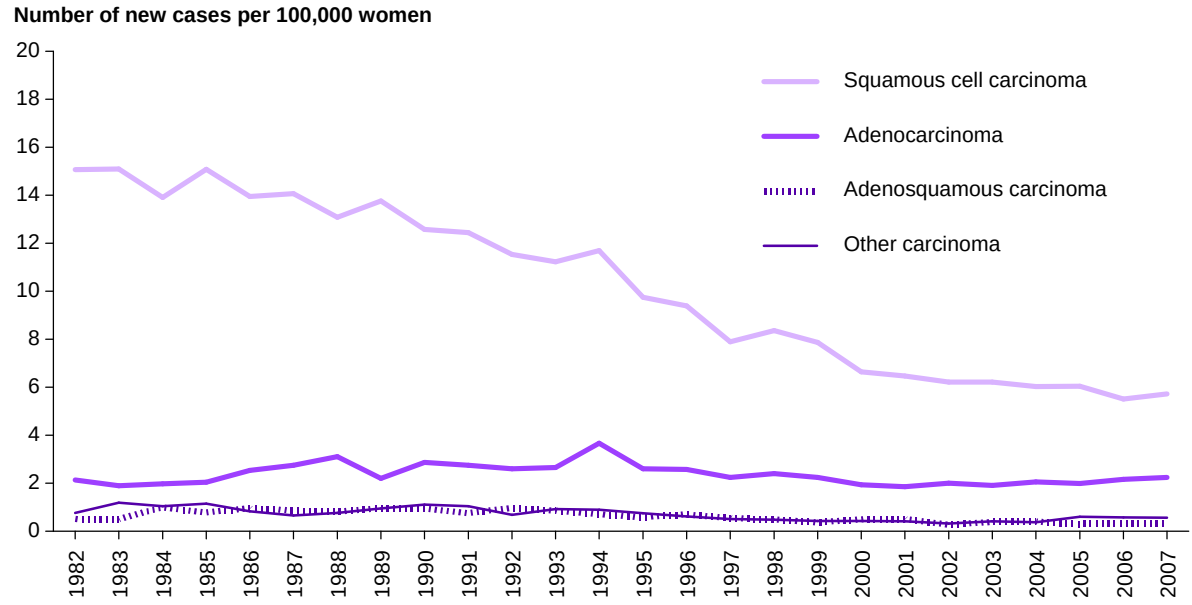
Table 6.4: Incidence of cervical cancer by histological type, women aged 20–69 years, 2007

Type of cervical cancer	New cases	AS rate	% of cervical cancers
1: Carcinoma	604	8.9	98.4
1.1: Squamous cell carcinoma	*389*	*5.7*	63.4
1.2: Adenocarcinoma	*153*	*2.2*	24.9
1.3: Adenosquamous carcinoma	*24*	*0.4*	3.9
1.4: Other specified and unspecified carcinoma	*38*	*0.6*	6.2
2: Sarcoma	0	0.0	0.0
3: Other specified and unspecified malignant neoplasm	10	0.1	1.6
Total	**614**	**9.0**	**100.0**

Note: Age-standardised (AS) rate is the number of new cases per 100,000 women and 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.

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



Note: The rates were 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), women aged 20–69 years, by year, 1982 to 2007

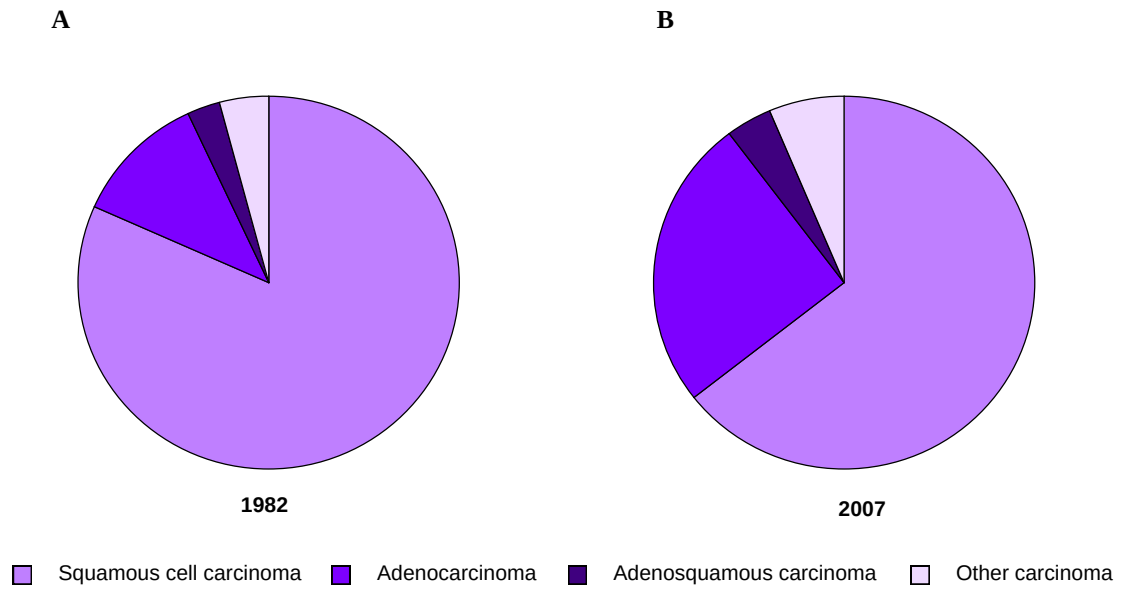
Squamous cell carcinoma has shown the most dramatic change over this time, decreasing from 15.1 new cases per 100,000 women in 1982 to 5.7 new cases per 100,000 women in 2007. Although evident prior to the introduction of the NCSP, incidence halved between 1990 and 2000 from 12.6 to 6.7 new cases per 100,000 women (a 46.8% decrease). Slower but still evident from 2000 onwards, incidence decreased from 6.7 to 5.7 new cases per 100,000 women between 2000 and 2007 (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 conforms 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 after 1994 to a low of 1.9 new cases per 100,000 women in 2000, thereafter remaining at 2 cases per 100,000 women (Figure 6.4).

Incidence of the rarer 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 2007.

All trends described for women aged 20–69 years are also true for women of all ages.

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 steadily over time, from 81.6% in 1982 to 64.4% in 2007. In contrast, adenocarcinomas have comprised an increasingly large proportion since cervical screening, from 11.4% in 1982 to 25.3% in 2007. Adenosquamous, other specified and unspecified carcinomas between them have comprised the remaining 10% of carcinomas over the years shown (Figure 6.5).



Source: AIHW Australian Cancer Database.

Figure 6.5: Squamous cell carcinoma, adenocarcinoma, adenosquamous carcinoma and other carcinoma, as a proportion of all carcinoma of the cervix in women, 1982 and 2007

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.

