Health and Safety Executive

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Asbestos-related diseases in Great Britain, 2018

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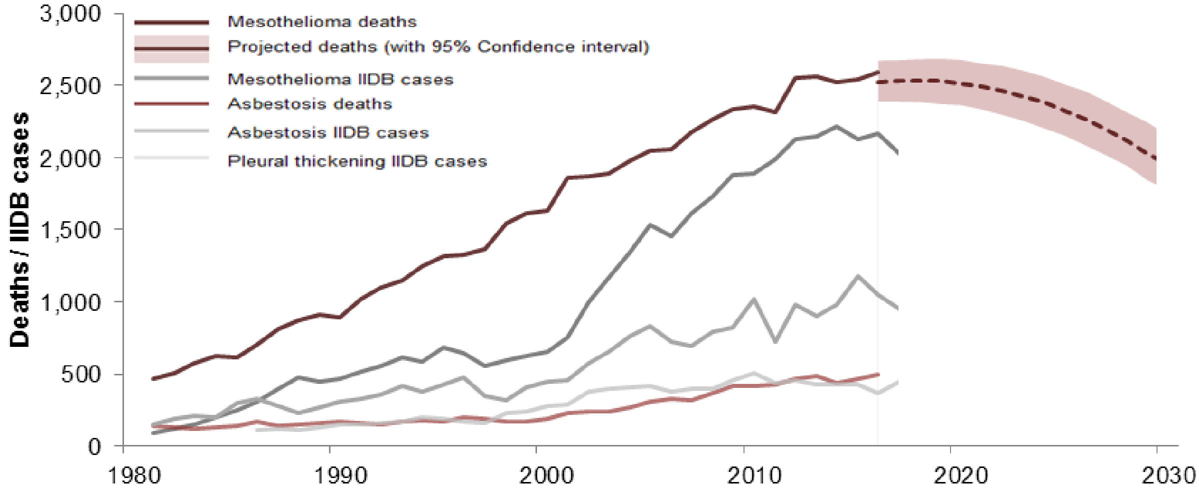
Asbestos-related disease

Over 5,000	2,595	500
Asbestos-related disease deaths per year currently, including mesothelioma, lung cancer and asbestosis	Mesothelioma deaths in 2016, with a similar number of lung cancer deaths linked to past exposures to asbestos	Asbestosis deaths in 2016 due to past exposures to asbestos

- Inhalation of asbestos fibres can cause cancers such as mesothelioma and lung cancer, and other serious lung diseases such as asbestosis and pleural thickening

Figure 1 - Mesothelioma, asbestosis, and pleural thickening: time trends in annual deaths and Industrial Injuries Benefit Disablement (IIDB) cases*



**Latest statistics are for 2016 for deaths and 2017 for IIDB cases*

- All asbestos-related diseases typically take many years to develop so current statistics reflect the legacy of past working conditions.
- Widespread use of asbestos containing products in the past- particularly in the post-WWII building industry- led to a large increase in asbestos-related disease in Great Britain over the last few decades.
- The cancer, mesothelioma, has such a strong relationship with asbestos that annual deaths give a particularly clear view of the effect of past exposures
- Annual deaths increased steeply over the last 50 years, largely as a result of asbestos exposure prior to 1980, and are now expected to continue at current levels for the rest of the decade before declining

[More detailed information on mesothelioma]

[Mesothelioma deaths by geographical area]

[Mesothelioma deaths by last occupation of the deceased]

Introduction

Inhalation of asbestos fibres can cause a number of serious diseases most of which affect the lungs or pleura (the external lining of the lung). These include a number of forms of cancer and chronic conditions such as asbestosis and pleural thickening. This document summarised the latest available statistics on these diseases.

All of these diseases have a long latency, meaning it takes a long time – typically decades – for symptoms to occur following exposure to asbestos. However, for cancers such as mesothelioma and lung cancer, cases are often rapidly fatal following disease onset, while conditions such as asbestosis may progress over time to seriously affect normal daily activity and lead to complications which can be fatal.

Asbestos was used extensively in Great Britain in a wide range of products, but particularly in insulation and building materials following World War II. Widespread asbestos-exposures during the 1950s, 1960s and 1970s led to a large increase in asbestos-related disease in Great Britain.

For some diseases – for example, mesothelioma and asbestosis – statistics can be derived from data sources that rely on counting of individual cases or deaths. For diseases that are regularly caused by other agents as well as asbestos – for example, lung cancer – statistics can be derived based on epidemiological evidence about the Attributable Fraction (AF) of cases or deaths due to asbestos exposure.

Asbestos-related cancers

Mesothelioma

Mesothelioma is a form of cancer that principally affects the pleura (the external lining of the lung) and the peritoneum (the lining of the lower digestive tract). It takes many years to develop following the inhalation of asbestos fibres. Cases are often diagnosed at an advanced stage as symptoms are typically non-specific and appear late in the development of the disease. It is almost always fatal, and often within twelve months of symptom onset.

Mesothelioma has such a strong relationship with asbestos that annual cases give a particularly clear view of the effect of past exposures, and as the disease is usually rapidly fatal following disease onset, the number of annual deaths closely approximates to the annual number of new cases (i.e. the annual disease incidence).

Annual deaths in Britain increased steeply over the last 50 years, a consequence of mainly occupational asbestos exposures that occurred because of the widespread industrial use of asbestos during 1950-1980.

The latest information shows:

- There were 2,595 mesothelioma deaths in Great Britain in 2016, broadly similar to the previous four years.
- The latest projections suggest that there will continue to be around 2,500 deaths per year for the rest of this current decade before annual numbers begin to decline.
- Annual deaths are continuing to increase among those aged 75 years or over, but are reducing among those aged below 70 years.
- In 2016 there were 2,197 male deaths and 398 female deaths, broadly similar to the annual numbers among males and females in the previous four years.
- There were 2,170 new cases of mesothelioma assessed for Industrial Injuries Disablement Benefit (IIDB) in 2016 of which 240 were female, compared with 2,130 in 2015 of which 220 were female.
- Men who worked in the building industry when asbestos was used extensively are now among those most at risk of mesothelioma.

A more detailed description of the latest mesothelioma mortality statistics is available at:

www.hse.gov.uk/statistics/causdis/mesothelioma/mesothelioma.pdf

Asbestos-related lung cancer

Asbestos is one of the most common causes of lung cancer after tobacco smoking. Lung cancer usually has no specific clinical signs associated with particular causes and so it is very difficult to be sure about the causes of individual cases. However, the overall proportion of annual deaths that are attributable to past asbestos exposures can be estimated from epidemiological information. Lung cancer is still typically fatal within a few years of diagnosis and so, as with the mesothelioma, the number of annual deaths is similar to the annual incidence of new cases.

