

Measures of exposure to secondhand smoke: recent developments

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ABSTRACT

About a third of the world's population is exposed to secondhand smoke (SHS), despite reductions in smoking prevalence in many countries. Accurate, cost-effective measures of exposure are needed in investigations of the health risks associated with SHS, and in studies of interventions to extend smoke-free environments. There have been important developments in the use of questionnaires, air quality monitoring and biomarkers, but still, there is no single, gold standard assessment of exposure to SHS. Choice of measure depends on circumstances, including cost, scale and time window.

It is more than 25 years since the US Surgeon General's report on the health consequences of involuntary smoking,¹ but many people around the world are still exposed to secondhand smoke (SHS). According to one estimate, in 2004 approximately 40% of children, and 34% of adult non-smokers, were exposed to SHS worldwide, and there were about 603 000 SHS-attributable deaths from heart disease, chest infections and cancer.² In the Southeast Asian region in 2009, the proportion of youth (13–15 years) exposed to SHS in public places ranged from 37% (India) to 78% (Indonesia).³

Three papers in this issue of the journal set out to summarise the current state of knowledge in the field of SHS exposure assessment.^{4–6} Some things have not changed. There is, for instance, still no 'gold standard' in the measurement of SHS. All approaches have advantages and disadvantages, and the right measure will depend on circumstances. Questionnaires remain the only way of gathering information on extended periods of exposure, and are likely to be the most cost-effective measure in studies of very large populations, although they are prone to partial and possibly biased reporting. Biomarkers such as cotinine in saliva or urine provide accurate measures of recent exposure to SHS, but are relatively expensive, and may not be helpful in studies of diseases with long lag times. Environmental monitoring (eg, counting airborne particulates) can be conducted cheaply (after the initial investment in machinery), and this approach provides continuous measurements, with high sensitivity for nearby smoking, but personal exposures must be inferred, and results may be affected by other sources of particulates than tobacco smoke.

But the field is not static: there have been important developments. For instance, we have much more evidence linking biomarker-defined exposures to SHS and subsequent disease,⁷ and better measures of exposure are contributing to improved understanding of disease mechanisms.⁸ Another significant development is the work now

underway to develop a common metric for exposure to fine particles, whatever the source, which aims to standardise risk assessments for SHS, active smoking and air pollution.⁹

The interpretation of measures of exposure has been affected by changes in the behaviour of smokers. In many countries the prevalence of smoking has fallen considerably in recent decades, as has the average amount smoked, and people have also changed the places in which they smoke (less likely to smoke indoors at home, for instance). This means that the concentrations of biomarkers such as cotinine and nicotine that distinguish active and passive smoking have to be revised downwards. In the US, on the basis of 1999–2004 National Health and Nutrition Examination Survey data it has been recommended that the optimal cut point for serum cotinine should be reduced from 14 ng/ml to 3 ng/ml.¹⁰

Hitherto most research on SHS exposures has been carried out in developed countries, but there is a growing number of studies from low-income countries, including Latin America, Asia¹¹ and Africa.¹² There is evidently some variation in exposures indoors (for instance, higher intensities are observed in Asia and the Middle East than in Europe) but overall, the relation between living with a smoker and personal exposure to SHS appears to be broadly similar, wherever one lives.² We have also seen the full range of measures of exposure applied in studies of comprehensive smoke-free interventions.¹³ The findings are generally very encouraging. In New Zealand, an investigation using repeated saliva cotinine measures found that legislation had reduced exposure to smoke in hotel bars by 90%.¹⁴ Other countries have reported striking reductions in the population at large.¹⁵

There are still challenges, but we should take heart from the considerable progress that has been made in both the science and control of exposures to SHS.

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