HES: Deaths within 30 days of a hospital procedure or of an emergency admission to hospital - Financial year 2010-2011

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Executive Summary

These mortality indicators provide information to help the NHS monitor success in preventing potentially avoidable deaths following hospital treatment.

The National Confidential Enquiry into Patient Outcome and Death (NCEPOD) have, over many years, consistently shown that some deaths are associated with shortcomings in health care. The NHS may be helped to prevent such potentially avoidable deaths by seeing comparative figures and learning lessons from the confidential enquiries, and from the experience of hospitals with low death rates.

The indicators presented measure mortality rates for patients, admitted for certain conditions or procedures, where death occurred either in hospital or within 30 days post discharge.

There are five 'deaths within 30 days' indicators:

- Operative procedures:
  - Deaths within 30 days of a hospital procedure: surgery (non-elective admissions)
  - Deaths within 30 days of a hospital procedure: coronary artery bypass graft

- Emergency admissions:
  - Deaths within 30 days of emergency admission to hospital: fractured proximal femur
  - Deaths within 30 days of emergency admission to hospital: myocardial infarction
  - Deaths within 30 days of emergency admission to hospital: stroke

Data is presented for the latest 10 year period (2001/02 to 2010/11), and in separate tables for females, males, and persons. The indicators are presented at the following health and local government geographies:

- England
- Region (aggregated from LAs, boundaries as of April 2009)
- ONS Area Classification (aggregated from LAs, boundaries as of April 2009)
- Strategic Health Authority of residence (boundaries as of July 2006)
- Local Authority of residence (based on postcode look-up, boundaries as of April 2009)
- PCO of residence (based on postcode look-up, boundaries as of April 2011)
- Counties (aggregated from LAs, boundaries as of April 2009)
- Index of Multiple Deprivation 2010 Based data at England level - Based on 7 groups
- Index of Multiple Deprivation 2010 Based data at England level - Based on 5 groups
- Trust clusters
- Trust

These indicators were previously published on the Compendium of Clinical and Health Indicators and are now published on the Health and Social Care Information Centre's (HSCIC) Indicator Portal as part of the continuing release of this indicator set.

Data, along with indicator specifications providing details of indicator construction, data quality, statistical methods and interpretation considerations, can be accessed by visiting the HSCIC's Indicator Portal (https://indicators.ic.nhs.uk) and using the left menu to navigate to *Compendium of population health indicators > Hospital care > Outcomes > Deaths*.

Key facts

In the 2010/11 financial year:

- Mortality rates per 100,000 persons in England are highest amongst patients admitted for stroke (18,245.92), followed by fractured proximal femur (7,321.38), myocardial infarction (4,988.87), non-elective admissions (3,684.79), and coronary artery bypass graft (1,636.34).
- There were around 3,091 fewer deaths than were expected for persons in England for admissions for stroke, compared to around 2,864 fewer deaths for non-elective admissions, around 1,231 fewer deaths for fractured proximal femur, around 419 fewer deaths for admissions for myocardial infarction, and around 54 fewer deaths for admissions for coronary artery bypass grafts.
- When compared to 2009/10 the mortality rate per 100,000 persons in England shows:
  - there has been a decrease of 5.2% (19,243 to 18,246) for admissions for stroke,
  - a decrease of 4.6% (7,677 to 7,321) for admissions for fractured proximal femur,
  - a decrease of 2.4% (3,777 to 3,685) for non elective admissions,
  - a decrease of 1.7% (1,664 to 1,636) for admissions for coronary artery bypass graft,
  - a decrease of 1.4% (5,062 to 4,989) for admissions for myocardial infarction.
- Over the latest ten year period (2001/02 to 2010/11), the mortality rate per 100,000 persons in England shows:
  - there has been a decrease in of 42% (8,594 to 4,989) for myocardial infarction,
  - a decrease of 33% (2,452 to 1,636) for admissions for coronary artery bypass graft,
  - a decrease of 31% (26,423 to 18,246) for admissions for stroke,
  - a decrease of 24% (4,850 to 3,685) for non elective admissions,
  - a decrease of 24% (9,660 to 7,321) for admissions for fractured proximal femur.

Considerations for interpreting these indicators:

A number of factors outside the control of hospitals may contribute to the variation shown by the indicators, and therefore the following should be considered:

- The socio-economic mix of local populations and events prior to hospitalisation.
- Differences in case-mix, severity of illness, comorbidities and other potential risk factors.
- The patterns of providing care may vary between NHS hospital trusts in terms of the extent of treatment in primary care settings, referral policies and practices, and hospital admission policies and practices.
- Some deaths may be potentially avoidable and a result of poor treatment in hospital, or poor or badly organised rehabilitation and support services when a person is transferred home following treatment. This analysis does not attempt to identify whether the deaths were avoidable.

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Introduction

The national confidential enquiries into deaths after surgery (carried out by NCEPOD) have, over many years, consistently shown that some deaths are associated with shortcomings in health care. The National Health Service (NHS) may be helped to prevent such potentially avoidable deaths by seeing comparative figures and learning lessons from the confidential enquiries, and from the experience of hospitals with low death rates.