Table 6.5: New cases and incidence of carcinoma of the cervix (squamous cell carcinoma, adenocarcinoma, adenosquamous carcinoma and other carcinoma), women aged 20–69 years, 1982 to 2007

Year of diagnosis	New cases				AS rate			
	SSC[(a)]	AC[(b)]	ASC[(c)]	Other[(d)]	SSC[(a)]	AC[(b)]	ASC[(c)]	Other[(d)]
1982	657	92	22	34	15.1	2.1	0.5	0.8
1983	663	83	23	56	15.1	1.9	0.5	1.2
1984	633	88	45	48	13.9	2.0	1.0	1.0
1985	689	95	35	55	15.1	2.0	0.8	1.2
1986	647	117	42	40	14.0	2.5	1.0	0.8
1987	684	132	41	32	14.1	2.7	0.9	0.7
1988	649	156	40	40	13.1	3.1	0.8	0.8
1989	691	112	50	48	13.8	2.2	1.0	0.9
1990	642	147	49	57	12.6	2.9	1.0	1.1
1991	648	143	41	55	12.4	2.8	0.8	1.0
1992	612	137	51	37	11.5	2.6	1.0	0.7
1993	596	144	47	50	11.2	2.7	0.9	0.9
1994	640	203	40	49	11.7	3.7	0.7	0.9
1995	545	147	34	42	9.8	2.6	0.6	0.8
1996	530	148	40	35	9.4	2.6	0.7	0.6
1997	455	130	33	30	7.9	2.2	0.6	0.5
1998	492	141	30	29	8.4	2.4	0.5	0.5
1999	471	135	23	26	7.9	2.2	0.4	0.4
2000	403	118	30	26	6.7	1.9	0.5	0.4
2001	400	115	32	26	6.5	1.9	0.5	0.4
2002	390	126	18	20	6.2	2.0	0.3	0.3
2003	396	122	25	27	6.2	1.9	0.4	0.4
2004	390	133	27	24	6.0	2.1	0.4	0.4
2005	396	131	20	40	6.0	2.0	0.3	0.6
2006	366	144	22	39	5.5	2.2	0.3	0.6
2007	389	153	24	38	5.7	2.2	0.4	0.6

(a) SSC = squamous cell carcinoma

(b) AC = adenocarcinoma;

(c) ASC = adenosquamous carcinoma

(d) Other = other and unspecified carcinoma

Note: Rates are the number of new cases of squamous cell carcinoma, adenocarcinoma, adenosquamous carcinoma and other carcinoma per 100,000 women and 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.

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 just below 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).

Incidence of cervical cancer by state and territory

Cervical cancer incidence for individual states and territories is presented over a 5-year period to increase stability and comparability. The most recent 5-year period is 2003–2007.

Table 6.6: Incidence of cervical cancer, by state and territory, women aged 20–69 years, 2003–2007

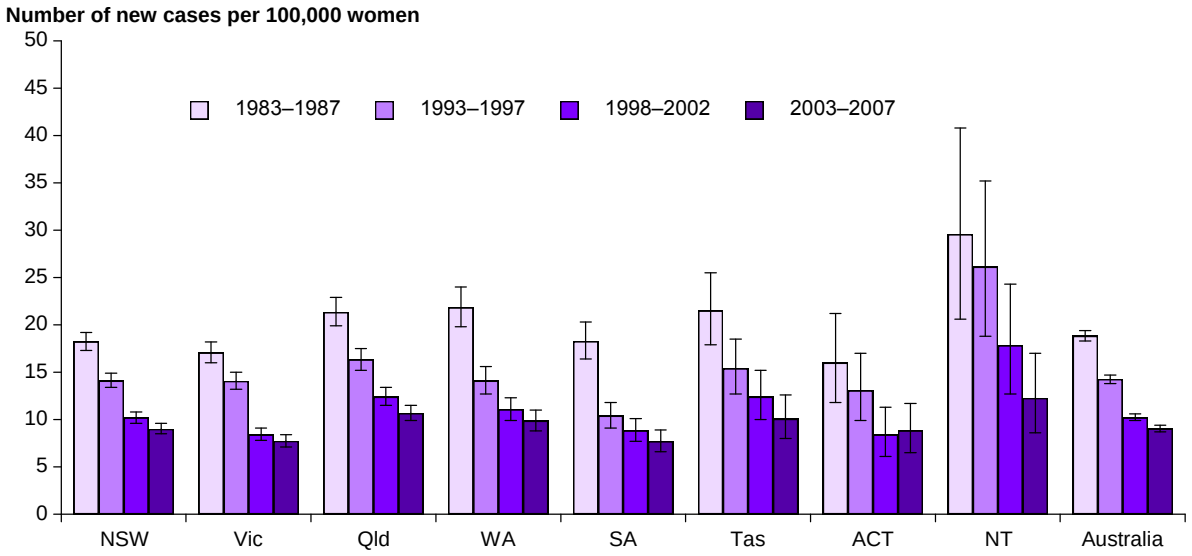
	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
New cases	982	634	683	317	190	79	48	39	2,972
AS rate	9.0	7.7	10.7	9.9	7.7	10.1	8.9	12.3	9.0
95% CI	8.5–9.6	7.1–8.4	9.9–11.5	8.8–11.0	6.6–8.9	8.0–12.6	6.5–11.7	8.6–17.0	8.7–9.4

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

Source: AIHW Australian Cancer Database.

In 2003–2007, incidence of cervical cancer for women aged 20–69 years among the states and territories was relatively stable, with the incidence rates of most states and territories having confidence intervals that overlapped those surrounding the national incidence of 9.0 new cases per 100,000 women (Table 6.6). The two exceptions to this were Victoria, with an incidence of 7.7 new cases per 100,000 women considered significantly lower than the national rate, and Queensland with an incidence of 10.7 new cases per 100,000 women considered significantly higher than the national rate. Note that, while South Australia shared Victoria's low incidence rate, this state's smaller population has led to broader confidence intervals that overlap those surrounding the national rate (Table 6.6).

Compared with the previous 5-year period of 1998–2002, the incidence of almost every state and territory appeared lower in 2003–2007(Figure 6.6). However, none of these are statistically significant owing to the overlap in confidence intervals. Figure 6.6 illustrates that incidence in all states and territories was lower in the earlier 5-year period of 1993–1997 compared with 2003–2007, but this was only statistically significant in the larger states and territories. The decrease in incidence from 1983–1987 (before the NCSP) and 1993–1997 (just after its introduction) was clear across states and territories, although small numbers precluded statistical significance in the territories (Figure 6.6).



Notes

1. The rates were age-standardised to the Australian population as at 30 June 2001.
2. The bars on the columns represent 95% confidence intervals.

Source: AIHW Australian Cancer Database.

Figure 6.6: Incidence of cervical cancer, by state and territory, women aged 20–69 years, 1983–1987, 1993–1997, 1998–2002 and 2003–2007

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. Due to the small number of new cases in the less populated areas, data are reported over a 5-year period to increase stability and comparability. To further 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 2003–2007 did not differ between *Major cities* and *Inner and outer regional* areas, both being 8.9 new cases per 100,000 women. However, incidence in *Remote and very remote* areas was found to be significantly higher than both *Major cities* and *Inner and outer regional* areas at 12.2 new cases per 100,000 women (Table 6.7).

This trend has not changed greatly since the previous 5-year period (Figure 6.7A).

