CO-Gas Safety's 25th Anniversary 1995-2020

24 Years of Data of Deaths & Injuries from
Unintentional Carbon Monoxide Poisoning
01.09.1995 – 31.08.2019

We have the technology to reduce these tragedies

Media Campaign
Could so easily raise awareness

CO Audio Alarm
Alarms to EN50291 standard should be in all homes and workplaces

GasTag
Appliance servicing & maintenance monitoring scheme

Flue Gas Analyser
Used to monitor appliance flue emissions

Cut-off Switch
CO Interlock cuts the power supply to gas appliances when a CO alarm sounds

Chimney Camera & Brushes
Used to clean and inspect flues, removing any blockages

Press pack kindly sponsored by

KANE

CO-Gas Safety's Carbon Monoxide Awareness Competition is now kindly run by

Cadent
Your Gas Network

Northern Gas Networks

SGN

WALES&WEST UTILITIES

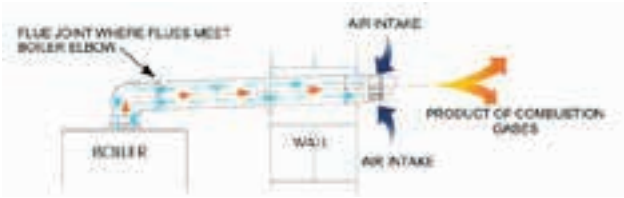
More useful tools in the fight to reduce unintentional CO incidents

CO Data Logger

These devices can monitor levels of CO in an environment and record them over time. This is very useful for those trying to prove how many PPM (parts per million) of CO are, or probably were, present over a given period and perhaps what day of the week this occurs, which can make identification of the source of the CO easier.

Personal Alarm Monitor (PAM)

These devices are handheld monitors that can measure CO in the air, rather than in an appliance/flue. We would like to see them used by all agencies that attend potential CO incidents, to safeguard staff & identify CO.



FLUESHOE

Flueshoe flue cutting aid

This innovative cutting jig aids the accurate cutting of both flues and flue extensions. The Flueshoe eliminates the risks and dangers associated with poorly cut flues.

Data

The data that CO-Gas Safety collects and collates on all aspects of unintentional carbon monoxide poisoning has proved useful to find common causes of deaths or injuries. We seem to be the only organization in the UK to collect such data on incidents resulting from the use of any and <u>all</u> carbon-based fuels as well as offering free, confidential victim support. Our work of helping victims often provides more details that could help prevent future unintentional deaths and injuries. Baroness Finlay recommended that all data from various agencies be pooled. CO-Gas Safety agrees with this approach.

Blood Test

A blood test to detect COHb (carboxyhaemoglobin, an indicator of CO exposure) needs to be done quickly after leaving the area of the suspected source of CO, since it reduces in a survivor breathing fresh air. A visit should be made to the GP or A&E quickly, to prove exposure to CO and ensure correct diagnosis. Survivors should know that there can be long-lasting and increasing symptoms after the COHb reduces, so tests are vital*.

CO Breath Analyser

Some doctors' surgeries and pharmacies have these analysers, which can detect CO in breath. However, the reading will reduce the longer a person is away from the source of CO, so victims should be advised to go quickly to get tested*.

*Blood and Breath Tests

Blood or breath tests should be undertaken quickly, i.e. survivors should seek tests **immediately**.
<u>Warning</u>: There is a danger of a <u>false</u> negative from a CO test after a survivor breathes fresh air or oxygen.

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The Carbon Monoxide & Gas Safety Society (CO-Gas Safety) is an independent charity committed to reducing deaths and injuries from Carbon Monoxide and other gas dangers worldwide and supporting gas related accident victims.

Company Limited by Guarantee,
Registered in England.
Registration No. 03084435.
Charity Registration No. 1048370

CO-Gas Safety's 25 years of work and 24 years of data on deaths and injuries from Unintentional Carbon Monoxide poisoning 01.09.95 – 31.08.19

Press Pack 2020 – 25th Anniversary pack
Dedicated to the memory of all those who have died or suffered from carbon monoxide poisoning and other products of combustion (CO+) their families & friends.

Case Studies

Articles

KANE is honoured to support CO-Gas Safety's mission to reduce deaths and injuries from Carbon Monoxide (CO) poisoning yet it's deeply frustrating little has changed since this campaign started in 1995.

Although CO poisoning deaths and injuries seem to have reduced since CO-Gas Safety started keeping records, it's not acceptable that zero deaths and injuries remain frustratingly out of reach. Furthermore, because testing for CO is rarely undertaken, it is entirely possible that deaths and injuries are in reality increasing.

Our fuel supply industry doesn't truly engage with CO poisoning victims who must live daily with the trauma of death, injury and suspicion of friends and family caused by events that should never happen.

Let's be clear - CO poisoning deaths and injuries are not 'unfortunate accidents' but real, avoidable tragedies yet no one appears to want to truly solve the problem.

The Health & Safety Executive ignores its own recommendations made in 2000, fails to require the gas industry to do more to reduce CO incidents and won't protect tenants from rogue landlords who put their lives in danger. It also fails to upskill heating installers and service technicians and refuses to require gas emergency service engineers and smart meter operatives to use test equipment to identify sources of CO in homes.

This absence of leadership allows fuel retailers and Energy UK, their trade association, to avoid funding meaningful awareness campaigns and victim support, despite the fact their product is morally responsible for these tragedies.

Equally, the Department of Health doesn't require an automatic test for CO on all dead bodies and fails to properly inform & train GPs how to spot signs of CO poisoning in patients. It also fails to use its influence to persuade fuel retailers to fund awareness campaigns and use readily available technological solutions.

All fail in their moral duty of care to home dwellers using fossil fuel energy for heat and hot water, yet solutions to stop needless deaths and suffering are readily available.

The last 25 years have not been wasted - Many homes now have approved CO alarms, some required by law, and most heating installers and service technicians regularly use approved Flue Gas Analysers to test appliances, the latest versions of which are better designed for safe operation. OFGEM funding has also helped Gas Distribution Networks implement CO reduction strategies.

There are also many people within the industry committed to reducing CO incidents but, as this review makes clear, there are too many examples of suffering caused by an industry that doesn't step up and authorities who don't lead.

One day we'll wonder why we needed this unfunded charity to provide support for CO victims when others with power and money could have done so much more for only a little more effort.

Until then, I applaud CO-Gas Safety and Stephanie Trotter's work to support victims and force our industry and regulatory bodies to confront their unwillingness to end these avoidable tragedies.

Jonathan Kane CEO, Kane International Ltd

Summary - 25 years trying to stop unintentional deaths & injuries from Carbon Monoxide (CO)

We learned from Einstein time is relative; sometimes it seems an eternity since CO-Gas Safety was launched at the House of Commons in 1995, yet because the charity is still asking for the same urgent preventative measures learned then from victims and families, it seems time has stood still.

This review highlights some of the trends and issues we still see unresolved:

The Future of Gas and other Carbon Based Fuels
If carbon based fuels are coming to an end, why do we campaign about carbon monoxide (CO) poisoning? The simple truth is, as Gi Magazine's November 2019 graph shows, gas is a primary fuel source and its consumption will increase until 2040 with only a small decline expected by 2050 (see https://tinyurl.com/qr7vhke).

Whilst gas & oil boilers will be banned in new build homes (see https://www.thegreenage.co.uk/are-gas-boilers-being-banned/) their use in over 22 million homes will continue for decades alongside coal and wood burners. It also doesn't help most people in the UK spend over 90% of their time at home, school or work (see https://tinyurl.com/sbb7qrx).

Case studies
Our new case studies highlight work over 25 years with two studies from even earlier. We are grateful to families who helped us whilst revisiting their most painful experiences in the hope of warning people and persuading industry and government to stop these avoidable deaths and injuries.

To quote Susan Henry who lost her mother in 2018, 'I have found writing this case study very therapeutic and has helped with my healing and with the grieving process of losing our beloved mum...I would like to help in any way I can to help and save others from this lack of awareness of CO.'

I found this deeply moving and such comments inspire me to ask for these stories and to carry on. It's been such a privilege to be helped by people, who in depths of grief still recognise the need for prevention and work with us to prevent future deaths and injuries. However, not everyone can and sometimes it takes years for them to do so.

We collect such accounts not for their emotional value but to raise awareness, find why things went wrong and work to prevent them happening again.

Sian Overton, who lost her big sister Katie in 2003, made a film soon to be on our website which explains this well (see https://drive.google.com/open?id=1GArVnTqc9QPcpzgSIBHB5gTbllZ8XerV & https://www.co-gassafety.co.uk/news/). Our thanks to Sian.

Catch 22 and endemic resistance to change
We find it difficult to understand the extraordinary resistance, endemic in the whole fuel supply system, to enabling victims to prove CO. It's Catch 22 – to prove poisoning by CO you must prove CO which the average victim cannot normally do.

Protocols
Following an accident at work or home there's a natural desire to clear up and move on. However, evidence necessary to prove CO poisoning is then lost or destroyed. The Guild of Master Chimney Sweeps recognised this problem and developed a protocol we published last year (see 14-15). In our opinion this was outstandingly responsible and forward looking and we also applaud Cumbria Fire and Rescue Service' working on a similar protocol following a recent CO incident (see p. 52). We hope the rest of industry, particularly Gas Distribution Networks, (GDNs), Gas Safe Register and Registered Gas Engineers (RGEs) will follow these excellent examples. If so, we'd be very happy to help.

Lack of enthusiasm to use new technology
In some areas of the fuel supply industry there seems an institutionalised agreement not to use technology to test for CO even though CO cannot be sensed using human senses. What someone who's been poisoned needs is a finding of CO in parts per million in writing to take to a medic. The gas emergency service still does not use equipment, readily available and relatively inexpensive, to test gas appliances for CO, although trials may be carried out. Interestingly, in remote Scottish areas, First Call Operators work on gas appliances because they are also installers/maintainers which isn't currently allowed in the rest of the UK (SGN webinar, 21.01.20).

8.2 of the policy of the Gas Safe Register – huge obstacle to proving exposure to CO
Work done by a RGE within the last 6 months can be reviewed by a GSR inspector who can inspect and test appliances for CO. However, if the person asking for this test is a tenant, 8.2 insists a landlord's permission is required to test for CO, see https://tinyurl.com/rxoohoq. Why?

I asked Chihiro, a former CO-Gas Safety competition winner, to explain this problem by developing, with John O'Leary, CO victim, artist and paper engineer, a 'Comic strip'; please see p. 12 & 13. There are so many hurdles for a claimant to overcome in a poisoning case that it prompts the comment, 'there is no civil justice anymore'. (see New Law Journal article 24th January at https://www.newlawjournal.co.uk/content/co-the-hidden-dangers for which I thank editor Jan Miller). The article about carbon monoxide poisoning in the BMJ (see https://www.bmj.com/content/365/bmj.l2299 published June 2019) is headed 'EASILY MISSED' so also features the hidden nature of CO poisoning. This article was written with CO-Gas Safety trustee Sue Westwood-Ruttledge as patient adviser and campaigner for carbon monoxide awareness.

The consequence of lack of proof leads Government to conclude there isn't a CO problem or it's very small - If only this was so (see https://www.co-gassafety.co.uk/about-co/numbers-affected-by-co/). But from extrapolating the data from respected university research it seems that at least 3 million people or even more, could be being exposed to carbon monoxide in the UK.

Lack of resources for HSE
The root of the problem is the lack of resources for HSE, which can only be relied upon to investigate a CO poisoning incident if a death has occurred. We recently heard the HSE described as 'reduced to one man and his dog' and there is a lack of political will to change this.

So many organizations set up, so little action
Many bodies have been started to reduce unintentional CO deaths and injuries since we started. You can see the ones I could recall at https://www.co-gassafety.co.uk/information/list-of-work-done/at 622.

All those meetings felt more like PR and delay rather than sensible discussion enabling real action to be taken. There is still no organization other than CO-Gas Safety, a charity run almost entirely by volunteers with no guaranteed funding, offering free, independent and confidential victim support.

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Our database
I am indebted to our database officers, Jo Richards, Beverley Squire and now Jennifer Wood for their very hard and conscientious work since we started. We now have some kind of official confirmation, mostly from Coroners, for over 95% of the fatal cases held in our database.

Our database was also inspected three times by expert statistician Dr Carolyn Craggs and again in 2018 by Dr Paul Hewson (arranged via the Royal Statistical Society) whose review is in our press pack 2019 p. 53. In 2017 we co-operated with Dr Fred Piel who applied to the Gas Safety Trust to create a map of the deaths. His application was then rejected and whilst we felt for Dr Piel, we were also not convinced a map would be helpful, although a very detailed interrogation of our data might find other factors, such as a greater number of deaths in cities or in areas where coal was historically the primary fuel used domestically. We would love to work with a university on such a project but simply can't afford the funding required of up to £100,000.

New dangers from CO – keyless cars, shipping containers and candles
Keyless cars have caused deaths in the USA probably due to the high number of garages connected to houses. So far, we have yet to see this problem in the UK but flag this as a potential danger.

Another danger is bags used to keep classic cars perfect. The deaths of William Reid and Kathryn Workman who died in October 2017 illustrate the unknown danger of driving a car into such bags.

Similarly, there was a sad case in September 2019 of an alcoholic man locked in a shipping container to stop him drinking while his family were shopping. He started up a motorbike engine and died from carbon monoxide poisoning (see https://tinyurl.com/tkd2v96)**.** Surely yet another example of lack of awareness of CO.

In October 2019 a woman went to sleep with a candle burning next to her and thankfully woke up with her nostrils full of soot and obviously affected by CO. Luckily, she survived (see https://tinyurl.com/s4e7rka). Some candles were recalled https://tinyurl.com/wt26ecf but again another example of lack of awareness.

Our media alerts also inform us of the lack of awareness of CO amongst our politicians (see https://tinyurl.com/y5gcy63a). Our current Prime Minister, Boris Johnson, questioned the need for a CO alarm and admitted he knew little or nothing about the dangers of CO.

Doesn't this deserve a PR campaign with prime time TV warnings as there are for getting a 'flu jab?

Survivors desperate for medical help
The good news is that Professor Mark Edwards is doing some excellent work at St Georges. He was kind enough to write an article (see p. 54) for us. We learned of his work from victims, but we would rather stop people becoming victims and the title of his article, 'Carbon Monoxide: A Preventable Cause of Catastrophic Neurological Damage and Death' says it all.

Algorithm for GPs
Despite a cross departmental committee on CO there is still no change in the Algorithm for GPs, leaving them unable to order an investigation and test of a patient's home and appliances for CO or even give patients an approved CO alarm and perhaps a data logger.

Unsafe procedures, procedure
In my opinion, the unsafe procedure seems to instruct registered gas engineers to decide if an appliance is dangerously emitting CO by using visual signs (see https://tinyurl.com/u2ewl38).

SGN data published in January 2018, which we saw in Autumn 2019, leaves me asking, why don't they use flue gas analysers? (see https://tinyurl.com/vvwmgaw)

Landlord's gas safety check & certificate
The landlord's gas safety check still relies on human senses and doesn't require the use of a flue gas analyser (FGA) to test emissions for CO in every case which could so easily be made mandatory. (see https://www.newlawjournal.co.uk/content/hidden-killer).
Less than 2% of CO in the air can kill in between one and three minutes – (see p. 26, para 74 and table 23 at the following link: https://tinyurl.com/j4wzju9)**.**

We advocate a legal tidy-up or change to law, to require mandatory appliance servicing or testing using a FGA during an annual landlord safety check. We also say, if CO alarms are mandatory in all rented properties, they should be tested as part of the mandatory annual gas safety check. We would also like CO alarms approved to EN50291 to be required to have sealed batteries or be mains powered.

Legal requirements for CO alarms
It is entirely possible, for a student like Anne Brennan in 1995, to die today of CO (see p. 32).
The legal system in the four countries, England, Wales, Scotland & N. Ireland has become so complicated that we have asked the All Party Parliamentary Group on Carbon Monoxide to write to all the countries and instruct a practising lawyer to write an informative brief and frequently update this. Scotland is doing more than England on CO alarms but we are concerned about enforcement.

RIDDOR – The reporting of injuries, diseases and dangerous occurrences.
https://www.hse.gov.uk/riddor/
The main problem seems even when an RGE reports to HSE under RIDDOR, HSE has no duty to do anything. There are also other problems when, for example, an incident is reportable.

It can be difficult doing this work but sometimes people are kind and generous to tell me they appreciate our efforts. John Atkins reacted to my article in Gi Magazine (see http://www.co-gassafety.co.uk/news/) by saying 'Your article in Gas International was nothing short of sensational, the evidence is overwhelming; well documented and un-refutable. You have my utmost respect in your pursuit of justice.' John, an experienced gas professional, was shocked at the lack of reaction to my article and the lack of support, which he assumed would follow publication.

Good News
Gas Distribution Networks have really enjoyed taking on the children's awareness competition we started in 2006 and taken it to another level. Their involvement has helped them understand the CO problem. They held another very successful prize giving event at the Houses of Parliament in 2019 (see back inside cover) and Safety Seymour for younger children is a huge success thanks to Cadent's Phil Burrows and Emmi Isham, who we also thank for their planned visit to Jersey this year to teach others to continue CO awareness work with children living there.

New Idea
Why not make regular maintenance mandatory before fuel delivery – similar to a MOT for cars? The cost of regular maintenance could be included in the price of fuel and was first suggested by Nigel Griffiths, then MP, many years ago. Increased efficiency would also reduce polluting emissions into the atmosphere causing climate change.

Thanks
We wouldn't survive without the generosity of Jonathan Kane and Kane International Ltd. This generosity isn't only financial; Jonathan gives us a lot of his time and his industry knowledge is much appreciated. We also could not do our work without enormous support from our unpaid directors & trustees (mainly victims & their informal representatives) particularly courageous survivors like the

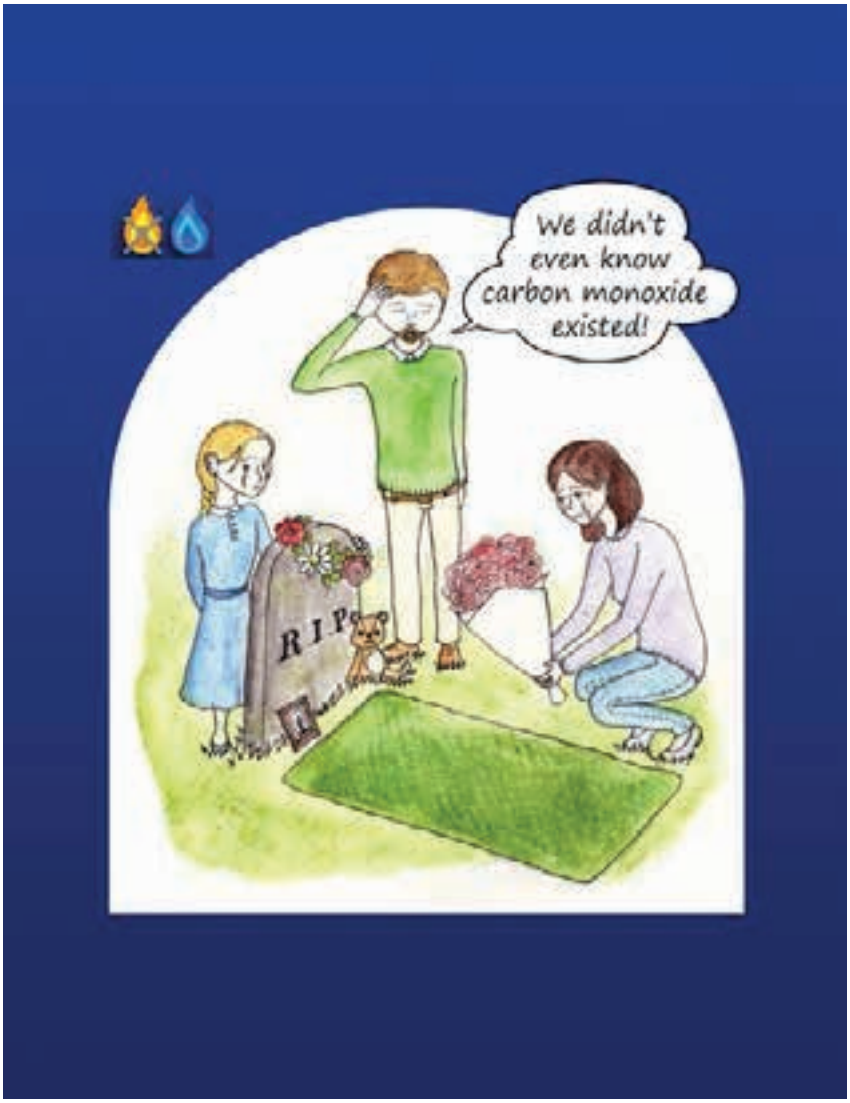
Overton family and victims of CO poisoning, who help us find out why these problems occur and how they can be solved.

There are others in the fuel industry we'd like to thank - Jim Lambeth (also director/trustee of CO-Gas Safety) who kindly wrote an article on wood burners (see p. 47). Roland Johns, who was a British Gas investigator & trainer, advocates improving training for RGEs by including more about CO from all fuels (see p. 46). Chris Geeves explains how sweeps save lives (see p. 44-45). Ron Gooding has written about CO dangers afloat (see p. 48-51) and Ben Kuchta updated his article on his cut off system (see p. 42-43). See also Cumbrian Fire Fighter Craig Drinkald's article about a CO incident on (see p. 52-53).

We are also particularly grateful for the support of those outside the charity, such as Frank Brehany as well as those in the fuel industry who understand what we are putting forward and do what they can to help us. I also thank my husband John Trotter of BWB, who is as supportive or even more so than Dennis Thatcher was to Maggie!

Death or injury from unintentional CO poisoning is completely avoidable if only industry, regulators & politicians would listen and learn from victims. Please also read Julie Connolly's PhD http://researchonline.ljmu.ac.uk/id/eprint/11785/.

Stephanie Trotter, OBE, President & Director CO-Gas Safety



Kindly drawn at our request by Chihiro

Avoid dying or being injured from carbon monoxide poisoning

Christi and Bobby Shepherd tragically died of carbon monoxide in 2006 in Corfu while on a Thomas Cook holiday.

What is carbon monoxide (CO)?

A deadly gas that can be emitted from faulty cooking and heating appliances powered by any carbon based fuel that burns.

Fuels include gas, coal, wood, petrol, diesel etc.

Can you identify potential sources of carbon monoxide in the picture above?

For the answers go to http://www.co-gassafety.co.uk/answers/

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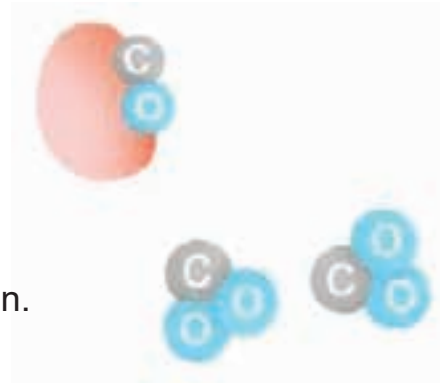
CO cannot be sensed using human senses of smell, taste, sight or touch.

