Exposure to Lead in Great Britain 2016

Medical Surveillance of Blood-Lead Levels in British Workers 2015/16

Contents

Summary 2
Introduction 3
Workforce under medical surveillance 4
Lead based industry distribution 5
Males under surveillance 5
Females under surveillance 6
Blood-lead levels in British workers 7
Male blood-lead levels 7
Female blood-lead levels 8
Suspensions 10
Male suspensions 10
Female suspensions 10
Appendix 1 11
Summary

This document describes the latest statistics for blood-lead measurements taken under statutory medical surveillance for work with lead during 2015/16.

The document can be found at www.hse.gov.uk/statistics/causdis/lead/

There has been an overall reduction in the number of British workers under medical surveillance for work with lead over the past decade. Women have consistently accounted for a small proportion of the total under surveillance, and the number of young people (under 18 years) under surveillance remains very low. The number and proportion of workers with higher levels of blood-lead concentrations have decreased substantially over the past decade.

The most recent data for 2015/16 show:

- There were 6451 workers under medical surveillance, a rise of 1% compared with the previous year.
- Male workers accounted for 6139 (95%) of those under surveillance.
- Just over 83% of men and 99% of women under surveillance had blood-lead levels below 25µg/100ml.
- There were 57 men with levels of 50µg/100ml or above, and 13 men with levels at or above the suspension level of 60µg/100ml.
- There were 3 women with levels of 25µg/100ml or above.
- Nine individuals (all male) were suspended due to excess blood-lead.
- The industry sector with the highest number of males under surveillance was the smelting, refining, alloying and casting sector.
- Work involving metallic lead and lead containing alloys accounted for the highest number of females under surveillance.

![Figure 1](image-url) The total number of British lead workers under medical surveillance since 2005/06

* Figures for 2012/13 are estimates which correct for undercounting in the originally published figures (see Appendix 1)
Introduction

Exposure to lead can result in a range of serious medical problems, which is why a regime of surveillance of workers in lead industries is undertaken in Great Britain.

Under the Control of Lead at Work (CLAW) Regulations all workers with significant exposure to lead are required to undergo medical surveillance which includes measurement of blood-lead concentrations. However the decision to put workers under surveillance rests with the employer. The regulations specify blood-lead concentration levels (µg/100ml) at which an appointed doctor is to decide if a worker should no longer be exposed to lead (known as the ‘suspension level’). In 1998, updated regulations introduced a lower ‘action level’ at which employers must take additional steps to help ensure worker’s blood-lead levels are reduced.

Since 1998/99, separate information has been collected on young people (aged under 18 years) under medical surveillance.

Before the introduction of the CLAW Regulations in August 1981, there were ten individual regulations that covered the use of lead, including regulations on ‘paint and colour manufacture’, ‘lead smelting and manufacture’ and ‘lead compounds manufacture’.

| Table 1 Summary of the Control of Lead at Work (CLAW) Regulations 1980, 1998 and 2002 |
|---------------------------------|---------------------------------|
| **CLAW Regulations 1980**      | **CLAW Regulations 1998 and 2002** |
| **Came into force**            | August 1981                      |
| **Collection**                 | April 1998                       |
| **Calendar years 1982-1986**   | Unchanged in November 2002       |
| **Financial years 1987/88 onwards** | Financial years                  |
| **Male and other workers**     | 80µg/100ml 1982-1985             |
| **Suspension level**           | 70µg/100ml 1986 onwards          |
| **Action level**               | -                               |
| **Female workers of reproductive capacity** | 60µg/100ml                     |
| **Suspension level**           | 40µg/100ml                       |
| **Action level**               | -                               |
| **Young workers (aged under 18 years)** | 30µg/100ml                     |
| **Suspension level**           | 50µg/100ml                       |
| **Action level**               | 40µg/100ml                       |

HSE’s Medical Inspectors, HSE Appointed Doctors (who are the main group of doctors carrying out statutory medical surveillance of lead-exposed workers in GB), and a body of scientific evidence would indicate that it is often the case that individuals with blood-lead levels at or above the suspension limit and who are suspended from working with lead do not have symptoms normally described as “lead poisoning”. Such workers are therefore removed from further exposure to lead to reduce the likelihood of such symptoms developing.