- Research suggests there are currently about as many lung cancer deaths attributed to past asbestos exposure each year in Great Britain as there are mesothelioma deaths. There is considerable uncertainty associated with this estimate.
- This implies there are currently around 2,500 asbestos-related lung cancer deaths each year.
- Estimation of attributable deaths is complicated by the fact that asbestos and smoking act together to increase the risk of lung cancer. This means that many cases of lung cancer will be caused by both smoking and asbestos rather than by one or other of these exposures.

Epidemiological studies of specific groups of workers that were heavily exposed to asbestos in the past have typically estimated a greater number of lung cancers attributed to asbestos than there were mesotheliomas[1]. However, other studies that are more representative of the British population as a whole provide the best basis for estimating the overall number of asbestos-related lung cancers. Such evidence suggest that there are around as many lung cancer cases attributed to past asbestos exposure each year as there are mesotheliomas, though this estimate is uncertain.[2,3] A ratio of one asbestos-related lung cancer for ever mesothelioma implies there are currently around 2,500 asbestos-related lung cancer deaths each year.

It is expected that there will be fewer asbestos-related lung cancers per mesothelioma in the future as a consequence of reductions in both asbestos exposure and smoking prevalence in past decades.

Data sources that rely on the counting of individual cases attributed to asbestos exposures, such as the Industrial Injuries Disablement Benefit (IIDB) and the Health and Occupation Reporting (THOR) schemes, tend to substantially underestimate the true scale of asbestos-related lung cancer cases.

In recent years there have been, on average, around 275 new cases of asbestos-related lung cancer each year, with 180 reported in 2017, within the IIDB scheme (see table IDB01 www.hse.gov.uk/statistics/tables/iidb01.xlsx). There have been, on average, around 80 cases identified by chest physicians each year within the THOR scheme, with 41 estimated cases in 2017. (See table THORR01 www.hse.gov.uk/statistics/tables/thorr01.xlsx.) Typically females account for 2% of IIDB cases and less than 1% of THOR cases.

Estimates of the burden of lung cancer attributable to occupational exposures other than asbestos are available based on the Burden of Occupational Cancer research (www.hse.gov.uk/cancer/research).

Other asbestos-related cancers

In their most recent review, the International Agency for Research on Cancer (IARC) concluded that in addition to mesothelioma and lung cancer there is sufficient evidence that asbestos can cause cancer of the larynx, ovary, pharynx and stomach[4].

Two of these cancers (larynx and stomach) were already known to be caused by asbestos when the Burden of Occupational Cancer research (www.hse.gov.uk/cancer/research) was carried out and so estimates of the current annual number of new cases and deaths are available.

Based on mortality data for 2005 and cancer incidence data for 2004, the current estimated annual number of cases and deaths attributed to past asbestos exposure were:

- for cancer of the larynx: 8 cases and 3 deaths;
- for cancer of the stomach: 47 cases and 32 deaths.

Non-malignant asbestos-related disease

Asbestosis

Asbestosis is a form of pneumoconiosis caused by the inhalation of asbestos fibres which is characterised by scarring and inflammation of the lung tissue. It is a chronic and irreversible condition in which symptoms typically start to develop several decades following exposure to asbestos. These often progress to seriously affect normal daily activity and can lead to various complications which can be fatal.

It is generally recognised that heavy asbestos exposures are required in order to produce clinically significant asbestosis within the lifetime of an individual. Current trends therefore still largely reflect the results of heavy exposures in the past.

The latest statistics for deaths where asbestosis contributed as a cause of death based on the Asbestosis Register show:

- Deaths mentioning asbestosis (excluding those that also mention "mesothelioma") have increased substantially over a number of decades: there were 500 such deaths in 2016 compared with around 100 per year in the late 1970s. Typically, in recent years, around 2-3% of these deaths were among women.
- In over half of these deaths in 2016, asbestos was mentioned on the death certificate, but not as the underlying cause of death.
- Deaths also mentioning mesothelioma are excluded, since here the term "asbestosis" may have been used incorrectly to indicate the role of asbestos fibres in causing the separate disease mesothelioma. There were 36 such deaths in 2016.
- There were 218 deaths in 2016 where asbestosis was recorded as the underlying cause of death (defined as the disease or injury that initiated the events leading directly to death).
- Interpretation of these figures is further complicated by the fact that cases of asbestosis may sometimes not be recorded as such because they may be mistaken for other types of lung fibrosis – or recorded as "idiopathic" cases (i.e. lung fibrosis without a known cause)[5] – or may go undiagnosed.

Table IIDB06 www.hse.gov.uk/statistics/tables/iidb06.xlsx shows the number of new cases of asbestosis (and other forms of pneumoconiosis) assessed under the Industrial Injuries and Disablement Benefit (IIDB) scheme. The number of cases of asbestosis has increased substantially over the long term from 132 in 1978 to 955 in 2017 (see Figure 2) of which 1-2% were among women.

Figure 2 – Annual deaths where death certificates mentioned asbestosis but not mesothelioma, and IIDB cases 1978-2017

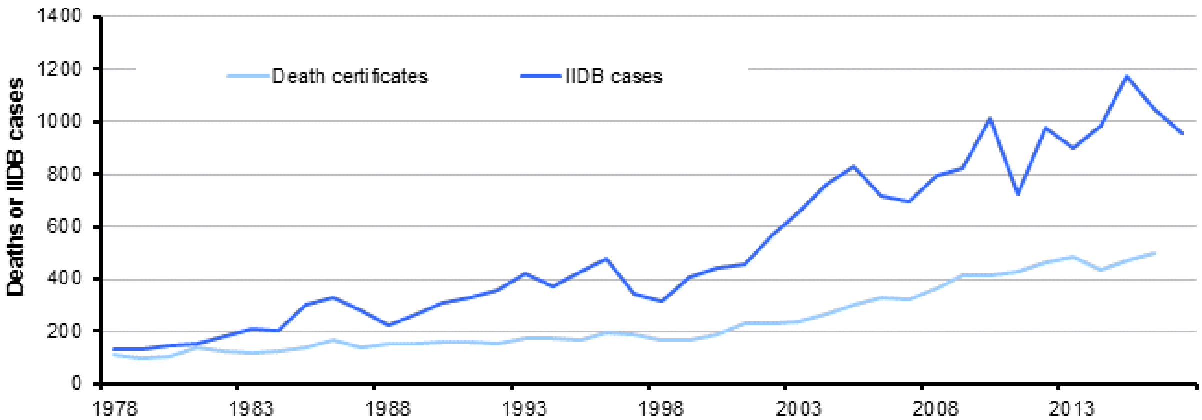


Table THORR01 (www.hse.gov.uk/statistics/tables/thorr01.xlsx) gives a breakdown of the pneumoconiosis cases seen by chest physicians in the THOR scheme. There were 143 cases of asbestosis out of the estimated 184 pneumoconiosis cases reported to respiratory physicians in 2017. Typically less than 1% of cases were female.