Table 6.7: Incidence of cervical cancer by remoteness area, women aged 20–69 years, 2003–2007

	Major cities	Inner and outer regional	Remote and very remote	Australia
New cases	2,031	842	86	2,972
Rate	8.9	8.9	12.2	9.0
95% CI	8.6–9.3	8.3–9.6	9.8–15.1	8.7–9.4

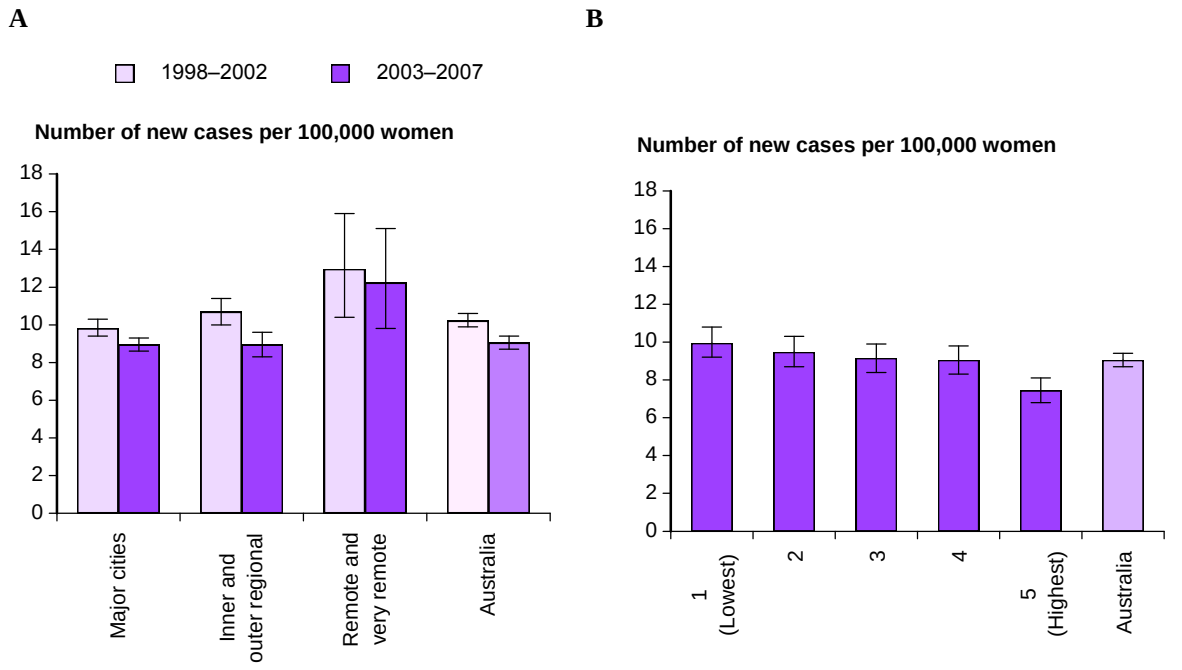
Notes

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 and age standardised to the Australian population at 30 June 2001.

Source: AIHW Australian Cancer Database.

Within remoteness areas, incidence in both *Major cities* and *Inner and outer regional* areas decreased significantly between 1998–2002 and 2003–2007—*Major cities* from 9.8 to 8.9 new cases per 100,000 women, and *Inner and outer regional* from 10.7 to 8.9 new cases per 100,000 women (Figure 6.7A). The decrease in *Major cities* occurred despite an increase in the number of new cases from 1,994 to 2,031, whereas the decrease in *Inner and outer regional* areas was associated with a decrease from 998 to 842 new cases.

Incidence in *Remote and very remote* areas, in contrast, was not found to be significantly different between 1998–2002 and 2003–2007, at 13.0 and 12.2 new cases per 100,000 women, respectively (Figure 6.7A). The number of new cases was also very similar between the two periods, 91 in 1998–2002 and 86 in 2003–2007.



Note: Bars represent 95% confidence intervals.

Source: AIHW Australian Cancer Database.

Figure 6.7: Incidence of cervical cancer, by geographic region, 1998–2002 and 2003–2007 (A) and by socioeconomic status, 2003–2007 (B), women aged 20–69 years

Incidence has never been reported by socioeconomic status of location of residence in this series and is presented in this report for the first time for the most recent 5-year period, 2003–2007.

In 2003–2007, incidence was found to be very similar across the socioeconomic status groups from 1 (lowest) to 4, ranging from 9.9 new cases per 100,000 women down to 9.1, with no significant differences found between these groups (Table 6.8). In contrast to this is the highest socioeconomic status group, with the reported incidence of 7.4 new cases per 100,000 women found to be significantly lower than all other socioeconomic status groups (Table 6.8, Figure 6.7B).

Table 6.8: Incidence of cervical cancer by socioeconomic status, women aged 20–69 years, 2003–2007

	1 (lowest)	2	3	4	5 (highest)	Australia
New cases	627	605	599	610	512	2,972
Rate	9.9	9.5	9.2	9.1	7.4	9.0
95% CI	9.2–10.8	8.7–10.3	8.4–9.9	8.3–9.8	6.8–8.1	8.7–9.4

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 and age standardised to the Australian population at 30 June 2001.

Source: AIHW Australian Cancer Database.

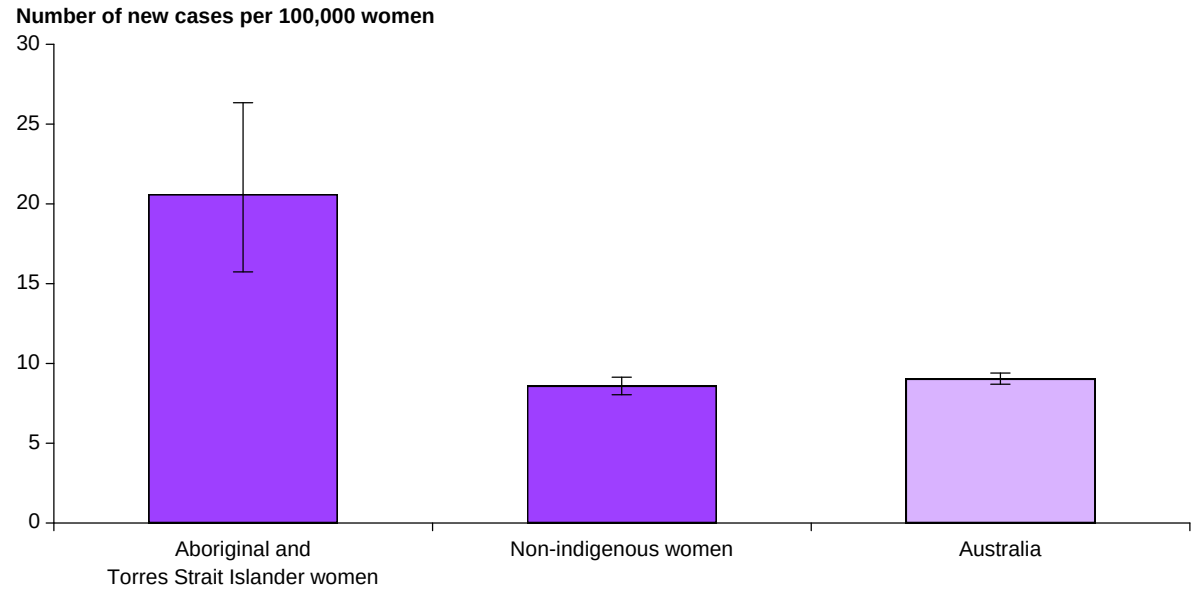
Incidence of cervical cancer by Aboriginal and Torres Strait Islander status

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—Queensland, Western Australia, South Australia and the Northern Territory—are considered of sufficient quality, and have been used to examine the incidence of cervical cancer by Aboriginal and Torres Strait Islander status. While the majority (60%) 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. Further, even for these four jurisdictions, the level of missing data on Aboriginal and Torres Strait Islander status for cancers diagnosed between 2003 and 2007 was 11% (AIHW & AACR 2010).

Cervical cancer incidence by Aboriginal and Torres Strait Islander status for Queensland, Western Australia, South Australia and the Northern Territory is presented here for the first time for the most recent 5-year period, 2003–2007.

It was found that, over the 5-year period 2003–2007, Aboriginal and Torres Strait Islander women in Queensland, Western Australia, South Australia and the Northern Territory had a significantly higher incidence of cervical cancer compared with non-Indigenous women from these states and territories at 20.6 new cases per 100,000 women compared with the non-Indigenous rate of 8.6 new cases per 100,000 women (Table 6.9, Figure 6.8). This was true for both women aged 20–69 years, as well as for women of all ages (with an age-standardised incidence of 18.3 new cases per 100,000 women compared with the non-Indigenous rate of 6.6 new cases per 100,000 women).



