

## An Indoor air quality guide for my friends in LA

I wrote this for my friends in Los Angeles, but wherever you are, you may find it useful. If this document leaves you with any questions, please don't hesitate to ask me.

Indoor air quality affects our health and especially the health of our children. Scientists have good evidence that it influences infectious disease<sup>1</sup> and other serious health events such as stroke. Remarkably, it also affects our thinking, which means better air quality might help our children grow, and help us grow as parents.

One important aspect of air quality is getting enough fresh air into your home to flush out pollutants. Because we exhale carbon dioxide (CO<sub>2</sub>), we can measure CO<sub>2</sub> level to tell us how much fresh air each of us is getting. However, we now have studies showing that CO<sub>2</sub> itself inhibits cognitive performance, even at levels well within what we normally experience in buildings.<sup>2,3</sup> The lesson here is to get plenty of fresh air.

A second pollutant of great importance, especially in LA, is fine particulate matter. Fine particulate is produced by combustion. It's commonly referenced by size - PM2.5 is particulate matter with a diameter less than 2.5 microns (thousandths of a millimeter). In the US, about half our exposure to PM2.5 comes from outdoor sources – mostly automobiles – and the other half from indoors – mostly cooking. Fine particulate matter is at much higher levels now than before industrialization, and it bypasses our bodies' dust filters, getting in to our bloodstreams and vital organs. It causes asthma, bronchitis, strokes, and other serious health consequences, and kids are the most vulnerable. A research review by a US national lab estimated that particulate exposure accounts for more public health damage than all other common indoor air pollutants combined.<sup>4</sup> A study in CA schools that received air filters as concession for a nearby gas leak found that installing an air filter improved test scores by an amount equivalent to reducing class size from 22 down to 15 students.<sup>5</sup> The WHO and EPA both set limits on short- and long-term exposure.

So limiting particulate exposure is good, and that may be in conflict with getting more fresh air when the outdoor particulate level is high. Here is an approach you can use to improve the air quality in your home. These are listed in rough order of cost-effectiveness.

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<sup>1</sup> Seppänen, O.A., Fisk, W.J., and Mendell, M.J. (1999) "Association of ventilation rates and CO<sub>2</sub> concentrations with health and other responses in commercial and institutional buildings," *Indoor Air*, 9, pp 226-252.

<sup>2</sup> Fisk, W.J., Satish, U., Mendell, M.J., Hotchi, T., and Sullivan, D. (2013) "Is CO<sub>2</sub> an Indoor Pollutant? Higher Levels of CO<sub>2</sub> May Diminish Decision Making Performance," Lawrence Berkeley National Labs publication 6148E.

<sup>3</sup> Allen, J., MacNaughton, P., Satish, U., Santanam, S., Vallarino, J., and Spengler, J.D., "Associations of Cognitive Function Scores with Carbon Dioxide, Ventilation, and Volatile Organic Compound Exposures in Office Workers: A Controlled Exposure Study of Green and Conventional Office Environments," *Environmental Health Perspectives*, Vol. 124 No. 6, pp 805-812.

<sup>4</sup> J.M. Logue et al, "A Method to Estimate the Chronic Health Impact of Air Pollutants in U.S. Residences," Lawrence Berkeley National Laboratory Report Number 5267-E

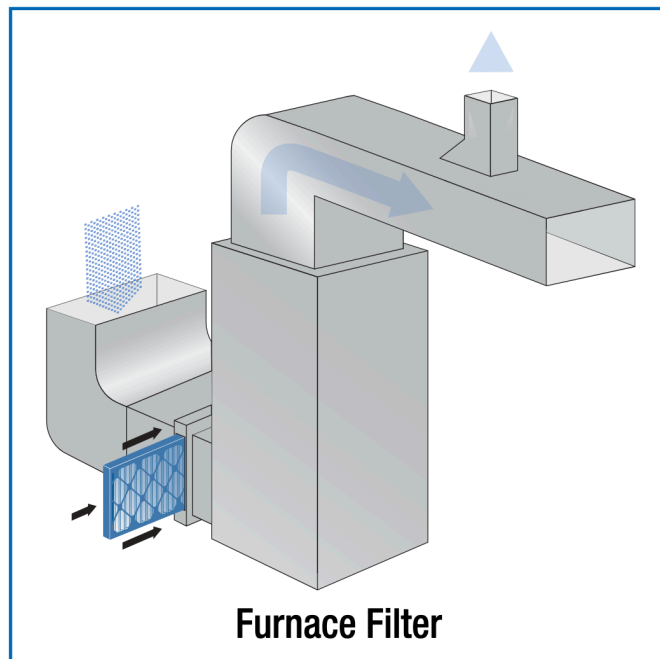
<sup>5</sup> Gilraine, Michael, "Air Filters, Pollution, and Student Achievement," Department of Economics, New York University, March 17, 2020, p. 21.

