ESTIMATED GLOBAL HUMAN MORTALITY FROM VEGETATION FIRE SMOKE

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Background and Aims: Vegetation fires annually release an average of approximately 2 petagrams of carbon to the atmosphere causing recurring episodes of severe regional air pollution and contributing to greenhouse gas emissions. We aimed to assess global mortality attributable to particulate matter in vegetation fire smoke (VFS).
Methods: We followed the methods of the WHO Global Burden of Disease, Comparative Risk Assessment studies (Ezzati *et al.* 2002). Ambient concentrations of particulate matter (1997-2006) were estimated at a resolution of 2 (lat) X 2.5 (long) degrees using satellite-based observations of fire activity, atmospheric aerosol loadings and a global atmospheric chemical transport model. We applied previously published exposure-response coefficients for VFS and acute all-cause mortality in WHO regions where smoke exposure was sporadic. In regions with chronic VFS exposure we used a conservative coefficient from studies of urban air pollution and all-cause mortality as studies of chronic VFS exposure are lacking. Coefficients were applied to population-weighted mortality rates to produce global and regional mortality estimates. We conducted sensitivity analyses to assess the influence of effect size coefficients, acute vs chronic exposure scenarios, and counterfactual VFS pollution estimates.
Results: We estimated that 480,000 deaths/yr were attributable to VFS. In sensitivity analyses the estimate ranged from 300,000 to 820,000 with the assumed counterfactual exposure having the greatest influence on results. Regions most severely affected were Sub-Saharan Africa and South East Asia.
Conclusions: Fire emissions are an important contributor to global mortality, although lower than that estimated for urban air pollution (800,000/yr) and indoor air pollution from cooking fires (1.6 million/yr) (Ezzati *et al.* 2002). Rapid improvements in health outcomes could be achieved through the cessation of deliberate burning of biomes that rarely naturally burn, such as tropical rainforests. The potential to reduce overall fire emissions from highly flammable biomes such as savannas, the primary source of firesmoke in sub-Saharan Africa, warrants further investigation.

Reference:
Ezzati M, Lopez A, Rodgers A, Vander Hoorn S, Murray C. Selected major risk factors and global and regional burden of disease. *The Lancet* 2002;360(9343):1347-60.