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NHS CSP Audit of Invasive Cervical Cancer: National Report 2007-2011

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CONTENTS

PREFACE

Since April 2007, the regional Quality Assurance Reference Centres (QARCs) in England have adopted a standardised protocol for capturing screening data on all cases of cervical cancer. The data are aggregated in a national database for the purpose of audit, with the aim of monitoring and improving the service.

The first national audit report analysing these data appeared in July 2011, and covered cases of invasive cervical cancer diagnosed between April 2007 and March 2010. This, the second national audit report, includes updates to the data presented in the first, and extends the period under scrutiny to March 2011. Cytology and histology review data are presented for the first time, and a section summarising future audit-related developments is also included.

The aim is to publish further audit reports at the beginning of each calendar year. It is hoped that this schedule will allow time for complete and accurate data to be collected on cases diagnosed during the previous financial year (from April to March). Though this publication includes four years of data, in future, information from earlier financial years will not be analysed.

The data in this report are influenced by two wider changes. Firstly, data from April 2010, reflect new policy (issued back in 2003, but implemented more recently) raising the age at which women are first invited for screening from 20 to 25. Since nearly 50% of woman are now screened for the first time within a few months of their 25th birthday, a small peak of screen-detected cancers at age 25 is observable. Secondly, the so-called 'Jade Goody effect' can be seen in the results, which show an increase in both cervical cytology testing and cancer diagnosis in late 2008 and early 2009, in the wake of the publicity surrounding the reality star's diagnosis of cervical cancer (August 2008) and untimely death from the disease (March 2009).

Finally, a word about the future. The ways in which the cervical screening programmes collect audit data, and the accuracy of those data, continue to improve. New audit guidelines, which will make the process more efficient and less time-consuming, will be implemented in 2012 and reflected in the 2013 annual publication.

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EXECUTIVE SUMMARY

The NHS Cervical Screening Programme (NHS CSP) in England provides high-quality cervical screening to a target population of about 15 million women. The NHS CSP is highly effective in preventing cervical cancer, and still more effective in preventing death from the disease.

- The NHS CSP audit comprises 8,566 women with confirmed diagnoses of cervical cancer (an estimated 90% of all cervical cancers in England), who are compared to 25,722 controls.
- The proportion of missing data on stage and treatment has decreased since last year's publication (from 16.6% to 13.3% for stage data, and from 45.7% to 33.7% for treatment data).
- There was an increase in the number of cervical cancers diagnosed in women under the age of 65 in 2008/09, due to the so-called 'Jade Goody effect' (this increase continued for several months after the reality star's death). Most of the excess cases were FIGO stage 1A.
- There was a shift towards earlier stage cancers in 2009–10. The numbers of advanced cancers (FIGO stage 2+) in the audit decreased by 10%, from 378 in 2007/08 to 344 in 2009/10.
- Data for the period September 2009-August 2010 showed a 22% reduction in cervical cancer incidence in women aged 65 and over, compared to data from September 2007-August 2008.
- 38% of cancers in women aged 25–64 were FIGO stage 1A and 71% of these were treated conservatively (by cone biopsy/ loop excision), without the need for hysterectomy, radiotherapy, or chemotherapy.
- Approximately 14% of screened women aged 25–49 were on short-term recall owing to a previous abnormal result (i.e. their rest resulted from a re-invitation sent 6-12 months after a previous test). However, among women on routine recall (i.e. those invited every 3 or 5 years) only 4% were screened early (within 2.75 years of their previous test).
- The 5-year coverage for cervical screening was 79%. However, only 64% of screened women who had not previously received an abnormal result were re-screened at an interval of less than 5.5 years.
- Women of all ages with fully invasive (stage 1B+) cervical cancer were less likely to have been screened regularly during the preceding 8 years than women without cervical cancer.
- 55% of women aged 50-64 with fully invasive (stage 1B+) cancer had not been screened for at least 7 years prior to their diagnosis, compared with only 17% of the general population. This suggests that cervical cancer rates in women aged 50-64 would be more than three times higher today, were it not for the screening programme.
- 55% of negatively reported LBC samples from women who subsequently developed cervical cancer were upgraded on non-blind review. This means that, with the benefit of hindsight, 12-14% of cervical cancers diagnosed in women under the age of 65 could have been identified at an earlier date, had an existing cytological abnormality been detected.

1. CONTEXT

1.1 The burden of cervical cancer in England

Cervical cancer is a malignant neoplasm of the cervix uteri. In 2008, 2,334 cases were registered in England, with an age-standardised incidence rate (ASR) of 8.9 per 100,000 women.[1] The highest incidence was among women aged 30–34 (ASR 18.6 per 100,000 women), followed by women aged 35–39 (ASR 17.1 per 100,000 women). It is estimated that, in the absence of cervical screening, the age standardised incidence rate would be between 25 and 40 cases per 100,000 women.

Mortality from cervical cancer is substantially lower than incidence, with 830 instances reported in 2009.[2] Age-standardised relative survival for patients diagnosed from 2005 to 2009 was 83.6% at 1 year and 66.6% at 5 years.[3]

1.2 Epidemiology of HPV and cervical cancer

Human papillomavirus (HPV) is a common, sexually transmitted infection. In rare cases, infection with high-risk forms of this virus can cause a woman to develop cervical cancer.

There is consistent evidence from across the world that high-risk (HR) HPV infection is a necessary cause of cervical cancer, and optimal testing systems have identified the virus in all invasive specimens.[4] HR-HPV is implicated in both squamous cell carcinoma (SCC) and adenocarcinoma (ADC), as well in over 95% cases of cervical intraepithelial neoplasia, grade 3 (CIN3), which can subsequently develop into cancer.

Cofactors that appear to increase the risk of developing cervical cancer in HPV-infected women include the use of oral contraceptives, smoking, high parity, unidentified genetic factors (possibly related to immunity), and previous exposure to other sexually transmitted diseases, such as *Chlamydia trachomatis* and herpes virus type 2. Women exposed to human immunodeficiency virus (HIV) are at high risk of HPV infection, HPV persistence, and cervical cancer.

Cervical screening and treatment of high-grade CIN have the potential to prevent the development of cervical cancer in HPV-infected women, and screening programmes have therefore had a substantial impact on cervical cancer incidence in many countries.[5]

1.3 Cervical screening

Cervical screening is not a test for cancer, but a means of preventing it: it uses cervical cytology to detect abnormalities which could lead to cancer if left untreated. Early treatment can prevent the development of almost 100% of cervical cancers.[5]

Though cervical screening sometimes does not detect an abnormality before the onset of cancer, it increases the chance of detecting asymptomatic disease at an early stage, which means that treatment is more straightforward and more likely to be successful. Virtually all micro-invasive (stage 1A) cancers are diagnosed by screening, and these can often be treated with fertility-sparing surgery[6], and can usually be cured (5 year survival >98%).

The cytological screening test involves the collection, staining, and microscopic examination of cells from the cervix. Between 1988 and 2003, conventional smears were used to screen women: samples were taken from around the cervix and wiped onto a glass slide, which was

then sent to the laboratory for examination. Between 2003 and 2008, a new way of preparing samples, known as liquid-based cytology (LBC) was introduced nationwide. Here, cells are brushed from the neck of the womb and placed into a small vial of preservative fluid. This is then sent to the laboratory, where a glass slide is prepared. The introduction of LBC has decreased the proportion of samples that are inadequate for evaluation, producing more representative specimens with less of the distracting background material that was found in conventional smears.[7]

1.4 HR-HPV DNA testing

There are over 100 types of HPV, most of which do not cause significant disease in humans. However, around 15 types of HPV have been implicated in cervical cancer, notably types 16 and 18, which together give rise to some 70% of all cases. Research has shown that women with no evidence of high-risk (HR) HPV infection are extremely unlikely to have concurrent precursor disease or cervical cancer, or to develop either for the following 6 years. [8]

HPV testing detects high-risk forms of HPV. Over the last few years, different uses for such tests have been under evaluation in England:

- to triage women whose cytology shows borderline changes or low-grade dyskaryosis, so that only those who are positive for HR-HPV are sent for further investigation.
- as a 'test of cure', to reduce the duration of surveillance following treatment for CIN, by safely returning women to routine recall at an earlier date.
- to replace cytology as the primary screening test.

From April 2012, HR-HPV testing will be introduced in England for triage and test of cure, following successful pilots at six sites within the NHS CSP.

1.5 NHS Cervical Screening Programme

The NHS CSP aims to reduce the incidence of, and mortality from, invasive cervical cancer. It does this by regularly screening all women at risk, so that abnormalities, which might otherwise develop into invasive cancer, can be identified and treated.

Cervical screening was introduced in England in the mid-1960s. By the mid-1980s, many women were undergoing regular cervical cytology, but there was concern that those at greatest risk were not being tested, and that those who had positive results were not being effectively followed up and treated. In response, the NHS CSP was established in 1988, after the Department of Health introduced quality standards for screening services and instructed all health authorities to introduce computerised 'call and recall' systems to manage invitations and results.

Between 1988 and 2003, women were invited for cervical screening at least every five years (and no more than every three years) between the ages of 20 and 64. In October 2003, it was announced that women would receive their first invitation at the age of 25, and that the interval between screening episodes would be three years up to the age of 49. Thereafter, women would be recalled every five years, until the age of 64 (Table A). This remains current policy. However, this change was designed to take effect from the date of a woman's next screening. This meant that a woman screened prior to 2003 at the age of 20 had already been allocated a three-year recall, and could therefore have been invited again in 2006, despite the fact that she was still not 25. Similarly, a 61-year old women screened in 2003 could have been invited again three years later, if that date had been entered on the call and recall system prior to the change in policy. Moreover, in some parts of England, the

policy change to a minimum age of 25 was not implemented until April 2005. It was therefore not until April 2010 that routine invitations to those aged 20-24 ceased.

Today, all women between the ages of 25 and 64 are eligible for free cervical screening, though because invitations are sent out a few months before a woman's 25th birthday, some women will still be screened in response to an invitation received at the age of 24. Cervical screening is not offered to women who have no cervix, or to those who have made an informed choice to opt out of the programme.

Table A Cervical screening intervals since October 2003

Age group (years)	Frequency of screening
25	First invitation.
25–49	Every 3 years.
50–64	Every 5 years.
65+	Routine screening for women who have not been screened since the age of 50, or who have had recent abnormal test results.

1.5.1 NHAIS

The process of calling and recalling women for screening is managed by a computer database called the National Health Authority Information System, or NHAIS (also known as 'the Exeter system'). It manages the invitation process, keeps a record of test results, and, if all is well, recalls the woman for her next routine appointment in three or five years, depending on her age. All women registered with a GP in England are eligible, including migrants aged between 25 and 64.

The programme screens almost four million women in England each year. Some women have more than one test, for clinical reasons or because a sample has proven to be inadequate. In total, almost four and a half million samples per annum are examined by pathology laboratories.

While no cervical screening test can be 100% effective, cervical screening programmes greatly reduce the incidence of this cancer in the screened population. Since the establishment of the NHS CSP, the number of cervical cancer diagnoses has halved, despite increasing rates of HPV infection (the number of cases has fallen from 16 per 100,000 women in 1988 to 8 per 100,000 women in 2005). The effectiveness of the programme can be further judged by its coverage, defined as the percentage of women in the target age group (25–64) who have been adequately screened in the last five years. In 2010/2011, screening coverage of eligible women was 78.6%.[9]

Table B Percentage of cancers prevented by a single negative cytology test

Screening interval	20–39 years	40–54 years	55–69 years
Three-yearly	41%	69%	73%
Five-yearly	30%	63%	73%

Adapted from Sasieni, Adams, Cuzick (2003)[10]

1.6 Cervical screening and HPV vaccination

Two prophylactic HPV vaccines are known to be effective at preventing both persistent HR-HPV infection, and the high-grade cellular abnormality (CIN3) that it causes. In September 2008, a national HR-HPV immunisation programme was introduced to vaccinate girls against HPV 16 and 18. It covers young women aged 12–13, but also includes a catch-up programme for those born between 1990 and 1995.

Despite this vaccination programme, the NHS CSP will continue to play an important role in the fight against cervical cancer. It will screen those women who have not been vaccinated, and it may also play a role in monitoring the vaccinated population, once clearer data are available about the cross-protection given by the vaccine for other HPV types, and the duration of the protection provided. Interim studies are needed to explore the impact of HPV vaccination, and to determine the best course of action for the cervical screening programme in future.

A woman's HPV vaccination status should be recorded on the call and recall computer system, so that her future screening interval can be determined. Unfortunately, the completeness with which this information is recorded is hugely variable, though ongoing work aims to simplify the process and improve the completeness and accuracy of the data.

2. AUDIT OF INVASIVE CERVICAL CANCERS

2.1 Introduction

Unfortunately, despite the effectiveness of population-based screening, women continue to develop cervical cancer. The reasons for this were recognised before the NHS CSP was established in 1988,[11] and have been taken into account in previous recommendations emerging from the audit process.[12]

Five-year cervical screening coverage has been around 80% since 1993, so the majority of cancers in England are probably occurring in women who have been screened at some point in their past. Monitoring incidence and mortality rates in this population can determine whether the programme is achieving its objectives. It does not give a complete picture, however; nor does it indicate the effectiveness of the screening programme under optimal conditions.

2.2 Purpose of the Audit

The purpose of the NHS CSP Audit of Invasive Cervical Cancer (hereafter, 'the audit') is to monitor the effectiveness of the cervical screening programme, to identify areas of good practice, to indicate where improvements might be made, and to monitor cases where the programme fails to prevent cervical cancer. At a time when changes are being made to the screening technologies employed, and to the age and frequency with which women are called for testing, the audit can monitor whether such alterations are affecting the incidence of cervical cancer in the screened population.

All cervical cancers are included in this audit, irrespective of their clinical stage, or the age of the woman at the time of diagnosis. The audit provides an early indicator of the pattern of disease incidence, using cases which have not necessarily been fully abstracted by the cancer registries. It allows the proportion of screen-detected cases to be determined, and explains why some cases occurred (e.g. cases in previously unscreened women, or cases that result from a failure of colposcopic treatment). It is also able to indicate in a timely fashion whether alterations in screening age and frequency have affected the incidence of cervical cancer.

