

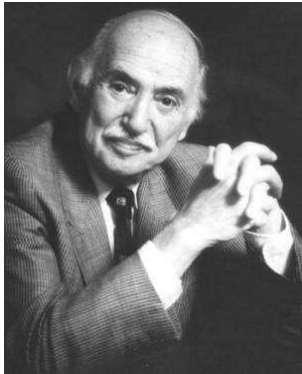
Unintentional Non-fire Related Carbon Monoxide Poisoning

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Tail-end Charlie



Alexander Russell OBE



Lack of Moral Fibre

- Headache
- Confusion
- Memory loss
- Nausea/vomiting
- Feeling of physical weakness
- Irritability/mood swings
- Impaired judgement

Chronic CO Poisoning

- Headache
- Confusion
- Memory loss
- Nausea/vomiting
- Feeling of physical weakness
- Irritability/mood swings
- Impaired judgement

Outline

- Introduction
 - Death of Elouise Littlewood
 - Death of Elizabeth Kerr
- Problems in gathering data on incidence of CO poisoning
- Fatal unintentional non-fire related CO poisoning data, England & Wales: 1979–2012
- Unintentional domestic non-fire related CO poisoning 1986–2011: Data from UK media report
- Conclusions

Disaster in Fife

- M 19, F 17 moved into LA flat in Fife, late August 1998
- Suffered flu-like symptoms, headache, lethargy
 - Told LA there was a problem with the heating of the flat
- M found dead from CO poisoning, F critical (11/98)
 - The day before they had felt dizzy and nauseous
 - F permanent physical and intellectual impairment
- LA fined £5,000 for failing to maintain the gas heating system properly
 - £500,000 spent replacing the 15-yr-old warm-air central heating system in 11 blocks of flats
 - Out-of-court settlement of just over £1 million (2004) to aid the ongoing care of the disabled F

Death of Elouise Littlewood

- Police called to a block of flats in Wooldridge Close, Bedfont at 22:20, 27 February 2008
- Ms Littlewood, 26, dead at the scene. PM blood COHb 77 %



- Her lodger Simon Kilby, 34, remains in long-term vegetative state
- Blood COHb 21–28 % on admission to hospital, likely higher when found

A Preventable Death

- Source of CO: gas-fired condensing boiler Potterton Powermax HE in the flat
- **Flue with snap-on fittings internal to flat with no means of inspecting joints**
- Elouise first occupant of flat in new development
 - Moved in 10 December 2007
- She developed features compatible with CO poisoning soon afterwards including headache, lethargy, fatigue, falling asleep, nausea, repeated vomiting
- E-mail from her dated 21 January 2008 *'Was ill till about half 9 last night still being sick. Clare came over with some resolve tablets but I was sick again! Finally ate a crumpet and went to bed after wild at heart'*

Why Did Death Occur When it Did?

- Investigation showed flue joint disconnected allowing CO into the flat
 - Staining on the surrounding area suggested joint leaking for some time
- Elouise found naked in bathroom, but no water in bath
 - Use of bath: increased demand on boiler hence more exhaust products available for release into the flat?
 - Vomit etc. elsewhere in flat
- Ambient temperature/air pressure, wind speed/direction different?
 - Nil obvious: 26/27 February 2008 brisk then breezy Westerly winds with ambient temp 3–9 °C

Why Did Death Occur When it Did?

- If any previous CO exposure(s) shorter/lower level, and the fatal exposure for some reason more prolonged, then this simple explanation
- Heating set to continuous heat/hot water and external door and all windows closed when police first attended
- Not known precisely when death occurred, but body cold when found and hypostasis present
 - CO concentration in the flat need not have been dramatically high for a short period
 - In life CO can be accumulated if ambient air concentration 0.08 % or so
 - Mr Kilby did not die, even though likely exposed to CO for several hours

Other Evidence

- Investigation showed that many residents in other flats complained of features compatible with CO poisoning
 - **Perceived need to replace all the gas fittings in the development**
- Several flues continued to separate following remedial works by British Gas
- An expert concluded that the push fit flue system was not fit for purpose
 - **Over successive heating cycles the pipes expanded and contracted in such a way that the flues were prone to disconnect**