The potential value of these indicators is to stimulate discussion and encourage local investigation, and to lead to improvement in data quality and quality of care. It is recommended that organisations utilising these data carry out studies to assess the extent to which deaths were linked to the previous surgery and truly represented potentially avoidable adverse events.

Statistical Methods

The indicators are listed below:

- Operative procedures:
  - Deaths within 30 days of a hospital procedure: surgery (non-elective admissions)
  - Deaths within 30 days of a hospital procedure: coronary artery bypass graft

- Emergency admissions:
  - Deaths within 30 days of emergency admission to hospital: fractured proximal femur
  - Deaths within 30 days of emergency admission to hospital: myocardial infarction
  - Deaths within 30 days of emergency admission to hospital: stroke

The indicators present indirectly standardised rates.

Indirect standardisation involves applying the age-specific rates of the standard population to the age structure of the subject population. This gives an expected number of events against which the observed number of events may be compared.

The expected number of events (deaths), the percentage change in rates from a previous year (or previous set of pooled years), plus the statistical significance of this change, have also been calculated. For all indicators a positive percentage represents improvement and a negative percentage represents deterioration.

Methods used for indirect standardisation, expected number of events, calculation of improvement, estimation of confidence intervals, and banding of significance of improvement can all be found in Annex 3 'Explanation of statistical methods' of the Health and Social Care Information Centre's Indicator Portal (*Additional reading > Statistical methods > Methods*).

Data Sources

The data are derived from Hospital Episode Statistics (HES) and deaths data from the Office for National Statistics (ONS). Explicitly, the 'deaths within 30 days' indicators report the number of continuous inpatient (CIP) spells, following the relevant admission/diagnosis/procedure, where the patient dies either in hospital or after discharge, between 0-29 days (inclusive) of admission in the respective financial year.

Deaths that occur outside hospital following discharge but between 0-29 days of admission are included. This was achieved through linkage of Hospital Episode Statistics (HES) data with deaths data from the Office for National Statistics (ONS). Records of all deaths which occurred in England during the period of analysis for each indicator plus 30 days after were obtained from ONS. Linkage was undertaken using the most recent CIP spell for each person discharged alive.

The date of admission, and the date and method of discharge from the last episode in the CIP spell (or HES/ONS linked data), are used to determine the interval between admission and death.

The indicators are based on CIP spells, which are constructed by linking individual finished consultant episodes to other episodes where all are part of one continuous spell of care for a patient. This linkage creates a dataset in which spells can contain data spanning more than one year and thereby allows analysis that would not be possible using standard HES (where data are in financial year blocks). For example, using the linked file, a spell which finished during April is able to contain admission information from an episode which started during the previous March. Further information on CIP spell construction is available in Annex 4 of the 'Methods' section of the Indicator Portal.

Accessibility

These data were published by the Health and Social Care Information Centre through its Indicator Portal website (https://indicators.ic.nhs.uk) on 28th February 2013, and can be found by following the left menu to navigate to *Compendium of public health indicators > Hospital care > Outcomes > Deaths*, or by following this link.

It is necessary to suppress some data to prevent the disclosure of information that might identify an individual. This has been done on the indicator spreadsheets which are publicly available. Figures have been replaced with an 'X'. The HSCIC has reduced the suppression applied to the publicly available spreadsheets of the HES-based indicators so that more statistics for Local Authorities and Primary Care Organisations are publicly available. The rates, their confidence intervals, and the statistics about change from the previous year and the comparison with the national average are now published, unless they are based on small numbers of admissions or procedures.

Unsuppressed data is available to NHS users through an N3 connection only http://nww.indicators.ic.nhs.uk. There are strict terms and conditions for the use of the unsuppressed data. In order to protect against the potential for disclosing the identity of an individual, no information about an individual that is not already in the public domain should be identifiable in official statistics. Even if you obtain permission to reproduce material you should not release any figures into the public domain that could identify an individual.

It should be noted that the confidentiality and disclosure rules still apply under the Freedom of Information Act 2000. Further information about disclosure control can be found in the 'Statistical methods and disclosure control' section of the Indicator Portal.

Considerations when using these indicators

Quality of Indicators:

Annex 12 (*Additional reading > Statistical methods > Methods* section of the HSCIC Indicator Portal) describes the criteria that should be used to judge the quality of this indicator. The application of the criteria is dependent on the context (e.g. describing a single organisation, comparing several organisations) and the level (e.g. national / regional with large numbers of events, local with small numbers of events) at which the data are to be used.

Confidence Intervals:

Some of the values and factors influencing the indicator may be chance occurrences, with values fluctuating at random between organisations and from year to year. Numbers of admissions may be small at Primary Care Organisation, Local Authority and provider Trust level. The results should therefore be interpreted with caution and with the aid of confidence intervals. The 95% confidence interval provides a measure of the statistical precision of the rate for an area or institution. It indicates a range which, with 95% confidence, will contain the underlying value of the indicator. If the confidence interval for an area's rate does not contain the overall national rate, the difference between the two rates is considered statistically significant. If the confidence interval overlaps the national rate, in most cases the difference between the rates would not be considered statistically significant. 95% and 99.8% confidence intervals have been calculated.

