



**CLEAN  
AIR  
BARNET**  
CITIZENS SCIENCE PROJECT

**Is Cooking on Gas Harmful to our Health?**

# Cooking on Gas Harmful to our Health?

## An investigation by Clean Air Barnet

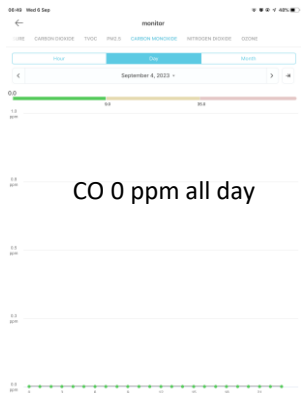
- This report is based on use of an air quality monitor to assess indoor air pollution levels during July and August 2023.
- The monitor records levels of Carbon Monoxide, Carbon Dioxide, Nitrogen Dioxide, Particulate Matter 2.5, Ozone and Total Volatile Organic Compounds. It also records temperature, humidity and air pressure data but this was not used for this analysis.
- The monitor was installed in the kitchen of a large flat with single occupier.
- The kitchen has dishwasher, microwave, electric oven, gas hob and gas boiler for hot water and central heating.
- Central heating not used during the assessment and main use of hot water is for showers.
- Pollution results analysed and compared to use of gas hob for cooking different recipes.

# Insights

## Insights from analysis

- When the home is empty pollution levels are lower.
- When I turn on a gas hob burner the level of air pollution increases.
- Over the 2-month period, Carbon Monoxide levels are consistently low. For other pollutants the results vary hourly, daily and across July and August. (Ozone has not been analysed).
- Outdoor pollution contributes to indoor pollution. Indoor levels of NO<sub>2</sub> seem to be most impacted by outdoor pollution.
- Cooking times frequently coincide with daily peak pollution measurements for Carbon Dioxide, Particulate Matter 2.5 and TVOC. But not for NO<sub>2</sub>.
- Taking a shower also creates spikes.
- Cooking different recipes influences pollution levels. Just boiling potatoes may be bad for my health
- Action is needed to avoid installation of new gas appliances and encourage a shift to less polluting hobs and ovens.
- I now need to think about the water and carbon footprint of food production and how I cook it.

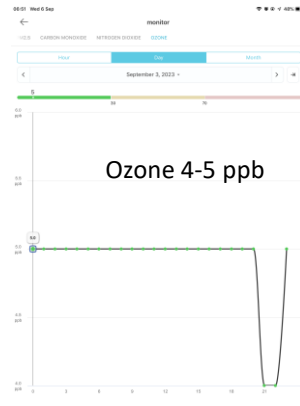
**Cooking on gas is a source of air pollution. All air pollution is harmful to health**



CO 0 ppm all day



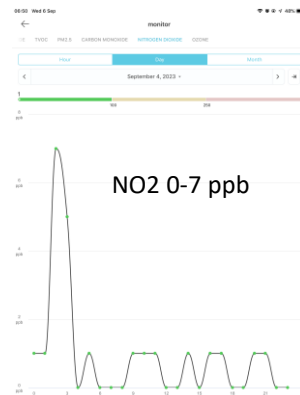
CO2 451-557 ppm



Ozone 4-5 ppb



PM2.5 6-11 ug/m3



NO2 0-7 ppb



TVOC 5-315 ppb

**When the home is empty pollution levels fall or stay low**

Nobody at home between 10.30am and 11.30pm. During this time, all pollutant levels are low.