A Failed Prosecution

- Paul Williamson, 53, gas fitter not guilty of (i) gross negligence manslaughter and (ii) GBH
 - Also not guilty of GBH wrt Mr Kilby
- Malden Plumbing and Heating Ltd cleared of failing in its duty to protect non-employees from risk
- Williamson, who inspected the boiler to certify the flue as safe, told the court that the flue must have become disconnected on the day of the incident
- Trial 4 yr post-event: defence asked for postponement
- **Judge described the HSE investigation as 'sub-standard'**
- Police destroyed the flue from flat 182 without reference to the defence

Death of Elizabeth Kerr

- Mrs Kerr, 76, died from CO poisoning, 5 December 2008
- CO from faulty boiler in the basement of the Bank below her flat
- Her son David, 40, also suffered life-threatening CO poisoning
- Found unconscious by her son at 13:00 when he awoke feeling sick and disorientated
- She was found naked and collapsed on the toilet, but was still breathing. Vomit was found elsewhere in the flat
- Her son called the emergency services, but she suffered CRA when moved and could not be resuscitated



A Preventable Death - I

- GMFRS had attended the Bank at 06:00 because of a report of steam coming from the basement
- Boiler switched off, gas supply disconnected, and forced ventilation of the basement commenced
 - May have had the effect of forcing CO up through the building
 - **No check for CO made**
- Evacuation of building ordered, but action limited to ringing doorbells/knocking on windows of the flats above the Bank
 - 3 of 4 flats vacant

A Preventable Death - II

- Firefighter did not notice Mrs Kerr's name on the doorbell, or the milk on the doorstep. Although he saw a light on he did not report it
- GMFRS stood down 08:30. Bank staff allowed to go to work as normal
- 12:30 Bank staff member asked about the Kerrs, saw the milk still on the doorstep, and called police
- GMFRS about to break into flat when Mr Kerr opened the door!
- Police entered the flat, but had to withdraw as the atmosphere inside still toxic



Family Solicitor

- *'I strongly agree with the concerns of the Coroner. This case was a shocking example of lack of awareness that carbon monoxide could result from a malfunctioning boiler by those attending the incident that morning. This is not an isolated incident. **I see new cases of preventable carbon monoxide poisoning on a weekly basis.** Carbon monoxide is so dangerous because its effects are that it can render people unconscious and unable to call for help.'*

CO Poisoning Data

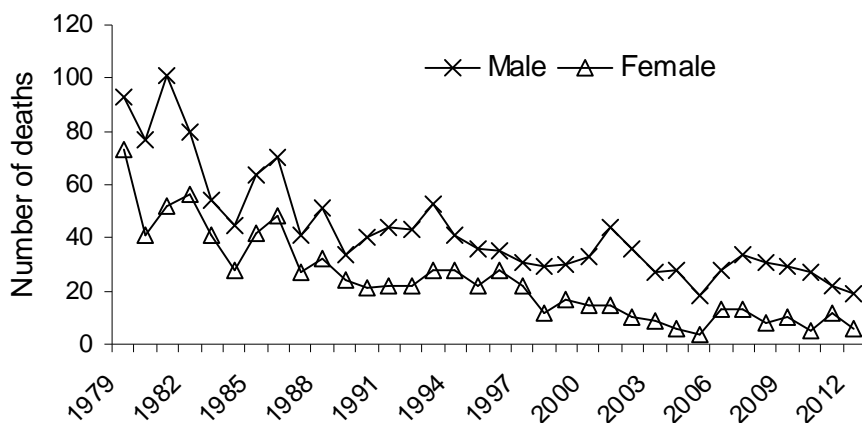
- Source of CO varies:
 - In (usually smouldering) fires
 - Suicide (very rarely homicide)
 - Accident
- Diagnosis often missed in life (and sometimes after death)
- Have to know circumstances in which exposure occurred in order to:
 - Derive appropriate statistics
 - Plan preventative measures

Fatal Unintentional Non-fire Related CO Poisoning, E & W: 1979–2012

- 2208 deaths (64 % male)
- Annual deaths fell from 166 in 1979 to 25 in 2012 (i.e. from 3.37 to 0.44 per million population)
- Some 81 and 92 % of deaths in males and in females, respectively, occurred at home address

