

# Making sense of carbon monoxide



## Facilitators:

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# and Welcome



What we'll cover:

- People's experiences of CO
  - Lack of what is considered evidence of exposure for many (who may have vague, non-specific symptoms)
  - Poor understanding of how exposure impacts people
- **Over to you/Call to action**
- **Pregnancy (and beyond)**
- **What we know**
- **What's next?**

**Underserved  
communities  
\*Disclaimer\***



CO Safety Summit 2024

# What I did/what I found

- I listened...
- 'Acute poisoning'
- 'Chronic, low level exposure'



## Findings/four main themes:

1. Traumatic experience
2. Power, justice and judgement
3. Identity and connectedness
4. Everybody seems to be in the dark

# Voices and research in CO: what doesn't help survivors

- 'Voice' as an issue
- Lack of knowledge
- Hierarchy of knowledge
- The 'sick role'
- Not being believed
- Onus on person to provide 'proof' of exposure
  - Investigations for/diagnoses: Fibromyalgia, Chronic Fatigue Syndrome, ME, MS, mental health problems



# People's experience: *paraphrased responses from transcripts*

- *'We don't know what to do with you'*
- *'There is no such thing as chronic CO poisoning recognised by the NHS'*
- *'Shouldn't you be in hospital, if you were really ill?'*
- *'All in your mind' 'mad and annoying' 'reading too much on the internet' 'there is nothing physically wrong with this woman'*
- *'You can't be ill; you don't have enough CO in your blood'*
- *'If you haven't had nausea/vomiting/headache then it can't be CO poisoning'*
- *'You're just in no man's land'*
- *'This isn't serious enough'*
- *'If it is CO, you'll be fine in 60 days'*
- *'Do other people get this?'*
- *'They treated me like dirt'*



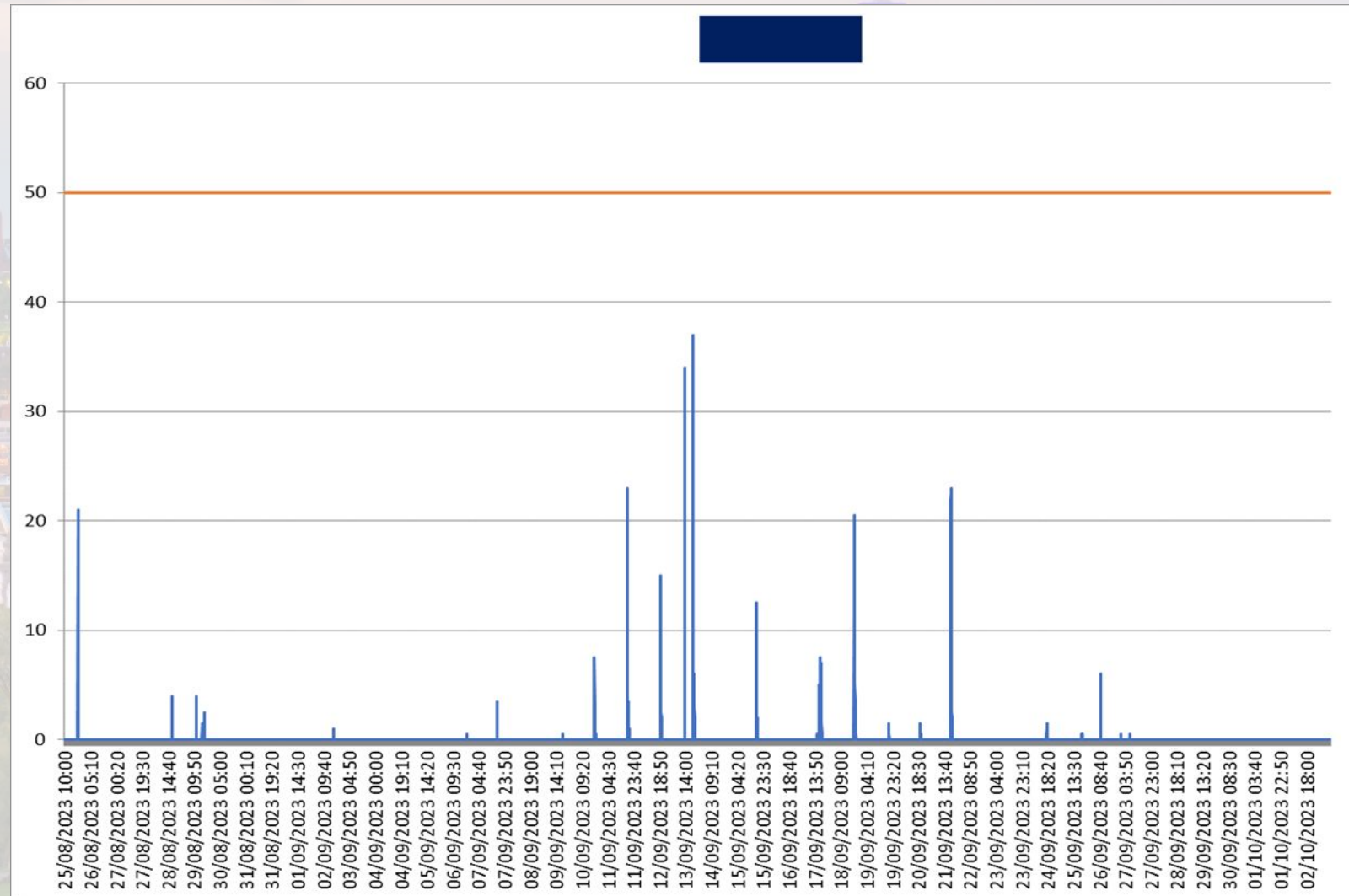
# Poverty, poor health and underserved communities: at risk?



