

iPiP

Environmental CO Exposure During Pregnancy



What do we know (about harm)

Studies have reported associations with:

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

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

In utero exposure in the 3rd 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.

Breath carbon monoxide monitors
Helping people to stop smoking



Adult

COppm	%COHb ¹
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 ²
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 885-887.
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

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

What do we know (about prevalence)

- There are approximately 650,000 live births in England each year
- About 4,700 perinatal deaths (3,200 stillbirths and 1,400 neonatal deaths).
- Of this figure, over 1,500 will be classified as unexplained deaths.
- It is unknown if any of these deaths were the result of the pregnant woman's exposure to environmental CO.

What do we know (about who)

The women and families we expect are most impacted 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 action if a problem is identified.

What do we know (about exposure levels)

- WHO, 2010, indoor air quality guidance states to prevent individuals COHb levels rising above 2%. The maximum exposure recommendations are as follows:
- 87 ppm (100 mg/m³) for 15 min.
- 31 ppm (35 mg/m³) for 1 hour
- 9 ppm (10 mg/m³) for 8 hours.
- 6 ppm (7 mg/m³) for 24 hours.

This guideline has recently (WHO 2021) been lowered to:

3.5ppm (4 mg/m³) for 24 hours

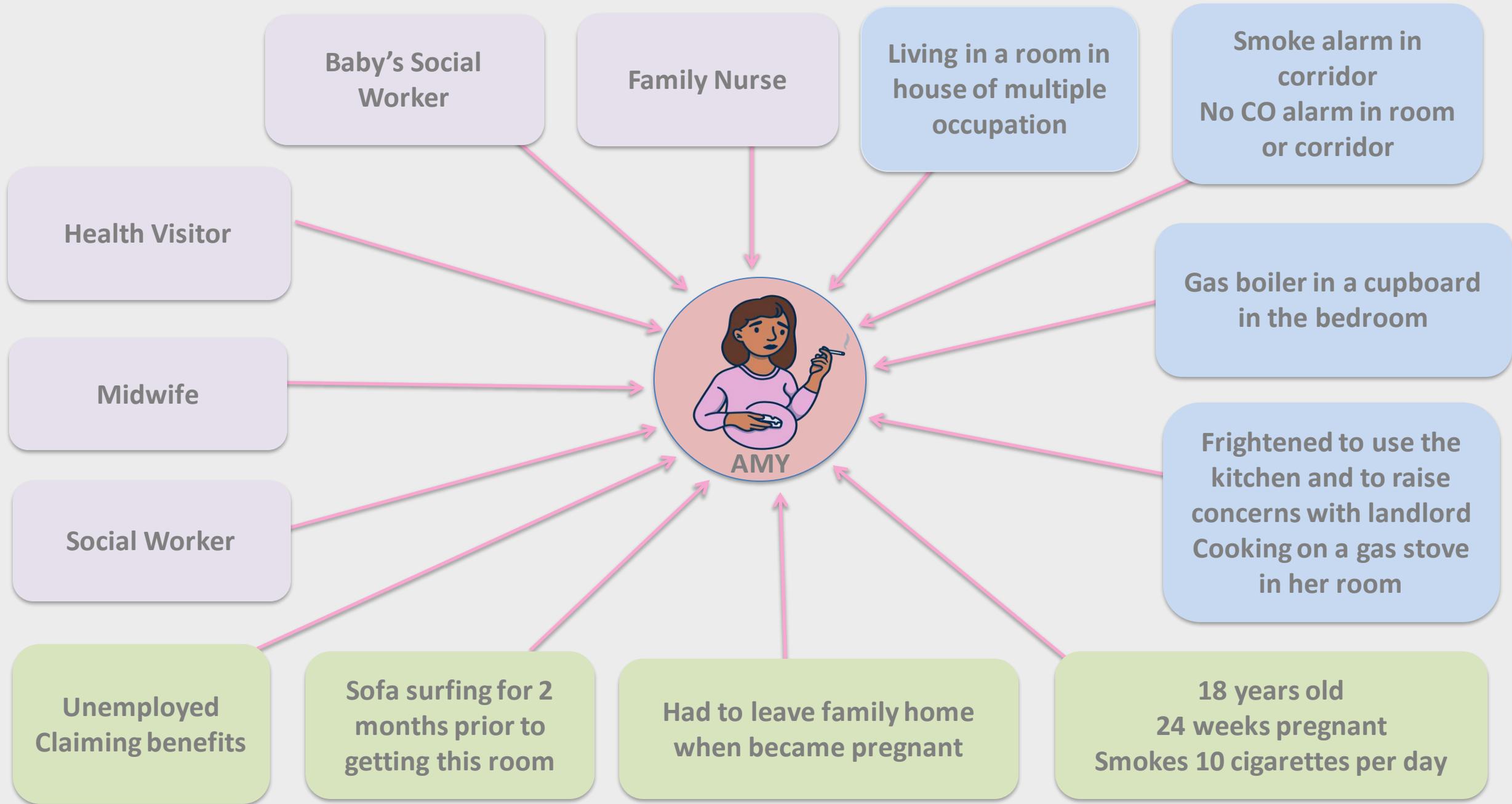
What do we know (about alarms)