The coverage of these statistics is limited by the extent of medical surveillance that occurs in practice, and this may not be completely aligned with what is required under the CLAW regulations. Some employers may keep workers under surveillance on a precautionary basis where exposure is not likely to be significant, whereas others may fail to implement surveillance where it is in fact required. A more detailed discussion of the basis for the statistics and their potential limitations is available on the data sources page, see www.hse.gov.uk/statistics/sources.pdf?pdf=sources for more information.
Workforce under medical surveillance

The number of workers under surveillance provides an indication of the extent of potential occupational lead exposure in the British population. Figure 2 shows the number of male and female workers under medical surveillance each year since 1996.

![Bar chart showing the number of male and female workers under medical surveillance each year since 1996.](image)

**Figure 2** The total number of British lead workers under medical surveillance since 1996/97 by sex

There were 6451 workers (6139 males and 312 females) under medical surveillance in 2015/16 (Table 2), an increase of 1% from the 6374 under medical surveillance in 2014/15.

There has been a long-term downward trend in the numbers under surveillance over the last two decades, which shows some signs of levelling off. Similar reductions have been seen among both men and women. Women have accounted for only a small proportion of the total under surveillance over this period (5% of all workers under medical surveillance in 2015/16).

The number of young people (under 18 years) under medical surveillance remains low, with 4 young males in 2015/16.

**Table 2** Breakdown of workers under medical surveillance

<table>
<thead>
<tr>
<th>Year</th>
<th>Males</th>
<th>% Males</th>
<th>Females</th>
<th>% Females</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005/06</td>
<td>8278 (12)</td>
<td>96%</td>
<td>340 (10)</td>
<td>4%</td>
<td>8618 (22)</td>
</tr>
<tr>
<td>2006/07</td>
<td>8376 (4)</td>
<td>96%</td>
<td>321 (4)</td>
<td>4%</td>
<td>8697 (8)</td>
</tr>
<tr>
<td>2007/08</td>
<td>7752 (7)</td>
<td>96%</td>
<td>317</td>
<td>4%</td>
<td>8069 (7)</td>
</tr>
<tr>
<td>2008/09</td>
<td>6563 (19)</td>
<td>96%</td>
<td>268 (3)</td>
<td>4%</td>
<td>6831 (22)</td>
</tr>
<tr>
<td>2009/10</td>
<td>6916 (8)</td>
<td>97%</td>
<td>246</td>
<td>3%</td>
<td>7162 (8)</td>
</tr>
<tr>
<td>2010/11</td>
<td>7214 (6)</td>
<td>97%</td>
<td>258</td>
<td>3%</td>
<td>7472 (6)</td>
</tr>
<tr>
<td>2011/12</td>
<td>7689 (14)</td>
<td>97%</td>
<td>260 (1)</td>
<td>3%</td>
<td>7949 (15)</td>
</tr>
<tr>
<td>2012/13*</td>
<td>6232 (1)</td>
<td>95%</td>
<td>294</td>
<td>5%</td>
<td>6526 (1)</td>
</tr>
<tr>
<td>2013/14</td>
<td>6505 (1)</td>
<td>96%</td>
<td>301</td>
<td>4%</td>
<td>6806 (1)</td>
</tr>
<tr>
<td>2014/15</td>
<td>6075 (6)</td>
<td>95%</td>
<td>299</td>
<td>5%</td>
<td>6374 (6)</td>
</tr>
<tr>
<td>2015/16</td>
<td>6139 (4)</td>
<td>95%</td>
<td>312</td>
<td>5%</td>
<td>6451 (4)</td>
</tr>
</tbody>
</table>

* Figures for 2012/13 are estimates which correct for undercounting in the originally published figures. Figures are for the total number of workers, of which the number under 18 years of age is given in brackets.
Lead based industry distribution

The current set of industry sector categories apply to statistics for 2010/11 onwards and were produced to best reflect the main industry sectors in which lead exposure may currently occur. Lead battery and glass recycling are identified separately from battery and glass manufacture, and a category for the paint removal sector is also included. The ‘other processes’ category includes any industries not covered by the specific categories.

Males under surveillance

The smelting, refining, alloying and casting sector has consistently accounted for the highest number of males under medical surveillance over the last 5 years, and in 2015/16 accounted for 20% of all males under surveillance.