Judging the effectiveness of the NHS CSP requires accurate data about the incidence of, prognosis for, and mortality from cervical cancer. Additionally, these data needs to be linked to individual-level information about screening uptake and outcome. In order to obtain consistently reported information for this purpose, all parties in the NHS CSP were asked to follow the same national protocol for auditing cases of invasive cervical cancer.[11]

2.3 Roles within the Audit

Although there are minor differences of procedure between regions, the broad principles of the audit, including the allocation of key roles, are the same nationwide. These have been outlined in the NHS CSP document, *Audit of Invasive Cervical Cancers* (NHS CSP Publication No 28), published 2006 and launched in April 2007.[11]

In brief, when a case of histologically confirmed invasive cervical cancer has been identified, the clinician treating the woman must ensure that the Hospital-Based Programme

Coordinator (HBPC) and the regional Quality Assurance Reference Centre (QARC) are informed. This will initiate a cascade of audit activities. The role of the HBPC is to organise audit activities locally (within each Trust), while the QARC ensures that local cytology, histology, and colposcopy review processes are coordinated according to the national audit protocol, and liaises with cancer registries to ascertain that the information captured includes a record of the diagnostic status of each cancer case. (The extent of liaison with the cancer registry varies between regions). The QARCs also assemble all the data for a region, ready for national collation.

The NHS CSP Audit Management Group is the steering committee for the audit. Based on its data and findings, the Group approves updates and makes recommendations.

2.4 Audit protocol

The document *Audit of Invasive Cervical Cancers* was intended to provide guidance on the procedure for reviewing a woman's full screening history after diagnosis.[11] However, variations in data collection suggest that not all regions are interpreting national guidance in the same way. To address this, the protocol document is currently being updated to enhance its clarity and ease of use.

2.4.1 Ethical approval

Anonymised data are routinely collected for women who have developed cervical cancer (known as 'cases') and for women of the same age who have not (known as 'controls'). Since collection of these data is regarded as part of the NHS CSP's service evaluation, the process is exempt from research ethics review by the National Research Ethics Service.[13]

2.4.2 Databases and other data sources

The audit is designed to collect data from a number of sources on a woman's age, stage, and call and recall status, as well as on her cytology, colposcopy, and histology results. Information on a woman's screening invitations and results, and laboratory data on her cytology, are drawn from NHAIS via Open Exeter.* Coordination between the HBPC and the QARCs is needed to obtain all other records, as the availability of data and access to databases varies. Colposcopy clinics are contacted for records of all appointments (e.g. information on patient attendance, details of the examiner, data on the colposcopic impression, account of any procedures performed). Histology results are collated to produce a fuller picture, and to facilitate slide review. GP notes are also obtained and recorded to permit a comprehensive review of the patient's screening history.

An audit database has been created to aggregate all data collected by regional QARCs for epidemiological analysis.

2.4.3 Essential fields

To generate a minimum dataset, information about each case of cervical cancer is entered into the database via a number of essential fields (see Appendix A).

* Open Exeter is a portal that allows bodies such as NHS trusts, GP practices, and laboratories to access the Exeter (NHAIS) system.

2.4.3.1 Selection of controls

To permit rigorous evaluation of the programme, cases of cervical cancer are compared to controls of the same age. Controls are identified using bespoke software within NHAIS.

All controls are registered with a GP in the same administrative district as the case, and women who are known to have had a hysterectomy are excluded. Additionally, controls fall into the following groups, based on their similarity with cases:

- GP controls, from the same group practice as the case.
- District controls, who share the same first half of a postcode with the case, but who are registered with a different GP.
- Screened controls, who underwent cytological tests over roughly the same period as the case (used where the case may have been diagnosed as a result of screening).
- Abnormal controls, who received an abnormal cytology test report during roughly the same period as the case.

Each case is assigned two population controls (one GP control and one district control). In addition, some cases are assigned controls who partially match their screening history. This allows the audit of both cases that are detected by screening (known as 'screen-detected cancers'), and cases where a woman received an abnormal screening result and was referred to a colposcopist some time prior to her actual diagnosis (see section 4.1). Population controls are used to study the importance of coverage and the efficacy of the screening programme. Screened controls are used to explore the impact of the screening interval on the incidence of screen-detected cancers. Abnormal controls are used to compare the way in which cases and controls are managed by the screening programme after a cytological test is reported as abnormal.

2.4.3.2 Cytology screening history

Before 2003, cytology samples took the form of conventional smears, but between 2004 and 2008, laboratories converted to liquid-based cytology (LBC). To reflect the use of both technologies during the audit period, cytology samples are referred to as 'tests' rather than 'smears'.

Details of every recorded cytology test for both cases and controls were downloaded from NHAIS, including data on a large number of privately-taken cytology samples, as well as information on all NHS CSP tests. The following information was obtained:

- the date the test was taken.
- the result of the test.
- the action code resulting from the test.

The action code is the national code used to define the woman's recall type, the type of notifications required, and the period of time between recalls. It determines the management action for each woman in the light of her latest test result, and records any additional clinical input.

The following additional information was collected for cases:

- date of birth.
- date of cancer diagnosis.
- the FIGO stage of the tumour.
- histology of the tumour.

- treatment received.
- the woman's score according to an Index of Multiple Deprivation.

Although treatment and Index of Multiple Deprivation score are not currently on the list of essential fields for cases, it is anticipated that they will be included in future. For controls, date of birth and Index of Multiple Deprivation score were collected.

2.4.3.3 Colposcopy

Colposcopy data were obtained for cases, including:

- date of appointment.
- attendance at appointment.
- whether the examination was satisfactory.
- information on any surgical procedure(s) performed.

Non-essential additional fields included:

- colposcopic impression.
- pathological diagnosis.
- whether the woman was pregnant.
- time to next follow-up appointment.

2.4.3.4 Cytology and histology reviews

Audit guidelines covering the period of this report suggest that, in cases of confirmed cervical cancer, all cytology samples and histology specimens obtained in the 10 years preceding diagnosis, including those that led to diagnosis, should be reviewed. The primary purpose of this slide review is educational, and collated national results from this exercise, with detailed analysis and commentary, have been published separately.[14] While some of these data are summarized here, those interested in obtaining a more detailed picture should refer to the published document.

Data obtained from the review process include:

- date of the original sample or specimen.
- date of the review.
- type of reviewer (screener, checker, advanced practitioner, consultant).
- original sample or specimen result.
- result of the review/consensus.

Revised guidelines, which will be implemented in April 2012, will require fewer slides to be reviewed and, in the case of cytology, fewer reviews per slide. This will result in a significant reduction in workload, as diagnostic biopsies, which currently form 78% (4780/6122) of histology reviews, will not form part of future audits.

2.4.3.5 GP notes

If the screening history is unclear, GP notes on a patient can be obtained. This may yield additional information on the woman's symptoms (if the cancer is symptomatic), and may also explain any non-attendance at appointments (e.g. where there is evidence of pregnancy, travel, co-morbidity, or private treatment).

However, data from GP notes are currently difficult to obtain. Following a recent review by the West Midlands QARC, the Evaluation Committee has agreed that, in most cases, it is not possible systematically to collect useful information from this source. Consequently, information derived from GP notes is not included in this report.

2.4.3.6 HR-HPV tests

Until now, HR-HPV DNA testing within the NHS CSP in England has been under evaluation at three pilot and six Sentinel Sites. The aim has been to assess its utility for two purposes:

1. the triage of women with low-grade or borderline cytology reports. Where HPV is found, these women are referred immediately to colposcopy, but where women are HPV-negative, they are returned to routine (three- or five-yearly) recall.
2. as a 'test of cure' for women who have been treated for cervical intraepithelial neoplasia (CIN). If a cytology test, taken six months after treatment, is reported as normal, borderline, or low-grade, an HPV test is performed. Women who are HPV-negative are returned to routine recall, but those who are HPV-positive are referred to colposcopy. (Women with high-grade cytology six months after treatment are referred immediately to colposcopy, without this additional HPV test).

From April 2012, both HPV triage and test of cure will be introduced nationally as part of the NHS CSP. HPV test results are currently recorded on NHAIS, but are not currently included in the download of screening histories, though they will be added to the list of essential fields in future.

2.4.3.7 Index of Multiple Deprivation

The Office of the Deputy Prime Minister produces the English Indices of Deprivation, from which the Index of Multiple Deprivation, utilized by this audit, is derived.*

For the purpose of this exercise, the index of deprivation has been divided into deciles, from the most deprived (0) to the least (9). However, because this data field is currently not essential, it has not been reported consistently across QARCs. The data received to date, while quite revealing, are therefore incomplete (see Appendix B, Table B-1a). The aim is to make this field essential in future, and to conduct more detailed analysis for next year's report.

2.4.4 Data aggregation

Names, addresses, and unique identifiers (such as NHS numbers) are deleted before data are transferred to the national audit database. The only personally identifying piece of information the audit receives is the date of birth for both cases and controls. However, since there are 750 women in England between the ages of 20 and 65 with any given date of birth, this information is considered insufficient to identify a particular individual, effectively making the data anonymous.

* For more information see http://www.communities.gov.uk/publications/communities/indiciesdeprivation07.

3. DATA COMPLETENESS AND LIMITATIONS

The findings presented in this report should be approached in light of the available information's varying degrees of completeness (see Appendix B). The difficulties involved in ensuring the completeness of essential data fields are described below.

It is rare for data to be reported as missing, but missing data should be distinguished from incompleteness of record. Missing data may be unavailable (e.g. where a death certificate, which does not provide information about cancer staging, has been used), or may not yet have been recorded as part of the audit. For this reason, the term 'none recorded' has been used to cover both scenarios, although reference is also made to 'missing values'.

Other cases may be subject to reporting delays, having been submitted to the audit before all essential fields could be completed. In these instances, missing fields are updated as and when data become available, with the result that complete information may not be received for some months after the case has been registered. An additional challenge, which can create further delay, is the need to coordinate between the various aspects of the audit process when a case of cervical cancer is diagnosed. In future, as the completeness of the audit for each case will be monitored, it will be possible to distinguish between data that are not available (after reasonable efforts have been made to collect them) and data that have not yet been collected.

3.1 Cancers and population controls

Cases of cervical cancer are identified by NHS hospital staff (primarily via gynae-oncology), and confirmed by histology. A small proportion of cancers will be missed by the audit, and a very small proportion will be excluded because the patients are not registered with an NHS GP. Table C (Section 4.1) illustrates the limited extent of this problem, comparing the number of registrations for cervical cancer in a given calendar year with the number of cases picked up by audit of data from the financial year.

Controls are selected randomly (subject to matching) from women registered with an NHS GP. All those selected are included in the audit.

3.1 Dealing with missing values

Where values are missing, estimates are reported on the assumption that the data are missing at random. For example, if 40 women were reported with FIGO stage 1A, 60 with stage 1B+, and 25 with stage unknown, it would be estimated that 40% of the 25 unknown (i.e. 10 women) were stage 1A. With the category 'IN' (stage 1B or worse cervical cancer, not otherwise specified) these cases are reassigned only to the specific 1B+ stages (see Tables 6 and 6a). Where this approach has been adopted, the label 'estimated proportion' is used. It is recognised that cancers with a missing stage are more likely to be advanced, but since 86.7% of stage information is captured, the overall bias from this simplifying assumption is likely to be small.

3.2 Cytology

Since data on cytological tests are downloaded directly from NHAIS, completeness is assumed for all cases and controls. This is because cytological test results are recorded for

all women who participate in the NHS CSP, and for some of those who are tested privately. The audit does not attempt to capture screening events that take place outside the UK.

3.3 Colposcopy

The quality and completeness of the colposcopic data are variable. This is principally because there is no central database to act as a repository for this information (indeed, most colposcopy records were not computerised until 2001). It is therefore difficult to determine where a woman attended for colposcopy, particularly if she visited more than one clinic.

The best indicator of whether a woman is likely to have had colposcopy is the presence of a 'suspend' code in her cytology record (see Table 19). Similarly, a record from the histology laboratory would suggest that a sample was taken at colposcopy. However, neither the cytology nor the histology record provides conclusive information regarding colposcopic examination.

3.4 Histology

The quality and completeness of the data on histology in this audit are also variable, as there is no national link between histology laboratories. The proportion of histological samples reviewed in the audit is based on the total number of samples recorded in the database, rather than the total number of histological samples taken within the NHS CSP.

3.5 GP notes

Not all regions have been able to collect data from GP notes, chiefly because this requires manual searching and extraction, rather than the use of electronic databases. To date, the quality and completeness of the available data from GPs are insufficient to allow meaningful conclusions to be drawn. Information from GP notes is therefore not presented in this report.

3.6 HPV DNA

Data on HPV testing are currently available from only one region, as HPV testing is, at present, restricted to the six Sentinel Sites. In view of this incompleteness, no further details on HR-HPV DNA tests are provided in this year's report.

3.7 Treatment

Data on treatment are obtained by the HBPC from patient notes or from the meeting notes of the multidisciplinary team (MDT). These fields tend to be provided as data become available, which may mean that the information is missing for a few months after cases are first entered. Obtaining treatment data can be especially challenging where women are diagnosed in one centre and treated in another.

There has been some confusion over the use of the category 'none' to report treatment. The intended meaning is that the treating hospital has given only palliative care, but at least one QARC interpreted the category as 'no treatment was reported'. Additionally, some HBPCs used 'none' when micro-invasive cancers were treated solely with the diagnostic LLETZ/cone. While efforts have been made to correct this miscommunication for the future, some cases classified as 'none' in this year's audit may, in fact, have received treatment. Future audits will include the category 'palliative care', to distinguish this from 'no treatment'.

4. ANALYSIS AND COMMENTARY

This section analyses and discusses the audit's key findings. Detailed data tables are presented in Appendix C.

4.1 Invasive cervical cancer

In the period 2007–2010, 8,566 cases of invasive cervical cancer and 25,722 controls were included in the audit. Table C provides a broad assessment of the audit's coverage, comparing the number of cases of invasive cervical cancer included in each audit year (corresponding to the financial year) with the number reported nationally in each calendar year. Although some cases included in the audit are not included in cancer registry data, and vice versa, the number of cancers reported to registries is only around 10% greater than the number included here. The Office for National Statistics (ONS) reported 2,334 diagnoses of invasive cervical cancer during 2008 and 2,747 during 2009, whereas the audit examines 2,205 cases during 2008-9 and 2,349 during 2009-10.[1,15] All QARCs are working to minimise these discrepancies and to make both data sources more directly comparable.