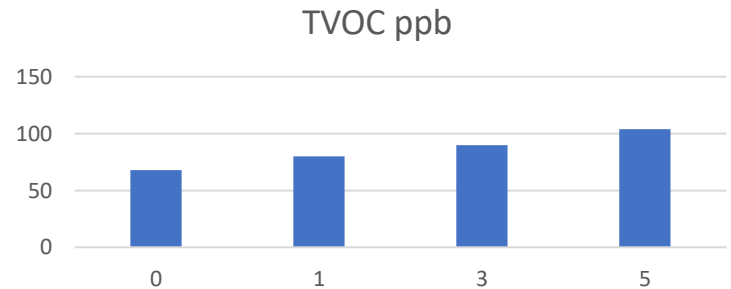
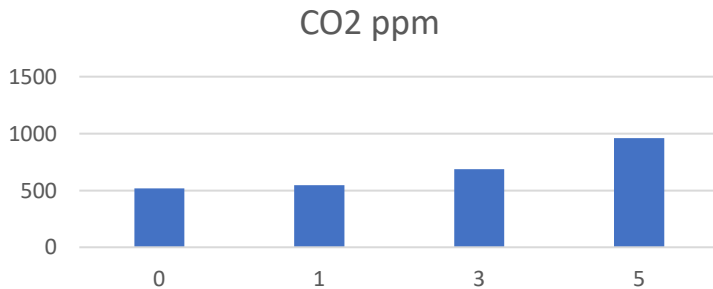
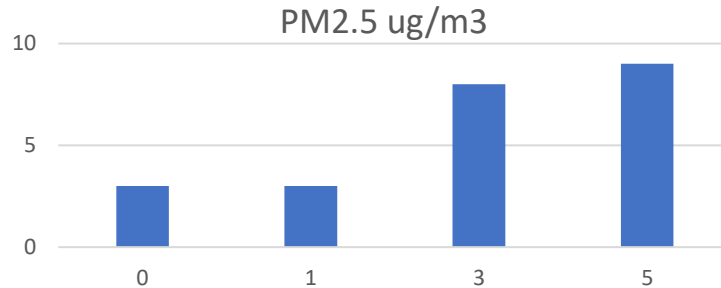
There was a spike in morning or CO2, PM2.5, NO2 and TVOC at time of shower.

Nighttime CO2 levels at start of day are higher than daytime.



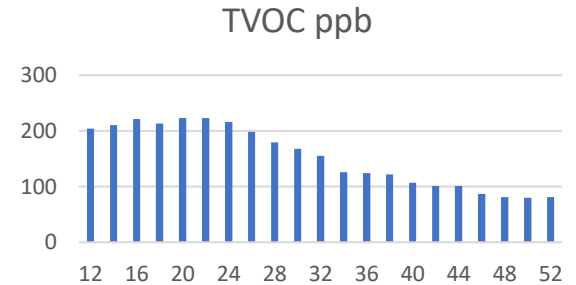
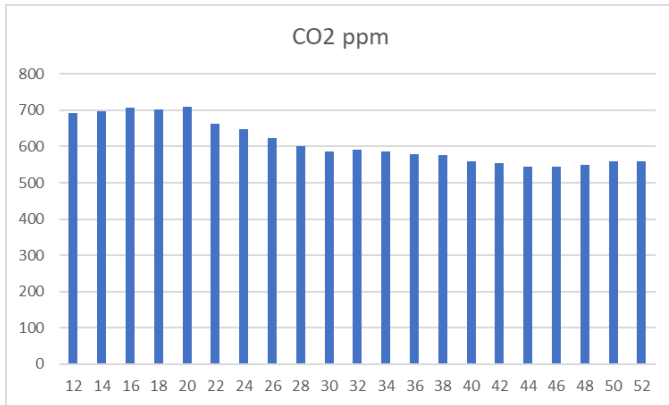
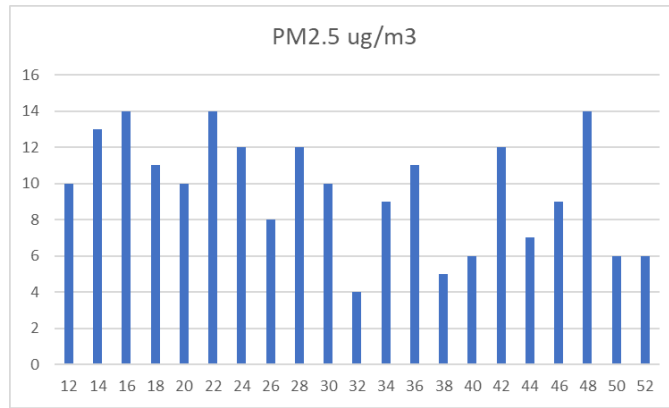
**What happens when I turn on a gas burner?**