In 2015/16, the next two sectors with the highest number of workers under surveillance were the lead battery manufacturing sector (11% of all male workers), and industries involving work with metallic lead and lead containing alloys (10% of all male workers).

One noteworthy change was that the scrap industry had around 345 males under surveillance in 2014/15, but this rose to 530 in 2015/16. This appears to be partly due to an increase in the number of males under surveillance for one particular company within this sector.

Other changes in the number of males under surveillance between 2014/15 and 2015/16 include an increase in the lead battery manufacture sector, from 585 to 665; a rise in the glass recycling sector, from 35 to 115; a decrease in workers in the paint removal sector, from 765 to 580; and a reduction in number in the smelting, refining, alloying and casting sector, from 1330 to 1220.

Figure 3 The breakdown of male lead workers under medical surveillance since 2010/11 by industrial sector

* Figures for 2012/13 are estimates which correct for undercounting in the originally published figures (see Appendix 1)
A summary of the distribution of blood-lead levels of all male workers under medical surveillance by industry sector and year can be found at www.hse.gov.uk/statistics/tables/claw1.xlsx

**Females under surveillance**

For females, the industrial breakdown shows a different pattern to that of males. Due to the relatively small numbers of females involved, year-on-year comparisons are subject to considerable variability.

The two industry sectors with the highest number of females under surveillance in 2015/16 were working with metallic lead and lead containing alloys (35% of all female workers), and the smelting, refining, alloying and casting sector (20% of all female workers).

Changes in the number of females under surveillance between 2014/15 and 2015/16 include a decrease in the number of workers in the glass making sector, from 40 to 20; and a reduction in potteries, glazes and transfers sector, from 20 to 10.

There was also an increase in the number assigned to the ‘other processes’ category. This appears to be due to an increase in the number of females under surveillance for one particular company and the inclusion of three new companies under surveillance.

![Diagram showing the breakdown of female lead workers under medical surveillance since 2010/11 by industrial sector.](attachment:image.png)

**Figure 4** The breakdown of female lead workers under medical surveillance since 2010/11 by industrial sector

A summary of the distribution of blood-lead levels of all female workers under medical surveillance by industry sector and year can be found at www.hse.gov.uk/statistics/tables/claw2.xlsx
Blood-lead levels in British workers

The distribution of blood-lead levels of all workers under medical surveillance during the last 5 years can be obtained from Tables CLAW1 and CLAW2.

The majority of workers under medical surveillance during this period had blood-lead concentrations below 25µg/100ml. In 2015/16, 5109 (83%) of the 6139 male workers and 309 (99%) of the 312 female workers had levels below this value.

If the lead concentration in a worker's blood reaches or passes specified levels, the worker may be suspended from working with lead until the concentration reduces naturally. Figures 5 and 7 show males with blood-lead levels greater than 50µg/100ml, and females with blood-lead levels greater than 25µg/100ml. All statistics are based on the highest recorded blood-lead level for each individual.

A worker whose maximum reading is at or above the suspension level will not necessarily be suspended from working with lead; a repeat measurement may be below the level, or in the case of females the worker may not be of reproductive capacity. Without further information being available it is assumed that all female employees less than 18 years of age are of reproductive capacity, thus the lower action and suspension levels are used for the statistics presented.

**Male blood-lead levels**

Numbers of males under surveillance by recorded blood-lead level are shown in Figure 5. Cut-off points for blood-lead categories represent: the suspension level under the previous (1980) Regulations (70µg/100ml); the current suspension level (60µg/100ml); and the current action level (50µg/100ml).

The number of males in the highest two blood-lead categories (60-70µg/100ml and >70µg/100ml) has decreased substantially over the past decade, both in absolute terms, and also as a proportion of the total number under surveillance. In 2015/16 the number of males with blood-lead levels at or above 60µg/100ml was 13 (0.2% of all male workers under surveillance) down from 87 males in 2005/06 (1.1% of all male workers under surveillance). These figures have reduced from 322 males in 1998/99 (the first year of the lower suspension levels), and 576 males in 1996/97.