*Remove pollutants.*

Don't smoke in the home, and move anything potentially harmful out, or lock it in an air tight container. This includes paint and other liquid construction materials, fuels, adhesives, even laundry products. If you are concerned about toxic ingredients in laundry and body care products, check out [ewg.org](http://ewg.org).


*Use an air filter.*

If you have a central forced-air system for heating and AC, install a filter with the highest MERV rating you can fit, ideally MERV-13 – that will remove PM2.5 very effectively. Make sure the filter fits tightly, or tape over the gaps, so the air doesn't slip around it. You might need to deepen the slot, and your system's fan might not be strong enough to blow through a high-MERV filter. Note that the filter only works when your system is running, and you can set the fan to keep running when the system isn't heating or cooling.



*Image credit: EPA Guide to Air Cleaners in the Home*

You can also consider a stand-alone air filter. These are a few hundred dollars new (also check [craigslist.org](http://craigslist.org)). Be sure to check the cost of filter media replacement, which is necessary once a year or so. Choose the highest clean air delivery rate (CADR) that you can, at least 0.7 cfm multiplied by the square footage of the room(s) being purified (70 cfm for a 100 sf room). If the label lists different CADR's for a few different pollutants as in the image below, use the CADR for "tobacco smoke."






**AHAM**  
**VERIFIDE**

Independently Tested.  
Consumer Trusted.

AIR CLEANER SUGGESTED CLOSED ROOM SIZE  
**450 SQUARE FEET**

**CLEAN AIR DELIVERY RATE TESTED**  
The higher the CADR numbers, the faster the units clean the air

TOBACCO SMOKE	DUST	POLLEN
 <b>298</b>	 <b>&gt;291</b>	 <b>&gt;343</b>

Portable air cleaners are most effective in rooms where all doors and windows are closed.

[www.ahamverifide.org](http://www.ahamverifide.org)

*Use the CADR for "tobacco smoke"*

### AHAM buying guide... where else?

The devices can be noisy - you might choose a larger unit than you need, then run it on low speed to limit noise and energy use. Other than particulate removal, activated charcoal is fine but not necessary; don't bother with devices that use ozone - it is dangerous and generally unnecessary. Note that Covid is a particle, and a MERV-13 filter, or any good stand-alone filter, removes it. Be sure to properly maintain your filter, including timely replacement of filter media. For more detail, see the [EPA guide to air filters](#).

#### *Limit your particulate exposure from cooking.*

If you use gas, thoroughly clean the underside of your pots, and when you are cooking, open windows and use a fan or other means to make a breeze running past your face. If purchasing new, consider moving from gas to electric or, better, induction. Switching to induction is a more effective way to reduce your exposure than using a range hood, and in my opinion effective enough to make the hood obsolete from a health standpoint. Most people who try it like it and it's increasingly affordable. Ikea sells an [induction hotplate](#) for \$50.



*IKEA induction hot plate. Image credit: IKEA.com*

Yes EMF has health risks not well understood, but the Swiss have made clear how to eliminate the risk: keep the pot properly centered, stay a foot away, and don't let kids within a couple of feet, especially when on high power.

If you have a range hood that blows to the outdoors, check to make sure it really does blow all the way outside, then use it if it does. If it doesn't, or you are thinking of installing one, contact me.