Effect of case-mix/severity:

A number of factors outside the control of hospitals may contribute to the variation shown by the indicators, such as:

- The socio-economic mix of local populations and events prior to hospitalisation,.
- Differences in case-mix, comorbidities and other potential risk factors also contribute to the variation.
- Current data do not allow assignment of severity of illness and seriousness of operations across continuous inpatient spells, nor do they allow adjustment for these factors. This may pose less of a constraint at geographical organisation level than at hospital level. We have tried to deal with this constraint by presenting the data in clusters that are similar with respect to institution or organisation type. Gender-specific data standardised to person rates as well as analyses at England level by the Index of Multiple Deprivation are presented.

Other potential confounding factors:

The patterns of providing care may vary between organisations in terms of the extent of treatment in primary care settings, referral policies and practices, and hospital admission policies and practices. Variation between hospitals in average length of stay may also lead to variation between hospitals in the proportion of deaths occurring in hospital as opposed to in the community after discharge from hospital.

It is important to note that the indicators provided as part of this release have a status 'Not yet assured' in line with the HSCICs Indicator Assurance Service. Further information on the Indicator Assurance Service is available at http://live.ic.nhs.uk/article/1674/Indicator-Assurance-Service

Summary of data

- Mortality rates per 100,000 persons in England are highest amongst patients admitted for stroke (18,245.92), followed by fractured proximal femur (7,321.38), myocardial infarction (4,988.87), non-elective admissions (3,684.79), and coronary artery bypass graft (1,636.34).

Table 1: Comparison of deaths within 30 days of a hospital procedure or of an emergency admission to hospital, indirectly standardised rates per 100,000 persons (2001/02 to 2010/11)

	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	Change (2001/02 to 2010/11)
Non-Elective Admissions	4,850.3	4,901.9	4,821.7	4,642.7	4,513.3	4,389.3	4,272.5	4,067.7	3,776.6	3,684.8	-24.0%
Myocardial Infarction	8,594.5	8,139.2	7,766.2	7,211.8	6,682.1	6,440.4	5,875.6	5,576.3	5,062.3	4,988.9	-42.0%
Stroke	26,423.1	26,228.4	25,569.5	24,819.3	23,810.4	22,949.8	22,870.8	21,328.5	19,243.3	18,245.9	-30.9%
Fractured proximal femur	9,660.4	10,207.5	10,309.2	10,196.8	10,106.6	9,509.6	9,316.5	8,481.0	7,677.3	7,321.4	-24.2%
Coronary Artery Bypass Graft	2,451.5	2,268.4	2,037.1	2,121.2	1,967.9	1,954.1	1,604.4	1,741.7	1,663.9	1,636.3	-33.3%

Chart 1: Comparison of deaths within 30 days of a hospital procedure or of an emergency admission to hospital, indirectly standardised rates per 100,000 persons (2001/02 to 2010/11)
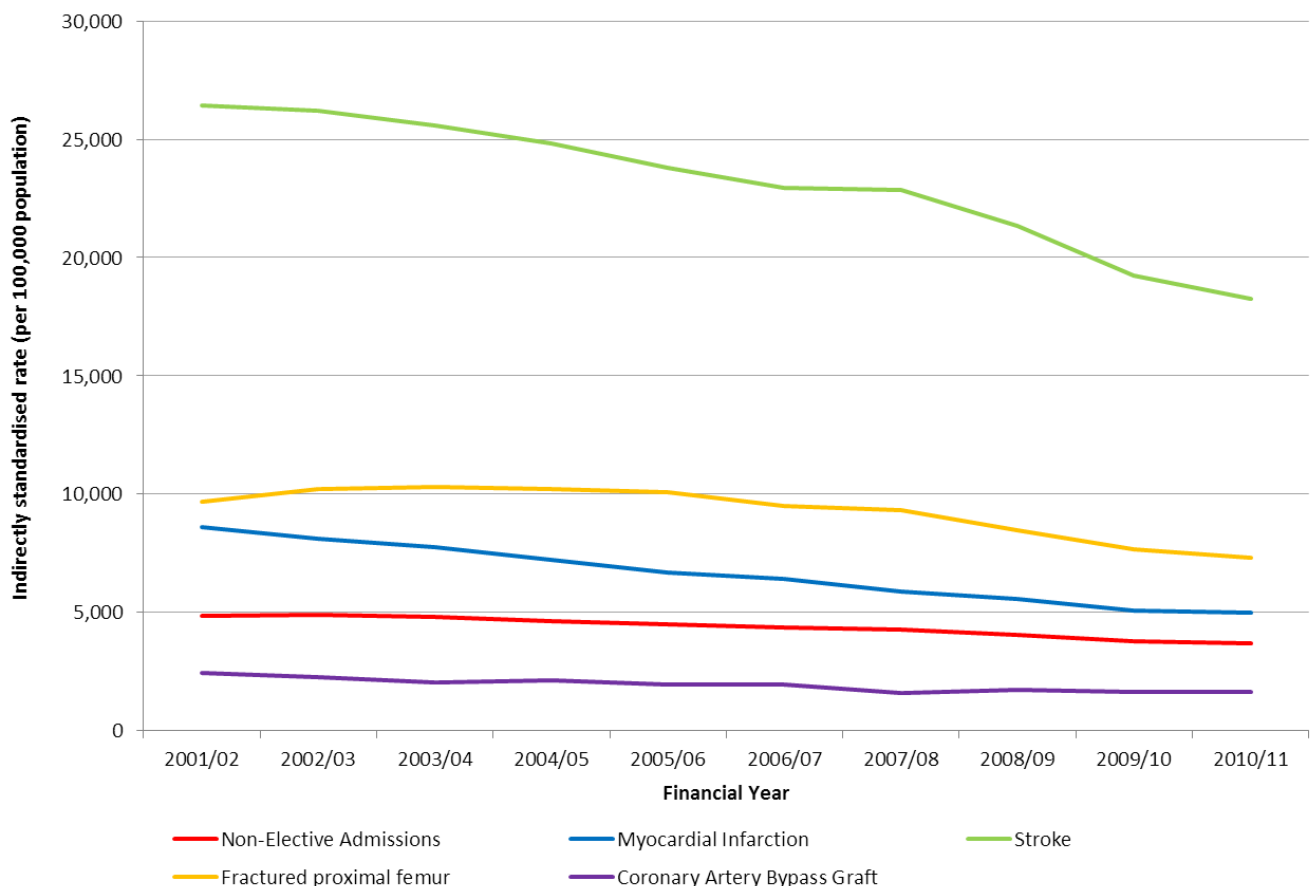
Non-elective admissions