Table C Number of cases of cervical cancer included in this report compared with those reported nationally

Audit Year	Calendar year	No of cases in Audit	Cancer registrations[a]
2007-2008	2007	2,136	2,276
2008-2009	2008	2,205	2,334
2009-2010	2009	2,349	2,747
2010-2011	2010	1,876	NP[b]
Total		**8,566**	

[a] Source: ONS MB1 38, MB1 39 and MB1 40

[b] NP: not yet published

Most cases submitted to the audit have at least two age-matched population controls (GP and district). However, for a small number of cases (42), only one of these controls was identified (see Table D), while 85 cases were submitted with no population control. For a defined subset of cases, up to two further controls were selected, resulting in 3,941 screened controls and 4,861 abnormal controls (see section 2.4.3.1.)

4.2 Age of invasive cervical cancer cases

Figure 1 shows the percentage distribution of cases of cervical cancer by age in the 2007–2010 audit. The peak number of cases is observed in the 35–39 age group (14.6%), followed closely by cases in women aged 30-34 (14.4%), and 25-29 (14.1%).

81% of all cases of invasive cervical cancer fell within the age group eligible for cervical screening (25-64 years, see Table 3, Appendix C). In 2009, women in this age group made up 80% of all cervical cancer registrations in England. As a proportion of all cancers, invasive cervical cancer at FIGO stage 2 or worse was more likely to be diagnosed in women over the age of 50 than in those under 50, with stage 1A disease becoming

increasingly infrequent with age. By contrast, between the ages of 25 and 39, the majority of women diagnosed with cervical cancer were found to have stage 1A or 1B disease.

Figure 1 FIGO stage of cervical cancer cases: estimated percentage distribution, by age

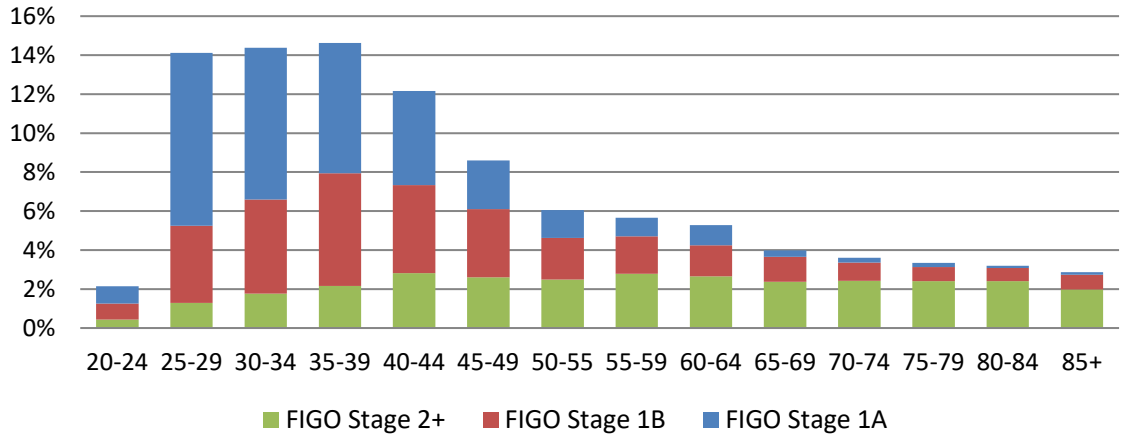


Table D Number of cases of invasive cervical cancer and controls submitted to the 2007–2010 audit by QARC region[a]

QARC	Case	Two Population Controls (GP and District)	One Population Control (GP or District)	No Population Controls
East of England	773	767	3	3
East Midlands	841	837	4	0
London	923	838	6	79
North East	586	582	4	0
Yorkshire and the Humber	985	979	6	0
North West	1,045	1,039	6	0
South Central	657	654	3	0
South East Coast	589	587	2	0
South West	1,059	1,056	3	0
West Midlands	1,108	1,100	5	3
Total	**8,566**	**8,439**	**42**	**85**

[a]Cancers diagnosed 01/04/07 to 31/03/2011

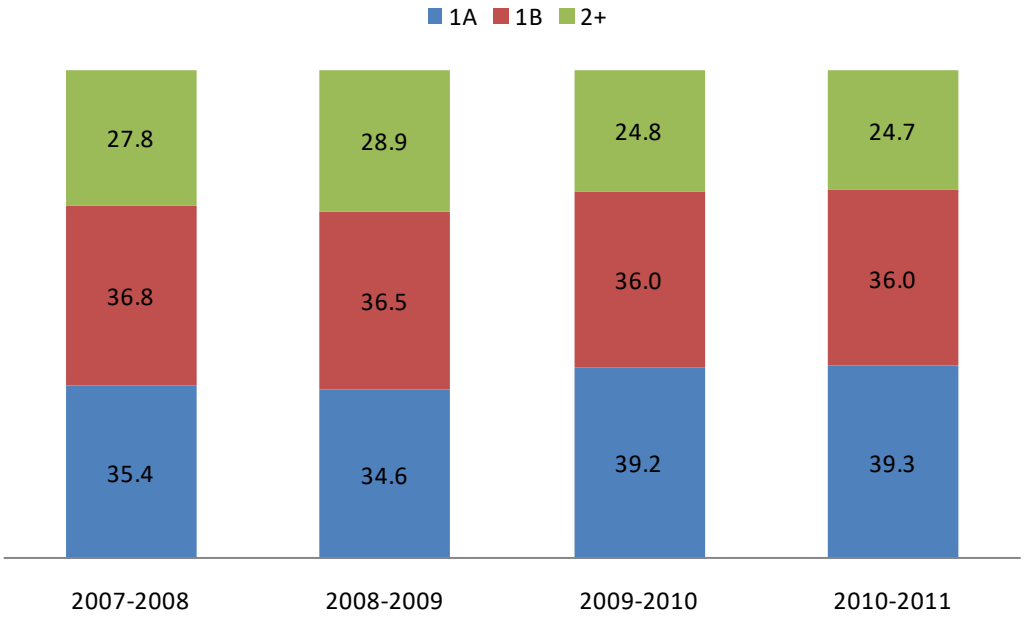
4.3 FIGO stage of invasive cervical cancers

Table E shows the number of cervical cancer cases by FIGO stage for each QARC region. Percentages are provided in Table 5a. A substantial proportion, 37%, of all cases with a known FIGO stage, are micro-invasive (1A). This is significant, as micro-invasive cancer is asymptomatic and can usually be cured.

In some cases, the FIGO stage information is missing. It is not possible to estimate how many of these are due to a lack of clinical staging, but histological type is missing from only 4.3% of cases (see section 4.4). The missing data may be due to the fact that some regions delay the audit process until the FIGO stage is available, while others complete the audit before the FIGO stage is known and experience subsequent difficulties in updating the database to include this information when it becomes available.

Figure 2 shows the estimated percentage distribution of cervical cancer cases by FIGO stage by year. This indicates a broad shift towards earlier stage cancers between 2007-08 and 2009–10, maintained in 2010-11. However, the data for this period are affected by the so-called 'Jade Goody effect', produced by the publicity surrounding the reality star's cervical cancer diagnosis (August 2008) and untimely death (March 2009) from the disease. The increase in the number of early cases detected that is due to this effect must be taken into account, and consequently all diagnoses from the beginning of September one year to the end of August of the following year have been tabulated (Table F). Selecting this timeframe means that most of the excess cancers diagnosed as a result of the 'Jade Goody effect' fall in one year (2008/09). It also means that the reasonably complete results for the first half of the last financial year under scrutiny (2009/10) can be included and compared with earlier data.

Figure 2 FIGO stage of cervical cancers cases: estimated percentage distribution by financial year



Grouping results by financial year (Table 7) suggests that the number of stage 2+ cancers has increased between 2007 and 2009. However, running the same analysis from September-August (Table F) shows that for women under the age of 65, the number of FIGO stage 2+ cases actually decreased (from 378 in 2007/08 to 344 in 2009/10), with no corresponding increase in the number of unstaged cancers.

The results also suggest that most of the excess cancers diagnosed in 2008/09 due to the 'Jade Goody effect' were early stage (1A) cervical cancers. No increase in the overall number of cancers diagnosed in 2008-09 is observable in women aged 65 or over, which perhaps suggests that the publicity surrounding Jade Goody struck a chord mainly with younger women. In fact, there was a substantial decrease in the total number of cancers diagnosed in women over the age of 65, falling from 422 in 2007/08 to 331 in 2009/10, a

21.6% decrease (the true value of this percent decrease in cancer lies somewhere between 9.4% and 32.1%, (95% confidence interval)).

Figure 3 shows the estimated percentage distribution of invasive cervical cancer by FIGO stage and by age group. As the age of women increases, the proportion of cases diagnosed as FIGO stage 1A decreases, and the proportion of women diagnosed at FIGO stage 2+ increases. Stage 1A cancer is often screen-detected, and treatment generally has fewer side effects and is more likely to be curative. The large proportion of cervical cancer cases diagnosed at stage 1 (particularly those at stage 1A) in women under the age of 49 can be regarded as a benefit of the screening programme.

Figure 3 FIGO stage of cervical cancer cases: estimated percentage distribution, by age-group

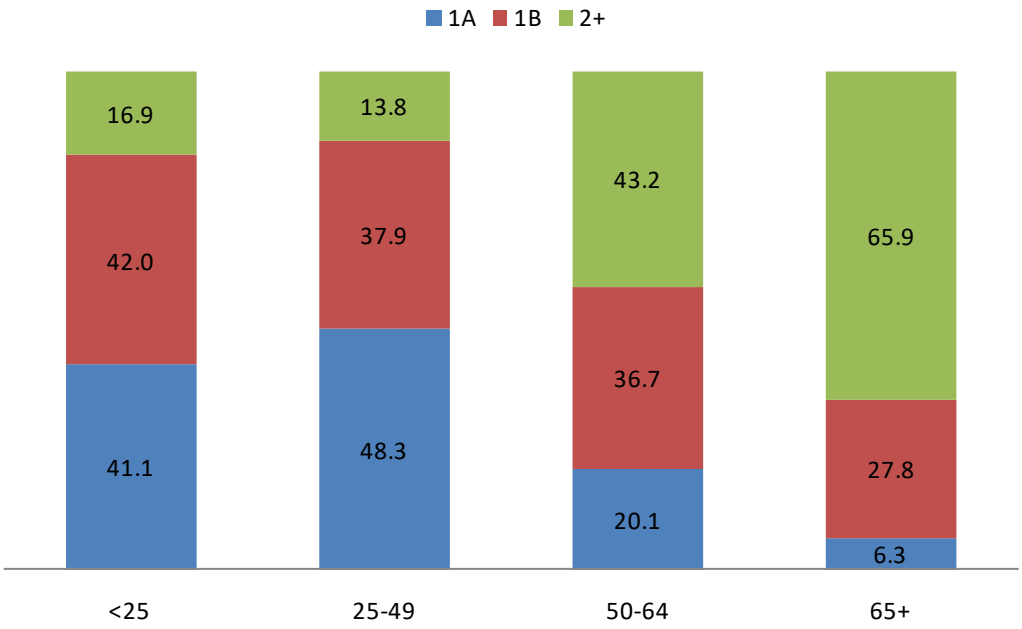


Table E Number of cervical cancer cases by FIGO stage in 2007–2010 audit, by QARC region

QARC Region	1A		1B		2+		1B(NOS)*		None recorded		Total	
East of England	226	29%	270	35%	210	27%	4	1%	63	8%	773	100%
East Midlands	294	35%	241	29%	134	16%	15	2%	157	19%	841	100%
London	286	31%	245	27%	288	31%	51	6%	53	6%	923	100%
North East	191	33%	172	29%	80	14%	84	14%	59	10%	586	100%
Yorkshire and the Humber	370	38%	227	23%	69	7%	37	4%	282	29%	985	100%
North West	303	29%	312	30%	125	12%	120	11%	185	18%	1,045	100%
South Central	236	36%	232	35%	143	22%	11	2%	35	5%	657	100%
South East Coast	219	37%	172	29%	139	24%	6	1%	53	9%	589	100%
South West	345	33%	321	30%	266	25%	36	3%	91	9%	1,059	100%
West Midlands	275	25%	290	26%	362	33%	0	0%	181	16%	1,108	100%
Total	**2,745**	**32%**	**2,482**	**29%**	**1,816**	**21%**	**364**	**4%**	**1,159**	**14%**	**8,566**	**100%**
* Cases reported as 1B(NOS) (known to be stage 1B or worse but detailed stage is not known)												

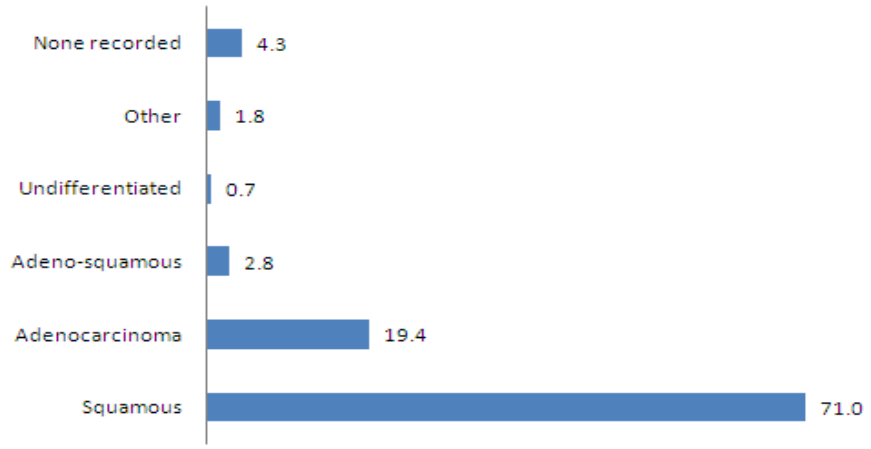
Table F. Diagnosis of cervical cancer made from September to August by FIGO Stage and age

Diagnosis made from September to August	FIGO Stage									
	1A		1B		2+		Unknown		Total	
	N	%	N	%	N	%	N	%	N	%
Cases age <65										
2007-08	618	35.7	529	30.6	378	21.9	205	11.9	1,730	100
2008-09	766	38.1	656	32.6	383	19.1	206	10.2	2,011	100
2009-10	697	39.2	543	30.5	344	19.4	194	10.9	1,778	100
Cases age 65+										
2007-08	20	4.7	83	19.7	234	55.5	85	20.1	422	100
2008-09	18	4.8	77	20.6	201	53.7	78	20.9	374	100
2009-10	12	3.6	66	19.9	169	51.1	84	25.4	331	100

4.4 Histology of invasive cervical cancers

Figure 4 shows the distribution of invasive cervical cancer cases by histological type. Almost three-quarters of cases of cervical cancer show squamous histology, while almost one-fifth are adenocarcinomas. Adeno-squamous types are significantly rarer.