Less than 2% of CO in the air can kill in between one and three minutes.
http://www.hse.gov.uk/foi/internalops/hid_circs/technical_osd/spc_tech_osd_30/spctecosd30.pdf
(Paragraph 74 table 23 page 26)

Firemen when talking about CO in smoke (which you can smell) say it takes only three breaths, the first you don't know there's a problem, the second you might suspect there's something wrong but by the third you are unable to take any action.

CO alone being emitted from cooking and heating appliances has no smell.

Why is CO so lethal?
Because it binds to the haemoglobin in the blood which normally carries oxygen so it suffocates.



What is the difference between CO and CO2?
CO2 consists of one atom of carbon and two of oxygen.

CO also contains one atom of carbon but only one atom of oxygen. CO is emitted when there is a lack of oxygen at the flame.

How do you prevent CO in your home?

1. Install all cooking and heating appliances correctly according to manufacturer's instructions using properly qualified people. With gas they must be Gas Safe Registered and qualified to work on your type of appliance.

2. Maintain your appliances regularly according to manufacturer's instructions using qualified people.

3. Have chimneys and flues swept and checked by a sweep belonging to a recognised trade organisation.

4. Ensure adequate ventilation. Don't block grilles which were put in to ventilate a fire etc.

5. As an extra safeguard (e.g.to protect against a bird's nest falling down the chimney) buy and fit a CO alarm to EN 50291 from a reputable supplier.

Low levels of CO over a long period can make people ill but GPs rarely diagnose this as CO.

Symptoms of low level poisoning include:-

HEADACHES DIZZINESS TIREDNESS BREATHLESSNESS NAUSEA

and generally feeling unwell similar to many viral illnesses.

Different members of the family can suffer different symptoms

Please make sure you're safe from CO and other products of combustion.

In an emergency please ring **0800 111 999 for the Gas Emergency Service** but please be aware they do not have the equipment to test gas appliances for carbon monoxide emissions.

If you need further information please visit **www.co-gassafety.co.uk**

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CO-Gas Safety is an independent registered charity run almost entirely by volunteers, offering free and confidential help and advice to victims and their families.

We are especially interested in helping those who have lost a loved one or who are suffering.
To get in touch please email **office@co-gassafety.co.uk**
You can also telephone or text Stephanie Trotter on 07803 088688. If she can't talk to you, please leave your name, number and email address and she will call you back. Stephanie will do her utmost to contact you and help, especially in emergencies & for anyone who has lost a loved one.

Stephanie will try to be accessible to help you at all times, but if she is not available you can contact a solicitor for free initial legal advice. It is vital to preserve evidence. Please see contact details which we will put up if necessary on our website at www.co-gassafety.co.uk

Account of the Corfu case by Stephanie Trotter OBE

Back in 2006 and before CO was announced as a cause of death of Christi and Bobby, I telephoned the hospital in Greece to suggest testing the dead children and, if the cause of death was CO, I urged that hyperbaric oxygen be given to the father Neil Shepherd and his then fiancé Ruth Beatson. Those I spoke to said they didn't speak English so a Greek friend kindly tried but also with little success. I telephoned the relatives with the same advice and spoke to Ruth's father who kindly reminded me about this at the inquest. Later, I recommended that gas expert Harry Rogers undertake an examination of the boiler that killed the children. Harry gave evidence at the inquest. I also recommended the barrister, Leslie Thomas, now QC. In our opinion, without Harry's evidence, Leslie's skill and the parents' courage and determination, the facts would not have emerged. I also wrote to the police on the 3rd November 2006.
This all arose from our experience of victims who, not knowing what to do, called to ask for independent and impartial help.
The inquest verdict was unlawful killing and the jury found a breach of Thomas Cook's duty of care. For more on the case, please go to the following links:
http://news.sky.com/story/goodwill-payout-to-family-of-corfu-children-10358646
http://www.independent.co.uk/news/business/analysis-and-features/carbon-monoxide-deaths-from-a-tragedy-to-a-corporate-disaster-for-thomas-cook-10259735.html
The Coroner made his recommendations public on 6th October 2015
http://www.co-gassafety.co.uk/corfu-inquest-hm-coroner-david-hinchliffs-reg-28-report-to-prevent-future-deaths/

CO-Gas Safety almost certainly has the best data on unintentional deaths and injuries from CO from all fuels in the UK from 1995.The charity received £50,000 in 2015 from Thomas Cook thanks to the parents of the Corfu children. However, the charity's costs are roughly £30-35,000 a year and that is with it being run almost completely by volunteers with a little paid help for the data. However, the charity's costs are approx. £35,000 and is run completely by volunteers except for the help we use to collate our data. Please see http://www.co-gassafety.co.uk/information/co-gas-safetys-statistics-of-deaths-and-injuries/ and download our years of data from 1995 & our pie charts, updated yearly.

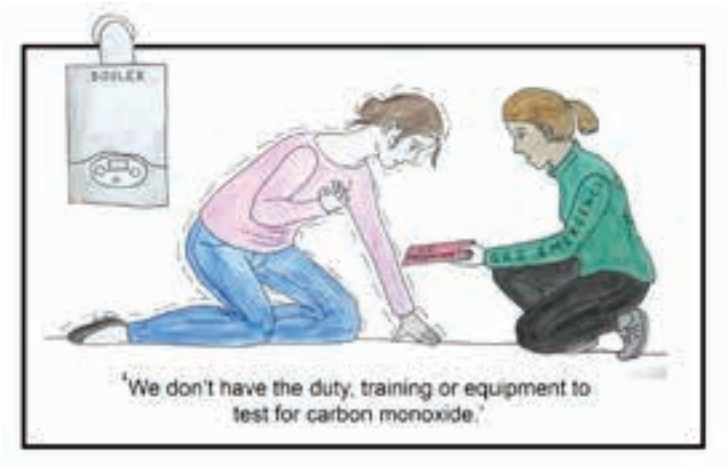
CO-Gas Safety has lobbied for prime time TV warnings about CO since 1995.

Company Registration No. 03084435
Charity Registration No. 1048370

Sponsored by Kane International

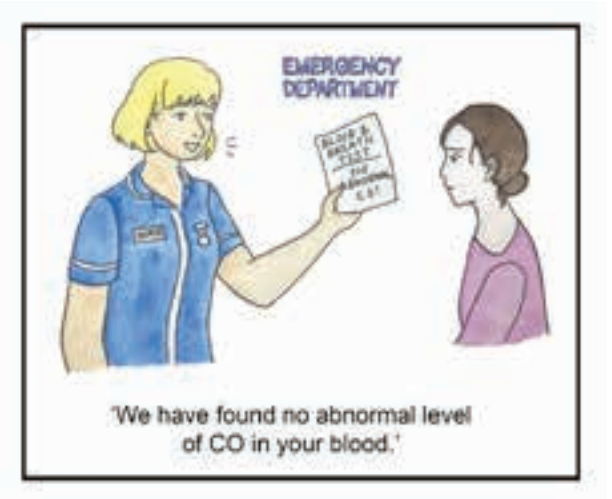
Illustrations of CO symptoms and grave by competition winner Chihiro.
All other illustrations by JohnO'Leary http://www.johnolearyillustration.co.uk

How it is for victims?



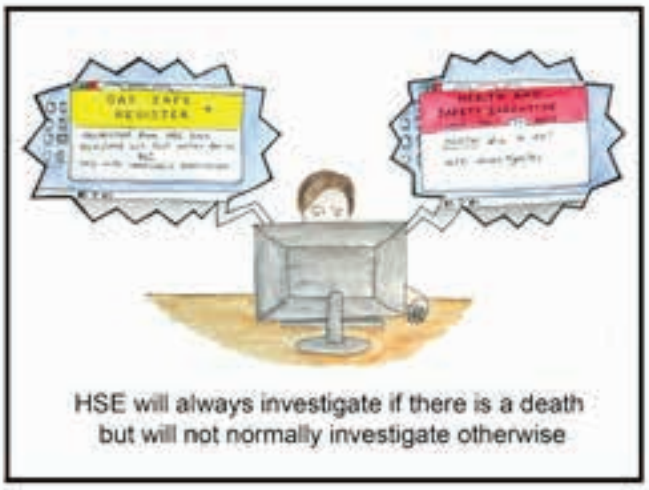
If you suspect a carbon monoxide (CO) leak open all the windows and doors and turn everything off. Unlike gas, you can't smell, taste, see or hear CO

The CO will have usually dispersed by the time the 'First Call Operator' (FCO) arrives. The FCO will turn the gas off & check next door but will not reconnect, relight & test gas appliances for CO. The FCO may advise you to go to A&E or your GP.



Over the charity's 25 years, survivors have consistently told us that breath or blood tests aren't carried out for several hours, often several days, by which time the CO will have usually left the blood.

Even when tested negative for CO and with all gas appliances turned off, survivors can report still feeling ill. It can take time for CO to cause injury and/or possible exposure from unsuspected appliance.



If gas work has been done in the last 6 months by a Registered Gas Engineer (RGE), the Gas Safe Register (GSR) will send a GSR inspector to inspect the appliance and test it for CO. The customer needs to request this free service. The GSR will also inspect suspected faults made by a non-registered engineer (https://tinyurl.com/rxoohoq).

Pictures by Chihiro, competition winner 2013-14

If the survivor is a tenant, the Gas Safe Register inspector will not test an appliance for CO without the landlord's permission (https://tinyurl.com/wvppdxg). Tenants are frightened of being evicted if they ask. RGEs seem to think GSR's policy applies to them too. Even if tenants do ask, the evidence may disappear. It is almost impossible for the average person to find &/or pay for a qualified independent gas expert to test.

Servicing/taking the boiler out destroys evidence because the emissions from the appliance & its flue cannot now be tested for CO. It is important for medical treatment to know how much CO a survivor is likely to have been exposed to in PPM. i.e. Parts Per Million.

A solicitor won't generally take on a tenant's claim for damages unless there is sufficient evidence of CO and its effect on their health. See https://www.newlawjournal.co.uk/

Deaths and injuries from unintentional CO poisoning cost the UK taxpayer £178 million per year (https://tinyurl.com/tebksgo). Simple Government measures could prevent tragedies & cost to taxpayer.

Survivors may become very ill and lose their jobs or housing. They are often disbelieved even by the GP, friends and family. Proof of PPM of CO in writing would change this.

Pictures by Chihiro, competition winner 2013-14

THE GUILD OF MASTER CHIMNEY SWEEPS

Powering chimney sweeping into the 21st Century

www.guildofmasterchimneysweeps.co.uk

Carbon Monoxide Protocol for chimney sweeps

https://www.guildofmasterchimneysweeps.co.uk/carbon-monoxide-protocol-actions-and-guidelines-for-sweeps/

As a Solid Fuel industry leader, the Guild of Master Chimney Sweeps recognised there was no protocol for what a sweep should do if they are advised of or if they suspect a Carbon Monoxide (CO) incident. Very importantly, there was no protocol for what a sweep should not do. With this in mind, the Guild has produced the following CO protocol and advice.

Sweeps – you will often ask a customer if there have been any problems with their appliance. During casual conversation, you may be told that someone has been unwell in some way, or perhaps been to the doctors. Perhaps the reasons are unexplained and symptoms are unresolved. It may be reported that a CO alarm has gone off but the reason was not identified and no investigation undertaken. You may be told that someone has been exposed and this has been medically identified but it's still possible that you are the first person to look at the appliance. Or for some other reason you may simply suspect that someone has been exposed to CO.

In any event, if you suspect a CO incident then you must have a system in place for dealing with this and making your decision to sweep the flue or to preserve the evidence and report the incident.

Protocol actions and guidelines.

If on initial inspection the sweep believes that something to do with the installation may have been a contributory factor then advice should be sought because the issue may be investigated by Trading Standards rather than the HSE.

The sweep must gather some information before they undertake the sweeping operation to enable them to make a decision on what to do next and what advice to give.

The following should be ascertained before sweeping any flue following a CO incident or if you suspect a CO incident.

a) Is it possible that anyone has been injured by CO poisoning.

b) Is the property owner occupied or rented.

c) When was the installation carried out.

d) Has there been any significant changes to the installation, the room (such as new windows etc.) or the property as a whole (such as new kitchen with extractor fan

etc.) or to the chimney or flue (such as cowl, terminal or liner).

e) If the answer to d) is yes then you need to know what these changes are and when they were done and if the stove has been used regularly since then.

f) If anyone else has been to work on the stove or chimney recently and if so, how long ago and who. If the answers to the above suggest that there may be a professional who has carried out work on the installation in the recent months (less than 6 months) then the following additional will be information required.

g) The date and time of the incident.

h) Was there a CO alarm present and did this activate. If an alarm is present, make a note of its location and ask where the alarm was located when the occurrence happened. Record the make and model, photos are a good addition to written records. It might be that the alarm should be tested, so make sure this is preserved.

i) Who was affected, to what extent and if medical help was required or have those affected been to a doctor? Please note that a negative test on a survivor for CO does not necessarily mean the survivor was not poisoned because tests tend to be after the survivor has been in the fresh air.

Actions

If the answers to the above give rise to ongoing concerns, then the sweep should take action and avoid sweeping the chimney or disturbing the evidence by removing a baffle or cleaning access. If in doubt, don't touch it, delay sweeping, take photos and notes and leave all the appropriate warning labels and notices to make sure nobody uses the installation. Either make a report under RIDDOR or seek advice on the next step from a suitable organisation – listed below.

HSE – Form for reporting a dangerous incident:
https://extranet.hse.gov.uk/lfserver/external/F2508DOE

Guild of Master Chimney Sweeps – info@guildofmasterchimneysweeps.co.uk or call 01226 242357. www.guildofmasterchimneysweeps.co.uk

CO-Gas Safety Society - Email Stephanie Trotter, OBE office@co-gassafety.co.uk Tel. 01983 564 165 or 01483 561633 or 07803 088688 www.co-gassafety.co.uk

If the sweep is advised or decides that the incident could not be investigated for a prosecution then they are free to sweep the chimney and provide all the correct advice to the customer to help prevent a repeat of the incident. However, someone who has been badly poisoned by CO may need to consider his or her options (e.g. to prove poisoning for medical treatment or a civil legal action) before evidence is changed.

On all occasions the CO Alarm must be checked and if it is incorrectly sited then advice should be given on where it should be placed.

Case studies

Background about carbon monoxide, its impact on the population and cost by Stephanie
For the facts about carbon monoxide (CO) (see p. 8-11) and *http://www.co-gassafety.co.uk/about-co/carbon-monoxide-poisoning/*

It is worth considering how many people die or are injured in the UK every year from unintentional CO* and civil servants always require a cost benefit analysis in order to justify any action. We think the official figures are a gross underestimate due to the fact that there is no automatic testing of CO on death, despite a recommendation from the All Party Parliamentary Carbon Monoxide Group, APPCOG, to do this.

However, even the accepted numbers mean that 'preventing carbon monoxide poisoning could save the UK **£178 million* a year**; as well as avoid immeasurable human tragedy and suffering.'
**http://www.publications.parliament.uk/pa/cm201314/cmselect/cmcomloc/50/50iii132.htm*

The research undertaken by UCL in 2005 and also by John Moore's university in 2011 extrapolated over the UK, leads CO-Gas Safety to the conclusion that about 3-5 million people at least could be being exposed to levels of CO above the WHO guidelines as well as other products of combustion. Please see *http://www.co-gassafety.co.uk/about-co/numbers-affected-by-co/*

Case Studies – we are very grateful to those who have agreed to allow their cases to be used
These case studies are in chronological order. Some are fatalities and some, thankfully are not. The fatalities are obviously tragic but so are the cases of long exposure. People may look fine; they may even appear to be fit and well. However, this can be deceiving and most of them have long term chronic problems such as loss of balance, energy and higher executive function that cause them day to day pain and exhaustion and endless stress to them and their families.

Surely it would be far better to stop these poisoning incidents in the first place?

My admiration for the efforts of those poisoned in helping us to inform and hopefully prevent others going through the same pain and suffering, is endless. I just wish those sitting at the top of the fuel industry and those in Government were a tenth as generous and courageous. Our function in offering victim support is to recommend good expert investigators and solicitors and there are sadly all too few of them. We seem to be the only body to do this while also collecting, collating and publishing data of CO deaths and injuries from ALL fuels. However, a further function is to find out exactly how this death or injury could have been prevented.

To us the main point of collecting the data is to find out why the injury or death happened and how to prevent similar deaths & injuries in the future. There are a few things we and sometimes industry have managed to achieve but most require action from industry and/or Government.

I have been talking to victims and their families for over 25 years yet august bodies in the industry seem reluctant to ask me to speak about this or make suggestions to reduce deaths and injuries, as well as make life easier for those who have already suffered.

Please persuade anyone particularly those in a position of power or influence in the industry or government to read these case studies and take a moment to consider what might stop these tragedies happening and how you might help to accomplish this. We would love to hear from you. Thank you.

CO-Gas Safety Unintentional Carbon Monoxide Poisoning Case Study

NORMAN & YVONNE REDSTONE, Survived in 2019

David Redstone at his parents' home

Ages: 85 & 78
Fuel: Mains gas
Appliance & Location: Back boiler in their home
Notes by CO-Gas Safety: This case study is written by David Redstone, whose parents were alerted to excessive CO in their home by an alarm given by CO-Gas Safety. The position of this type of boiler, behind another fixed gas appliance, means that they very often do not receive full servicing and maintenance as often as is required. Chimneys and flues servicing these boilers are often not swept regularly, nor the boilers themselves given a thorough inspection or clean.

How I met Stephanie Trotter

I am a Premier Manager at Barclays bank, and met Stephanie in Ryde in May 2018 to discuss normal banking issues. I was interested in what Stephanie told me about carbon monoxide poisoning. She gave me the CO-Gas Safety press pack 2018 and a free CO alarm to EN 50291 from Honeywell but I never thought we might need it.

My parents' heating system

I already had a CO alarm to EN 50291 in my home, so I installed the one she had given me at my parents' house in March 2019. My parents own their own detached home in Binstead on the Isle of Wight. They have a gas back boiler, which is about 30 years old. In front of this boiler is a gas fire in a large 1930s fireplace, as can be seen in the photo above. My parents also have a gas hob and an electric oven.

The flues from the fire and boiler go up the chimney used by the old open fire. They have always had their gas boiler regularly serviced and as far as know this was by a Gas Safe registered engineer. I think they had it last serviced in March 2018. However, I cannot recall when the fire had last been taken out of the fireplace in order that the boiler could be really cleaned properly.

CO alarm sounded

Earlier this year in April 2019, the alarm went off. Luckily, thanks to the press pack and talking to Stephanie, we all coped really well. My parents called me, and I called my own registered gas engineer, who visited them and took the fire out and cleaned out the boiler.

We subsequently discovered that the back boiler had developed a fault because the ignition coil had failed and the boiler needed a good clean. The boiler is now fixed and working as it should do but the episode does go to show the importance of CO alarms. We did think of putting in a new boiler, but my registered gas engineer told me that now it had been cleaned out, it was working fine.

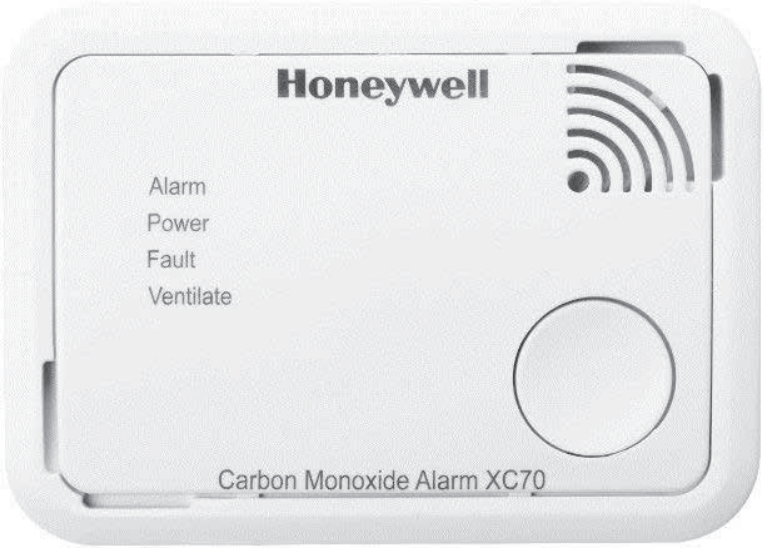
Thinking about it, perhaps these back boilers are less likely to be properly and fully serviced because of having to take the fire out first. They are not installed now as much as they were, and I think that's a good thing. With regard to servicing, I have now taken over organising that for my parents and I will make sure I send my registered gas engineer.

Grateful to the CO alarm, Honeywell and CO-Gas Safety
We are very grateful to Stephanie for giving us a CO alarm to EN 50291, for the work Stephanie does and for highlighting the importance of this topic. I feel sick at the thought of the possible consequences if she hadn't given me the CO alarm or if I hadn't installed it at my parents' home.

We also want to thank Honeywell for sending the free CO alarms to Stephanie.

CO symptoms and my suggestions
While talking to Stephanie about this near miss, Stephanie asked if my parents had experienced any CO symptoms. I told her that thankfully they hadn't although they did know what the symptoms were. Stephanie was glad for them. Stephanie explained that CO alarms to EN 50291 are designed not to alarm until there is 30 parts per million of CO present in the surrounding environment for two hours, yet the World Health Organisation guidelines are much lower, at about 4.5 ppm for 24 hours and longer. Stephanie explained that although it was very rare, the charity had come across one or two people who said they had suffered symptoms, despite having an operating CO alarm to EN 50291. I then suggested that perhaps CO alarm levels should be changed to alarm after say 2 hours at 20 or 10 PPM of CO. Obviously research would have to be undertaken to make sure there weren't so many alarms sounding that people no longer used CO alarms (as happened with smoke alarms when they first came out) and to find out if there were any unexpected consequences. However, I hope that the levels could be reduced and I also hope that one day smart phones will have a built in CO alarm.

I think that all houses should have CO alarms to EN 50291. They really do save lives.



CO-Gas Safety Unintentional Carbon Monoxide Poisoning Case Study

SUSAN HENRY, Deceased in 2018

Susan Henry

Age: 66
Fuel: Solid
Appliance & Location: Wood-burning stove in her home
Notes by CO-Gas Safety: This case study is written by Susan's daughter, also called Susan. Thankfully, another of Susan's daughters survived this incident, as did her husband, although his health is still affected by his exposure to carbon monoxide. The family pets alerted them to the fumes that were spreading through the house and undoubtedly saved two lives, but a carbon monoxide alarm and greater knowledge of the dangers of CO would almost certainly have prevented this tragedy. We are extremely grateful to Susan's family for their work on this account so soon after such a deep loss.