- There were 2,864 fewer deaths than would have been expected in England.
- The mortality rate per 100,000 males in England (4130.20) was around 19% higher than mortality rate per 100,000 females in England (3365.84).
- There has been a decrease of 2.4% in the mortality rate per 100,000 persons in England; from 3776.56 in 2009/10 to 3684.79 in 2010/11. In the same period, the mortality rate per 100,000 females decreased by 3.6% (from 3491.78 to 3365.84), and the mortality rate per 100,000 males decreased by 1.2% (from 4178.61 to 4130.20).
- Over the ten year period, there has been a decrease of around 24% in the mortality rate per 100,000 persons in England; from 4850.31 in 2001/02 to 3684.79 in 2010/11. In the same period, the mortality rate per 100,000 females in England decreased by around 25% (from 4496.45 to 3365.84), and the mortality rate per 100,000 males in England decreased by around 22% (from 5298.18 to 4130.20).

Chart 2: Deaths within 30 days of a non-elective hospital procedure, Indirectly age, sex, method of admission of discharge spell, diagnosis and procedure standardised rates, all ages, per 100,000 persons / females / males (2001/02 to 2010/11)
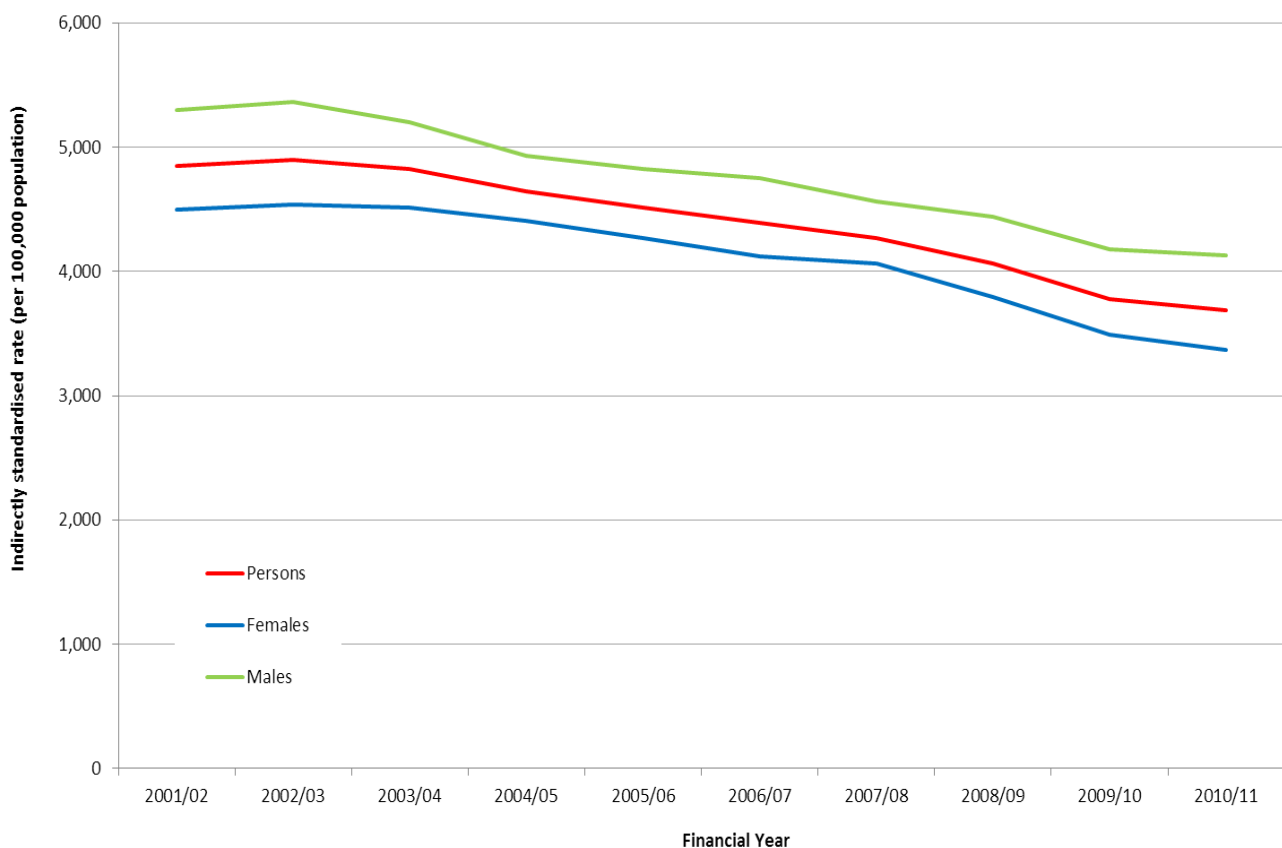
Coronary artery bypass graft