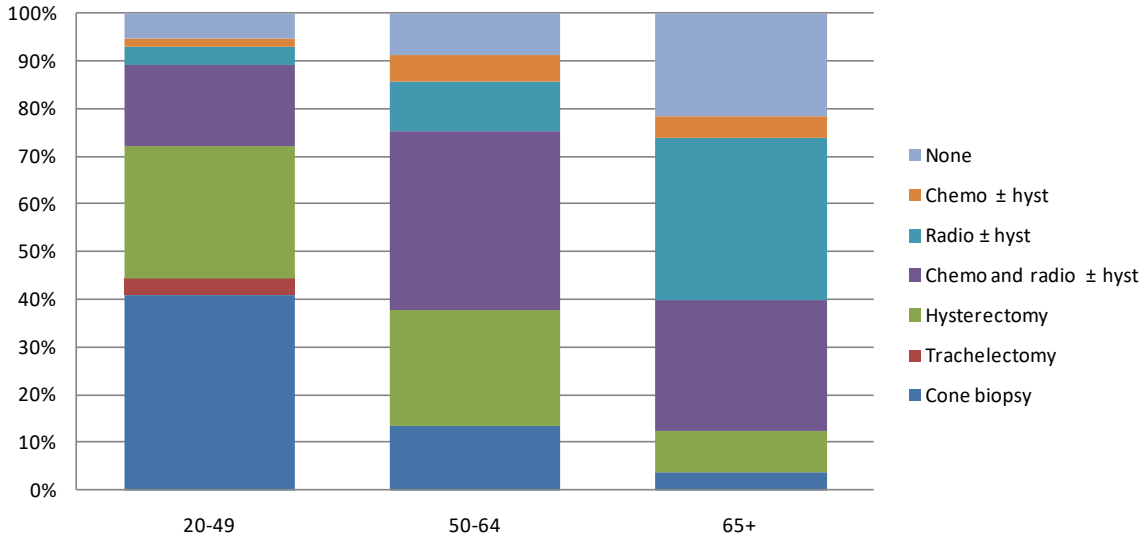
Figure 4 Percentage of cervical cancer cases, by histology



4.5 Treatment of invasive cervical cancers

Figure 5 shows the distribution of treatment for cervical cancers, according to age (see also Table 12). The most aggressive treatment employed in each case has been captured. Treatment was recorded in 66% of cases (Table 11). Out of all cases with treatment recorded (5676), the most common treatment was cone biopsy/loop excision (30%), followed by simple or radical hysterectomy (24%), and radiotherapy plus chemotherapy ± hysterectomy (24%).

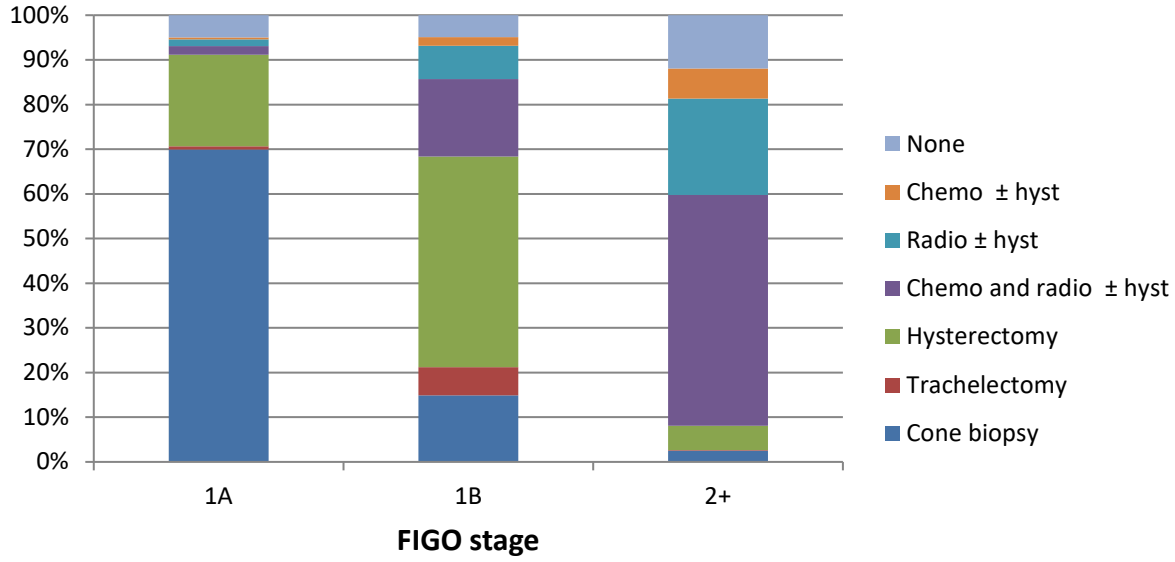
Figure 5 Percentage treatment of cervical cancer cases, by age at diagnosis



Filtering the results by age reveals that, for women aged 50 to 64, the most common treatment was radiotherapy plus chemotherapy ± hysterectomy (38%), followed by hysterectomy alone (24%). By contrast, 44% of women under 50 had fertility-sparing treatment (cone biospy/loop excision or trachelectomy) with only 28% undergoing a hysterectomy. For those aged 65+, radiotherapy ± hysterectomy (34%) was the most common treatment, followed by radiotherapy plus chemotherapy ± hysterectomy (27%). However, 22% of women in this age group reportedly received no treatment, other than perhaps palliative care. Given the substantially poorer relative survival of elderly cervical cancer patients nationally,[16] this appears to warrant further investigation. It should be borne in mind, however, that some regions may have recorded 'no treatment' because they were unable to find a record of treatment, rather than because the patient was not treated (see section 3.7).

Figure 6 shows the distribution of treatment for invasive cervical cancer by stage of disease (Table 13). The graph reveals that the majority of women diagnosed with FIGO stage 1A received cone biopsy/loop excision (70%), whereas those with stage 1B were most likely to have had a simple or radical hysterectomy (47%). The majority of those with stage 2 or worse (62%) cancer received radiotherapy plus chemotherapy ± hysterectomy. Of women with no recorded stage, 23% received a cone biopsy/loop excision and 24% were given no treatment (other than perhaps palliative care).

Figure 6 Percentage treatment of cervical cancer cases by FIGO stage



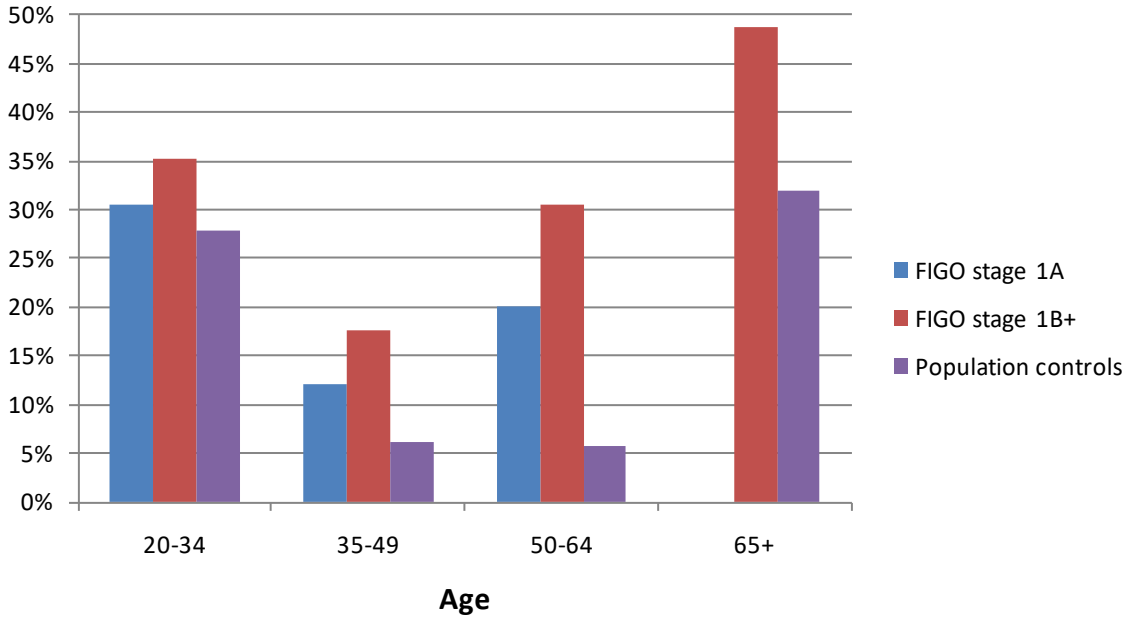
4.6 Cervical screening history (cases compared with controls)

4.6.2 Proportion of women never screened

Figure 7 shows the proportion of cases and controls with no recorded screening history up to six months prior to diagnosis. 1,159 cases are excluded because no information on stage was available. The data show that controls were generally more likely than cases to have attended screening previously. The exception to this was women aged 20–34 with invasive cervical cancer at FIGO stage 1A, who were almost as likely as controls to have been

screened (see section 4.6.4 for a more detailed comparison). Note that we have excluded 25 women aged 65+ with FIGO stage 1A cancer because the lack of routine screening for women in this age group means that it is unlikely that these cancers were screen-detected. Instead, this small number of cancers (25 out of 71 in women aged 65+) may represent rare instances of incidental cancer diagnosis.

Figure 7 Proportion of women with no screening test (other than those taken within six months of diagnosis), by FIGO stage and age



4.6.3 Coverage and number of cytology tests in the previous three (or five) years

Table G presents a snapshot of the coverage achieved by the cervical screening programme, by age group. NHS CSP statistics for 2010–11 show that the 3.5-year coverage in women aged 25–49 was 73.7%, and the 5-year coverage for women aged 50–64, 78.0%.*

An analysis of coverage, broken down into 5-year age groups, is presented in Table 16, which uses 3-year coverage for women aged 20–49 and includes comparable NHS CSP data.§ These coverage figures are based on the number of screened individuals in a sample of the population, whereas national coverage figures are based on the total number of women screened compared to the total population in the age group. The audit's figures are thus subject to sampling error, but are not compromised by a disconnection between the coverage denominator and numerator.

Table G quantifies the number of women attending for screening more than once during the recommended interval, revealing that 14% (i.e. (524+456)/(6125+524+456) of those aged 25–49) underwent two or more cytology tests in the previous three years. This figure can be compared with the proportion of screened women on early repeat or suspended screening (Table 15): in women aged 20-49 and women aged 25-49 (whose data are not shown), this figure is 11%.

* See The NHS Information Centre,[9] table 2.
§ See The NHS Information Centre,[9] table 3.

Table G Proportion of population controls (GP and district) screened in the 3–5 year interval preceding the date of diagnosis of their matched case[a]

Age	Coverage (>=1 test in interval)	Not screened in previous interval		Screened once in previous interval		Screened twice in previous interval		Screened ≥3 times in previous interval	
	%	N	%	N	%	N	%	N	%
25-49	66.5	3,586	33.5	6,125	57.3	524	4.9	456	4.3
50-64	77.2	653	22.8	1,600	55.9	499	17.4	110	3.8
65-79	71.3	529	28.7	890	48.2	372	20.2	55	3.0
80+	34.7	669	65.3	277	27.0	70	6.8	9	0.9
Total		**5,437**	**33.1**	**8,892**	**54.1**	**1,465**	**8.9**	**630**	**3.8**

[a] For women under 50 the screening interval is 3 years; for those over 50 it is five years. For women aged 65+, it is the number of samples taken in the five years before their 65th birthday.

Table G indicates that 71% of women aged 65 to 79 were screened at least once between the ages of 60 and 64. Coverage in this age group is important because women are only discharged from the screening programme once all cervical abnormalities have been dealt with, thus ensuring that the risk of developing cervical cancer subsequently is very small. As coverage in this age group increases, the number of cancers diagnosed will decrease. Table G also reveals that a large proportion of women over the age of 50 were screened twice in the previous interval. This is most striking in women aged 50–54 (see Table 16), though this is almost certainly due to the fact that a number of them were screened at age 46 and then again at age 49 (prior to 2003, screening policy meant that individuals in many parts of the country were tested at three-yearly intervals up to the age of 65). The 20% of women aged 65–79 who were screened twice in the previous interval probably reflects a similar phenomenon.

The figures for women screened three or more times in the previous interval include cases where women underwent an early repeat test because of an abnormal result. (A similar figure is reported in the KC53: 3.1% for 2010/11). Women over the age of 80 have low coverage because they would have been over 60 when the screening programme began in 1988, and data prior to this point are unreliable. However, the coverage figures for this age group should increase with each extra year of data reported.

4.6.4 Observed screening interval in women with routine recall

For the purposes of this report, a ‘screen-detected’ cancer is defined as a cancer that is diagnosed after a referral to colposcopy, where that referral is due to a cytology test taken at least 3 weeks, and no more than 4 months, prior to diagnosis. However, there is no national record of the reason for taking the original cytology test, i.e. there is no way of confirming whether it arose from routine screening, or from a test to investigate suspicious symptoms. Therefore, some women whose cancers are defined as screen-detected will have gone to their GP with symptoms and been offered a cytology test as an alternative to rapid referral for suspected cancer. Conversely, some stage 1A cancers may not be included if, for instance, a woman went to see a gynaecologist without a screening-based referral, following a borderline cytology test.

