DOWNSTREAM GAS

and

CORGI TRUST

**Working in Partnership**

# A REVIEW OF CARBON MONOXIDE INCIDENT INFORMATION, FOR 2008/9, PRODUCED FROM THE FULL INVESTIGATION OF INCIDENTS WHICH INVOLVED PIPED NATURAL GAS AND LPG, WITHIN GREAT BRITAIN

**J Hayton**
**M Moore**
**J Moseley**
**G Pool**

Prepared by Downstream Gas Ltd
Website:www.downstreamgas.co.uk/

Funded by The CORGI Trust

This report has been prepared by Downstream Gas and is funded by The CORGI Trust as a continuation of the work established during a Joint Industry Programme (JIP) addressing carbon monoxide (CO) issues in 1996. This work identifies common concerns involved in CO incidents related to appliance and system design, the home environment, installation, servicing and maintenance. The conclusions reached are intended to help further improve safety, to target investment on CO incident prevention and to identify additional research work.

This is the thirteenth report in a series that began with the publication of a first annual report in 1996 and covers the 12 months of July 2008 to June 2009. During the period details of 56 domestic piped gas incidents were submitted to Downstream Gas and their analysis constitutes the main part of the report. None were linked mains LPG. Details of a further seven incidents that occurred before July 2008 were also received and are included in an appendix and in the revised historical figures in the main body of the report.

**The CORGI Trust is pleased to fund this report and believes the information and data contained within to be crucial to the further reduction of death or serious injury from accidental carbon monoxide exposure.**

# CONTENTS





*Funded by:*
CORGI TRUST

## TABLES AND FIGURES





*Funded by:*
CORGI TRUST

*Funded by:*
CORGI TRUST

# EXECUTIVE SUMMARY

This report prepared by Downstream Gas builds on the work initiated during a Joint Industry Programme in the 1990's concerned with accidental carbon monoxide (CO) poisoning in Great Britain associated with the use of piped natural gas and LPG in the home. The report presents CO incident investigation information, for example that which involves appliance and system design, the home environment, installation, servicing and maintenance. A statistical analysis of the contributory factors and the installations are undertaken to established national and yearly trends. The aim of any conclusions is intended to help further improve safety, to target investment on CO incident prevention, to recommend changes to best practice in the form of standards or legislation and to identify any appropriate research work.

This is the thirteenth annual report and is for the period from 1st July 2008 to 30th June 2009. The annual cut-off date was chosen to help identify yearly trends in incident statistics as these are at their lowest in the summer. The main focus of the analysis of incidents relates to domestic piped natural gas and LPG with details of any reported incidents involving LPG and non-domestic use of gas received from incident investigators presented in the appendix. There were no such LPG or non-domestic DIDR reports received this year.

Information on fatalities, casualties, main appliance types and causes was provided for all incidents but detailed appliance and installation information was not recorded in a third of the reported incidents. Lack of detailed reporting is a concern that was noted last year and is primarily a consequence of Health and Safety Executive (HSE) officials advising that detailed investigation is not necessary from a prosecution perspective. There is a duty in law on the gas supplier to carry out an investigation irrespective of whether the HSE intends to prosecute any parties or not. Some measures taken to further improve the detailed reporting of CO incidents have yet to work through to the 2008/9 records. However, it is recommended that ways are sought to involve the HSE in issuing updated guidance both to Gas Supply Companies and HSE regional offices to ensure that DIDR forms are fully completed in all relevant cases.

Figures reported for the 15 month period April 2007 to June 2008 have been revised upward from 9 to 13 fatalities, 41 to 44 casualties and 40 to 45 incidents due to information received after last year's report was completed. Similarly, for April 2006 to March 2007, figures have been revised upward from 7 to 10 fatalities and from 29 to 31 incidents; casualty numbers have remained unchanged.

Between 1st July 2008 and 30th June 2009, 17 deaths and 96 casualties in 56 incidents were reported and confirmed to be CO poisoning linked to piped gas although none were linked to LPG. Whilst 17 is below the average of 25 deaths per year prevalent a decade ago, it is the highest number since 2000/1 and is therefore a cause for concern. Two deaths were linked to room heaters, seven to central heating and one to an unspecified appliance. The remaining seven were associated with cookers, which is statistically higher than the average of 1 per year recorded over the last seven years and the highest since 1996. The increase in cooker related deaths has therefore contributed significantly towards the 2008/9 total.

An examination of the cooker incidents has revealed four of the deaths were linked with enclosed grills that are more typical of modern designs and were caused by the users incorrectly operating the grill with the grill door shut. The particular cookers involved did not have automatic shut-off valves that operate when the grill door is closed, which is a feature of some of the more expensive models. This risk should be brought to the attention of the public, installers and manufacturers.

The mortality rate for 2008/9 was 0.31 per million people at risk per year (i.e. those living in households supplied by mains gas) and this is well within the criteria for the tolerability of risk generally accepted by the HSE (1 per million persons at risk per year). The mortality rate associated with central heating and any cooking appliance was between 0.14 and 0.16 and between 0.22 and 0.25 per million people at risk per year respectively.

Of the 17 deaths reported, 3 were double fatalities and 11 were single fatalities.



*Funded by:*

CORGI TRUST

There is statistical evidence that privately rented households are 180% more at risk of an incident than other households and that open flued boilers pose a risk of at least 6 times the risk of room sealed boilers. Unlike last year's analysis there is no statistical evidence of an increased risk associated with older properties.

An analysis of the established causes of incidents reported revealed the following concerns:

- Lack of servicing (specified in 25% of the cases)
- Flue/terminal positioning, for which best practice is defined in BS 5440: Part 1: 2008. Outbuildings, covered passageways and exposed porches are particular areas featured here
- The fitting or seal between flues and appliances
- Misuse of cookers – cookers were used over extended periods and grills were operated with the grill door shut or used for prolonged periods when open. It is unclear whether the prolonged use was deliberate (i.e. to heat the room) or accidental.

Finally, it is recommended that:

- Urgent attention is given to enhance cooker safety with respect to closable grills without automatic shut-off valves that remain operational when the door is closed and that related to use over prolonged periods. This could be addressed by incorporating such a safety feature into the relevant manufacturer's performance standard which is already required for hob covers/lids. In addition, it is recommended that the public, installers and manufacturers are made aware of the risk.
- The potential dangers of incorrectly using cookers over prolonged periods in smaller and/or perhaps less well ventilated kitchens should also be more widely advertised among manufacturers, gas installers, double glazing installers, building alteration approval officers and the general public.
- Efforts are continued to achieve a co-ordinated approach with those representing other fuel suppliers, so that the true extent of CO related incidents across the range of domestic fuels can be quantified. Such a joint co-coordinated approach was recommended in last year's report. As a result, discussions are proceeding with representatives of the solid fuel and oil industries to develop the DIDR form for collating and reporting their fuel related CO incident information.
- Two additional questions are added to DIDR forms concerning CO alarms and the details of the established cause(s) to improve future analysis.



*Funded by:*

# 1 Introduction

## 1.1 Context

Downstream Incident Data Report (DIDR) forms are completed by investigators following the investigation of accidental carbon monoxide (CO) poisoning in Great Britain from the use of piped natural gas or LPG in the home. The information received has been gathered, placed on a database, analysed and presented in a series of twelve consecutive annual reports from 1996/7 to 2007/8. The initial reports were funded by the Health and Safety Executive (HSE) with The CORGI Trust taking over the funding for the reporting period commencing April 2006.

This is the thirteenth report and the second produced by Downstream Gas for The CORGI Trust. It covers the 12 months between 1st July 2008 and 30th June 2009. The previous annual report covered the 15 months from 1st April 2007 to 30th June 2008[1].

## 1.2 Scope

The gas industry has clear mandatory obligations and responsibilities in terms of reporting gas related CO incidents. These are specified in the Gas Safety Management Regulations (GSMR) 1996 and in particular place duties upon the supplier of mains natural gas or piped LPG.

The GSMR state that: -

*Where an incident notifiable under regulation 6(1) of the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995 has arisen as a result of an escape of carbon monoxide (CO) from incomplete combustion of gas in a gas fitting, the person who supplied the gas shall, as soon as is reasonably practicable after receiving notice of the incident, cause an investigation to be carried out so as to establish, so far as is reasonably practicable, the cause of the escape and accumulation of the carbon monoxide gas.*

The Regulations are known as RIDDOR (the acronym for the 1995 Regulations specified above).

Regulation 6(1) states that:-

*Whenever a conveyor of flammable gas through a fixed pipe distribution system, or a filler, importer or supplier (other than by means of retail trade) of a refillable container containing liquefied petroleum gas receives notification of any death or major injury which has arisen out of or in connection with the gas distributed, filled, imported or supplied, as the case may be, by that person, he shall forthwith notify the Executive of the incident, and shall within 14 days send a report of it to the Executive on a form approved for the purposes of this regulation*.

The Executive is the Health and Safety Executive.

The Guidance to Regulation 6(1) states that:-

*The trigger for a report to the HSE under regulation 6(1) is the receipt by the person on whom the reporting duty is placed of 'notification' of a flammable gas incident causing a death or a major injury other than one reportable under regulation 3(1).*

[1] Page 1, ref 1



*Funded by:*
CORGI TRUST

Regulation 3(1) relates to death or major injury as a result of an accident arising out of or in connection with work whether or not the person was at work. It also covers hotel or care home residents, pupils or students and customers in shops.

In general it may be interpreted that for the understanding of this report, regulation 6 (1) covers domestic premises.

As specified in GSMR, a CO incident has to fulfil specific criteria in order to be formally reported. Such an incident is notifiable under regulation 6(1) of the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995 and for this reason is frequently known as a RIDDOR reportable incident.

Primarily, following the inhalation of a substance (in this case CO) the incident has to result in:

- an acute illness requiring medical treatment or
- a loss of consciousness

An acute illness means:

- one that progresses rapidly to a crisis after the onset of symptoms and
- has severe symptoms

Medical treatment covers: -

- hospital treatment
- treatment by a general medical practitioner or
- treatment by a firm's medical and nursing staff
- treatment by a paramedic is also included.

Based on the gas industry's duty to investigate CO related incidents, the DIDR process was set-up to achieve the systematic gathering of details from incident investigations in order to help identify trends and common underlying features.

Incidents that occur in domestic properties attached to shops, offices, restaurants, etc are only included if the causes were related to the domestic use of gas. Incidents involving multiple residential properties such as student accommodation and sheltered housing are included but care homes are excluded as the latter are work related. Occasionally DIDR forms are completed for incidents occurring in non-domestic premises so for completeness, any received are included in a separate appendix and these details will not feature in the statistical analysis of data covered in the main body of the report.

The reporting of LPG incidents via the DIDR forms is limited to those associated with refillable LPG tanks or cylinders.

To get a more comprehensive nationwide picture of CO incidents related to LPG from non-refillable bottles, oil and solid fuels, information would need to be gathered and reported systematically which requires a co-ordinated approach across many industries. Such an approach was recommended in last year's report. In response to this recommendation, discussions have started and are progressing well about using a variation of the DIDR form as the basis of a co-ordinated approach.

The statistics in the main body of report:

- Include data on DIDR forms received relating to the domestic use of piped natural gas or LPG and other fatal incidents not reported on DIDR forms but which have been reported to the HSE and have been clearly established as accidental CO poisoning involving the use of piped gas in a dwelling



*Funded by:*
CORGI TRUST

- Exclude any DIDR forms received detailing CO incidents associated with LPG or piped natural gas in a non-domestic situation. However, for completeness any data received on DIDR forms is presented in appendices to the report.

## 1.3 Coverage

The information gathered during an incident investigation relies on the investigators working on behalf of gas suppliers completing a DIDR form for each CO incident and sending it to Downstream Gas for entry onto the database. Occasionally a few fatal incidents involving domestic use of piped gas may go unreported via a DIDR form but are known to the HSE and are clearly accidental CO incidents. In these cases only, information such fatality age and type of appliance was gathered from reliable press reports on inquest results to supplement information provided by the HSE.

From 1st July 2008 to 30th June 2009, a total of 56 incidents were reported to Downstream Gas of which 19 were short reports; these short reports only include the incident date, geographical location, casualty details (section 1 and 2 of the form) and the suspected cause and type of appliance. In a full report, additional sections contain detailed information about the appliance installation and dwelling characteristics. Full reports were received for 37 out of the 56 reported incidents. Therefore, comprehensive detailed information remains unknown for 19 of the 56 reported incidents.

Enquiries relating to these short reports revealed that there were a number of incidents where the HSE had advised it was not necessary for a site investigation as there was no duty holder against whom a case could be pursued. A major aim of the work reviewed here is to analyse in detail the circumstances of all carbon monoxide incidents in order to reveal any common concerns and conclusions that will help to improve gas safety in the future. It is therefore vital that all incidents meeting the criteria for an investigation by law are fully examined and reported. It should be understood by both HSE Inspectors and the gas suppliers that there is a duty in law on the gas supplier to carry out such an investigation, irrespective of whether the HSE intends to take any further action or not.

There may be occasions when a report is delayed, for example whilst waiting on the result of an inquest or a trial. Details of seven incidents occurring before July 1st 2008 were received after the analysis for 2007/8 had been completed; including seven incidents with 7 fatalities and 3 non-fatalities in four full and three short reports. The corresponding details are given in appendix C and have been added to the appropriate historical figures, charts and tables in the main body of the report.



*Funded by:*
CORGI TRUST

## 1.4 Report content

After reconciling the number of incidents recorded by British Gas, CORGI Services and the HSE, the information provided to Downstream Gas in the DIDR forms was analysed and presented in this report. Tables and charts are included relating to the numbers of reported fatalities, non-fatalities and incidents. Also, where appropriate the expected number in a specific category is given assuming the number of incidents in each category is in the same proportion to that of the category in the general population. As an example, if, hypothetically, there were 40 female and 20 male non-fatalities, the expected number if both were equally at risk would be 30 each as the general population is split almost 50:50 between male and female.

Absolute risk of accidental CO poisoning associated with the use of gas in the home is calculated and expressed in terms of fatalities, casualties or incidents per million people potentially at risk per year. People considered potentially at risk are those living in properties with at least one gas appliance (i.e. those supplied with mains gas nationwide). Rates associated with particular appliance types are estimated taking the number of people at risk as those living in homes with the particular appliance type installed.

In order to reveal the annual trends, fatality, casualty and incident rates are also presented in this report for the 13 yearly periods starting from the 1st July 1996 to 30th June 2009.

Section 2 of this report analyses data in the same order as the DIDR form making use of appliance population statistics, where available. Section 3 then draws together the salient parts, making recommendations where appropriate.

- Appendix A is intended for domestic LPG incidents reported to Downstream Gas on the DIDR form. None were received this year.
- Appendix B is intended for non-domestic incidents reported to Downstream Gas on the DIDR form. None were received this year.
- Appendix C is intended for details of incidents received this year but applicable to previous years and therefore too late to include in previous reports. Details of seven such incidents were received. Historical data and charts in the main body of report are updated according.



*Funded by:*
CORGI TRUST

## 2 ANALYSIS of DIDR Forms

### 2.1 Preliminary overview

There were 56 domestic incidents reported on DIDR forms that met the criteria for inclusion during the 12 month period (1st July 2008 to June 30th 2009 inclusive). The main criteria are that either a definitive CO cause was established (usually through blood tests) or that the appliance was shown to be produce dangerous levels of carbon monoxide in the 'as found' condition. Deliberate acts such as suicides are excluded.

All 56 involved use of mains natural gas. No incidents were reported on the use of LPG; that is from refillable fuel tanks or cylinders.

The incidents are usually notified directly to British Gas or CORGI Services both of whom provide an investigation service to a number of gas suppliers. Three of the 56 incidents were reported to HSE but had not been notified either to British Gas or CORGI Services. Incident Co-ordinators from British Gas and CORGI Services liaise with each other to ensure any incident they become aware of is investigated and that the HSE is suitably advised that this will take place. Possible duplicate reports are checked before being entered onto the database.