- There were 54 fewer deaths than would have been expected in England.
- The mortality rate per 100,000 females in England in 2010/11 (2,234.40) was around 34% higher than the mortality rate per 100,000 males in England in 2010/11 (1,465.32).
- There has been a decrease of 1.7% in the mortality rate per 100,000 persons in England; from 1,663.92 in 2009/10 to 1,636.34 in 2010/11. In the same period, the mortality rate per 100,000 females increased by 4.1% (from 2,146.63 to 2,234.40), whilst the mortality rate per 100,000 males decreased by 3.7% (from 1,521.10 to 1,465.32).
- Over the ten year period, there has been a decrease of around 33% in the mortality rate per 100,000 persons in England; from 2,451.52 in 2001/02 to 1,636.34 2010/11. In the same period, the mortality rate per 100,000 females decreased by around 26% (from 3,023.45 to 2,234.40), and the mortality rate per 100,000 males decreased by around 37% (from 2,325.41 to 1,465.32).

Chart 3: Deaths within 30 days of a hospital procedure: coronary artery bypass graft (OPCS-4 codes: K40-K46), Indirectly age, sex and method of admission standardised rates, all ages, per 100,000 persons / females / males (2001/02 to 2010/11)
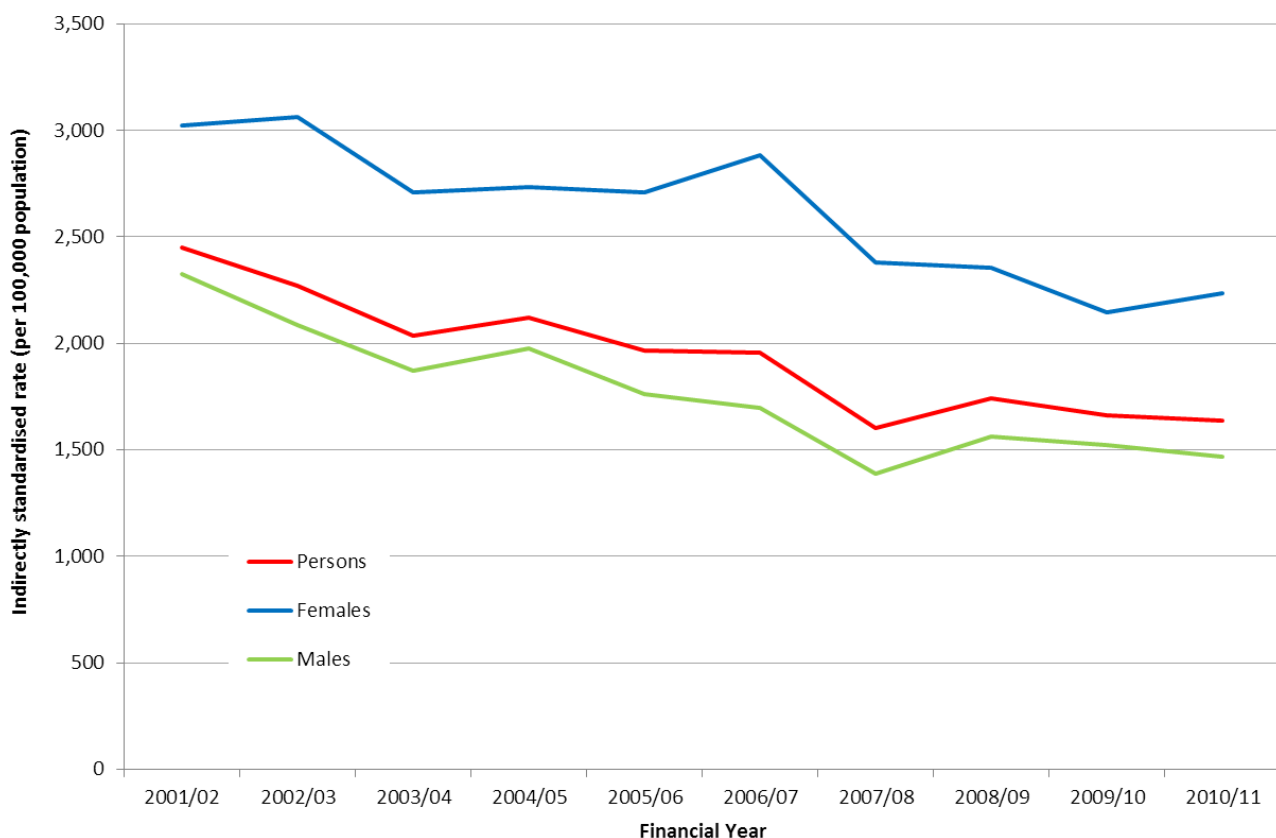
Fractured proximal femur

