



Sources, behaviour and mitigation strategies influencing indoor air quality

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Indoor air quality

- Average UK person spends 90% time indoor
- High exposure to indoor air pollutants:
 - ❑ particulate matter
 - ❑ volatile organic compounds
 - ❑ carbon monoxide
 - ❑ biological materials

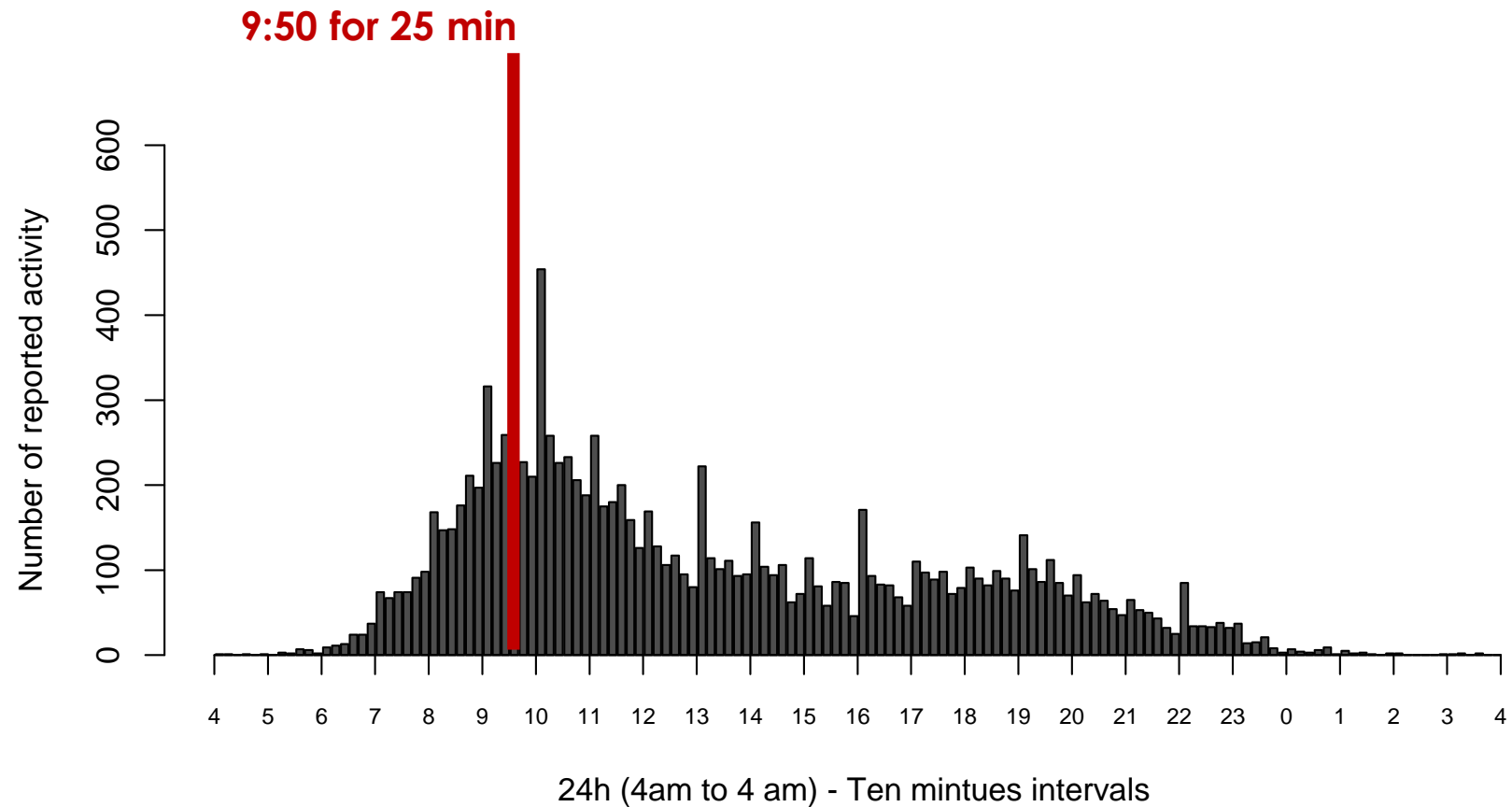


Sources of pollution



Behaviour: cleaning

- UK Time Use Survey to establish frequency & duration of behaviour



Behaviour: typical schedule for a day

Activity	Time	Duration (mins)
Cooking Breakfast – Toast & Tea	08:00 – 08:16	16
Leave the room	08:16 – 09:10	
Washing up	09:10 – 09:25	15