# One Gas Burner no cooking



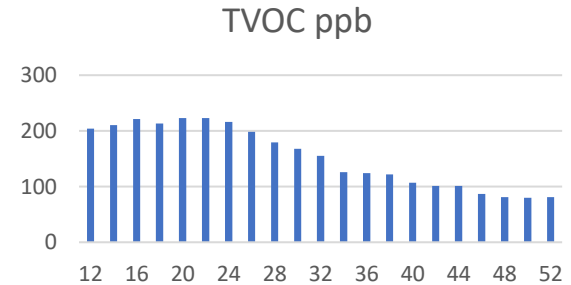
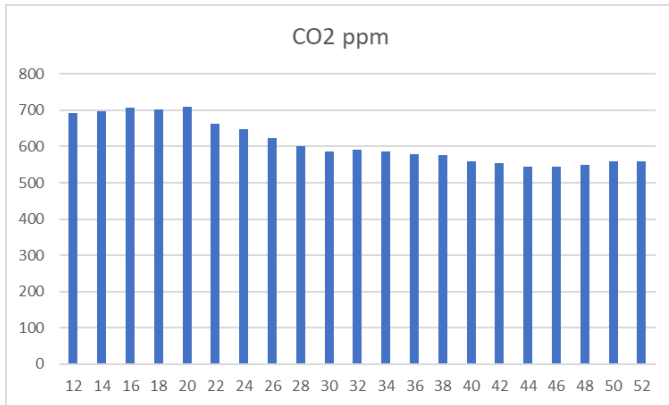
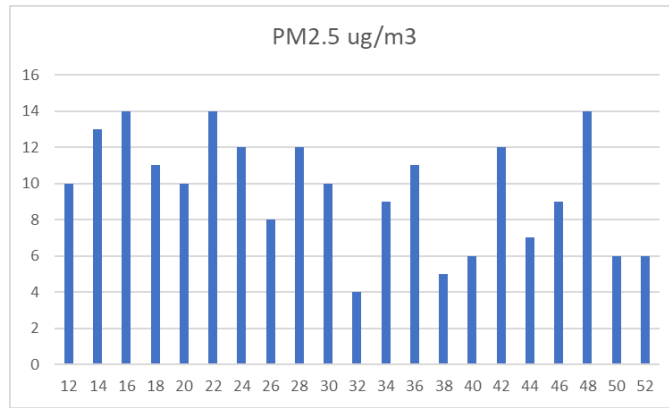
## Impact of one Gas Hob burner being on

To explore the impact of gas, one burner was turned on for 5 minutes in a ventilated kitchen. There was no impact on CO, Ozone, NO<sub>2</sub> levels but PM<sub>2.5</sub>, CO<sub>2</sub> and TVOC all increased.



**Pollution continues to build up after the gas is turned off and takes time to d-spense**

After the gas was turned off PM2.5 continued to increase for the next 16 minutes - TVOC and CO2 for 20 minutes. Returning to levels before the gas was on took up to 50 minutes.



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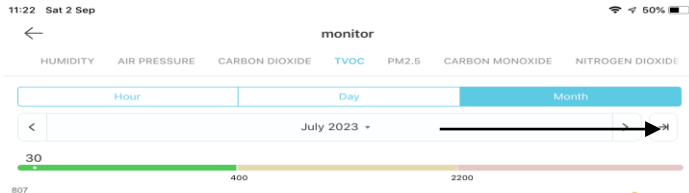
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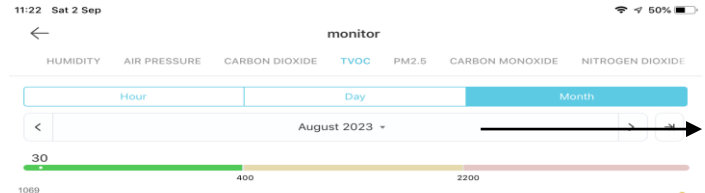
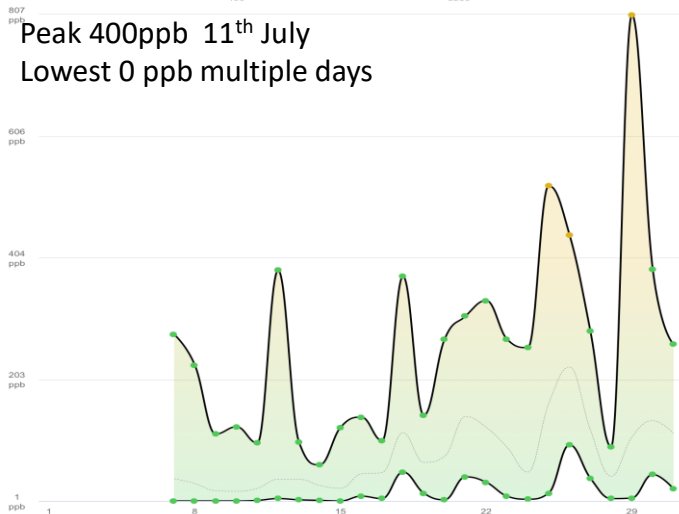
### **July and August Data**

Data collected by the monitor highlights variances by hour, day and month across most of the pollutants. Peaks frequently coincide with cooking using the gas hob.