- There were 1,231 fewer deaths than would have been expected in England.
- The mortality rate per 100,000 males in England (11,398.66) was around 45% higher than the mortality rate per 100,000 females in England (6,215.98).
- There has been a decrease of 4.6% in the mortality rate per 100,000 persons in England; from 7,677.26 in 2009/10 to 7,321.38 in 2010/11. Over the same period, the mortality rate per 100,000 females decreased by 4.1% (from 6,484.82 to 6,215.98), and the mortality rate per 100,000 males decreased by 5.4% (from 12,048.01 to 11,398.66).
- Over the ten year period, there has been a decrease of around 24% in the mortality rate per 100,000 persons in England; from 9,660.43 in 2001/02 to 7,321.38 in 2010/11. Over the same period, the mortality rate per 100,000 females in England decreased by around 23% (from 8,122.55 to 6,215.98), and the mortality rate per 100,000 males in England decreased by around 26% (from 15,390.90 to 11,398.66).

Chart 4: Deaths within 30 days of emergency admission to hospital: fractured proximal femur (ICD 10 codes: S72.0, S72.1, S72.2), Indirectly age and sex standardised rates, all ages, per 100,000 persons / females / males (2001/02 to 2010/11)
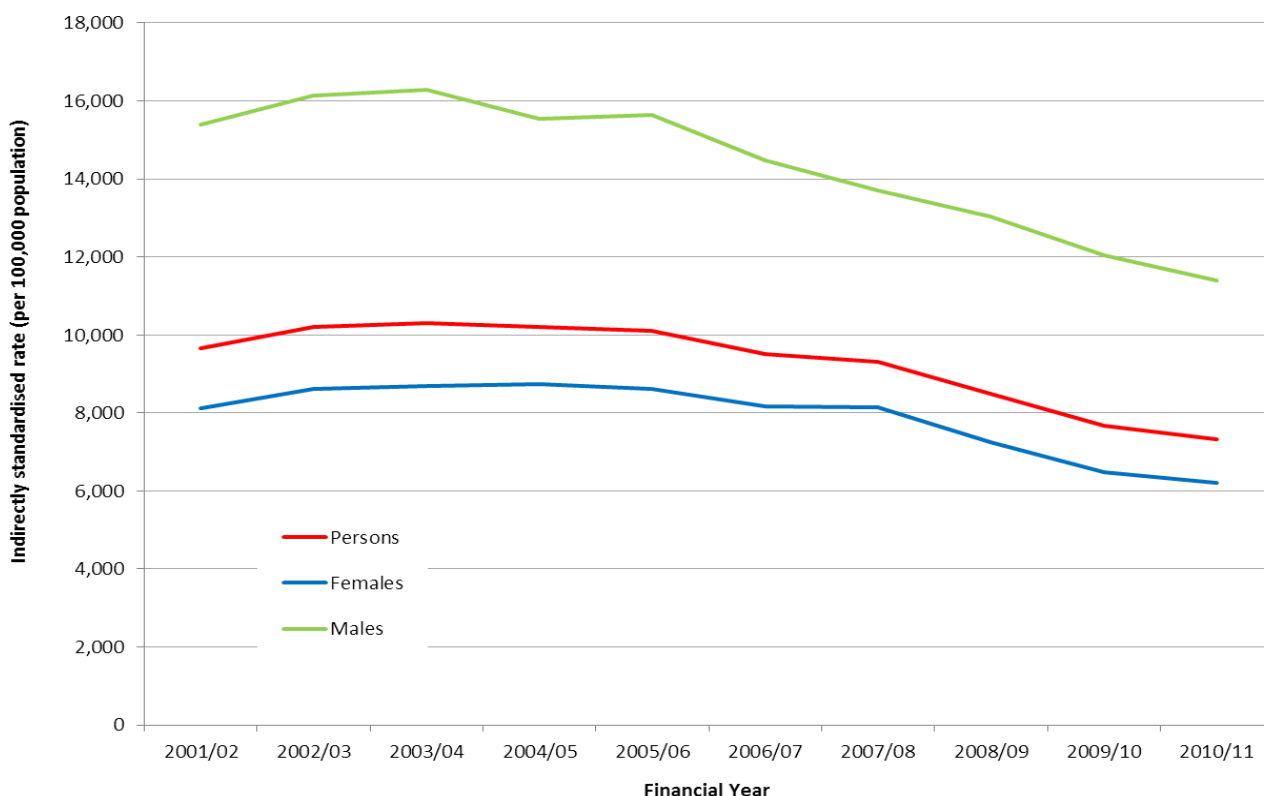
Myocardial infarction