Notes

1. The rates were age-standardised to the Australian population as at 30 June 2001.
2. The bars on the columns represent 95% confidence intervals.

Source: AIHW Australian Cancer Database.

Figure 6.8: Incidence of cervical cancer (Queensland, Western Australia, South Australia and Northern Territory), by Aboriginal and Torres Strait Islander status, women aged 20–69 years, 2003–2007

Table 6.9: Incidence of cervical cancer (Queensland, Western Australia, South Australia and Northern Territory) by Aboriginal and Torres Strait Islander status, women aged 20–69 years, 2003–2007

	New South Wales, Queensland, Western Australia, South Australia and the Northern Territory[a]			Australia[c]
	Aboriginal and Torres Strait Islander	Non-Indigenous	Total[b]	
New cases	71	1,042	1,229	2,972
Crude rate	18.3	8.6	9.9	9.1
AS rate	20.6	8.6	9.9	9.0
95% CI	15.8–26.4	8.1–9.2	9.4–10.5	8.7–9.4

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

(b) 'Total' includes Aboriginal and Torres Strait Islander, non-Indigenous and women in the 'not-stated' category for Aboriginal and Torres Strait Islander status for Queensland, Western Australia, South Australia and the Northern Territory only.

(c) All women in Australia.

Notes

1. Crude rates are the number of cervical cancers detected per 100,000 women.
2. Age-standardised rates are the number of cervical cancers detected per 100,000 women, age-standardised to the Australian population at 30 June 2001.

Source: AIHW Australian Cancer Database.

Indicator 7 Mortality

Mortality at a glance

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 the 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 most recent data for mortality from cervical cancer are for 2007.

Key results

Mortality in 2007

- In 2007 there were 1.9 deaths per 100,000 women from cervical cancer for women aged 20–69 years.

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, Western Australia, South Australia and the Northern Territory compared with non-Indigenous women from these states and territories at 10.6 deaths per 100,000 women compared with the non-Indigenous rate of 1.9 deaths per 100,000 women.

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 AIHW also holds these data in the AIHW National Mortality Database, from which the data presented here are sourced.

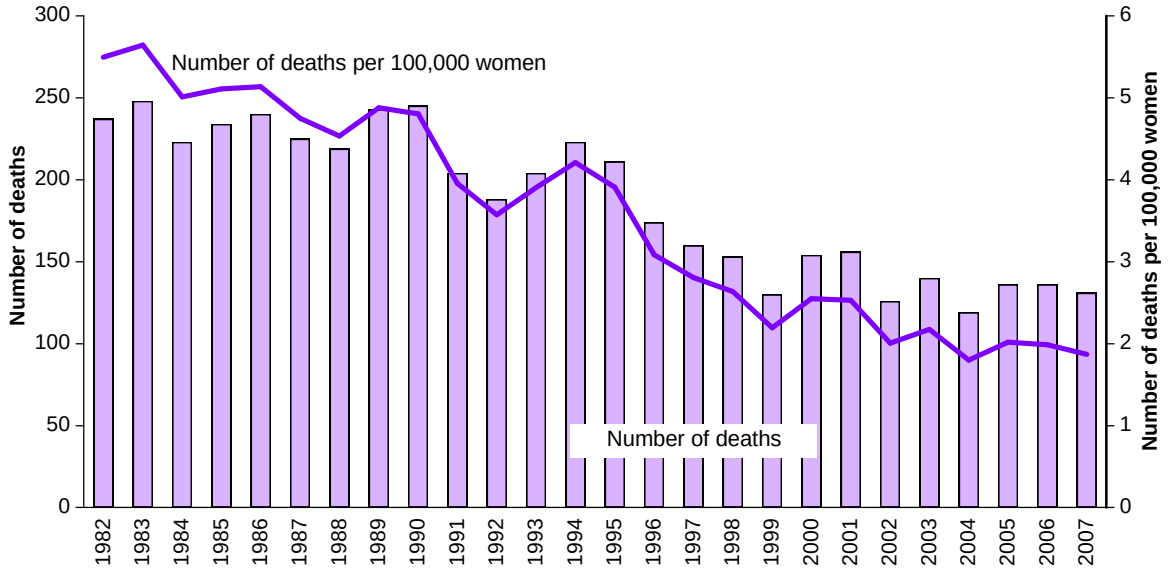
Mortality from cervical cancer measures the number of deaths each year for which cervical cancer was the underlying cause of death. Analyses are based on the year of death, except for 2007 (the latest year for which mortality data are available), which is based on the year of registration of death. Note that about 5% of deaths are not registered until the year following the death (ABS 2007).

Detailed analyses

Cervical cancer mortality in 2007

In 2007, deaths from cervical cancer comprised 1.2% of all cancer deaths in women, with a mean age of death of 62.6 years. Risk of dying from cervical cancer was 1 in 817 by age 75 years and 1 in 502 by age 85 years (AIHW & AACR 2010).

Trends in mortality from cervical cancer



Note: The rates were 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 years, 1982 to 2007

The number of deaths from cervical cancer is considerably smaller than the number of new cases of cervical cancer. This creates greater fluctuations in the mortality rates from year to year, although these are not sufficient to hide the broad trends that are apparent.

Mortality from cervical cancer has decreased more or less steadily over the years shown. 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 continued to fall to 2 deaths per 100,000 women between 2002 and 2007 (Figure 7.1). In 2007, the latest year for which data are available, mortality from cervical cancer was 1.9 per 100,000 women for women aged 20–69 years (Table 7.1).

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

	Deaths		AS rate	
Year	20–69 years	All ages	20–69 years	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.
2. Rates are the deaths from cervical cancer per 100,000 women and age standardised to the Australian population at 30 June 2001.

Source: AIHW National Mortality Database.

Although the mortality rate decreased between 1982 and 1990, prior to the introduction of the NCSP, the number of deaths from cervical cancer in women aged 20–69 years did not decrease, instead fluctuating between around 220 and 250 deaths each year between 1982 and 1990. The number of deaths from cervical cancer then decreased between 1990 and 2007, in line with the decrease in mortality rate described above, from 245 deaths in 1990 to 126 deaths in 2002 (although with number of deaths mirroring the peaks in mortality noted above in the early and mid-1990s), thereafter remaining fairly stable at between around 120 and 140 deaths between 2002 and 2007 (Table 7.1).

Similar to incidence, women aged 20–69 years comprise the majority of women of all ages who die from cervical cancer, at between 56.1% and 72.3% for the years 1982 to 2007. Thus broad trends in mortality and number of deaths for women of all ages is driven by, and is therefore similar to, those for women aged 20–69 years (Table 7.1).

The proportion of deaths from cervical cancer in women aged 20–69 years ranged between 63.5% and 72.3% between 1982 and 1990, thereafter decreasing to a low of 56.1% in 1997, and remaining steady at between 58% and 59% until 2004, where it was 56.7%. The year 2005 then saw this proportion increase to above 60% for the first time since 1995, remaining at this higher level in 2006 and 2007. In 2007, 63.0% of deaths from cervical cancer were in women aged 20–69 years. While the overall decrease in the proportion of deaths from cervical cancer in women aged 20–69 years may be due to a proportionately greater number of women in the target age group having improved outcomes through cervical screening, possible reasons for the increase in the latest years of data—that mirrors the increase in the proportion of cervical cancers diagnosed in women aged 20–69 years noted earlier—are not clear.