- Very young/very old
- Pregnancy/childbearing age
- Different ethnic minority groups
- Sex/gender/LBTGQ+ orientation
- Military veterans
- People who DNA medical appointments
- People in multiple excluded categories
- Socially marginalised people
- Stigmatised populations
- Looked after children
- Language barriers
- Digital exclusion/disadvantage
- Disabilities/learning difficulties
- Lower educational attainment
- Socio-economically disadvantaged/unemployed/ low income
- People in alternative residential circumstances (e.g. migrants, asylum seekers, care homes, prison populations, Traveller communities, the displaced and those of no fixed abode)
- People living in remote areas
- Religious minorities
- Carers



# People *are* living with lower levels of CO



## Complex situation: summary

- People are living in their own *context*
- CO really is tasteless, odourless and invisible; yet the smallest amounts cause significant harm and fatalities
- Growth after trauma is possible





# Case Studies

## The Ask

You have ?? minutes

One member of your group has access to a **case study** they will share with you

- They will provide you with background **information** about a family or individual
- You will then be presented with some **questions**
- Your facilitator will then provide you with **further information** and present **more questions**
- Please **record the outcomes** of your discussions/answers to the questions on the flip chart provided.
- Appoint one person to **provide feedback** to the wider group.

# Case Studies

- **Scenario 1 - Taylor & Daniel**
- **Scenario 2 – Ryan & Lauren**
- **Scenario 3 - Dorothy**
- **Scenario 4 - Hannah**
- **Scenario 5 - Linda & Mitch**
- **Scenario 6 - Harvey**
- **Scenario 7 - Sara**

# What do we know (pregnancy and beyond)

Studies have reported associations with:

- Preterm delivery
- Low birthweight
- Congenital malformations
- Sudden infant death
- Neurodevelopmental problems

Symptoms can be attributed to pregnancy itself, including nausea, vomiting, fatigue and headache.

Fetal haemoglobin having a **higher affinity for CO** than oxygen

CO elimination taking longer in the fetal circulation compared to maternal circulation.

In utero exposure in the 3<sup>rd</sup> trimester followed by neonatal (and onwards) exposure is key to health outcome of a child by 5 in terms of developmental outcomes.

This relates importantly to the low level chronic exposure that can so easily be missed.

Whatever the source, carbon monoxide does the same harm to the unborn child

The COHb in the baby will be higher for same level of exhaled breathe would predict in a adult

Pregnant women exhaled breath reading may read lower for same level of COHb

# Smokerlyzer®



Breath carbon monoxide monitors  
Helping people to stop smoking



Adult	
COppm	%COHb <sup>1</sup>
30	5.43
29	5.27
28	5.11
27	4.95
26	4.79
25	4.63
24	4.47
23	4.31
22	4.15
21	3.99
20	3.83
19	3.67
18	3.51
17	3.35
16	3.19
15	3.03
14	2.87
13	2.71
12	2.55
11	2.39
10	2.23
09	2.07
08	1.91
07	1.75
06	1.59
05	1.43
04	1.27
03	1.11
02	0.95
01	0.79

Maternity	
COppm	%FCOHb <sup>2</sup>
20+	5.66
19	5.38
18	5.09
17	4.81
16	4.53
15	4.25
14	3.96
13	3.68
12	3.40
11	3.11
10	2.83
09	2.55
08	2.26
07	1.98
06	1.70
05	1.42
04	1.13
03	0.85
02	0.57
01	0.28

Having a reading in this zone indicates you may well be a **regular smoker** with higher levels of CO in your blood. Do not despair! Help is at hand and your stop smoking advisor can help you to give up smoking and lower your reading into the target "Green zone".

