

The Union

Department of Tobacco Control



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## Air Quality Monitoring Toolkit: Assessing Second-Hand Smoke in Hospitality Venues



## **Authors:**

Dr Angela Jackson-Morris, Department of Tobacco Control, The International Union Against Tuberculosis and Lung Disease, Edinburgh, Scotland; Dr Sean Semple, Scottish Centre for Indoor Air, Respiratory Group, Division of Applied Health Sciences, University of Aberdeen, Aberdeen, Scotland; Ruaraidh Dobson, Scottish Centre for Indoor Air, Child Health, University of Aberdeen, Aberdeen, Scotland.

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## **Contact:**

The International Union Against Tuberculosis and Lung Disease (The Union)  
Department of Tobacco Control  
8 Randolph Crescent  
Edinburgh  
UK  
EH3 7TH

T: 0131 240 0252

E: [tobaccofreeunion@theunion.org](mailto:tobaccofreeunion@theunion.org)

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## **Contact:**

Ruaraidh Dobson

T: +44 7803 406 343

E: [ruaraidh.dobson@abdn.ac.uk](mailto:ruaraidh.dobson@abdn.ac.uk)

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## Introduction

This toolkit is designed for public health professionals to assess compliance with smoke-free laws in hospitality venues. It was compiled following publication of research that tested whether air quality monitoring (AQM) practices could be used in indoor public places in low and middle income countries where outdoor air pollution levels are high. The research showed that data could be accurately gathered from these locations in this way – six cities around the world featured in this research which was published in the journal *Nicotine and Tobacco Research*. It provided evidence for public health professionals to advocate for stronger smoke-free legislation and enforcement. Results were shared widely with policymakers, enforcement agencies and media.

This kit includes the tools and instructions needed to conduct a complete smoke-free compliance assessment. It was developed collaboratively by the [Scottish Centre for Indoor Air](#) at the University of Aberdeen and the [Department of Tobacco Control](#) at the International Union Against Tuberculosis and Lung Disease (The Union).

## Using AQM to measure second-hand smoke in hospitality venues

### What is second-hand smoke, and why is it a major public health concern?

Second-hand tobacco smoke (SHS) is a mixture of particle-phase and gaseous compounds that are released when a tobacco product is burned. SHS is associated with a wide-range of serious ill-health outcomes among people exposed to it [1,2]. These chemicals quickly build to dangerous levels in enclosed indoor spaces.

Article 8 of the World Health Organization's Framework Convention on Tobacco Control (WHO FCTC) directs signatories of this treaty to ban smoking in all public indoor venues to protect people from the harms of second-hand smoke and to de-normalise smoking behaviour. Commonly known as 100 percent smoke-free laws, many of the 181 Parties to the WHO FCTC have passed such legislation. However in some places the law is not well implemented. In others the law is weak and allows for 'designated smoking areas' which separate smokers and non-smokers but do not reduce health hazards.

AQM can provide scientific data to advocate for stronger smoke-free laws and enforcement.

### Measuring second-hand smoke

Over the past two decades measurement of fine particulate matter (PM), less than 2.5 microns in diameter (PM<sub>2.5</sub>), has been commonly used as a marker of SHS concentrations in air [3-5]. PM<sub>2.5</sub> is generated by the combustion of tobacco. Its measurement provides data on SHS levels that can be compared to outdoor levels of air pollution and international health standards.

The World Health Organization (WHO) has stated that there is no safe level of exposure to SHS therefore any detection of PM<sub>2.5</sub> where smoking is present reflects a danger to health. We can also

compare indoor PM<sub>2.5</sub> levels to the WHO outdoor air quality guidance limit for PM<sub>2.5</sub> (25 µg /m<sup>3</sup> over a 24 hour period) which has been approved for use regarding indoor environments [9]. This provides a helpful benchmark for communicating about the health harms of PM from tobacco smoke.

Using an air quality monitor to measure the levels of PM<sub>2.5</sub> in hospitality venues we can assess whether SHS is present, and identify dangerous SHS levels. Graphs produced using the data collected from venues can illustrate PM<sub>2.5</sub> levels and offer direct comparisons with outdoor PM<sub>2.5</sub> and WHO recommendations.

### Measuring instruments

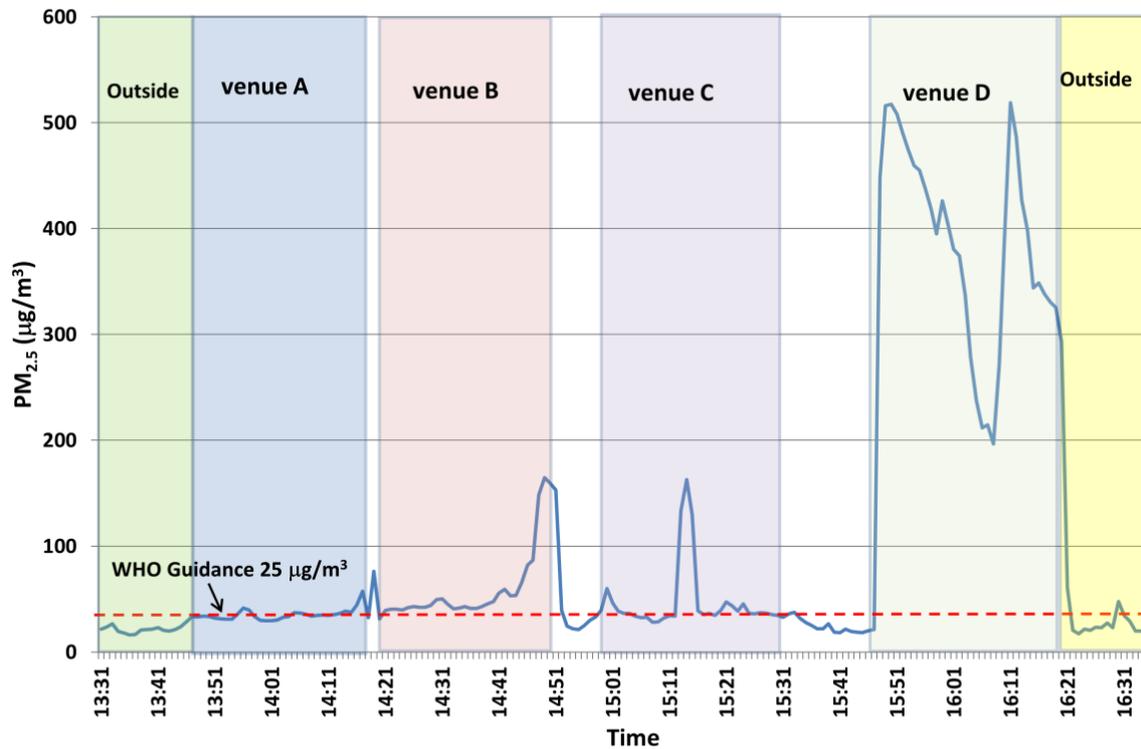
A *Dylos DC1700* (Dylos, Inc., CA, USA) was used in our research. This toolkit will describe the process we followed using this instrument. Other particle monitors are available and may provide results suitable for your needs. No members of the Scottish Centre for Indoor Air at the University of Aberdeen or The Union have any financial links of any kind with the Dylos Corporation

The Dylos is used to sample and record levels of PM<sub>2.5</sub> in the air. This instrument uses a laser light scattering technique to measure the number of particles in two particle size ranges: >0.5µm and >2.5µm. Data covering the >0.5µm size range is relevant for SHS measurement.

The instrument draws air through an inlet in its casing using a small fan. It logs the number of particles every minute and is capable of logging 10,000 data points. The device is supplied with a CD containing software for downloading the data: Dylos Logger, v1.60. Alternatively, you can use software developed by the University of Aberdeen which both downloads data and creates graphs automatically. Particle counts are expressed as a concentration per 0.01 cubic feet of sampled air. The upper limit of the device's memory is 65,536 particle counts per 0.01 cubic feet (or 0.283 litres).

The device weighs 400g and is 20cm x 10cm x 10cm in size. It is highly portable. Details of work to validate this device for measurement of SHS and the process of converting particle number concentrations to a PM<sub>2.5</sub> mass concentration have been published [14-15].

Dylos DC1700 monitors can be purchased at [www.dylosproducts.com](http://www.dylosproducts.com). When ordering, we advise that buyers request that the monitors are loaded with firmware version 2.05b. It displays the message 'Logging data' instead of particle counts on its screen.