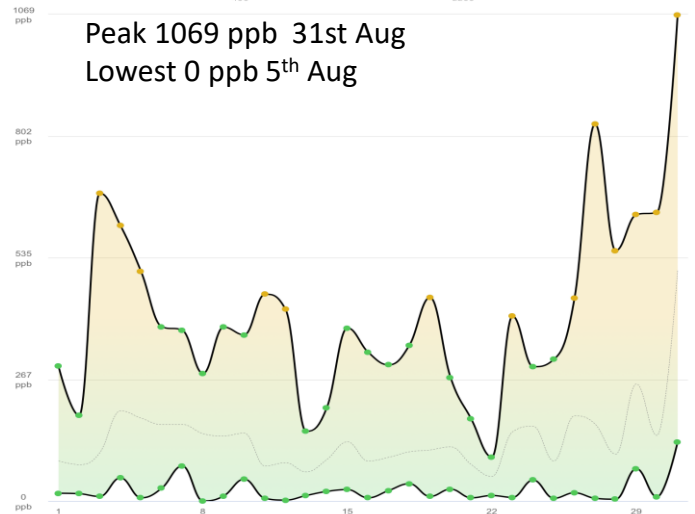
# Daily Total Volatile Organic Compounds (TVOC) July and Aug. Lowest and highest hour of each day



Peak 400ppb 11<sup>th</sup> July  
Lowest 0 ppb multiple days



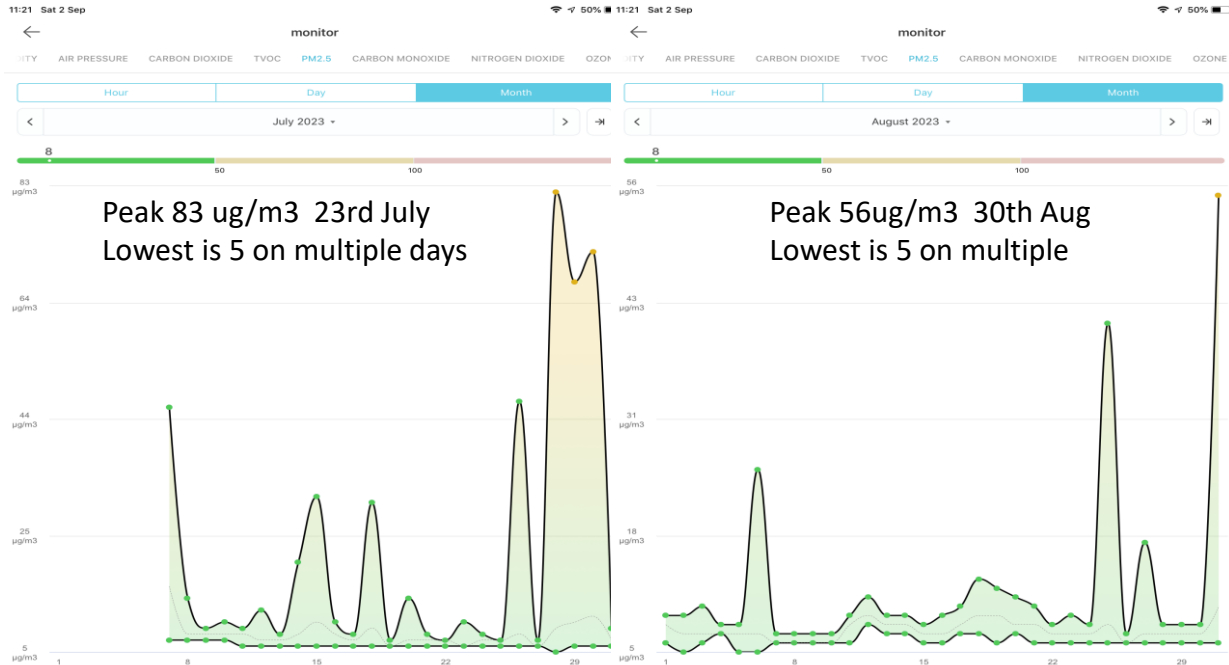
Peak 1069 ppb 31<sup>st</sup> Aug  
Lowest 0 ppb 5<sup>th</sup> Aug