In this section we aim to establish whether women with screen-detected cancer were screened less often than screened women who do not have cervical cancer. Table H shows the interval between the previous screening test and the test that led to diagnosis for screen-detected cases, and compares this to the interval between screening episodes for controls. If a previous test result was recorded for cases, the interval was taken to have started after an action code specifying routine recall; if there was no previous adequate test, the time to the previous screen is shown as 'none within 9.5 years'.*

Compliance with three-yearly screening in women under the age of 50 was poor, reaching a maximum level of 50% among screened controls aged 35–49. By contrast, the majority (78%) of screened controls aged 50–64 had been tested during the previous 5-year period (36% of this group were screened during the previous 3.5 years, a further 15% were screened between 3.5 and 4.75 years earlier, and the final 27% between 4.75 and 5.5 years earlier). Viewed across all ages, only 64% of women who had a routine screen in 2007–11 had been screened during the previous 5.5 years. This suggests that the overall figure for 5-year coverage of 79% relies on excellent coverage among women after colposcopy or during the early recall period (especially in those under the age of 35). It would also appear that 15% of women aged 25–49 with a routine recall interval of 3.5 years were, in fact, screened between 3.5–4.75 years later.

In the 25–34 year age group, a substantial proportion of women (both cases and controls) had never been screened (classified as 'none within 9.5 years'). For women aged 35–49, 32% of cases had not been screened during the previous 9.5 years, compared to just 10% of controls, a striking difference repeated in women of the 50-64 age group. Fewer than 5% of women on routine recall were screened at an interval of less than 2.75 years (see Table 17).

Women aged 25-34 who developed screen-detected cancer had not been screened less frequently than their screened controls. However, in women aged 35–64, screen-detected cases were much less likely than their screened control counterparts to have been screened at the recommended 3-yearly interval (see Table 17a). However, these figures must be viewed in light of the fact that only 22% of cervical cancers in women aged 50–64 (318 of 1,455 cases) were potentially screen-detected, compared with 46% (2,513 of 5,471 cases) in women of the 25–49 age group. These percentages are similar to those for cancers diagnosed as stage 1A: 48% at age 25-49, and 20% at age 50-64 (see Table 6a).

4.6.5 Regular screening interval

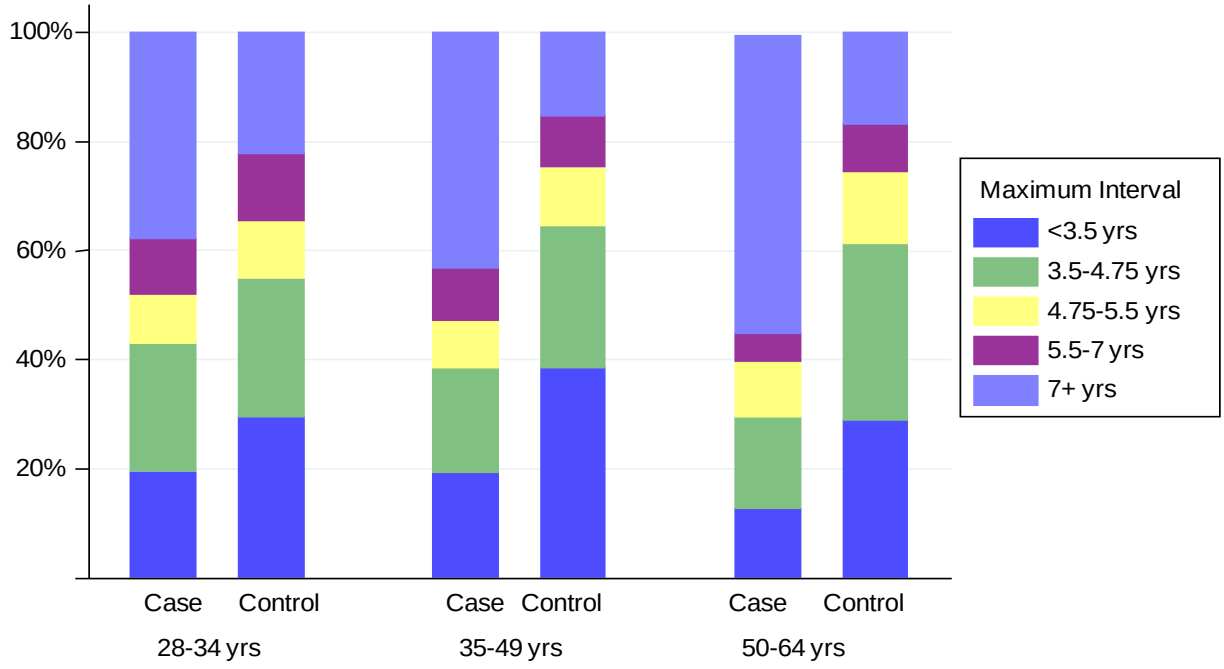
Figure 8 presents the maximum interval between any cytology tests taken over the 8 years preceding diagnosis for women with stage 1B or worse cervical cancer, and for their population controls. The numbers are presented in Table 18. Women aged under 28 are not included, because they would not have been eligible for screening for the whole of the previous 8 years.

In all age groups, women with stage 1B+ cervical cancer were less likely than controls to have been screened every 3.5 years during the period under scrutiny. The proportion of women with a maximum interval of more than 7 years between cytology tests, or with no cytology recorded, is greatest among those aged 50–64, where 55% of those with stage 1B+ cancer were in this category, compared with 17% of controls. This corresponds to a relative risk of 5.99 in women with an interval of over 7 years between screening episodes. Since

* When discussing controls, these intervals are informally referred to as the 'actual interval after routine recall', although, in fact, the calculation looks back from a current test rather than forwards from one resulting in routine recall.

17% of controls are in this category, the relative risk of the this population (compared to those screened at more frequent intervals) is (0.17*5.99)+0.83 = 1.84. This means that cervical cancer rates in women aged 50-64 today would be more than three times higher (5.99/1.84=3.25) were it not for the screening undertaken over the last decade.

Figure 8 Maximum interval between cytology tests (in the last 8 years) among stage 1B+ cases and their population controls, by age



4.7 Colposcopy and Histology

Collecting colposcopy data for this audit has been challenging, and the variability of the available information has made interpretation still more difficult. However, data on colposcopic history are of particular importance where there is an interval of four months or more between cytology results that indicate referral and subsequent diagnosis. This is because the interval indicates either a delay in administering the diagnostic procedure (attributable to the woman or her service provider), or the recurrence of a previously-treated cervical abnormality.

Overall, 69% of all cervical cancers in the audit had cytology with an action code of suspend (suggesting referral). A much smaller proportion, 20% (1,749 cases in total), had a cytology report dated more than 4 months prior to diagnosis (Table 19). Among those 1,749 cases, 63% had a colposcopic appointment recorded. Those who attended within 2 months of diagnosis were excluded, on the grounds that the colposcopic examination presumably resulted in the diagnosis of cancer (this audit focuses on management prior to diagnosis). This leaves 713 cases where referral to colposcopy preceded diagnosis by more than 4 months. These are recorded in Table 19.

Results for histology reporting are difficult to interpret, due to confusion over data capture. A total of 4,930 histology samples from women who were subsequently diagnosed with cervical cancer were recorded on the audit database between April 2007 and March 2011. Despite the fact that audit guidelines request that the date of diagnosis is reported as the

date the sample was taken (not the date on which it was reported), the two match in only 47% of cases on the database (2,303/4,930). Of the remaining 2,627 slides:

- 287 (10.9%) were taken after the recorded date of diagnosis.
- 1,845 (70.2%) were taken less than two weeks before the recorded date of diagnosis.
- 270 (10.3%) were taken between two weeks and one month before the recorded date of diagnosis.
- 151 (5.7%) were taken between one and four months before the recorded date of diagnosis.
- 74 (2.9%) were taken more than four months before the recorded date of diagnosis.

4.8 Cytology and Histology Review

Audit guidelines covering the period of this report suggest that, in cases of confirmed cervical cancer, all cytology samples and histology specimens obtained in the 10 years preceding diagnosis, including those that led to diagnosis, should be reviewed by a screener, a checker, and a Consultant Biomedical Scientist or Consultant Pathologist. All three review results are recorded in the database and occasionally a consensus result is also documented (especially when reviewers disagree on the review result). The process is conducted with the benefit of hindsight, with the viewer knowing that the slides under investigation are from women with cancer.

Out of a total of 8,566 cases in the database, 1,072 (12.5%) had no cytology tests of any kind recorded. 1,215 (14.2%) had a cytology test, but not within 10 years of diagnosis. Of the 6,284 women with a cytology test recorded within 10 years of diagnosis, 4,086 (65%) have a review result recorded in the database.

A total of 11,672 cytology tests have a documented review result in the database, and the audit data presents either the consensus result (where this has been reported) or the result reported by the Consultant Biomedical Scientist or Consultant Pathologist. A total of 430 review slides were excluded because they were not reviewed by a consultant or Advanced Practitioner, leaving 11,242 samples remaining. Of these, 44.4% (4,987) were conventional cytology smears, and 42.3% (4,759) were liquid-based cytology samples. No record of the type of test used was available for 13.3% (1,496) tests. Table 20 summarizes all review results.

Of all the negative tests that were reviewed, only 51% remained negative when investigated for a second time. 43% of the borderline tests remained borderline, and 41% of those showing low-grade dyskaryosis were confirmed as such. However, over 90% of samples reported as ?invasive or ?glandular had this diagnosis confirmed. One result that stands out from Table 20 is that 14% of the borderline slides were ?glandular upon review, though it should be noted that some of these would have been reported as ‘borderline, high-grade not excluded’ or ‘borderline changes in glandular cells’, resulting in immediate referral. Of the 721 borderline tests taken more than 6 months before diagnosis, 75 (10%) were ?glandular on review, compared to 23% (59/256) of those taken within 6 months of diagnosis.

Table H Time to previous cytology test among potentially screen-detected cases and their screened controls (percentages)

	Time to previous screen													
Age	<3.5 yrs		3.5-4.75 yrs		4.75-5.5 yrs		5.5-9.5 yrs		No previous cytology within 9.5 years		Total		<5.5 yrs	
	Cases	Controls	Cases	Controls	Cases	Controls	Cases	Controls	Cases	Controls	Cases	Controls	Cases	Controls
25-34	26.8	30.3	13.7	12.7	5.8	6.2	14.9	13.3	38.7	37.4	100	100	46.4	49.3
35-49	31.1	49.9	13.6	17.2	5.9	8.1	17.7	15.1	31.7	9.7	100	100	50.6	75.2
50-64	14.5	35.9	11.3	15.6	17.0	26.6	11.0	11.6	46.2	10.3	100	100	42.8	78.1
Total	**27.2**	**39.3**	**13.4**	**15.0**	**7.1**	**9.3**	**15.6**	**13.9**	**36.6**	**22.5**	**100**	**100**	**47.8**	**63.6**

Table I shows review results for slides originally reported as negative. These are tabulated separately for LBC and conventional cytology, and subdivided by the interval between test and diagnosis. Overall, 55% of LBC slides originally reported as negative in women who subsequently developed cervical cancer were upgraded upon review. The proportion of upgraded slides increases as the amount of time between sample and diagnosis decreases: 35% of slides taken more than 5 years prior to diagnosis are upgraded on review, rising to 52% for those taken 3-5 years prior to diagnosis, and to 61% for those taken within 3 years of diagnosis. Thus, the majority of cancers diagnosed within 5 years of a negative screening test can, with the benefit of hindsight, be seen to follow a missed cytological abnormality, rather than being caused by rapidly progressing disease or poor sampling.

To put this into context, we need to consider the proportion of women with cancer who had a negative test prior to diagnosis. Clearly a woman who has never been screened cannot attribute her cancer to a missed cytological abnormality. From Table 15 it can be seen that approximately 20% of women with cervical cancer aged 20-49 had a negative test within 3.5 years of diagnosis and 28% of those aged 50-64 had a negative test within 5.5 years of diagnosis. Thus, very roughly, one can estimate that 12% (60% of 20%) of cancers in women aged 20-49 and 14% (50% of 28%) of cancers in women aged 50-64 could potentially have been diagnosed earlier (possibly even as CIN) had the cytological abnormality discovered on review been identified originally.

New audit guidelines will make review of the diagnostic sample, and of any subsequent samples taken, unnecessary. Since the vast majority of histology reviews involve such samples, workload will be reduced by around 80% (approximately 5,000 samples).

As explained in section 4.7, not all of the samples used to diagnose cancer were taken on the date registered on the database. For some of those taken in the six months before diagnosis (Table J), this discrepancy seems to have resulted from misinterpretation of the audit guidelines. In a few instances, however, an earlier sample appears to relate to a prior diagnosis of cervical cancer, even though women with recurring cancers should not be included into the audit. In other instances, the lack of agreement between dates appears to be the result of clerical error (since there is no central database for histological samples equivalent to that for cytology results, these results were entered manually).

Out of 4,241 women with a biopsy review result recorded in the database, 25 (0.6%) had a specimen taken more than 6 months before diagnosis, which was upgraded to cancer upon review (Table J). Out of these 25, the delay in diagnosis was less than a year for 9 women, between one and two years for five women, and between three and six years for another five. Six women had a delay in diagnosis of more than six years. Despite this, 17 of these cancers were stage 1A or 1B at diagnosis, four were of unknown stage, and only four were stage 2+.

Table I. Review results of slides originally reported as negative tabulated separately for LBC and conventional cytology and by time prior to diagnosis.

Slides reported as normal originally, but found upon review to be:	Time from slide to diagnosis							
	<3years		3-5 years		5+ years		Total	
LBC	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
Normal	212	38.8	172	47.8	96	65.3	480	45.5
Inadequate	10	1.8	10	2.8	14	9.5	34	3.2
Low-grade	141	25.8	91	25.3	22	15.0	254	24.1
High-grade	184	33.6	87	24.2	15	10.2	286	27.1
Total	547	100	360	100	147	100	1,054	100
Conventional								
Normal	91	41.4	443	43.7	1,351	57.2	1,885	52.4
Inadequate	14	6.4	76	7.5	296	12.5	386	10.7
Low-grade	49	22.3	241	23.8	426	18.1	716	19.9
High-grade	66	30.0	254	25.0	287	12.2	607	16.9
Total	220	100	1,014	100	2,360	100	3,594	100

Table J. Time from histology sample to diagnosis. Numbers in parenthesis are those samples with a review result of cervical cancers[1]

	Time from diagnosis								Total samples with original diagnosis and a review result	
	Post-diagnosis		0-1 months Pre-diagnosis		2-6 months Pre-diagnosis		>6 months Pre-diagnosis			
<CIN2	(1)	37	(8)	49	(1)	47	(9)	177	(19)	321
CIN2-3[2]	(7)	18	(67)	446	(20)	272	(16)	275	(110)	1,029
Cancer	(284)	287	(4,460)	4,532	(40)	41	(19)	20	(4,803)	4,881

[1] Shaded cells indicate samples that would not be included under new guidelines.
[2] Includes samples coded as CIN ungraded, CGIN ungraded and High grade GCIN

5. Future developments/ Ongoing work

Results from this audit will be presented to the advisory group, and changes will be implemented as part of the screening programme where appropriate.