Of the 56 domestic incidents reported, 37 were fully reported. For the remaining 19 only short reports were received. Thus, whilst for 56 cases the analysis covers incident date, casualty information and main appliance data (sub-sections 2.1, 2.2 and 2.6), for 37 of these the analysis additional covers incident installation appliances, flues, ventilation provision, appliance operation and servicing (sub-sections 2.3-2.13).

Each DIDR form is dedicated to a separate CO incident and will be referred to as such throughout the rest of this report. The incident rates and yearly trend data have been combined with the casualty details and are described within section 2.2.

Details of seven domestic natural gas incidents that occurred before July 1st 2008 were received after last year's analysis had been completed. Four full reports and three short reports were received involving a total of 7 fatalities and 3 non-fatalities. The details of these are presented in appendix C and the appropriate historical figures, charts and tables in the main body of the report have been updated accordingly.

### 2.2 Incident Details - Section 1 of DIDR

The number of domestic incidents, by month, involving fatal and non-fatal casualties between 1st July 2008 and 30th June 2009 inclusive are plotted in Figures 1 and 2 respectively. The 12-month period commences on the 1st July to reduce annual trends being skewed because CO incidents are higher in number in cold weather (as is evident from Figures 1 and 2).



*Funded by:*
CORGI TRUST

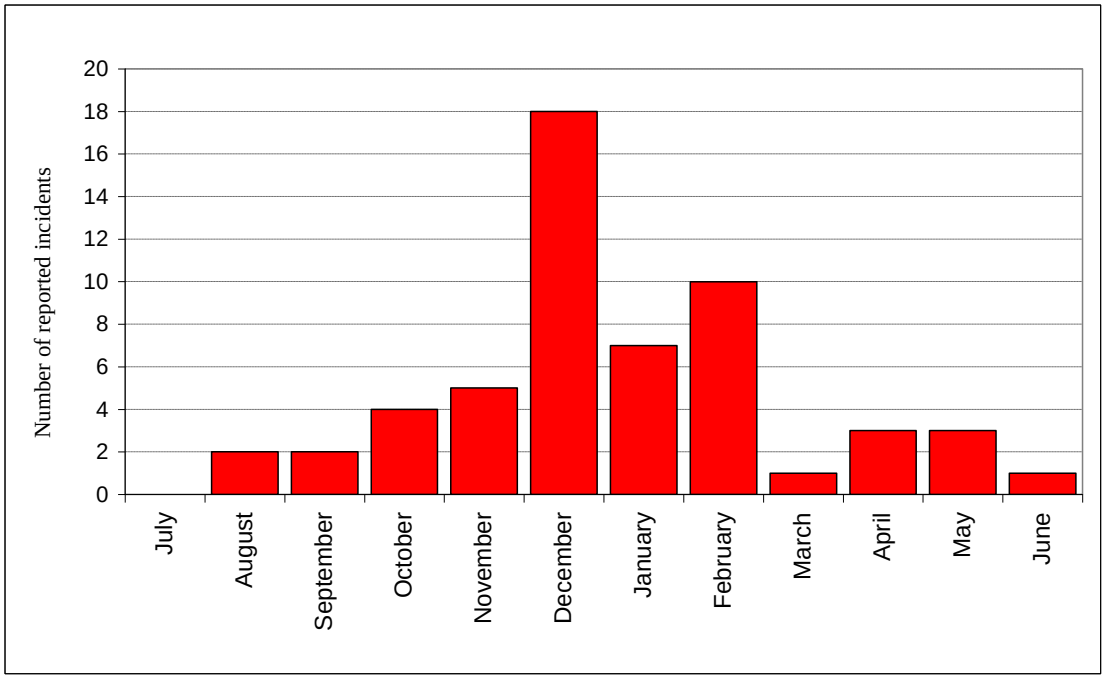


**Figure 1 Monthly incident numbers**

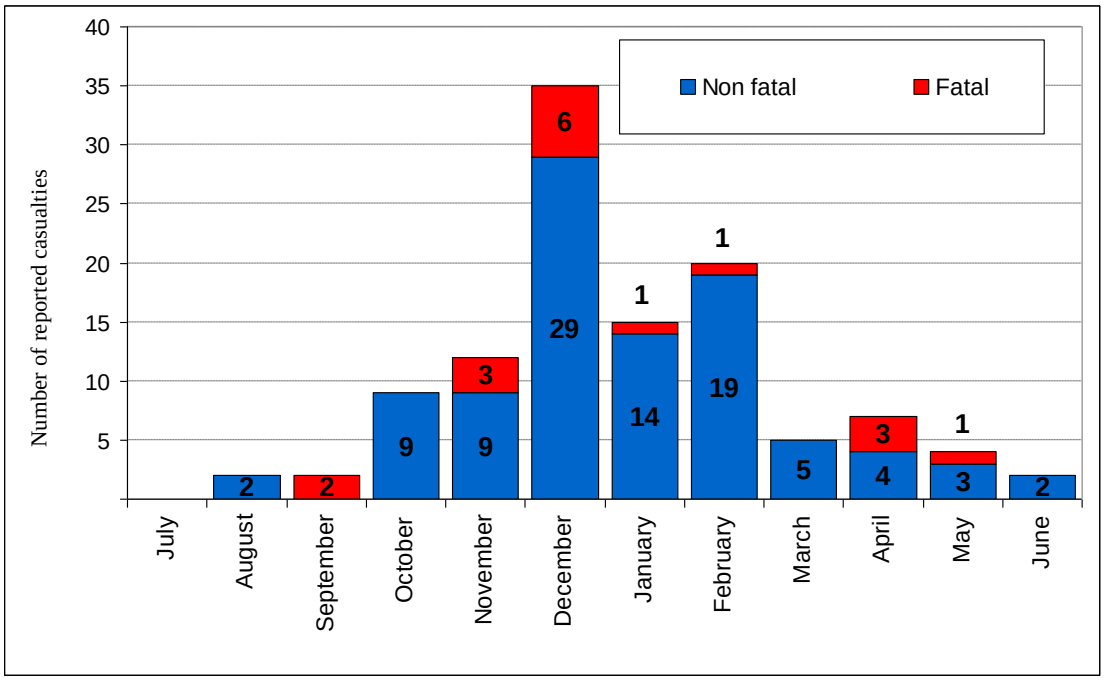


**Figure 2 Monthly casualty numbers**

Figures 1 and 2 show that fatal and non-fatal incidents showed a similar seasonal variation.



*Funded by:*
CORGI TRUST

From the 1st July 2008 to 30th June 2009 there were 56 separate incidents classified as accidental CO poisoning. These were related to the use of natural gas in the home and affected 113 people, of whom 17 died. At the time of writing, provisional estimates by the HSE for April 2008 to March 2009 had not been published, but after discussions with the HSE it was established that three fatal incidents had not been reported via DIDR forms. These cases are listed in Table 1 and are included in the incident statistics in the main body of the report.

**Table 1 Fatal incidents not reported on a DIDR form**

| Postal sector | Date of incident | Details | Source |
|---|---|---|---|
| TN6 | 18/1/2009 | One male death | HSE |
| E10 | 20/4/2009 | Elderly couple died | Press cutting; suspected boiler problem; falls within 2009/10 HSE reporting period. |
| TA6 | 24/9/2008 | 53 year old man | HSE still investigating; suspected cause cooker |

## 2.3 Casualty Details - Section 2 of DIDR

A breakdown of those persons (96) reported to Downstream Gas as having been injured but not killed in CO incidents associated with the use of piped natural gas in the home during the reporting period 2008/09 is presented in Table 2 and in Figure 3, with the severity of the casualties classified into four groups.

**Table 2 Classification of non-fatalities**

| *Classification* | *N1* | *N2* | *N3* | *N4* | *Not stated* | *Total* |
|---|---|---|---|---|---|---|
| Number of casualties | 7 | 61 | 4 | 15 | 9 | 96 |

*Table Notes:*
*The classifications N1 to N4, as used on the DIDR form, are:-*

*N1 - requiring immediate hospitalisation for more than 24 hours*
*N2 - requiring immediate hospitalisation for less than 24 hours, and/or hospital tests*
*N3 - requiring other medical treatment (e.g. GP or Paramedic)*
*N4 - receiving no medical treatment (e.g. treatment refused)*



*Funded by:*
CORGI TRUST

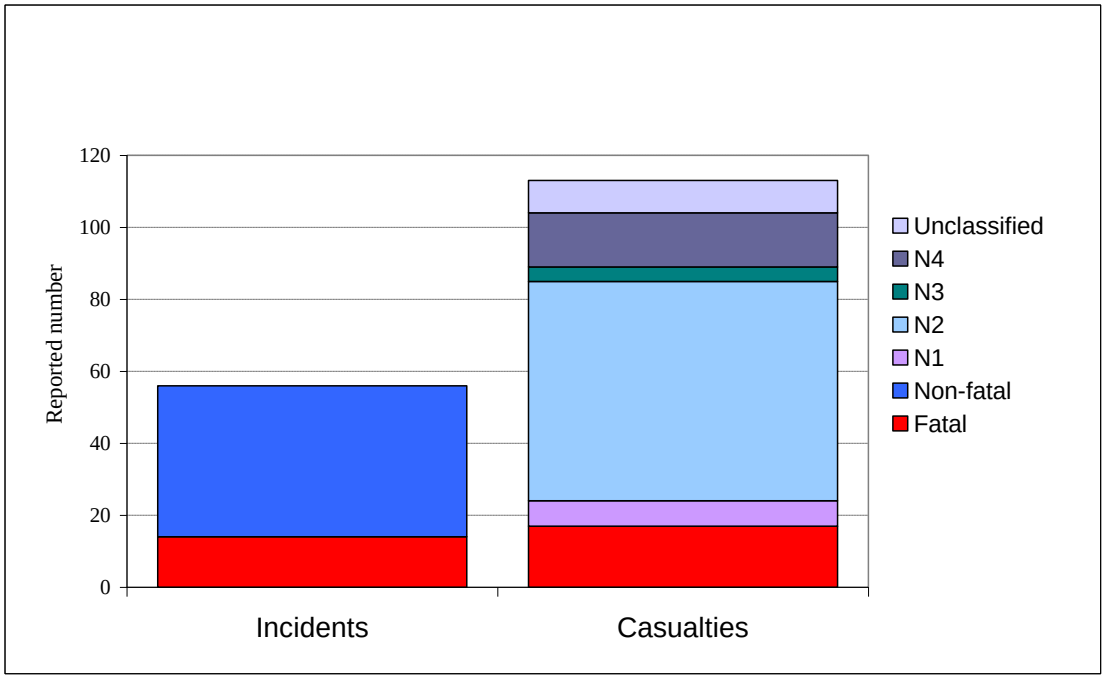


**Figure 3 Reported Incident and casualty numbers**

Last year there were no “casualties” categorised as N3 and N4. This year a quarter of the casualties reported were classified as N3 or N4, which may suggest an increased reporting rate.

Figure 3 shows the number of incidents and casualties that were notified during the 12 month reporting period. Using the data for the 12 months commencing on 1st July 2008 and the estimated number of exposed people for December 2008, a corresponding incident, casualty and fatality rate has been determined (Table 3).

The risk values in Table 3 were calculated by dividing the number of incidents, casualties or deaths by the number of people at risk. The exact number of people potentially at risk is open to interpretation. It could be argued that anyone in the vicinity of a gas appliance is potentially at risk and so could include visitors from home or overseas as well as residents. Including visitors would increase the number of people temporarily at risk. Conversely, it could be argued that residents who have a gas appliance and who are visiting a home without a gas appliance are temporarily not at the risk or indeed overseas, decreasing the number of people at risk. It was therefore concluded that for this report, the number of people at risk is taken to be the number of people that live in homes with at least one gas appliance (i.e. the number of households supplied with mains gas multiplied by the average number of people living in a household).



*Funded by:*
CORGI TRUST

The tabulated data above uses the following information:

**a)** The number of households using mains natural gas for December 2008 is 22.9 million. This was estimated from a projection of December 2007 (22.4 million) and March 2006 (21.6 million)[2] figures.

**b)** The average number of people per household in Great Britain for mid 2008 is 2.42 [3] (the latest available figures). As in previous reports this assumes the number of people per household with at least one gas appliance is the same as that for the whole population.

**Table 3 CO incident numbers and rates for 1st July 2008 to 30th June 2009**

| ***Total*** | ***Numbers of people affected*** | | ***Incidents, deaths or casualties per million people at risk per year*** | | |
|---|---|---|---|---|---|
| ***Incidents*** | ***Fatal*** | ***Non-fatal*** | ***Incident*** | ***Fatality*** | ***Non-fatal*** |
| 56 | 17 | 96 | 1.01 | 0.31 | 1.73 |

The risk values for the 12 years previously reported are given in Table 4 and include the seven cases notified after the completion of the 2007/8 report. Yearly trends recorded in fatality and incident rates are also shown in Figures 4 and 5. The trend is a moving average over three years centred on the middle year.

**Table 4 Yearly data (July 1st to June 30th)**

| ***Reporting year*** | ***Number*** | | | ***Overall rate per million people per year*** | | |
|---|---|---|---|---|---|---|
| | ***Incidents*** | ***Fatalities*** | ***Casualties*** | ***Incidents*** | ***Fatalities*** | ***Casualties*** |
| ***96/97*** | 75 | 21 | 176 | 1.63 | 0.46 | 3.83 |
| ***97/98*** | 93 | 24 | 198 | 2.04 | 0.53 | 4.35 |
| ***98/99*** | 108 | 24 | 237 | 2.30 | 0.51 | 5.05 |
| ***99/00*** | 69 | 23 | 147 | 1.52 | 0.51 | 3.24 |
| ***00/01*** | 85 | 17 | 193 | 1.87 | 0.37 | 4.25 |
| ***01/02*** | 53 | 11 | 108 | 1.14 | 0.24 | 2.32 |
| ***02/03*** | 35 | 11 | 60 | 0.73 | 0.23 | 1.25 |
| ***03/04*** | 38 | 8 | 85 | 0.81 | 0.17 | 1.82 |
| ***04/05*** | 27 | 7 | 48 | 0.57 | 0.15 | 1.01 |
| ***05/06*** | 18 | 11 | 20 | 0.38 | 0.23 | 0.42 |
| ***06/07*** | 29 | 7 | 60 | 0.59 | 0.14 | 1.22 |
| ***07/08*** | 43 | 12 | 68 | 0.81 | 0.23 | 1.28 |
| ***08/09*** | 56 | 17 | 96 | 1.01 | 0.31 | 1.73 |

[2] Page 42 ref 2 and page 37 ref 3
[3] 60.4 million people in GB (mid 2008 ref 4) ÷ 25 million households in GB Q2 2008 (table 2.1 ref 5)



*Funded by:*
CORGI TRUST

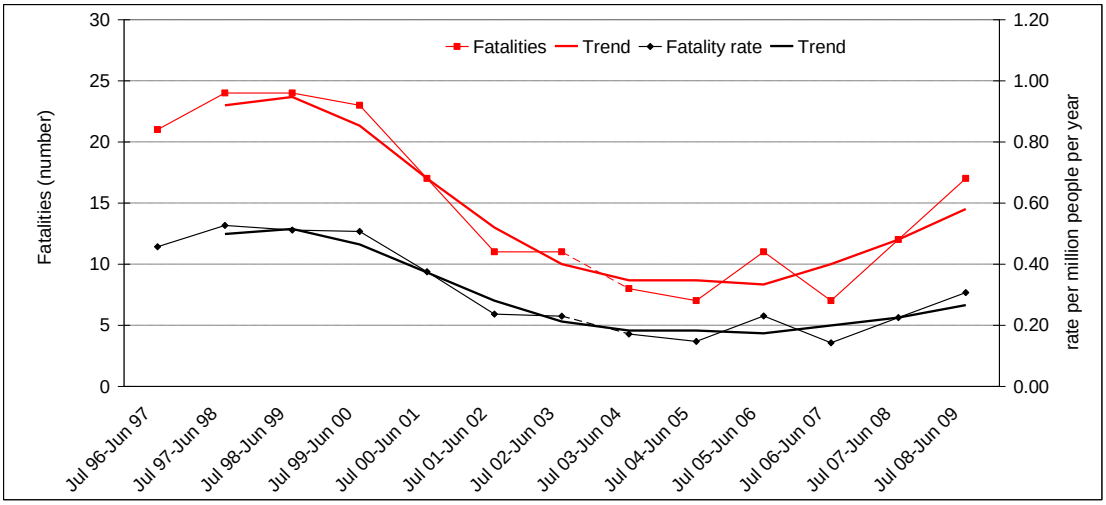


**Figure 4 Fatality trends**

The overall fatality count averaged nearly 25 per year for the year commencing on the 1st July in 1997, 1998 and 1999. After that it declines quickly to 10 per year, perhaps due to nationwide measures introduced such as the new gas safety responsibility placed on Landlords and the introduction of minimum efficiency limits on new boilers encouraging the update to room sealed appliances from 1998. The downward trend levelled in the following years but over the last two years has increased reaching its highest since 2001.