Graph illustrating difference in air quality between several hospitality venues

## Step-by-step protocol for AQM in hospitality venues

### Step 1: Select a sample of hospitality venues

The aim is to assemble a sample of hospitality venues of sufficient scale and diversity to reasonably reflect those of hospitality venues in the city. This will ensure your data is robust enough for policy advocacy.

**Sample size:** There is no minimum or maximum sample size, but most international studies include 20 to 100 venues. Choose a number within this range depending on the resources you have available. Use a telephone / online directory to list and categorise your chosen indoor hospitality venues. You need to include a range representative of the area or city where you are collecting. Categories could include bars, hotels, restaurants, cafes and nightclubs, for example.

### Step 2: Make a schedule for venue visits

Develop a schedule for visiting each of the venues to collect data. Between two and ten venue visits could reasonably be visited with one device in any given day depending on the time available. The study may be completed over several weeks to capture data from all the venues in your sample. Allow at least 30 minutes to collect the air quality sample from each venue.

On each collection day 30 minutes of outside air should also be sampled in the area where the

venues are located. Visits should be scheduled whenever the venues usually have an average to high number of customers.

### Step 3: The venue visit

**Personal safety:** Always undertake venue data collection with a partner and have a 'check-in' procedure, ensuring that someone from your organisation knows where you are and is informed when you have completed a visit. Avoid confrontation with hospitality venue owners or staff – if asked about the AQM instruments explain that they are being used for scientific measurement of air quality in indoor and outdoor locations across the city. If at any time you feel unsafe, discontinue data collection and leave.

**Covert measurement:** It is necessary to undertake the AQM measurement discreetly to ensure that your presence and the measurement process do not alter smoking behaviour or use of ventilation in the venue. Please see published papers for details regarding ethics and practicalities [4,10-12,13]. You should patronise the venue by buying food or drink as appropriate.

**Preparing the Dylos:** Prior to each measurement session:

- Charge the Dylos' in-built battery
- Check the internal clock is set to the correct time
- Clear the internal memory of previous data by pressing the 'Mode' button twice and then the 'Select' button – see the Dylos User's Manual if necessary

Place the Dylos in a shoulder bag or backpack with the top vent exposed to the outside, allowing air to be pulled into the device. Space should be left around the bottom vent to prevent any airflow resistance. The bag instructions are crucial to ensure measurement is discreet and valid. The Dylos should be switched on to automatically start the logging process at the start of the sampling day. Leave it on throughout the entire data collection period.

**Daily outdoor air measurement:** Spend at least 30 minutes collecting air quality data outside on each sampling day in the town or city where the venues are located. You can do this at the start of the day. This measurement will provide comparative data.

**Recording sheet:** Use the templates included in this toolkit to take notes (see page 15). Do this discreetly to avoid drawing attention to yourself – using the data recording sheet inside a newspaper, for example.

### Using the Dylos to gather data:

At each venue follow this procedure:

- Spend a minimum of 30 minutes in the venue. Record entry and exit times on the data recording sheet.
- Collect observational data as per the recording sheet.
- Monitor PM by locating yourself in a central area. Aim to be more than five metres from any open external door wherever possible. In a multi-room venue, locate yourself in the room with the highest occupancy. Avoid the immediate vicinity of open windows and doors, ventilation ducts and fans, kitchen areas and the bar area. Do not sit at the same table as smokers, or within one metre of an active smoker.

- Carry the instrument bag, or place it on a table. Do not put it on the floor – this will avoid damage to the device and will ensure air monitoring occurs within people’s normal breathing zone.

#### **Step 4: Downloading information from the Dylos**

On return from a sampling day, finalise notes made within each venue on the air quality assessment sheets. One of these must be completed for each venue.

Download data from the Dylos as per the step-by-step guide to using [AFRESH software](#). If you cannot download AFRESH use the manual instructions included later in this toolkit.

#### **Step 5: Preparing the data report**

Follow the instructions in the step-by-step guide to using the AFRESH software, as above.

#### **Step 6: Using the results for policy advocacy**

The protocol above can be used to gather data and assess changes over time. The data may be used to make a case to authorities, the media and public stakeholders regarding the need for better smoke-free laws and enforcement in public hospitality venues. We recommend linking to other national and local organisations that support smoke-free and agreeing key messages to accompany your data. The next section of this toolkit addresses this in more detail (see page 8).

#### **Step 7: Follow-up measurement**

You may want to assess whether SHS levels and air quality improve over time after the first period of measurement. If you are undertaking advocacy and implementation of smoke-free legislation improves, this would then allow you to assess if your advocacy contributed to a positive change in air quality in hospitality venues.

To undertake a follow-up measurement follow the same protocol as above, but use the ‘follow-up’ data recording sheets. It is recommended that a suitable time period is allowed for any changes to occur – i.e. if you undertake an advocacy campaign then you need to allow time for the authorities and business owners to take action before you measure again – for example 12 months after the original measurement.

## References

1. Jackson-Morris A, Bleymann K, Lyall E, Aslam F, Singh Bam T, Chowdhury I, Daouda EA, Espinosa M, Romo J, Singh RJ, Semple S (2016) Low-cost air quality monitoring methods to assess compliance with smoke-free regulations: a multi-center study in six low and middle-income countries. *Nicotine & Tobacco Research*
2. U.S. Surgeon General. The health consequences of involuntary exposure to tobacco smoke: A report of the Surgeon General. Atlanta, GA: U.S. Department of Health and Human Services. Centers for Disease Control and Prevention, Coordinating Center for Health Promotion, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; 2006.
3. Royal College of Physicians Tobacco Advisory Group. 'Passive Smoking and Children'. 2010.
4. Hyland A, Travers MJ, Dresler C, et al. A 32-country comparison of tobacco smoke derived particle levels in indoor public places. *Tob Control* 2008; 17:159-65.
5. Semple S, Creely KS, Naji A, et al. Secondhand smoke levels in Scottish pubs: the effect of smoke-free legislation. *Tob Control* 2007; 16:127-32.
6. Sureda X, Fernández E, López MJ, et al. Second-Hand Tobacco Smoke Exposure in Open and Semi-Open Settings: A Systematic Review. *Environ Health Perspect* 2013 May 7. [Epub ahead of print]
7. US Environmental Protection Agency, US Environmental Protection Agency Air Quality Guidelines. <http://www.airnow.gov/index.cfm?action=aqibasics.aqi> [Accessed 30<sup>th</sup> May 2013]
8. Repace JL. Secondhand smoke in Pennsylvania casinos: a study of nonsmokers' exposure, dose, and risk. *Am J Public Health* 2009; 99:1478-85.
9. Jiang RT, Cheng KC, Acevedo-Bolton V, et al. Measurement of fine particles and smoking activity in a statewide survey of 36 California Indian casinos. *J Expo Sci Environ Epidemiol* 2011; 21:31-41.
10. World Health Organization. WHO Guidelines for Indoor Air Quality. Selected Pollutants. Copenhagen, Denmark: WHO, 2010. ISBN 978 92 890 0213 4.
11. Semple S, van Tongeren M, Galea KS, MacCalman L, Gee I, Parry O, et al. UK smoke-free legislation: changes in PM<sub>2.5</sub> concentrations in bars in Scotland, England, and Wales. *Ann Occup Hyg*. 2010 Apr;54(3):272-80.
12. Semple S, MacCalman L, Naji AA, et al. Bar workers' exposure to second-hand smoke: the effect of Scottish smoke-free legislation on occupational exposure. *Ann Occup Hyg*; 2007;51:571-80.
13. Apsley A, Semple S. Secondhand smoke levels in Scottish bars 5 years on from the introduction of smoke-free legislation. *Tob Control*. 2012;21:511-3.
14. Petticrew M, Semple S, Hilton S, Creely KS, Eadie D, Ritchie D, Ferrell C, Christopher Y, Hurley F. Covert observation in practice: lessons from the evaluation of the prohibition of smoking in public places in Scotland. *BMC Public Health*. 2007; 7:204.
15. Semple S, Apsley A, MacCalman L. An inexpensive particle monitor for smoker behaviour modification in homes. *Tob Control*. 2012 Sep 26. [Epub ahead of print].
16. Semple S, Ibrahim AE, Apsley A, Steiner M, Turner S. Using a new, low-cost air quality sensor to quantify second-hand smoke (SHS) levels in homes. *Tob Control*. 2013 Sep 17. doi: 10.1136/tobaccocontrol-2013-051188. [Epub ahead of print].