This audit will form the basis for a number of peer-reviewed articles, which will use the data to analyse: (i) the impact of the 'Jade Goody effect' on the diagnosis of cervical cancer within the screening programme and (ii) the degree of protection offered by screening women who are over the age of 65.

The audit management group are working on updates to the audit guidelines in order to make the process more efficient and to enhance its educational focus. The national office and the audit management group aim to run several workshops in late spring to outline the changes.

The colposcopy review process will be improved as part of the audit, but changes will not be included until 2013.

In the longer term, the audit database will be integrated into the new national cancer registry for England, which will increase capacity to store and manage information on each registration. This will enable screening history to be related to mortality allowing us to study survival.

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GLOSSARY

Action code	This field (downloaded as part of the screening history from NHAIS) denotes the action to be taken in response to the result of each cytology test. The codes are: A. Routine screening/call and recall. H. Result recorded, but no change in current action code. (This code is normally used when privately-taken cytology tests are entered into the system). R. Early recall at an interval specified by the laboratory. S. Suspend recall pending referral.
Cases	Women diagnosed with invasive cervical cancer in England.
Controls	Women who have not been diagnosed with cervical cancer, who are registered with a GP in England. They are matched by age and place of residence with a case.
Cervical Screening Evaluation Group /Audit Management Group	The group charged with evaluating developments in the NHS Cervical Screening Programme. The CSEG oversaw the NHS CSP national audit until February 2011, when an Audit Management Group was established, consisting of a subgroup of individuals from the Evaluation Group. The new Audit Management Group is charged with coordinating the development of audit protocols, and with gathering and disseminating recommendations for best practice
Confidence Interval	Confidence interval is a term used in inferential statistics that measures the probability that a population parameter will fall between two set values. The confidence interval can take any number of probabilities, with the most common being 95% or 99%.
Exeter call and recall system	The system used to invite women for screening. Since 1988, it has stored screening records for all women registered with a GP
FIGO stage	The cancer staging classification developed by the International Federation of Gynaecological Oncologists (I, IA, IA1, IA2, IB, IB1, IB2,III, IIIA, IIIA, IV, IVA, IVB).
Hospital Based Programme Coordinators (HBPC)	The named individual within each NHS trust who is responsible for collating cases of invasive cervical cancer and initiating the audit process.
Quality Assurance Reference Centres (QARC)	The nine Quality Assurance Reference Centres (QARCs) in England are responsible for the quality of the screening programme in their area. With the exception of the North East and Yorkshire and The Humber QARCs, each covers one region of the country.

Appendix A: Essential fields

SECTION A & A1	**Personal details**	NHS number (to be held locally) Date of birth For cases only: Date of diagnosis Stage of tumour (FIGO) Histology
SECTION B	**Cytology**	No cytology records found Date test was taken Result of test
SECTION C	**Colposcopy**	For cases only: Number of colposcopic appointments Date of colposcopy Satisfactory examination or DNA Surgical procedure
SECTION D1	**Histology cancer diagnosis**	For cases only: Date of specimen FIGO stage Pathological diagnosis
SECTION D2	**Specimen history**	Date of specimen Type of specimen Pathological diagnosis Clear margins
SECTION E **Cytology Review of cases**	**E1. Original slide**	Slide ID Date of original test Cytology type Original test result
	E2. Review results	Reviewed location Review result
SECTION F **Histology Review of cases**	**F1. Original specimen**	Specimen ID Date of original specimen
	F2. Review results	Review of pathological diagnosis
	F3. Cancer original specimen	Specimen ID Date of original specimen
	F4. Cancer review results	Review of pathological diagnosis
SECTION G	**GP notes**	Although Section G is not essential, if you attempt to collect data, all fields are required
SECTION H	**HPV DNA Testing**	Date of sample Result

Appendix B: Completion of data (essential fields)

NHS Number is not received nationally

B-1 Proportion of essential data collected for cases in **Section A. Personal and cancer details**

		Section A: Essential fields							
		Date of Birth		Date of Diagnosis		Stage*		Histology*	
QARC Region	**Case**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
East of England	773	773	100	773	100	721	93.3	770	99.6
East Midlands	841	841	100	841	100	684	81.3	812	96.6
London	923	923	100	923	100	870	94.3	882	95.6
North East	586	586	100	586	100	527	89.9	562	95.9
Yorkshire and the Humber	985	985	100	985	100	703	71.4	892	90.6
North West	1,045	1,045	100	1,045	100	860	82.3	1,039	99.4
South Central	657	657	100	657	100	623	94.8	615	93.6
South East Coast	589	589	100	589	100	536	91.0	533	90.5
South West	1,059	1,059	100	1,059	100	972	91.8	1,013	95.7
West Midlands	1,108	1,108	100	1,108	100	927	83.7	1,079	97.4
Total	**8,566**	**8,566**	**100**	**8,566**	**100**	**7,423**	**86.7**	**8,197**	**95.7**

[a] See section 6 for details regarding missing data

B-1a Proportion of non-essential data collected for cases in **Section A. Personal and cancer details**

Section A: Non-essential fields											
		Treatment (in those with known tx, **excluding** palliative care*)		Treatment (in those with tx recorded **including** palliative care)		Index of Multiple Deprivation			Index of Multiple Deprivation		
QARC Region	**Case**	n	%	n	%	n	%	**All Controls**	n	%	
East of England	773	554	71.7	581	75.2	716	92.6	2,688	13	0.5	
East Midlands	841	518	61.6	543	64.6	0	0.0	2,952	0	0.0	
London	923	593	64.2	681	73.8	1	0.1	2,894	0	0.0	
North East	586	203	34.6	213	36.3	580	99.0	2,125	0	0.0	
Yorkshire and the Humber	985	417	42.3	431	43.8	960	97.5	3,571	0	0.0	
North West	1,045	313	30.0	404	38.7	861	82.4	3,644	4	0.1	
South Central	657	493	75.0	520	79.1	649	98.8	2,419	2,375	98.2	
South East Coast	589	426	72.3	445	75.6	578	98.1	2,130	2,068	97.1	
South West	1,059	853	80.5	915	86.4	1,044	98.6	3,565	3,504	98.3	
West Midlands	1,108	829	74.8	942	85.0	1,096	98.9	3,670	0	0.0	
Total	**8,566**	**5,199**	**60.7**	**5,675**	**66.3**	**6,485**	**75.7**	**29,658**	**7,964**	**26.9**	

[a] Where treatment was recorded as 'none', this is interpreted as meaning 'none other than palliative care'. See section 6 for details.

B-1b Proportion of cases with FIGO stage reported as not recorded, unstaged,* or '1B+' (1B or worse), by QARC region, age, and audit year

QARC Region	Unstaged	None recorded	1B+ (NOS)	Total
East of England	0.0	8.2	0.5	773
East Midlands	0.0	18.7	1.8	841
London	0.0	5.7	5.5	923
North East	0.0	10.1	14.3	586
Yorkshire and the Humber	0.0	28.6	3.8	985
North West	0.0	17.7	11.5	1,045
South Central	0.0	5.3	1.7	657
South East Coast	0.0	9.0	1.0	589
South West	7.7	0.9	3.4	1,059
West Midlands	5.2	11.1	0.0	1,108
Age				
<25	1.1	11.4	3.8	184
25-49	0.9	9.8	3.1	5,471
50-64	2.3	14.1	6.1	1,455
65+	3.7	18.1	6.5	1,456
Audit Year				
2007-2008	1.2	12.3	5.1	2,136
2008-2009	1.4	11.6	4.0	2,205
2009-2010	1.1	10.4	3.8	2,349
2010-2011	3.1	14.0	3.9	1,876
Total	**1.6**	**12.0**	**4.2**	**8,566**

*Where cases are reported as unstaged, a reasonable amount of effort has been made to find staging information, but none has been available. This figure is derived from cases recorded as "audit complete", which means that no further details are being sought for these women. Currently, not all QARCs report completed cases, but from next year this option will be available.

B-2 Proportion of data collected for cases in **Section B. Cytology**

Completeness of data among recorded cytology tests								
QARC Region	**Case**	**Total No. of tests on cases[a]**	**Date test was taken**		**Result of Test**		**Action Code**	
			n	**%**	**n**	**%**	**n**	**%**
East of England	773	3,266	3,266	100	3,266	100	3,265	100
East Midlands	841	3,957	3,957	100	3,957	100	3,956	100
London	923	2,071	2,071	100	2,071	100	2,071	100
North East	586	2,314	2,314	100	2,314	100	2,314	100
Yorkshire and the Humber	985	4,425	4,425	100	4,425	100	4,422	99.9
North West	1,046	4,542	4,542	100	4,542	100	4,526	99.6
South Central	657	2,750	2,750	100	2,750	100	2,743	99.7
South East Coast	589	2,691	2,691	100	2,691	100	2,681	99.6
South West	1,059	4,317	4,317	100	4,317	100	4,317	100
West Midlands	1,108	4,577	4,577	100	4,577	100	4,575	100
Total	**8,567**	**34,910**	**34,910**	**100**	**34,910**	**100**	**34,870**	**99.9[b]**

[a] Cytology tests known to the audit, taken before diagnosis

[b] Cytology data obtained directly from Open Exeter should have all three data fields complete. Missing data, we believe, is the result of inclusion of test records found in the laboratory, but not recorded on Exeter. These tests will not have an "Action Code" as this field is generated by Exeter.

B-3 Proportion of data collected for cases in **Section C: Colposcopy**

	No. of cases with an Action Code of suspend	No. of cases with a suspend and a colposcopy		Additional cases with a colposcopy but no suspend (n)	No. of Colposcopy appts	Date of colposcopy		Satisfactory exam or DNA		Colposcopic procedure	
QARC Region		**n**	**%**		**n**	**n**	**%**	**n**	**%**	**n**	**%**
East of England	521	364	69.9	62	636	636	100	636	100	586	92.1
East Midlands	595	245	41.2	17	466	466	100	466	100	426	91.4
London[1]	641	634	98.9	258	1,226	1,226	100	1	0	568	46.3
North East	409	192	46.9	38	413	413	100	413	100	326	78.9
Yorkshire and the Humber	739	340	46.0	31	764	764	100	764	100	616	80.6
North West	733	390	53.2	52	811	811	100	811	100	653	80.5
South Central	463	314	67.8	39	607	607	100	607	100	524	86.3
South East Coast	428	251	58.6	26	524	524	100	524	100	428	81.7
South West	673	486	72.2	67	1,003	1,003	100	1,003	100	867	86.4
West Midlands	682	388	56.9	57	717	717	100	717	100	626	87.3
Total	**5,884**	**3,604**	**61.3**	**647**	**7,167**	**7,167**	**100**	**5,942**	**82.9**	**5,620**	**78.4**

[1] London reports the diagnostic sample for every cancer. This has been taken as a colposcopy appointment, making the results look complete. However, cases very rarely have any other colposcopy recorded

Appendix Ci: List of Data Tables

Appendix Cii: Data tables

Table 1. Number of cases of invasive cervical cancer, 2007-2011, by audit year* and QARC

	Year				
QARC Region	**2007-2008**	**2008-2009**	**2009-2010**	**2010-2011**	**Total**
East of England	180	205	202	186	773
East Midlands	200	196	232	213	841
London	237	230	267	189	923
North East	135	159	170	122	586
Yorkshire and the Humber	268	245	269	203	985
North West	300	280	287	178	1,045
South Central	170	160	181	146	657
South East Coast	139	142	171	137	589
South West	262	288	278	231	1,059
West Midlands	245	300	292	271	1,108
Total	**2,136**	**2,205**	**2,349**	**1,876**	**8,566**

*Audit year between 1 April and the 31 March

Table 2. Number and percentage of invasive cervical cancer in five-year age groups, by year of diagnosis

Audit Year[1]	<20*	20-24	25-29	30-34	35-39	40-44	45-49	50-55	55-59	60-64	65-69	70-74	75-79	80+	Total
2007-2008	0	58	238	307	313	250	185	133	124	114	94	95	84	141	2,136
2008-2009	1	37	299	321	347	280	173	126	126	112	87	73	75	148	2,205
2009-2010	0	50	382	355	339	283	206	131	123	116	84	81	70	129	2,349
2010-2011	0	38	290	248	254	229	172	128	112	110	76	60	57	102	1,876
Total	**1**	**183**	**1,209**	**1,231**	**1,253**	**1,042**	**736**	**518**	**485**	**452**	**341**	**309**	**286**	**520**	**8,566**
Percentage															
2007-2008	0.0	2.7	11.1	14.4	14.7	11.7	8.7	6.2	5.8	5.3	4.4	4.4	3.9	6.6	100
2008-2009	0.0	1.7	13.6	14.6	15.7	12.7	7.8	5.7	5.7	5.1	3.9	3.3	3.4	6.7	100
2009-2010	0.0	2.1	16.3	15.1	14.4	12.0	8.8	5.6	5.2	4.9	3.6	3.4	3.0	5.5	100
2010-2011	0.0	2.0	15.5	13.2	13.5	12.2	9.2	6.8	6.0	5.9	4.1	3.2	3.0	5.4	100
Total	**0.0**	**2.1**	**14.1**	**14.4**	**14.6**	**12.2**	**8.6**	**6.0**	**5.7**	**5.3**	**4.0**	**3.6**	**3.3**	**6.1**	**100**

[1]Audit year runs 1 April to 31 March

*Case is 16 yrs old

Table 3. Number and percentage of invasive cervical cancer cases in 2007-2011 audit for each QARC region, by age