**There is variance between days and August was higher than July**

The highest reading in July was 400ppb while in August it was 1069. VOCs are typically from indoor sources. ( The graph scales shown are different in July and Aug)

# Daily Particulate Matter(PM2.5) July and Aug. Lowest and highest hour of each day

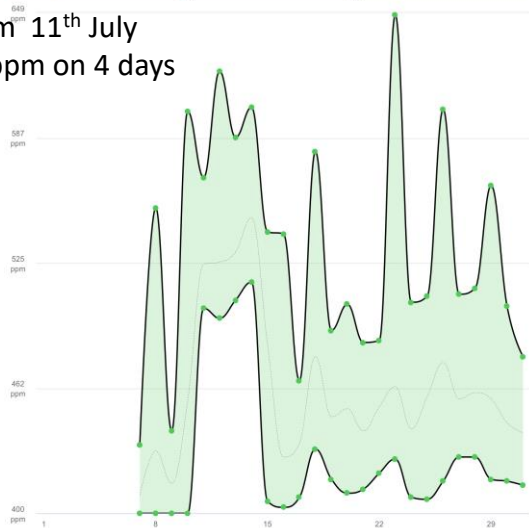


**There are daily variances. The lowest readings are always higher than the annual guideline**  
The lowest daily readings are all 5  $\mu\text{g}/\text{m}^3$  or higher. 5 is the WHO annual guideline for PM2.5  
Note that scales are different

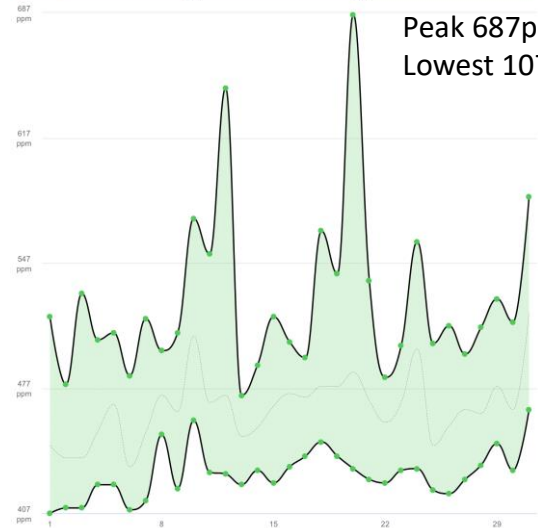
# Daily Carbon Dioxide (CO2) July and Aug. Lowest and highest hour of each day