## Using your AQM results for policy advocacy

Your data may be the first objective measurements of second-hand smoke concentrations in hospitality venues in your country – if so they will be a valuable resource. Depending on what they show, they can be used to initiate discussion and debate about the need for smoke-free laws, greater enforcement of existing legislation, or to show that effective legislation is providing the public with clean air when they visit smoke-free venues. Many countries have used similar measurements of air quality in bars, cafes and restaurants to engage with the public, media and policymakers about smoke-free laws. It is worth looking at what others have done.

### Basic Advocacy Steps:

- Come together with like-minded organisations – form a coalition or short-term working group.
- Set specific and achievable objectives. What specifically are you trying to change?
- Decide who you are trying to influence and how best to make the case to them.
- Develop clear and attractive message using your data results – focus on the rationale and benefits of the changes you want to make.
- Package your evidence so that it will be clear and understandable for people who have limited knowledge of the topic.

### Key points to consider:

- Uniqueness – is this the first study in your country of SHS levels in hospitality venues?
- Size – was your study the largest ever undertaken in your country?
- Representativeness – was the work carried out in one area or one city? Is there any reason to think that venues in other areas would be worse / better?
- Comparability – are there any historical data that you can compare your results to? Can you compare to results from other countries?
- Winners and losers – do some types of venues have much lower or much worse SHS levels than others?
- Key message – what one key message do your results provide? Everybody loves numbers!
- What next? Follow up to see if there are any changes in SHS concentrations.
- Anniversaries are good times to re-focus attention. Re-run the stories, with updates, on significant dates.

### Some strategy examples:

- Media releases
- Meetings and events for policymakers and parliamentarians
- Campaign materials and events targeting public and / or policymakers

## Case studies

### Scotland

Scotland introduced smoke-free legislation prohibiting smoking in all enclosed public spaces including bars, restaurants and cafes in March 2006. There was much interest in its potential impact – many studies were commissioned to review this. One study looked at the air quality in bars before, one month after and then one year after the law came in to effect.

It is worth noting how much of the media coverage focuses on the numerical results – the 86 percent air quality improvement is quoted in many. Even 10 years on the media were interested in a calculation showing that the legislation had helped the population of Scotland avoid inhaling ‘half a tonne’ of cigarette smoke.

BBC

<http://www.bbc.co.uk/news/uk-scotland-35901485>

BBC

<http://news.bbc.co.uk/1/hi/scotland/6333611.stm>

The Scotsman

<http://www.scotsman.com/news/bar-workers-breathe-easy-as-indoors-air-quality-improves-1-1337154>

Heart

<http://www.heart.co.uk/scotland/news/local/scots-feel-benefits-of-smoking-ban/#Gk98Rbm0BflrbHXG.97>

### Indonesia

The AQM results were presented to policymakers: the Indonesian Mayors’ Alliance and local parliaments of multiple cities. This led to support for 100 percent smoke-free environments in public places in a number of locations. Many cities have now introduced smoke-free legislation including Jakarta, Bali, Medan, Bogor, Palembang, and Yogyakarta. The findings were also used to combat tobacco industry litigation against smoke-free laws introduced by the governments of Jakarta and Bogor. Both sub-national governments won their cases.



Smokers at a café, Indonesia

## Bangladesh

A report on the study's findings was shared with the Ministry of Health and government officers involved in implementation of tobacco control law. The results were included in training programmes designed for members of civil society who work to support and improve tobacco control in Bangladesh. A press release was also circulated widely amongst media.

Observer

<http://www.observerbd.com/2016/02/01/134095.php#sthash.zVQHH6bc.dpuf>

BD News 24

<http://bdnews24.com/health/2016/01/28/indoor-air-quality-in-dhaka-venues-that-allow-smoking-is-worse-than-outdoor-says-a-study>

Daily Sun

<http://www.daily-sun.com/printversion/details/110479/Indoor-air-quality-in-Dhaka-that-allows-smoking-worse-than-outdoor:-Study>

## Mexico

The publication of the AQM data was very timely in Mexico as a worrying trend to re-introduce designated smoking areas had been gaining traction in several states. A press release on the report was widely distributed. It contextualised findings to support a proposed amendment to the national tobacco control law which would include 100 percent smoke-free environments in federal law. Smoke-free is currently comes under state level jurisdiction and enforcement agencies.

In Nuevo Leon state, AQM study results were included in reports to the State Legislature, in support of the governor's veto of a proposal to reinstate designated smoking areas. A summary of the main findings was circulated to civil society organisations working in tobacco control.

El Pulso Laboral

<http://www.elpulsolaboral.com.mx/seguridad-social-y-salud/1529/mala-calidad-del-aire-en-restaurantes-peor-que-en-la-calle>

Radio Mujer

<http://www.radiomujer.com.mx/articulos/salud/mala-calidad-del-aire-en-restaurantes-peor-que-en-la-calle>

Mundo de Hoy

<http://www.mundodehoy.com/index.php/noticias/21642.html>

Milenio

[http://www.milenio.com/cultura/Aire en locales donde se fuma-mas contaminado que en calle-fumadores-calidad del aire 0 679732051.html](http://www.milenio.com/cultura/Aire%20en%20locales%20donde%20se%20fuma-mas%20contaminado%20que%20en%20calle-fumadores-calidad%20del%20aire%200%20679732051.html)

La Jornada

<http://www.jornada.unam.mx/2015/02/12/sociedad/039n3soc>

Mexico Nueva Era

<http://mexiconuevaera.com/opinion/hector-rendon/quiroyfano/2016/02/9/tabaquismo-el-problema-nos-rebaso>

Quadratin Mexico

<https://mexico.quadratin.com.mx/Calidad-de-aire-donde-se-fuma-peor-que-el-de-la-calle-estudio/>

Quadratin Jalisco

<https://jalisco.quadratin.com.mx/sucesos/Calidad-de-aire-en-locales-donde-se-fuma-peor-que-en-la-calle-estudio/>



**No smoking signs at a restaurant in Latin America**

### **Pakistan**

In Pakistan AQM was conducted in February and March 2014 in 100 restaurants in Islamabad. The results were shared at various scientific and administrative fora to enhance enforcement and promote research.

The presence of PM<sub>2.5</sub> in restaurants was highlighted at the district tobacco control implementation and monitoring committee. Action to reduce levels of particulate matter was taken as a result and capacity building sessions were run to increase enforcement. 72 restaurants were subsequently inspected and fines given for non-compliance.

Results were shared with the Higher Education Commission and proposals to make all universities smoke-free and to introduce tobacco control research options were discussed.

Results were also shared with a civil society organisation that was keen to conduct an AQM assessment of hospitality venues in its region.

## China

In Tianjin the local smoke-free law took effect in 2013. Three rounds of PM<sub>2.5</sub> monitoring were conducted: in 2012 (before the law was introduced), 2013 (immediately after the law came into effect), and in 2014 to evaluate the status of implementation. The venues monitored included government office buildings, restaurants, hospitals, private industry office buildings, schools, public transportation, hotels, and internet cafes. Significant decreases in PM<sub>2.5</sub> were recorded.

Findings were presented to the municipal smoke-free law implementation mechanism during annual meetings along with other evaluation data such as observation of smoking and number of penalties issued.