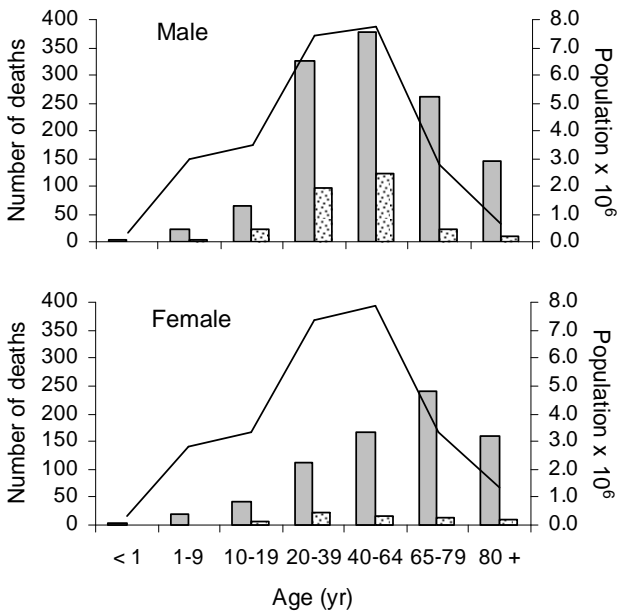
Data from ONS

Fatal Unintentional Non-fire Related CO Poisoning, E & W: 1979–2012



Data from ONS

Home Away from home Average population



E & W
CO-
related
Deaths:
Age &
Sex

Fatal Unintentional Non-fire Related CO Poisoning, E & W: 1979–2012

- Preponderance of deaths in males aged 20–64
 - Increased proportion away from home
 - May be due increased exposure in temporary facilities i.e. sheds, garages, boats, tents?
- Highest proportion of deaths/head of population in >65s
 - Higher risk?
 - Higher chance of exposure?
- Problem with simply looking at mortality data is lose the context of the death

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ORIGINAL ARTICLE

Unintentional domestic non-fire related carbon monoxide poisoning: Data from media reports, UK/Republic of Ireland 1986–2011

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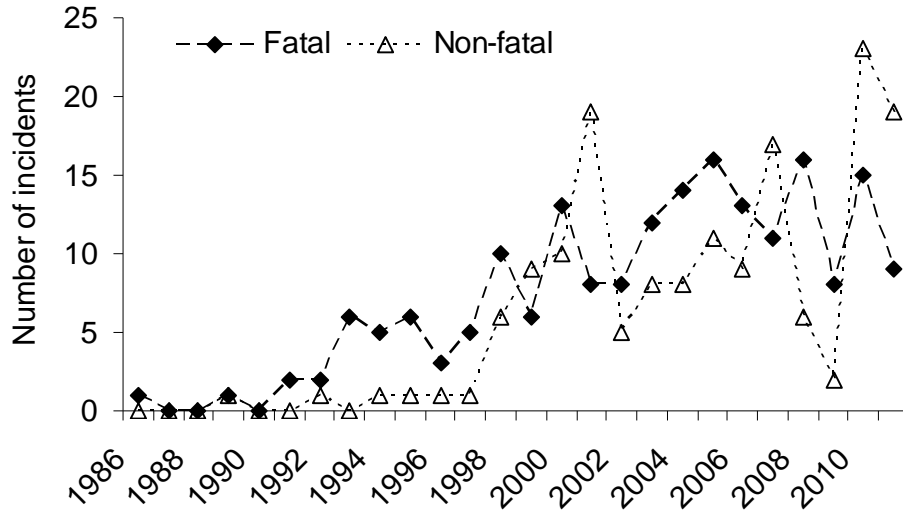
Unintentional Domestic Non-fire Related CO Poisoning: 1986–2011

- 348 incidents (880 victims: 334 male, 352 female, 194 sex not stated)
- Reports increased from 1986 (1) to 2011 (28)
- 298 deaths (169 male, 124 female, 5 sex not reported)
- Source of CO often central heating or water boiler (48 % of 244 incidents)
- Many incidents (49 %) in private dwellings.
 - Incidents in caravans, tents, sheds, and outhouses had a much higher death rate