Having a reading in this zone would indicate a **light smoker** or a **non-smoker** breathing in poor air quality or passive smoke. Your stop smoking advisor will be able to advise on the best course of action to lower this reading to the target "Green zone".

**This is where you really need to be!**  
It means you have less than 2% carbon monoxide (CO) in your blood. Most people have a small amount of CO in their breath, this is due to the air quality around you.

References:  
1. COppm- %COHb calculation taken from: Jarvis M et al (1986) "low cost Carbon Monoxide monitors in smoking assessment." Thorax 41 pp 886-887.  
2. COppm- %FCOHb calculation taken from: Gomez C. et al (2005) "Expired air carbon monoxide concentration in mothers and their spouses above 5ppm is associated with decreased fetal growth." Preventive Medicine 40 pp 10-15

# What do we know

- Young children are especially vulnerable to the effects of CO.
- They are more susceptible to CO and may experience symptoms sooner than a healthy adult.
- Due to their smaller bodies, children may be more severely affected by carbon monoxide in their blood.
- The long-term effects can include memory loss, impaired motor skills, and heart and lung problems. They may need to deal with the CO injury for the rest of their lives.

# What do we know

Women and families we expect could benefit most from work in this area are from **lower socio-economic and disadvantaged groups.**

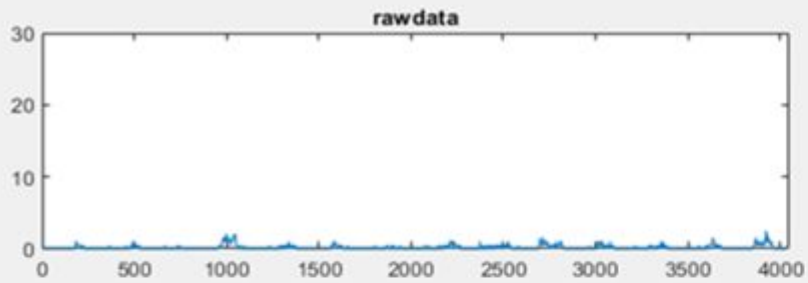
They are more **likely to be living in lower quality, private rented accommodation, less aware of the dangers of CO exposure**, less likely to consider CO poisoning a priority, **less empowered** to improve their living conditions and less able to take positive action if a problem is identified.

# What are we doing?

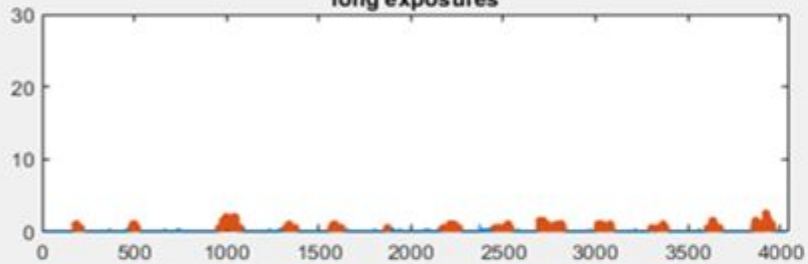
- IPPCO Study identifying **levels and scale** of harm (quant) along with building an understanding of how to better protect women and their families (qual).
- Paper bringing together what is known about **harm**
- Developing and trialling:
  - ✓ **E learning modules** for a range of healthcare professionals and medical examiners.
  - ✓ Trialling new **pathways** to better protect women and families.
  - ✓ UK Health Security Agency **guidance**

# EXAMPLE PATTERNS: Several samples exhibit intermittent exposures (random, non random)

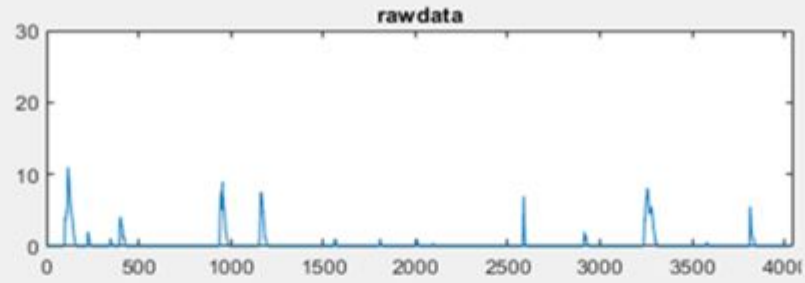
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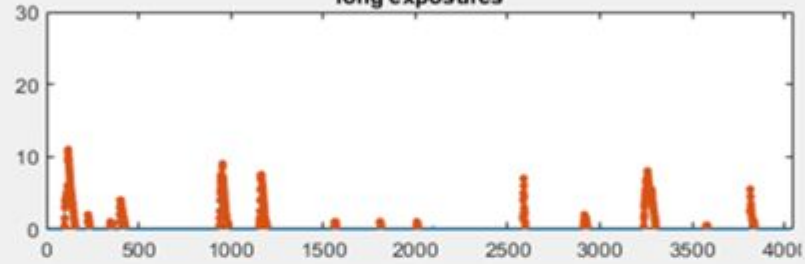
long exposures