My mum

My mum, Susan Henry, was 66 years old when she died at Craigavon Area Hospital in Northern Ireland, on August 14th 2018 from carbon monoxide (CO) poisoning. The CO poisoning was caused by a wood-burning stove situated in the living room of the family home, which was installed approximately 15 years ago.

It was found that she had 53% carboxyhaemoglobin in her blood; a level of around 30% or less can be fatal. My mum had a kind and gentle nature. Although she was inflicted with ill health, she still found a lot of pleasure in life. Her great loves were gardening and looking after her beloved pets, whom she treated like members of the family. They provided her with a lot of comfort and relief at night when she struggled to sleep due to stress or pain. Her favourite hymn, which she would hum while she tended to her potted plants, was 'All things Bright and Beautiful'; which I feel sums up her personality and passion for nature perfectly.

My mum had four children, Olive, Hester, Thomas and me

My mum suffered from poor health, namely mental illness, insomnia, diabetes, blindness in her right eye and arthritis which led to limited mobility. Due to this she barely ventured far beyond her home so her family was her whole world. She was the proud mother of four children: Olive the eldest, followed by Hester, then her son Thomas and finally me, whom she named after herself. She was also the grandmother to three beautiful grandsons: Reece, Adam and Jake.

The incident in 2018 that caused her death from carbon monoxide

Along with my mother, my father Desmond and my sister Hester lived at the family home, which is a privately-owned terraced house. My mother's health would disrupt her sleep frequently and she would often go downstairs during the night to sleep on the sofa. She took comfort from the company of her dog, Freddie, and cat, Gizmo, who also slept in the living room. My father lit the wood-burning stove for her and Hester before he went to bed at around 10.30 p.m. Hester stated the fire was almost out, just glowing ashes, when she and mum retired to bed after midnight.

How Hester was roused

The family cat woke my sister Hester up by clawing at the bedclothes and generally going berserk. Hester was reluctant to wake up because she felt really sleepy but she realised something was terribly wrong from the cat's behaviour, particularly when she heard my father's breathing coming

from the next room, which sounded very strange. Hester woke my father up and he went downstairs, collapsing at the bottom step. Hester then rang me. She wasn't making a lot of sense, so I told her I would come around right away but would be ringing 999, instructing her to answer the house phone as I would get them to ring it. I rang the emergency services thinking this was about my father collapsing and not realising the full tragedy unfolding. I also rang my brother, who was heading to work at the time and was 5 minutes away. I had no car and it was a 15 minute walk. Through the panic, adrenaline kicked in so I ran to my family home. While my sister was on the phone to the emergency services, she discovered our mum unconscious on the sofa and was guided by the operator to commence CPR.

When I arrived at the house
When I arrived at the house, Hester was at the door getting air as she felt unwell. There was a paramedic in the hallway, attending to my dad who was drifting in and out of consciousness. I witnessed my brother carrying out CPR on my mother. The paramedic asked me to take over from my brother, which I did until a police officer (from the Police Service Northern Ireland) arrived, who then assisted the paramedic in helping mum. More emergency services kept arriving, including the fire service.

The Fire Service Group Commander, Max Joyce, suspecting carbon monoxide poisoning due to two unconscious/collapsed people, rang through and told everyone to leave the house. The paramedics, who were still performing CPR on my mother and treating my father, refused to stop so Mr Joyce ordered every door and window to be opened immediately.

Hester, Thomas (who had grabbed the dog; the cat, refusing to leave my dad's side, was kindly removed by the fire service later) and myself, were told that for our safety we had to leave the house. The next-door neighbours were also evacuated by the fire service, as they were concerned that with the gas rising it could possibly enter into the house next door through the attic.

At the Hospital
My mother, father and sister Hester where taken via ambulance to Craigavon Area Hospital for treatment. Sadly, my mother did not survive. My father and Hester recovered in hospital. My father later recalled that he remembered hearing the dog barking and going downstairs to investigate but didn't remember anything after that until he awoke in hospital.

The inquest
At the inquest in Omagh, Mr Joyce's investigation showed gaps around the wood-burning stove and debris in the flue which would have allowed carbon monoxide to build up. There was also soot in the living room.

CO is odourless, colourless and hard to detect, and Mr Joyce was asked if animals could sense CO. Why did they survive as both were in the living room with mum? Mr Joyce could not explain the family pets' reactions as he stated animals, like humans, wouldn't have been able to detect it. A possible theory was a reaction to fear they may have felt from a lack of oxygen. He believed the cat and dog survived mainly because they were lower to the ground and the CO was rising, with the highest levels being found in the loft.

The Coroner's conclusions
The Coroner, Mr McGurgan, said that there is 'a pressing need for legislation' regarding the fitting of carbon monoxide alarms. He stated he would write to the head of the Civil Service about this but urged householders to fit a working smoke alarm and CO alarm. He also said he would write to the chief executive of the ambulance service about personnel putting themselves at risk by entering premises to save lives.

My mum's death could so easily have been prevented

It's heart-breaking to think that my mother's death could so easily have been prevented if we had known about the dangers of CO and had a CO alarm. We are thankful that my father and sister survived. However, my father has ongoing health issues and it's not known for certain how long my parents were exposed to CO.

We as a family just cannot understand why there is so little education or awareness of the dangers of carbon monoxide. The only cases we were aware of in the past were due to gas cookers/faulty boilers, which was not relatable to us. Gas heating and appliances were uncommon in Northern Ireland, and up until recent years our main source of fuel was oil central heating, with the burner being situated outside. We now know oil appliances produce CO too, but didn't at the time.

We never once had considered that we had a need for a CO alarm to monitor our solid fuel-burning and wood-burning stove. When Dad got the wood-burning stove installed; which was 15 years ago, there was little guidance or legislation. He was never aware of the serious dangers of CO and the importance of a working alarm. Dad believes if he had been educated and advised he would have bought an alarm once he got the stove installed. He stated he wouldn't have given it a second thought to get a CO alarm as he values his family's safety. This still causes him deep regret and upset.

Why hasn't there been a PR campaign to raise awareness about CO and the need for alarms?

My mother's death was widely reported on local TV and it caused mass fear locally. The only comfort we can take from this as a family was that people learnt from this tragedy and purchased CO alarms. Why hasn't there been a PR campaign to raise awareness about CO and the need for alarms? Surely, they are just as important as smoke alarms, which have been highlighted in numerous campaigns. My vision for the future is that everyone has the opportunity to be educated on the dangers of CO and it becomes mandatory to own a CO alarm. Everyone should be informed about the potential dangers and that many fuel types can have CO implications. There should be a campaign informing/reminding the public of the dangers from different fuels (for example, seasonal factors; petrol generators and engines on boats in summer, solid fuel fires and gas boilers in winter etc.). I work as a nurse in the health service and we receive fire training every 6 months; it would be helpful if every workplace had mandatory training including CO education and the danger posed, how quickly it can kill, the symptoms it can cause and its after effects.

Desmond Henry

Susan Henry

CO-Gas Safety Unintentional Carbon Monoxide Poisoning Case Study

GILL WING, Survived in 2016

Gill Wing

Age: 50
Fuel: Mains gas
Appliance & Location: Central heating boiler in her home
Notes by CO-Gas Safety: This private householder had her boiler serviced annually by Gas Safe registered engineers, but it was her neighbour's carbon monoxide alarm that saved her from a potentially fatal fault in the design of her installation. In this case study she tells of the frustration she then experienced when accessing medical help.

I own my own home, an end-of-terrace house, which has a gas boiler housed in an external cupboard next to my front door. I have the boiler serviced by a Registered Gas Engineer every year. The last service before the events described below was in December 2015.

On 8 November 2016, my gas supply was compulsorily turned off. This was because the carbon monoxide (CO) leaking from my boiler had set off my next-door neighbour's CO alarm. When her alarm had sounded, my neighbour immediately called out an engineer from British Gas, believing her own boiler to have developed a fault. However, the fault turned out to be with mine.

An immediate danger to life

The engineer explained that he was legally obliged to cap a gas supply if the levels of CO measured above 80 parts per million (ppm). The levels in my boiler cupboard measured 21 times higher: 1,718 ppm. The form he gave me after he'd disabled my boiler described this toxicity as presenting 'an immediate danger to life'. I was extremely shocked.

Location of the two boilers

My external boiler cupboard and that of my neighbour's are located next to each other. These cupboards are adjacent to our front doors and below our bedrooms. In September, while tending her front garden, my neighbour had heard the gas in my boiler 'popping' as if the pilot light wasn't catching, and had recommended I book a service. I'd immediately contacted my Registered Gas Engineer but, despite repeated calls, texts and emails over a period of six weeks or so, he'd failed to make contact. Events then overtook me, because it was a particularly demanding time at work, and I'd also suffered injuries in two accidents in quick succession, so was distracted with recuperation.

The previous month, I'd had a couple of out-of-character trip accidents in the street within three weeks of each other, falling full-length on both occasions. In the first, I tore the rotator cuff in my shoulder and, in the second, I sprained my jaw, bruised my chin and sustained a black eye and whiplash. The jaw injury left me unable to chew or close my misaligned teeth without pain in my ear for several weeks, and the shoulder injury took 18 months to heal, during which I didn't have full use of my left arm. I'd put these accidents down to absent-mindedness caused by stress, but their having taken place in quick succession prompted my GP to sign me off work for a fortnight's sick leave.

Discovery of CO leak from boiler

It was during the last few days of my leave, much of it spent recuperating in bed, that I discovered that CO had been leaking from my failing boiler. Despite insisting my partner – who lives elsewhere in a flat – bought a CO alarm, I didn't have one myself. I'd mistakenly thought my boiler being located outside my house, in a draughty cupboard, meant I was safe from any fumes. However, as I would learn, those fumes had actually been going straight up through a vent in the eaves of the dormer roof a few inches above the flue. From there, they'd travelled into the roof void over my bedroom – and, later, on a windy day, my neighbour's. The flue had been installed in the 1980s – and, by current legal standards, it was much too short. Given what I was breathing in, it was little wonder, then, that I'd been feeling worse while signed off work, rather than better – I'd been waking very early each morning, when the heating came on, my heart pounding, feeling exhausted and low.

Seeking medical help

My gas supply having been capped by the British Gas engineer called out by my neighbour, I went within the hour to my local pharmacy, which, I learnt, had a blow device called a Smokerlyzer[1], used to measure the CO levels in the lungs of those trying to give up smoking. Mine measured 14 parts per million (ppm), which is comparable to the levels of someone regularly smoking a pack of cigarettes. The pharmacist tested his own levels to give me a comparison and his measured 2ppm. Neither of us has ever smoked. Since the levels decrease with every in and out breath, they'd clearly have been higher still had I been tested earlier, while still in my home, breathing the noxious air.

I went next to my doctors' surgery, where I was given an emergency appointment within 10 minutes. My GP advised that I should go immediately to A&E – a drive of some 45 minutes. Although I was promptly triaged on arrival, the wait for a test to determine the levels of CO in my blood was around an hour, with another hour's wait after that to see a consultant. Almost five hours had passed since I'd left home after my boiler had been condemned and the presence of high levels of CO confirmed.

Why are you here?

When the time finally came for my assessment, the consultant asked me what had brought me to A&E. I explained that I believed I'd suffered chronic CO poisoning, possibly over several months, but certainly over a few weeks, and referenced the levels referred to above. He asked me twice, 'But why are you here?' and then, 'Do you have a letter from your GP?' I replied that I'd been referred by my GP and had been supplied with an explanatory letter by my pharmacist. However, he waved that away, saying, 'That's of no use to me – I don't know what measure was used.' He also refused to look at the form supplied by British Gas declaring the levels presented an 'immediate danger to life', saying, 'I'm not a heating engineer.' Yet any layperson would have been able to appreciate the relative difference between my levels and the norm.

The consultant's assertion

The consultant's assertion that he knew nothing about heating engineering didn't prevent him telling me there was likely to be no significant problem with my boiler because my neighbour's alarm would've been sufficiently sensitive to have been set off well below the level of dangerous toxicity. But this is simply not true – I've since learnt that even if a CO alarm conforms to the European appliance standard BS EN 50291-1:2018, one can become seriously ill after exposure to levels that aren't high enough to actually set it off. That means it's possible to be unknowingly subjected intermittently to quite high levels – for example, 29 ppm for 24 hours or more; 50 ppm for 59 minutes; 100 ppm for 9 minutes; or 300 ppm for 2 minutes. Yet the World Health Organisation's

recommendation for safe 24-hour exposure is about 7 ppm.[2] Even if this were not the case, the CO levels in my neighbour's house that triggered her alarm would've been far lower than I had been subjected to in my own house, right next to the malfunctioning boiler. The consultant also claimed most of the CO would have been dispelled into the air. By now I also knew that this was untrue in my case, given the position of the flue.

Google it

Nonetheless, when I explained that I was on sick leave after two trip accidents, and had been suffering acute anxiety and depression, he told me CO poisoning causes an array of neural symptoms. 'Google it,' he said. I already had, and knew from the NHS website that it can cause ataxia, or a lack of co-ordination – the same website that advises sufferers to go immediately to A&E if they have been exposed to high levels of CO[3].

You only have yourself to blame

Concluding my consultation, the consultant asked, 'Are you the homeowner or a tenant?' 'The homeowner,' I replied. 'Then you have only yourself to blame.' I was a 50-year-old homeowner who responsibly maintained my property and regularly maintained all my appliances. On that occasion, however, I was a vulnerable patient. Most would agree that an unsubstantiated value judgment such as this is highly inappropriate, not to mention unfeeling, in the medical context.

In December, encouraged by my GP, I made an official complaint about the consultant. I wanted him to understand how his ill-informed approach and flippant attitude had made me feel when I was already distressed. I attached a report drawn up by a fellow CO-poisoning survivor and an academic to promote the awareness, understanding and diagnosis of chronic CO exposure. It had been disseminated by the Chief Medical Officer to all GPs and prompted a national poster campaign. In it, the consultant would have read that CO has a half-life of four-and-a-half hours, which would have explained why, when I finally presented for the test, he was able to dismiss my carboxyhaemoglobin levels as 'within the range expected for non-smokers living in a city' and to conclude that 'no abnormality was detected'. I was also interested in his opinion as to why, during the period in which I maintain I was being poisoned, I suffered short-term memory loss that resulted in my leaving the handbrake off my car twice and my car keys in a shop on two consecutive days and, on a third, in the car door, and in losing the keys to my partner's home. The response – when I finally received it three months later, after two reminders that it was overdue – was disappointingly disengaged.

Awareness campaign long overdue

I'm really supportive of the work of hard-pressed clinicians, especially in the current climate. I hope that, in highlighting the variable level of NHS care I received – excellent from my pharmacist and GP, and poor from the A&E consultant – I can help improve the consistency of treatment for anyone else unlucky enough to have an encounter with carbon monoxide in the future. Another awareness-raising campaign would seem to be long overdue. This would ensure that medics know that a person presenting at hospital after exposure to carbon monoxide needs an *immediate* breath and blood test, and that a thorough investigation into the circumstances of their exposure and its aftermath are essential.

Sources

[1] *https://www.bedfont.com/shop/smokerlyzer*

[2] *http://www.euro.who.int/__data/assets/pdf_file/0009/128169/e94535.pdf*, p86 and also *https://apps.who.int/iris/bitstream/handle/10665/141496/9789241548885_eng.pdf?sequence=1* at page 12

[3] *https://www.nhs.uk/conditions/carbon-monoxide-poisoning/*

CO-Gas Safety Unintentional Carbon Monoxide Poisoning Case Study

FRANCESCA DINGLEY, Deceased in 2015

Francesca Dingley

Age: 22
Fuel: Mains gas
Appliance & Location: Water heater in rented apartment in China
Notes by CO-Gas Safety: This case study is written by Francesca's father, Mark Dingley. The investigation into his daughter's death was very much complicated by the fact that it happened abroad, in accommodation arranged by her employer. Francesca and her flatmate, who was seriously injured in the incident, did not have a carbon monoxide alarm or detector and such incidents are probably more common in China and many other countries.

Francesca had discovered a love for Asia when she studied in Hong Kong in 2013 as part of her Bristol University degree course, taking the chance whilst there to also visit Macau, Taiwan and the Philippines. In 2015, she was therefore over the moon to be offered the opportunity to teach English as a foreign language (TEFL) in Chengdu, China for one of the largest educational organisations in the world. The company has been operating since 1965 and has a presence in over 100 countries, most notably in China, Indonesia and Russia. We knew that they had arranged Francesca's accommodation in China, and that she had a flatmate, and I suppose that gave us a false sense of security about the quality of the apartment being provided. We were not aware of the dangers of carbon monoxide poisoning and I don't think we even knew that carbon monoxide detectors existed. This was simply not on our radar.

Settling in to life in China

Francesca had arrived in China in early January and shared an apartment with a fellow teacher. She completed her short teacher training course and began gaining teaching experience shadowing others working at the school, which was a franchisee of the company. Within a few weeks, she emailed to say that her flatmate had been fired and, rather than stay in the apartment on her own, she was going to move in with another teacher, Emily. By early February it was all arranged and Francesca told us that the new apartment was in an area where more of the other foreign teachers lived, so she was looking forward to it.

Hot water issues in new flat

Emily had moved into the flat in mid-January and Francesca joined her on 5th February. On the evening of 9th February they went out for dinner, grabbed some groceries on the way home and spent a couple of hours at home chatting and getting excited about the company's 50th birthday celebrations that were happening the next day. At around 11pm Francesca went to bed, while Emily tried to wash her hair in the bathroom. The school knew from the previous tenants, who had chosen to shower at the local gym, that there were problems with the hot water in the flat. When Emily had moved in a few weeks before Francesca, a member of staff from the school had shown her around the flat and said that you had to turn on the kitchen tap to get hot water in the bathroom. So Emily turned on the kitchen tap but the hot water failed to kick in, so she gave up and went to bed. Unfortunately, she forgot to turn the kitchen tap off.

The next morning, Emily got up as usual, doing yoga and meditation in her room for an hour before hearing the kitchen tap. She went into the kitchen and turned it off. She returned to her room to get ready for work, shut the door, but, feeling unwell, she lay down on her bed.

The girls are missed at work

The alarm was raised when neither of the girls arrived for work, or for the 50th birthday celebrations at lunchtime. Since no-one was able to get hold of them, a colleague went round to the apartment and found them both. Emily woke up in hospital, but it was too late for Francesca.

No safeguards in place or responsibility shown

Francesca's employment contract clearly stated that the appliances in the apartment, arranged by her employer, should be tested before new tenants moved in. The school rented it from a private landlord, and even the contract between those two parties stated that the equipment should be in 'a good, workable and safe condition'. When I questioned these procedures it seemed that there had actually been an inspection of the apartment by the landlord, the agent and an admin officer from the school – but they had only checked that items worked, not that they were safe! None of them had any knowledge of gas or electrical safety.

The landlord was supposed to show documentation to the school that the boiler had been maintained, but he never did. The fact that Emily had been shown how to turn on the kitchen tap to get the hot water in the bathroom shows that the school were aware that there was at least some sort of problem. If someone with gas experience had attended to that, they would have spotted the major problem that killed Francesca.

Faulty installation

The flue to the water heater was a tube that vented out through the kitchen, where the boiler was actually located. The tube went out through a hole in the kitchen window, but it was too large in diameter for the hole and so had been distorted to get it to fit through – this led to gaps all around, between the window and the flue. The tube was also cut too short on the outside of the window, so it was inevitable that gasses exiting it there would blow back into the flat through the gaps. The fact that the kitchen tap had been accidentally left on all night meant that the boiler had been running for hours and the fumes kept accumulating. If the flue had been installed correctly and up to Chinese regulations, it wouldn't have mattered how long the boiler was running for, the girls would have been safe.

Conclusion

The company has now introduced new health and safety protocols and provide all teachers in China with smoke and carbon monoxide alarms. However, we have been left utterly heartbroken… and it was all so avoidable.

Poor Francesca paid with her life for the company's new health and safety policy.

CO-Gas Safety Unintentional Carbon Monoxide Poisoning Case Study

ANGELA PINKNEY, Deceased in 2005

Angela Pinkney

Age: 35
Fuel: Mains gas
Appliance & Location: Central heating boiler in her rented home
Notes by CO-Gas Safety: This case study is written by Angela's older brother, Michael. Angela's case is one where, sadly, despite the landlady being diligent in attempting to maintain the boiler safely, mistakes were made by qualified professionals. Not only did the boiler receive sub-standard care from engineers, but also Angela herself visited her local hospital with symptoms the day before she died and carbon monoxide poisoning was not diagnosed by staff there.

Angela found dead March 2005

Angela Pinkney, 35, an Oxford University admissions officer and administrator, was found dead in her bedroom in Littlemore, Oxford, in March 2005. Angela was my sister. Her death devastated our family and we still miss her terribly.

Angela moved into her privately-rented flat in 2003. Angie's best friend Joanne owned the flat and Angie paid rent to Joanne. It was a two bedroom flat and they had a room each. The flat was a fairly new, high-spec build in a converted hospital.

British gas engineers visited the flat many times

The boiler that supplied heating and hot water to the flat had been giving them problems and British Gas engineers had visited the flat ten times over the previous 18 months to look at it. Both Joanne and Angie were involved in calling out the engineers. Joanne was very diligent in trying to get the boiler fixed.

On March 16th a British Gas engineer visited the flat and I believe this is when an adjustment to the air-gas ratio valve was made. It was not possible to prove this in the legal proceedings following Angela's death and so charges were dropped against the engineer in question, but at some point in all the engineer visits the valve was certainly altered to make the incoming gas a richer mix, which would have increased levels of carbon monoxide being produced.

Joanne took Angela to hospital

Later on the same day, Joanne took Angela to the John Radcliffe Hospital, which was not far away. She was suffering from dizziness, a headache, nausea and anxiety. The doctors could not find any explanation for her symptoms and she improved as she waited there. At around 5.30am they came home without any diagnosis and Angela went to bed to try and recuperate, while Joanne went to work. When Joanne returned from work she found Angela dead in her bedroom.

High levels of CO found in Angela's room

Extremely high levels of CO were found in her room. A Post Mortem revealed that Angela had 55% COHb (carboxyhaemoglobin) in her blood. This binds to the blood's red blood cells, so preventing them from carrying oxygen, and that level is often fatal. It might seem odd that Joanne had not been as affected as Angela, despite living in the same flat. That seemed to be because the blocked ventilation pipe, which had been incorrectly fitted, was above Angie's ceiling. It could so easily have been a double tragedy. The occupants of the flat above Joanne's also had some effects of the CO but luckily one of them was a scientist and, when they realised they were simultaneously feeling nauseous, they had the wherewithal to realise that it must be CO; they opened all their windows and contacted the gas emergency service.

The inquest

At the inquest of Angela's death at Oxford Coroner's Court, a jury returned a verdict of death by misadventure after hearing that engineers were called out on numerous occasions. The jury heard that the valve adjustment caused the boiler to not work properly and there was evidence it was leaking toxic fumes. There were several faults with the boiler and its flue; it was mal-aligned and thus it collected condensation water that caused an obstruction; the air inlet was partially blocked with a collection of construction debris – screws, wall plugs and a plastic bag; there were loose screws at the top of the boiler which may have made it easier for combustion gases to escape into the flat, and there were gaps in the flue above the boiler.