Discounting the current year (08/09), the average number of fatalities per year since 2001/2 has been 10. A Poisson distribution of a mean of 10 counts per year has an expected yearly variation of between 4 and 17 deaths (inclusive) per year, in 19 out of 20 years. The 17 fatalities recorded this year may be due to ill fortune or signs of a new risk may be emerging because 17 is exactly on the significant limit (alternatively 17 can be expressed as the expected count to occur once in 18 years). This is discussed further in part 3.8.

The rate of accidental CO fatalities that were related to the use of natural gas has similarly decreased to around 0.2 fatalities per million people per year, but worryingly increased in the last two years to near 2001 levels. Nevertheless, the rate remains below 1 fatality per million people at risk per year which the HSE tends to take as the maximum figure for an acceptable level of risk.



*Funded by:*
CORGI TRUST

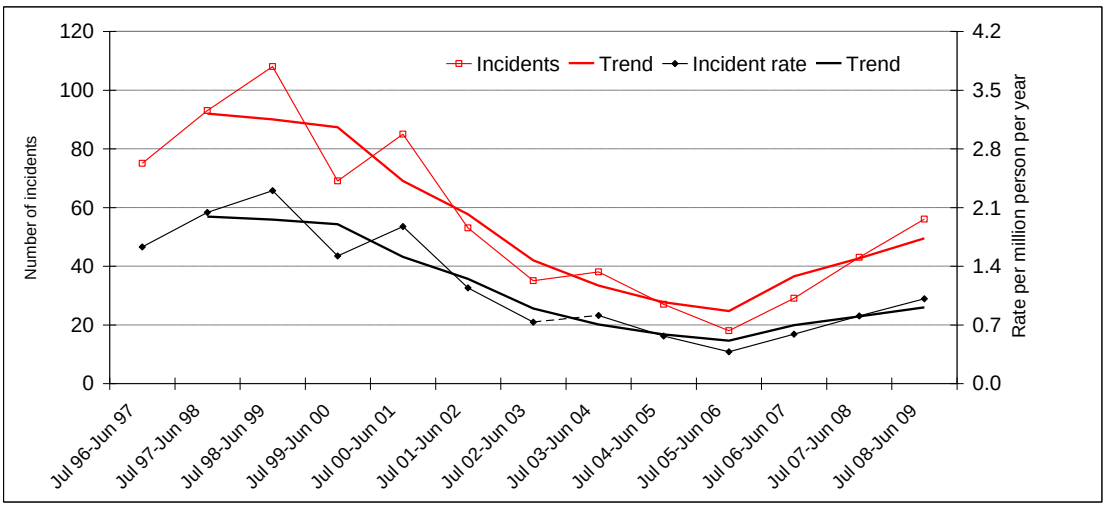


**Figure 5 Incident trends**

The *trend* in the yearly number of incidents (fatal or non-fatal) has declined considerably since 1997 from just under a 100. The minimum number reached was 18 incidents per year for 2005/6. There has since, however, been a noticeable increase in the last three reported years which is a cause for concern, with 56 incidents reported during the year 2008/9.

Discounting the current year (08/09), the average since 2001/2 has been 35 incidents per year. If incidents were distributed with a Poisson distribution of mean 35 per year, a reasonable assumption for independent event data like accidents, the expected yearly variation due to chance alone would be between 24 and 48 (inclusive) in 19 out of 20 years[4]. The current count of 56 reported incidents is outside this range and so it is concluded that this is not part of the normal yearly variation, and as such is a cause for concern. This is discussed more in part 3.8.

### 2.3.1 Casualty ages

The number of people affected fatally and non-fatally by age band is given in Figures 6 and 7 respectively. The groups in Figures 6 and 7 have been deliberately chosen to reduce the number of ranges but still represent groups with perceived differing vulnerabilities and potential for exposure to CO.

The expected number of incidents by age group is also shown in Figures 6 and 7. The expected number is the percentage of ages resident in GB in mid 2008 (the latest available figures) obtained from the Office for National Statistics (ONS)[5] multiplied by the total number of casualties with an age recorded. In effect, the expected number is the average number that would occur if all ages were equally susceptible to and exposed to the same risk.

[4] Poisson Cumulative distribution function Table, page 30 ref 6
[5] 18.7%, 12.1%, 53.0%, 16.2% respectively ref 4



*Funded by:*
CORGI TRUST

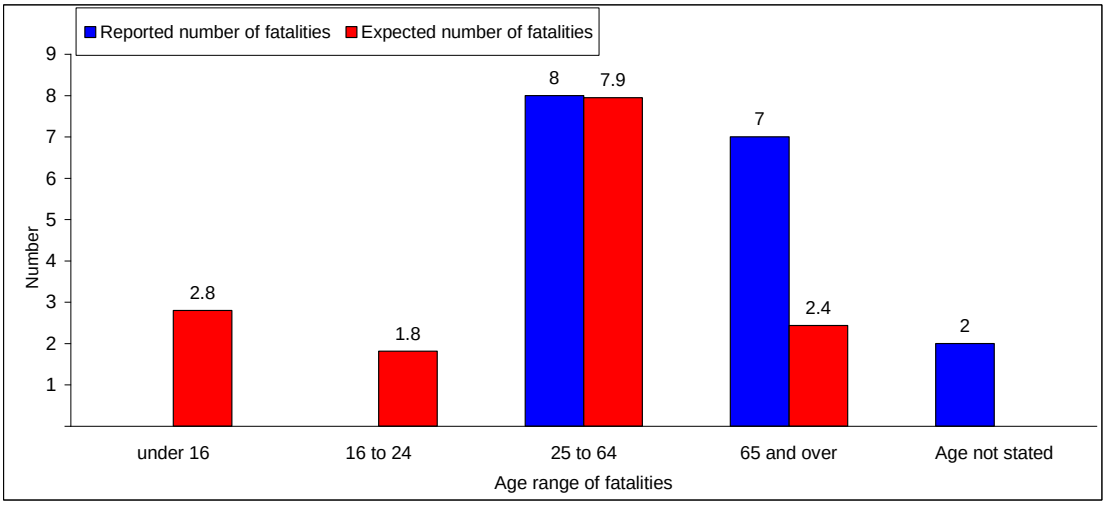


**Figure 6 Fatality age profile**

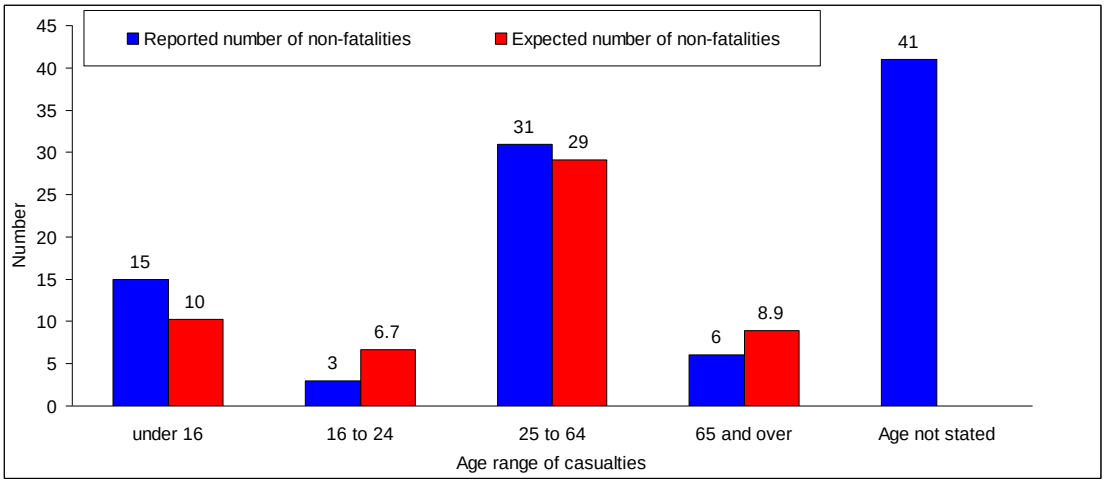


**Figure 7 Casualty age profile**

From Figure 7 it is evident that there are only minor differences between the age profiles of non-fatalities. Indeed, a statistical Chi-squared test shows that the reported distribution is not significantly different to that which would be expected by chance alone from the age distribution of the general population.

There were no reported fatalities for those under 25, which is less than that expected by age profile alone (probability of 0.4%), suggesting they are at less risk of death from carbon monoxide exposure than those aged 25 years and above. The same result occurred last year. To achieve a larger sample size figures for 2007/8 and 2008/9 were combined where 24 deaths were recorded where the aged was noted. 30% of the population are under 25. It would be expected if the number of fatalities followed the population age distribution alone, that the number of deaths in the under 25 age group would be 7 (i.e. 30% of 24) but in fact there were none. This is highly statistically significant and therefore it is concluded that there is less risk of a child or a young adult (under 25) dying from CO poisoning than an adult aged in the range 25 to 64. The numbers are too small to quantify reliably by how much.

The number of deaths reported amongst the 65 and over age group was higher than would be expected from the age profile alone. This is again is very statistically significant to 0.5% (that is given the population age distribution and each age is equally likely to be affected, then there is only 0.5% probability of reported number of



*Funded by:*
CORGI TRUST

deaths among 65 years would arise by chance alone). It is concluded that a person aged 65 years of over is at 50% more at risk of dying from carbon monoxide than an adult aged 25-64.

The number of non-fatal casualties is not statistically significantly different from those anticipated by the age profile alone according to a Chi-squared test. However, this is an unreliable conclusion, as 41 casualties out of the 96 were of unknown age,

## 2.4 Incident Location Details - Section 3 of DIDR

Column A of Table 5 shows the percentage of properties in Great Britain by dwelling form or type. Averaging Column B shows that in England, 83.4% of properties had gas as the main heating fuel. Assuming the English percentages are similar to Great Britain as a whole, which is a reasonable assumption, the final column shows the percentage of gas properties in Great Britain by dwelling form or type.

**Table 5 Estimated national breakdown by housing tenure**

| | ***% of gas and non-gas properties by type in GB[6]*** | ***% of properties in England[7] that have gas as the main heating fuel*** | ***% of gas properties by type in GB*** |
|---|---|---|---|
| | Column A | Column B | A x B ÷ Total(A x B) |
| ***Owned*** | 72% | 87% | 73% |
| ***Rented Privately*** | 9% | 77% | 8% |
| ***Council rented*** | 11% | 88% | 11% |
| ***Registered Social Landlords*** | 8% | 82% | 8% |
| ***ALL*** | 100% | 83.4% | 100% |

Figure 8 shows the number of reported and expected incidents by accommodation type. The number expected is the national proportion by accommodation tenure (last column of Table 5) multiplied by the total number of reported incidents of known tenure.

In Figure 8, the only substantial difference between the reported and anticipated incidents is for the number of privately rented homes: 7 are reported whilst only 3 are expected based on the national profile. A binomial statistical test assuming privately rented households are equally at risk to those that are not privately rented, reveals the probability of 7 or more incidents occurring by chance alone in privately rented accommodation is only 2%. This is less than the usual 5% level of significance and so it is concluded that people in privately rented homes have risk of 2.8 times[8] that of other tenure types, including other rented options, of a CO incident.

[6] Table 4.5 ref 7
[7] Table SST6.1, ref 8
[8] If a and c are the reported and expected number for privately rented and b and d are expected and reported number for not privately rented then the relative risk is (a x d)÷(c x b)



*Funded by:*
CORGI TRUST

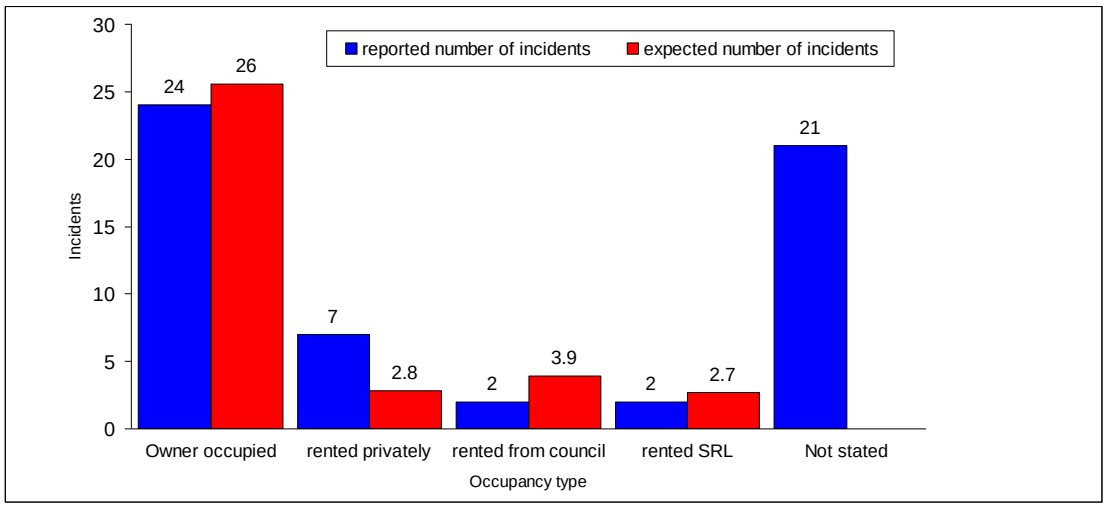


**Figure 8 Incidents by accommodation type**

Column A of Table 6 shows the percentage of properties in England by dwelling form or type. Column B shows in England that 84.3% of detached homes, for example, had gas as the main heating fuel. The final column shows the percentage of gas properties in England by dwelling form.

Figure 9 provides a breakdown of incidents by dwelling type and the expected number based on the national profile, if an incident in a particular type of dwelling were as equally likely as in another type. The reported numbers of incidents by dwelling type are similar to the proportion of properties supplied with gas by dwelling type (Table 6 final column) and so it is concluded that there is no noticeable increase in risk associated with dwelling form.



