The Effects of Traditional Cooking Technologies and Small Control Interventions on Indoor Air Quality in Cayo Paloma, Panama

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Abstract

It has been estimated that around the world 2 million people die each year because of the effects of unhealthy indoor air quality. Acute respiratory infections, a likely effect of exposure to large amounts of air pollution in the home, are the number one killer worldwide of children under the age of five. Unhealthy indoor air quality is especially a problem in developing nations because upwards of about 90% of rural households use unprocessed solid fuels for their cooking and heating needs. The burning of biomass fuels produces many toxic compounds, carbon monoxide gas and, most importantly, coarse and fine particulate matter which can infiltrate the airways and deep into the lungs of those exposed to it. While there is thus a large impact on human health in the developing world from the use of solid fuels, information on pollutant exposures, specific health effects, control technologies and health interventions is much scarcer then that related to outdoor air pollution or indoor air pollution in the industrialized nations.

For this study carbon monoxide and PM2.5 monitoring took place in a total of ten households in a small indigenous community in rural Panama in an attempt to describe the current indoor air quality situation in the area and to judge the effect of different cooking technologies on the indoor environment. The cooking technologies studied were the traditional open cooking fire of the area, LPG stoves, and a modified version of the standard fire box. Measurements were made on a minute basis using the TSI DustTrak (PM2.5, resolution of 1 μg/m3) and TSI Q-Trak (CO, resolution of 1 ppm). It was found that PM2.5 concentrations produced during the use of the traditional open fires exceeded background values by a large margin (on average by a factor of about ten to twenty times). The use of the traditional cooking fire resulted in 24-hr mean concentrations that were seven or more times greater than the guidelines recommended by the WHO. The use of the LPG stove was shown to reduce PM2.5 exposures by about 92% on average and CO exposures by about 47% on average as compared to the use of the standard cooking fire, but its cost prohibited wider use. It was found that the modification of one traditional fire box resulted in an 82% reduction in the geometric mean PM2.5 concentration experienced in the cooking space.