No smoking signs in a mall, China

**Baseline air quality assessment sheet: 1**

Venue ID	
Venue name	
Venue type	
Description of venue	
Assessor	
Date of visit	
Outdoor environmental conditions (wind, precipitation, temperature)	
Time of entry	
Time of departure	
Does venue have an outdoor area?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Food available during time of visit?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Open fires lit during visit?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Burning candles during visit?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Dylos device used during visit?	Yes <input type="checkbox"/> No <input type="checkbox"/> ID number <input type="text"/>

**Baseline air quality assessment sheet: 2**

Number of persons in venue	
Number of actively burning cigarettes	
No. people standing at doorway (within 5m) Smokers and non-smokers	
Windows open?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Staff smoking	Yes <input type="checkbox"/> No <input type="checkbox"/>
Subjective assessment of SHS levels	High <input type="checkbox"/> Medium <input type="checkbox"/> Low <input type="checkbox"/> None <input type="checkbox"/>
Events taking place during visit (football on TV, pub quiz, pool etc)	
Evidence of	Signage <input type="checkbox"/> Ashtrays inside <input type="checkbox"/> Outside facilities <input type="checkbox"/> Outside ashtray <input type="checkbox"/>
Food normally served	Yes <input type="checkbox"/> No <input type="checkbox"/>

**Follow-up measurement of air quality assessment sheet: 1**

Venue ID	
Venue name	
Venue type	
Description of venue	
Assessor	
Date of visit	
Outdoor environmental conditions (wind, precipitation, temperature)	
Time of entry	
Time of departure	
Does venue have an outdoor area?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Food available during time of visit?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Open fires lit during visit?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Burning candles during visit?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Dylos device used during visit?	Yes <input type="checkbox"/> No <input type="checkbox"/> ID number <input type="text"/>

**Follow-up measurement of air quality assessment sheet: 2**

Number of persons in venue	
Number of actively burning cigarettes	
No. people standing at doorway (within 5m) Smokers and non-smokers	
Windows open?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Staff smoking	Yes <input type="checkbox"/> No <input type="checkbox"/>
Subjective assessment of SHS levels	High <input type="checkbox"/> Medium <input type="checkbox"/> Low <input type="checkbox"/> None <input type="checkbox"/>
Events taking place during visit (football on TV, pub quiz, pool etc.)	
Evidence of	Signage <input type="checkbox"/> Ashtrays inside <input type="checkbox"/> Outside facilities <input type="checkbox"/> Outside ashtray <input type="checkbox"/>
Food normally served	Yes <input type="checkbox"/> No <input type="checkbox"/>

# How to download data using AFRESH

## What does AFRESH do?

It's one handy piece of software to:

- download results from a Dylos DC1700 PM monitor
- calculate PM<sub>2.5</sub> equivalent values
- output CSV files with this data
- prepare a customisable report including graphs of the data

## You will need:

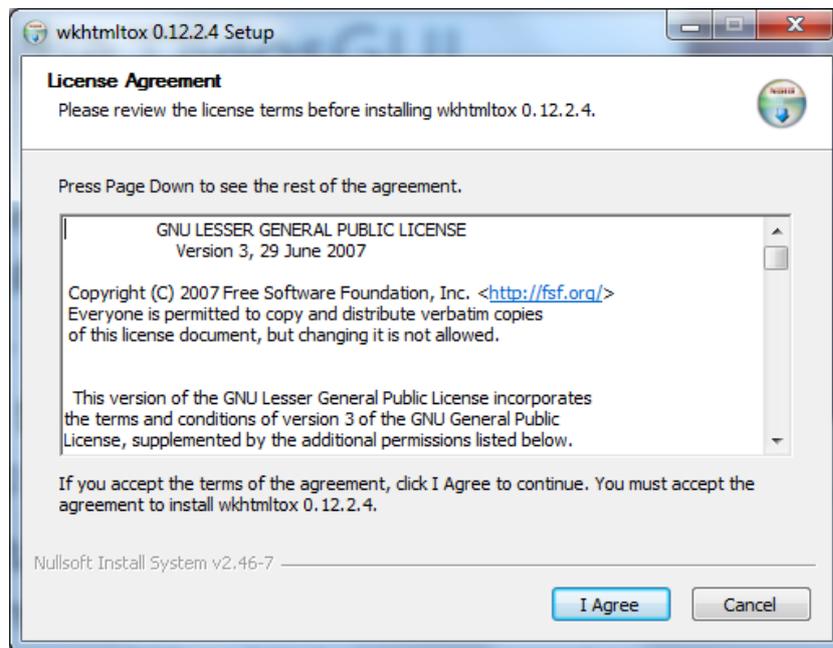
- A laptop or PC running Windows XP or later
- A Dylos DC1700
- A USB Serial converter cable. This will come with a CD containing a piece of software called a 'driver'. You need to install it before you do anything else.
- The AFRESH software
  - You can get this from here: <http://smokefreehomes.network/afresh-software>, the AFRESH software page.
  - You'll need to be able to install software on your computer
  - Be aware that AFRESH is still in development at the moment so there will be a few bugs. If you notice any please email [Ruairaidh.Dobson@abdn.ac.uk](mailto:Ruairaidh.Dobson@abdn.ac.uk)

## Installing AFRESH:

- If you have an IT administrator they might be able to help
- Launch the installer and follow the steps

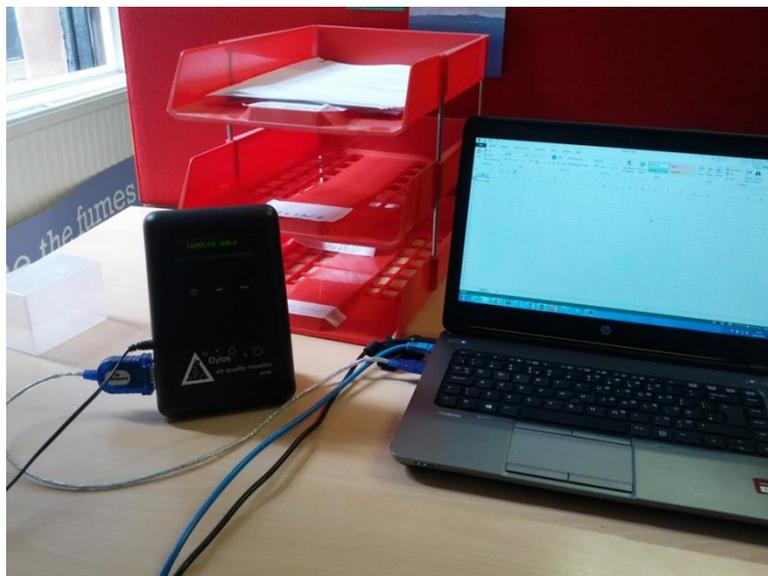


- The installer will also install a programme called 'wkhtmltox' which is required to make PDF reports



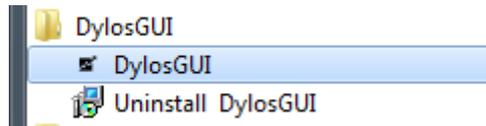
**First of all:**

- Make sure the Dylos is switched on showing 'Logging Data' on the front
- Then, plug the Dylos into your laptop or PC with your converter cable