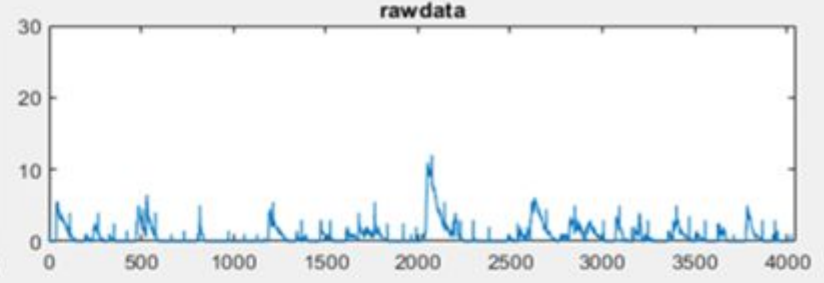
CV124.txt



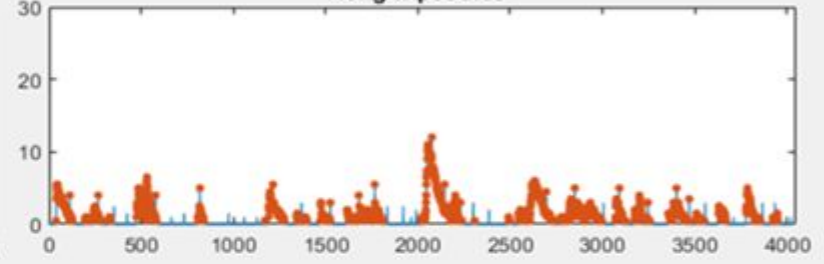
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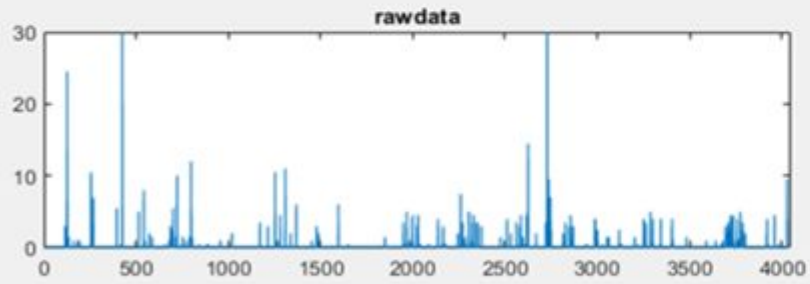
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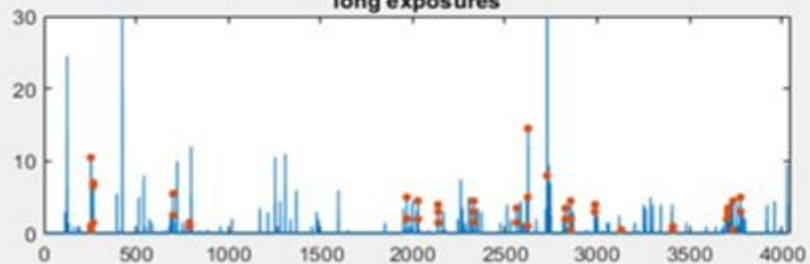
long exposures