BS EN 50291-1:2018

Alarm conditions		
Co concentration	Without alarm before	With alarm before
30 ppm	120 min	-
50 ppm	60 min	90 min
100 ppm	1 0 min	40 min
300 ppm	-	3 min

Amy's story

Before the study





Baby's SW
Talks about smokefree home but no mention of other CO exposure
Seen at home

Govt
Claiming benefits and healthy food vouchers.
No accompanying advice or support about budget, fuel, home safety etc.

LA/Social Housing
No special considerations when finding emergency accommodation for pregnant women

Midwife
Undertakes CO test but when raised only considers smoking status
Does not ask about other CO exposure or alarm
Not seen at home

Landlord
Smoke alarm in corridor
No CO alarm in room or building as not required by law

Social Worker
No questions or advice about smoking or other CO exposure
Seen at home

Family Nurse
Talks about smoking and smokefree homes but not other CO exposure
Seen at home

Gas Emergency Service
Pregnant women not a specific priority group
Lack of specific knowledge re impact of CO exposure in pregnancy or appropriate actions

Health Visitor
Talks about smoking and dangers of secondhand smoke.
Does not ask about other CO exposure or alarms
Seen at home

A call to action

To better protect women and their unborn child we need:

- **A better understanding of the scale of environmental CO exposure in pregnancy.**
- **An understanding of the barriers and facilitators to identification.**
- **Protocols/Pathways/Interventions for prevention, identification, treatment and removal of harm.**
- **Training for midwives and other healthcare staff.**
- **A recognition that raised CO levels in pregnancy are not always due to tobacco use.**

Study Objectives

Part A

- Establish what levels of CO are present in the home of pregnant women by monitoring for CO over a two-week period.
- Establish whether breath testing at time of booking can be used as an indicator of exposure to CO in the home based on any positive breath readings, information collected at time of booking and by the Fire and Rescue Services (FRS) safe and well visits plus CO monitoring.
- Obtain household data (housing type and status; appliance and fuel-type) and personal CO exposure data amongst pregnant women through these methods.
- Assess any change in CO levels in the home and personal exposure levels after the safe and well FRS visit.
- Understand the levels of CO that pregnant women are exposed to in their homes and evaluate this against the potential for such levels to cause harm.

Study Objectives

Part B

- Understand **what women (and their families) and health professional know about the harm.**
- Understand the **barriers and facilitators to taking action** to remediate problems – both for women and professionals involved in their care.
- With women, health care providers and industry professionals, **codesign approaches and interventions** that can help protect pregnant women and their unborn child

Literature review and roundtable

- What we know about the harm of moderate or severe CO exposure to the unborn child.
- Current knowledge about how best to identify those women who are being exposed.
- The evidence regarding how pregnant women should be treated to minimise harm to her and the unborn child.
- What are the gaps in knowledge and understanding.
- How and by whom the knowledge gaps can be filled.
- A call to action, ensuring current knowledge is utilised and the gaps in knowledge filled so we can better protect pregnant women and their unborn babies.

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**Any
questions?**

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