*Funded by:*
CORGI TRUST

**Table 6 Estimated national breakdown by dwelling form**

| | *% of gas and non-gas properties by type in England*[9] | *% of properties in England*[10] *that have gas the main heating fuel* | *% of gas properties by type in England* |
|---|---|---|---|
| | Column A | Column B | A x B ÷ Total(A x B) |
| ***Detached*** | 18% | 84.3% | 17.7% |
| ***Semi*** | 28% | 90.7% | 29.3% |
| ***Terrace*** | 28% | 91.7% | 30.3% |
| ***Bungalow*** | 9% | 80.9% | 9.0% |
| ***Flats purpose built*** | 14% | 67.5% | 10.8% |
| ***Flats converted*** | 3% | 71.6% | 2.9% |
| ***Total*** | 100% | | 100% |

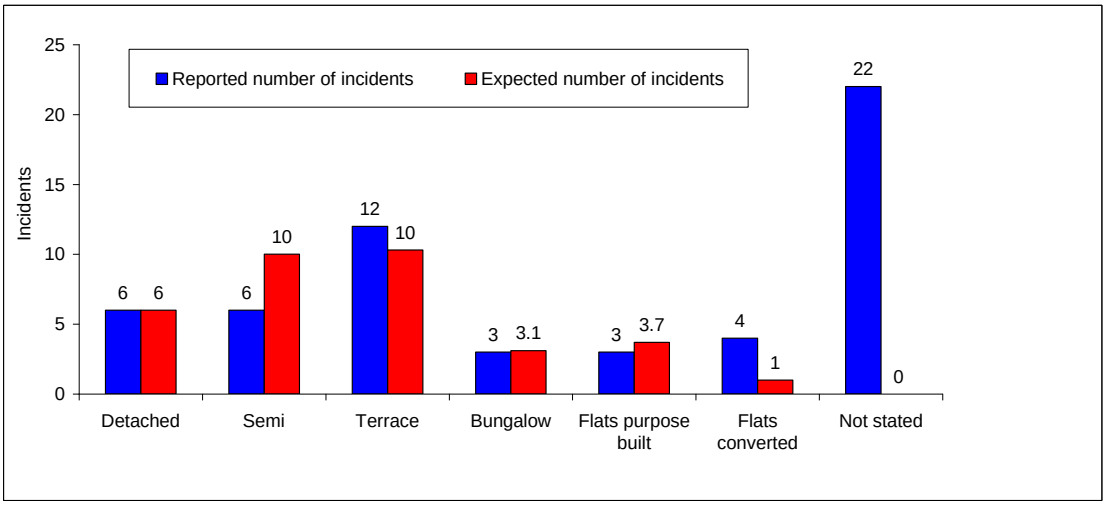


**Figure 9 Incidents by dwelling type**

[9] Table SST6.1, ref 8
[10] Table SST6.1, ref 8



*Funded by:*
CORGI TRUST

Figure 10 shows the reported number and expected number of incidents by property construction period, based on the estimated national profile of the four age periods on the DIDR form (see Table 7) assuming all construction periods pose equal risk.

**Table 7 Estimated national breakdown by property construction period**

| | *% of English gas and non-gas properties by built era*[11] | *% of English properties that have gas as the main heating fuel*[12] | *% of gas properties by built era in England* |
|---|---|---|---|
| ***Built era*** | Column A | Column B | A x B ÷ Total(A x B) |
| ***Pre 1946*** | 38.9% | 86.8% | 39.1% |
| ***1945 to 1965*** | 19.6% | 89.3% | 20.4% |
| ***1966 to 1980*** | 21.7% | 84.5% | 21.4% |
| ***Post 1980*** | 19.9% | 81.9% | 19.1% |
| ***Total*** | 100% | | 100% |

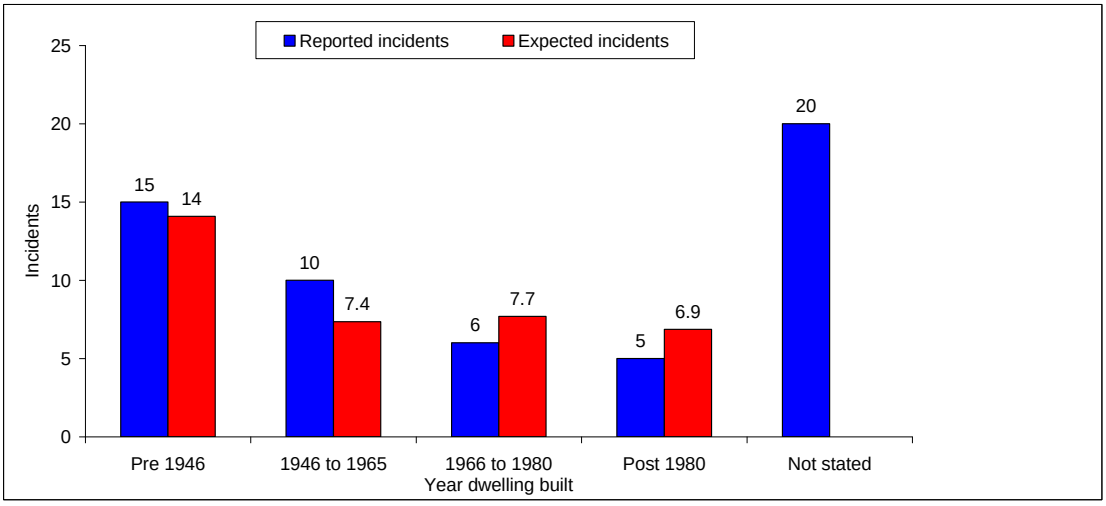


**Figure 10 Property construction period**

Figure 10 shows, proportionately, a similar number of reported incidents in older properties compared to newer properties. This is confirmed using a Chi-square test. It is concluded that the risk of an incident was not significantly affected by property age. This contrasts to last year where the risk was 50% more in a pre-1946 property compared to post-1945 property.

The estimated national proportion of properties by glazing type was obtained[13]. Figure 11 compares the number of reported incidents with those expected from the national breakdown. There are some differences between the expected and reported numbers but these are not statistically significant.

[11] Table SST6.1, ref 8
[12] Table SST6.1, ref 8
[13] Glazing mix: 11.4% single, 21.7% mixed and 66.9% double in England in 2006: Table SST6.5, ref 8



*Funded by:*
CORGI TRUST

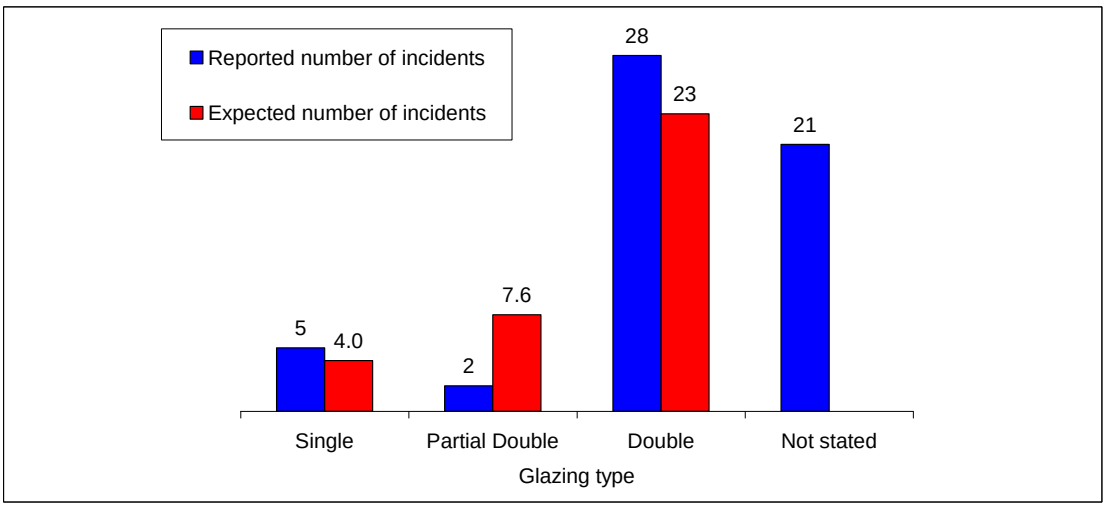


**Figure 11 Glazing details**

The following table shows the incidents reported by ground floor construction type. National statistics on floor construction are not readily available; however, an approximate estimate in England based on property age is that 30% have suspended floor construction[14]. If this were the case, the expected number of incidents in properties with a suspended floor construction would be 9. In fact, there were 12 reported, although this is a higher number it is not statistically significant.

**Table 8 Incidents by floor constructions**

| ***Ground floor construction*** | ***Reported number of incidents*** |
|---|---|
| Solid | 18 |
| Suspended | 12 |
| Partial solid | 3 |
| Not stated | 23 |
| **Total** | **56** |

## 2.5 Casualty & Appliance Location - Section 4 of DIDR

For those cases where an incident appliance was specified, all but one reported a single incident appliance to be involved. The exception noted two incident appliances which were a room heater and a cooker. In the analysis the cooker has been neglected as details of faults were only indicated for the room heater.

Details of incident appliance locations, by floor level, are given in Table 9.

[14] This assumes dwellings built before 1929 are suspended floors and those after are solid floor, which is reasonable for England and Wales. Scotland has different historic practices.



*Funded by:*
CORGI TRUST

**Table 9 Location of the reported incident appliances**

| *Floor on which the appliance was situated* | *Number of incident appliances* |
|---|---|
| ***Roof space*** | 1 |
| ***Fourth*** | 1 |
| ***Third*** | 2 |
| ***Second*** | 2 |
| ***First*** | 3 |
| ***Ground*** | 25 |
| ***Below ground*** | 2 |
| ***Not stated*** | 20 |

The most common location for an incident appliance was the kitchen followed by the living room and hall/landing. However, without data on the nationwide breakdown of appliance installations by room, it is not possible to judge the significance, if any, of the incident appliance locations (see Table 10).

**Table 10 Appliance and casualty locations**

| | *Number of appliances at each location* | *Number of casualties at each location* | *Number affected where the occupants were in the same room as the appliance* | |
|---|---|---|---|---|
| | | | ***Fatal*** | ***Non-fatal*** |
| ***Landing/hall*** | 5 | 3 | 0 | 0 |
| ***Kitchen*** | 13 | 6 | 0 | 0 |
| ***Living rooms*** | 7 | 6 | 2 | 0 |
| ***Bathroom*** | 0 | 3 | 0 | 0 |
| ***Utility*** | 2 | 2 | 0 | 0 |
| ***Other*** | 6 | 0 | 0 | 0 |
| ***Bedroom*** | 2 | 22 | 0 | 6 |
| ***Not stated*** | 21 | 54 | | |

The most common location of casualties was the bedroom, followed by living rooms, kitchen and bathroom. This is not surprising given that people probably spend most time in the bedroom, followed by the living room and kitchen. Indeed, someone may go to bed when feeling ill from the symptoms of CO poisoning, thinking they were suffering from an ailment such as influenza.

Only 8 of the casualties were reported to have fallen victim to CO poisoning whilst in the same room as the suspected appliance.



*Funded by:*
CORGI TRUST

A further breakdown concerned the number of incident appliances fitted in compartments. There were 12 incidents reported that involved appliances in compartments, out of a total 35 where the necessary details were recorded. This is presented in Figure 12. However, without knowledge of the number of appliances in the general population that are installed in compartments, it is not possible to gauge the significance or otherwise of these numbers. Last year a similar proportion of 11 in 29 of the detailed reported incidents involved appliances in compartments.

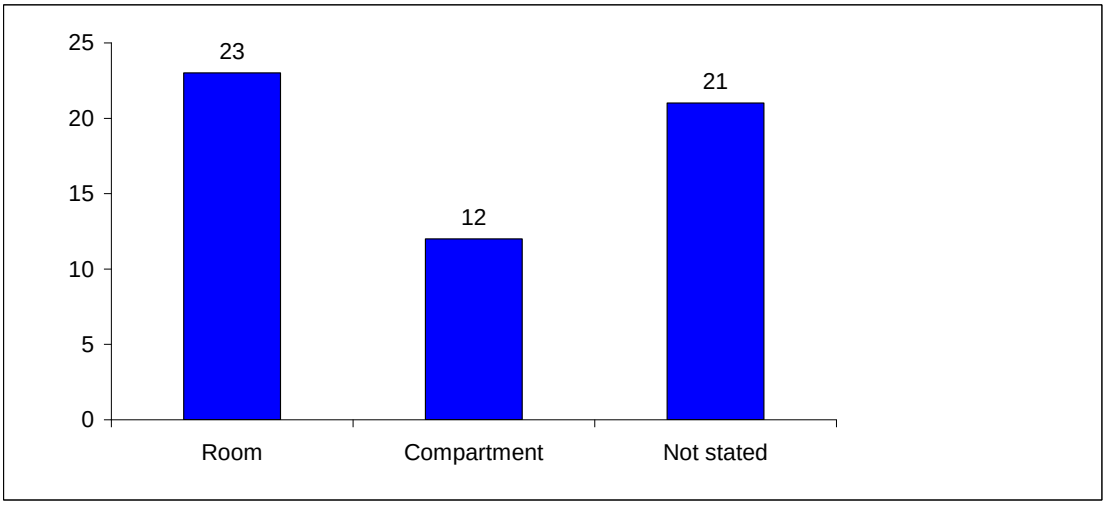


**Figure 12 Appliance compartment incident numbers**

The casualties were located within the same property as the incident appliance in all but one case. The exception was an incident appliance that was located in the flat below.

## 2.6 Incident Appliance Details - Section 5 of DIDR

### 2.6.1 Incidents details

Details of incidents classified by appliance type are given in Figure 13.

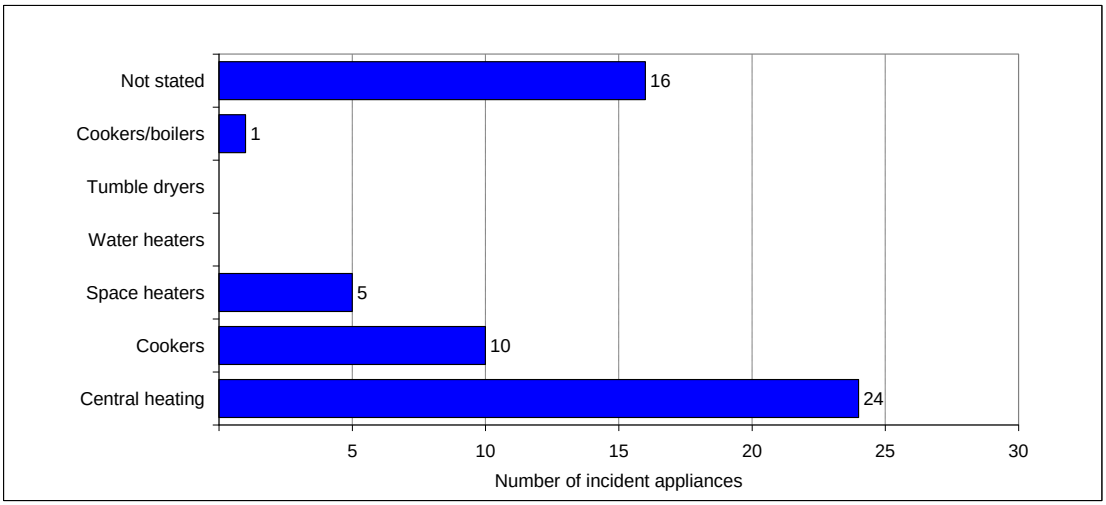


**Figure 13 Incidents by appliance type**



*Funded by:*
CORGI TRUST

As expected, most reported incidents of known type (24 out of 40) were associated with central heating appliances, two of which were warm air heaters. This is as expected given the prevalence of central heating appliances nationwide, their larger heat output, and the fact that they tend to operate for longer periods.

There was only one incident reported with a cooker last year. This year there were 10 incidents with cookers and one with a cooker-boiler.

The incident numbers related to the known 25 incidents involving central heating appliances or cooker/boilers are further broken down in Figure 14.

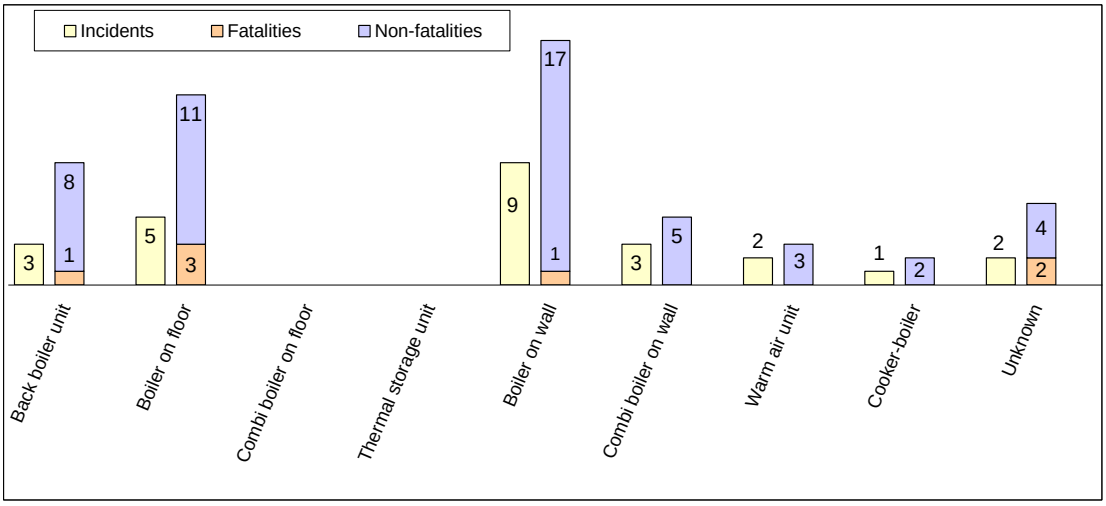


**Figure 14 Incidents by central heating type**

Table 11 shows the estimated boiler population during April 2007 and that projected forward 19 months to the middle of the current reporting period of July 2008 to June 2009 using annual boiler sales in England of 1.35 million[15], apportioned 2:1 between condensing combi boilers and condensing regular boilers.