Mortality from cervical cancer by age

In 2007, cervical cancer mortality increased with age. In line with this pattern, the highest mortality was seen in women aged 85+ years with a rate of 10.5 deaths per 100,000 women. Within the target age group, the highest mortality in 2007 was in women aged 60–64 years, with 28 deaths resulting in a rate of 5.3 deaths per 100,000 women for this age group (Table 7.2).

Table 7.2: Mortality from cervical cancer by age, 2007

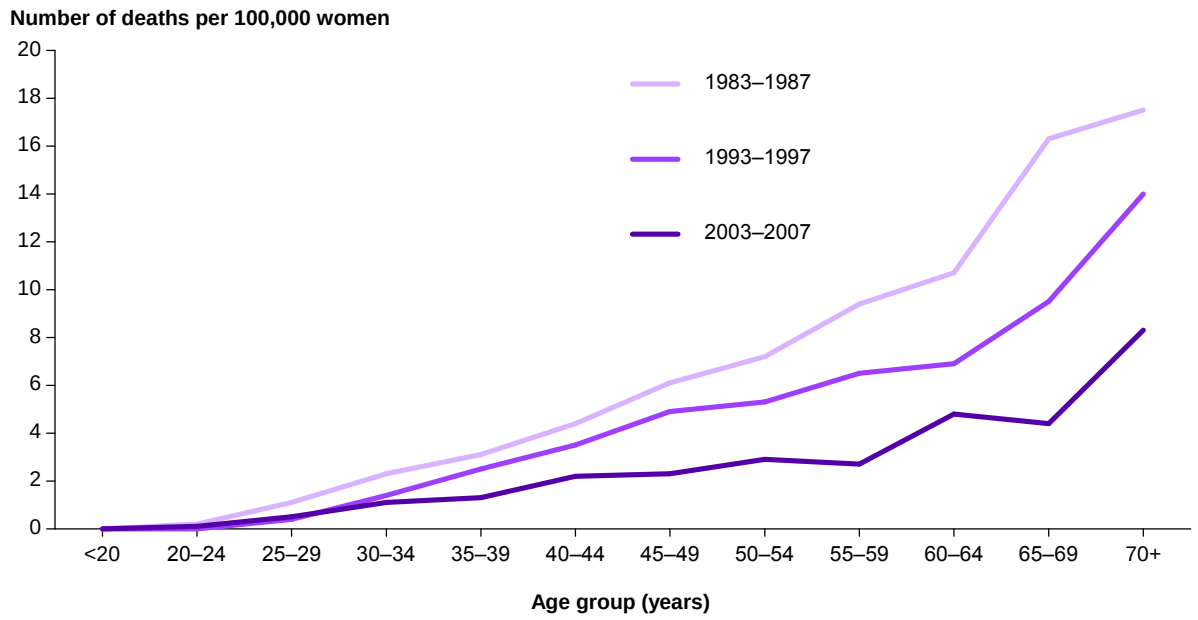
	Age group (years)									
	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	65–69
Deaths	n.p.	n.p.	7	12	17	14	26	11	28	14
Rate	n.p.	n.p.	0.9	1.5	2.2	1.8	3.7	1.7	5.3	3.4

n.p not published (number of deaths of 1 or 2 and rates based number of deaths of 1 or 2 are not reported)

Note: 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

Cervical cancer mortality for individual states and territories is presented over a 5-year period to increase stability and comparability. The most recent 5-year period is 2003–2007.

In 2003–2007, mortality from cervical cancer across states and territories for women aged 20–69 years ranged between 1.5 and 3.1 per 100,000 women (Table 7.3).

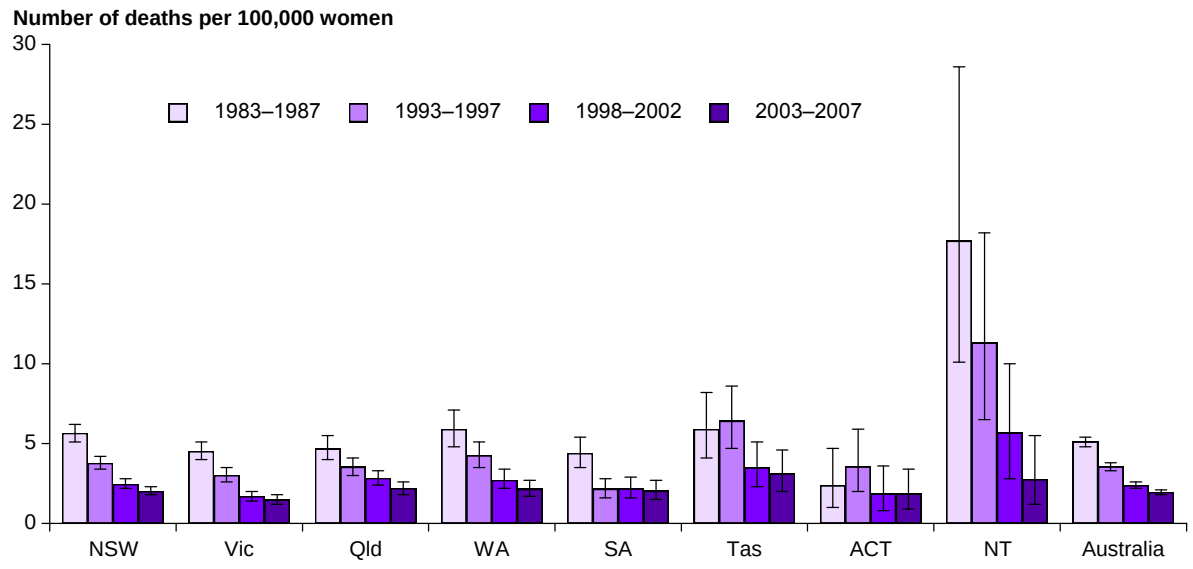
Table 7.3: Mortality from cervical cancer, by state and territory, women aged 20–69 years, 2003–2007

	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

Note: 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.

Apparent decreases in mortality between 1998–2002 and 2003–2007 across the states and territories were not found to be statistically significant for women aged 20–69 years. The decreases in mortality from 1983–1987 to 1993–1997 are also shown in Figure 7.3, with a reduction in the mortality from cervical cancer clearly evident in all states and territories from 1983–1987 to 2003–2007, although not statistically significantly in the smaller states and territories (Figure 7.3).



Notes

1. The rates were age-standardised to the Australian population as at 30 June 2001.
2. The bars on the columns represent 95% confidence intervals.

Source: AIHW National Mortality Database.

Figure 7.3: Mortality from cervical cancer, by state and territory, women aged 20–69 years, 1983–1987, 1993–1997, 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. Due to the small number of new cases in the less populated areas, data are reported over a 5-year period to increase stability and comparability. To further increase stability, 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).