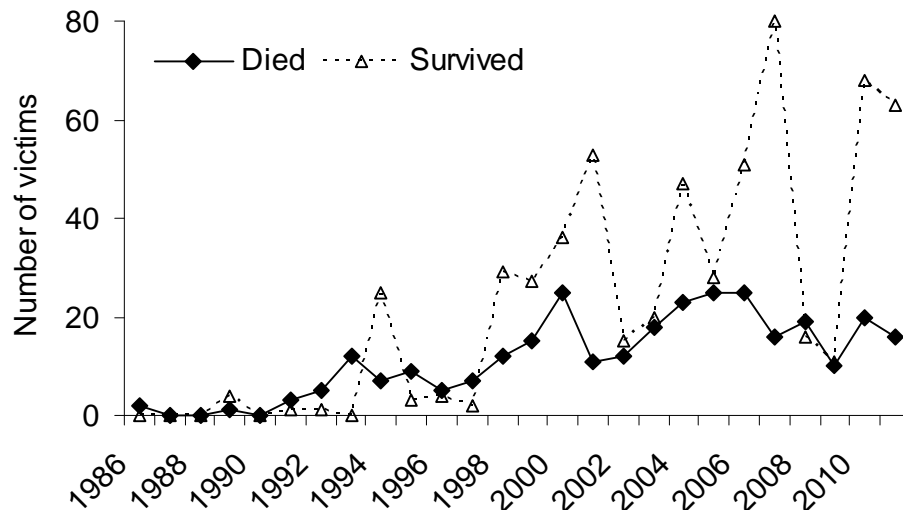
Unintentional Domestic Non-fire Related CO Poisoning: 1986–2011

- If victim discovered alive chances of survival relatively good (87 %), even if found unconscious
- Pets recorded in 31 incidents (17 died).
 - In 5 cases, CO poisoning was identified through illness or death of a pet
- Prosecutions recorded in 49 incidents
 - At least 7 custodial (prison) sentences, with 34 further convictions resulting in a fine
- Charges preferred against either an installer/maintenance engineer (42 %), or landlord (31 %)

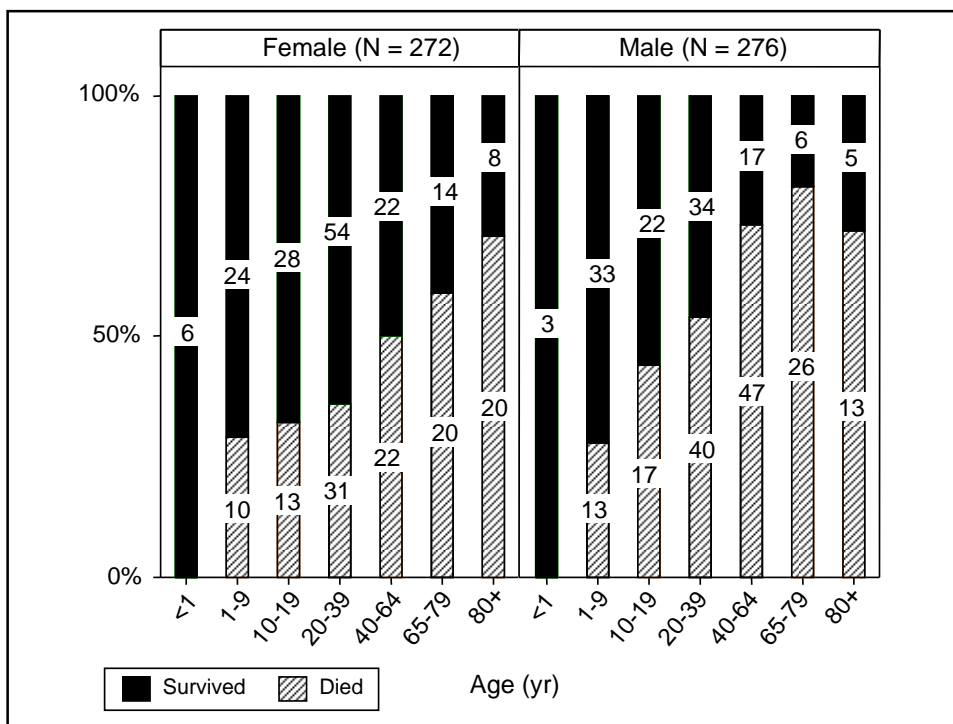
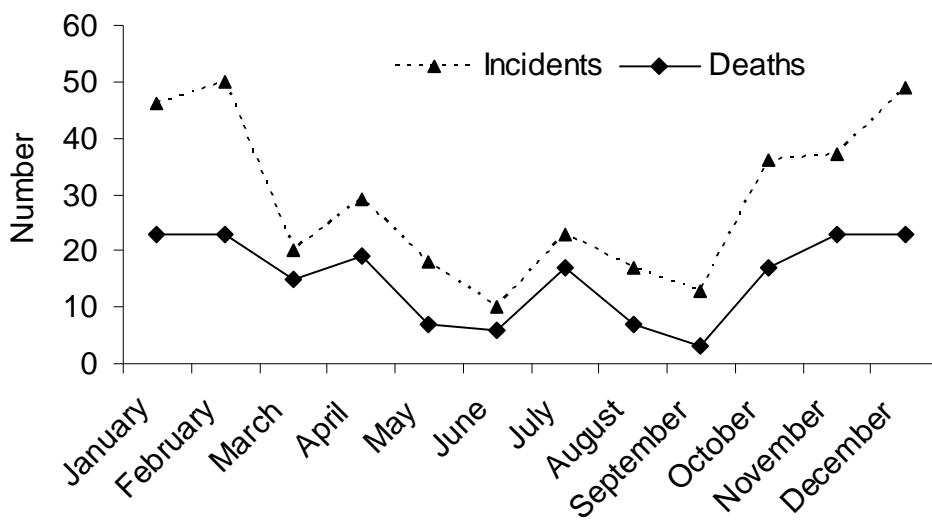
Unintentional Domestic Non-fire Related CO Poisoning: 1986–2011