The statistics based on reporting by chest physicians in the THOR scheme also support a continuing increase in annual asbestosis cases. The latest analysis of trends in THOR data[6] suggests that the incidence of all pneumoconiosis – the majority of which is known to be asbestosis within that scheme – has been increasing with an average change of + 3.6 % per year (95% CIs: +1.8, +5.3) over the time period 1999-

2017. For the more recent period 2007-2017, the equivalent estimate was +8.2% per year (95% CIs: +4.6, +11.9), with the increase largely due to asbestos rather than silica, coal etc. However the last five years show a relatively flat trend (with wide confidence intervals).

Asbestosis deaths by age group and time period

Table ASIS02 www.hse.gov.uk/statistics/tables/asis02.xlsx shows the total number of death certificates mentioning the term asbestosis without mention of mesothelioma among males, and equivalent death rates, by age group for the three-year time periods during 1978-2016.

Age-specific death rates for males are also shown in Figure 3 below.

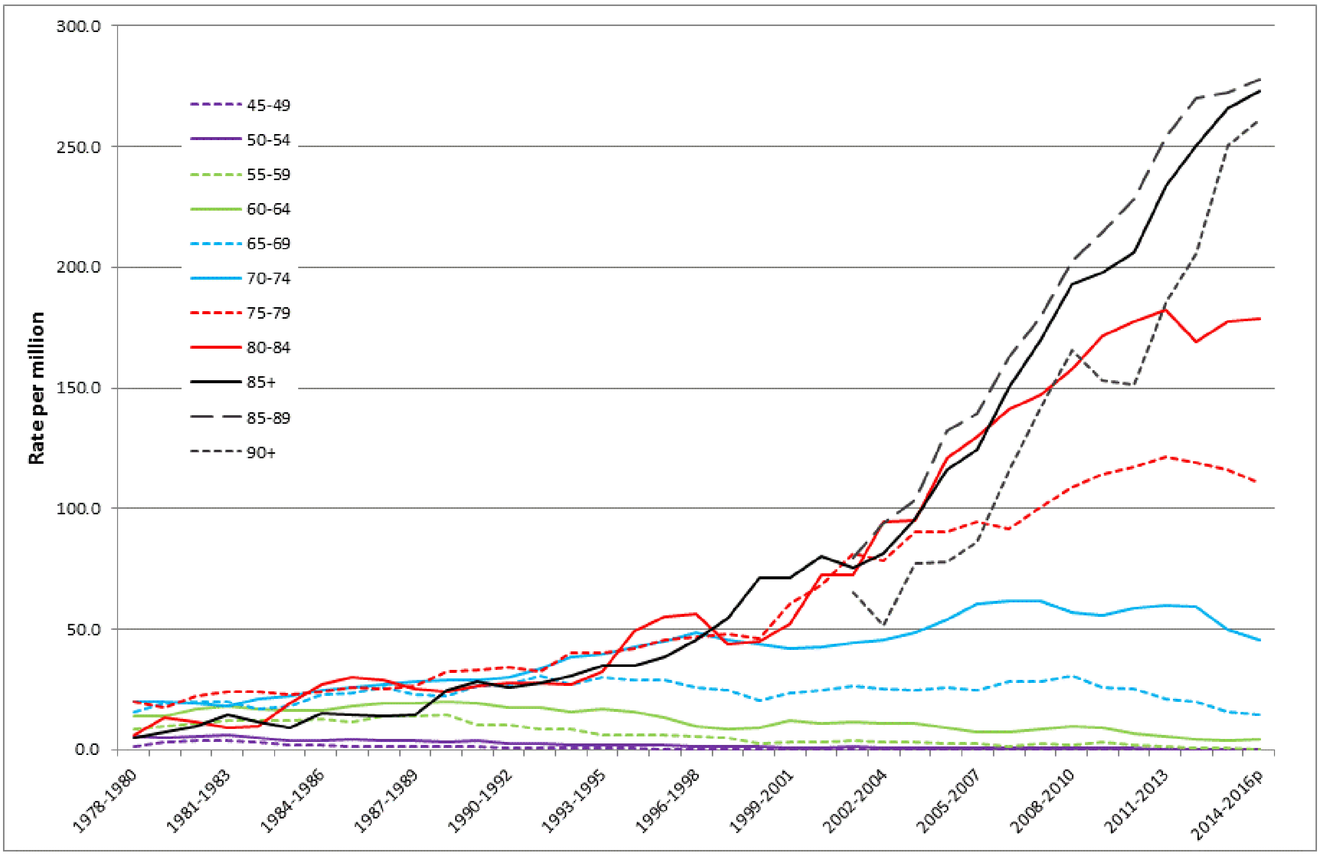
There are large differences in the magnitude of the rates between the different age groups:

- Death rates at ages below 65 years have been falling since the 1980s;
- This contrasts with strongly increasing rates for deaths at ages 75 years and above.

This is consistent with those that were born more recently tending to have lower asbestos exposures than those born earlier and who were of working age during the period when asbestos was most widely used.

Due to the small number of female deaths, age-specific death rates for women have not been shown, but also indicate an increase in rates in the 85-89 and 90+ age bands over the last 10 years.

Figure 3 – Average annual male death rates based on death certificates mentioning asbestosis but not mentioning mesothelioma by age and time period, 1978-2016(p)



Note: rates for the age band 85+ years can be split into 85-89 and 90+ from year 2001 only (broken black lines).

Asbestosis deaths by region

Age-standardised death rates for males by 3-year time period and region (again restricted to deaths mentioning asbestosis but not mesothelioma) are available in Table ASIS03 www.hse.gov.uk/statistics/tables/asis03.xlsx .

Age-standardisation allows comparison of rates taking account of changes in the age-structure of the underlying population over time and between regions. The period 2014-2016 was taken as the base for standardisation over time and Great Britain for standardisation over region. A small number of deaths with overseas addresses were excluded.

