Pan American Journal of Public Health

Environmental health in Peru: outdoor and indoor air contamination

To the editor:

We read with interest a recent report by the World Health Organization (WHO) on outdoor air contamination in the world, "Ambient (outdoor) air pollution in cities database 2014" (1). Air quality is represented by annual mean concentration of fine particulate matter, i.e., particles smaller than 2.5 microns (PM2.5). The report included assessments for 17 countries in the Region of the Americas, and only Canada (8 $\mu g/m^3$) was within the WHO reference value of < 10 $\mu g/m^3$ of PM2.5. Three countries, Honduras (32 $\mu g/m^3$), Guatemala, (33 $\mu g/m^3$), and Peru (38 $\mu g/m^3$, in Lima) had the highest mean annual PM2.5 values, a situation of grave public health concern.

Specifically regarding Peru, PM2.5 levels in Lima during 2001–2011 averaged about 50 $\mu g/m^3$ PM2.5 (2). Using standard formulas and exposure-response data from the literature (3), we estimate that the excess of PM2.5 in Lima (above the 10 $\mu g/m^3$ reference level) during this period, resulted in approximately 2 300 premature adult deaths annually from cardiorespiratory disease (4). This situation was discussed at a recent workshop held in Lima, Peru, on 28–30 April 2014 (5), sponsored by the Fogarty Program of the National Institute of Health (NIH, Bethesda, Maryland, United States of America).

Another important problem is indoor air contamination. Almost 3 billion people worldwide use biomass for cooking and heating in their houses (6). WHO estimates that in 2012, there were approximately 81 300 deaths in the Americas caused by household air pollution (HAP) due to burning of biomass fuel and coal (7).

In Peru, biomass is used for cooking/heating by about 1/3 of the population (2 million households); estimated indoor levels of PM2.5 are 100 $\mu g/m^3$ (8). Given these levels, we estimate that there are 3 000 premature adult deaths annually in Peru from cardiorespiratory disease due to indoor contamination, plus an unknown number of deaths among children (4).

Improved biomass cooking-stoves have been implemented in many areas of Peru; however, as in other parts of the world (6), the improved stoves have, generally, not been able to sustain levels of particulates below the recommended value (9). It may be that cook-stoves cannot decrease exposure significantly enough to reduce adverse health effects, and that alternatives, such as gas, now cheaper worldwide and more accessible to large populations, are needed. In the meantime, we need to better understand the exposure-response between indoor PM2.5 and health effects by conducting evidence-based risk assessments and cost-benefit analyses.

In summary, both outdoor and indoor air pollution in the Americas, and in Peru, in particular, occur at unacceptable levels. Reducing air pollution to WHO-recommended levels requires difficult political action that must balance the potential economic cost against the current cost in human lives. Since burning fossil fuel produces both CO_2 and PM2.5, it is helpful that the current worldwide push to limit carbon emissions coincides with the need to reduce levels of PM2.5 in outdoor and indoor air.

Gustavo F. Gonzales
Faculty of Sciences and Philosophy
Department of Biological and Physiological Sciences and High Altitude Research Institute
Universidad Peruana Cayetano Heredia
Lima, Peru
gustavo.gonzales@upch.pe

Kyle Steenland
Rollins School of Public Health
Emory University
Atlanta, Georgia
United States of America

REFERENCES

1. World Health Organization. Ambient (outdoor) air pollution in cities database 2014. Available from: www.who.int/phe/health_topics/outdoorair/databases/cities/en/# Accessed 19 July 2014.
2. Dirección General de Salud Ambiental, Peru. Informe técnico. Available from: www.digesa.sld.pe/ Accessed on 30 July 2014.
3. Pope CA 3rd, Burnett RT, Turner MC, Cohen A, Krewski D, Jerrett M, et al. Lung cancer and cardiovascular disease mortality associated with ambient air pollution and cigarette smoke: shape of the exposure-response relationships. Environ Health Perspect. 2011;119(11):1616–21.
4. Gonzales GF, Zevallos A, Gonzales-Castañeda C, Nuñez D, Gastañaga C, Cabezas C et al. Salud ambiental en el Perú: Impacto de la contaminación del aire, agua y de la variabilidad climática/cambio climático. Rev Per Med Exp Salud Pub. 2014;31(3):547–56.
5. Academia Nacional de Ciencias. Geo Health Peru. Available from: http://geohealthperu.wordpress.com/ Accessed on 19 July 2014.
6. Subramanian M. Deadly dinners. Nature. 2014;509:548–51.
7. World Health Organization. Burden of disease from household air pollution for 2012. Available from: http://go.nature.com/smuctx. Accessed on 19 July 2014.
8. Li Z, Sjodin A, Romanoff LC, Horton DK, Fitzgerald CL, Eppler A, Aguilar-Villalobos M, et al. Evaluation of exposure reduction to indoor air pollution in stove intervention projects in Peru by urinary biomonitoring of polycyclic aromatic hydrocarbon metabolites. Env Intl. 2011;37:1157–63.
9. Hartinger SM, Commodore AA, Hattendorf J, Lanata CF, Gil AI, Verastegui H, et al. Chimney stoves modestly improved indoor air quality measurements compared with traditional open fire stoves: results from a small-scale intervention study in rural Peru. Indoor Air. 2013;23(4):342–52.