- There were 419 fewer deaths than would have been expected in England.
- The mortality rate per 100,000 females in England (5,204.12) was around 6% higher than the mortality rate per 100,000 males in England (4,905.61).
- There has been a decrease of 1.5% in the mortality rate per 100,000 persons in England; from 5,062.32 in 2009/10 to 4,988.87 in 2010/11. Over the same period, the mortality rate per 100,000 females decreased by 6.0% (from 5,534.60 to 5,204.12), and the mortality rate per 100,000 males increased by 0.7% (from 4,871.93 to 4,905.61).
- Over the ten year period, there has been a decrease of around 42% in the mortality rate per 100,000 persons in England; from 8,594.46 in 2001/02 to 4,988.87 in 2010/11. Over the same period, the mortality rate per 100,000 females in England decreased by around 49% (from 10,209.91 to 5,204.12), and the mortality rate per 100,000 males in England decreased by around 38% (from 7,899.43 to 4,905.61).

Chart 5: Deaths within 30 days of emergency admission to hospital: myocardial infarction (ICD 10 codes: I21-I22), Indirectly age, sex and diagnosis standardised rates, age 35 to 74 years, per 100,000 persons / females / males (2001/02 to 2010/11)
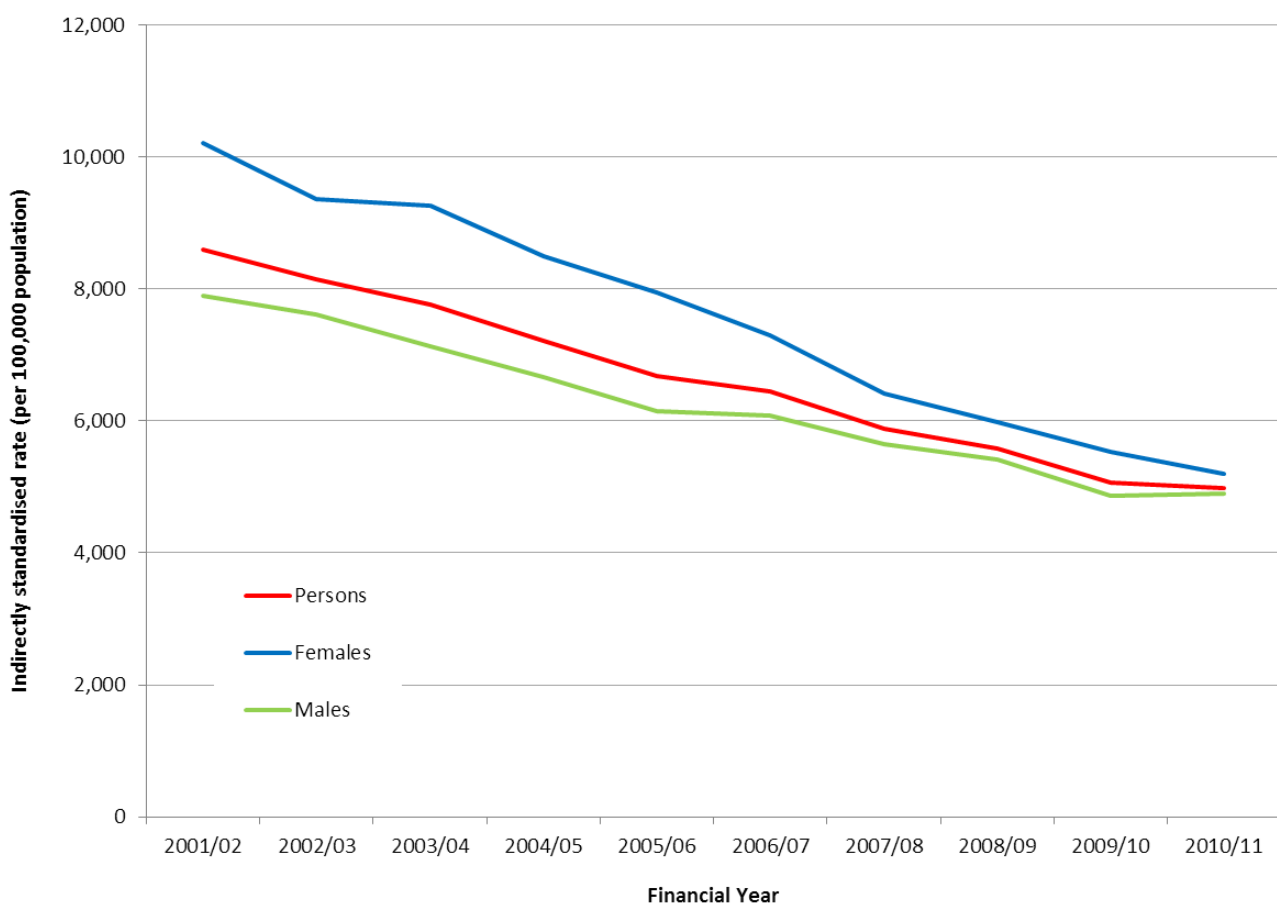
Stroke

