

We need to talk about woodburners

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Woodburners come up in the news a lot at the moment. And not in a good way. They are much maligned as a source of air pollution. Confession time I have a woodburner which I love, so it was with interest and some trepidation I heard that



the the radio 4 programme

"More or Less" was covering the

issue. For those of you this programme throws an unbiased eye over statistics in the news. For example the same programme briefly has a look at the statistic that had been in the news that week that the average length that someone (women) kept new clothes was 5 weeks. It turns out that is completely untrue and was plucked of thin air. But I digress... All combustion produces oxides of nitrogen (NOX), soot and carbon monoxide (a product of incomplete combustion). Most combustion produces sulphur dioxide as well. NOX is produced largely since air is nearly 80% nitrogen. This is present as a molecule made up of two nitrogen molecules joined by a very stable triple bond. The energy of combustion is enough to break this bond and the nitrogen reacts with any oxygen present. This is true of central heating, wood burning, in fact any combustion. Gas central heating produces soot, NOX and sulphur dioxide since the compound added to give it odour is a sulphur based organic. After the concern over acid rain in the 1980's cars in all Western countries had to be fitted with catalytic converters. In addition NOX is carcinogenic. Petrol cars have three way cats fitted these remove the NOX, organic hydrocarbons and carbon monoxide. Diesel cars have two way cats fitted these remove the last two but not the NOX for technical reasons. Under EU rules new diesels have particulate filters fitted to remove the smallest particles. These are known as PM2.5's due to their size (2.5 millionth of a millimetre). These particles are now known to have a very wide range of health effects, none of them good. Its been found that 100 $\mu\text{g}/\text{m}^3$ increase of PM2.5, the morbidity of residents increased by 12.07% (1). There has been a clear correlation between some asthma deaths and PM2.5's. So its a serious problem. Now getting back to woodburners. The UK government states that 38% of all PM2.5's comes from burning wood (notice the subtle distinction). Up until now my view as been as the following*;

- I have been wary of accepting this figure. One reason for that is the ratio of cars to woodburners is very high. There are about 2 million woodburners in the UK and over 30 million cars. To give an example. I left my woodburner (reluctantly) to give my daughter and her friends a lift on Friday evening to the Theatre (since they were late). It took me nearly an hour to make a return journey of 3 miles. The reason was wall to wall cars (mostly diesel). It seemed to me that my stove and the relatively few others compared to car numbers in my city would have be pushing a lot of filth to compete.
- My stove has been thoroughly tested and is exempted under the clean air act. I burn dry wood and regularly check to see what's coming out the flue. Usually this is invisible (yes I know PM2.5's are not going to be visible, but it seems like its a reasonable check on general pollution levels). When I bought the stove manufacturers were complaining the tests were too onerous and it was taking them 5 years to get a model licenced.
- We are not sure what people are actually burning. You can tell its wood but it could be wet wood, open fires (these are not legal), coal etc.

However, as a scientist I have to take peer reviewed scientific data seriously. So where does this 38% figure come from? "More or Less" explained. Apparently according to the programme its from taking all woodburning combustion (from a survey) divided by all PM2.5 emissions for the UK. This uses an assumption on PM2.5 emissions on cars but I wonder whether this is high enough, since the manufacturers cheated on their emission data? Anyway the question is what happens when you measure real data? By measuring particle size and using a mass spectrometer you can tell where particles come from. One of the much maligned experts has done this and in urban areas found that *woodburning* makes up 6-9% of PM2.5's. This figure is also *falling*. Notice the use of that word *woodburning* since we still don't know quite what's being burned or how. Also as the programme pointed out air quality is much better than it used to be although the

problems it causing are certainly acute particularly regards childhood asthma The last issue is why are [asthma](#) rates rising? A number of theories have been put forward that are given in that link. In addition warnings have been made about air quality within increasingly well sealed buildings as well as without which would be interesting to look at. To conclude. I've felt that woodburners are being blamed unfairly. This seems to be true looking at hard scientific evidence. Its a lot easier to go after 2 rather than 30 million especially when this involves the motor car. To really cut PM2.5's we need to cut road traffic. I would also point out I mainly burn scrap wood from skips and that saves me a whole lot of greenhouse gas emitting natural gas. The programme can be heard [here](#). *they are not worried about the NOX presumably since the contribution is low compared to cars and central heating. 1) Kan HD, Cheng BH. Analysis of exposure-response relationships of air particulate matter and adverse health outcomes in China. Journal of Environment and Health 2002;19:422-4 Neil

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