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

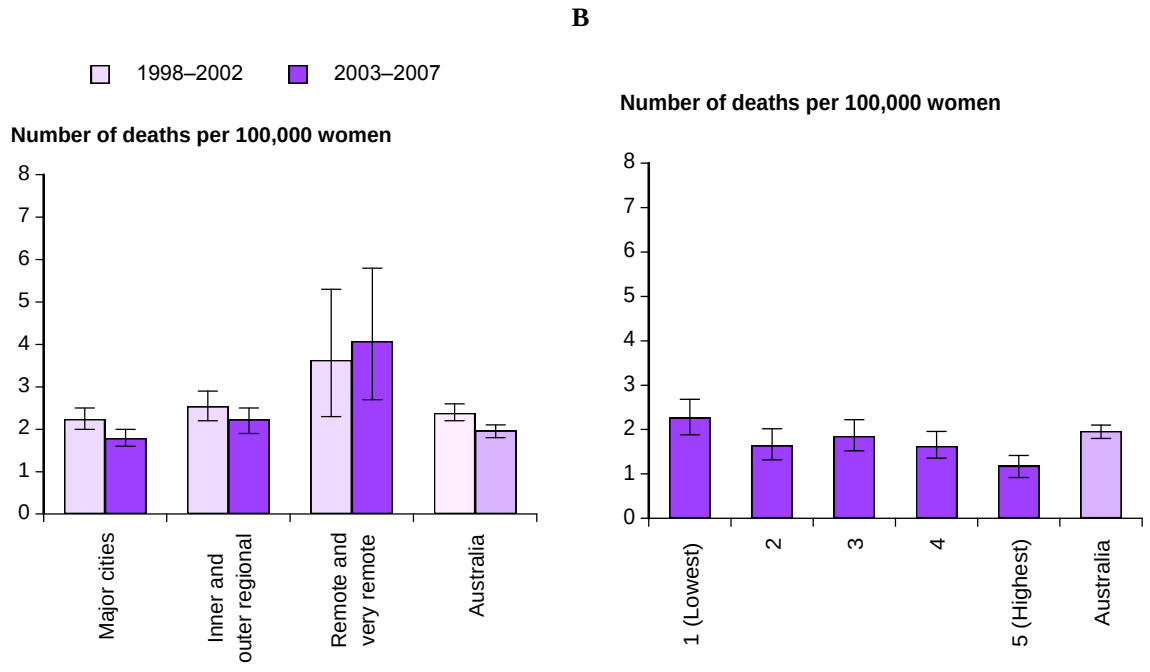
	Major cities	Inner and outer regional	Remote and very remote	Australia
Deaths	409	224	28	662
AS rate	1.8	2.2	4.1	2.0
95% CI	1.6–2.0	1.9–2.5	2.7–5.8	1.8–2.1

Notes

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

Source: AIHW National Mortality Database.

Despite a significant decrease in the national rate, mortality from cervical cancer among women aged 20–69 years by remoteness areas did not change significantly between 1998–2002 and 2003–2007 (Figure 7.4A).



Note: Bars represent 95% confidence intervals.

Source: AIHW National Mortality Database.

Figure 7.4: Mortality from cervical cancer by remoteness area, 1998–2002 and 2003–2007 (A) and by socioeconomic status, 2003–2007 (B), women aged 20–69 years

Mortality has never before been reported by socioeconomic status of residence in this series, and is presented here for the first time for the most recent 5-year period, 2003–2007. Note that the population in each socioeconomic quintile is approximately equal.

In 2003–2007, mortality was clearly higher in the lowest socioeconomic status group with 2.4 deaths per 100,000 women and lower in the highest socioeconomic status group at just over 1 death per 100,000 women, but with no apparent differences between the middle three groups (Table 7.5, Figure 7.4B).

Table 7.5: Mortality from cervical cancer by socioeconomic status, women aged 20–69 years 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 Standard Geographic Classifications for 2006
2. Age-standardised (AS) rate is the number of deaths due to cervical cancers per 100,000 women and age standardised to the Australian population at 30 June 2001.

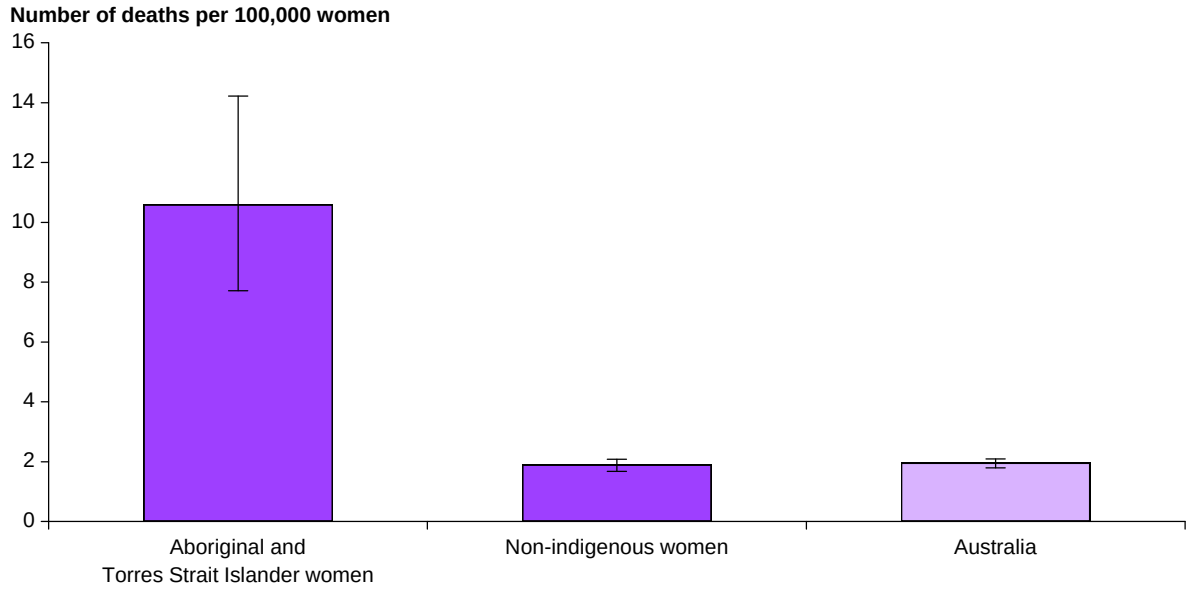
Source: AIHW National Mortality Database.

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 five jurisdictions—New South Wales, Queensland, Western Australia, South Australia and the Northern Territory. The majority (89%) of Aboriginal and Torres Strait Islander people reside in these five jurisdictions (ABS 2009).

Mortality from cervical cancer by Aboriginal and Torres Strait Islander status for New South Wales, Queensland, Western Australia, South Australia and the Northern Territory is presented for the most recent 5-year period, 2003–2007.

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, Western Australia, South Australia and the Northern Territory compared with non-Indigenous women from these states and territories—10.6 deaths per 100,000 women compared with the non-Indigenous rate of 1.9 deaths per 100,000 women (Table 7.6, Figure 7.6). This was true for women aged 20–69 years, and for women of all ages (with an age-standardised mortality of 9.9 new cases 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 Chapter 6.



Notes

1. The rates were age-standardised to the Australian population as at 30 June 2001.
2. The bars on the columns represent 95% confidence intervals.

Source: AIHW National Mortality Database.

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

Table 7.6: Mortality from cervical cancer by Aboriginal and Torres Strait Islander status, women aged 20–69 years, 2003–2007

	New South Wales, Queensland, Western Australia, South Australia and the Northern Territory[a]			Australia[c]
	Aboriginal and Torres Strait Islander	Non-Indigenous	Total[b]	
Deaths	48	449	501	662
Crude rate	8.3	2.0	2.2	2.0
AS rate	10.6	1.9	2.1	2.0
95% CI	7.7–14.2	1.7–2.1	1.8–2.5	1.8–2.1

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

(b) 'Total' includes Aboriginal and Torres Strait Islander, non-Indigenous and women in the 'not-stated' category for Aboriginal and Torres Strait Islander status for Queensland, Western Australia, South Australia and the Northern Territory only.

(c) All women aged 20–69 years in Australia.

Notes

1. Crude rates are the number of deaths from cervical cancer per 100,000 women.
2. Age-standardised rates are the 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.