No records of checks

We don't know why none of these failings were detected during the ten engineer visits but the Coroner, Dr Richard Whittington, did note that there were no records of any safety tests, checks or certificates on any of the visits. He also said he would be writing to British Gas, and that if a boiler was unusual, like the Powermax 155 in Angela's home, engineers should stop work and seek advice. He said that safety tests must be carried out and records kept and suggested that check lists should be completed by an engineer and customers given certificates stating their boilers were safe.
British Gas spokesman Mark Duffell said the company would give the coroner's recommendations full consideration. He said: 'We would like to make it clear that all of our engineers have the most up-to-date equipment and we spend over £30m a year to ensure they are very thoroughly trained. We have strict operating procedures to very high standards and it is therefore disappointing and distressing to see that those procedures were not fully adhered to in this instance.'

We hope lessons have been learned

As a family, we hope that lessons were learned from Angela's death. There were so many opportunities for the faults to have been rectified, for Angela's symptoms to have been identified, or at least for the possibility of CO to have been discussed by either the gas or medical professionals. If it had, I am sure that Joanne or Angela would have installed a carbon monoxide alarm to EN 50291. They only cost about £15 and one would surely have alerted them before it was too late.
This is why the family gives support to CO-Gas Safety. They continue to lobby for raised awareness among both the relevant industrial and medical bodies, but also throughout the general public. They also lobby for changes in the laws on landlords' gas safety checks and CO alarms. We can only hope that the recommendations they have been lobbying for since the 1990s are put into law sooner rather than later.

Michael Pinkney, Angela's brother.

CO-Gas Safety Unintentional Carbon Monoxide Poisoning Case Study

ANN DANIELS, Survived in 2002

Ann Daniels

Age: 37
Fuel: 'White gas', a type of LPG (Liquefied Petroleum Gas)
Appliance & Location: Portable cooker in a tent on an expedition to the North Pole
Notes by CO-Gas Safety: Ann Daniels is a World Record-breaking polar explorer. She has completed over 14 polar expeditions. In 2002 she put together the first all-woman team to ski continually from land to the North Geographic Pole. Having heard about a near-fatal exposure to carbon monoxide that Ann and her team had on that epic expedition, despite their good knowledge of the dangers of CO, CO-Gas Safety asked her to write this case study and we are immensely grateful to her for doing so.

I first began my Polar adventures when I gained a place on a North Pole relay. I applied for a place on the expedition when my triplets were 3 and after a grueling selection process was delighted when, despite there being over 250 applicants, I secured a place. This expedition consisted of 5 groups of 4 women with 2 guides, each did a leg of the journey and were then replaced by the next 4 to ski Northwards. I was fortunate enough to be in the first team on the ice and it was here I fell in love with the arctic region and expedition life. After 17 days on the frozen arctic ocean we were taken out and the next lot took up the challenge. On the 27th May 1997 the final team made it to the North Pole which was a huge success for a group of inexperienced women.

After that expedition 5 of the women from the relay, including myself got together and planned an expedition to the South Pole. This time there were no guides and we planned, trained and put together the expedition ourselves, learning all the skills we would need to survive crossing Antarctica to the pole. After skiing 1130 km across the highest, coldest and windiest continent on earth we reached the South Pole to become the first British all women's team to make the journey.

Pulling the sledge, which weighed over 250 lbs

Taking a breather

I began guiding expeditions but had a yearning to ski all the way to the North Pole. Besides the relay this hadn't been completed by a team of women and in 2002 I put the team together and myself Caroline Hamilton and Pom Oliver began our journey from Ward Hunt Island, Nunavut. From the outset we were beset by problems I hadn't encountered before. Not even on the original relay. Temperatures for the first 27 days were between -46°C and -58°C. Everything froze. Our clothes, our

kit and even our brains slowed down in the extreme temperatures. Our sledges weighed over 250 lbs and progress was extremely slow.

We used stoves for cooking powered by Coleman fuel is a petroleum naphtha product marketed by The Coleman Company. Historically called 'white gas' (not white spirit), it is a liquid petroleum fuel (100% light hydrotreated distillate) usually sold in one gallon cans. It is used primarily for fuelling lanterns and camp stoves. See ***https://tinyurl.com/y3stlx9r***

Tent in which food is cooked

Dinner is served

Because of the conditions and terrain we always cooked in the tent. Something I have done on every expedition. Our tent was specifically made for the expedition and had vents inserted to eradicate the dangers of carbon monoxide poisoning. Because of the length of the extreme temperatures we were enduring, the vents froze up and weren't doing the job they were supposed to do. We didn't envisage there being a problem so didn't check the vents and on the 5th day paid the price. As I finished cooking and began to turn the cookers off I felt light headed and dizzy, as if I'd drank too much alcohol. I turned to Pom, who was sharing the cooking, to tell her the problem and watched her collapse in front of me.

It was obvious that we both had carbon monoxide poisoning and Pom was in dire straights. I rallied and Caroline and I dragged Pom out of the tent into the cold night air. It took over an hour before she came round enough for us to feel that she was out of danger and we put her in her sleeping bag but kept watch throughout the night in case there were any other problems. We all knew the dangers of cooking in the tent but thought we had enough venting to make sure this didn't happen and were more afraid of a tent fire.

We still needed to cook in the tent for the rest of the expedition as it's impossible to cook outside but we couldn't risk this happening again and so we cut a hole in the top of the tent, cut out the mesh on the tent vents and always cooked with the door open, even though the cold temperatures made this a very painful experience. We figured it was better to be in pain from the extreme cold than dead from Carbon monoxide poisoning. I am now more aware than ever of Carbon monoxide poisoning and make sure the tent is always fully ventilated and take fresh air regularly when the cookers are on.

We didn't have any further carbon monoxide episodes throughout the expedition, although did have many other obstacles, including cracking moving ice, huge ridges and of course extreme cold. After 80 days we successfully reached the North Pole and celebrated at the top of the world.

Since this expedition I've sledge hauled for thousands of miles on ice, mainly with scientific expeditions and take great care to make sure Carbon Monoxide poisoning is something I never have to deal with again.

While working on this case study, Stephanie asked Ann how she knew about CO poisoning and she said, 'I can't tell you exactly how I know but I'm a fairly intelligent person and CO is well documented and a pretty well-known danger. I read many factual books, watch the news etc. and it's something I knew about long before I started on expeditions. And before I took part in any expedition, I learnt about all the dangers and the importance of ventilation. I didn't exactly learn about what to do but it seemed pretty obvious that fresh air was the answer and getting rid of the residual CO in the tent essential. Just common sense I guess.

Whilst I was also affected, the mind is a powerful thing in an emergency and survival situation and getting to Pom was essential, so my instincts just kicked in and the adrenaline beat the confusion in my own brain. As for Pom, once she became lucid and we knew the tent was safe again all we could do was monitor her that evening and keep an eye on her during the days that followed, taking clues from her manner and ability to perform clearly. Obviously, we had no way of knowing when either of us were fully recovered. As we were dealing with mild hyperthermia, frostbite and temperatures of -58C there were a lot of difficulties to encounter and it was impossible to separate one from the other. We both managed to perform and survived to tell the tale.'

Breathing through frozen clothing in extreme temperatures is not an easy task

If you want to contact Ann Daniels for a talk, please visit website *www.anndaniels.com* which has a contact form and full information. Alternatively email her on *ann@anndaniels.com*

Celebrations at the North Pole. 1 June 2002. Feeling elated!

Note: See further confirmation of the dangers of CO at the North Pole by explorer Inge Solheim *www.f3nws.com/news/it-s-the-most-hostile-place-life-at-the-north-pole-with-inge-solheim-6ca3637592f* (article dated 12.12.19)

CO-Gas Safety Unintentional Carbon Monoxide Poisoning Case Study

ANNE BRENNAN, Deceased in 1995

Anne Brennan

Age: 20
Fuel: Mains gas
Appliance & Location: Central heating boiler in a student house
Notes by CO-Gas Safety: Anne's death was the catalyst that caused CO-Gas Safety to recommend that the public only buy and install CO detectors with audible alarms to British Standard, later EN 50291. At the time, disposable detector indicators that changed colour when exposed to CO (black spot detectors) were in wider use. These seemed cheaper, but weren't over a longer period, and obviously couldn't rouse victims from sleep or a CO-induced stupor.

Anne was living with about six other students in a house in Flass Street in Durham. In 1995 she was in her second year of study of English literature.

As of 1994 landlords were required to have gas appliances checked every 12 months by a registered engineer. The residents of Anne's house had suspected carbon monoxide and had purchased a 'black spot detector'. If only they had instead purchased a CO alarm to what was then British Standard, Anne would still be alive. However, CO alarms cost £30 to £60 at the time, which was a great deal more in real terms at the time.

House occupants aware of dangers of CO

There had been some work done in the area where Anne was living, such as condemning gas fires in older student properties. The students were therefore aware of carbon monoxide and had asked the landlord for ventilation. He had seemed angry about this request and came to the house with a drill and said, 'You want ventilation, well I'll give you ventilation' and drilled many holes in the back door.

Anne not the only victim

On the 15th November 1995 a female student in the house fainted and had been taken to hospital. Doctors suggested that carbon monoxide could be responsible. The other housemates later realised that they hadn't seen Anne all day so her friends broke into her bedroom and found her on her bed. Paramedics arrived very quickly and tried to resuscitate Anne for about three quarters of an hour but were unsuccessful. Anne's room was over the boiler location in the kitchen, which explained why she died but her fellow students survived.

Such a loss

Anne wanted to become a Labour party MP. She even had red hair like Barbara Castle, the prominent northern Labour MP and cabinet minister. Anne's teachers described her as highly intelligent and motivated, and extremely popular. Friends said she was very happy, helpful, always smiling and loved being at college.

Margaret Brennan, Anne's mother says, 'the last time I saw Anne she said, I love you mother, take care of yourself and I'll see you at the weekend'.

Hugh Brennan, Anne's father says, 'When I took Anne back to the student house and went into her room I said, 'I'll open this window here Anne and let some fresh air in.' Anne said, 'Oh no, I like to keep warm'.

CO-Gas Safety's role

CO-Gas Safety couldn't do a great deal for the Brennan family in the aftermath of Anne's death, but we did advise them that they should consider instructing a lawyer for the inquest. Stephanie attended the inquest in Durham and met the police officer in charge, Steve Kitchin. He was very helpful and when Sonja Hyams, another student, died from CO a year later in November 1996, Steve kindly helped the police and the proceedings went more easily. Thankfully we haven't had another university student death since 1996, which is real progress.

At the inquest, Margaret was kind enough to thank Stephanie for her advice to instruct a lawyer.

Prosecutions by Health & Safety Executive

In 1997 a landlord, Graham Williams, and a gas fitter, Edgar Maddison, were fined £10,000 and £3,500, respectively (plus £2,000 costs each) by Newcastle Crown Court. The judge said that he would have sent them to jail if he had had the power. The inquest returned a verdict of unlawful killing.

Anne's parents recovered no damages for Anne's death because there are no damages for death itself in English law. There are limited damages for bereavement (£12,980) but these are only for a child not yet 18 or for a spouse. Anne was 20 and not married.

Anne's death prompted the Northern Echo newspaper to start a valuable campaign against the 'silent killer'.

Tony Blair, then Labour MP and Leader of the Opposition, sent a letter to Anne's housemates dated 12th December 1995 in which he expressed his sorrow and sympathy. He wrote that 'Everything must be done to help this tragic accident from ever happening again'.

Parliamentary debate

The family's MP at the time of the inquest, Fraser Kemp, said the following in Parliament:
(see *https://api.parliament.uk/historic-hansard/commons/1998/jan/21/carbon-monoxide-poisoning)*

HC Deb 21 January 1998 vol 304 cc972-9

'I had the privilege of meeting the parents of Anne Brennan recently, and spoke to them yesterday to talk about the issue and about my raising my concerns in the House. I beg the indulgence of the House while I read from a letter they sent me, and I ask the House to listen carefully: We were obviously saddened and devastated by the death of our daughter Anne. She was a gifted girl who had vitality and a great love of life, she was a talented singer and artist, she helped underprivileged children in the north-east. Apparently her real ambition, declared in writing, was to become a Member of Parliament.

The letter continues: We know nothing can replace Anne and our lives were torn apart with her passing. What we are determined to do is help prevent other families having to suffer a similar loss. We urge the government to do anything it can to ensure her death was not in vain. Although Anne's parents have had to cope with that tragedy, they still want to see some good come out of it, so that she will not have died in vain.

I must tell the Minister that I realise that there are no easy answers and no quick fixes. None the less, we must realise that there is a real problem. The CO-Gas Safety charity, to whose work I pay tribute, estimates that, between September 1995 and November 1997, about 134 deaths resulted from carbon monoxide poisoning, as well as about 800 near misses.'

Having made the point that the dangers of carbon monoxide poisoning can also arise from coal, wood and fuels other than gas, he went on to say:

'Following the denationalisation of British Gas, the position of that company and of Transco should be examined, and the major gas companies need to exercise greater responsibility. All gas users pay a standing charge of £32.92 a year, and a small proportion of that could go towards trying to solve the problem.

I am reliably informed by the carbon monoxide safety campaign that Transco, one of the British Gas businesses, has no equipment for tracing carbon monoxide. That is a bit like asking someone to investigate radioactivity without supplying a Geiger counter. We need to think about the support that gas companies have.'

CO-Gas Safety comments

We wish we could report that things have changed radically since Anne died in 1995. A rented house such as hers would now require a landlord's Gas Safety Check & certificate but that does not necessarily require a test of the flue gasses. Sadly, Anne's landlord still would not be obliged to install a CO alarm as the law stands in England on 20.01.20. The gas emergency service is still not required by law to carry and use equipment to test gas appliances for CO. Anne and her housemates were all concerned about CO but raising the issue with their landlord brought an inadequate response. Today, many tenants are too intimidated to even raise such issues with their landlords but might find it easier to contact the gas emergency service, as an independent body. However, as the law stands on 20.01.20, the students still wouldn't be able to request a mandatory test of the flue gasses by the gas emergency service; calling them now would probably simply result in them cutting off the gas supply, leading to even more difficulties with their landlord & no resolution or proof of CO.

There are now four companies, the Gas Distribution Networks (GDNs), that provide the gas emergency service and operate in different areas of the country: Cadent (West Midlands, North West England, East of England & North London), Wales & West Utilities (Wales and South West England), Northern Gas Networks (North East England) and SGN (Scotland and Southern England including South London).

The GDNs have thankfully taken over CO-Gas Safety's CO awareness competition and made this a great success. (see back inside page).

Anne Brennan on the left and her friend, Rachel Hastie, on the right.
Rachel was a big help to CO-Gas Safety and to Anne's parents, Hugh and Margaret Brennan.

CO-Gas Safety Unintentional Carbon Monoxide Poisoning Case Study

SANDRA SMITH, Long-term exposure in 1986

Sandra Smith

Age: Exposure at 43, symptoms ongoing for decades
Fuel: Mains gas
Appliance & Location: Central heating boiler & fire in her home
Notes by CO-Gas Safety: Sandra Smith, Carbon Monoxide Support, Barnsley, first contacted Stephanie Trotter around 20 years ago to tell Stephanie about her poisoning. She had been doing what she could to survive and to raise awareness ever since, despite her poor health. Stephanie is very grateful to this survivor for all her support to the work of CO-Gas Safety and also to Stephanie over the years. Sadly, Sandra has recently passed away and her husband has helped us to conclude this case study, initially written by Sandra herself.

Thirty years ago – we moved to the house in 1978

When we moved to the house in 1978 where we are still living in now I had heard that the lady who owned it had been poorly. We had bought and had fitted a new gas fire in 1986, but when it came to be fitted the fitter refused because he said that the flue was not suitable. We had the remedial work done and the fire was duly fitted. Over a 9-month period in 1986/1987, I got what I now believe to be chronic CO poisoning. This started with 'flu-like symptoms'; also the muscles over my ears were swollen and sore; then I had a red rash down both sides of my neck; a big blotch on my left foot; my tongue was blue and I felt like I was walking on 'sponge.' i.e. off balance! Also, my normally shiny hair had gone dull. These symptoms did, however, clear up to some extent when I went on holiday. Then one day I thought I could smell something from the gas fire. I called a big reputable firm which was CORGI registered and had fitted the fire initially. A man came and did a smoke test to test the flue. I was in the living room and the smoke didn't go up the flue. The next thing I knew was that I was outside because the fitter had taken me there, because I had fainted. The gas fitter who repaired the fire told me that my symptoms were those of CO poisoning.

I wasn't advised to go to a doctor but went eventually because I felt so ill

The fitter didn't tell me to go to the doctor but eventually I decided to call one and made an appointment because I felt so ill. However, when I related what had happened to my doctor, he said that he had 'Seen CO poisoning; it kills you or it doesn't and it wears off when you get into the fresh air'! In any event he had a 'plane to catch'! My symptoms were dismissed as 'psychosomatic'. It was about this time I felt the need to have the doors and windows open, as often as possible. I am pretty sure people, and particularly women, are being sectioned when they are in fact suffering from the effects of carbon monoxide poisoning.

Referred to a consultant

I was referred to a consultant in Sheffield, who asked if I had ever worked with toxic chemicals. This was the nearest anyone got to any diagnosis.

Foreign Accent syndrome

One of the reasons people couldn't work out what was wrong was that the damage to my brain caused by CO gave me foreign accent syndrome (please see *www.utdallas.edu/research/FAS*) My accent was a mixture of Scottish, Welsh and Geordie but when I contacted a speech training teacher she told me that I had a lilt and in her opinion was Pakistani, as she had taught enough Pakistani doctors' children to recognise it. This was over the telephone and she confirmed this again when we met face to face.

No witnesses or evidence
Once the gas fire had been put right, I had no witnesses to confirm that the fire had been faulty. Unfortunately, in my opinion I just became part of a 'cover up' as, obviously, the fitter who had told me about the CO poisoning was not going to confirm it, in case he lost his job. It was just as if I had committed a crime, instead of having a gas fire fitted!

Several tests were done and the powers that be (the so-called experts) decided that it was the boiler which was at fault, as it had not been serviced for about 14 months. The firm duly serviced the boiler but after about 3 weeks the symptoms returned, so we called them in again. The fitter said that unfortunately the fitter who had serviced the boiler had accidentally punctured a seal with his screwdriver (who says lightning can't strike twice?).

My life was ruined
My health was ruined, my reputation ruined, my marriage ruined, and my life was just about ruined. I was left with a balance problem and muscle problems. I did, however, purchase one of the detectors available then. This consisted of a cardboard strip with a centre piece, which was supposed to change colour in the presence of carbon monoxide!

Over the years I have watched, read and listened to articles about CO poisoning with interest. By the late 1990s I still had balance and muscle problems. By that time though I had acquired two of the new battery-operated detectors, so felt safer. I also had a computer and the Internet was expanding rapidly. I contacted CO-Gas Safety, and they have been a really big help - thank you very much indeed.

What I have learned
(a) Doctors are taught very little about the effects of toxic gasses. I took articles about chronic CO to doctors but sadly I don't think they read them, thus compounding their ignorance. In fact I showed a doctor on a home visit an article which Mrs Trotter had emailed to me about a case in Hull, and after reading it she dismissed it by saying, sarcastically in my opinion, 'Oh she is not a professional' to which my husband replied 'no, she has just had 20 years' experience of dealing with cases'.

(b) It was around this time, I think, that I discovered that chronic CO poisoning is like having 'The Bends'. Also, that CO has a 'Half-life'. This gas halves in the body every four hours for seven days, does its damage, then leaves! A pathologist once told me that whilst this gas remains in your body, you will react to its presence.

(c) Apparently, dogs can be a very good indicator of the presence of dreadful CO. If you possess a dog and it suddenly stops lying in front of the gas fire, then you could have a problem. I say this because our dog at the time had stopped lying in front of the fire when it was lit. After it had been put right she was back in front of it again.

(d) Always try to have a small window open if you have a gas appliance lit.

(e) If you think you have been exposed to CO poisoning, you might try asking your doctor to organise a COHb test at A&E. This way you should be able to prove you've been poisoned. I have been told that CO can leave the blood and breath quickly, so there is a danger of a false negative result to this test. It is therefore safer to test the appliance if you can. The problem for a survivor is firstly how to find someone to test the appliance with the correct qualifications to give evidence in court later, if necessary, and secondly, how to obtain a test without changing the appliance.

(g) Please buy at least one CO alarm to EN 50291 standard from a reputable supplier. However, CO alarms even to EN 50291 are designed not alarm for 120 minutes at about 30 parts per million of CO in the surrounding air. This means that although they seem excellent at saving lives, CO-Gas Safety tells me that they have come across one or two people with a good CO alarm to EN 50291 who have complained of symptoms of CO.

Please also be aware that gas fires and boilers are not the only culprits. We had a kitchen make-over in 1996 and were persuaded to have new gas hobs fitted. We reported to the firm doing the work that we could smell gas when the hob was lit. Despite their best efforts they could not seem to cure the problem and therefore called in an engineer from the suppliers. When he arrived, he opened his toolbox and he had a new universal joint. Once this had been fitted the problem disappeared.

October 2017 update
Thirty years have passed now, I have still got a balance problem, muscle problems and also breathing problems! Despite all the publicity and valiant work of dedicated people - trying to get the message across - there is still, it would seem, some of the 'It will never happen to me' attitude. It really saddened me recently to read an article in a national newspaper about CO poisoning. It was the same old story - no detector, the doctor didn't recognise symptoms etc. **Luckily nobody got hurt this time!**

Thank you
Thank you for reading this. If you haven't already got an alarm to EN 50291, I hope you will be encouraged to buy one. After all, my only crime was to have a new gas fire fitted. I found out the hard way that gas fitters are human; they have 'off days'. They can, and do, make mistakes!
With best wishes, Sandra Smith; a survivor.

From Robert Smith, Sandra's husband – It is now 2019 and since Sandra wrote this she has unfortunately and very sadly passed away. Sandra had previously sent this account to Mrs Trotter but asked her not to publish it straight away because, on reflection, she did not want any publicity. I now, unfortunately, have my own problems inasmuch that I have been diagnosed as having white matter disease in my frontal and parietal lobes, which causes balance problems. Accident and Emergency doctor and CO expert John Henry told Mrs Trotter that he had sent symptoms of CO to 200 GPs and asked what could have caused these symptoms. Many sensible suggestions were made but not one GP suggested CO as a cause.

In 2007 Sandra & I went to one of the CO Awareness Week sessions organised by Lynn Griffiths of CO Awareness. This was held in the Welsh National Assembly in Cardiff. On the same platform was a man in a wheelchair, who related his story. Prior to moving in with his partner he had been fit and healthy but unfortunately there was a problem with a flue in the property and they both suffered chronic CO poisoning, which resulted in him now having to use a wheelchair. At the same meeting, after Sandra had related our experience, a man approached both Sandra and I and introduced himself as being from the Federation of Small Installers. He said that when that particular gas fire was being brought on to the market they tried to stop it, as they knew it could cause problems. He tried hard to raise this issue with the authorities but got nowhere.