Leave the room	09:25 – 09:50	
Cleaning the dwelling	09:50 – 10:15	25
Leave the room	10:15 – 12:30	
Cooking Pasta – low emission	12:30 – 12:48	18
Leave the room	12:48 – 13:30	
Washing up	13:30 – 13:46	16
Leave the room	13:46 – 17:30	
Cooking Stir fry - High emission	17:30 – 17:53	23
Leave the room	17:53 – 18:40	
Washing up	18:40 – 18:57	17



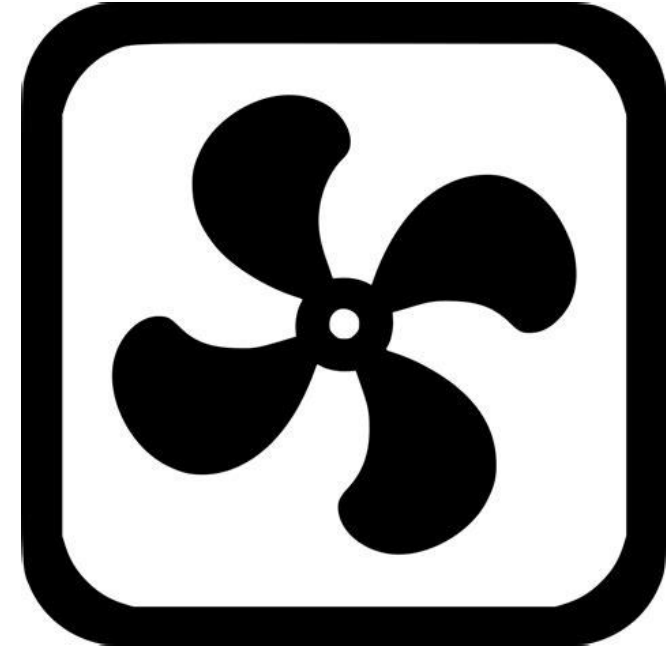
Question:

What would be the particulate emission from these two dishes under different ventilation scenarios?



Mitigation strategies

- Reduce behaviours – cooking, cleaning, solid-fuel fires, use of candles, smoking, etc.
- Choose low emission materials
- **Increase ventilation**