For Great Britain as a whole, male asbestosis death rates increased from 5.4 per million in 1981-83 (the earliest period available for regional data) to 14.9 in 2014-16. Male regional rates have similarly increased over time, although to a lesser extent in Wales and London. The highest rates are in the North-West (20.9 per million) and in the North East, where they have declined from a peak of 44.3 in 2010-12 to 32.1 in 2014-16.

The female asbestosis death rates for GB have fluctuated over time with the current rate of 0.3 per million being around the average for the period. The highest rates are in the North East with a rate of 1.6 per million in 2014-16.

More detailed analyses of asbestosis mortality by Unitary Authority (UA) and Local Authority (LA) area for the period 1981 to 2016 are available in Annex 1, with associated data tables available at www.hse.gov.uk/statistics/tables/ASISAREA.xlsx and interactive maps at https://arcg.is/K4i8m.

Non-malignant pleural disease

Non-malignant pleural disease is a non-cancerous condition affecting the outer lining of the lung (the pleura). It includes two forms of disease: diffuse pleural thickening and the less serious pleural plaques. A substantial number of cases continue to occur each year in Great Britain, mainly due to workplace asbestos exposures many years ago.

- There were 450 new cases of pleural thickening assessed for Industrial Injuries Disablement Benefit in 2017. (See table IDB01 www.hse.gov.uk/statistics/tables/iidb01.xlsx.)
- The annual number has been fairly constant over the last 10 years, with an average of around 430 new cases per year of which around 10% are female.
- An estimated 429 new cases of non-malignant pleural disease mainly caused by asbestos were reported by chest physicians in 2017. Typically around 2-3% of cases are female. A substantial proportion of these were cases of pleural plaques. (See table THORR01 www.hse.gov.uk/statistics/tables/thorr01.xlsx.)
- Pleural plaques are usually symptomless and are often identified in the THOR scheme when individuals have chest x-rays for other conditions.
- For these reasons, there are likely to be substantially more individuals in the population with pleural plaques than those identified by chest physicians.

Annex 1: Asbestosis deaths by geographical area 1981-2016

Introduction

This analysis of asbestosis mortality by Unitary Authority (UA) and Local Authority (LA) area includes deaths occurring during the period 1981 to 2016, the longest period for which data are available according to the current UA and LA structure. It also provides detailed analysis of temporal trends within selected geographical areas using Generalised Additive Models.

The analyses presented in the maps and charts in this annex are based on the 8,727 male and 325 female deaths occurring during 1981 to 2016 due to asbestosis, defined as any death with asbestosis recorded on the death certificate (either as the underlying cause or otherwise mentioned) but excluding deaths that also mentioned mesothelioma. During this period, male asbestosis deaths increased from 130 in 1981 to 489 in 2016; female deaths fluctuated between 5 and 17 a year.

Results are available as interactive maps at: https://arcg.is/K4i8m
Full results are also available in Excel tables at www.hse.gov.uk/statistics/tables/ASISAREA.xlsx , including additional analyses based on all death certificates mentioning asbestosis (including those that also mention mesothelioma) and analyses restricted to where the underlying cause of death was recorded as asbestosis.

The analysis is based on the last area of residence of the deceased, as recorded on death certificates, and uses Standardised Mortality Ratios (SMRs) which compare the mortality rate in a particular area with the mortality rate for GB, taking account of age differences. SMRs are expressed as a percentage: values higher or lower than 100 indicate mesothelioma rates that are higher or lower, respectively, than for GB as a whole.

The analyses of temporal trends for geographical areas within Great Britain should be interpreted in the context of increasing annual asbestosis deaths in Great Britain as a whole. Overall deaths have increased substantially since the 1970s. Since Standardised Mortality Ratios (SMRs) compare the mortality rate in a particular region with that for GB as a whole, trends in SMRs for a particular area indicate whether rates for that area have increased relatively more or less rapidly than for GB as a whole. No change in the SMR for an area over time indicates that the mortality rates have increased in line with the trend for GB as a whole.

Results

Figure A1.1 is a map showing SMRs by Unitary/Local Authority area for males for the overall period 1981-2016. Figure A1.2 highlights those areas for which the mortality rate was statistically significantly higher or lower than for GB as a whole.