When we got back from Cardiff, I went to work the next day. During the day Sandra rang me to say that she was switching the boiler off because she was experiencing CO symptoms. It was at this point that we decided enough was enough and that we were going to go all electric. Fortunately it was a relatively mild winter as we did not get the new boiler installed until May. One man, supposedly a surveyor, had the effrontery to say that you can't get CO poisoning from the new combi boilers – naturally his firm did not get the job, and I sent him away with a flea in his ear.

Sandra has tried to highlight the problems of CO poisoning and was doing so even when she was in hospital. Let us hope the message went home to some of the people she spoke to.

At least you shouldn't get CO poisoning from an electric boiler and, even though they are costlier to run, we had peace of mind. When the old boiler was eventually taken out we discovered that there was a split in the seal, and one of the prongs on the flue outlet had broken off and birds had been getting into the back of the boiler, which was evidenced by feathers and bird crap. The house is now all electric and the gas meter has been removed.

This picture was taken about 5 years ago when Sandra was 71 years old and it was for a *Sound of Music* screening. Sandra decided to go as the bride since her own wedding dress was styled on the one in the film.

Robert Smith

Note by Stephanie Trotter, CO-Gas Safety Doesn't Sandra look stunningly beautiful in this picture? She was always brave & caring: a good friend to the charity, to the cause of raising awareness of the dangers of carbon monoxide poisoning and a good friend to me. She cheered me when I was depressed at the lack of progress in preventing these avoidable tragedies.

Sandra Smith at a carol service in December 2018 – she will be greatly missed

CO-Gas Safety Unintentional Carbon Monoxide Poisoning Case Study

TONY DYMOTT, Survived in 1976

Tony Dymott

Age: 23
Fuel: Petrol
Appliance & Location: Police van used at work
Notes by CO-Gas Safety: This incident would most likely not happen today, due to changes in vehicle technology and Police working practices, but it shows the danger posed by petrol exhaust emissions, even when not in an enclosed space.

Traffic cones needed outside Bristol City football ground

In 1976 I was a Police Constable in the Avon and Somerset Constabulary, working from Bishopsworth Station. On our patch was the Bristol City football ground. Prior to each match around 150 parking cones had to be put down to try and prevent the often daft parking that occurred as people rushed to the ground.

I put the cones down and collected them up

The cones were put down using a van with one PC driving and the other crouching down by the open side door. As the van crawled along each cone was dropped into the gutter. The cones were heavy, weighted down with sausage-shaped bags of sand inside the base, and putting down a large number would be a time-consuming and physical job by any other method at the time. I had no interest in football so this was a job I was quite happy to do. Once the match had started, we would then repeat our journey, picking up the cones and stacking them back in the van.

I suddenly fell out of the vehicle

On one occasion, I was carrying out the task of collecting the cones into the side of the van, and I suddenly fell out of the vehicle. Apparently, the last thing I said was “Hang on I’ve missed one”.

When the driver realised something was wrong, he went round the van to the pavement and found me on the floor having convulsions. I recollect only a sea of faces, including two ambulance men looking down on me, and managed to miss the blue light and two tones high speed dash to the hospital escorted by two police motorcyclists. I woke again briefly in A & E and then spent the night in hospital before being discharged in the morning.

Carbon monoxide was likely to have been a major factor

It was concluded that it was likely that carbon monoxide was a major factor, as the exhaust pipe exited below the side door over which I had been crouched. Another factor was my crouching down, affecting the blood flow, and a lack of food and sleep were possibly contributory. I was asked if I intended taking any action but having no long-term effects I declined.

Because of the convulsions I was sent for an EEG to determine if I was epileptic. I have no recollection of the treatment, if any, that I was given at the time.

Outlet of exhaust changed to the back of the vehicle

The vehicle in question was almost certainly petrol, without a catalytic converter. The only change made was to move the outlet of the exhaust to the back of the van. The method of putting cones out was continued. Of course we now have improved attitudes to health and safety; carrying a passenger not in a proper seat and not restrained would no longer be allowed.

Letter from Mrs Michelle Hindson written after the tragic death of her daughter, Nikki, from CO on 5th December 2016 in a vehicle as part of her endeavours to raise awareness of the dangers of CO from modified cars.

Mrs Michelle Hindson
45 Fox Crescent, Chelmsford
Essex
CM1 2BN

20/2/2019

Michelle.hindson70@icloud.com

An open letter to whom it may concern. (2nd email)

I am writing you all at once with the hope that we as a family may finally get some help with an issue that we feel needs tackling.

Allow me to explain briefly, in December 2016 our 23 year old daughter was found along with her friend, dead inside a modified car, the cause ruled at an inquest as carbon monoxide poisoning as a result of the car being inadequately modified.

2 years down the line and we still miss her every day,

We have been in correspondence with Chris Grayling MP, who via whatever means he has available has had an information sheet published; this is now available on the *Gov.uk* website. Within this information sheet it states that under the Road Traffic Act 1988 (section 42) it is an offence to use an on road vehicle which has been modified in such a way that it no longer complies with the air pollutant emissions standards it was designed to meet, the penalties of £1000 per car and £2500 per bus, van or lorry are also enforceable, it goes on to state that it is an offence to alter a vehicle in such a way that the use of the vehicle on a road would be unlawful, this also carries potential unlimited fines.

Our daughter paid way more than a fine for being in a passenger in a badly modified car, She lost her life.

The law is out there but no one so far seems to be taking responsibility for enforcing it.

The car had been modified in such a way that it was not safe, or road legal, the emissions produced were 1000 times higher than the legal limit required to pass an MOT, but this went undetected as it was a newer car and was therefore exempt from any MOT, this car was driving around the roads throwing out huge amounts of deadly gases and unlike poorly maintained cars with lights not working or tyres that are worn, this is an issue that cannot be seen, heard or smelt, but can still kill so why is it not being taken seriously?

So to the police I ask why can they not enforce this when carrying out roadside checks?
To the Government I ask why is this law out there if it is not being enforced?, both from a traffic problem but also an air pollution perspective.

To the DVSA I ask why are we just looking at HGVS and buses, when cars can be just as lethal?

To the Motor industry why are carbon monoxide detectors not fitted as a safety feature within cars?

If you can install windscreen wipers to detect rain why not install something that can save a live?

Whilst what happened to our daughter is not an everyday occurrence, it still happened, and it shouldn't have done, and it shouldn't be ignored, it could happen again.

Information links –
www.gov.uk/goverment/publishcations/modifying-your-vehicle/modifying-your-emmissions-the-legal-safety-and-health-implications#contents
www.chelmsfordweeklynews.co.uk/news/15172840.VIDEO police release forensic footage that show what led to the deaths of Tom Putt and Nikki Willis
www.bbc.co.uk/news/uk-england-essex-39339063

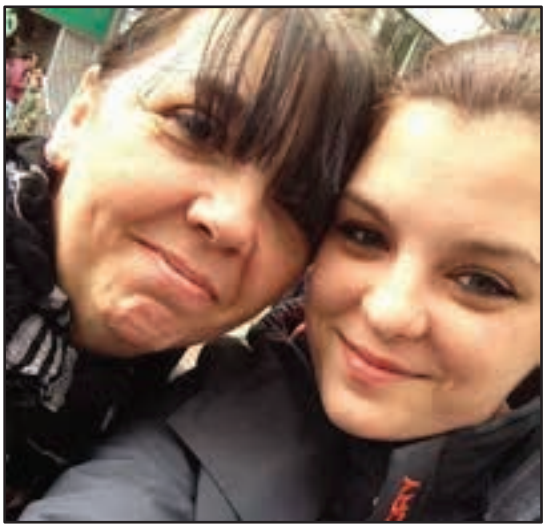
Awaiting a hopeful response.
Michelle Hindson

Update by Michelle Hindson
This letter to Jesse Norman (Dept of Transport) Chris Grayling (MP) Michael Gove (MP) and Matt Hancock (MP), along with the contacts I had previously made within the fire and police department, was sent from me dated 20/2/19. Unfortunately, out of the 9 people who received this, only 2 responded. Determined not to give up, I tried other avenues. My efforts eventually led to me getting as far as having a meeting with the acting chief inspector of roads policing in Essex, along with a member of the fire safety team.

It was agreed that the fire team will put together a leaflet (with my input) that can be distributed at car events highlighting the dangers of tampering with emissions. However, this has now stalled as both parties that I was communicating with have now changed roles, so I am now in the process of trying to trace who has replaced them.

We did launch the web page, *http://www.helpfromnikki.co.uk* and this has been done with the support of Essex police. This has led to me attending a training session on the 6th December 2019 for family Liaison officers to give them a family's insight on what they actually go through.

I have already been invited back to do the next one, which is being held in 6 months' time. The web page is now being used by current family Liaison officers to help others.



A case study about Nikki's tragic death can be found in CO-Gas Safety's Press Pack 2019 on pages 14-16.

Nikki died in a souped up vehicle powered by petrol. The car had had its catalytic converter removed. The person who worked on the car obviously lacked awareness of the dangers of the exhaust leaking CO into the car through the heater.

My work has been to raise awareness of this danger and to prevent other deaths and other families having to experience the loss and grief we have experienced.

Michelle Hindson and her daughter Nikki Willis

Project SOTER – Technology that could save lives

CO-Gas Safety are in support of the appropriate use of new technologies to help prevent as many unintentional carbon monoxide (CO) poisonings as possible. We have always advocated that any appliances that use combustion, from any fuel, carry the risk of producing unintentional CO if not used and maintained as they are intended to be – but that increased knowledge of this risk, and how to avoid it by using such appliances safely, is the key to reducing CO-related incidents. Awareness is undoubtedly the number one method of helping the end user stay safe.

However, as CO detectors and alarms have become more advanced, reliable, affordable and familiar to the general population, they have undoubtedly saved lives and reduced long-term exposures that can so often ruin quality of life for victims. We therefore support their use as a last line of defence, as long as they meet quality standard EN50291 and are purchased from a reputable supplier to avoid cheap and inferior devices often sold online.

In the majority of cases, the sound of an alarm will be sufficient to avert tragedy. Those nearby will hear it and take steps to reduce the toxicity in their environment and/or leave the area, but this isn't always the case. There are instances where the hard-of-hearing or those incapacitated by other illnesses or conditions are not aware of the alarm in time to take action, or the siting of the alarm means that the victim is closer to a source of CO than the alarm is and fumes have already incapacitated their mobility to the extent that they are either unable to move or are too confused by an alarm to realise they should take action (CO quickly reduces brain function). Perhaps the sounding alarm is in an unoccupied property and the appliance therefore continues to produce enough CO to seep through to the adjoining dwelling, where occupants are totally unaware of the danger they are then in.

CO-Gas Safety has heard of one case when a chef's alarm woke his neighbours in the next-door terraced house, who then banged on the door and saved his life. Gill Wing, one of CO-Gas Safety's case studies (see p. 22-24), is also an example of a CO alarm next door alerting someone to a CO leak. At *www.theguardian.com/technology/2017/feb/23/smoke-alarms-children-sleep-through-fire-investigator* is an article about how children sleep through alarms. There are simply too many scenarios to describe that demonstrate how a single alarm alone is not a failsafe.

Young inventor and entrepreneur, Ben Kuchta, saw that this was the case when he began work in the domestic gas industry over ten years ago. He started work as a support engineer with a Gas Safe registered firm in 2008 and qualified to join the Gas Safe Register himself by March 2010. By that time he had already been part of a team of engineers that attended an unintentional CO poisoning fatality caused by a faulty gas boiler – an experience that understandably affected Ben deeply.

Project SOTER
CO Interlock

From that point on Ben recommended CO alarms to all his customers, often obtaining and installing them himself to ensure they were as effective as possible. His work brought him in contact with a number of unintentional CO poisoning victims, with various levels of exposure, symptoms and long-term effects. More than one incident had involved injuries despite an alarm activating. Through speaking to his customers he realised that, while valuable, solitary alarms or detectors could be improved upon as a defence against defective or misused appliances.

Ben has invented a device, called Project SOTER, which he describes as a CO Interlock. It undoubtedly has the potential to save lives in incidents that involve any fuel-burning appliance that relies on electricity for part of its operation; for example, gas or oil boilers, gas grills and cookers. In layman's terms it is a cut-off switch that activates when it 'hears' a CO alarm sounding. It isolates the electricity supply to the appliance, therefore shutting it down automatically if raised CO levels are detected by a CO alarm.

This means that, whether the residents have heard the alarm or not, the appliance will be stopped. Thus, no-one has to risk further poisoning by getting close to it to turn it off manually. If occupants are asleep, absent or incapacitated for any reason, the source of the CO is halted (assuming that it is the one fitted with the interlock and not, say, an open fire in another room).

Ben has developed technology that prevents the cut-off from activating due to other noises, thus reducing the likelihood of false alarms. SOTER 'learns' the sound of the particular alarm in question, which also ensures that it will work with most common CO alarms that conform to EN50291. This was important to Ben from both a practical and environmental point of view; the customer does not need to buy a new or specific alarm, reducing wastage of existing working detectors.

The SOTER is also easy to retrospectively install, as neither the gas supply or appliance have to be disturbed and its low cost makes it a viable means of increased protection for consumers. Peace of mind would be offered to carers of those living with dementia or immobility, for instance – the device is not only of benefit to newly-constructed properties but can be added to existing systems in all types of accommodation.

The CO Interlock won Safety Initiative of the Year at the H&V News Awards 2018. CO-Gas Safety is delighted at this recognition of both the potential of the technology but also of all the research, development and self-funding that Ben has had to work through. Still only in his twenties, Ben has also been admitted as the youngest Chartered Engineer at IGEM, via technical report, and has plans to market SOTER globally to ensure that its benefits can reach as many as possible.

Sean Lock (host), Tom Bell (Northern Gas Networks), Ben Kuchta (Project SOTER) and Benjamin Thorne (EMAP/H&V News Awards)

How your chimney sweep could save your life

by Chris Geeves

Picture by John O'Leary
www.johnolearyillustration.co.uk

I have been a chimney sweep for over 30 years and have seen many horror stories relating to carbon monoxide poisoning. A few typical examples come to mind as being more commonplace and could easily happen to anyone who does not take the precaution of having the chimney checked.

Most families have some form of heating appliance that burns a fuel to heat the home. A very large number of these will rely on having a chimney to take the fumes, and possibly smoke, safely away from the living spaces and outside to the surroundings. Everyone knows the importance of getting the heating appliance serviced to ensure it works properly, but equally critical to the removal of poisonous fumes and smoke is the chimney. The person for this job is the chimney sweep, who will be qualified to clean and inspect the flue ways to ensure that they will work adequately. Many homes have a carbon monoxide alarm fitted, but this should not be used as a last resort thinking that it will save you if the chimney stops working.

Below are a few examples of unintentional carbon monoxide poisoning that I have come across in my everyday work. Any one of them could have proved far more serious, even fatal, if exposure had been for a longer period of time.

Gas fire

I visited a house that had a conventional radiant gas fire fitted to a fireplace that was using the brick chimney as it's flue. The lady customer had come home from work one wet, miserable night. She lit the gas fire, as she didn't need the central heating on, and sat on the sofa to wait for her husband to come home. He came home about an hour later to find her asleep on the sofa. She was in fact very close to death from carbon monoxide poisoning. The chimney had been blocked in the spring by jackdaws building a nest, but had not been checked prior to the fire being used. This meant that the majority of the fumes were not able to escape up the chimney and were leaking directly into the living room. On finding his wife in this state and being unable to wake her, the husband immediately switched off the gas fire and carried his wife out into the fresh air. He still couldn't wake her so phoned 999. On their arrival, the paramedics quickly got the lady breathing oxygen, which she continued to do for the next two weeks in hospital. The medical team don't think that any long term damage was caused, but there could be some as it can take years to develop.

Wood burning stove

On another occasion, an elderly customer had an old solid fuel Rayburn cooker replaced with a new wood burning stove. The landlord organised the whole job from start to finish but he employed unqualified people to install the new stove and connect it to the chimney. Needless to say, the installation was not done

correctly which lead to the new stove constantly spilling smoke into the living space. This happened so regularly that the carbon monoxide alarm went off most days. The elderly chap living there asked several times about this but was told that all fires smoke a bit. He got that fed up with the alarm going off that he eventually removed it and put it outside. A couple of weeks later, in the middle of winter, the landlord found the chap unconscious on the floor of the sitting room. Thinking that he had fallen, the landlord called an ambulance. After carrying out some test in hospital, it was found that the chap had serious carbon monoxide poisoning which took six weeks of breathing oxygen to restore his blood to the levels that are safe. He was left with memory issues that meant he could no longer live alone.

Open fire with CO alarm

Another one of my customers bought a carbon monoxide alarm to put in her sitting room because she had been told it was a good idea to have one for her open fire. She burned wood, but seldom had the chimney checked. She asked me to go and inspect the chimney as it was spilling smoke into the room occasionally and the wallpaper was getting sooty marks on it. She reported that the carbon monoxide alarm had never gone off though so she assumed she was safe. When I got there, I found the chimney partially blocked with soot and tar. I cleared this and the chimney worked perfectly afterwards with no spillage. I was chatting to the customer about carbon monoxide poisoning and she was quite worried to learn that she had been experiencing mild symptoms but put it down to it being winter and mild flu. She said that it couldn't be carbon monoxide as the alarm hadn't gone off. When I checked the alarm though, the lady hadn't removed the battery tag to switch it on. She made an appointment to see a doctor and thankfully recovered without any medication.

Not unique – countrywide, indeed worldwide

These three cases are not unique and chimney sweeps across the country, and even the world, all have similar tales to tell. All could have been prevented by getting the chimneys cleaned and inspected by a qualified chimney sweep prior to the fires being used.

Chris Geeves

J Bird Chimney Sweep
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NVQ Assessor for Chimney Occupations
Director of Chimney Skills Training & the
National Chimney Maintenance Group

Gas Engineer Training and CO Awareness

by Roland Johns, Board of Reference CO-Gas Safety

I was employed by British Gas for 40 years, (all my working life) and built up a very varied amount of experience in the domestic and commercial sectors. I started as a gas fitting apprentice and finished as a Senior Manager in Technical Support. During my career I qualified as a CO incident investigator and attended many fatal and non fatal incidents. For the fatal incidents I was required to give expert witness testimonies at inquests.

I have been associated with CO-Gas Safety since 2012 and I have become increasingly concerned about the general lack of knowledge and awareness of Carbon Monoxide (CO) within the fuel industry. Through the awareness sessions I have given and by talking to engineers and managers I have come to the conclusion that, at a minimum, gas engineer basic training needs to be more robust and cover not just natural gas (NG), but all carbon based fuels.

We still have deaths and many injuries, (some life changing) due sometimes to a lack of CO awareness and engineering mistakes. There have been cases of Registered Gas Engineers (RGEs) being overcome by CO themselves, some with fatal consequences. Some were due to other fuels, not just NG. Please see the tragedies at *https://www.co-gassafety.co.uk/information/gas-installers/* Apart from lack of awareness, there are human factors that need to be investigated, for instance, pressure of work and time constraints.

Within the training scheme there is provision for general CO awareness sessions but they are always part of another subject. I/we would like to see standalone sessions on CO awareness built into the RGE scheme with real case studies (all fuels) for understanding, and question papers for consolidation of learning. I suggest sessions should be in three parts, at the start of training, during training and at the end of training namely:-

1. Introduction to CO awareness during induction (1hr)
2. CO awareness and real case studies (all fuels) plus question paper (2hrs)
3. Review of CO awareness and final question paper (2hrs)

If this was implemented just half a day in total would be spent totally focussed on CO awareness. It would be nice to have more but time and money are always a consideration too. This focussed half day could save a life or even lives, not to mention possible prevention of life changing injuries.

Thinking wider than the gas industry, shouldn't this same training regime be introduced to all trades in the construction sector? No one can be deemed to be exempt from CO awareness, we are all at risk. But those who work in build/maintain, domestic and commercial/industrial properties have a duty of care to themselves & their customers to ensure CO awareness is always high on the agenda.

With the known 40 deaths and over 5,000 injuries (mostly preventable) per annum this is unacceptable, so to start CO awareness (all fuels) programmes early and throughout all trades training must be the way forward. The unknown deaths & injuries are worrying.

At present we are lobbying the gas engineer training sector to introduce a more robust CO awareness regime into RGE training.

We hope that support for our initiative will be forthcoming from all quarters, surely it makes sense?

Roland Johns, Board of Reference CO-Gas Safety, November 2019 *johns7@ntlworld.com*

Update 18.01.20 Sadly we've received no further communication from the IGEM or EU Skills.

Observations on '*An unusual incident: Carbon Monoxide poisoning risk in 540 homes due to faulty wood burner installations*'

(a report published in *Public Health* Volume 173, August 2019, Pages 17-20)

www.sciencedirect.com/science/article/pii/S0033350619301477?via%3Dihub

by Jim Lambeth
Former General Manager, Solid Fuel Association

Before retiring from my position as General Manager of the Solid Fuel Association I was made aware of this incident in Wales involving an HETAS Registered solid fuel installer.

At the time I recall expressing concerns about the seemingly poor response by HETAS Ltd when considering the scale of the complaint against one of their registered installers. To have carried out 541 faulty installations, putting at risk around 1000 people, I believe, should have justified HETAS Ltd arranging for every installation to be inspected to determine the level of risk from CO poisoning and potential house fire.

Further, the failure to install CO alarms to every property concerned, contrary to Building Regulation Approved Document J, (ADJ) should have been addressed. Again, surely HETAS Ltd should have made arrangements to supply or at least offer to sell CO alarms to EN 50291 to every property? Whilst The Incident Management Team supplied 200 CO alarms to those households requesting one, there remained 341 who were likely to be without and therefore remained in contravention of ADJ requirements.

The work carried out by HETAS registered installers are subject to inspection by HETAS Inspectors on a regular basis. It is of concern that over the seven year installation period these installations were undertaken the poor workmanship reported was not detected.

The penultimate paragraph of the report highlights the fact that few prosecutions by HSE for faulty or dangerous installation work are recorded. This comes as no surprise to me as HSE have a poor track record in showing any interest in problems associated with solid fuel installation work. It seems the problem arises due to a lack of enforceable legislation relating to solid fuel and heating oil. Standards relate specifically to current Building Regulations and European Standards, neither of which is enforceable in law – they are regarded as 'guidance documents' only. As such it is up to local authorities to enforce the best practice.

Why doesn't Government treat solid fuel and oil installations in the same way as gas? i.e. introduce a requirement that solid fuel, wood, biomass and oil installations must meet minimum legal safety standards.

Further, the mechanism employed by all Competent Person Scheme (CPS) operators make it very difficult for rogue installers to be immediately struck off the membership list. Opportunity must be given for appeal, which often results in rogues continuing to carry out poor workmanship for many months/years. This needs addressing by the body responsible for the management of all CPS operators.