- There were 3,091 fewer deaths than would have been expected in England.
- The mortality rate per 100,000 females in England (19,300.77) was around 13% higher than the mortality rate per 100,000 males in England (16,846.98).
- There has been a decrease of 5.2% in the mortality rate per 100,000 persons in England; from 19,243.34 in 2009/10 to 18,245.92 in 2010/11. Over the same period, the mortality rate per 100,000 females decreased by 4.9% (from 20,298.79 to 19,300.77), and the mortality rate per 100,000 males decreased by 5.5% (from 17,829.40 to 16,846.98).
- Over the ten year period, there has been a decrease of around 31% in the mortality rate per 100,000 persons in England; from 26,423.11 in 2001/02 to 18,245.92 in 2010/11. Over the same period, the mortality rate per 100,000 females decreased by around 28% (from 26,844.17 to 19,300.77), and the mortality rate per 100,000 males decreased by around 35% (from 25,909.85 to 16,846.98).

Chart 6: Deaths within 30 days of emergency admission to hospital: stroke (ICD 10 codes: I61-I64), Indirectly age and sex standardised rates, all ages, per 100,000 persons/ females/ males (2001/02 to 2010/11)
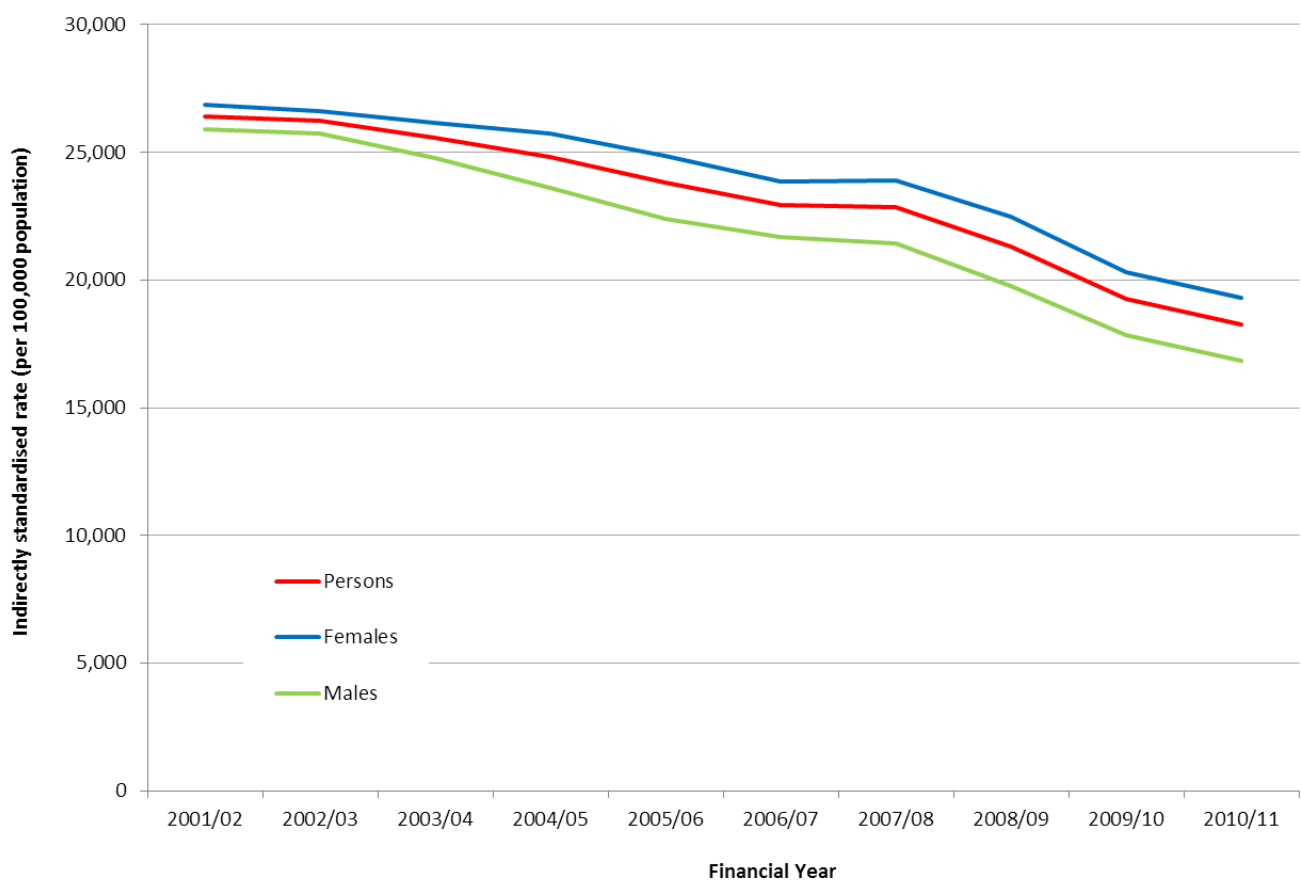
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