Figure A1.1 – Asbestosis SMRs for males by geographical area 1981-2016

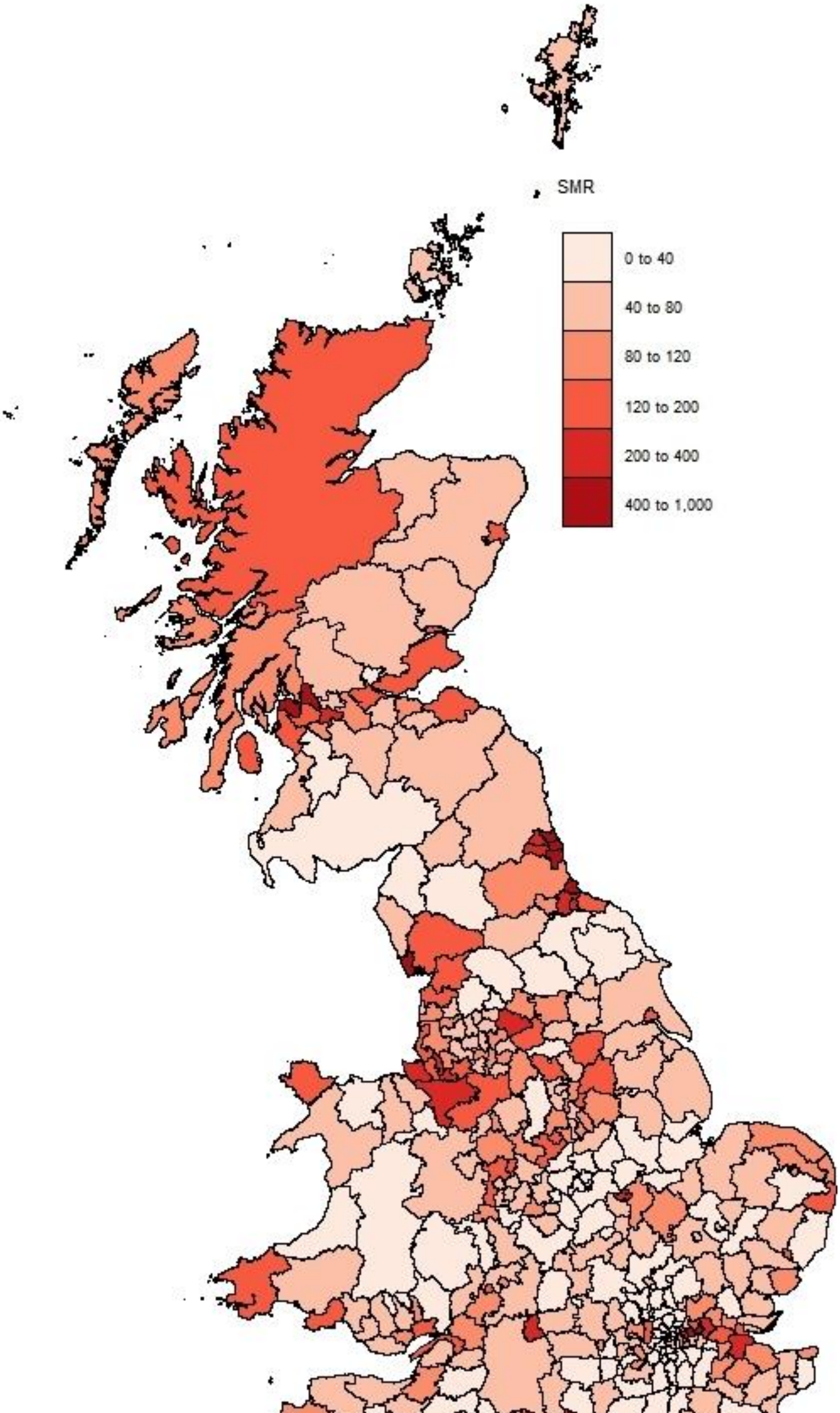
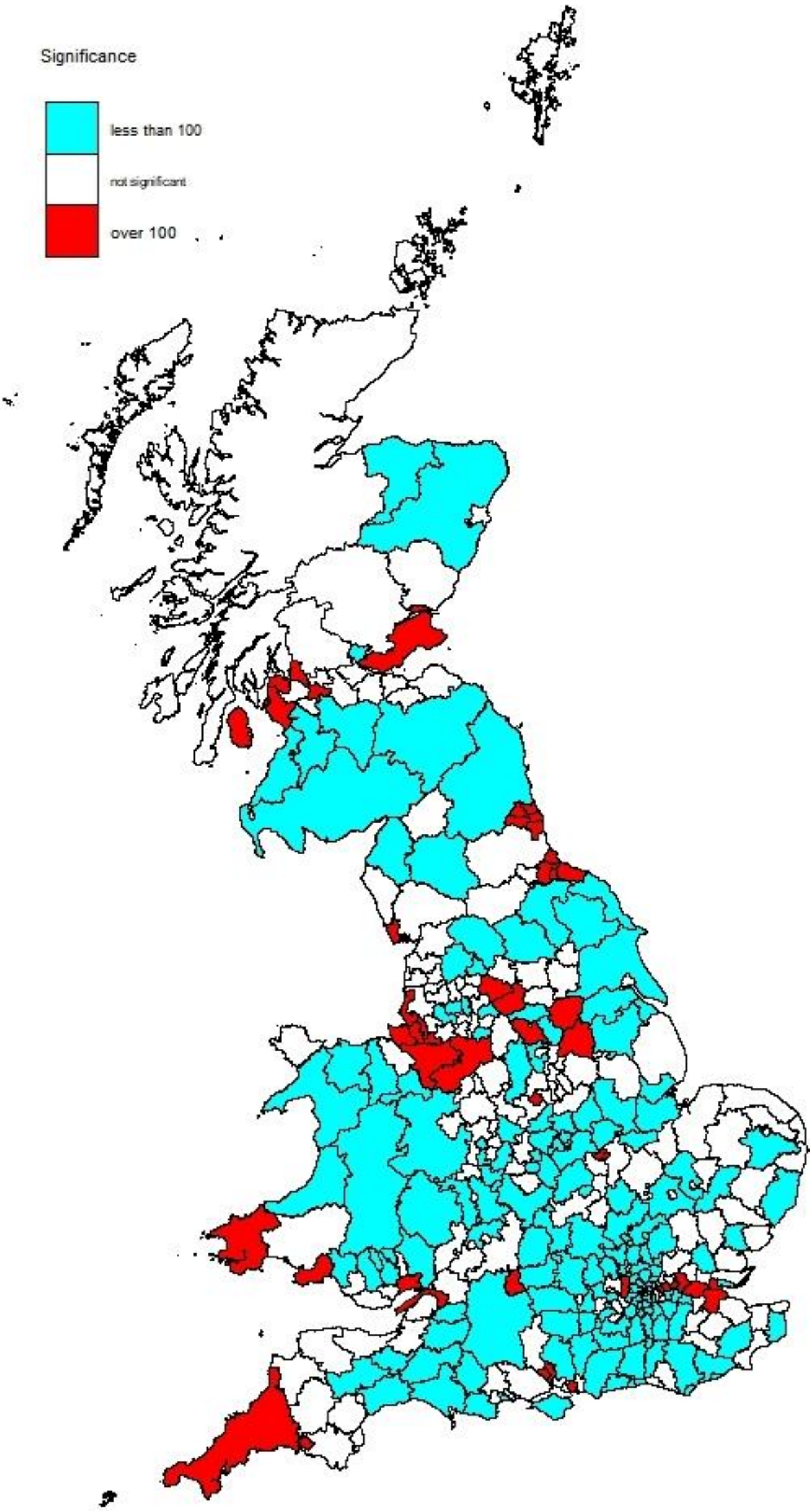


Figure A1.2 – Statistical significance of asbestosis SMRs for males by geographical area 1981-2016



Temporal trends in asbestosis mortality

Temporal variation in asbestosis SMRs for regions within Great Britain and selected Unitary/Local Authority areas are shown graphically in this section.

