Commentary: Smoke pulls the blinds

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In this issue, Pokhrel et al. publish an intriguing study from the Nepal–India border region that calls our attention to both what it shows and what it hides.1 This case–control study suggests an almost 2-fold risk for cataract related blindness among women using solid fuel unvented stoves. This risk gradient is similar to the one described between smokers and non-smokers.2,3 As in many economically underprivileged countries, unvented stoves are a far more prevalent problem than smoking.4,5 In fact, 80% of cases as well as 57% of the controls in this hospital-based study reported the use of unvented stoves whereas 22% reported past or current smoking.1 The association between fuel stove and cataract remained strong even after controlling for numerous cofactors, including kitchen ventilation. The risks increased monotonically with exposure duration and across the three exposure gradients (unvented stoves, improved vented stoves, and clean fuel stoves).

The observations are biologically plausible and add an outcome to the list of similar effects reported for active or passive smoking and for exposure to smoke from biomass and burning fossil fuel.2,3 These similarities across a range of outcomes on cells, tissue, organs, and health suggest partly common pathways. Pokhrel et al. did not provide separate exposure odds for the three anatomical types of cataract. Smoking is associated with nuclear opacity but neither cortical nor sub-capsular cataract.2,3 Type-specific analyses could strengthen the case for the tobacco smoke analogy and causality. One could also test interactions of the stove effects with vegetable or vitamin intake. This would strengthen the argument for oxidative stress pathways thought to partly explain cataractogenetic effects of tobacco smoke and the preventive effects of antioxidants.2,3

However, four hidden aspects of the study relate to its public health relevance. First, employing the methods developed for case–control data,6 one can conclude from Table 3 in Pokhrel et al.1 that >50% of cataracts may be attributable to unvented stoves. One may also derive ‘numbers needed to treat’, or more appropriately, for public health interventions, the ‘impact numbers’ proposed by Heller et al.7 Of particular interest is the Exposure Impact Number (EIN), i.e. the number of individuals with the exposure among whom, one excess case is attributable to the exposure—in other words: the number of stoves needed to be replaced to prevent one case of blindness.7 With 60 000 new cataract cases among the 23 million people in Nepal8 a rough estimate of EIN reveals that a prevention programme needs to replace stoves of ~400 women to prevent one case of blindness. Heller et al. used the example of smoking to introduce the concept of impact numbers.7 They showed that some 390 or 770 smokers need to give up their addiction to prevent one case of coronary heart disease or lung cancer, respectively.

Second, one may further elaborate on effect modifications. It could help identify the ‘hot spot’ of the public health problem. For example, are effects of unvented stoves different in Nepal and India? Are the illiterate at particularly high risks of stove related cataract? Are stoves in rural areas or in specific house types associated with higher risk? In the light of limited economic resources, an assessment of interactions may help to prioritize preventive actions.

Third, Pokhrel et al. could refer to an impressive research agenda of co-authors: clean stoves would not only prevent blindness but eliminate a major cause of debilitating acute and chronic lung diseases in both children and adults, substantially reducing disability adjusted life years.4,9,10 Smith et al. published numerous studies showing the respiratory effects of indoor smoke and they attributed at least 3% of the global burden of disease to this preventable cause4 and the local burden may be larger.

Fourth, one may need to talk about money to promote stove replacements in that area of Nepal and India. The authors claim that ‘economic realities may prevent [such replacements] from becoming widespread’. However, one wonders whether any (individual or national) economy can afford to let people go blind, often at very early ages, just as a consequence of doing one of the most important activities of daily living to sustain the survival of families and the entire work force, namely cooking food? What is the economic loss for the thousands of blind women, for their families, communities, and the economy at large? Who covers the (direct and indirect) costs of the cataract surgeries and other health and social services such as those provided by the study hospital in the Nepal–India border region? What are the costs of all the respiratory health problems caused by smoky stoves?4,10

According to Mehta and Shaphar, improvements of stoves cost $3–4, or more durable solutions up to $50 per household.11 Using the above EIN one may conclude that $1500 spent on stove improvements can prevent one woman from becoming blind. Although visionary surgery networks provide cataract operations in Nepal for <$100,12 one has to emphasize that cataract surgery coverage is far from complete and clearly lower in women than in men, in Nepal and elsewhere,13 thus primary prevention remains a key strategy to sustain health of all people.

With a purchasing power adjusted per capita gross domestic product (GDP) of <$1500 (~3–4% of the mean per capita GDP in the five richest countries) Nepal is one of the poorest countries in the world. According to WHO, total annual health expenses currently amount to $19 per person. Therefore, a ‘clean stove program’ may still be a major investment. However, for internationally funded initiatives, these costs are low. Stove programmes were highly successful in China14 and lessons may be applied to this region of Nepal and India as well.

An objective assessment of (true) costs and (true) health benefits (including all adverse effects of smoke) of a stove
replacement programme is needed. It may very well lead to the conclusion that it is economically irrational not to ensure widespread provision of clean stoves—healthy people are a prerequisite for a healthy economy!

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References