Furthermore, why do gas installers and maintainers have to be registered by law while those installing and maintaining solid fuel appliances do not? Mandatory registration should make better training and alerting of new dangers and safety inventions or gadgets easier. Also, it is interesting to note that per user CO-Gas Safety has found more deaths from CO from fuels other than gas, than from gas. Surely, all those installing and maintaining heating appliances that could cause a danger should be registered by law?

Life aboard - in London in 2012 there were 2,000 boaters, according to the Canal and River Trust. This total has now reached 4,000 and is growing

Ron Gooding is a Gas Safe Registered Engineer, a BSS examiner and runs a boat yard.
He has written this article about carbon monoxide from a boating perspective

Life aboard
What a great photo this is. Idyllic boating in central London. Life aboard a boat on the canals will ensure a steady stream of predictable questions from "land lubbers". Pause reading right now and think of two. How do you get your post and doesn't it get cold in winter? If I was correct then you will be pleased to hear modern technology now means we can shower, cook a full roast dinner and go online. In the depths of winter woodburning stoves and gas central heating soon make even the coldest of days warm, cosy and of course potentially dangerous.

Dramatic rise in boats used as primary residence
In London in 2012 there were 2,000 boaters, according to the Canal and River Trust. This total has now reached 4,000 and is still growing. The cheap way to live, coupled with the ability to go on the internet and own a washing machine, means it is an attractive option for those saving for a deposit - and with squatting made illegal, it has also become a place of refuge for the vulnerable. Please see *https://canalrivertrust.org.uk/media/original/30911-hundreds-of-boats-used-as-homes-in-london-as-numbers-soar.pdf*

Shortage of marine professionals This influx of numbers and utilisation of everyday appliances has resulted in industry-wide accelerated change. Unfortunately this has resulted in shortages of marine professionals to install and maintain boats, a lack of resources to tackle training and supervision of new recruits and, most importantly, a lack of policing to prosecute the modern-day pirates who will pray on new boaters' lack of skills and knowledge.

Checks

But there are checks of course? Well sort of. On some waterways a boat will have a Boat Safety Scheme examination every four years, which is widely called a "BSS". It covers a lot of the things you would expect and an easy way to think of it is as an MOT. Unlike your annual standard Ford car MOT, a BSS is at four-yearly intervals and craft may have changed hands and been significantly altered between BSS inspections. Therefore, it is possible to buy an empty boat as a young student, refit the boat yourself, complete a university degree and sell the boat on, without a single marine professional having once set foot on your boat.

Let that sink in for a second. With boating swiftly becoming a trendy thing to do, that means nobody told that teenage student how to drive the boat, install or light the fire, put up a CO alarm or checked the credentials of anyone that they employed to do so. Maybe not like taking your car for an MOT after all.

Boat Safety Scheme

> The Boat Safety Scheme, or BSS, is a public safety initiative owned by the Canal & River Trust and the Environment Agency. Its purpose is to help minimise the risk of boat fires, explosions, or pollution harming visitors to the inland waterways, the waterways' workforce and any other users.

I should add that this is in no way a fault of the Boat Safety Scheme. Its aim was always very clear and it has, in my opinion, done a great job and saved many lives over the years. More information on the Boat Safety Scheme and some useful boaters guides can be found at *www.boatsafetyscheme.org* and was the source of the quotes in this section.

In the past, I would like to think advice from an expert to fix something was largely listened to and actioned. With so much fake news, and social media experts ready to say "that's nonsense", we all know someone that will not spend money fixing something which is "only advisory". The CO-related risks associated with advisory comments on BSS include ventilation and flues/chimneys for gas and woodburning appliances. I do fear most advisory comments are left undone and the perception that it doesn't really matter is often applied to CO issues.

> "Each year boaters die or are made seriously ill from carbon monoxide (CO) poisoning - Boats are built to keep water out, but this also makes them good containers for gases and fumes."

Enforcement

So, when we do see something bad, what happens? Not much is the answer. I am aware of several professionals, including myself, who have reported illegal gas work. Without the consent of the boaters in question I can of course only give a more general overview of what we routinely discover.

As gas engineers we have a legal obligation to report illegal work to the Health and Safety Executive. What will surprise you is that the Health and Safety Executive have no obligation to investigate or to even acknowledge your submission. In my 5 years as a BSS examiner and 3 years as a Gas Safe Registered gas engineer, I am yet to see any case investigated and concluded that was reported by myself or my colleagues. I should add that several cases are ongoing and technically open.

It would be unfair to pick solely on the gas industry or BSS and it's worth mentioning that as a gas engineer and BSS examiner I have more experience here. The truth is that the marine industry as a whole has managed to escape scrutiny from trading standards, local councils and the HSE.

Lack of preventative action

Investigations tend to come after serious injury or death, instead of being preventative. I do understand why this happens. Day to day all I see is boats, every day, they are everywhere. But step back a little and you realise that there are not actually very many from a national perspective. There are millions of houses, hundreds of thousands of caravans and static homes, but only tens of thousands of boats.

This means the commercial investment just doesn't stack up for product testing on marine craft. Also, what council or government body isn't cash strapped? Of course they put boats at the bottom of the list, but now the boats are the first rung on the housing ladder. Do we need to do better as an industry and does the Government and their appointed agencies need to review their positions?

Ideas – training, compliance & enforcement

I naturally have thought of a few solutions on the best way forward and it can be broken down into two areas, "training and compliance".

Compliance is as you would think; identify the bad apples and prosecute accordingly. Most people who are caught agree, if it is their first offence, not to do it again and that concludes the case. With no firm industry message sent out, there certainly is no widely-held fear of being caught doing something wrong.

Training and education of both engineers and customers is available but due to a lack of compliance, take-up is often lacking. It is vital going forward that this is addressed and the culture changes. This will be a mountain to climb. A boater's belief that the risk from CO is low may be as basic as, "well I am still here". Nanny State accusations often follow advice that involves change or financial outlay.

The CO risks associated with boats do have three main culprits; engines, gas appliances and woodburning stoves. Thankfully a CO alarm is now, as of 2019, included in the BSS examinations as a mandatory requirement and in three years' time every boat examined should have already had a BSS since the introduction of that requirement and therefore have one in place.

BSS does not safeguard all boats

We should remember that coastal boats and some inland waterways are not covered by the Boat Safety Scheme so there will still be lots of boats with no CO alarm on board. But it's a good start. If you've paid attention so far you may have thought, "hold on, I thought they only made you do things that hurt other people, why do you have to have a CO alarm?" The reason is simple; you need to know you are producing CO as it is possible you may be sending it into your neighbours' boat without either of you knowing. Due to mooring layouts people often fail to realise CO may come from the boat next door. With no planning rules in place, you can park your boat's exhaust or chimney a single meter away from your neighbours' open window and no one will think to check.

The boatyard Ron Gooding runs

Woodburning Stoves and Gas

HETAS, which manages the register of woodburning stove installers, deserve some recognition. They have finally developed a marine stove installation course for winter 2019 for its members. There will soon be an industry-recognised course available and in my opinion this is good progress towards a better standard. It is, however, voluntary. It would also be unfair to not mention that the gas industry also appears to be waking up to its responsibility in this field due to some long campaigning from various groups. As they already have qualified marine gas engineers (like me) they are already a bit more ahead on this, though do need to do better in some areas as well.

There is a phrase I feel sums up the modern marine world and the dramatic changes in technology; "there are boaters and people who live on boats". Historically we were boaters; we knew the risks and understood our responsibilities for the canal, the boat and its systems. Now we have people who live on boats and they need protecting.

A picture tells a thousand words, look again at that lovely picture at the top of the article. Look for the chimneys on the roofs and note how low they are. At the waterline, look for the engine exhausts (I think I can see two and they are surrounded by black staining) and then at the air vents (the little mushroom things on the roof) and, of course, the open windows. With your background knowledge of CO being "the silent killer", ask yourself this: How clean is the air inside that woman's boat if her neighbours are running an engine or appliance?

Ron Gooding

Boat Safety Scheme Examiner, marine gas engineer, British Marine electrical technician and currently running a boat yard in East London.

CO-Gas Safety Support the Work of the Fire and Rescue Services

CO-Gas Safety monitor national and local media reports to identify unintentional CO incidents. As part of this work, Stephanie Trotter contacted Cumbria Fire & Rescue Service in connection with a report published on 9th December 2019.
(please see *www.newsandstar.co.uk/news/18088445.carbon-monoxide-close-call-prompts-firefighters-speak-dangers/)*

Stephanie talked to Adam Lewis of CFRS about the callout, and also asked for the charity's contact details to be passed to the family concerned because the charity offers free and confidential help and advice. Stephanie commended CFRS via Adam, stating '**how wonderful the fire service had been as they rushed in with their breathing apparatus and gas testing equipment and confirmed it was CO which is a huge help to the victim and to the victim's medics.'** Adam was brilliant and soon after he had spoken to Stephanie, Craig Drinkald contacted her too.

Craig Drinkald

Area Manager – Community Safety

Craig drew our attention to the National Fire Chiefs Council and their position statement, which is available online via the following link, and also quoted below:

www.nationalfirechiefs.org.uk/write/MediaUploads/Position%20statements/Prevention/Carbon_monoxide_safety_Position_statement_.pdf

Carbon Monoxide Safety

The National Fire Chiefs Council (NFCC) is committed to making people safer in their homes using the skills, knowledge and experience of the Fire & Rescue Service (FRS).

People likely to be affected by Carbon Monoxide (CO) poisoning share many of the characteristics of those most likely to experience a fire in the home.

The NFCC recognises that although many organisations collect information relevant to CO safety there is an incomplete picture of CO risk, exposure and response in the UK.

The NFCC recognises that regulation and standards relating to CO safety are not always clear, consistent and supportive of improved CO safety.

Some FRSs provide CO alarms as well as smoke, and heat alarms during home fire safety checks/visits. The NFCC supports FRSs who install CO alarms as part of a holistic home safety solution.

The NFCC will:

• Promote consistent CO safety messages to the public and partners that takes account of the level of risk and promotes safety whilst aiding health partners to more easily identify CO exposure.

• Promote the fitting of CO alarms in all rooms with fuel burning appliances (whether solid, liquid or gas fuel) in all property types.

• Assist with the national collection of CO incident data by encouraging FRSs to collect and share data on the CO incidents they attend including (where possible):-

*information on where CO alarms were fitted.

*information on their effectiveness in raising the alarm.

*Categories of CO incident information according whether they were a false alarm, CO incident no injury, CO incident injury, CO incident fatal.

*Record the source of the CO and cause.

• Work with the fire industry, partners and suppliers such as the Gas Safety Trust (GST), Gas Safety Register, National Association of Chimney Sweeps and the Council of Gas Detection and Environmental Monitoring (CoGDEM) to:-

*promote the inclusion of CO alarms in home safety systems, integration with other alarms types, reduce costs, and increase connectivity between systems/devices.

*increase the use of sealed for life battery CO alarms that replace the detection element when batteries are replaced.

*Increase the use of CO alarms with easily available CO concentration information at the point of exposure to aid CO poisoning diagnosis.

*incorporate this new position into all NFCC work and lobby for this position to be reflected in all relevant standards, regulation and guidance

Craig said, 'Here at Cumbria Fire and Rescue Service (CFRS), we're sadly familiar with the dangers associated with the silent killer that is Carbon Monoxide (CO). According to our data, between 1/12/2017 and 9/12/2019 we received calls to over 100 incidents where CO was suspected. Approximately 70% of these have been false alarms, or no CO was present on arrival.

However, other incidents have involved the rescue of three people, one of which was a two year old child. Sadly, two people have died as a result of CO poisoning and another two required hospital treatment.

Educating our communities about the dangers of CO and the importance of having a CO detector on each level of your property is a key part of the free CFRS 'Safe and Well' visit. We typically carry out 10,000 visits every year in people's homes, schools, places of work and community centres to educate people about fire safety and to offer guidance and advice for dealing with fire incidents.

Cumbria Fire and Rescue Service support the National Fire Chiefs Council position statement on this matter and will work to support organisations to try and prevent harm, or worse, death form incidents of this type.'

Just before Christmas 2019 CO-Gas Safety and Cumbria Fire and Rescue Service started work on a first draft of a protocol regarding the steps the fire and rescue service should take at a Carbon Monoxide (but not fire) incident. This is being developed and will hopefully run as a pilot within Cumbria before being offered to other fire and rescue services.

Carbon Monoxide: A Preventable Cause of Catastrophic Neurological Damage and Death

by Professor Mark Edwards, movement specialist at St George's, University of London
Atkinson Morley Regional Neuroscience Centre

I first met someone with carbon monoxide poisoning when doing specialist training in neurology. He had not died, as many do, but the action of carbon monoxide in blocking oxygen reaching the brain had caused irreparable damage to his control of movement and his ability to think clearly and communicate.

Carbon Monoxide (CO) is a very effective poison. It is odourless, colourless and binds irreversibly to haemoglobin. Haemoglobin is the component of our blood that should be carrying oxygen from the lungs to the body and brain, but when carbon monoxide is bound to it, it simply can't perform this task. Neurological symptoms (confusion, headaches, dizziness) are very common in the initial stages of poisoning. The brain is very sensitive to lack of oxygen, and so with continued exposure irreversible brain damage or death often result.

This is a preventable catastrophe. Carbon Monoxide poisoning typically results from faulty gas appliances but can be emitted by any heating or cooking appliance powered by any carbon-based fuel (wood, coal, oil etc.). Indeed, CO and other products of combustion can be emitted from cars, barbecues, tent gas lights and even a blanket wrongly placed over an old fashioned oil-filled electric radiator for days which then starts smouldering. However, there is little public awareness of the dangers of carbon monoxide and what symptoms might be caused by it. There is, surprisingly, no requirement for the gas emergency service to test for gas appliances for carbon monoxide. This is a particular problem for those who are tenants, where getting an appliance tested for Carbon Monoxide safety is sometimes almost impossible. This is because although the Gas Safe Register will, without charge, inspect a gas appliance that has had work done on it by a Registered Gas Engineer within the previous six months, the inspector from the GSR will only test that appliance for CO if the landlord gives permission. In CO-Gas Safety's experience most tenants are too worried about being evicted to ask permission.

Indeed, there is an urgent need for action to prevent more deaths and disability because, according to research conducted on behalf of the Health and Safety Executive by University College London (UCL), of 270 homes assessed, 23% had a faulty gas appliance, 18% had CO levels which exceeded WHO guidelines, with 8% having dangerous levels of CO according to WHO guidelines.

CO-Gas Safety do what they can with very little funding to try to raise awareness amongst the public and to lobby politicians for change. A public education campaign and a change in the law to require testing of gas appliances for CO by the gas emergency service would be a good start. With these and other measures we could prevent more people from suffering unnecessary harm and loss of life.

Alphabetical list of recorded deaths from unintentional carbon monoxide poisoning 01.09.95 to 31.08.19

The following is an extract of a list of UK unintentional carbon monoxide fatalities that appears on our website, at http://www.co-gassafety.co.uk/information/deaths/.

All these deaths have been in the public domain but if anyone wishes us to remove a name from our website then of course we will do so (we would also look into a request to change any detail, such as the appliance or fuel involved). However, we hope that families and friends will understand that the reason for having a list of names is to bring it home to the authorities that those who have died of unintentional carbon monoxide poisoning were people with loved ones, not a mere list of statistics.

CO-Gas Safety endeavour to check every death we become aware of with the Coroner concerned and most Coroners and their officers are very helpful. We are extremely grateful to them. We also confirm details of fatal incidents with other agencies such as the Health & Safety Executive, Marine Accidents Investigation Branch, Police and Fire & Rescue Services, the Solid Fuel Association and others as appropriate, to ensure we have as up-to-date and complete records as possible of all aspects of the events. Our thanks go to the officers and staff who help with this research. We now have some kind of official confirmation for over 95% of the fatal cases we hold details of in our database.

List of abbreviations used in the list of UK deaths:

BBQ	barbeque	OO	owner occupier
CHB	central heating boiler	PRH	portable room heater
HA	housing association	PR	private rented
LPG or BG	liquid petroleum gas or bottled gas	Temp	Temporary
OPH	outdoor patio heater	-	unknown

Surname	Forename	Age	Date of Death	Location	Situation	Tenure	Fuel	Appliance
Ross	Ceridwen Jane	60	26/10/2009	Lothian	House	OO	Solid	Room heater
Rowland	Ernest Charles	65	06/03/2012	Wiltshire	Bedsit	Council	Mains gas	Gas fire
Rowlands	Patrick	51	18/08/2006	Northamptonshire	Boat	OO	Solid	Room heater
Rowley	Kevin	45	19/12/2009	South Yorkshire	Garage	Council	Petrol/diesel	Engine
Rutherford	John George	80	17/06/2007	Tyne & Wear	House	HA	Solid	Room heater
Ryan	Colleen Ellen	49	13/12/2002	Lancashire	Flat	Council	Mains gas	Gas fire
Ryan	Martin	71	08/12/1997	South Yorkshire	House	OO	Solid	Room heater
Sanderson	Bernard	59	05/07/2007	North Yorkshire	House	OO	Solid	CHB
Scallon	Killian	52	10/11/2010	County Fermanagh	House	OO	Oil	CHB
Scallon	Pauline	55	16/11/2010	County Fermanagh	House	OO	Oil	CHB
Schenker	Robert	32	19/03/2006	Cambridgeshire	House	OO	Mains gas	CHB
Schofield	Christine	89	14/01/2002	Worcestershire	House	-	Solid	CHB
Scholes	Harold	79	12/09/2012	Gtr Manchester	House	OO	Solid	Open fire
Scott	Gary	21	25/01/2003	Tyne & Wear	House	OO	Mains gas	Water heater
Screen	Tracy	34	15/08/2011	Gwynedd	Tent	Temp	Solid	BBQ
Scully	David Michael Joseph	35	28/10/2002	Essex	House	Other	LPG or BG	PRH
Searle	John	55	12/05/2001	Essex	Vehicle	OO	Petrol/diesel	Engine
Seaton	Eric Ray	89	20/03/2008	Cumbria	House	OO	Mains gas	Gas fire
Sewell	Matthew	3	19/11/1996	Staffordshire	House	-	Mains gas	CHB
Shannon	Alan	31	23/01/2004	Cumbria	Wood cabin	OO	Petrol/diesel	Generator
Sharma	Rajlaxmi	57	27/02/1996	Greater London	House	OO	Mains gas	CHB
Silk	Wayne	36	23/12/2008	Somerset	Caravan or mobile home	OO	LPG or BG	Room heater
Sim	Neale John	51	04/12/2018	Norfolk	Shed or similar	OO	Petrol/diesel	Engine

CO-Gas Safety's summary of statistics on deaths and injuries

UK deaths caused by unintentional Carbon Monoxide (CO) poisoning*
(Between 1 Sept 1995 - 31 Aug 2019): **Total: 712**

*CO-Gas Safety collect information on unintentional poisoning caused by the CO that is produced by any and all fuels used in appliances that work via combustion (burning). We do not include deaths or injuries from CO that is produced by unintentional fire or flames (often smoke inhalation in domestic fire accidents). The incidents that we document are those where a fire or appliance involving combustion was intentionally used, but the resulting CO poisoning was not expected and was avoidable. Please see www.co-gassafety.co.uk/data-menu/ for more details.

TENURE	
Total number of unintentional CO deaths by Tenure: (1 Sept 95 – 31 Aug 2019):	
Owner/Occupier	409
Private Rental	72
Council	67
Temporary (e.g. hotel, tent)	30
Housing Association	19
Other (e.g. owned by relative)	19
Owned by Employer	12
Unknown	84

SITUATION					
Total number of unintentional CO deaths by Situation (1 Sept 1995 – 31 Aug 2019):					
House	397	**Boat**	33	**Tent**	17
Flat	103	**Vehicle**	31	**Workplace**	6
Garage	36	**Commercial premises**	26	**Other**	6
Caravan or mobile home	33	**Shed or similar**	20	**Unknown**	4

FUEL TYPE

Total number of CO unintentional deaths by Fuel Type and CO-Gas year (1 Sept to 31 Aug):

	95/96	96/97	97/98	98/99	99/00	00/01	01/02	02/03	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	TOTAL
Gas (mains)	30	20	18	21	14	15	8	9	8	14	14	9	12	18	4	11	2	5	4	3	5	·	3	·	**247**
Gas (portable)	9	8	5	6	10	6	7	7	6	4	6	5	3	7	6	4	3	4	3	2	2	·	·	·	**113**
Solid	22	18	23	13	17	14	4	8	5	7	9	14	11	3	8	7	12	6	6	5	1	1	3	·	**217**
Petrol/diesel	6	7	3	9	3	7	6	1	2	3	2	10	6	4	4	7	3	5	4	2	4	10	3	2	**113**
Oil	·	2	·	·	·	·	·	·	·	·	·	1	·	1	1	2	·	1	·	·	1	·	·	·	**9**
Paraffin	·	·	·	1	1	·	·	·	·	·	·	·	1	·	·	·	·	·	·	·	·	·	·	·	**3**
Unknown	·	1	·	·	1	·	2	1	2	1	·	·	·	·	·	·	·	·	1	·	·	1	·	·	**10**
Total	**67**	**56**	**49**	**50**	**46**	**42**	**27**	**26**	**23**	**29**	**31**	**39**	**33**	**33**	**23**	**31**	**20**	**21**	**18**	**12**	**13**	**12**	**9**	**2**	**712**

Note: Zane Gbangbola, aged 7, died in February 2014. The Coroner's verdict in September 2016 was that Zane died of carbon monoxide poisoning. However, the blood test found only 8% carboxyhaemoglobin and we have never heard of a death of an otherwise healthy person dying at such a low level. The family disputes the finding and continues to maintain that Zane died of hydrogen cyanide from a flood from a landfill site, so we have not included this death. see http://www.dailymail.co.uk/news/article-3794537/Justice-Zane-New-hope-parents-blamed-death-flood-tragedy-son-MP-attacks-seriously-flawed-inquest.html

Notes relating to the compilation of CO-Gas Safety statistics and graphic representations

The statistics represented in this press pack have been prepared using the CO-Gas Safety database of information relating to unintentional carbon monoxide poisoning cases.

The database records both fatal and non-fatal incidents, but the statistics published here include only those that resulted in a life lost. Other exposures that caused injury or potential risk to health are not included. Many of the incidents that resulted in the included fatalities will have also injured or affected other individuals.

The database itself covers all information that CO-Gas Safety has been able to compile for incidents that took place from 01/09/1995 to the present day. The statistics shown in this press pack were gathered from the database on 31/08/2019 and therefore do not include any data that was added to, or updated in, the database after that date. For this reason, there may be incidents that took place before 31/08/2019 (but recorded by CO-Gas Safety after that date) that are not included in this set of statistics. This often includes cases where the necessary inquest has not yet been concluded and it sometimes this can take several years.