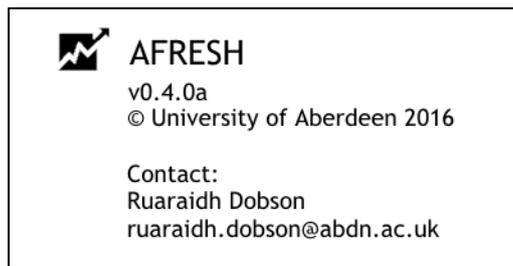


**Now open AFRESH:**

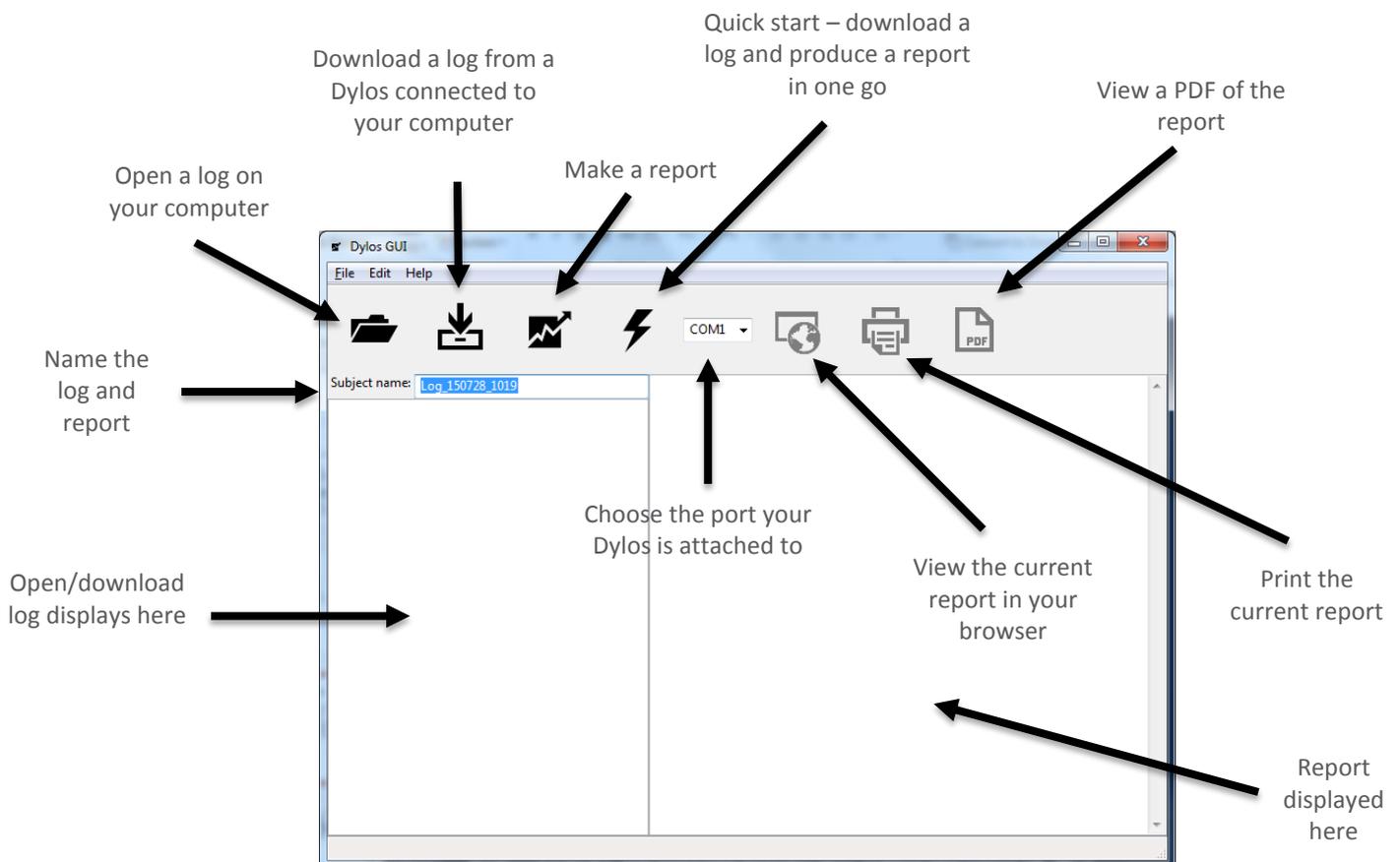
- There should be a start menu icon that looks like this:



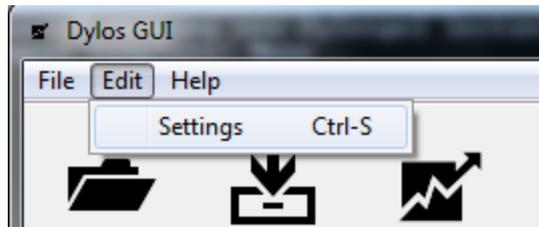
- The software will start up (it might take a few seconds)
- You'll see a screen like the below



- You will then see this screen:



## Settings:



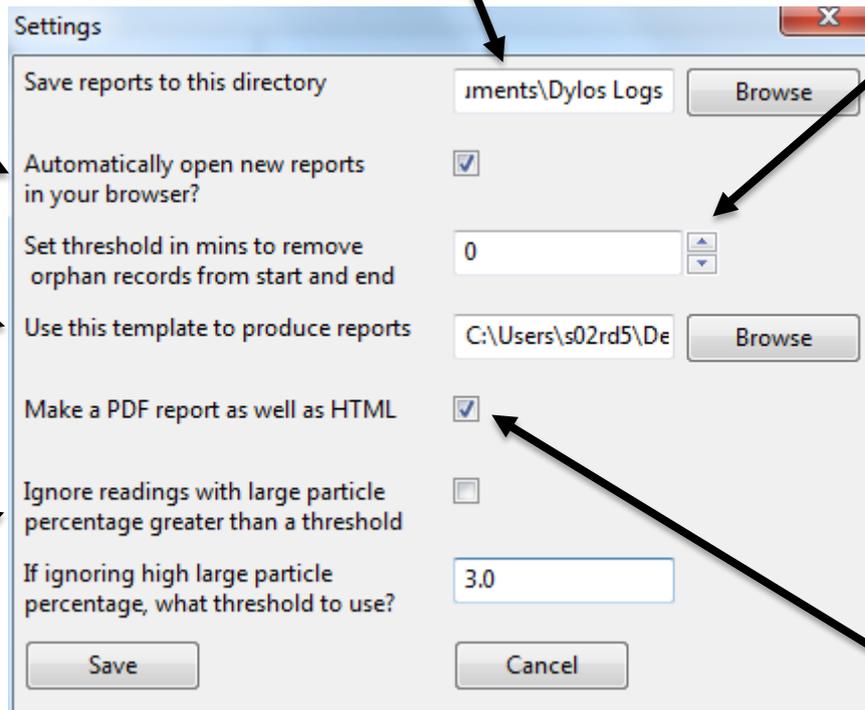
Choose where to save reports. By default this will be My Documents\Dylos Logs

If there are a few minutes of data from a different day at the start or end of a log, DylosGUI ignores them as they are usually from the few minutes when data's being downloaded from the Dylos. It's simplest to leave this at 0

If this is ticked your web browser will automatically open new reports when they are generated (recommended)

Choose a different template for producing air quality reports

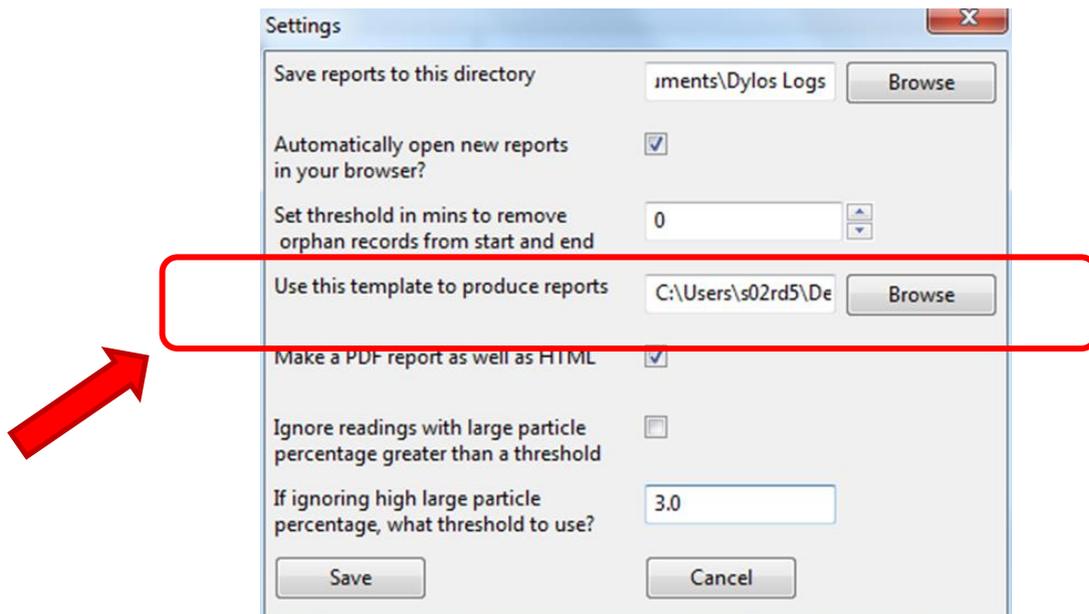
This is an experimental setting – make sure it's not ticked



Make a PDF file containing the report (recommended). That makes it a lot easier to send the report from one computer to another. By default PDF files are stored in My Documents\Dylos Logs

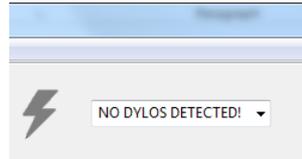
### Using the right template:

- The default template included with the AFRESH software is used for influencing parents to keep smoke-free homes and includes information not needed for measuring in venues
- A suitable template is available at:  
[http://smokefreehomes.weebly.com/uploads/4/6/8/1/46815415/union\\_template.html](http://smokefreehomes.weebly.com/uploads/4/6/8/1/46815415/union_template.html)
- Download it and save it, then select it in the 'Settings' dialogue