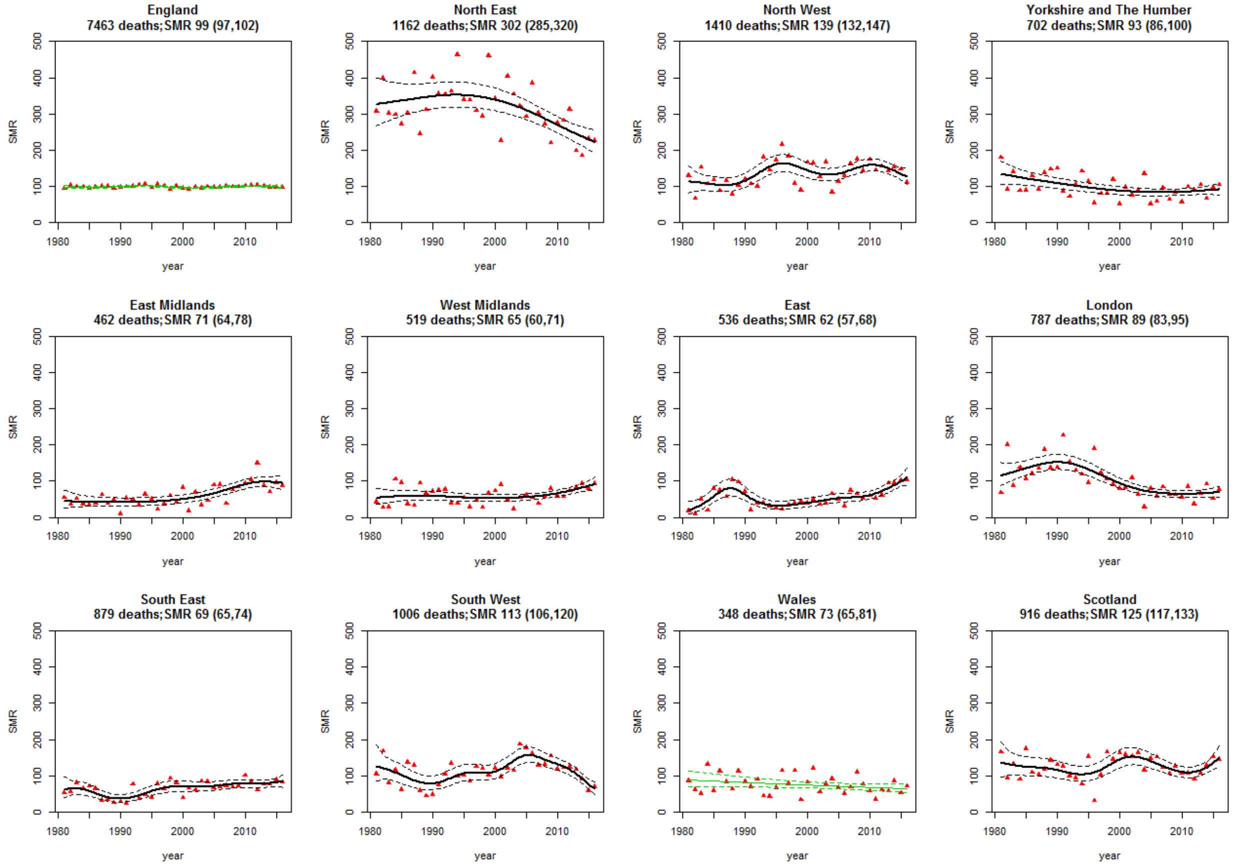
Charts with trend lines shown with solid **bold black lines** indicate statistically significant temporal changes, while those with **green lines** indicate trends of borderline significance, and for those with **blue lines** trends were not significant. The dashed lines represent the 95% confidence intervals.

Male asbestosis deaths by area 1981-2016

Figure A1.3 shows the regional variation for male SMRs calculated annually along with 95% confidence intervals.

There were statistically significant temporal changes in the SMR in all regions except Wales and England as a whole. The highest male SMR for asbestosis was seen in the North East (SMR 301.8, 95% Confidence Interval 284.7 to 319.6, 1162 deaths), although there was a significant declining trend over time. SMRs elsewhere were much lower. For example, in the South West, whilst the SMR for 1981-2016 as a whole was significantly higher than 100, the trend analysis suggests it has reduced to being significantly lower than 100 in recent years.

Figure A1.3 – Annual asbestosis SMRs for males by region, 1981-2016



The Unitary/Local authority areas with the highest male asbestosis SMRs for the period 1981-2016 were:

- Barrow-in-Furness (SMR 975.8, 95% CI 801.1 to 1177.1, deaths 109);
- Sunderland (SMR 829.2, 95% CI 741.9 to 924.0, deaths 328);
- Plymouth (SMR 804.6, 95% CI 715.5 to 901.7, deaths 296);
- Barking and Dagenham (SMR 641.7, 95% CI 538.7 to 758.7, deaths 137);
- South Tyneside (SMR 554.4 95% CI 464.1 to 657.0, deaths 133);
- Hartlepool (SMR 522.4, 95% CI 405.7 to 662.3, deaths 68);
- West Dunbartonshire (SMR 517.5, 95% CI 398.6 to 660.9, deaths 64);
- North Tyneside (SMR 497.3, 95% CI 421.4 to 583.0, deaths 152);
- Newham (SMR 476.7, 95% CI 390.6 to 576.1, deaths 107);
- Inverclyde (SMR 449.8 95% CI 338.8 to 585.4, deaths 55).

Figure A1.4 – Annual asbestosis SMRs for males for the top six UA/LA areas, 1981-2016