**Table 11 : Projected boiler populations by type (England, Dec 2008)**

| | *April 2007* | | | *December 2008* | |
|---|---|---|---|---|---|
| | *% of all dwellings by type boiler [16]* | *Number, millions* | *Number Sold from April 2007 to Dec 2008, millions* | *Number, millions* | *% of dwellings with boilers* |
| ***Data Source:*** | ***English housing survey 2007*** | | ***Heating and Hot Water Industry Council*** | ***Projected forward*** | |
| ***Boiler type*** | | | | | |
| ***regular*** | 39.6% | 8.5 | <0.07 | 7.73 | 41.0% |
| ***back boiler*** | 8.8% | 1.9 | <0.07 | 1.88 | 10.0% |
| ***Combination*** | 28.3% | 6.1 | <0.07 | 4.55 | 24.1% |
| ***condensing-regular*** | 3.1% | 0.7 | 0.71 | 1.37 | 7.3% |
| ***condensing-combi*** | 8.3% | 1.8 | 1.43 | 3.21 | 17.0% |

[15] 1.6 million sales in the UK (SBGI) x 21.9 dwellings in England / 25.9 dwellings in GB , page 144, ref 5
[16] SST6.1, Ref 8, (11.9% do not have boiler).



*Funded by:*
CORGI TRUST

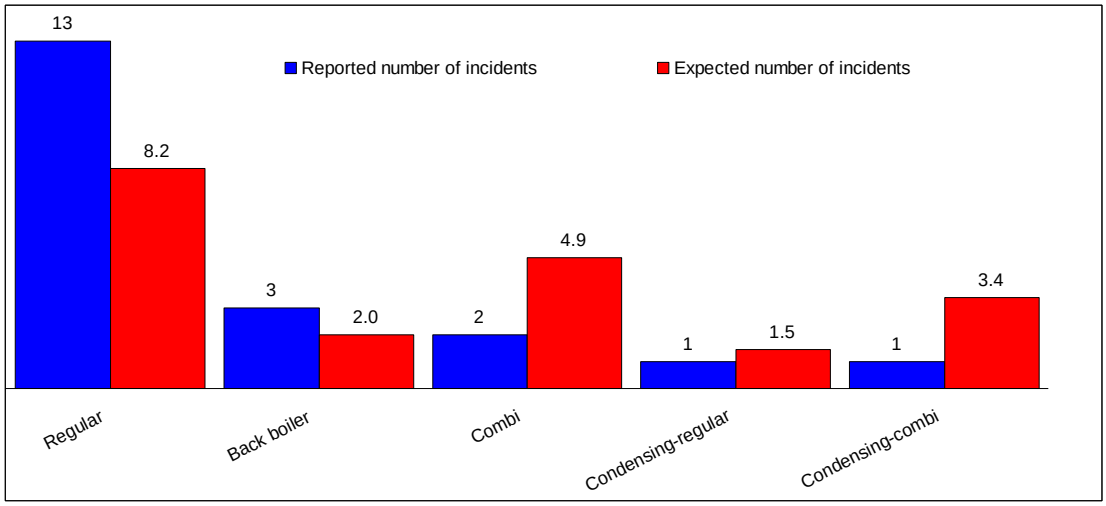


**Figure 15 Reported and expected incidents by boiler type**

Figure 15 compares the 20 reported number of CO incidents with a known boiler type with those expected given the prevalence of boiler type in the general population. The expected number is the total number of incidents reported with a known boiler type multiplied by the percentage breakdown of boiler types in the general population. The reported and expected numbers are fairly similar. The expected numbers in at least 20% of the categories are too few (less than five) to a carry out a Chi-square test, so this cannot be confirmed or refuted.

For the second year running, there are some (2) reported incidents involving what are generally considered to be safer condensing boilers (all room sealed). This is considered to be a reflection of the rapid increase in the condensing boiler market (over 97% of sales) due to energy efficiency legislation introduced in April 2005. If an incident involving a condensing boiler and a non-condensing boiler were equally likely, it would be expected, based on the estimated condensing boiler population, that 4 out of 19 incidents would involve condensing boilers. In fact, the number reported was 2. Comparing the number of incidents reported with those expected to be associated with condensing boilers as opposed to non-condensing boilers reveals there were fewer reported involving condensing boilers. However, this is not significantly less statistically[17], so there is insufficient evidence to challenge the suggestion that incidents with condensing boilers are equally likely as non-condensing boilers.

The two condensing boiler incidents were reported as having been caused by factors not unique to condensing boilers as follows:

- the flue becoming separated from the appliance casing
- the flue being wrongly installed in a covered passageway and when the passageway was damaged by water, it allowed fumes to enter the properties.

[17] The chance of only 2 or less incidents out 19 involving condensing boilers is 11%, well above the usual 5% significant level, so not statistically significant.



*Funded by:*
CORGI TRUST

Figure 16 shows the reported and expected incident numbers for the boilers of known age. The expected number is based on the age profile from the 2006/7 annual incident report which will be a reasonable approximate for the January 2009 profile.[18] The reported number is higher than expected number for boilers greater than 20 years old, similar in the range 6 to 20 years and less than expected in the newest age range (less than 6 years old). Expected numbers are too few in 20% of the groups, however, to determine statistical significance using the Chi-squared test across the age groups. Neverthless, with fewer incidents than expected linked with newer boilers and more than expected linked with older boilers, there is some evidence that suggests boilers over 20 years old are more of a liability than newer boilers (less than six years old).

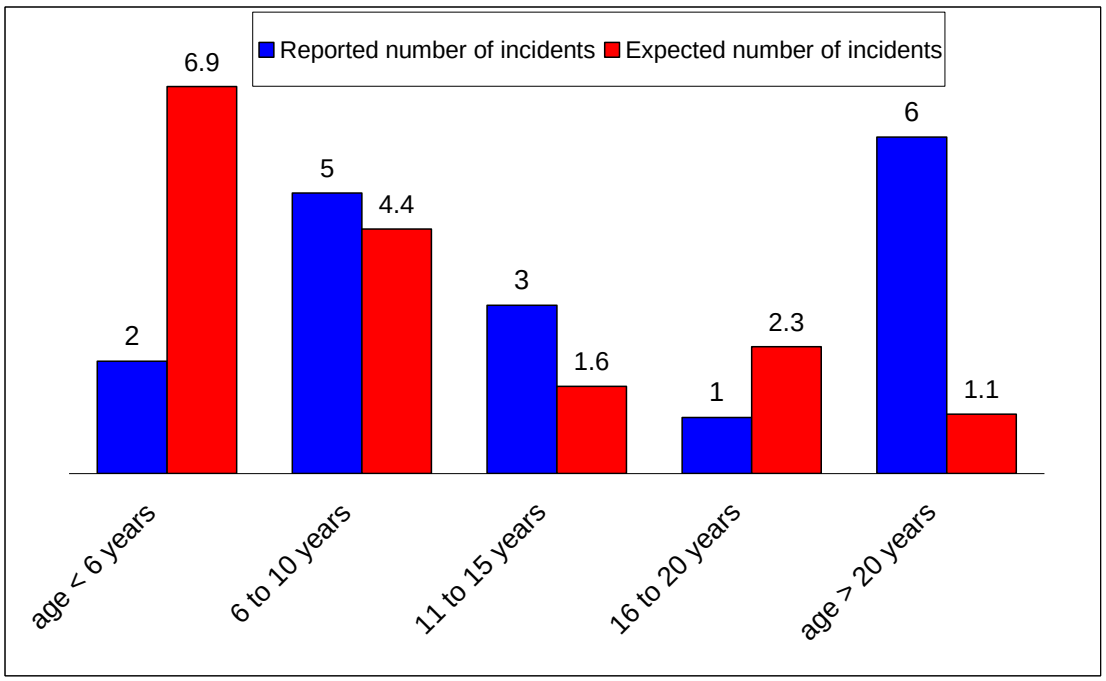


**Figure 16 Incidents by boiler age**

**Table 12 Incident numbers by appliance age**

| ***Appliance Type*** | ***Age (years)*** | | | | | |
|---|---|---|---|---|---|---|
| | ***0 - 5*** | ***6 - 10*** | ***11 - 15*** | ***16 - 20*** | ***Over 20*** | ***Unknown*** |
| Cookers | 4 | 0 | 0 | 0 | 1 | 5 |
| Other | 1 | 0 | 0 | 0 | 0 | 1 |
| Space Heaters | 1 | 0 | 1 | 0 | 0 | 3 |
| Central Heating | 2 | 5 | 3 | 1 | 6 | 7 |
| Water Heaters | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total** | 8 | 5 | 4 | 1 | 7 | 16 |

[18] Appendix E, ref 1



*Funded by:*
CORGI TRUST

Figure 17 shows the yearly fatality numbers associated by appliance type since 1996. It shows the main difference between incidents in 08/09 and 07/08 is the higher number involving cookers. In fact, seven in a single year is the highest number recorded since 1996; the start of DIDR process. Over the last seven years the number of fatalities due to cookers has averaged 1 per year. The numbers are expected to vary year by year due to chance; some years accident numbers will be higher and some years lower. The extent of this year-by-year variation for accident type data usually follows a Poisson distribution. Therefore, the chances of 7 or more occurring in a single year is very small (less than 0.1%), assuming a Poisson distribution. The seven deaths linked to cookers this year are statistically different than previous years strongly suggesting a new risk factor is involved. The fact that, at least 4 out of 10 of the reported cooker incidents, fatal or non-fatal, involve newer cookers (5 years old or less) supports the suggestion of a new risk factor.

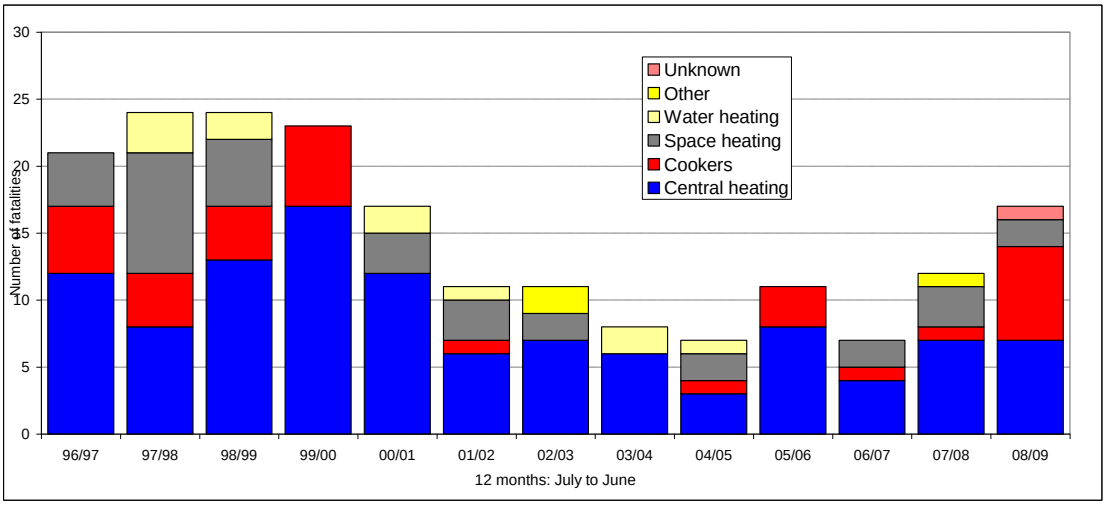


**Figure 17 Fatalities by appliance type**



*Funded by:*
CORGI TRUST

For 2008/9, the population estimate for gas households in Great Britain is 21.5 million[19]. Some of these will not have central heating (about 4.2% will have no boiler) leaving an estimated total of 20.6 million with central heating. This compares with the 22.9 million domestic natural gas customers projected from OFGEM figures (see paragraph prior to Table 3, part 2.3).

Using 20.6 million as the number of homes with gas central heating (49.9 million people), an estimate of the range of the incident rates related to gas boilers can be derived (see Table 13). Ranges are estimated as assumptions about the unknown incident appliances have to be made.

**Table 13 Incident data for central heating (July 1st 2008 to June 30th 2009)**

| | ***July 1st 2008 to June 30th 2009*** | | |
|---|---|---|---|
| ***Central heating appliance*** | ***Incidents*** | ***Deaths*** | ***Non-fatalities*** |
| CO related incidents including 16 incidents with unknown appliances which had 1 fatality and 31 non-fatalities | 40 | 8 | 79 |
| CO related incidents excluded unknowns | 24 | 7 | 48 |
| Rate per million people per year (including unknowns) | 0.80 | 0.16 | 1.6 |
| Rate per million people per year (excluding unknowns) | 0.48 | 0.14 | 0.96 |

[19] 85.9% x 25m; (25.0 million households in GB 2008 table 2.1 ref 5) which is similar to Scotland, where 88% are on the gas grid, table 6, ref 9.



*Funded by:*
CORGI TRUST

Using the estimated population[20] of 13.4 million gas hobs (including those on free standing cookers) and 9.0 million free standing gas cookers, an estimated of range of associated risk with any gas cooking appliance and a free standing cooker can be established (Table 14). Ranges are estimated as assumptions about the unknown incident appliances have to be made.

**Table 14 Incident data for cookers (July 1st 2008 to June 30th 2009)**

| | ***July 1st 2008 to June 30th 2009*** | | |
|---|---|---|---|
| | ***Incidents*** | ***Deaths*** | ***Non-fatalities*** |
| ***Any gas cooking appliance*** | | | |
| CO related incidents including 16 incidents with unknown appliances which had 1 fatality and 31 non- fatalities | 26 | 8 | 41 |
| CO related incidents excluding unknown | 10 | 7 | 10 |
| ***Any gas cooking appliance*** | | | |
| Rate per million people per year (including unknowns) | 0.80 | 0.25 | 1.3 |
| Rate per million people per year (excluding unknowns) | 0.31 | 0.22 | 0.31 |
| ***Free standing gas cooker*** | | | |
| Rate per million people per year (including unknowns) | 1.2 | 0.36 | 1.9 |
| Rate per million people per year (excluding unknowns) | 0.46 | 0.32 | 0.46 |

## 2.7 Details relating to individual appliance types and models

Detailed information about the incident appliances are given as it was stated on the DIDR form; including the manufacturer's name and model as a matter of record. No significance or otherwise can be attributed to models or manufacturers without knowledge of the general appliance population by model and manufacturer. For example, the most frequent manufacturer's name in the incidents may be solely because it is the most common manufacturer in the general population or the incident may have nothing to do with the quality of the boiler, but be related to poor installation practice.

[20] Inferred from 16.4m electric ovens and 12m electric hobs in a total of 25.4m (table 3.11 ref 10) assuming non-electric ovens homes have freestanding gas cookers and non-electric hobs are gas hobs or gas cookers.



*Funded by:*
CORGI TRUST

### 2.7.1 Fatal incidents

#### 2.7.1.1 Boilers

Seven fatalities were linked to boilers. One incident was a double fatality with a boiler with no reported details. The others were single fatal incidents and are listed below.

- Back boiler units (BBU)

  Glow-worm Inset BBU 50, one fatality – cause: flue/terminal fault and a lack of servicing. The connection between the flue pipe and the flexible liner was not in accordance with the flue pipe manufacturer's instructions. Sooting at the fuel bed of the fire front was evident. The anti-vitiation device was operating at the time of the initial investigation. Fluff & lint was evident around the user controls of the BBU.

- Floor mounted regular boiler

  Ideal concord, CX205, one fatality – cause: not yet established or unknown.

  Vulcan Continental 45/60, one fatality – cause: lack of ventilation provision and flue terminal fault.