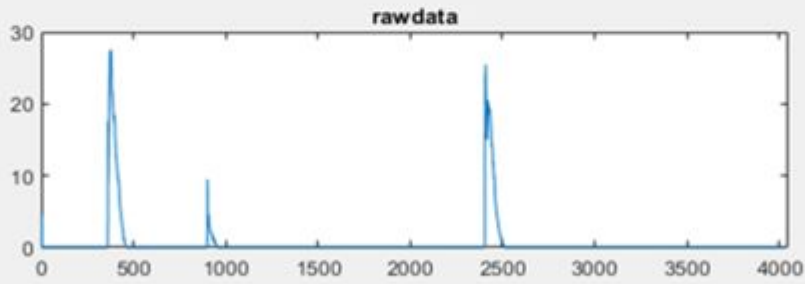
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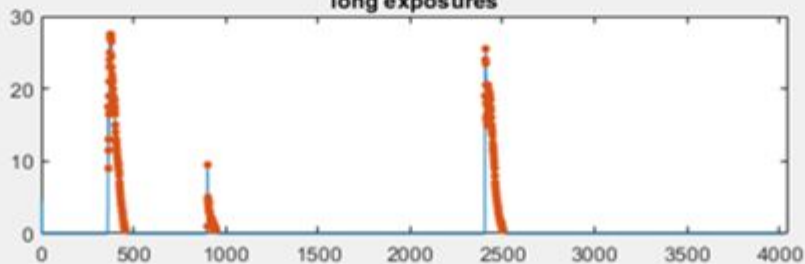
long exposures



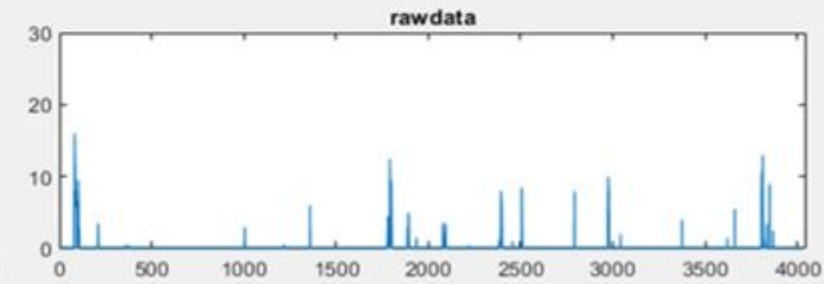
CV162.txt



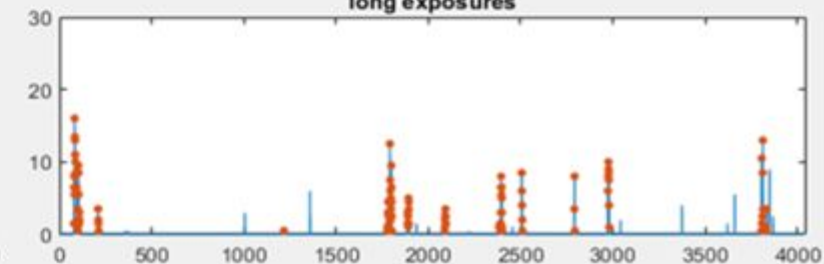
long exposures



CV099.txt



long exposures





# Headlines from Pregnant Women - Co-designing the Future

Participants agreed that for an intervention to make a difference it must include:

**1. A risk perception message related to the individual and delivered by the midwife**

**2. A clear pathway** which includes

- a) Where action matches the severity of the message
- b) Which keeps everyone safe

*“You can’t tell me it’s important, for you then to dismiss and not do anything! This is counterproductive. That will send the message to me that it’s not important and then what”*

**4. Participants identified four key aspects to any targeted Communication and messaging** with the aim of raising the importance/priority

- 1. CONVERSATION**
- 2. CONSISTENCY**
- 3. CLARITY**
- 4. CONNECTION**

# National CO Guidance

**Midwives and maternity staff sit at a critical interface** with the ability to identify pregnant women who are at risk, and take appropriate public health action, during routine antenatal appointments when exhaled CO levels are above thresholds

- **All pregnant women should have a CO test undertaken** at the booking appointment to help identify and treat women who smoke (NICE 2021)
- **Opportunity to identify other unexplained sources of CO and provide advice and support**
- Appropriate guidance can **empower midwives & maternity staff** with the knowledge and understanding of the health risk of CO, how to identify it, and what advice to give/actions to take



# Trial of new pathway in maternity

>4ppm = smoking and environmental exposure discussed

Home visit by Fire and Rescue Service



Offered a safe and well visit

- ✓ CO test at booking appointment
- ✓ Brief written info
- ✓ Easy link for Priority Service Register
- ✓ Beyond the Meter offer

- ✓ Advice
- ✓ CO alarm fitted
- ✓ Referral to Emergency Gas Safety if required

# What Next?

- What further research do we need?
- What actions could agencies take now (policy/practice)?
- What actions can be taken to help women and families to protect themselves from harm?
- Who else should we be working with (fuel poverty/ healthy homes/.....) ?

# A Call to Action

What action(s) can you commit to take now?

What actions should others take now  
(policy/practice)?

- Prevention?
- Early detection?
- Treatment?
- Support for those impacted?

**Thank you  
for  
listening.  
Any  
Questions?**

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