### Downloading a data log:

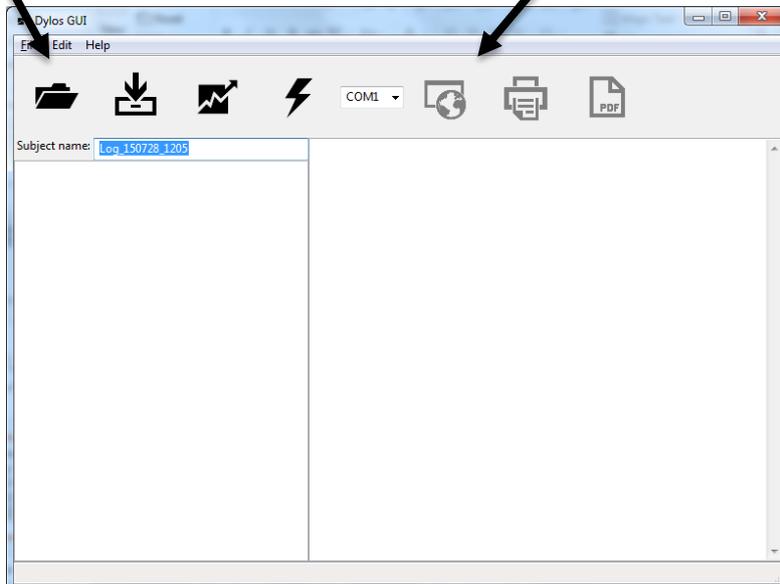
- Make sure the box on the right of the toolbar says 'COM<number>'
- If it doesn't, take the Dylos out and plug it in again. Make sure it's on!
- If you keep getting 'No Dylos Detected' make sure your cable's drivers are installed



- Be aware that downloading a log takes a few minutes

Click here to download

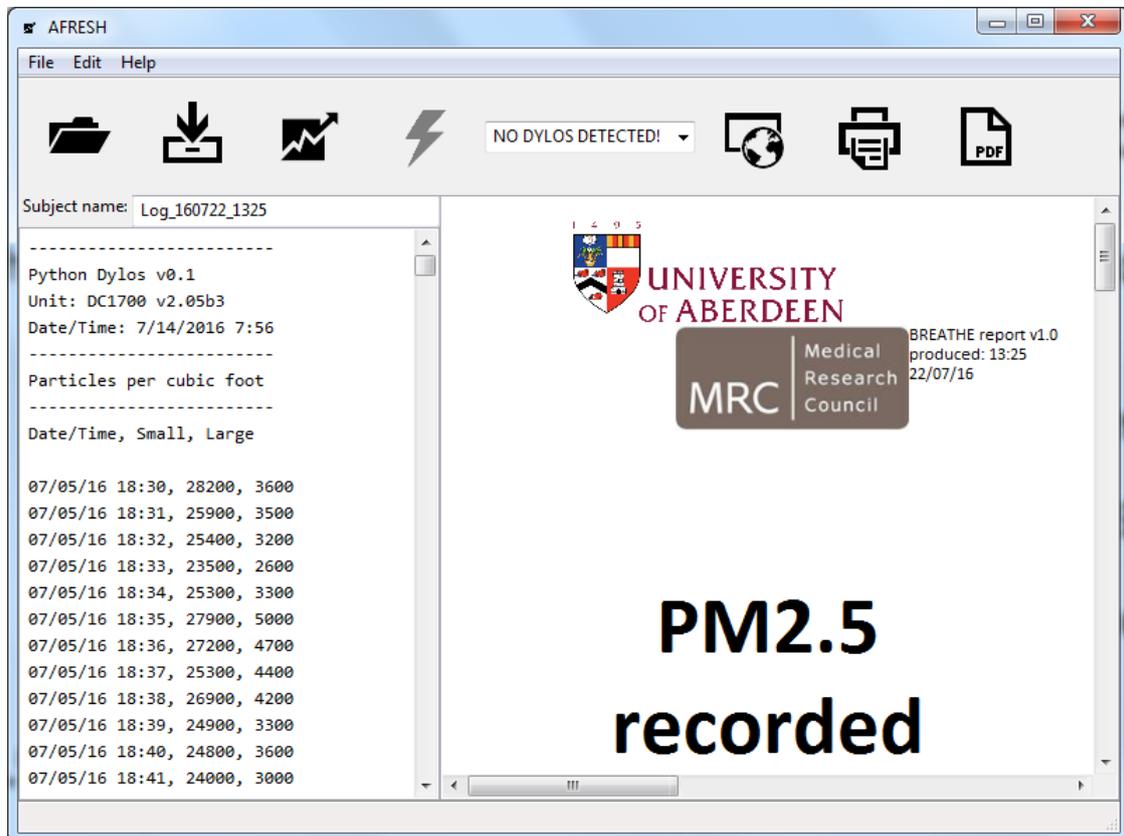
Type the name you want to give the report here or it will be assigned a name based on the date and time of download





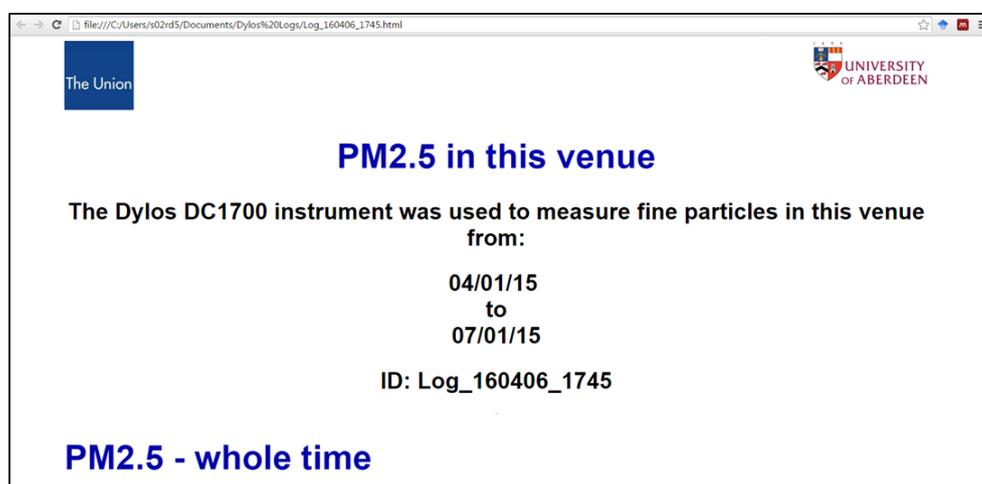
### When the report is generated:

- You can see the report in the right hand panel
- If you haven't changed the settings it should also open automatically in Internet Explorer, Firefox or Google Chrome



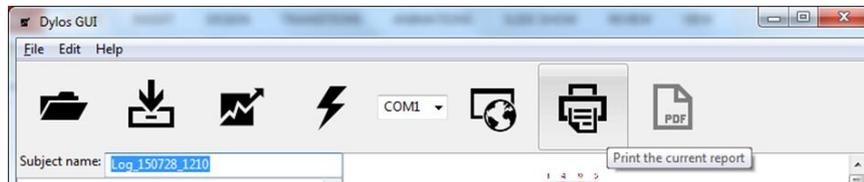
### In the browser, the report is easier to skim:

- You can print the report now if you'd like
- But it's saved on your hard drive for later if you'd prefer not to deal with it at the moment