  Glow-worm Hideaway CF 60, one fatality – cause: flue and ventilation partially blocked unintentionally and lack of servicing.

- Wall mounted regular boiler

  Potterton Suprima 60, one fatality – cause: customer misuse ("boiler flue elbow removed").

- Wall mounted condensing combi boiler

  No fatalities.

- Wall mounted condensing regular boiler

  No fatalities.

#### 2.7.1.2 Space heater

Two fatalities in separate incidents involved space heaters.

Focal point, B&Q Slimline, one fatality – cause: coals incorrectly located causing incomplete combustion and flue/terminal fault.

Cannon Miser K16 mark 4, one fatality – cause: mounted incorrect on wall not hearth.



*Funded by:*
CORGI TRUST

#### 2.7.1.3 Cookers

Two double and three single fatal incidents involved one cooking appliance each. Two single fatal incidents were not investigated fully so no cooker details are available.

Leisure, Alta freestanding cooker, double fatality – cause: grill used with door shut. Cooker does not have a safety feature that automatically cuts out if grill is used with the door closed.

Belling, G755 Mk2 AN, freestanding cooker, double fatality – cause: customer misuse: grill used with door shut. Cooker does not have a safety feature that automatically cuts out if grill is used with the door closed.

Belling, G755 Mk2 AN, freestanding cooker, single fatality – cause: grill used for prolonged period, anything up to 14 hours in kitchen with double glazed windows and sealed solid floors resulting in oxygen depletion and build-up of dangerous levels of CO.

### 2.7.2 Non-fatal incidents

The following sub-sections describe the appliances involved in the non-fatal incidents that were fully investigated.

#### 2.7.2.1 Boilers

Boilers were involved in 16 incidents.

- Back boiler units (BBU)

  Baxi Bermuda 552 – cause: lack of servicing

  Thorn House warmer – cause: blocked ventilation, lack of servicing and a faulty flue/terminal.

- Wall mounted condensing regular boiler

  Saunier Duval, Enviroplus F24e – cause: lack of servicing: the flue terminal was incorrectly positioned in a covered passageway. The ceiling had recently been damaged by a water leak, allowing combustion products to enter the property.

- Wall mounted condensing combi boiler

  Coopra Advanced Technologies BV Eco EC25HJ – cause: flue separated from boiler due to sub-standard servicing.

- Combi non-condensing boilers

  Saunier Duval SO220 – cause: poorly sited terminal of unapproved design and ventilation partially blocked



*Funded by:*
CORGI TRUST

Vokera Linea – cause: appliance fault (no further details)

- Regular boilers non-condensing

  Regular boilers were involved in 10 incidents as detailed in Table 15 below.

**Table 15 Regular boiler non-fatal incident details**

| ***Make*** | ***Model*** | ***Cause*** |
|---|---|---|
| Ideal | Mexico, RS 60 Super 2 | Appliance fault |
| Potterton | Kingfisher 2, CF60 | Lack of servicing, appliance installation fault, ventilation fault and defective combustion chamber seals |
| Thorn | EMI 20/30 | Sub-standard servicing - the flue baffles were almost completely blocked with soot |
| Thorn | Apollo | Appliance fault, lack of servicing |
| Ideal Classic | Classic BF | Appliance fault - case not secured correctly |
| Myson | Economist | Appliance fault - corrosion of combustion chamber breaching integrity of appliance |
| Potterton | Netaheat 6-10 electronic | Appliance fault |
| Vaillant | Eco Max 618/2E | Appliance fault - plastic flue melted & hole occurred |
| Ideal | Classic RS250 | Sub-standard servicing – Dirty heat exchanger Impingement by heat exchanger/heat shield board |
| Glow-worm | Energy Saver 40 | Heat exchanger blockage – lack of servicing |

2.7.2.2 Warm air heaters

Two incidents involved warm air heaters.

Johnson and Starley, JT 19/25 MK 2– cause: lack of servicing (lint and soot build-up and lack of ventilation provision)

Johnson and Starley, Modairflow, J55-65 – cause: was reported appliance fault, sub-standard servicing, inadequate ventilation provision to the compartment and a flue/terminal fault (bends in flue).

2.7.2.3 Space heater

Three incidents involved space heaters.

Flavel Emberglow Classic – cause: flue blockage and damp on the outside



*Funded by:*
CORGI TRUST

Flavel – cause: customer misuse, lack of servicing (debris in catchment area of chimney), weather conditions, no closure plate fitted to facilitate inspection of the catchment area.

Robinson Willey, Firegem Visa – cause: appliance fault (no further details given).

#### 2.7.2.4 Cooker/boiler

One incident involved a cooker/boiler

AGA Rayburn Heat ranger – cause: flue terminal installed in a car port which was only open on one side.

#### 2.7.2.5 Cooking appliances

Five incidents involved cookers. Details were not supplied for one.

DeLonghi, Professional – cause: appliance fault (no further details given).

Stores New Home Cabinet – cause: lack of ventilation provision.

Flavel Stoneleigh – cause: appliance fault.

Cannon Foldaway, wall mounted grill – cause: appliance fault and lack of servicing.

### 2.8 Appliance Installation Details - Section 6 of DIDR

Information relating to the installer and whether the appliance met the installation standards is given in Table 16.



*Funded by:*

**Table 16 Appliance installation details (for 29 of the 56 incidents)**

| *Installer details* | *To current standards* | *To standards current at time of installation* | *Not to any appropriate standards* | *Unsure/don't know* | *Total* |
|---|---|---|---|---|---|
| CORGI or equivalent | 1 | 1 | 1 | 0 | 3 |
| Non-CORGI | 0 | 0 | 0 | 0 | 0 |
| DIY | 0 | 0 | 0 | 0 | 0 |
| Unknown | 7 | 6 | 11 | 2 | 26 |
| Grand Total | **8** | **7** | **12** | **2** | **29** |

One CORGI, or equivalent, installer carried out an installation that was not to standard and this was a condensing boiler installed in 2003.

## 2.9 Flue Details – Section 7 of DIDR

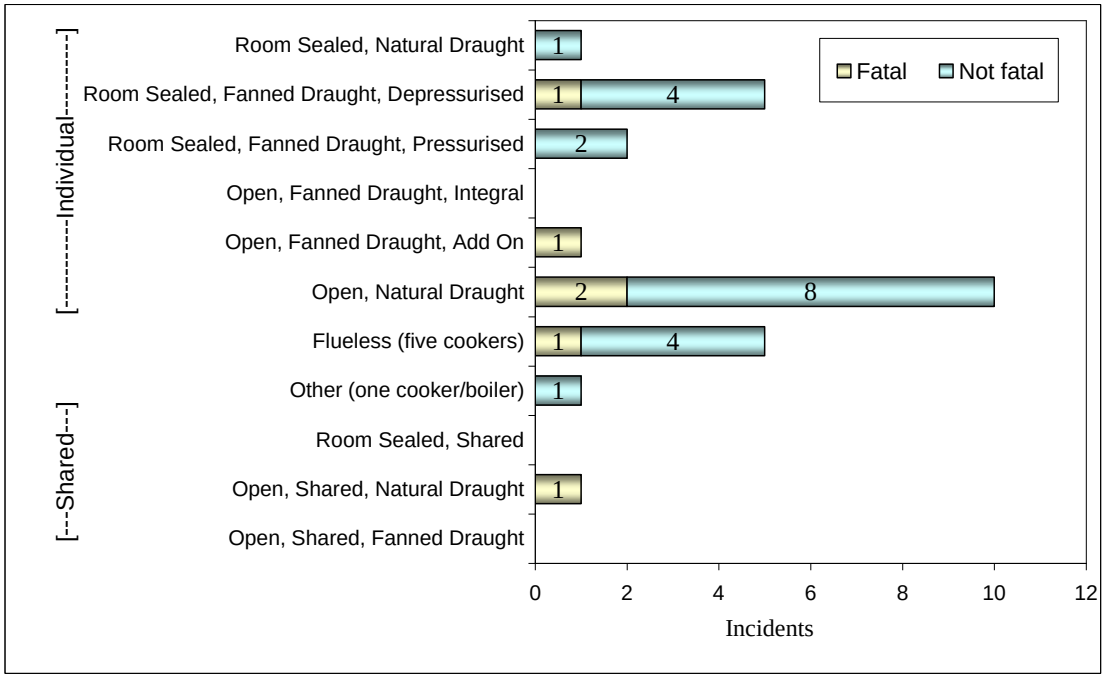


**Figure 18 Incidents by flue type**

An analysis of 26 (out of the 56) incidents by flue details is shown in Figure 18. As expected, incidents involving open flues were common (12) and were associated with 5 out of 6 fatalities. There were also 8 incidents related to room sealed appliances, with one fatality.



*Funded by:*
CORGI TRUST

Open flued boilers are also becoming less common in the home. A DTI study[21] estimates that the boiler population in May 2005 was 3.8 million with open flued and 16.5 million with room seals. Since then the expected number of room sealed boilers will have increased as condensing boilers (all room sealed) are now over 99% of the annual sales. Table 17 shows the reported boiler incidents where the flue status was specified (15) and the expected number based upon the estimated boiler population for May 2005. Note however, using the May 2005 data will under estimate the relative risk in 2007 of open flued versus room sealed boilers.

**Table 17 Reported and expected incident for boilers by flue type**

| ***Boiler flue*** | ***Reported number*** | ***Expected number*** |
|---|---|---|
| ***Open flued*** | 12 | 4 |
| ***Room sealed*** | 8 | 16 |

Assuming open flued and room sealed appliances are equally likely to be involved in an incident, then the probability of 12 or more incidents occurring by chance is very small (less than 0.1%). It is therefore concluded that open flued boilers expose occupants to a significantly higher risk of a CO incident, fatal or not - at least 6 times that of room sealed appliances. This is not unexpected given that open boilers are intrinsically less safe because they potentially allow the spillage of combustion products into the room. Furthermore open flued boilers statistically pose at least 7 times the risk of death than their room sealed counterparts.

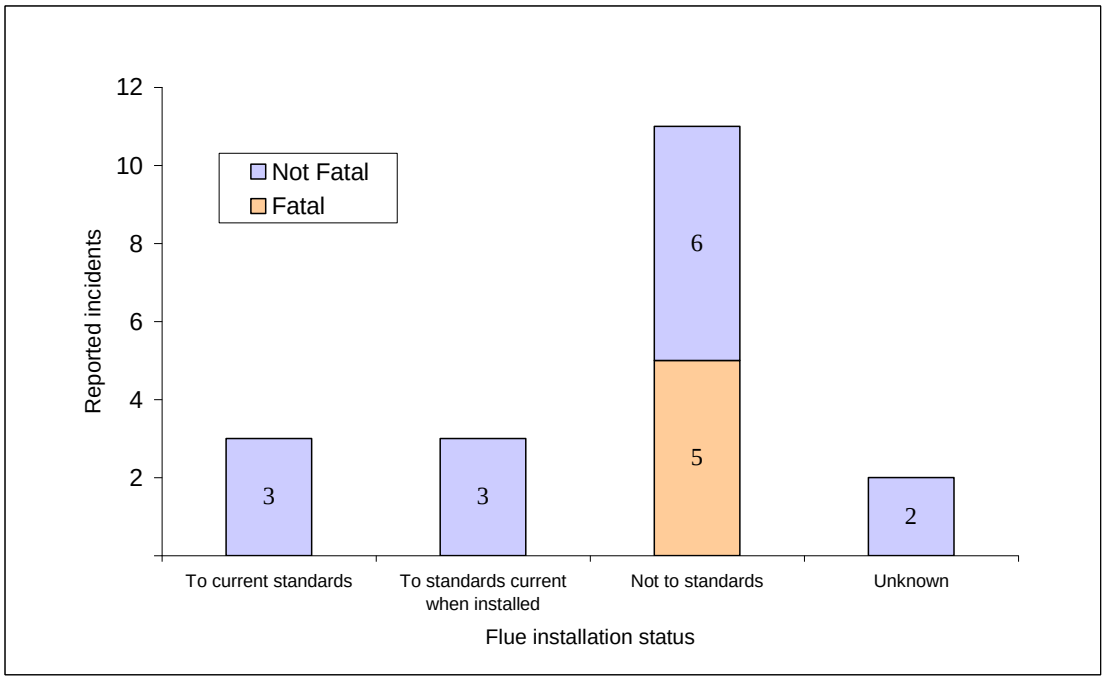


**Figure 19 Incidents by flue standards**

[21] page 64, ref 11



*Funded by:*
CORGI TRUST

An analysis of the 19 incidents with known flue status indicates that just over half were not installed to standard (current or previous), which is a sizeable proportion. This is thought to be a considerably greater proportion than in the general population and so is significant. In addition, the fatal incidents were all linked to flues that had not been installed to any standard.

## 2.10 Permanent Ventilation – Section 8 of DIDR

Under half of the completed DIDR forms (20 out of 56) indicated whether permanent room ventilation was required or not. 14 out of these 20 reports (70%) stated the required room ventilation provision was provided. The breakdown of DIDRs where it was stated that ventilation was required is summarised in Figure 20.

When permanent ventilation was provided it was generally substandard. 14 incidents that indicated room ventilation was required had inadequate provision and they included three fatal incidents. The two fatal incidents that had adequate room ventilation had causes that were not related to ventilation provision.

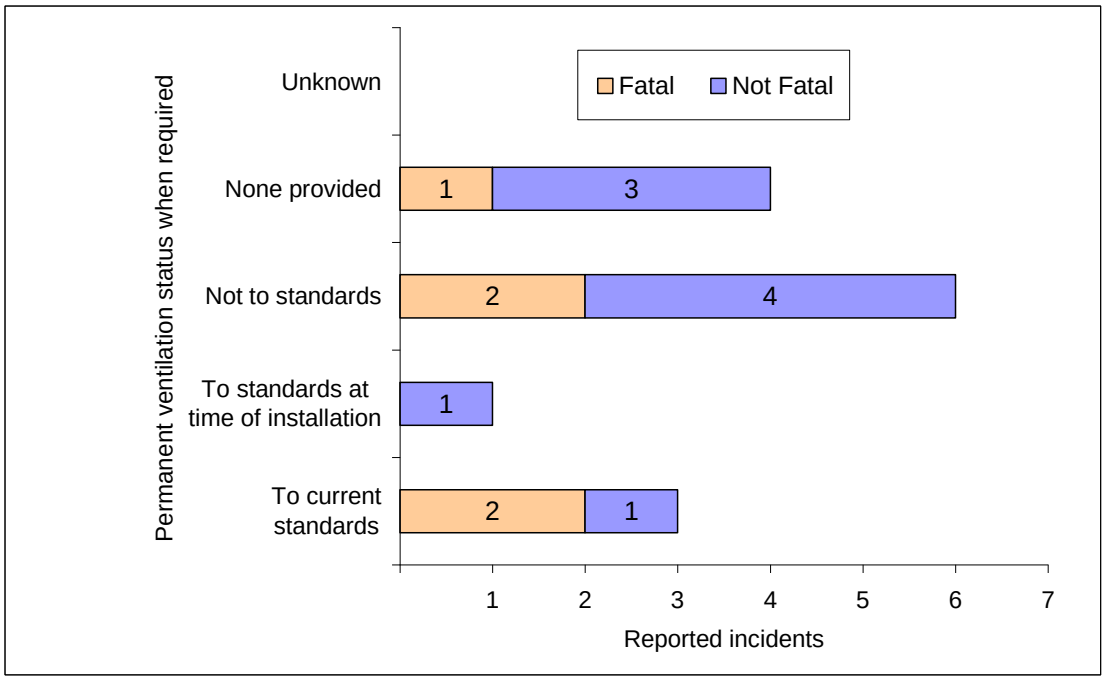


**Figure 20 Ventilation to standards**

Where ventilation was provided, there were four sites where it was unobstructed. Details of partially or totally obstructed vents are given below in Table 18.