Figure A1.5 – Annual asbestosis SMRs for males for UA/LAs ranked 7-12, 1981-2016

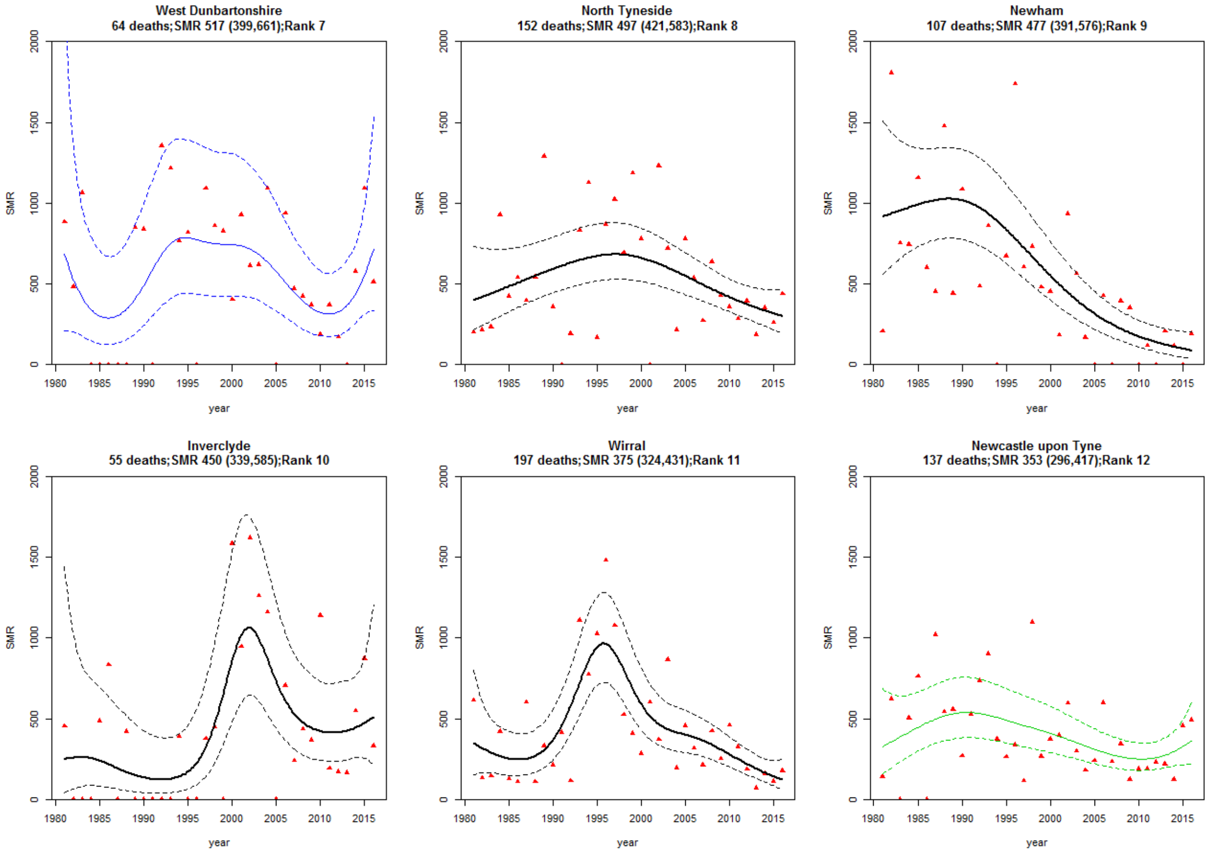
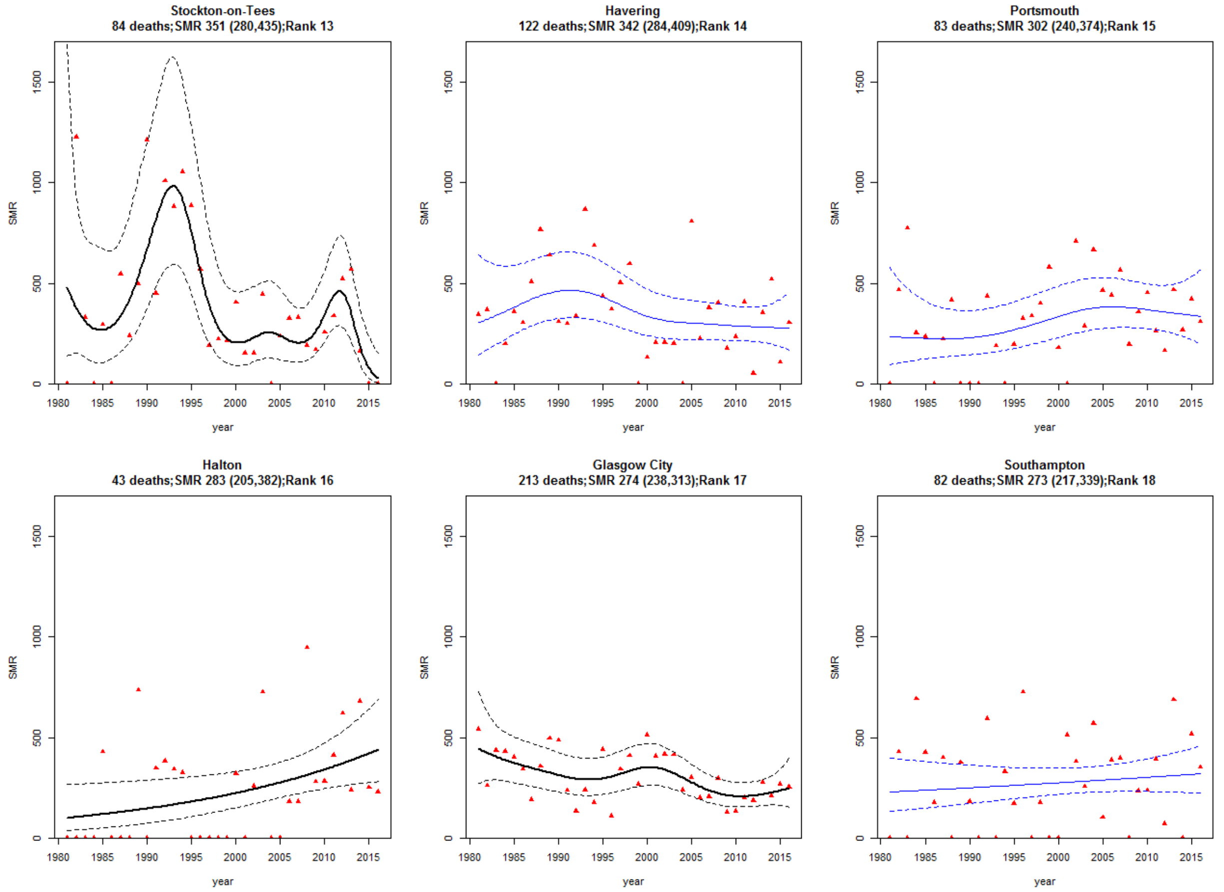


Figure A1.6 – Annual asbestosis SMRs for males for UA/LAs ranked 13-18, 1981-2016



Female asbestosis deaths by area 1981-2016

There were far fewer asbestosis deaths among females than males. SMRs for many UA/LA areas were therefore associated with considerable uncertainty due to there being small numbers of actual deaths observed, and no analyses of temporal trends for females are presented. Nevertheless, the results for the whole period 1981-2016 show that certain areas known to be associated with industries with heavy historic asbestos exposures have particularly high SMRs.

The North East region accounted for 119 deaths of the 325 deaths for GB as a whole during 1981-2016 (SMR 812.6, 95% CI 673.0 to 972.4), and 75 deaths occurred within the Sunderland LA (SMR 4874.4, 95% CI 3833.8 to 6109.8).

The UA/LA area ranked second was Barking and Dagenham LA, where there were 17 deaths (SMR 1989.1 95% CI 1158.3 to 3184.9).

Newham LA was ranked 3rd with 13 deaths (SMR 1554.5 95% CI 827.5 to 2658.2) and the area ranked 4th was South Ribble LA with 7 deaths, although none since before the year 2000 (SMR 1254.3, 95% CI 503.5 to 2583.9).

Annex 2 – Methodology for the mortality analyses by geographical area

Data for death certificates mentioning asbestosis occurring during the period 1981-2016 were obtained from the Health and Safety Executive Asbestosis Register. SMRs were derived using mid-year population estimates provided by the Office for National Statistics.