QARC Region	<25	25-49	50-64	65+	Total
East of England	8	495	135	135	773
East Midlands	18	546	135	142	841
London	25	585	170	143	923
North East	21	384	90	91	586
Yorkshire and the Humber	22	680	156	127	985
North West	21	647	175	202	1,045
South Central	14	453	101	89	657
South East Coast	15	379	101	94	589
South West	23	639	181	216	1,059
West Midlands	17	663	211	217	1,108
Total	**184**	**5,471**	**1,455**	**1,456**	**8,566**
Percent					
East of England	1.0	64.0	17.5	17.5	100
East Midlands	2.1	64.9	16.1	16.9	100
London	2.7	63.4	18.4	15.5	100
North East	3.6	65.5	15.4	15.5	100
Yorkshire and the Humber	2.2	69.0	15.8	12.9	100
North West	2.0	61.9	16.7	19.3	100
South Central	2.1	68.9	15.4	13.5	100
South East Coast	2.5	64.3	17.1	16.0	100
South West	2.2	60.3	17.1	20.4	100
West Midlands	1.5	59.8	19.0	19.6	100
Total	**2.1**	**63.9**	**17.0**	**17.0**	**100**

Table 4. Number and percentage of invasive cervical cancer cases in 2007-2011 audit, by FIGO Stage*

FIGO Stage	Number	Percentage
1A	2,745	32.0
1B+ NOS	364	4.2
1B	2,482	29.0
2 NOS	68	0.8
2A	154	1.8
2B	753	8.8
3 NOS	94	1.1
3A	60	0.7
3B	338	3.9
4 NOS	149	1.7
4A	116	1.4
4B	84	1.0
None recorded	1,159	13.5
Total	**8,566**	**100**

*NOS= not otherwise specified (or not further specified)

Table 5. Number of invasive cervical cancer cases in 2007-2011 audit for each QARC region, by FIGO stage

QARC Region	1A	1B	2	3	4	1B+	None recorded	Total
East of England	226	270	118	53	39	4	63	773
East Midlands	294	241	80	28	26	15	157	841
London	286	245	145	95	48	51	53	923
North East	191	172	44	21	15	84	59	586
Yorkshire and the Humber	370	227	33	22	14	37	281	985
North West	303	312	71	30	24	120	186	1,045
South Central	236	232	78	38	27	11	35	657
South East Coast	219	172	79	42	18	6	53	589
South West	345	321	140	73	53	36	91	1,059
West Midlands	275	290	187	90	85	0	181	1,108
Total	**2,745**	**2,482**	**975**	**492**	**349**	**364**	**1,159**	**8,566**

Table 5a. FIGO stage of invasive cervical cancer cases in 2007-2011: estimated percent distribution, by QARC region

QARC Region	1A	1B	2+	Total
East of England	31.8	38.3	29.8	100
East Midlands	43.0	36.6	20.4	100
London	32.9	30.9	36.3	100
North East	36.2	43.5	20.2	100
Yorkshire and the Humber	52.6	36.4	11.1	100
North West	35.3	46.2	18.5	100
South Central	37.9	38.4	23.7	100
South East Coast	40.9	32.7	26.4	100
South West	35.6	35.2	29.2	100
West Midlands	29.7	31.3	39.1	100
England	**37.1**	**36.3**	**26.6**	**100**

Table 6. Number of invasive cervical cancer cases in 2007-2011 audit, by age and FIGO stage

Age	1A	1B	2	3	4	1B+(NOS)	None Recorded	Total
<25	67	62	16	4	5	9	21	184
25-49	2,362	1,725	419	130	81	178	576	5,471
50-64	245	406	232	141	104	92	235	1,455
65+	71	289	308	217	159	85	327	1,456
Total	**2,745**	**2,482**	**975**	**492**	**349**	**364**	**1,159**	**8,566**

Table 6a. FIGO stage of invasive cervical cancer cases in 2007–2011 audit: estimated percentage distribution, by age-group

Age	1A	1B	2	3	4	Total
<25	41.1	42.0	10.8	2.7	3.4	100
25-49	48.3	37.9	9.2	2.9	1.8	100
50-64	20.1	36.7	21.0	12.8	9.4	100
65+	6.3	27.8	29.7	21.0	15.3	100
All ages	**37.1**	**36.3**	**14.3**	**7.2**	**5.1**	**100**

Table 7. Number of invasive cervical cancer cases in 2007-2011 audit, by FIGO stage and year of diagnosis

Year	1A	1B	2	3	4	1B+(NOS)	None Recorded	Total
2007-2008	657	616	239	143	83	108	280	2,136
2008-2009	665	651	275	140	101	90	283	2,205
2009-2010	813	698	254	128	98	88	273	2,349
2010-2011	610	517	207	81	67	78	323	1,876
Total	**2,745**	**2,482**	**975**	**492**	**349**	**364**	**1,159**	**8,566**

Table 7a. FIGO stage of invasive cervical cancer cases: estimated percentage distribution, by year of diagnosis

Year	1A	1B	2	3	4	Total
2007-2008	35.4	36.8	14.3	8.5	5.0	100
2008-2009	34.6	36.5	15.4	7.8	5.7	100
2009-2010	39.2	36.0	13.1	6.6	5.1	100
2010-2011	39.3	36.0	14.5	5.6	4.7	100
Total	**37.1**	**36.3**	**14.3**	**7.2**	**5.1**	**100**

Table 8. Number and percentage of invasive cervical cancer cases in 2007-2011 audit, by histology

Year	Squamous	Adenocarcinoma	Adeno-Squamous	Undifferentiated	Other	None recorded	Total
2007-2008	1,501	406	58	15	37	119	2,136
2008-2009	1,551	441	60	19	41	93	2,205
2009-2010	1,672	475	69	17	34	82	2,349
2010-2011	1,358	343	53	6	41	75	1,876
Total	**6,082**	**1,665**	**240**	**57**	**153**	**369**	**8,566**
Percent							
2007-2008	70.3	19.0	2.7	0.7	1.7	5.6	100
2008-2009	70.3	20.0	2.7	0.9	1.9	4.2	100
2009-2010	71.2	20.2	2.9	0.7	1.4	3.5	100
2010-2011	72.4	18.3	2.8	0.3	2.2	4.0	100

Total	**71.0**	**19.4**	**2.8**	**0.7**	**1.8**	**4.3**	**100**

Table 9. Number and percentage of invasive cervical cancer cases in 2007-2011 audit, by age at diagnosis and histology

Age	Squamous	Adenocarcinoma	Adeno-Squamous	Other (incl undiff)	None recorded	Total
<25	133	27	7	11	6	184
25-49	3,907	1,093	154	87	230	5,471
50-64	1,005	300	48	39	63	1,455
65+	1,037	245	31	73	70	1,456
Total	**6,082**	**1,665**	**240**	**210**	**369**	**8,566**
Percent						
<25	72.3	14.7	3.8	6.0	3.3	100
25-49	71.4	20.0	2.8	1.6	4.2	100
50-64	69.1	20.6	3.3	2.7	4.3	100
65+	71.2	16.8	2.1	5.0	4.8	100
All ages	**71.0**	**19.4**	**2.8**	**2.5**	**4.3**	**100**

Table 10. Percentage of invasive cervical cancer cases in 2007-2011 audit, by FIGO Stage and histology

Stage	Squamous	Adenocarcinoma	Adeno-Squamous	Other (incl undiff)	None recorded	Total
1A	36.6	22.7	8.8	11.0	25.8	32.1
1B+	51.6	64.2	78.3	59.9	39.2	54.4
None recorded	11.8	13.1	12.9	29.1	35.0	13.5
Total	**100**	**100**	**100**	**100**	**100**	**100**

Table 11. Number of invasive cervical cancer in 2007-2011 audit for each QARC region, by treatment

QARC Region	None	Cone biopsy/ Loop excision	Trachelectomy	Simple hysterectomy	Radical hysterectomy	Hysterectomy/ Radiotherapy	Hysterectomy/ chemotherapy	Hysterectomy/ Radio/ Chemo	Radiotherapy	Chemotherapy	Radiotherapy/ Chemotherapy	Other	None recorded	Total
East of England	27	178	24	28	111	11	6	26	43	12	115	0	192	773
East Midlands	25	166	8	46	105	12	1	5	41	8	126	0	298	841
London	88	135	27	49	98	8	1	9	88	45	110	23	242	923
North East	10	84	4	16	52	1	1	2	11	1	31	0	373	586
Yorkshire and the Humber	14	167	7	34	80	5	1	6	32	12	74	0	554	985
North West	91	188	4	25	39	5	2	1	18	3	28	0	641	1,045
South Central	27	245	10	17	87	10	3	5	31	11	74	0	137	657
South East Coast	19	137	11	41	95	9	1	12	15	9	96	0	144	589
South West	62	251	28	54	177	16	3	23	80	21	200	0	143	1,059
West Midlands	113	167	12	142	72	16	3	43	100	18	256	0	166	1,108
Total	**476**	**1,718**	**135**	**452**	**916**	**93**	**22**	**132**	**459**	**140**	**1,110**	**23**	**2,890**	**8,566**

Table 11a. Percentage of invasive cervical cancer cases in 2007–2011 audit for each QARC region, by treatment

QARC Region	None	Cone biopsy/ Loop excision	Trachelectomy	Simple hysterectomy	Radical hysterectomy	Hysterectomy/Radiotherapy	Hysterectomy/chemotherapy	Hysterectomy/Radio/ Chemo	Radiotherapy	Chemotherapy	Radiothearpy/ Chemotherapy	Other	None recorded	Total
East of England	3.5	23.0	3.1	3.6	14.4	1.4	0.8	3.4	5.6	1.6	14.9	0.0	24.8	100
East Midlands	3.0	19.7	1.0	5.5	12.5	1.4	0.1	0.6	4.9	1.0	15.0	0.0	35.4	100
London	9.5	14.6	2.9	5.3	10.6	0.9	0.1	1.0	9.5	4.9	11.9	2.5	26.2	100
North East	1.7	14.3	0.7	2.7	8.9	0.2	0.2	0.3	1.9	0.2	5.3	0.0	63.7	100
Yorkshire and the Humber	1.4	17.0	0.7	3.5	8.1	0.5	0.1	0.6	3.2	1.2	7.5	0.0	56.2	100
North West	8.7	18.0	0.4	2.4	3.7	0.5	0.2	0.1	1.7	0.3	2.7	0.0	61.3	100
South Central	4.1	37.3	1.5	2.6	13.2	1.5	0.5	0.8	4.7	1.7	11.3	0.0	20.9	100
South East Coast	3.2	23.3	1.9	7.0	16.1	1.5	0.2	2.0	2.5	1.5	16.3	0.0	24.4	100
South West	5.9	23.7	2.6	5.1	16.7	1.5	0.3	2.2	7.6	2.0	18.9	0.0	13.5	100
West Midlands	10.2	15.1	1.1	12.8	6.5	1.4	0.3	3.9	9.0	1.6	23.1	0.0	15.0	100
Total	**5.6**	**20.1**	**1.6**	**5.3**	**10.7**	**1.1**	**0.3**	**1.5**	**5.4**	**1.6**	**13.0**	**0.3**	**33.7**	**100**

Table 12. Number and percentage of invasive cervical cancer cases in 2007–2011 audit, by age at diagnosis and treatment

Treatment	<50	50-64	65-79	80+	Total
None	196	81	89	111	476
Cone biopsy/ Loop excision	1,560	123	25	10	1,718
Trachelectomy	135	0	0	0	135
Hysterectomy only (simple or radical)	1,065	223	57	23	1,368
Radiotherapy (+/- hysterectomy)	142	96	167	147	552
Chemotherapy (+/- hysterectomy)	74	49	34	5	162
Chemo-radiotherapy (+/- hysterectomy)	646	347	214	35	1,242
Not recorded (Other)	1,837	536	350	189	2,913
Total	**5,655**	**1,455**	**936**	**520**	**8,566**
Percent					
None	3.5	5.6	9.5	21.3	5.6
Cone biopsy/ Loop excision	27.6	8.5	2.7	1.9	20.1
Trachelectomy	2.4	0.0	0.0	0.0	1.6
Hysterectomy only (simple or radical)	18.8	15.3	6.1	4.4	16.0
Radiotherapy (+/- hysterectomy)	2.5	6.6	17.8	28.3	6.4
Chemotherapy (+/- hysterectomy)	1.3	3.4	3.6	1.0	1.9
Chemo-radiotherapy (+/- hysterectomy)	11.4	23.8	22.9	6.7	14.5
Not recorded (Other)	32.5	36.8	37.4	36.3	34.0
Total	**100**	**100**	**100**	**100**	**100**

Table 13. Number of invasive cervical cancer cases in 2007-2011 audit, by FIGO Stage and treatment

Treatment	1A	1B	2	3	4	1B+(NOS)	None recorded	Total
None	93	86	44	39	74	27	113	476
Cone biopsy/ Loop excision	1,312	262	16	2	3	18	105	1,718
Trachelectomy	13	111	2	0	0	0	9	135
Hysterectomy	385	830	50	7	5	22	69	1,368
Radiotherapy (+/- hyst)	28	132	140	109	74	10	59	552
Chemotherapy (+/- hyst)	8	34	36	33	28	6	17	162
Radiotherapy/Chemotherapy (+/- hyst)	37	305	478	192	97	27	105	1,242
Not recorded (Other)	869	722	209	110	68	254	682	2,913
Total	**2,745**	**2,482**	**975**	**492**	**349**	**364**	**1,159**	**8,566**

Table 13a. FIGO stage of invasive cervical cancer cases: estimated percentage distribution in 2007–2011 audit, by treatment

Treatment	1A	1B	2	3	4	Total
None	25.3	26.3	13.5	12.3	22.7	100
Cone biopsy/ Loop excision	81.3	17.3	1.1	0.1	0.2	100
Trachelectomy	10.2	88.2	1.6	0.0	0.0	100
Hysterectomy	29.5	65.6	4.0	0.6	0.4	100
Radiotherapy (+/- hyst)	5.6	27.4	29.0	22.6	15.3	100
Chemotherapy (+/- hyst)	5.5	24.5	26.0	23.8	20.2	100
Radiotherapy/Chemotherapy (+/- hyst)	3.2	27.6	43.1	17.3	8.7	100
Not recorded (Other)	39.2	39.6	11.5	6.0	3.7	100
Total	**37.0**	**36.4**	**14.3**	**7.2**	**5.1**	**100**

Table 14. Cervical screening status of invasive cervical cancer cases and controls under age 65, up to six months prior to diagnosis (percentages)

