

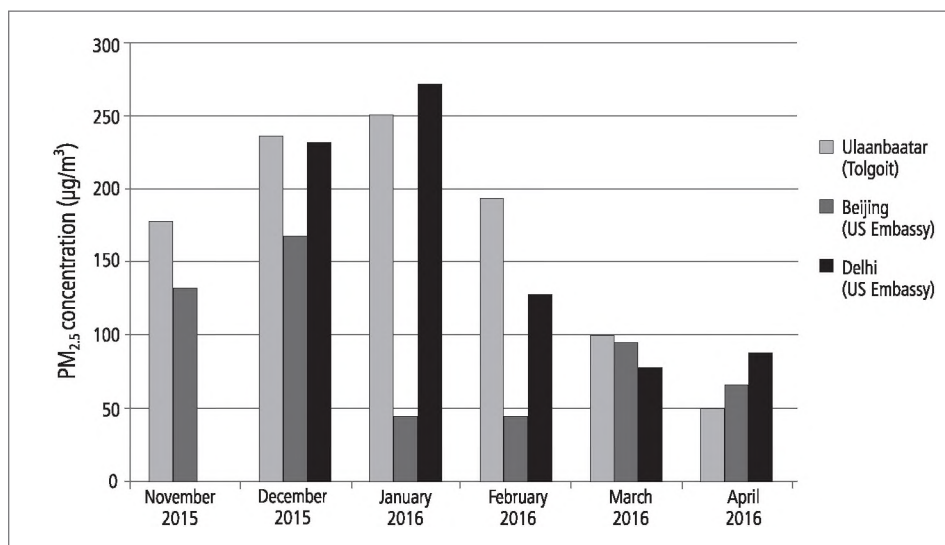
# Air Pollution Versus Humans: Are We Losing?

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The “International Expert Consultation on Understanding and Addressing the Impact of Air Pollution on Child Health in Mongolia” was held in Ulaanbaatar, Mongolia on January 25-26, 2016. Even though conferences on environmental issues including air pollution are held in Ulaanbaatar, the air pollution situation seems to change very little. Astounding concentrations of air pollutants have become normal in the winter season of Ulaanbaatar, yet this city receives less media attention compared to Delhi, India or Beijing, China. Figure 1 shows a comparison of monthly average concentrations of one type of air pollutant, particulate matter of 2.5 micrometers or less in size (PM<sub>2.5</sub>), for November 2015 through April 2016 in the aforementioned cities. It can be seen here that PM<sub>2.5</sub> concentrations are comparable between all three cities and even Beijing had much lower PM<sub>2.5</sub> concentrations in January and February than the two other cities (maybe due to the Lunar New Year celebrations). Also note that these concentrations are averages from just one location in each city. Ulaanbaatar, Beijing, and Delhi have annual PM<sub>2.5</sub> averages well above the World Health Organization’s (WHO) guideline of 10 µg/m<sup>3</sup>. This seems to suggest that air pollution is winning the battle in these cities and unfortunately many other cities in the developing world.



**Figure 1.** Monthly average PM<sub>2.5</sub> concentrations in three cities (monitoring site in parentheses). Note that no data was available for Delhi for November 2015. Raw data used from [1].

High concentrations of  $PM_{2.5}$  in Ulaanbaatar, especially in the wintertime, are due to coal burning at the power plants and in personal homes. Changing how heat and hot water is supplied to buildings and homes is a large task if coal is to be eliminated. Using other fossil fuels would require infrastructure changes and increase cost to already poor families. Using more renewable energy would require high initial investment. The problem is overwhelming and will not be solved quickly or inexpensively, but action cannot wait because the health effects of the air pollution are very egregious.

In Ulaanbaatar, it was estimated from 2009-2010 data that 9.7% of the total deaths, 29% of the cardiopulmonary deaths, and 40% of the lung cancer deaths of those aged 30 and above are attributable to the air pollution [2]. It has also been shown that the number of spontaneous abortions increased three-fold in the winter compared to the summer in 2011 [3]. A study monitoring the personal exposures of children to black carbon within the  $PM_{2.5}$  fraction found that children had several peak exposures above  $100 \mu\text{g}/\text{m}^3$  during their daily activities in the winter season [4]. This value is only for a part of the total  $PM_{2.5}$  concentration (the black carbon), so their  $PM_{2.5}$  exposure would have been even higher than concentrations reported in the study.

There have not been many studies on specific health effects of air pollution in Ulaanbaatar, but they really are not necessary. Science from around the world shows that air pollution, especially  $PM_{2.5}$ , affects the respiratory, cardiovascular, and reproductive systems. There were several occasions where I had trouble breathing in my own apartment which is nearer to the city center and not next to the districts that burn coal. I was shocked when one day in January 2016 the  $PM_{2.5}$  concentration at my apartment (the city's monitoring station is just outside) peaked at  $1272 \mu\text{g}/\text{m}^3$  and the 24-hour average was  $511 \mu\text{g}/\text{m}^3$ . The WHO 24-hour mean guideline for  $PM_{2.5}$  is  $25 \mu\text{g}/\text{m}^3$ . This day was 20 times the WHO guideline.

The smoky days in Ulaanbaatar are largely out of the control of the general public. Coal is burned at the power plants. It is a government decision to change that. Coal is burned in homes, which would be a personal decision to change that, but largely those who burn coal cannot afford other fuel sources. Since the elimination of coal cannot easily be changed soon, individuals need to take steps to protect themselves from the air pollution.

Seeing many people walk through the smoky streets unprotected and opening their windows to the pollution really makes me wonder why people do not seem to care about what the air pollution is doing to them. Air pollution should not be in control here, each individual should be in control of their exposure to the air pollution!

There are four simple steps to take for protection from air pollution, no matter where you live. First, do not spend much time outside when the air pollution is severe. Second, wear an air pollution mask when outside. Masks are available for adults that are rated as N, R or P 95, 99, or 100 (United States National Institute for Occupational Safety and Health system) and P or FFP 2 or 3 (European Standard system). All masks given these ratings filter between 94-99.97% of airborne particles depending on the rating. Masks must be used with caution because failure to secure a tight seal of the mask on the face will result in ineffectiveness of the mask. From personal experience and experiences of others, these masks greatly reduce exposure when used properly. Unfortunately, these masks are not available for children, so their time outdoors in pollution should be extremely limited. Third, use a HEPA filter inside of your home. HEPA filters trap and immobilize small particles from the air. A HEPA filter combined with a fan is all that is necessary and these models can be bought relatively inexpensively. Fourth, keep doors and windows to the outside closed. Opening the door or windows is inviting the outdoor air pollution inside. Also, air pollutants are small in size, therefore they will enter the building through small crevices so make sure that doors and windows have tight seals around them.

The developing world will struggle with air pollution for years and years to come. Economics always plays a role in environmental decisions and even though it is best to use the cleanest fuel available, the reality is that many just cannot afford the cleaner fuel. However, this does not leave the individual powerless. There are inexpensive ways to protect ones' health such as using masks outside, keeping doors and windows closed, and using HEPA filters inside. Let us at least try to win the fight against air pollution rather than willingly let it destroy our health and well-being.

## References

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