As we are continually working on the information that we hold on the database (to ensure that press reports are officially verified by bodies such as Coroners, the Health & Safety Executive, Police & Fire Services etc) there will be differences between the figures published by CO-Gas Safety here and in previous CO-Gas Safety releases. This would be particularly noticeable in those statistics that quote fatality figures by specific annual intervals.

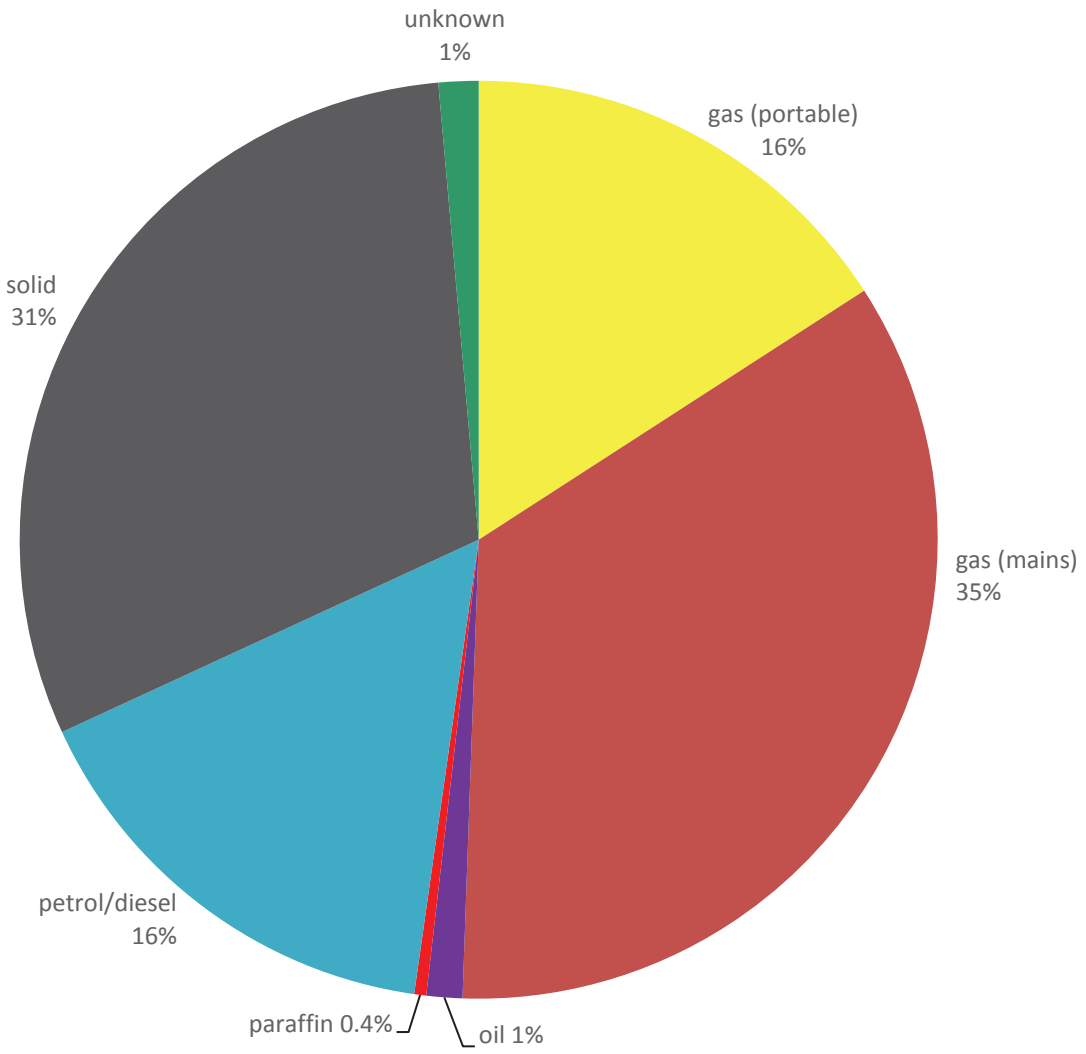
As percentage figures are quoted as whole numbers (and to one decimal place for any results less than 1%), the sum of all categories quoted may not give a total of exactly 100%.

For many of the systems and appliances involved in unintentional carbon monoxide poisoning incidents, the cause of the leak of carbon monoxide that results in a potentially fatal situation may be a fault or blockage in the flue system, rather than the appliance itself. However, it is the appliance requiring the flue that is used to produce our statistics. In some cases it may be that there was no fault with the actual appliance but that it was used inappropriately, such as without adequate ventilation (if vents were covered over or if an outdoor generator, BBQ or patio heater was used indoors).

Most of the charts included in this press pack show a category of ‘unknown’. For these cases the field of data relevant to that particular chart may be inconclusively definable for a number of reasons – the information may not have been deemed relevant to the circumstances of the death and therefore not included in the inquest proceedings, or the wording used in a press report may have had multiple possible interpretations. For some incidents, Coroner’s offices no longer held full paper records, due to fire or flood, and held only sparse details on computer archives. If CO-Gas Safety could not determine the information with certainty, then a response of ‘unknown’ was recorded for statistical purposes, and notes of our assumptions and/or suspicions will have been made anecdotally within the database notes.

Where necessary, notes have been given below a chart to help clarify the categories used in their production. These are sometimes difficult to define and incidents can often fall into more than one dataset. In such circumstances a judgement must be made by the compiler of the statistics. Examples are as follows: in the *appliance type* chart, cases resulting from misuse of portable outdoor patio heaters have been included in the ‘portable heater (outdoor)’ category, but could just as easily have been assigned to the ‘camping equipment’ category instead; in the *place* chart, a case of a tradesman being poisoned while working on an unfinished new-build home was categorised under ‘workplace’ rather than ‘house’; and a victim discovered in a shed behind a restaurant was categorised under ‘commercial premises’ rather than ‘shed or similar’, as it was felt that it was more important to reflect the ownership of the locations than their construction. This may be an aspect of our research that we show with further detail and clarity in future publications.

FUEL TYPE relating to UK deaths from unintentional carbon monoxide poisoning from 01.09.1995 to 31.08.2019

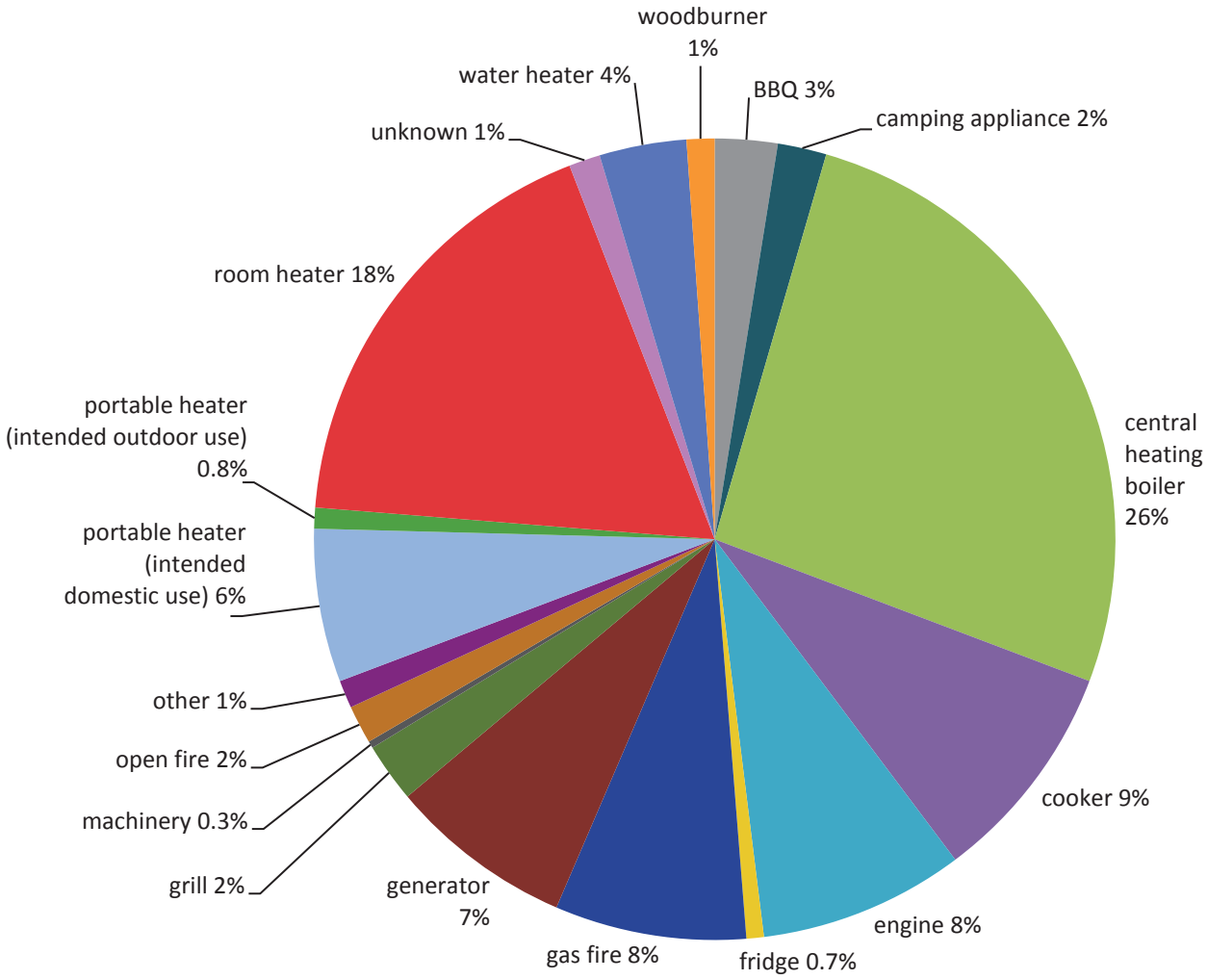


CO-Gas Safety comment

This chart shows that gas is responsible for the greatest percentage of the deaths included in our data, but our data so far also suggests that, per user, gas causes *less* deaths from carbon monoxide than solid fuel (since the number of users of solid fuel across the UK is far less than that of gas users).

In other words, considering the relatively small number of solid fuel users, there is a high incidence of deaths from solid fuel compared to that of gas.

APPLIANCE TYPE relating to UK deaths from unintentional carbon monoxide poisoning from 01.09.1995 to 31.08.2019

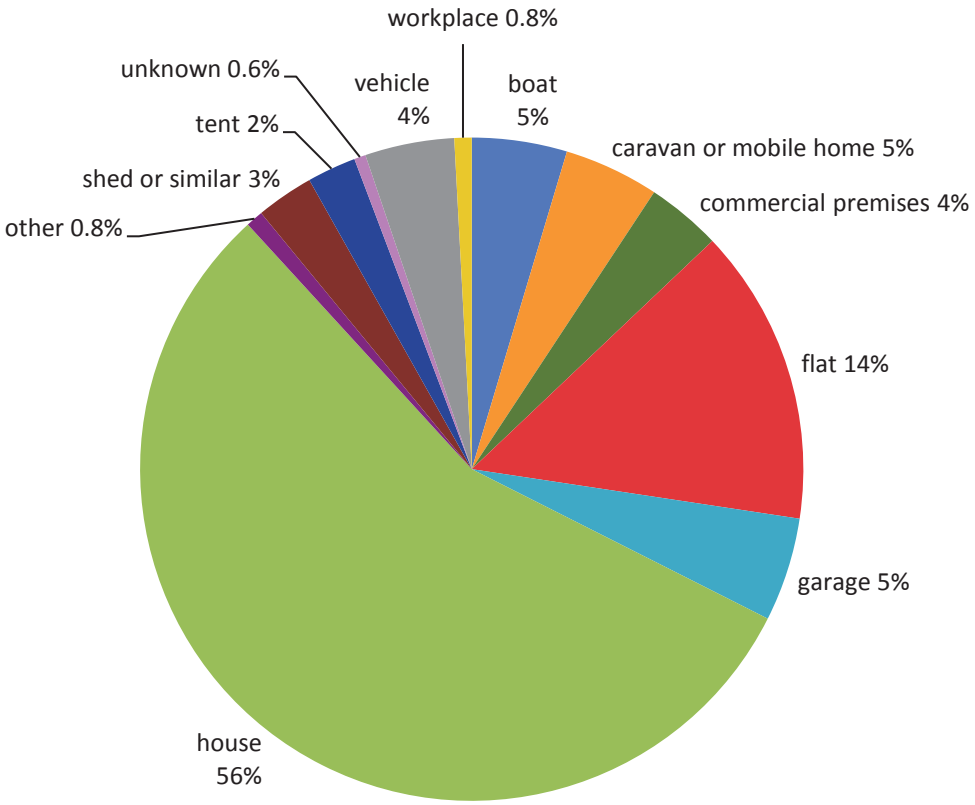


'camping appliance' includes items other than BBQ's, such as gas lamps and gas or paraffin stoves.
'central heating boiler' includes mains gas, oil and solid fuel systems. Back boiler systems are included in this category.
'cooker' includes hobs, range cookers and permanent stoves (not portable camping stoves).
'engine' is of any type, including from a car, lorry (or other motor vehicle), aeroplane or boat.
'fridge' is of a portable type, powered by Liquid Petroleum Gas cylinder.
'generator' is a portable machine.
'machinery' indicates industrial or commercial machinery, such as a disc cutter.
'woodburner' indicates a permanently installed domestic appliance intended for indoor use. Multi-fuel burners are included in this category.

CO-Gas Safety comment

It is interesting that the largest proportion of deaths by one appliance is by a central heating boiler.

PLACE OF INCIDENT relating to UK deaths from unintentional carbon monoxide poisoning from 01.09.1995 to 31.08.2019

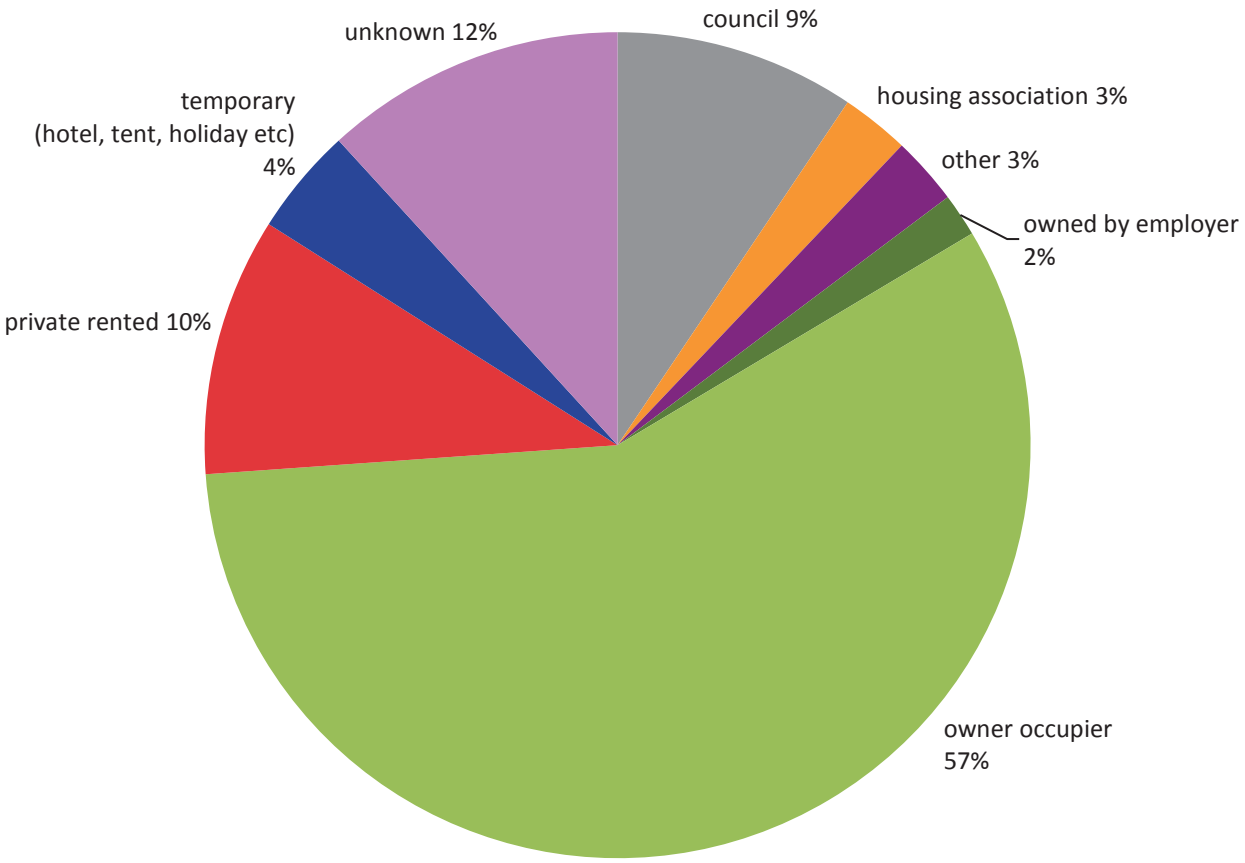


'commercial premises' includes shops, public houses, hotels, restaurants & guest houses.
'flat' includes bedsits, and both purpose-built flats and those converted from larger dwellings.
'house' includes bungalows, detached, semi-detached and terraced houses.
'other' includes a greenhouse, care homes, public halls and workshops.
'shed or similar' includes metal containers, wood cabins, outhouses and portacabins.
'vehicle' includes all types (other than boat) such as car, lorry, camper van and aeroplane.
'workplace' includes building sites, offices and other work sites.

CO-Gas Safety comment
It is easy to see that people at home are most at risk from carbon monoxide poisoning.
Despite this, more than a third (36%) of UK households do not have a CO alarm and over half (52%) of those who do not have a CO alarm say they are aware of what one is but don't feel a need for one at home. *https://www.hpmmag.com/news/half-uk-households-say-not-need-carbon-monoxide-detector*
For an example of long-term CO exposure in the home please see *http://www.mirror.co.uk/news/real-life-stories/thought-early-dementia-three-years-5930721 Daily Mirror*, 22 June 2015 by Angela Cooke.

Dr Ben Croxford's research at UCL (University College London) in 2006 found:
• 23% of homes had one or more defective gas appliance;
• 8% of homes were judged to be at risk of dangerous levels of CO;
• 45% of homes had received no information on the dangers of CO; and
• A higher prevalence of problem appliances was found in the homes of vulnerable people, such as the young, the old, and those in receipt of benefits. (Taken from HSE press release 2006).

TENURE TYPE relating to UK deaths from unintentional carbon monoxide poisoning from 01.09.1995 to 31.08.2019

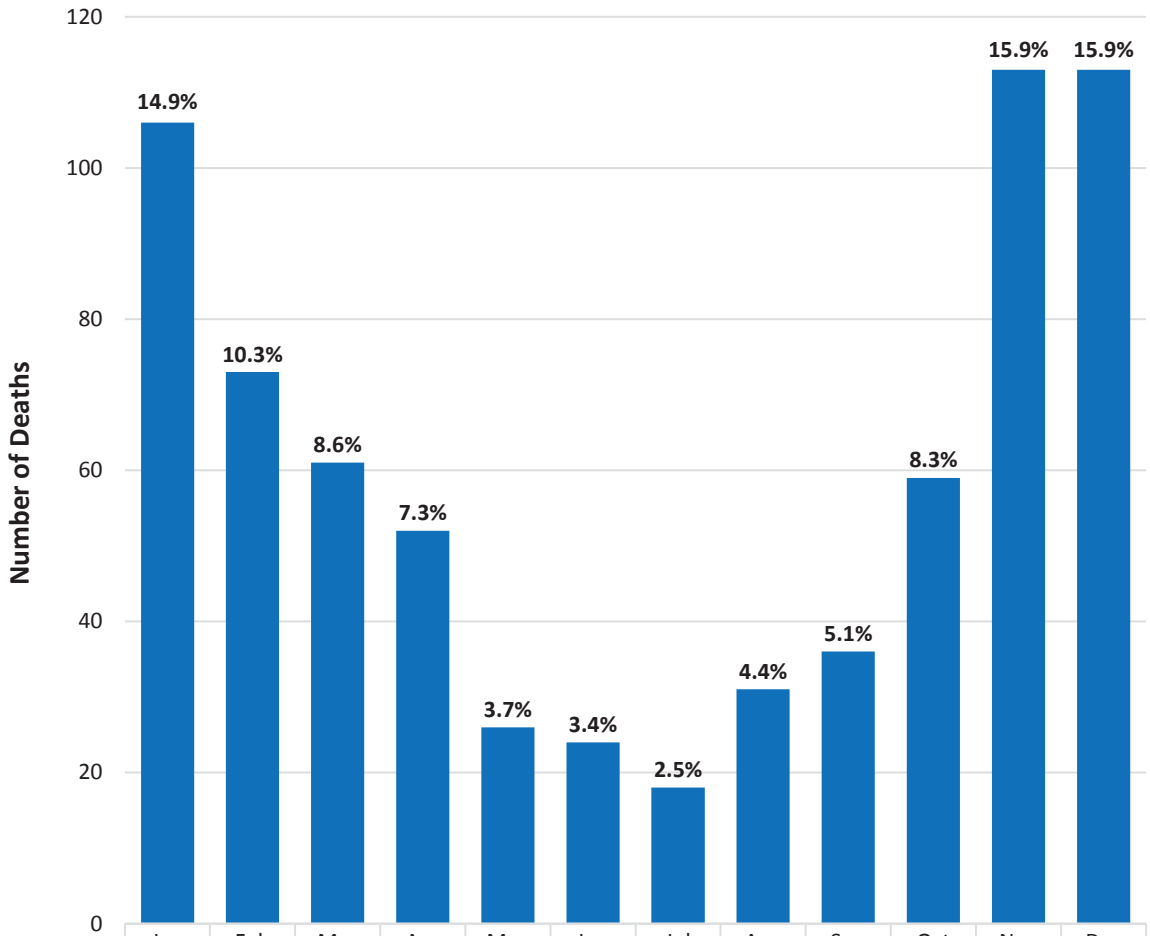


Changes in the way that housing statistics are collected in N Ireland mean that official statistics on tenure are no longer published for the UK as a whole but Table 102 at this link does give them for Great Britain (England, Scotland & Wales): *https://www.gov.uk/government/statistical-data-sets/live-tables-on-dwelling-stock-including-vacants* For 2017 this quotes 28 million dwellings in Great Britain; an increase of 240,000 dwellings (0.86%) on 2016. Of these, 17.6 million dwellings were owner occupied dwellings, 5.4 million private rented dwellings and 4.9 million social and affordable rented dwellings (2.9 million housing association dwellings and 2 million rented from Local Authorities).

CO-Gas Safety comment

Bearing in mind the figures above (although they relate only to Great Britain and our data covers all of the UK), the incidence of unintentional CO deaths in housing association dwellings looks low compared to the percentage of properties owned by housing associations (accounts for 3% of deaths we have recorded, whereas housing associations own 10% of GB dwellings). The incidence of deaths in owner occupied property also looks lower than expected (57% of deaths as opposed to expected 63%), as do deaths in privately rented properties (our data shows 10% but GB housing stock figures suggest 19% of dwellings are privately rented). Unfortunately, there is quite a high incidence of unknown tenure in our data (12%) which could account for some of these anomalies, and our tenure data also includes locations not included in the official statistics, such as boats, tents and cars. In order to establish accurate conclusions it would be really helpful to have even more co-operation from Coroners to record the tenure of dwellings which, of course, the government could require.