Unintentional Domestic Non-fire Related CO Poisoning: 1986–2011



Unintentional Domestic Non-fire Related CO Poisoning: 1986–2011



Location of Incident/Outcome

	Number of incidents	% Fatal
Private house	121	62
Tenant/Care home	68	49
Caravan/Tent/Boat	29	79
Hotel/B&B/Hostel	17	65
Shed/Outhouse/Hall	9	89

Clinical Features Reported

	Victim died	Victim survived
Headache	7	113
Nausea/vomiting	6	94
Tiredness	4	48
Dizziness	7	34
Weakness	1	37
Unwell or flu-like	10	22
Collapse	7	12
Confusion	1	16
Difficulty breathing	1	12

CO Poisoning: Missed Opportunities - 1

Presentation/ diagnosis	GP / hospital	Time before diagnosis	Final outcome	How CO poisoning identified
No diagnosis	EGP	Hours	Died	Found dead
Inner ear infection + shock (couple)	Hospital	Hours	Both died	Found dead
No diagnosis, released	Hospital	Hours	Died	Found dead
Virus and ear infection	GP	Days	Died	Found dead
Collapse – No diagnosis	Hospital	2 days	Died	Found dead
No diagnosis	GP	Weeks	Died	Found dead
Collapse - Suspected heart attacks (two admissions)	Hospital	Months	Died	Found dead
Collapse - Suspected stroke (grandfather)	Hospital	Hours	Survived	Death of grandson left in bed at home

CO Poisoning: Missed Opportunities - 2

Presentation/ diagnosis	GP / hospital	Time before diagnosis	Final outcome	How CO poisoning identified
Sick, dizzy - possible pregnancy	GP	Days	Survived	By chance took CO breath test
Sleep apnea	GP	Days	Survived	Found unconscious
Migraine	GP	Days	Survived	Phoned for help
Virus	EGP	Days	Survived	Phoned for help
Virulent influenza	GP	1 Week	Survived	Phoned for help
Influenza	GP	Weeks	Survived	Problem alerted (missing flue noticed)
No diagnosis	GP	Weeks	Survived	Bought CO alarm
No diagnosis	GP	Months	Survived	CO alarm went off
Tiredness; thyroid problems; depression	GP	Months	Survived	Problem identified at service of appliance
Influenza / lupus	GP	Months	Survived	Bought CO alarm

Conclusions

- Unintentional non-fire related CO poisoning remains significant cause of morbidity and mortality in the UK
- Preponderance of middle-aged males in the fatal poisoning data attributable in part to deaths in garages or outhouses, or associated with BBQs
- CO alarms in domestic dwellings, boats, caravans, etc. one way forward
- More education of the dangers posed by CO still needed, even by the emergency services