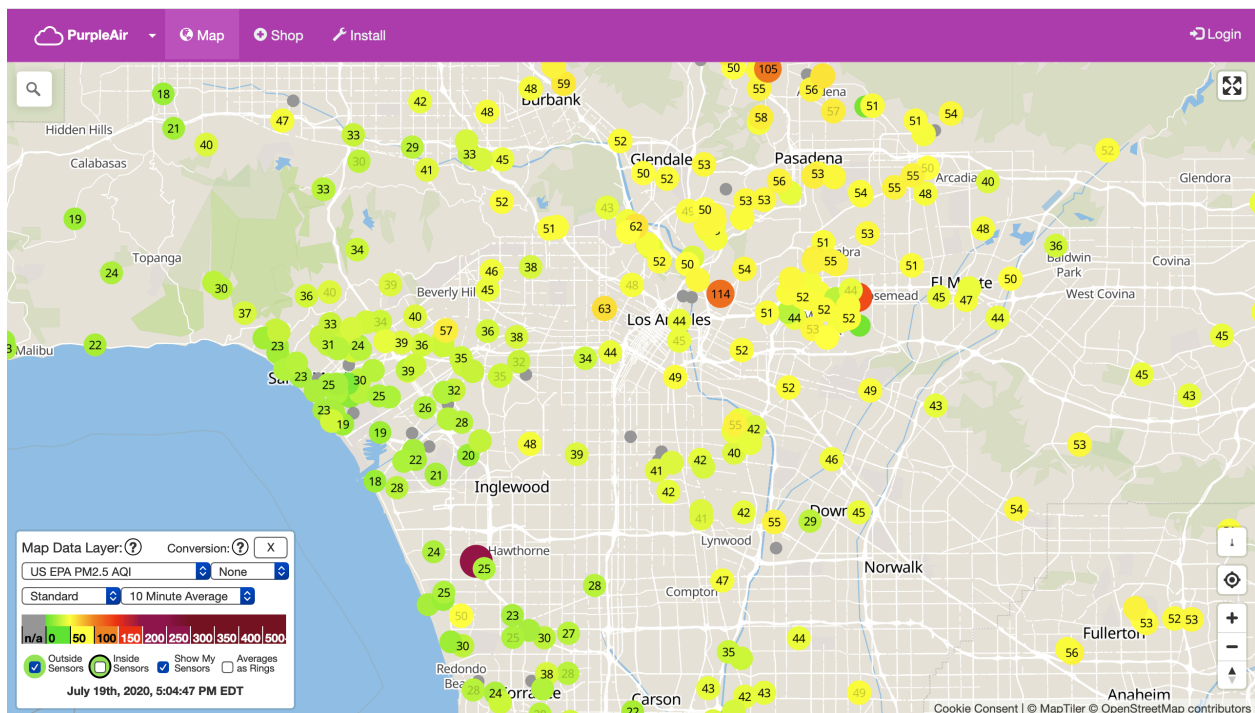
*Heighten your awareness of indoor and outdoor pollutant levels.*

Consider an air quality monitor. The [AirVisual Pro](#) measures particulate very accurately, and also measures CO<sub>2</sub>, temperature, and humidity (it's good to keep your home between 30-70% RH). It compares your IAQ to a network of nearby outdoor measurements, so you know when it's a good idea to open windows, run your air filter, etc. It has a clear, simple user interface on the device. Leave it in your most used room, or move it from room to room as you like. It sells for \$270 via resellers.



*AirVisual Pro. Image credit: iqair.com*

There's also a device called [Purple Air](#) that measures only particulate, is even more accurate than the AirVisual, and sells for \$179. You go online to find your device on a map, so you might check your IAQ less often than you would with IQAir. If you don't use an IAQ monitor, you can use your nose (indoors), eyes (find something far off you can look at every day to observe the relative dirtiness of the air), and especially the internet (the Purple Air [map](#) is free to access, and there are lot of points in LA - just set it to show outdoor measurements only, nearest your home).



*Purpleair map of LA. Note - click the boxes to turn on/off indoor & outdoor measurements*

*Air seal your home*

I air sealed my in-laws' home in Mar Vista, using scrap wood and corrugated cardboard to close around 2 or 3 basketball's worth of hole in a couple of hours. Yes, that saves energy, cost effectively, even in LA. But I did the sealing because they were unhappy with how dry the indoor air was in winter. If you can choose how much to open/close the house, you can better control the air quality, including the humidity. If you want to air seal, definitely contact me.

Please let me know if I can do anything to make this more useful. I hope it helps you take better care of your kids, and thank you for helping me take better care of mine.