The method of age standardisation used in the production of SMRs is commonly referred to as the indirect method. Age-specific death rates in a standard population (in this case Great Britain by gender) are applied to the age structure of the population for each geographical area in order to calculate expected numbers of deaths. The ratio of the observed number of deaths to the expected number of deaths in the area is calculated and multiplied by 100 to give the SMR. The SMR of the standard population is 100. An SMR greater or less than 100 indicates a respectively higher or lower than expected mortality rate in a specific area. If the lower bound of the 95% Confidence Interval for the SMR is greater than 100 this indicates that the observed number of deaths was statistically significantly higher than expected. A worked example of the SMR calculation is provided below.

The statistical models involved fitting a smoothed term for the year in a Generalized Additive Model (GAM) to identify annual trends. In a most cases a Poisson error term was assumed; for a small number of cases a Negative Binomial or Normal (Gaussian) error term was assumed.

SMR calculation – worked example

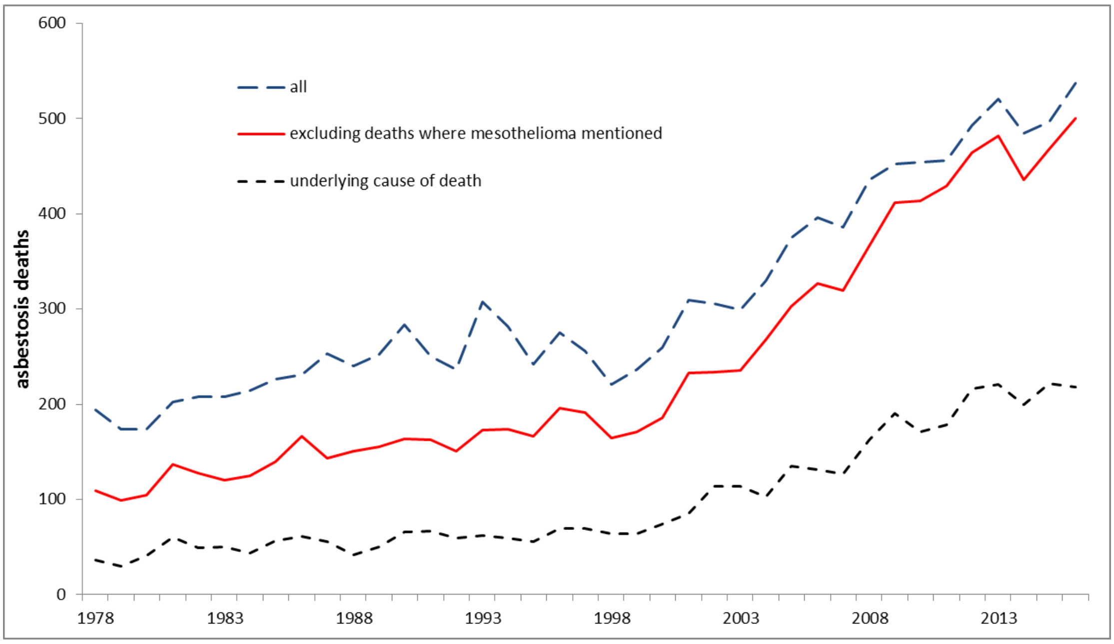
Table A2.1 illustrates the calculation of an SMR for men in geographical area 'A'. The total population of Great Britain is used as the standard population (column 1). The asbestosis death rate in the population for each age group (column 3) is the total number of male asbestosis deaths (column 2) divided by the total number of men in Great Britain (column 1) to give age-specific death rates in the standard population. These rates are applied to the total population in area A, given in column 4, to give the expected numbers of deaths in this area, in column 6. The total observed number of deaths, shown in column 5, summed over the age groups (532) divided by the expected number of deaths (210.57), multiplied by 100, gives an SMR of 252.7.

Table A2.1: Example of SMR calculation

	Total persons in Great Britain			Persons in geographical area 'A'		
Age group	Population (1)	Asbestosis deaths (2)	Asbestosis death rate (3) = (2) / (1)	Population (4)	Observed asbestosis deaths (5)	Expected asbestosis deaths (6) = (3) x (4)
0 - 4	285,545	0	0	6,926	0	0
5 - 9	296,837	0	0	8,514	0	0
10 - 14	323,242	0	0	9,286	0	0
15 - 19	350,617	1	<0.00001	8,729	0	0.02
20 - 24	349,316	1	<0.00001	7,833	0	0.02
25 - 29	329,490	5	0.00002	7,907	0	0.12
30 - 34	311,884	16	0.00005	7,770	3	0.40
35 - 39	292,209	76	0.00026	6,443	6	1.68
40 - 44	274,546	199	0.00072	6,222	14	4.51
45 - 49	249,834	402	0.00161	6,243	40	10.05
50 - 54	243,985	699	0.00286	6,391	66	18.31
55 - 59	240,015	1,141	0.00475	6,269	75	29.80
60 - 64	221,551	1,412	0.00637	5,367	77	34.21
65 - 69	195,541	1,531	0.00783	4,997	89	39.12
70 - 74	152,322	1,319	0.00866	3,729	78	32.29
75 - 79	102,328	1,308	0.01278	2,176	45	27.81
80 - 84	51,761	472	0.00912	1,007	25	9.18
85+	25,034	145	0.00579	525	14	3.04
Total, all ages	**4,296,057**	**8,727**		**106,334**	**532**	**210.57**

SMR = 100 x 532 / 210.57 = 252.7

Annex 3: Figure A3.1 – Annual asbestosis deaths 1978-2016



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National Statistics

National Statistics status means that statistics meet the highest standards of trustworthiness, quality and public value. They are produced in compliance with the Code of Practice for Statistics, and awarded National Statistics status following an assessment by the Office for Statistics Regulation (OSR). The OSR considers whether the statistics meet the highest standards of Code compliance, including the value they add to public decisions and debate.

It is Health and Safety Executive's responsibility to maintain compliance with the standards expected by National Statistics. If we become concerned about whether these statistics are still meeting the appropriate standards, we will discuss any concerns with the OSR promptly. National Statistics status can be removed at any point when the highest standards are not maintained, and reinstated when standards are restored.

An account of how the figures are used for statistical purposes can be found at www.hse.gov.uk/statistics/sources.htm.

For information regarding the quality guidelines used for statistics within HSE see www.hse.gov.uk/statistics/about/quality-guidelines.htm

A revisions policy and log can be seen at www.hse.gov.uk/statistics/about/revisions/

Additional data tables can be found at www.hse.gov.uk/statistics/tables/.

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