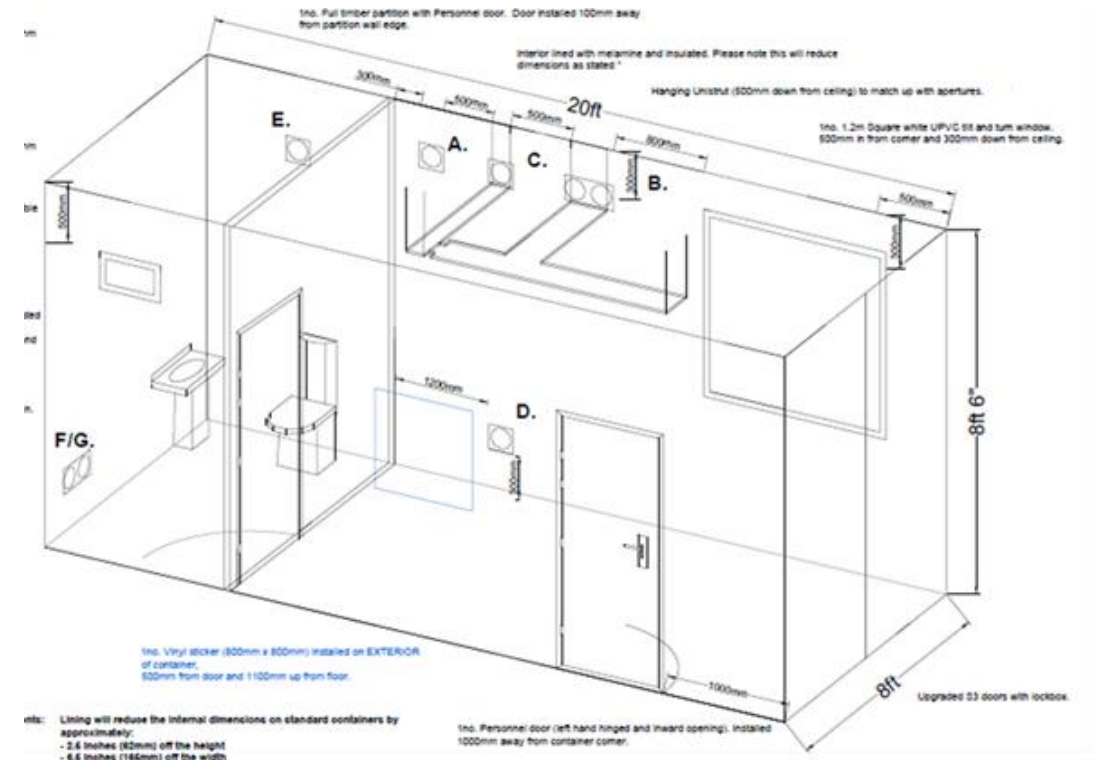


Tests

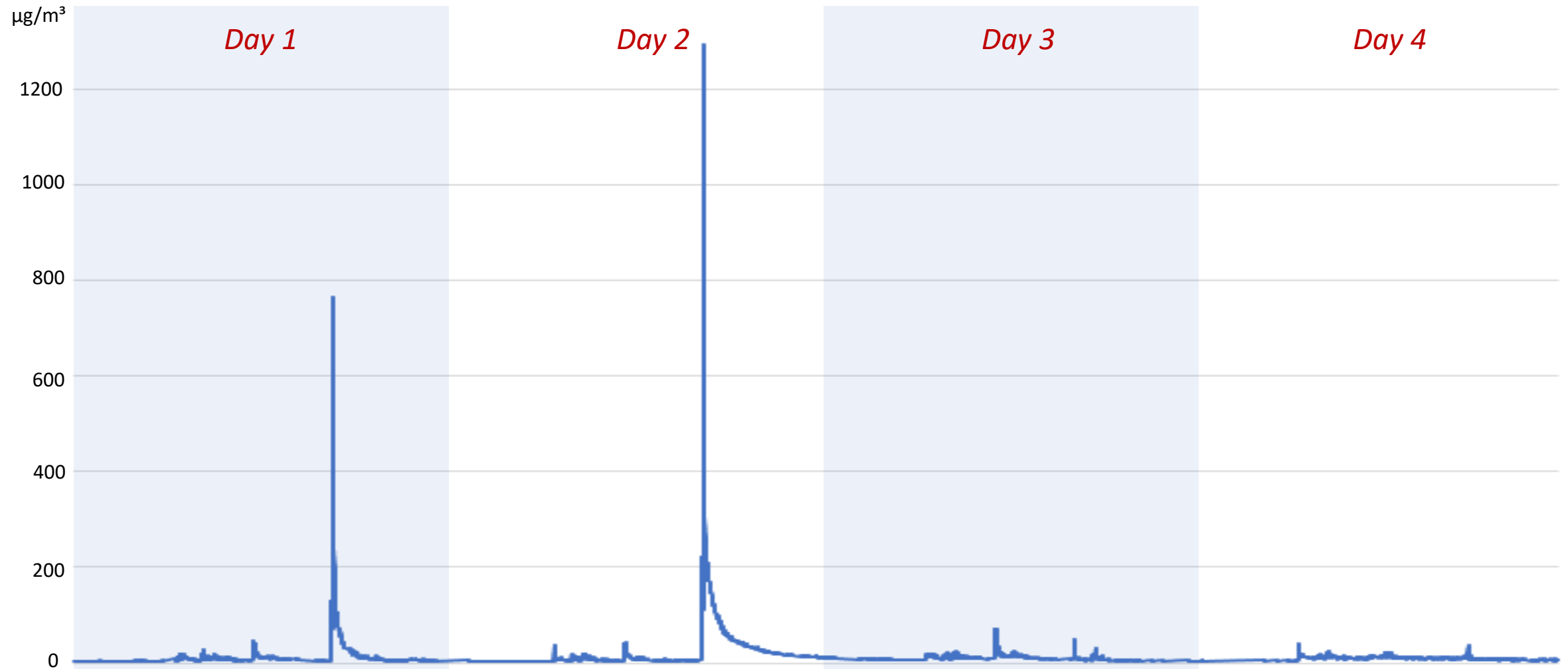
4 tests:

- two days *low* ventilation (Tue 6th & Wed 7th July 2021)
- two days *high* ventilation (Thu 8th & Fri 9th July 2021)

Measures: T, RH, V_a , CO_2 , NO_x , PM_1 , $PM_{2.5}$, PM_{10} , O_3 , TVOC, CH_4 , irradiance, bioaerosol

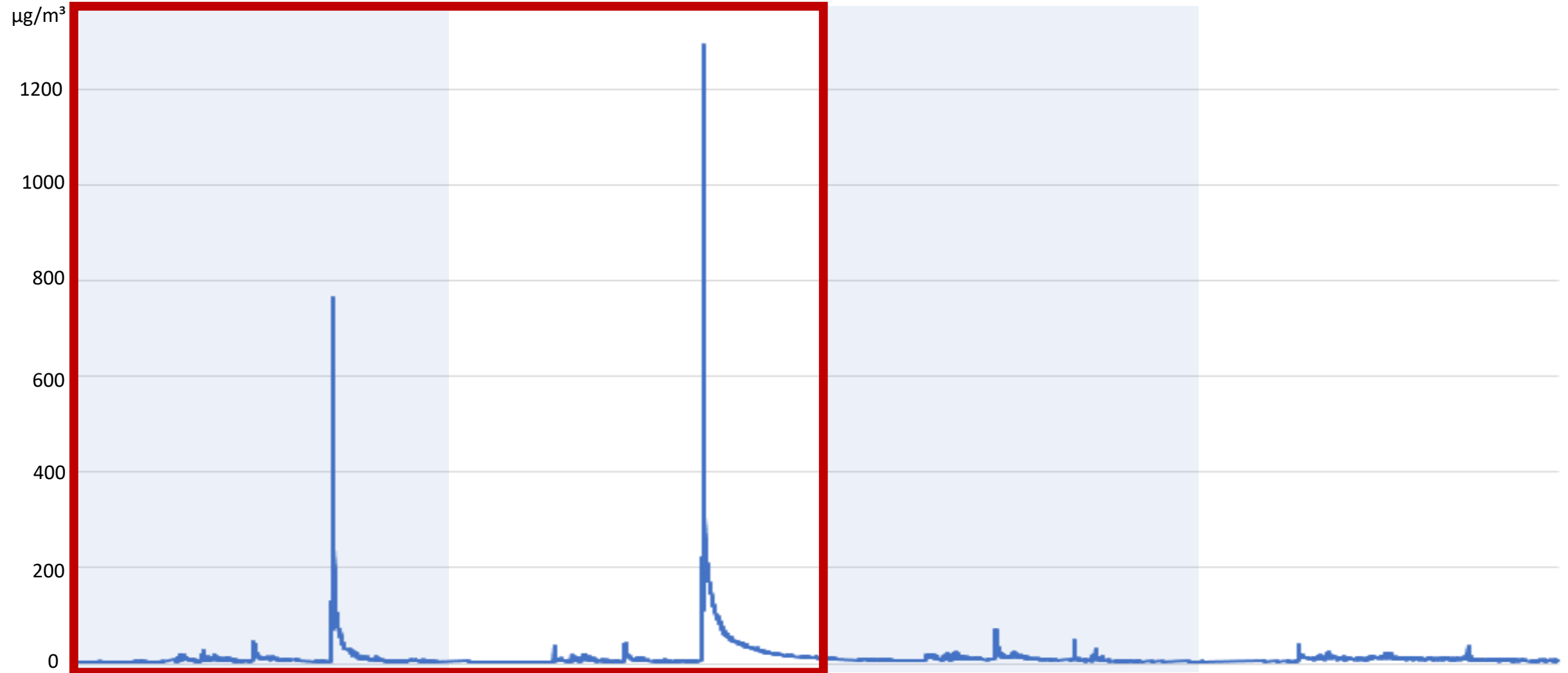


Early Results – PM10

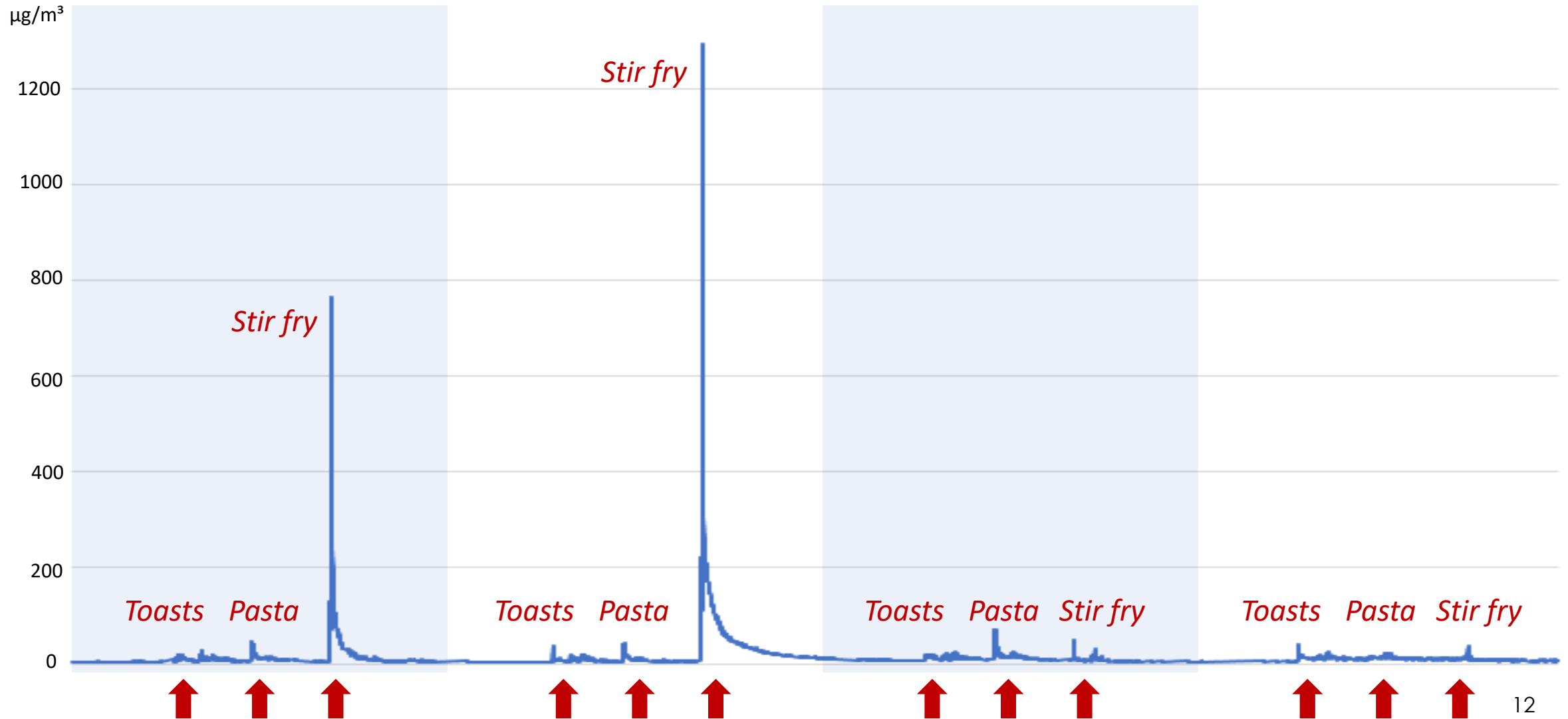


Early Results – PM10

Low ventilation



Early Results – PM10



Conclusions

Exposure is linked to

- Behaviour: type, duration, frequency

stir fry cooking ($344 \mu\text{g}/\text{m}^3/20\text{min}$) = 19.2 * pasta cooking ($18 \mu\text{g}/\text{m}^3/20\text{min}$)

- Ventilation practices

low ventilation (daily mean $20.4 \mu\text{g}/\text{m}^3$) = 2.6 * high ventilation (daily mean $7.7 \mu\text{g}/\text{m}^3$)

WHO 09/2021 $15 \mu\text{g}/\text{m}^3$ annual mean & $45 \mu\text{g}/\text{m}^3$ 24-hour mean



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