Peak 649 ppm 11<sup>th</sup> July  
Lowest 400 ppm on 4 days

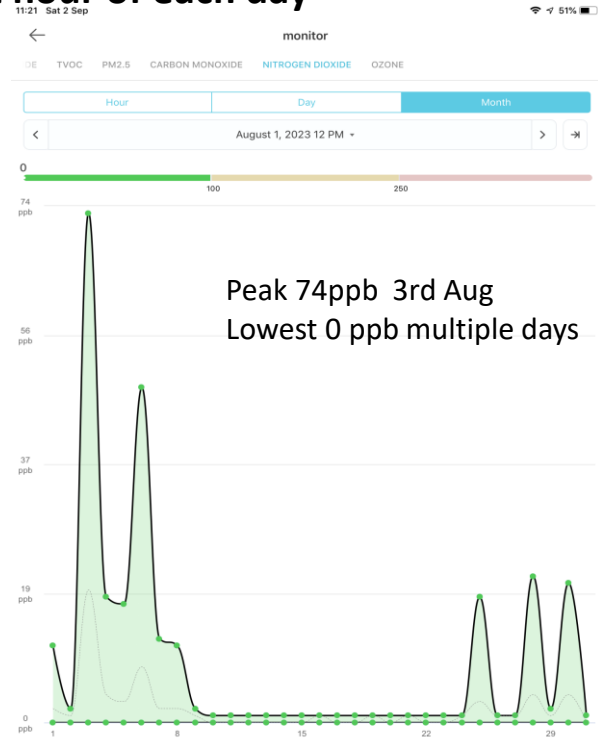
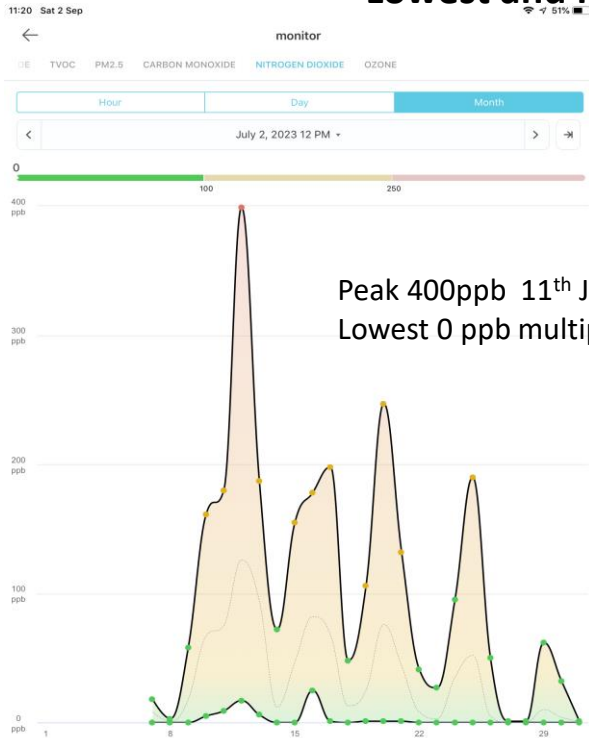


Peak 687ppm 3rd Aug  
Lowest 107 ppm 1<sup>st</sup> Aug



**There is variance between days and August reached higher and lower than July**  
Hourly level ranges from 107 to 687ppm  
Note that scales are different

# Daily Nitrogen Dioxide (NO2) July and Aug. Lowest and highest hour of each day

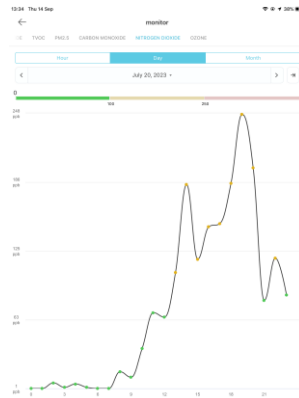


**There is variance between days and July was higher than August**  
Hourly level ranges from 0 to 400ppb in July and 0 to 74ppb in August.  
Outdoor NO2 pollution may be a significant factor in indoor measurements.  
(Note that scales are different)