*Funded by:*
CORGI TRUST

**Table 18 Incident numbers by obstructed ventilator details**

| **Number of incidents with:** | |
|---|---|
| Vents partially obstructed | 2 |
| Vents totally obstructed | 2 |
| Vents partially or totally obstructed vents intentionally blocked | 1 |
| Vents partially or totally obstructed vents unintentionally blocked | 3 |
| Vents where the method of blockage was not given/unknown | 0 |

Incident appliances were fitted in compartment/cupboards at 12 incident sites. A breakdown of compartment status is shown in Figure 21.

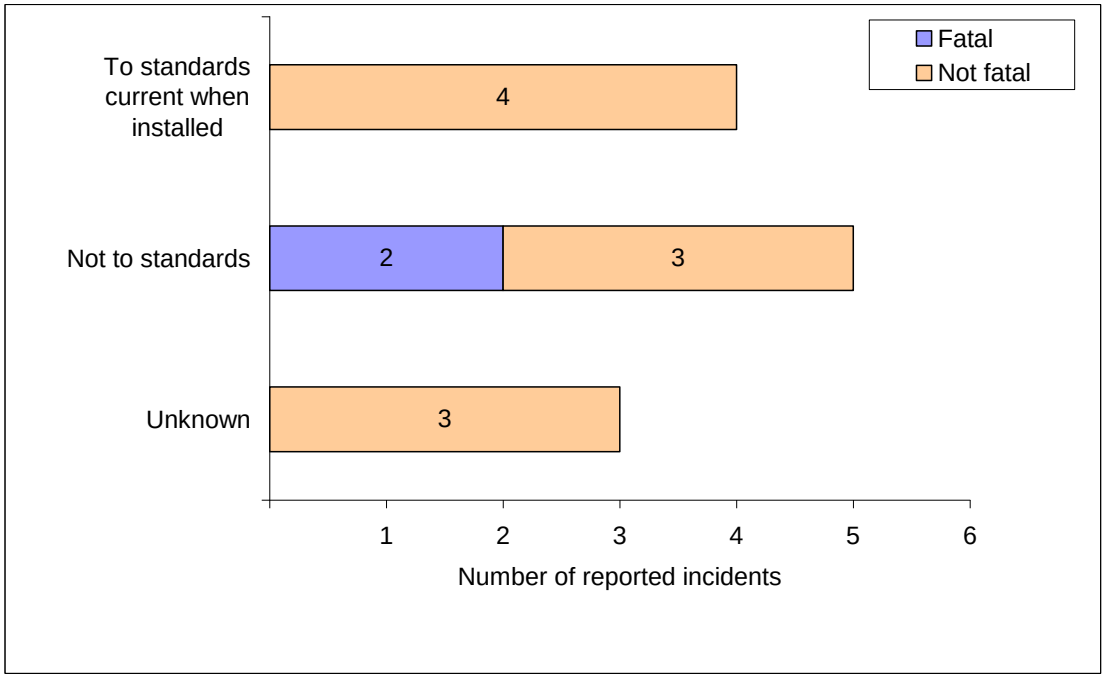


**Figure 21 Compartment/cupboards to standard**

## 2.11 Safety Devices - Section 9 of DIDR

Safety devices were recorded to have been in use at 11 sites. Two of these sites involved fatalities: an anti-vitiation device (operational) and a downdraught detector (not operational).

There were 9 sites which had CO alarms, of which 6 were recorded as operational; all were non-fatal incidents. Of the three that were recorded as not operational: one was neither checked on site or by the manufacturer and therefore it cannot be confirmed as having been operational (despite another response on the DIDR form indicating to the contrary). The other two were confirmed as not operational because both were checked on-site with one installed in the same room as the appliance and the other located in the same room as the casualty – the bathroom. In both cases the alarms should have sounded. Both inoperable alarms were deemed to meet the relevant performance standards (BS7860 kite marked and EN50291:2001) and were installed at the correct height, 1.8m and 2.1m. The former being probably installed slightly too low, that is, not within 30cm of the ceiling.



*Funded by:*
CORGI TRUST

Of the six sites with operational CO alarms; it is not known if the alarm was sounded and therefore whether the alarm helped prevent further injury or not. These devices are designed to detect CO levels and provide an audible alarm before occupants are adversely affected in terms of health effects.

It is suggested that a question should be added to the DIDR form asking whether or not any CO alarm is known to have sounded at the time of the incident.

## 2.12 On-site Checks - Section 10 of DIDR

The number of faults reported after on-site inspections had taken place is given in Figure 22 and Table 19. There was a wide range of faults with the provision of ventilation, burner problems and appliance performance providing the greatest number and safety devices the least. The distribution reflects the varied number of possible faults and not any particular variation in risk. It should be remembered that these faults have not necessarily contributed to the incident. The specific faults which were considered to have contributed to each incident are discussed in part 2.14.

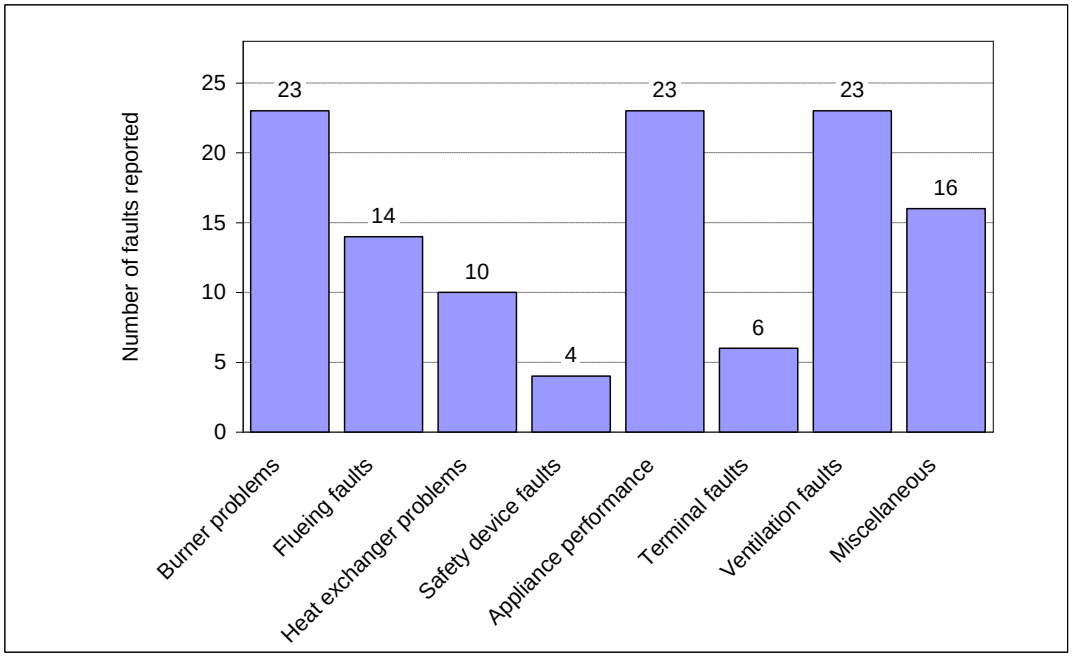


**Figure 22 Reported faults by type**



*Funded by:*
CORGI TRUST

**Table 19 Incident appliance faults**

| *Fault group* | *Number of faults* | | *Fault group* | *Number of faults* |
|---|---|---|---|---|
| **Burner** | | | **Appliance performance** | |
| Corrosion | 0 | | High $CO/CO_2$ ratio | 13 |
| Defective flame picture | 8 | | Failed spillage test | 7 |
| Linting | 8 | | Overrated | 2 |
| Over-pressure | 4 | | Underrated | 1 |
| Under-pressure | 0 | | **Terminal** | |
| Other | 3 | | Down draught | 1 |
| **Flue** | | | Bad siting | 4 |
| Blockage | 1 | | Unapproved design | 1 |
| Corrosion | 1 | | Other | 0 |
| Flue not to any standard | 0 | | **Ventilation** | |
| Installation fault | 5 | | Air vent/vents ineffective | 4 |
| Other | 7 | | Air vents obstructed - intentionally | 1 |
| **Heat exchanger** | | | Air vents obstructed - unintentionally | 3 |
| Blockage - shale | 1 | | Compartment not to any standards | 5 |
| Blockage - soot | 6 | | No permanent ventilation provided | 4 |
| Cracked | 0 | | Ventilation was not to any standard | 6 |
| Other | 3 | | **Miscellaneous** | |
| **Safety device** | | | Local topography | 0 |
| CO inoperable alarm† | 3 | | Weather | 6 |
| Failed down draught detector | 1 | | Signs of spillage – outside the appliance | 9 |
| Failed vitiation device | 0 | | Signs of spillage – inside the casing | 6 |

*Note to Table 19*
*The numbers quoted are the numbers of appliances found with the fault listed.*
*† CO alarm could be inoperable as no battery or when tested using a portable CO kit or tested off site.*

## 2.13 Incident Appliance History - Section 11 and 12 of DIDR

The appliance service history details section was completed for 25 incidents and details are given in Table 20. These 25 appliances are only about a half of the cases involved in the total number of reported incidents (25 in 56), the total number involving non-fatalities (40 in 96) and the number involving deaths (6 in 17). Therefore no useful quantifiable conclusions can be inferred.

It is a concern that 3 of the deaths reported had a regular service contract but these were incidents where the burner plate in the oven has been misplaced, the flue elbow removed, and one where the cause has not yet been established; therefore causes were not related to servicing issues.



*Funded by:*
CORGI TRUST

**Table 20 Details of the service history**

| | *Number of incidents* | *Number of deaths* | *Number of Non-fatalities* |
|---|---|---|---|
| ***On a regular service contract*** | 5 | 3 | 3 |
| ***Not on a regular service contract*** | 16 | 2 | 30 |
| ***Unknown if on a regular service contract*** | 4 | 1 | 7 |
| ***Reported service history*** | 25 | 6 | 40 |
| ***Total reported incidents*** | 56 | 17 | 96 |

An assessment of those persons attending the last working visit to each incident property is given in Table 21. A working visit is a visit other than the original installation.

**Table 21 Details of last working visit**

| | *Number reported* | *Number of deaths* | *Number of Non-fatalities* |
|---|---|---|---|
| ***Non-CORGI*** | 1 | 0 | 3 |
| ***CORGI or equivalent*** | 10 | 3 | 15 |
| ***Unknown*** | 2 | 1 | 6 |
| ***Working visited reported*** | 12 | 2 | 16 |
| ***Total for reported incidents*** | 25 | 6 | 40 |

Only one reported incident involved a last working visit by a non-CORGI or equivalent worker and this involved three non-fatalities.

A breakdown of the time period between the last working visit and the incident occurring is given in Table 22 for each incident. Just over half of the incidents reported with a working visit involved a working visit within a year of the incident. Whether this is statistically significant is impossible to say without knowledge of how many working visits were made amongst the general population. In cases of death, it is more difficult to obtain information on whether a service contract was active at the time of the incident.

Those visited within 6 months coincide with two reported deaths that have an unknown cause and a cause where the flue elbow had been removed and so could not be picked up at the last working visit. The other two visited within 12 months involving fatalities were caused by:



*Funded by:*
CORGI TRUST

- a misplaced oven burner plate impinging burner. It is not noted when the misplacement occurred and so it not possible to tell whether it should have been spotted during the last working visit which was a Landlord's safety inspection.

- A poorly installed and partially blocked flue fitted to a boiler that lacked servicing and had a partially blocked ventilation provision. All of these should issues have been picked at the last working visit which was reported as a handyman attending a breakdown.

**Table 22 Interval between the last working visit and the incident**

| *Time between the last working visit and the incident* | *Number of reported visits* | *Number of reported deaths* | *Number of reported non-fatalities* |
|---|---|---|---|
| ***Less than 6 months*** | 9 | 2 | 14 |
| ***6 months to 1 year*** | 3 | 2 | 6 |
| ***1 year to 2 years*** | 1 | 0 | 4 |
| ***More than 2 years*** | 2 | 0 | 3 |
| ***Unknown*** | 10 | 2 | 13 |
| ***Total with some appliance history*** | 26 | 6 | 40 |
| ***Total of all reported incidents*** | 56 | 17 | 96 |

## 2.14 Incident Cause/Causes - Section 13 of DIDR

Details of the cause(s) of reported incidents are summarised in Figure 23 and 24. These causes are different from the general faults discussed in section 2.12.

Figure 23 shows the distribution by the number of faults reported. For example, a single cause was recorded for 34 cases whilst a further 7 incidents had 2 causes recorded. Zero means those with an unknown or not yet established cause. A surprisingly high number had single causes, as accidents tend to happen when a series of factors coincide.

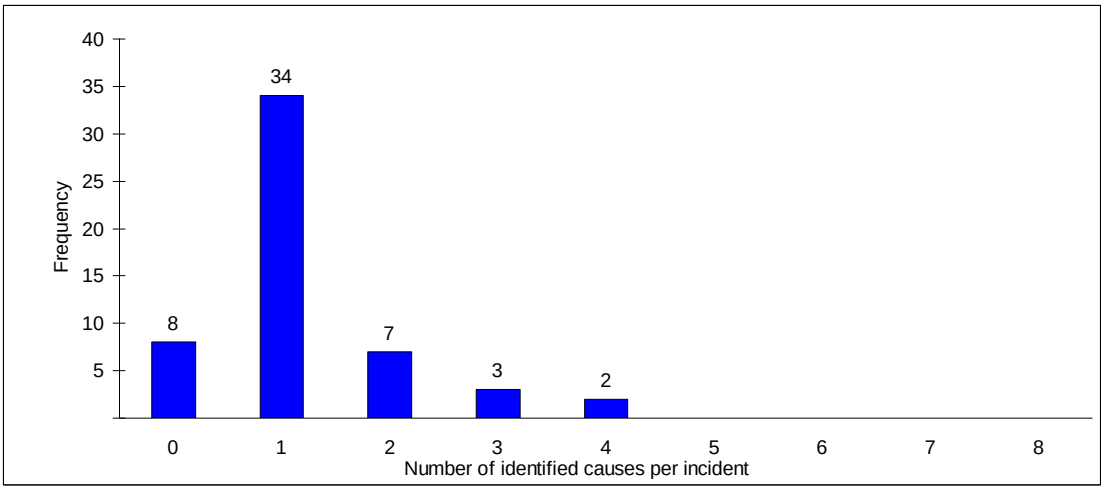


**Figure 23 Distribution of the number of stated causes**



*Funded by:*
CORGI TRUST

In Figure 24 the counts have been standardised by dividing the counts by the number of established causes per incident and are expressed as a percentage of the total count (56). For example, if there were three causes stated for one incident, each of the three causes would be allocated a third of a count.

Lack of servicing was the still the most common cause stated by investigators with an equivalent sole cause in a quarter of the incidents, followed by a group of four: appliance fault (18%), customer misuse (13%), unknown cause (14%) and flue/terminal fault (12%).

The precise nature of the appliance fault was not usually stated as there is no provision to enter it on the DIDR form, so it is perhaps worth adding a suitable question to future forms.

Weather usually means high winds but could also mean low temperatures.

Customer misuse was high this year and is linked to either cookers being left on too long or a grill being used with the compartment closed and in one case where the flue elbow was removed. The misuse of cooker grills is a new cause for concern.