Cervical screening status up to six months prior to diagnosis	Population Controls		Cases Stage 1A		Cases Stage 1B+		Cases Stage not recorded	
	N	%	N	%	N	%	N	%
No cytology test (except within 6 months of diagnosis)	1,983	14.1	595	22.3	938	26.0	204	24.5
Last smear routine and								
Up to date	8,072	57.5	525	19.6	871	24.2	190	22.8
Lapsed	2,590	18.5	828	31.0	1,031	28.6	243	29.2
Last smear early repeat								
Up to date	583	4.2	206	7.7	187	5.2	32	3.8
Lapsed	597	4.3	208	7.8	285	7.9	89	10.7
Last smear suspend (not followed by any negative(s))	109	0.8	297	11.1	272	7.5	66	7.9
Last smear suspend (followed by at least one negative)	100	0.7	15	0.6	19	0.5	8	1.0
Total	**14,034**	**100**	**2,674**	**100**	**3,603**	**100**	**832**	**100**

Table 15. Cervical screening status of invasive cervical cancer cases and controls up to six months prior to diagnosis (numbers and percentages), by age

Cervical screening status up to six months prior to diagnosis	All Cases				Controls			
	20-49	**50-64**	**65-79**	**80+**	**20-49**	**50-64**	**65-79**	**80+**
No cytology test (except within six months of diagnosis)	1,320	417	350	363	1,820	163	264	653
Last smear routine and								
Up to date	1,166	420	364	136	5,979	2,093	1,295	355
Lapsed	1,785	317	116	1	2,155	435	227	2
Last smear early repeat and								
Up to date	364	61	13	8	535	48	9	4
Lapsed	467	115	65	8	498	99	48	10
Last smear suspend*	552	125	28	4	185	24	3	1
Total	**5,654**	**1,455**	**936**	**520**	**11,172**	**2,862**	**1,846**	**1,025**
Percent								
No cytology test (except within six months of diagnosis)	23.3	29.8	36.8	70.6	15.0	5.5	15.7	66.6
Last smear routine and								
Up to date	19.9	28.3	39.0	25.2	52.8	73.3	69.5	31.6
Lapsed	33.7	21.3	12.0	0.0	20.9	14.8	11.4	0.1
Last smear early repeat and								
Up to date	6.6	4.5	1.6	1.8	4.8	1.9	0.7	0.4
Lapsed	8.6	7.5	7.6	1.6	4.8	3.7	2.6	1.1
Last smear suspend*	9.8	8.6	3.1	0.8	1.8	0.8	0.2	0.1
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

* The categories "last smear suspend (not followed by any negative)" and "last smear suspend (followed by al least one negative)" found in table 14 are combined due to small numbers

Table 16. Number and percentage of population controls (GP plus district controls) screened in the 3-5 year interval preceding the date of diagnosis of their matched case, by age

Age		Total	Not screened in previous interval	Screened once in previous interval	Screened twice in previous interval	Screened ≥3 times in previous interval
20-24		484	405	62	7	10
25-29		2,266	932	1,098	122	114
30-34		2,414	794	1,357	142	121
35-39		2,505	821	1,449	135	100
40-44		2,076	599	1,323	71	83
45-49		1,430	440	898	54	38
50-54		1,022	195	482	285	60
55-59		965	225	598	108	34
60-64		875	233	520	106	16
65-69		662	175	352	120	15
70-74		614	180	288	124	22
75-79		570	174	250	128	18
80+		1,025	669	277	70	9
Total		16,908	5,842	8,954	1,472	640
Percent	**National Coverage reported in 2010***	**Coverage (>=1 test in interval)**	**%**	**%**	**%**	**%**
20-24	4.3	16.3†	83.7	12.8	1.4	2.1
25-29	60.0	58.9	41.1	48.5	5.4	5.0
30-34	68.4	67.1	32.9	56.2	5.9	5.0
35-39	71.9	67.2	32.8	57.8	5.4	4.0
40-44	73.8	71.1	28.9	63.7	3.4	4.0
45-49	84.0	69.2	30.8	62.8	3.8	2.7
50-54	82.6	80.9	19.1	47.2	27.9	5.9
55-59	76.9	76.7	23.3	62.0	11.2	3.5
60-64	73.4	73.4	26.6	59.4	12.1	1.8
65-69	-	73.6	26.4	53.2	18.1	2.3
70-74	-	70.7	29.3	46.9	20.2	3.6
75-79	-	69.5	30.5	43.9	22.5	3.2
80+	-	34.7	65.3	27.0	6.8	0.9
Total			**34.6**	**53.0**	**8.7**	**3.8**

* Source: NHS Cervical Screening Programme in England in 2010-11. **Note:** we have calculated the 3-yearly coverage using table 2 (see reference 8) for women aged 20-49

† Note: 60.5 % of controls aged 20-24 are aged 24, only 7.4 % are aged 20 or 21. Thus, this age group is a reflection of the age at which their matched cases were diagnosed and not of the distribution of women aged 20-24 nationally, which explains the difference in coverage nationally and in the audit.

Table 16a. Number and percentage of population controls (GP plus district controls) screened in the 3-5 year interval preceding the date of diagnosis of their matched case (aged 25-64), by QARC region

QARC	Total	Not screened in previous interval	Screened once in previous interval	Screened twice in previous interval	Screened ≥3 times in previous interval
East of England	1,234	365	739	85	45
East Midlands	1,333	368	810	98	57
London	1,366	473	741	104	48
North East	924	282	515	80	47
Yorkshire and the Humber	1,648	533	942	115	58
North West	1,631	526	886	139	80
South Central	1,104	350	638	83	33
South East Coast	959	305	549	64	41
South West	1,630	500	940	110	80
West Midlands	1,724	537	965	145	77
Total	**13,553**	**4,239**	**7,725**	**1,023**	**566**
Percent	**Coverage** (>=1 test in interval)				
East of England	70.4	29.6	59.9	6.9	3.6
East Midlands	72.4	27.6	60.8	7.4	4.3
London	65.4	34.6	54.2	7.6	3.5
North East	69.5	30.5	55.7	8.7	5.1
Yorkshire and the Humber	67.7	32.3	57.2	7.0	3.5
North West	67.7	32.3	54.3	8.5	4.9
South Central	68.3	31.7	57.8	7.5	3.0
South East Coast	68.2	31.8	57.2	6.7	4.3
South West	69.3	30.7	57.7	6.7	4.9
West Midlands	68.9	31.1	56.0	8.4	4.5
Total		**31.3**	**57.0**	**7.5**	**4.2**

Table 17. Time to previous cytology among screened controls

Age	Time to previous screen						
	<2.75 yrs	2.75-3.5 yrs	3.5-4.75 yrs	4.75-5.5 yrs	5.5-9.5 yrs	No previous cytology within 9.5 years	Total
25-29	20	139	62	31	71	353	676
30-34	24	212	104	50	102	134	626
35-39	29	228	103	38	99	73	570
40-44	15	189	69	39	55	31	398
45-49	9	131	35	21	28	13	237
50-54	7	66	22	9	8	14	126
55-59	6	23	13	41	14	9	106
60-64	0	13	15	35	15	10	88
Total	**110**	**1,001**	**423**	**264**	**392**	**637**	**2,827**
Percent							
25-29	3.0	20.6	9.2	4.6	10.5	52.2	100
30-34	3.8	33.9	16.6	8.0	16.3	21.4	100
35-39	5.1	40.0	18.1	6.7	17.4	12.8	100
40-44	3.8	47.5	17.3	9.8	13.8	7.8	100
45-49	3.8	55.3	14.8	8.9	11.8	5.5	100
50-54	5.6	52.4	17.5	7.1	6.3	11.1	100
55-59	5.7	21.7	12.3	38.7	13.2	8.5	100
60-64	0.0	14.8	17.0	39.8	17.0	11.4	100
Total	**3.9**	**35.4**	**15.0**	**9.3**	**13.9**	**22.5**	**100**

Table 17a. Time to previous cytology test among potentially screen-detected* cases of cervical cancer and their screened controls

Age	Time to previous screen													
	<3.5 yrs		3.5-4.75 yrs		4.75-5.5 yrs		5.5-9.5 yrs		No previous cytology within 9.5 yrs		Total		<5.5 yrs	
	Cases	Controls	Cases	Controls	Cases	Controls	Cases	Controls	Cases	Controls	Cases	Controls	Cases	Controls
25-34	353	395	181	166	77	81	196	173	510	487	1,318	1,302	611	642
35-49	372	601	163	207	70	98	211	182	379	117	1,195	1,205	605	906
50-64	46	115	36	50	54	85	35	37	147	33	318	320	136	250
Total	**771**	**1,111**	**380**	**423**	**201**	**264**	**442**	**392**	**1,036**	**637**	**2,831**	**2,827**	**1,352**	**1,798**
Percent														
	Cases	**Controls**	**Cases**	**Controls**	**Cases**	**Controls**	**Cases**	**Controls**	**Cases**	**Controls**	**Cases**	**Controls**	**Cases**	**Controls**
25-34	26.8	30.3	13.7	12.7	5.8	6.2	14.9	13.3	38.7	37.4	100	100	46.4	49.3
35-49	31.1	49.9	13.6	17.2	5.9	8.1	17.7	15.1	31.7	9.7	100	100	50.6	75.2
50-64	14.5	35.9	11.3	15.6	17.0	26.6	11.0	11.6	46.2	10.3	100	100	42.8	78.1
Total	**27.2**	**39.3**	**13.4**	**15.0**	**7.1**	**9.3**	**15.6**	**13.9**	**36.6**	**22.5**	**100**	**100**	**47.8**	**63.6**

*A potentially screen-detected case is one in which cytology results are consistent with screen detection; there is no national record of whether the cytology was in response to screening or to symptoms

Table 18. Maximum interval between cytology tests (over the previous 8 years) among cases with FIGO stage 1B+ and their population controls

	Maximum interval between cytology tests											
Age	**<3.5 yrs**		**3.5-4.75 yrs**		**4.75-5.5 yrs**		**5.5-7yrs**		**>7 yrs or no cytology**		**Total**	
	Cases	**Controls**	**Cases**	**Controls**	**Cases**	**Controls**	**Cases**	**Controls**	**Cases**	**Controls**	**Cases**	**Controls**
28-34	187	555	225	475	88	200	96	233	364	416	960	1,879
35-49	366	1,439	363	971	160	401	184	357	819	574	1,892	3,742
50-64	144	643	190	719	115	295	62	192	621	376	1,132	2,225
Total	**697**	**2,637**	**778**	**2,165**	**363**	**896**	**342**	**782**	**1,804**	**1,366**	**3,984**	**7,846**
Percent												
28-34	19.5	29.5	23.4	25.3	9.2	10.6	10.0	12.4	37.9	22.1	100	100
35-49	19.3	38.5	19.2	25.9	8.5	10.7	9.7	9.5	43.3	15.3	100	100
50-64	12.7	28.9	16.8	32.3	10.2	13.3	5.5	8.6	54.9	16.9	100	100
Total	**17.5**	**33.6**	**19.5**	**27.6**	**9.1**	**11.4**	**8.6**	**10.0**	**45.3**	**17.4**	**100**	**100**

Table 19. Number and percentage of invasive cervical cancer cases in 2007-2011 audit with colposcopic appointment recorded, by QARC region

QARC region	Number of cases	Cases with a recorded colposcopy		Cases with an action code "suspend"		Cases with a "suspend" code >4 months before diagnosis		Cases with "Suspend" >4 months before diagnosis + colposcopy		Cases with "Suspend" >4 months before diagnosis + colposcopy (excluding colposcopy within 2 months of diagnosis)	
		n	%	n	%	n	%	n	%	n	%
East of England	773	426	55.1	522	67.5	128	16.6	85	66.4	55	43.0
East Midlands	841	262	31.2	596	70.9	171	20.3	76	44.4	45	26.3
London	923	892	96.6	645	69.9	199	21.6	196	98.5	100	50.3
North East	586	230	39.2	409	69.8	86	14.7	37	43.0	25	29.1
Yorkshire and the Humber	985	371	37.7	739	75.0	238	24.2	126	52.9	79	33.2
North West	1,045	442	42.3	734	70.2	245	23.4	150	61.2	102	41.6
South Central	657	353	53.7	466	70.9	122	18.6	87	71.3	64	52.5
South East Coast	589	277	47.0	428	72.7	135	22.9	78	57.8	62	45.9
South West	1,059	553	52.2	674	63.6	221	20.9	156	70.6	113	51.1
West Midlands	1,108	445	40.2	685	61.8	204	18.4	105	51.5	68	33.3
Total	**8,566**	**4,251**	**49.6**	**5,898**	**68.9**	**1,749**	**20.4**	**1,096**	**62.7**	**713**	**40.8**

Table 20. Original cytology result by review result[1]

Original result	Review Result																	
	Negative		Inadequate		Borderline		Low-grade (mild)		Low-grade (Mod)		High-grade (severe)		?Invasive		?Glandular		Total	
	N	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
Negative	2,800	51.1	506	9.2	997	18.2	135	2.5	181	3.3	572	10.4	29	0.5	260	4.7	5,480	100
Inadequate	58	8.2	417	59.1	93	13.2	15	2.1	12	1.7	72	10.2	11	1.6	27	3.8	705	100
Borderline	22	2.3	10	1.0	424	43.4	69	7.1	64	6.6	234	24.0	20	2.0	134	13.7	977	100
Low-grade (mild)	4	1.1	1	0.3	35	9.5	152	41.3	78	21.2	88	23.9	5	1.4	5	1.4	368	100
High-grade (moderate)	1	0.2	0	0.0	6	1.5	4	1.0	138	33.9	229	56.3	19	4.7	10	2.5	407	100
High-grade (severe)	9	0.4	3	0.1	5	0.2	0	0.0	9	0.4	1,788	85.1	204	9.7	84	4.0	2,102	100
?Invasive	1	0.1	0	0.0	0	0.0	0	0.0	1	0.1	41	6.1	621	91.9	12	1.8	676	100
?Glandular	2	0.4	0	0.0	3	0.6	0	0.0	0	0.0	30	5.7	13	2.5	479	90.9	527	100
Total	2,897	25.8	937	8.3	1,563	13.9	375	3.3	483	4.3	3,054	27.2	922	8.2	1,011	9.0	11,242	100

[1] Updated version of Table 1 in Castanon et al[14]