Appendix A Additional data

Notes

1. All the symbols represent the average of the ABS estimated resident population for women aged 20–69 years in 2008–2009 adjusted to include only women with an intact cervix using age-specific hysterectomy fractions derived from the AIHW National Hospital Morbidity Database.
2. The highlighted symbols represent the proportion (age-standardised) of women screened in 2008–2009.
3. The single darker highlighted symbol represents the proportion (age-standardised) of women with a high-grade abnormality detected by histology in 2008–2009.

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

Figure A1: Women in the National Cervical Screening Program, 2008–2009

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+
Figures 1.1&1.4	2-year participation 2008–2009[(a)]	. .	44.8	54.3	60.7	63.1	63.3	64.2	62.6	60.0	56.9	49.6	. .
Figure 1.4	3-year participation 2007–2009[(a)]	. .	59.3	69.9	76.1	77.8	76.8	77.4	73.8	70.0	65.2	57.7	. .
Figure 1.4	5-year participation 2005–2009[(a)]	. .	78.4	88.4	93.3	91.2	88.7	87.4	82.1	76.7	69.6	65.3	. .
Figure 3.1A	Unsatisfactory cytology 2009[(b)]	2.4	2.3	2.3	2.1	2.0	1.8	1.8	1.9	2.2	2.2	2.3	2.6
Figure 3.1B	Negative cytology 2009[(c)]	83.9	83.8	87.9	91.4	93.4	94.3	94.9	95.7	95.9	96.2	96.3	95.1
Figure 3.2	No endocervical component 2009[(d)]	17.0	16.4	16.1	16.3	16.7	18.4	20.7	23.2	26.3	29.6	31.4	35.0
Figure 3.3B	Low-grade abnormalities detected by cytology 2004[(e)]	14.9	13.2	8.2	5.6	4.7	4.5	4.0	3.3	2.5	2.2	1.9	2.3
Figure 3.3B	Low-grade abnormalities detected by cytology 2009[(e)]	11.9	10.9	7.0	4.5	3.4	3.0	2.6	2.0	1.4	1.2	1.1	1.4
Figure 3.3D	High-grade abnormalities detected by cytology 2004[(f)]	2.1	2.6	2.5	1.8	1.2	0.9	0.7	0.6	0.6	0.5	0.5	1.0
Figure 3.3D	High-grade abnormalities detected by cytology 2009[(f)]	1.8	2.9	2.8	2.0	1.3	0.9	0.6	0.5	0.4	0.4	0.3	0.6
Figure 4.2B	Low-grade abnormalities detected by histology 2004[(g)]	44.8	39.8	32.5	29.1	25.9	21.4	17.9	14.2	13.6	12.3	9.7	5.0
Figure 4.2B	Low-grade abnormalities detected by histology 2009[(g)]	36.4	30.6	26.3	23.8	20.4	16.2	13.1	10.7	9.2	7.7	5.9	3.4
Figure 4.2D	High-grade abnormalities detected by histology 2004[(h)]	33.7	36.2	39.6	36.5	25.4	16.3	10.2	7.4	8.1	8.0	6.3	5.8
Figure 4.2D	High-grade abnormalities detected by histology 2009[(h)]	40.1	45.9	48.7	43.5	31.5	18.7	12.1	8.2	7.4	8.3	6.9	4.0

(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 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
CervicalScreenNT	
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.

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 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 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).

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 have been calculated using the average of the ABS estimated resident population for 2008 and 2009 (2-year participation) the average for 2007, 2008 and 2009 (3-year participation), and the average of the ABS estimated resident population for 2005, 2006, 2007, 2008 and 2009 (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 Australian Bureau of Statistics (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 years. 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 relatively 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 was 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.

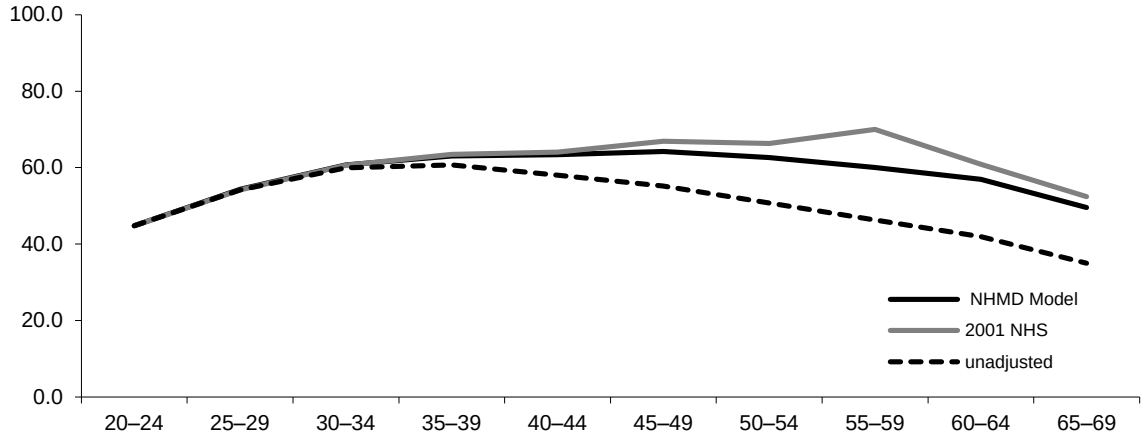
The fractions themselves are similar to previous estimates taken from population health surveys with the proportion of women with an intact cervix remaining comparatively higher in most age groups—a reflection of the national trend of decreasing incidence of hysterectomies over time. These are shown 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 years 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 (CDs) 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, many postcodes (and hence women) are unable to be allocated to a remoteness area.

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.

Appendix D 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 years over *Female population* aged 50–54 years) 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, divide 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 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.

Small cell sizes

In line with the 'small cell size' policy that numbers of 1 and 2 and the rates on which these are based have been suppressed (the exception to this is Indicator 5, for which these are important to show). Additional suppression was applied to some data on the request of the data custodians.

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.

Benign: not *malignant*.

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.

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 register: a database that stores *cervical cytology test* 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).

Colposcopy: a microscopic examination of the lower genital tract with a magnifying instrument called a colposcope. This method of conservative evaluation allows the clinician to more accurately assess the cytologic abnormality by focusing on the areas of greatest cellular abnormality and by sampling them with a biopsy to attain 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 study of cells.

Dysplasia: abnormal development or growth patterns of cells.

Endocervix: the inside of the uterine cervix or the mucous membrane lining 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 a *cervical cytology test*.

High-grade abnormalities (HGA): in this report high-grade abnormalities are defined as CIN1/2, CIN 2, CIN 3 (see *CIN)*, endocervical *dysplasia*, and adenocarcinoma in situ.

Histology: the microscope study of the minute 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 a tendency to invade healthy or normal tissue.

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: abnormal changes 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 have invaded just below the surface of the cervix, but have not developed any potential to spread to other tissues.

Mortality: see *Cancer death*.

Neoplasia: the new and abnormal development of cells that may be harmless 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 test: a test 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 D 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 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.

References

ABS (Australian Bureau of Statistics) 2006. Statistical Geography Volume 1—Australian Standard Geographical Classification (ASGC). Canberra: ABS. Viewed 28 June 2010, <http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/1216.0Main+Features1Jul%20200 6?OpenDocument>.

ABS 2007. Deaths, Australia, 2006 Canberra: ABS. Viewed 28 June 2010, <http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/3302.0Explanatory%20Notes1200 6?OpenDocument>.

ABS 2008. Information Paper: An introduction to Socio-Economic Indexes for Areas (SEIFA) 2006. Canberra: ABS. Viewed 28 June 2010, <http://www.abs.gov.au/ausstats/abs@.nsf/mf/2039.0/>.

ABS 2009. Experimental estimates and projections, Aboriginal and Torres Strait Islander Australians, 1991 to 2021. ABS cat. no. 3238.0. Canberra: ABS.