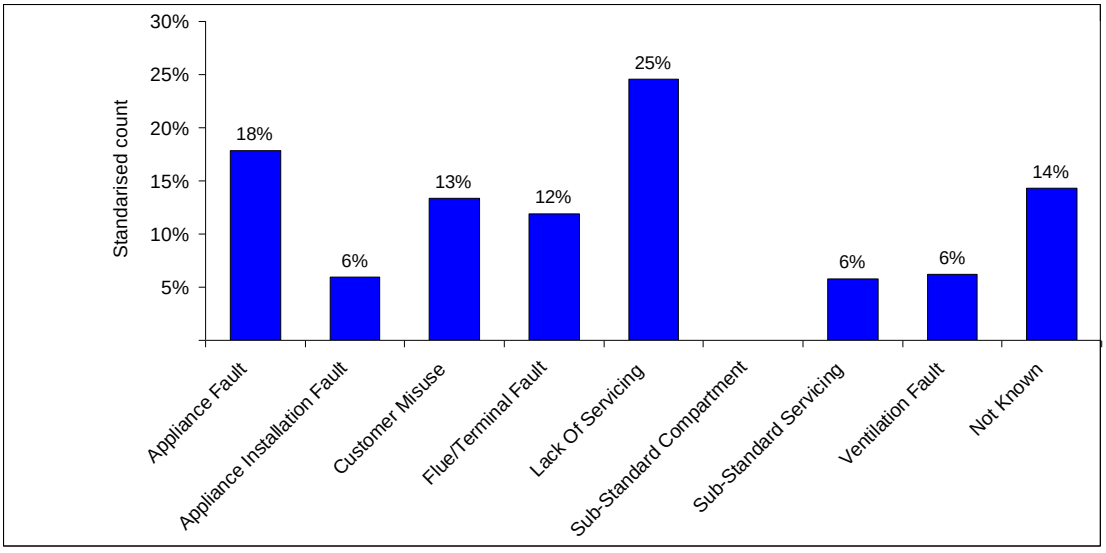


**Figure 24 Reported causes**



*Funded by:*
CORGI TRUST

# 3 Conclusions and recommendations

This is the thirteenth annual report of CO incident data and the second to be produced by Downstream Gas from information supplied via DIDR forms by British Gas and CORGI Services on behalf of the Gas Industry.

## 3.1 Data Coverage

Two thirds (37) of the natural gas related CO incidents (56) reported the full details and a third, therefore, were missing important detailed information about the appliance installation. Lack of detailed reporting was noted last year and associated steps suggested to improve the detailed reporting rate have not had sufficient time to work through to the 2008/9 records.

*It is recommended that ways to involve the HSE are sought in issuing updated guidance to Energy Supply Companies and HSE officials to ensure detailed investigation and reporting of all relevant incidents.*

## 3.2 Overall numbers

The headline values for the numbers of deaths (9 to 13), non-fatalities (67 to 70) and incidents (40 to 45) reported in the last reporting period (April 2007 to June 2008 inclusive) were revised after new information was received this year. In the previous reporting period (April 2006 to March 2007) the headline numbers of deaths (7 to 10) and incidents (29 to 31) were also revised for the same reason. (Note the values in Table 4 include to the resultant changes for 12 months periods of July 2006 to June 2007 and July 2007 to June 2008).

Seventeen fatalities were reported during July 2008 to June 2009 and this total was the highest since 2000/2001. Four deaths in three incidents were confirmed by the HSE and from reliable press reports. They were added to the 13 reported via DIDR process. The lack of a DIDR on *fatal* incidents highlights the need for the recommendation made in 3.1 above.

Central heating appliances were implicated in seven deaths, cookers in seven, heating appliances in two and an unreported appliance in one. The seven fatalities associated with cookers were the highest since DIDR records started in 1996. This is discussed further in part 3.8.

Provisional numbers have yet to be released by the HSE for the period April 2009 to March 2009, although private communication with the HSE has confirmed the number of fatalities above. As in previous years the number of non-fatalities reported by HSE is likely to be significantly higher than reported here as the HSE figures include suspected and not necessarily confirmed cases.



*Funded by:*
CORGI TRUST

## 3.3 Yearly Trends

This year the 17 deaths reported were each linked to accidental CO poisoning from using natural gas in the home and is the highest since the period July 2001 to June 2002. Seventeen is the upper limit expected in the year-by-year variation due to chance alone in 18 out of 20 years. This is discussed more in section 3.8.

The number of reported fatal or non-fatal incidents is also up from 42 (July 2007 to June 2008) to 59 continuing the recent upward trends. This is higher than the expected year-by-year variation of between 24 and 48 incidents. The reason for this is unknown.

## 3.4 Geographical spread

Unlike last year, where a possible cluster was identified in the Cardiff area, there is no evidence of clustering this year as only one or two incidents were reported per postal sector (first part of the post code). The data outcome from this subject will be produced in a Carbon Monoxide report by The Gas Safety Trust (formerly The CORGI Trust).

## 3.5 Casualty age

Based on the 17 reported deaths and the age of people in the general population, there is statistical evidence that people under 26 are less likely to die in a CO related incident, and that people over 59 are more likely to die than people between 25 and 59. This is reinforced by last year's figures.

Combining the last two year's data to increase the sample size, the estimated risk of older people dying in an incident is 50% more than adults aged 25-59. It is not possible to estimate the decrease in risk of younger people reliably as there no records of deaths occurring.

However, the chances of becoming a casualty (i.e. sustaining non-fatal injury) are similar for different age ranges in the general population.

## 3.6 Dwelling characteristics

There is evidence that this year private tenants were 180% more at risk from CO exposure than other households (owner-occupiers or those renting from the social sector) and this compares to 160% last year. The chance of this occurring if all household types were equally at risk and based on the number of household mix by tenure is 1.1%, much lower than the usually accepted statistical criteria of 5% (see section 2.4).

There is no evidence that incident rates vary with the type of dwelling (detached, semi detached and terraced houses, bungalows and flats), glazing mix or floor type, the latter of which was inferred from property age.



*Funded by:*
CORGI TRUST

There were proportionately a similar number of reported incidents in older properties compared to newer properties. This contrasts to last year when the risk was 50% greater in a pre-1946 property compared to a post-1945 property.

### 3.7 Location of casualties and appliances

The most common location for the incident appliance was the kitchen, followed by the living room and hall/landing. Without a breakdown of general appliance installation by room it is not possible to judge the significance, if any, of the incident location.

The most common location of casualties was in the bedroom, followed by living rooms, kitchens and bathrooms. This is not surprising given that people probably spend most time in the bedroom, followed by the living room, kitchen and bathroom.

Information on whether incident appliances were installed in a cupboard or a compartment was obtained, but no conclusions could be drawn because of the lack of knowledge associated with the prevalence of such installations in the general population.

### 3.8 Incident appliances

Cookers contributed to seven deaths this year. This is the highest number since DIDR records began in July 1996 and higher than the fatality rate associated with boilers. As such, it is a cause for concern. Over the last seven years, the number of fatalities resulting from cooker use has averaged 1 per year. The chances of 7 or more occurring in a single year is less than 0.1%, suggesting that the number of cooker-related fatalities is statistically different than in previous years and therefore a new risk may be evident. This is supported by the fact that 4 of the 10 fatal or non-fatal incidents related to cookers involved fairly new appliances (5 years old or less) and is therefore a worrying sign.

Six fatalities attributed to cooker use were reported to have been caused by occupants failing to use the appliances correctly, including two double fatalities caused by the occupants operating the grill with the door shut. One fatality was attributed to prolonged use of the grill in a kitchen fitted with double glazing and a sealed floor.

The two double fatalities linked to cooker grill use have raised concerns about what seems to be a newly reported risk associated with the use of closable grill doors. Older grill designs (traditional eye-level grill) have not generally been enclosed whereas newer designs are often in closable compartments. Some have cut off values to prevent operation when closed and others have not, including the two implicated here. Manufacturers should be alerted to consider improved safety features and instructions for use. Consideration should be given to raising public awareness of this issue and whether appliance performance standards should be amended to make such grill safety cut off features a requirement of approval. It is recommended that this is highlighted in any press release issued with this report.



*Funded by:*
CORGI TRUST

As expected, most incidents where the specific appliance was investigated and reported occurred with central heating appliances (22 boilers and 2 warm air systems) because these are the most prevalent gas appliances in domestic properties, are used for long periods and have high power ratings.

Based on ONS housing and boiler populations[22], the best estimate of the natural gas fired central heating population in Great Britain is 20.6 million, with 49.9 million people potentially exposed (i.e. those living in homes with gas central heating appliances). This gives an estimate of between 0.14 and 0.16 deaths per million people per year for the mortality rate during 2008/9 associated with accidental CO poisoning and related to the use of domestic gas boilers. An estimate for the risk of being a casualty (non-fatal) is between 0.96 and 1.6 casualties per million people per year.

There were between 0.22 and 0.25 deaths per million people per year and between 0.31 and 1.3 casualties per million people per year associated with a gas hob or freestanding cooker.

As expected, and by comparing the trends reported in previous years, open flued boilers accounted for most of the reported incidents (10 of 15 incidents that report a flue type). Based on the 2005 boiler population estimate[23], the relative risk of an incident involving an open flued boiler was at least 6 times and the risk of death at least 7 times that of an incident involving a room sealed boiler. Since 2005, the open flued boiler population will have declined making this a conservative estimate of the risk in 2008/9, hence the words “at least”.

## 3.9 Incident causes

Each accidental CO poisoning event will inevitably have its own set of unique causal factors. Causes that have been identified indicate that lack of servicing is the most common contributory factor.

The areas of most concern were related to a lack of servicing (25%), flue/boiler seals or fittings and flues installed in the wrong place particularly in relation to adjacent buildings, out houses and covered passage ways.

## 3.10 Protective measures

There were six incidents reported during 2008/9 where a CO alarm at the property was described as operational. Six is the highest yearly total recorded but not unusually high; there were five in 1998/9, four in 2001/2 and 2005/6, three in 2006/7 and 2000/1.

[22] table 2.1 ref 5
[23] There were an estimated 3.9 and 16.5 million open flued and room sealed boilers in Great Britain in 2005, ref 11



*Funded by:*
CORGI TRUST

Given that CO alarms are intended to alert occupants before symptoms of CO poisoning occur, it is a possibility that some are failing to alert and protect occupants by a drifting sensitivity level. It is therefore suggested that investigators arrange to check the calibration of operational CO alarms to assess whether they have drifted in calibration.

### 3.11 DIDR improvements

It was apparent that the lack of specific information about CO alarms performance and fault details is restricting the analysis. It is recommended that the following requests are added to the DIDR:

- Has the CO alarm sounded? (yes/no/don't)
- Please describe briefly the details of the cause(s) of the incident.



*Funded by:*
CORGI TRUST

## 4 References


1. Hayton J, Moore M, Pool G and Moseley J, A review of carbon monoxide incident information, for 2007/8, produced from the full investigation of incidents which involved piped natural gas and LPG, within Great Britain, The CORGI Trust, 2009
2. Energy Supply Probe - Initial Findings Report, 6 October 2008, OFGEM, 140/08
3. Domestic Retail Market Report - June 2007, OFGEM, 169/07
4. UK population estimates 1971 – 2008, Office of National Statistics, 2009
5. Social Trends Survey, No 39, April 2009
6. Statistical Tables, HR Neave Routledge, 2002.
7. General Household Survey (Longitudinal), Office for National Statistics, 2007.
8. English House Condition Survey 2007 Annual Report, Communities and Local Government, September, 2009
9. Scottish House Condition Survey Key Findings 2007, Housing and Regeneration Directorate, Communities Analytical Services, Scottish Government, March 2009
10. Energy Consumption in the UK, Domestic data tables, 2009 Update, Office for National Statistics
11. Crowther M, Forrester H and Wood M, Assessment of the size and composition of the UK gas appliance population. DTI. GAC3407, 2005.




*Funded by:*

# APPENDIX A DIDR LPG INCIDENTS

No details of LPG incidents were received on DIDR forms.



*Funded by:*

## APPENDIX B DIDR NON-DOMESTIC INCIDENTS

No non-domestic incidents were received on DIDR forms.



*Funded by:*

# APPENDIX C PAST INCIDENTS PREVIOUSLY UNREPORTED

There were seven incidents from previous years that have been reported since the completion of last year's report. Of these, four were reported via the DIDR process and the other three were known to the HSE but not reported via the DIDR process. Details of these four incidents are given below, along with the limited information available for the remaining three. The relevant historical charts and tables have been updated accordingly in the main body of the report.

The information for these incidents has now been added to the CO incident database.

Incident 1

During April 2008 an incident took place in an owner occupied, semi-detached property built between 1946 and 1965. The property was located in the PR2 post code area and had double glazing and a suspended floor. As a result of the incident a male aged 42 was hospitalised for over 24 hours and a female aged 42 received treatment from a GP or paramedic. The male was found to have a COHb level of 7.2% when tested that day.

The casualties were located in the bathroom and the incident appliance was a New World Option 3 free standing cooker located in the kitchen. It had been made during 1986 and had been installed at that time, to standards current at that time. Since installation there had been no 'working visits' for the cooker. The investigation identified that there was a crack in the burner gauze of the solar grill. The incident causes were listed as an appliance fault and a lack of servicing.

Incident 2

Also during April 2008 a further incident took place in the GL54 post code area. This resulted in the death of a 78 year old female. The property was an owner occupied semi-detached bungalow built between 1966 and 1980. The property was fitted with double glazing and had a solid floor.

The casualty was found in the kitchen and the incident appliance was a Glow-worm 24 CXi wall mounted condensing combi boiler fitted in the utility room. This has a room sealed, individual, fanned draught flue system with a depressurised boiler casing. The boiler and flue system was thought to have been installed new, by a CORGI registered installer, during 2007. The flue was noted to be 'not to any appropriate standards' with a flue joint not being fixed by self tapping screws.

A Honeywell CO battery powered alarm had been fitted in the same room as the appliance. It was tested on site and was described as being operational. The boiler was tested during the investigation and it was found to be producing a high $CO/CO_2$ ratio. However, the room build-up tests carried out did not indicate any dangerous build-up of CO in the property. The appliance was covered by a regular service contract and within the last 6 months of the incident there was a 'working visit' by a CORGI registered installer due to a breakdown and to service the appliance. The investigation was unable to establish a cause for the incident.



*Funded by:*
CORGI TRUST

Incident 3

Details from the Hounslow Chronicle and confirmed by the HSE show that during February 2008 an incident took place in a shared ownership flat in the TW14 post code area. This resulted in the death of a 26 year old female. In addition a male lodger, aged 32, went into a coma, described as a permanent non-responsive state, from which he is unlikely to recover.

The property was built by a national house builder, on a new estate, and the flat had only been occupied for two months. Following an HSE investigation it was reported that a safety alert was issued to developers highlighting the potential poisoning risk caused by building gas flues into areas where they cannot be checked. It is thought that the boiler flue for the flat, and others on the estate, had been concealed within ceiling cavities.

Incident 4

During November 2007 a 41 year old male died as a result of an incident which took place in a flat above a pub that he managed. Details from the Liverpool Echo and confirmed by the HSE indicate that the cause of death was a gas fire which malfunctioned and released CO into the flat in which the occupant was sleeping. When the occupant was discovered the gas fire was still in use. The pub was located in the L20 post code area and one month before had been leased from a large pub chain. There was said to be no safety checks carried out on the gas fire and there was no gas certificate. The newspaper stated that a loophole in the law meant that the property's management company did not have a responsibility to ensure gas safety checks were carried out.

An HSE investigation is reported to have found that the gas fire produced significant levels of CO and that the chimney and the back of the fire were blocked by debris and soot.

Incident 5

During April 2007, in the ME2 post code area, the death of a 78 year old man has been reported to the HSE. High levels of CO were produced from a cooker fitted in the kitchen of his property, although no post-mortem COHb blood tests were taken.

Incident 6

During December 2006 an incident took place in an owner occupied, semi detached house built in 1970. The property was located in the LD3 postal sector and had double glazing and a suspended floor. As a result of the incident a male aged 74 and a female aged 73 died. Both were found to have a COHb level of 70%.

The fatalities were located in the living and the incident appliance was a Johnson and Starley Warm-air heater Hi-Spec installed in 1999. It was not installed to the standards, appropriate at the time; in a compartment in the passage way with insufficient. The stated cause was sub-standard servicing. There was no information regarding when servicing was carried out. A prosecution is pending.



*Funded by:*
CORGI TRUST

Incident 7

Also during, December 2006, an incident took place in an owner occupied, semi detached house. The property was located in the CA22 postal sector and had partial double glazing and a solid floor construction. As a result of the incident a female aged 76 died. COHb blood levels were not reported but the appliance was shown to be producing high levels of CO. She was found in the WC.

High levels of CO were produced from a radiant space heater and convector; Robinson Willey, Firearm installed in the living room. It had a cracked heat exchanger, a blocked flue and linting of the burner. When tested the spillage test failed and a high $CO/CO_2$ ratio was recorded (0.052) and CO was able to enter the property. The reported cause was a flue terminal fault and substandard servicing. No information regarding servicing was available.



*Funded by:*