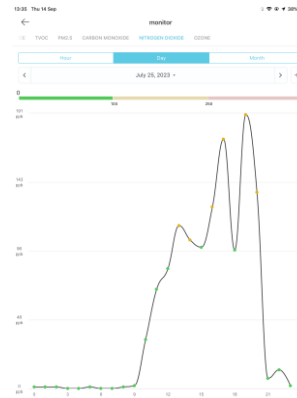
## Days with high NO2 – hourly levels



Mon 7<sup>th</sup> July  
Peak 199 ppb



Thurs 20<sup>th</sup> July  
Peak 248 ppb



Tues 25<sup>th</sup> July  
Peak 191 ppb



Thurs 3<sup>rd</sup> Aug  
Peak 73 ppb

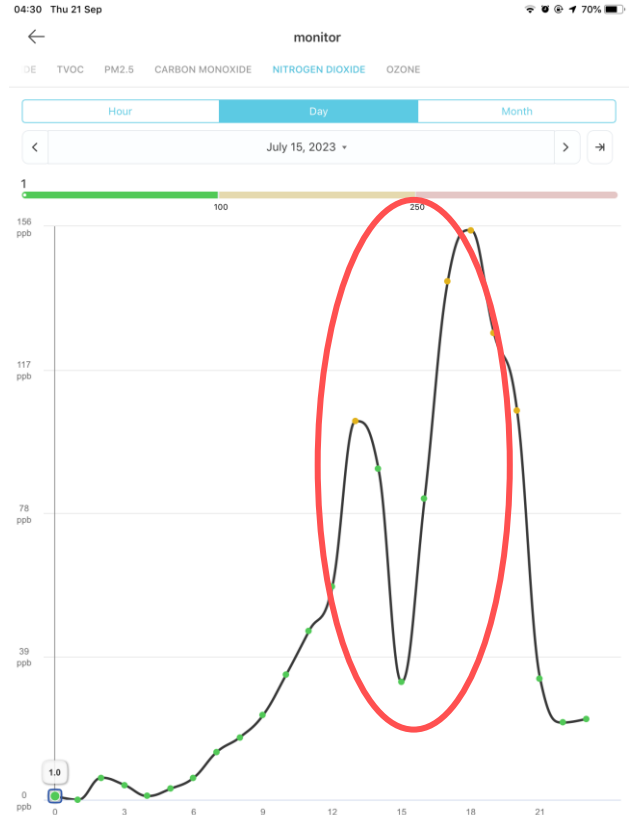
### NO2 builds during the day

These charts show NO2 levels for 4 days when NO2 was high. NO2 levels increased during the day starting around 8am and peaking before cooking times. These days were midweek when traffic is busy on the road at the front of the block of flats.



### **Outdoor Pollution is a source of Indoor Pollution**

On 15<sup>th</sup> July there was a concrete mixer in operation in the garden.  
NO<sub>2</sub> readings in the kitchen increased from 23ppb in the morning to 155ppb late afternoon.  
(Photo taken from kitchen window on 2nd floor).



## Impact of Closing the Window

When I started cooking I closed the window and the NO<sub>2</sub> level significantly dropped.

After cooking I opened the window and NO<sub>2</sub> rose again.

Ventilation helps indoor pollution to escape but also lets in outdoor pollution.



# July 18<sup>th</sup> at 9pm NO2 was low



On 18<sup>th</sup> July NO2 reading was low at cooking time



Pollution range during cooking	TVOC ppb	PM2.5 Ug/m3	CO2 ppm	NO2 ppb
Gas only	68-204	3-10	518-708	0-1
Brunch	35-181	3-53	446-579	0-1
Chilli	33-746	8-20	430-744	0-1
Paella	213-1802	3-154	505-697	0-8
Boiled Potatoes	61-145	3-10	511-923	0-1

**Cooking on Gas creates indoor air pollution and different menus give different results**

Paella – most TVOC and PM2.5; Boiled potatoes – most CO2 and least PM2.5.

Measured NO2 pollution was consistently low.

Duration of cooking, level of heat, pan used and ingredients will influence pollution

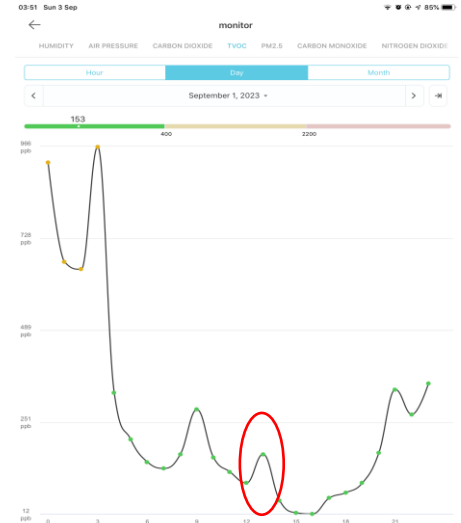
## CO2



## PM2.5



## TVOC



### Boiling Potatoes may be bad for my Health

Just boiling potatoes led to the highest hour that day for CO2 and PM2.5 pollution.

TVOC rose but was higher at other times of the day.



## Boiling Potatoes didn't increase NO2 levels

On this day measured NO2 levels were low all day - between 0 and 1 ppb



### **Healthy Diet?**

While my salad may be healthy, cooking boiled potatoes to go with it increased levels of indoor air pollution. So now as well as considering the water and carbon footprint of the food I buy, I also need to think about the impact of how I cook.

**We need to reduce air pollution  
not have to live with it**

Cooking on gas is a source of  
air pollution.

All air pollution is harmful to  
health.

Action is needed to reduce the  
use of gas in our homes.

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# Clean Air Barnet – making sense of data

Our objective is to provide data about air quality to the general public and to decision makers in ways that raise awareness, stimulate discussion and drive support for action to reduce air pollution.

To do this we seek to move from sharing data and information about specific locations to providing insights about air quality across London.

This report uses data collected using a uHoo smart air quality sensor provided by Global Action Plan





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