*Figure 5 The breakdown of male lead workers under medical surveillance since 2005/06 with elevated blood-lead levels (>50µg/100ml)*

In 2015/16, there were 57 males (0.9% of all male workers under surveillance) with blood-lead levels at or above 50µg/100ml. The three industry sectors with the majority of the highest blood-lead level readings were: work with metallic lead and lead containing alloys, accounting for 16 males, the paint removal sector, with 10 males, and the smelting, refining, alloying and casting sector, with 9 males.

In contrast to 2014/15 the number of males under surveillance in 2015/16 with blood-lead levels above the action limit of 50µg/100ml has:

- decreased in the smelting, refining, alloying and casting sector, from 15 to 9; and
- decreased in the lead battery recycling sector, from 9 to 3.

No young males (under 18 years) were recorded with a blood-lead level above the action limit of 40µg/100ml in 2015/16.
The proportion of males with blood-lead levels at or above 25µg/100ml since 2010/11 by industrial sector is shown in Figure 6. The potteries, glazes and transfers sector had the largest proportion of male workers with blood-lead levels above 25µg/100ml in 2010/11 and 2011/12 but this has dropped in recent years. In contrast, the proportion of male workers with blood-lead levels above 25µg/100ml involved in work with metallic lead and lead containing alloys has increased in recent years.

**Figure 6** The proportion of male lead workers under medical surveillance since 2010/11 with blood-lead levels at or above 25µg/100ml, by industrial sector

### Female blood-lead levels

The number of women with high blood-lead levels is small and so the proportion tends to fluctuate from year to year, making changes over time difficult to interpret.

Numbers of females under surveillance by recorded blood-lead level are shown in Figure 7. Cut-off points for blood-lead categories represent: the suspension level under the previous (1980) Regulations (40µg/100ml); the current suspension level (30µg/100ml); and the current action level (25µg/100ml).

The number of females in the highest two blood-lead categories (30-40µg/100ml and >40µg/100ml) has tended to decrease over the past decade, both in absolute terms, and also as a proportion of the total number under surveillance, but with substantial year-on-year fluctuations. There were no females in 2015/16 with a blood-lead level at or above 30µg/100ml, down from 11 females in 2005/06 (3.2% of all female workers under surveillance). These figures have reduced from 50 females in 1998/99 (the first year of the lower suspension levels), and 64 females in 1996/97.
In 2015/16, there were 3 females (1% of all female workers under surveillance) with blood-lead levels at or above 25µg/100ml.
Suspensions

Figure 8 shows the number of workers suspended from work due to excess blood-lead levels each year from 2005/06.

Neither the number of workers with measurements over the suspension level nor the number suspended should be interpreted as the number of lead poisonings; the purpose of the arrangements under the CLAW Regulations is to remove workers from exposure to lead to reduce the likelihood of symptoms of lead poisoning developing.

![Graph showing number of male and female lead workers under medical surveillance suspended from working with lead since 2005/06](image)

**Figure 8** Number of male and female lead workers under medical surveillance suspended from working with lead since 2005/06

### Male suspensions

In 2015/16, 9 males (0.1% of all male workers under surveillance) were suspended from work due to excess blood-lead levels. This was a decrease from the 19 males (0.3% of all male workers under surveillance) suspended in the previous year.

### Female suspensions

No females were suspended due to an excess of blood-lead in 2015/16. There was 1 female suspended the previous year. The numbers of female workers involved are small and tend to fluctuate from year to year.
Appendix 1

Figures for 2012/13, originally published in March 2014, were subject to undercounting. An investigation suggested that some of the annual returns providing data for individual companies were missing, although overall summary information from appointed doctors was available for analysis. These figures were withdrawn in March 2015. Estimated figures for 2012/13 were subsequently produced by taking into account all available information relating to the number of returns made for the years 2010/11 - 2013/14. These figures were first published in December 2015 and are also included in this publication.

The total number of workers under medical surveillance during 2012/13 was estimated using information about the overall number of workers and measurements recorded by doctors identified as having missing returns for specific companies, taking into account information they reported in years 2010/11, 2011/12 and 2013/14. Estimates by industry sector and sex for 2012/13 were then produced by taking into account the numbers under surveillance working at specific companies in these other years. Finally, the distributions of blood-lead levels within each industry sector averaged over these years were used to estimate the number of workers by blood-lead level category within each industry sector for 2012/13.