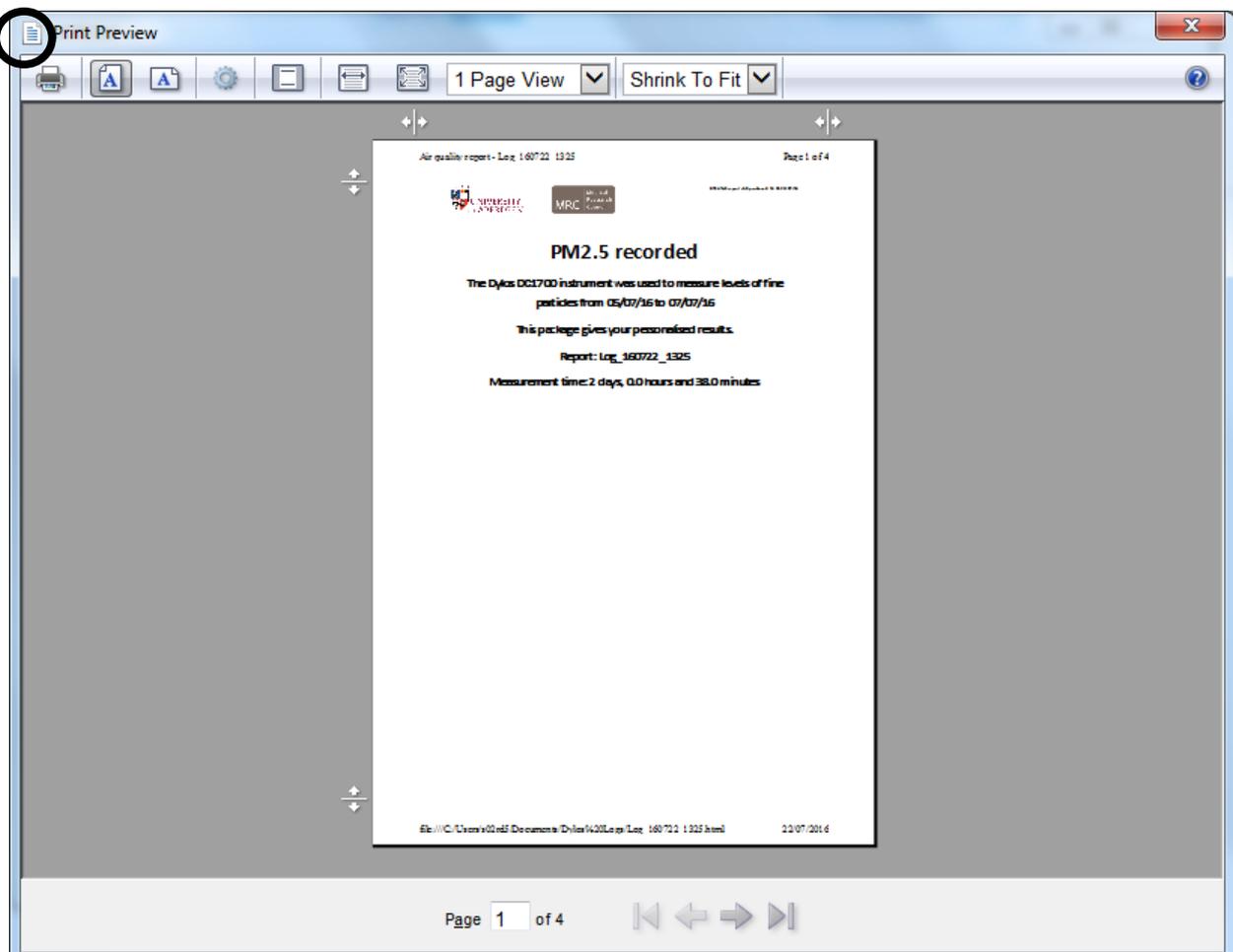


### Printing your report:

- Note – on older PCs the PDF might look better (see next slide)
- Click on the print button on the toolbar

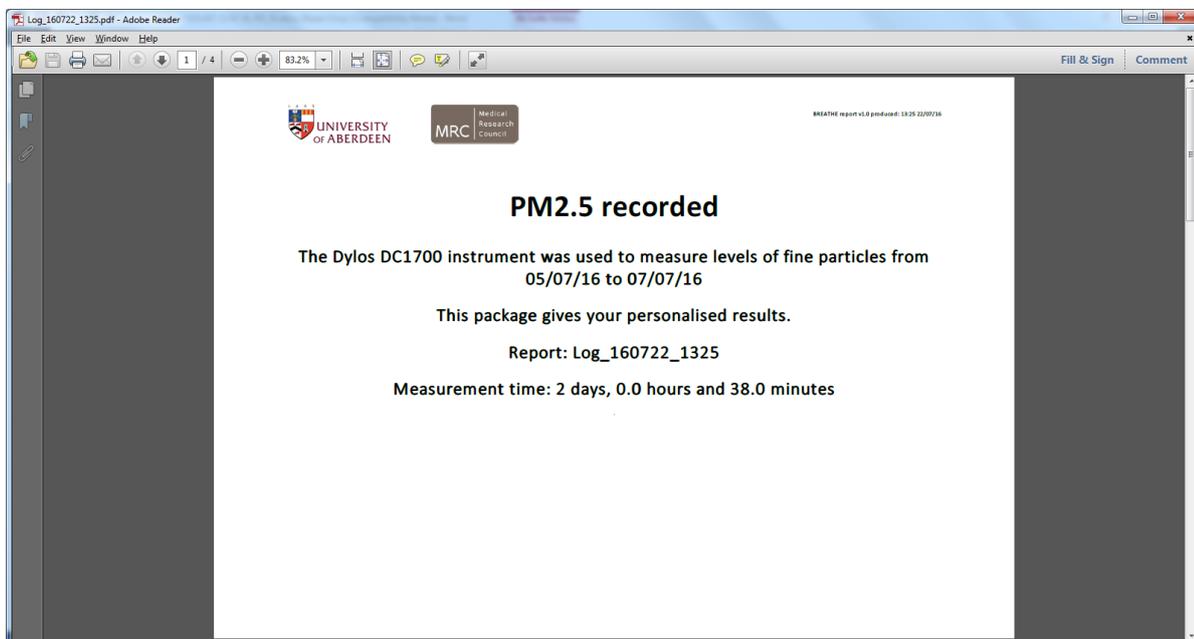
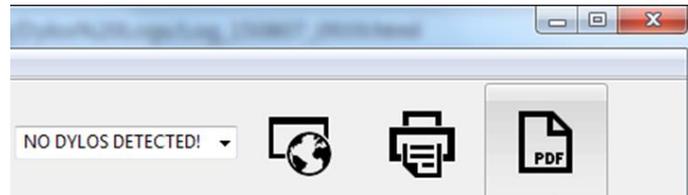


- You'll then see a 'Print Preview' window like the one on the right
- Make sure you've selected 'landscape' view before printing



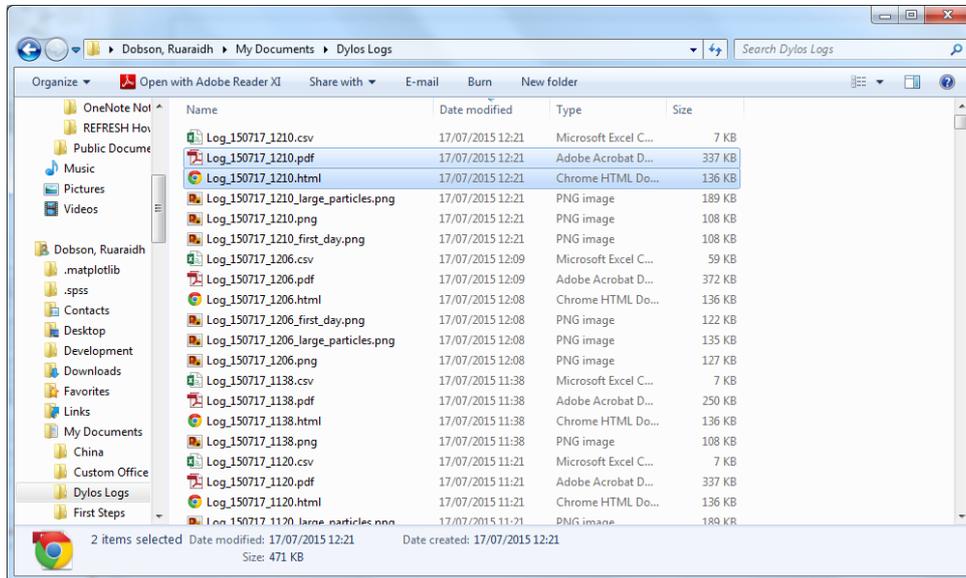
### Opening a PDF:

- PDF files are easy to email and always look the same on different computers
- They also print well, particularly on computers with older web browsers
- Click on the PDF button to open it when your report has been generated
- Note – you'll need Adobe Reader or similar software to open PDFs. This usually comes with your computer or you can download it for free



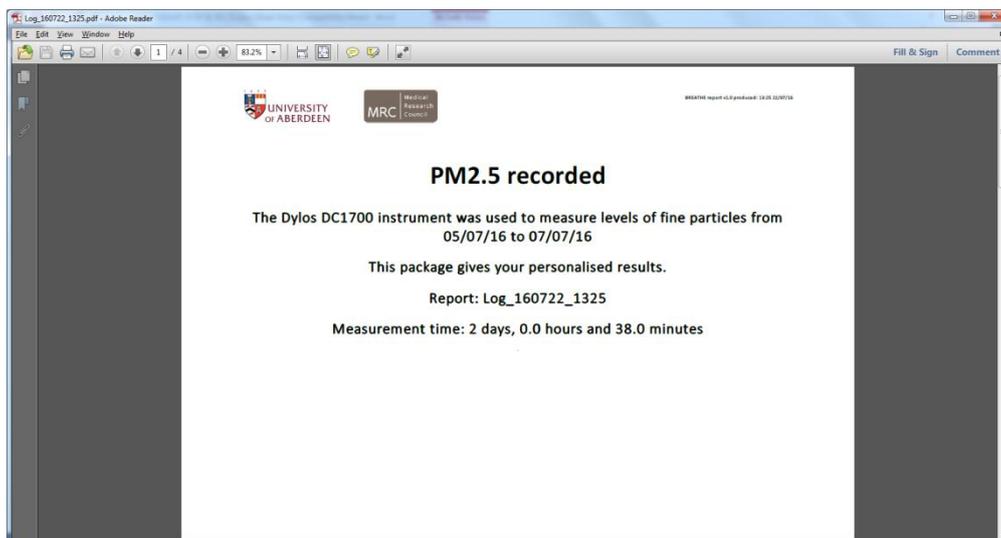
## Finding your reports:

- By default, logs can be found in My Documents\Dylos Logs
- All the files have the name you gave the log under 'Subject Name' or a default name based on the date and time
- There are lots of files but the only ones you need to worry about are those ending in 'PDF' and 'HTML'



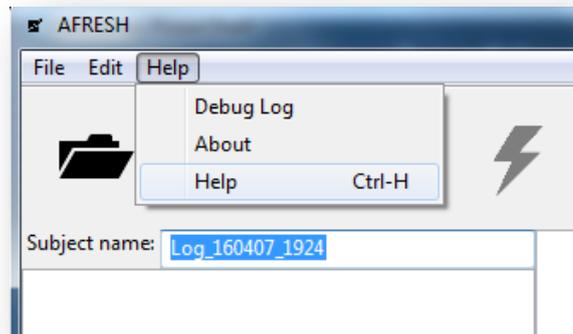
## Printing your report from saved files:

- Double click on the PDF file of the report. This might be called an Adobe Acrobat Reader File or similar
- If there isn't a PDF file, double click on the HTML file. This might have the Internet Explorer logo
- Then go to File and click Print, or press Ctrl-P. It's best to print in colour if you can



### If you need help:

- AFRESH comes with built-in help files
- Click on the 'Help' menu and then on 'Help'
- The help files will open in your browser
- If you can't find the answer to your question there visit <http://smokefreehomes.network/afresh-software>
- If you still need help, you can email [ruaraidh.dobson@abdn.ac.uk](mailto:ruaraidh.dobson@abdn.ac.uk)



### If you find a bug

- Email [ruaraidh.dobson@abdn.ac.uk](mailto:ruaraidh.dobson@abdn.ac.uk)
- Include a full description of what you were doing and what happened
- If you can, include a screenshot with your email (press 'prt scn' at the top right of your keyboard, then paste into an email)
- Then attach the following files to the email:
  - C:\Program Files\DylosGUI\debug\_log.txt
  - C:\Program Files\DylosGUI\settings.ini
  - If you can't find them, look under C:\Program Files (x86)\DylosGUI

## How to download data manually

### To download the data carry out the following steps:

1. Attach the USB/Serial converter to the computer and to the Dylos serial port at the other end.
2. The Dylos has to be switched on.
3. Launch the Dylos Logger software.
4. Click the 'browse' folder icon on the right hand side of the screen.
5. In the 'file name' box enter a new file name with a unique ID (eg Placename1.txt, Placename004.txt)
6. Click on the 'Download History' icon (5<sup>th</sup> icon from the top left showing a computer).
7. A 'Download History' box opens. Click the 'Download' button.
8. The device will now start to download to this box and numbers should appear. This process may take a couple of minutes.
9. When complete. Click on 'create log'.
10. A graph will appear giving an overview of the concentrations measured. Do not attempt to interpret this data. You will need to export the file to Microsoft Excel to obtain data in mass concentration units.
11. Take a note of the file path e.g. C:\Users\Documents\Dylos Logs\F525F001.txt
12. Close the Dylos Logger software.

### To convert data to a mass concentration and produce a graph:

1. Open Microsoft Excel. Go to Open, navigate to the folder where the file is stored. [Select 'All files' to see .txt files]. Open file.
2. Check delimited; starting at row 1; press next.
3. Delimiters should be tab; comma and space.
4. Treat consecutive delimiters as one.
5. Column date format; date; MDY.
6. Click finish.
7. File opens in Excel. Re-size column A to see the date.
8. Remove any data from the start or end that is outside the sampling time in the venue. [Select and delete the appropriate rows].
9. Select and copy from cell A9 to bottom of column D.
10. Save file as an excel file with a name that corresponds to your ID for this venue.
11. Open graph creation excel file example found in the ZIP file on the [AFRESH software page](#).
12. Save this new file with a new file name, matching the log file's ID.
13. Go to Data worksheet
14. Select cell A2 and paste.
15. Select cell E2 and F2, and drag the black cross in bottom right corner of cell F2 all the way down to the bottom of the F column to copy the equation in E2 and F2 equation to the

- bottom of the data. This calculates the mass concentration for every minute of the sampling time.
16. Take a note of the final row number in the worksheet that contains data. This is the total number of minutes of sampling (for 7 whole days it will be about 10,000).
  17. Move to the 'Main Graph' worksheet.
  18. There should be a graph showing the levels of smoke over the whole week.
  19. Click anywhere on the blue line. The following should come up  

$$=SERIES(Data!$E$1,Data!$B$2:$B$9999,Data!$F$2:$F$9999,1)$$
 if necessary adjust the numbers '9999' to the number of rows identified in step 16.
  20. To change axes scales. Click on a number on the axis. Right click and then select 'format axis'. Adjust the scale as required. Note that if you do this for the y-axis then you may need to move the red 'WHO guidance line' so that it remains at the 25 microgram/m<sup>3</sup> level. Similarly adjust the x-axis so that the number of time markers is appropriate for the sampling – (keep in multiples of 60, suggested values are 180 or 360 for the main graph).
  21. Move the 'WHO guidance' box and arrow to the red line wherever is best on the graph. Then if you identify any periods when the Dylos was switched off then insert a text box with arrows indicating this on the graph.
  22. Move to the 'Graph 1 day' worksheet.
  23. There should be a graph showing the levels of smoke over the first day of sampling. This can be adjusted to the last day of sampling by changing the numbers.
  24. Click anywhere on the blue line. The following should come up  

$$=SERIES(Data!$E$1,Data!$B$2:$B$1441,Data!$F$2:$F$1441,1)$$
 if necessary adjust the numbers '2' and '1441'. For example if the last row identified at step 16 was 8000 then to get the last 24 hours of sampling then we would replace 2 by (8000-1440=6360) and replace 1441 with 8000 so the equation would become  

$$=SERIES(Data!$E$1,Data!$B$6360:$B$8000,Data!$F$6360:$F$8000,1)$$
  25. Again, to change axes scales, click on a number on the axis. Right click and then select 'format axis'. Adjust the scale as required. Note that if you do this for the y-axis then you may need to move the red 'WHO guidance line' so that it remains at the 25 microgram/m<sup>3</sup> level. Similarly adjust the x-axis so that the number of time markers is appropriate for the sampling – (keep in multiples of 60, suggested values are 120 for the 'graph 1 day').
  26. Move the 'WHO guidance' box and arrow to the red line wherever is best on the graph. Then if you identify any periods when the Dylos was switched off then insert a text box with arrows indicating this on the graph.
  27. Once the graphs have been finalised then save the file again.
  28. Open the baseline (or repeat) feedback template.ppt file.
  29. Complete slide 1 by inserting the measurement day and dates and the Venue ID.
  30. Delete the example graph on slide 2 and paste in the 'Main graph' from the Excel file. Paste this in using 'Paste Special' and insert as a 'Picture (GIF)'.
  31. Re-size this as necessary on the slide.
  32. Edit and modify the days of the week boxes along the bottom of the graph.
  33. For slide 3 repeat steps 30-32 for the 'Graph 1 day' and inset this to slide 3.

34. On slide 4 insert various numbers from the Data worksheet of the excel file. The days, hours, mins comes from the data displayed in cell K2 of the 'Data' worksheet of the Excel file.
35. The average level comes from cell I6, work out how many full multiples of 25 this number is and insert this.
36. The maximum level is from cell I7.
37. The percent of time above the WHO guidance is cell K8.
38. The percent of time above the smoky bars level is cell K9.
39. Modify the text: 'Fine particle levels in the venue are **high** and suggestive of **frequent smoking**. This is likely to **increase the risk of ill-health** to staff and customers' depending on the average and maximum values; if there are no peaks and the average is <25 then it can be modified to read 'Fine particle levels in the venue are **low** and suggest that smoking did not take place in the venue'.