ABS 2010. Population by Age and Sex, Australian States and Territories. ABS cat. no. 3201.0. Canberra: ABS.

AHMAC (Australian Health Ministers'Advisory Council) 1991. Cervical Cancer Screening Evaluation Committee. Cervical screening in Australia: options for change. Australian Insitute of Health: Prevention Program Evaluation Series no. 2. Canberra: Australian Government Publishing Service.

AIHW (Australian Institute of Health and Welfare) 1998. Breast and cervical cancer screening in Australia 1996–97. Cancer series no. 8. Cat. no. CAN 3. Canberra: AIHW.

AIHW 2011. National Cervical Cancer Prevention Dataset. Canberra: AIHW.

AIHW & AACR (Australasian Association of Cancer Registries) 2010. Cancer in Australia: an overview, 2010. Cancer series no. 60. Cat. no. CAN 56. Canberra: AIHW.

Anttila A, von Karsa L, Aasmaa A, Fender M, Patnick J, Rebolj M et al. 2009. Cervical cancer screening policies and coverage in Europe. European Journal of Cancer 45:2649–2658.

Autier P, Coibion M, Huet F & Grivegnee AR 1996. Transformation zone location and intraepithelial neoplasia of the cervix uteri. British Journal of Cancer 74:488–490.

Binns PL & Condon JR 2006. Participation in cervical screening by Indigenous women in the Northern Territory: a longitudinal study. Medical Journal of Australia 185:490–494.

Blomfield P & Saville M 2008. Outstanding problems—glandular lesions. CancerForum 32, Number 2.

Bosch FX, Lorincz A, Munoz N, Meijer CJ & Shah KV 2002. The causal relation between human papillomavirus and cervical cancer. Journal of Clinical Pathology 55:244–265.

Brotherton JM 2008. How much cervical cancer in Australia is vaccine preventable? A meta-analysis. Vaccine 26:250–256.

Budd AC & Sturrock CJ 2010. Cytology and cervical cancer surveillance in an era of human papillomavirus vaccination. Sexual Health 7:1–7.

Canfell K, Sitas, F, Beral, V 2006. Cervical cancer in Australia and the United Kingdom: comparison of screening policy and uptake, and cancer incidence and mortality. Medical Journal of Australia 185:482–486.

Commonwealth Department of Human Services and Health 1993. Making the Pap smear better. Report of the steering group on quality assurance for the prevention of cancer of the cervix. Canberra: Australian Government Publishing Service.

Centre for Public Health Research 2008. National Cervical Screening Programme: Annual Monitoring Report 2007. Wellington, New Zealand: Massey University.

Cervical Screening Wales 2010. Cervical Screening Programme, Wales: 2009/2010. Cardiff, Wales: Cervical Screening Wales.

Coory MD, Fagan PS, Muller JM & Dunn N 2002. Participation in cervical screening by women in rural and remote Aboriginal and Torres Strait Islander communities in Queensland. Medical Journal of Australia 177:544–547.

Creighton P, Lew JB, Clements M, Smith M, Howard K, Dyer S et al. 2010. Cervical cancer screening in Australia: modelled evaluation of the impact of changing the recommended interval from two to three years. BMC Public Health 10:734.

Curado MP, Edwards B, Shin HR, Storm H, Ferlay J, Heanue M et al. (eds) 2007. Cancer incidence in five continents. IARC scientific publications no. 160. Lyon, France: International Agency for Research on Cancer.

Dickinson JA 2002. Cervical screening: time to change the policy. Medical Journal of Australia 176:547–550.

DoHA (Department of Health and Ageing) 2004. Principles of practice, standards and guidelines for providers of cervical screening services for Indigenous women. Canberra: Commonwealth of Australia.

DoHA 2011a. National Cervical Screening Program: NCSP Policies. Viewed 27 May 2011, <http://www.cancerscreening.gov.au/internet/screening/publishing.nsf/Content/NCSP-Policies-1>.

DoHA 2011b. Human Papillomavirus (HPV): Information about the National Human Papillomavirus (HPV) Vaccination Program funded under the Immunise Australia Program. Viewed 2 June 2011, <http://www.health.gov.au/internet/immunise/publishing.nsf/Content/immunise-hpv>.

Ferlay J, Shin HR, Bray F, Forman D, Mathers C & Parkin DM 2010. GLOBOCAN 2008: Cancer incidence and mortality worldwide: IARC CancerBase no. 10. Lyon, France: International Agency for Research on Cancer Press.

IARC (International Agency for Research on Cancer) 2005. IARC handbooks of Cancer Prevention: Cervix cancer screening. Lyon: IARC*Press*.

ISD (Information Services Division) Scotland 2010. Scottish Cervical Screening Programme Statistics 2009/2010.

Jensen O, Parkin D, MacLennan R, Muir C & Skeet R (eds.) 1991. Cancer registration: principles and methods. IARC scientific publications no. 95. Lyon: International Agency for Research on Cancer.

Luke C, Nguyen AM, Heard A, Kenny B, Shorne L & Roder D 2007. Benchmarking epidemiological characteristics of cervical cancer in advance of change in screening practice and commencement of vaccination. Australian and New Zealand Journal of Public Health 31:149–154.

Mitchell HS 2003. How much cervical cancer is being prevented? Medical Journal of Australia 178:298.

National HPV Vaccination Program Register 2011. Information for health professionals. Melbourne: Victorian Cytology Service Inc. Viewed 9 May 2011, <http://www.hpvregister.org.au/health-professionals.aspx>.

NHMRC (National Health and Medical Research Council) 2005. Screening to prevent cervical cancer: guidelines for the management of asymptomatic women with screen detected abnormalities. Canberra: NHMRC.

NPAAC (National Pathology Accreditation Advisory Council) 2006. Performance measures for Australian laboratories reporting cervical cytology. Canberra: Australian Government Department of Health and Ageing.

Ostor AG 1993. Natural history of cervical intraepithelial neoplasia: a critical review. International Journal of Gynecological Pathology 12:186–192.

Raffle AE, Alden B, Quinn M, Babb PJ & Brett MT 2003. Outcomes of screening to prevent cancer: analysis of cumulative incidence of cervical abnormality and modelling of cases and deaths prevented. British Medical Journal 326:901.

Sasieni P, Castanon A & Cuzick J 2009. Screening and adenocarcinoma of the cervix. International Journal of Cancer 125:525–529.

The Cancer Council Australia 2007. National Cancer Prevention Policy 2007−09. NSW: The Cancer Council Australia.

The National Health Service Information Centre Public Health Indicators and Population Statistics team 2010. Cervical Screening Programme England: 2009–10. London, England: NHS Information Centre for Health and Social Care.

Walboomers JM, Jacobs MV, Manos MM, Bosch FX, Kummer JA, Shah KV et al. 1999. Human papillomavirus is a necessary cause of invasive cervical cancer worldwide. Journal of Pathology 189:12–19.

Wang SS, Sherman ME, Silverberg SG, Carreon JD, Lacey JV, Jr., Zaino R et al. 2006. Pathological characteristics of cervical adenocarcinoma in a multi-center US-based study. Gynecologic Oncology 103:541–546.

WHO (World Health Organization) 2010. Report of the meeting of HPV Vaccine Coverage and Impact Monitoring, 16-17 November 2009. Geneva, Switzerland: WHO.

List of tables

List of figures

Related publications

Cervical screening in Australia 2008–2009 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 *Cervical screening Australia 2008–2009: supplementary data tables*. This can also be downloaded for free from the AIHW website <http://www.aihw.gov.au/publications >.