MONTH of death relating to UK deaths from unintentional carbon monoxide poisoning from 01.09.1995 to 31.08.2019

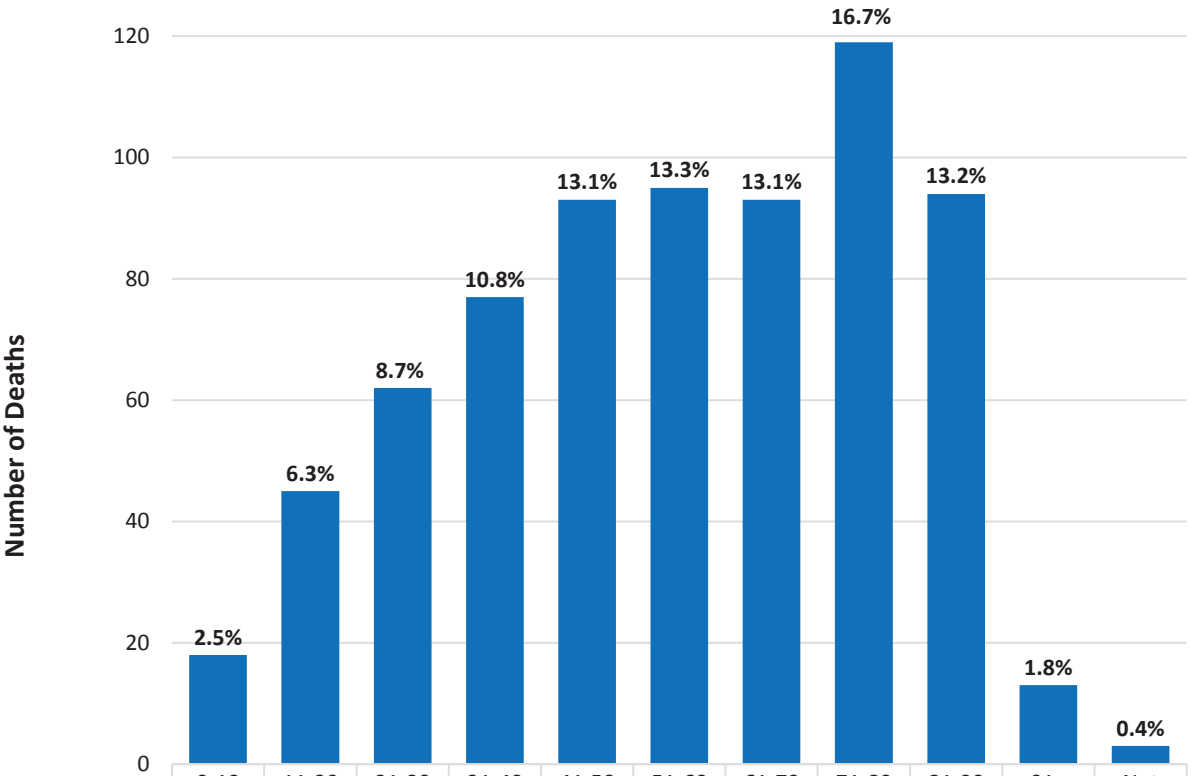


	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
No. of Deaths	106	73	61	52	26	24	18	31	36	59	113	113

CO-Gas Safety comment

It is unsurprising that the colder months of November, December and January contain the highest number of deaths.

AGE OF VICTIMS relating to UK deaths from unintentional carbon monoxide poisoning from 01.09.1995 to 31.08.2019



Age of Victims	0-10 years	11-20 years	21-30 years	31-40 years	41-50 years	51-60 years	61-70 years	71-80 years	81-90 years	91+ years	Not known
No. of Deaths	18	45	62	77	93	95	93	119	94	13	3

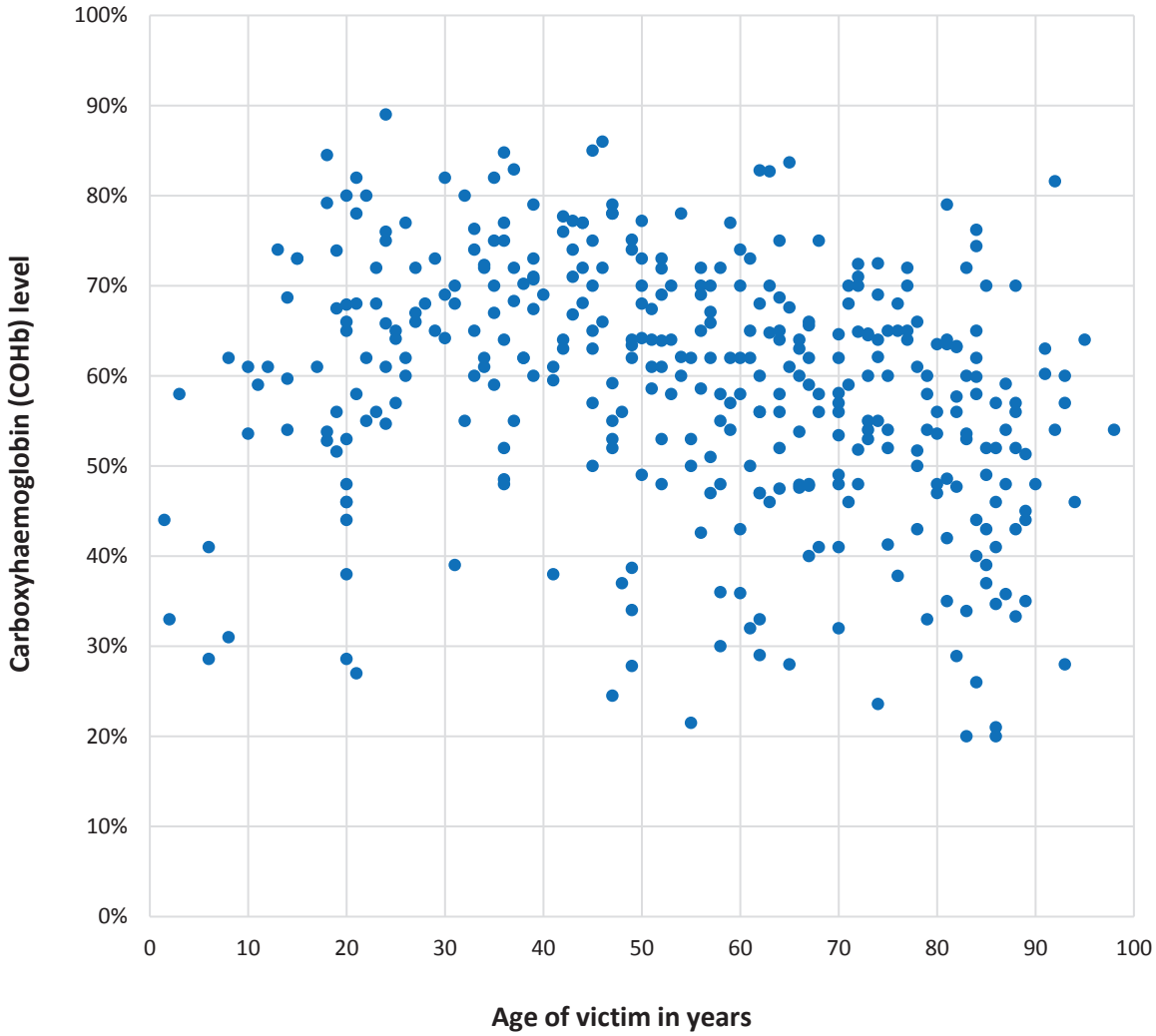
CO-Gas Safety comment

It is interesting to note that those aged 71-80 years make up just over 7% of the population* yet represent around 17% of the total deaths. In our opinion, many more deaths in this age group that may actually be due to CO are probably put down to 'heart attack' or other 'natural causes' (and therefore do not come to our attention and become included in our statistics). This is because there is no automatic test for CO on death, meaning the number of deaths in this age group in particular could be even higher.

**Taken from ONS Table P01 2011 Census: Usual resident population by single year of age and sex, England and Wales.*

The Gas Safety Trust has funded a pilot which originally sought to develop a protocol to test all dead bodies for CO. This started in early 2016 and has not yet been published. The update is that the report is currently being reviewed and will be published in the coming months. There have been issues which have caused significant delays primarily due to the need to reflect and capitalise on recent legislative changes. Gas Safety Trust - *GST@electralink.co.uk*

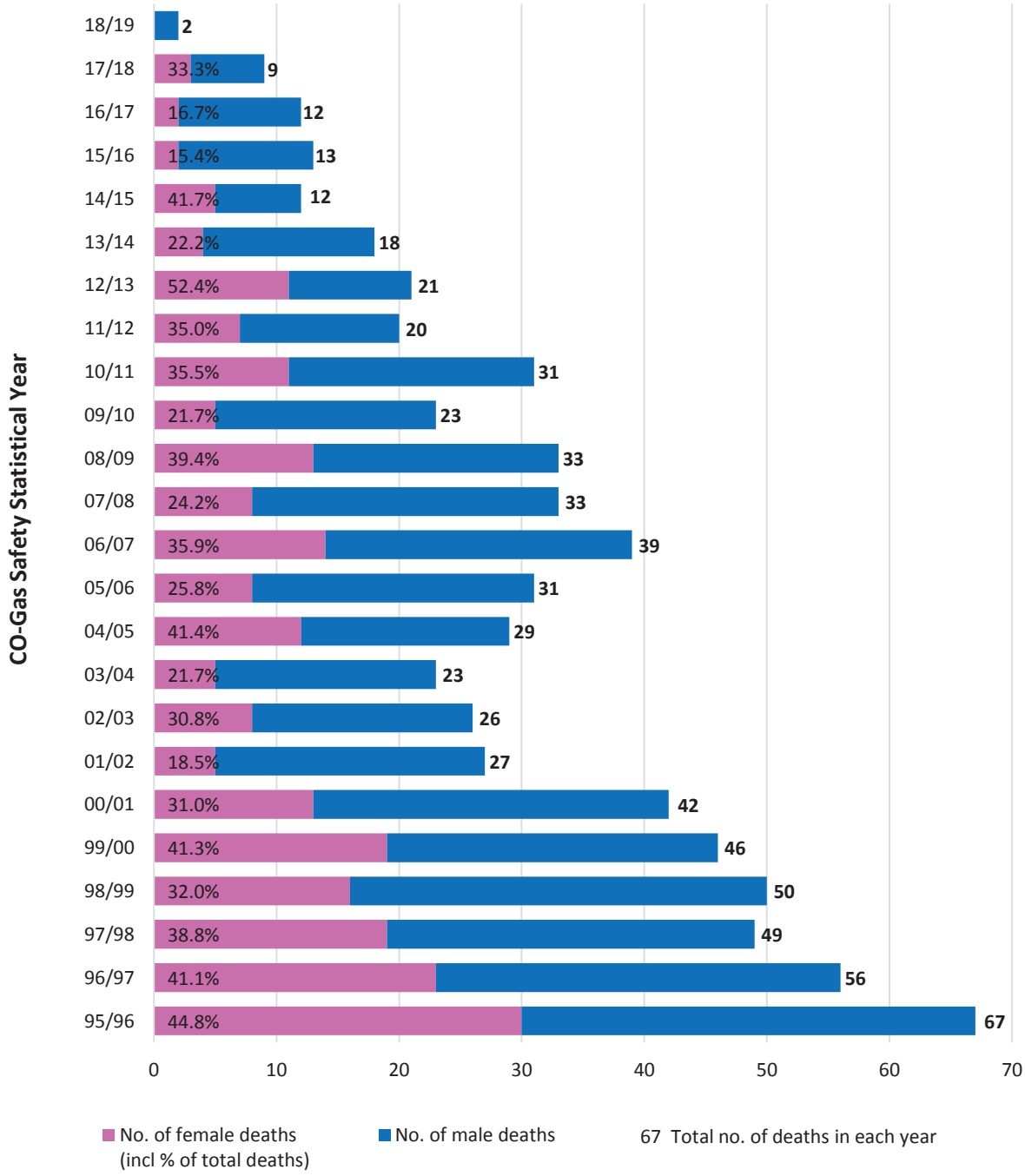
COHb LEVEL OF VICTIMS relating to UK deaths from unintentional carbon monoxide poisoning from 01.09.1995 to 31.08.2019

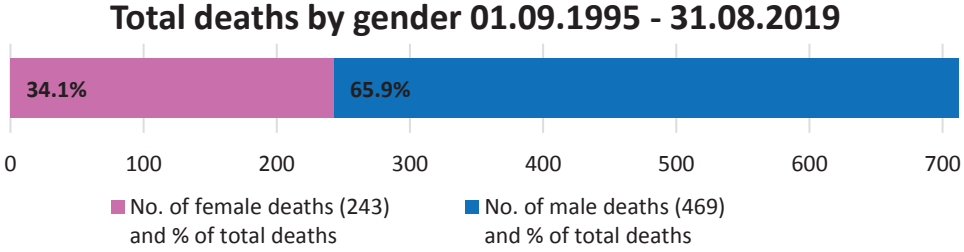


CO-Gas Safety comment

For this analysis we now have data available for 377 victims. This represents another increase on the recording of COHb levels in our database over the last year and may be of interest to the scientific community.

GENDER OF VICTIMS relating to UK deaths from unintentional carbon monoxide poisoning from 01.09.1995 to 31.08.2019





LOCATION OF INCIDENT relating to UK deaths from unintentional carbon monoxide poisoning from 01.09.1995 to 31.08.2019

ENGLAND	No. of deaths
Bedfordshire	1
Berkshire	7
Buckinghamshire	8
Cambridgeshire	6
Cheshire	5
Cornwall	20
Cumbria	20
Derbyshire	27
Devon	11
Dorset	7
Durham	9
East Sussex	10
East Riding of Yorkshire	2
Essex	21
Gloucestershire	6
Greater London	63
Greater Manchester	18
Hampshire	7
Herefordshire	2
Hertfordshire	12
Kent	25
Lancashire	18
Leicestershire	8
Lincolnshire	17
Merseyside	7
Norfolk	19
North Yorkshire	15
Northamptonshire	2
Northumberland	5
Nottinghamshire	11
Oxfordshire	13
Shropshire	10
Somerset	13
South Yorkshire	32
Staffordshire	23
Suffolk	5
Surrey	4
Tyne & Wear	11
Warwickshire	7
West Midlands	14
West Sussex	8
West Yorkshire	23
Wiltshire	9
Worcestershire	4
TOTAL	**565**

WALES	No. of deaths
Clwyd	6
Dyfed	23
Gwent	20
Gwynedd	8
Mid Glamorgan	16
South Glamorgan	6
West Glamorgan	13
TOTAL	**92**

SCOTLAND	No. of deaths
Borders	2
Central Scotland	2
Fife	7
Glasgow	3
Grampian	1
Highlands and Western Isles	1
Lanarkshire	4
Lothian	3
Renfrewshire	2
Tayside	3
Unknown Scottish Location	2
TOTAL	**30**

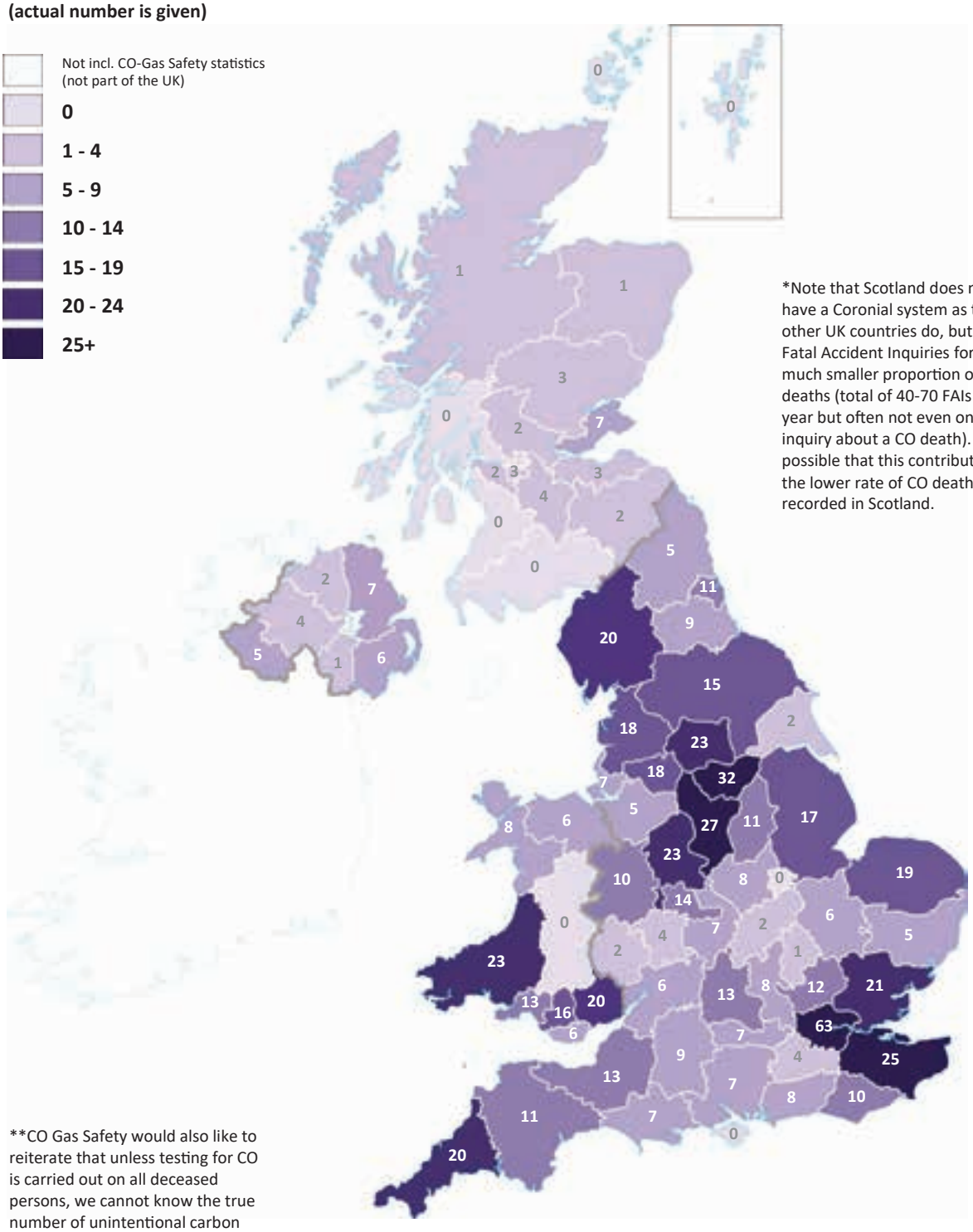
NORTHERN IRELAND	No. of deaths
County Antrim	7
County Armagh	1
County Down	6
County Fermanagh	5
County Londonderry	2
County Tyrone	4
TOTAL	**25**

England	565
Wales	92
Scotland*	30
Northern Ireland	25
TOTAL UK DEATHS	**712**

*Note that Scotland does not have a Coronial system as the other UK countries do, but holds Fatal Accident Inquiries for a much smaller proportion of deaths (less than 100 per annum). It is possible that this contributes to the lower rate of CO deaths recorded in Scotland.

LOCATION OF INCIDENT relating to UK deaths from unintentional carbon monoxide poisoning from 01.09.1995 to 31.08.2019

Number of deaths recorded in each administrative area
(actual number is given)



*Note that Scotland does not have a Coronial system as the other UK countries do, but holds Fatal Accident Inquiries for a much smaller proportion of deaths (total of 40-70 FAIs per year but often not even one inquiry about a CO death). It is possible that this contributes to the lower rate of CO deaths recorded in Scotland.

**CO Gas Safety would also like to reiterate that unless testing for CO is carried out on all deceased persons, we cannot know the true number of unintentional carbon monoxide poisoning deaths within any of the UK countries.

In Loving Memory of

all who died of unintentional carbon monoxide poisoning & other gas dangers or other products of combustion

&

Heartfelt Thanks

to all those who have helped raise awareness of the dangers of CO

&

helped the charity, CO-Gas Safety,
with donations or hard work including:-

The Guild of Master Chimney Sweeps
Kane International
Lord Hunt of Kings Heath
John O'Leary
Chihiro
Dr Ben Croxford
The Late Harry Rogers, Independent Gas Investigator & Court Witness
Roland Johns
Ben Kuchta
Dave Bendle
Gary Farnhill
Adrian McConnell
Oliver Buckley-Mellor
Danielle Royce
Tom Bell
Phil Burrows
Amanda O'Shea
Honeywell Analytics
Frank Brehany, Consumer Champion
The Corfu parents, Neil & Ruth Shepherd and Sharon & Paul Wood

Jan Miller of the New Law Journal
Madelene Holdsworth of Slater Gordon
Debra Morris of Affinity Law
The Department of Health
Inquest
Headway
The Chief Coroner
Coroners' Officers
Colin Breed, when an MP
Fraser Kemp MP

Crispin Blunt MP
CORGI
Matthew Cole of npower
The Gas Distribution Networks
Baroness Maddock
John Courtney
Jo Richards, Beverley Squire & Jennifer Wood
Michele Perry & David Fairhurst
The late David Jenkins of RoSPA
The late John Ball, MBE

CO-GAS SAFETY 25TH ANNIVERSARY PRESS PACK 1995-2020
Publication of 24 years of data of Deaths & Injuries from Unintentional Carbon Monoxide Poisoning 1995-2019

Prize giving of the GDNs' CO awareness competition at the House of Commons 2019 – a great success!

1

2

3

4

Competition Winners ***(from left to right)*****:**

Livie Yelland - W&WU
Lily Jean - W&WU
George McDonald - NGN
Cody Motherwell - SGN
Evie Beeston - Cadent
Nikki Maisuriya - Cadent
Isabella Bradbury - NGN
Morgan Hughes - W&WU
Emilia Chichester - W&WU

5

6

7

1. Stephanie Trotter & Laura Davis of W&WU.
2. Barry Sheerman MP, co-chair of APPCOG.
3. Stephanie Trotter & Barry Gardiner MP.
4. Presentation awards.
5. Stephanie Trotter and Jonathan Shaw, Chief Executive of Policy Connect.
6. From right to left, Olivia Murray, Stephanie Trotter, trustees CO-Gas Safety & Phil Burrows, Cadent.
7. Representatives from the GDNs & others at the prize giving.

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The Guild of Master Chimney Sweeps

Congratulates CO-Gas Safety

on its

25th Anniversary

Members of the Guild of Master Chimney Sweeps

The Guild is the first organisation to have voluntarily recognised the need for a protocol to preserve the evidence in a carbon monoxide incident.