Burden of Lung Cancer Deaths due to Smoking for Men and Women in the WHO Western Pacific and South East Asian Regions

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Abstract

Introduction: Eighty percent of all smokers live in low and middle-income countries of the Asia Pacific region but actual estimates of the burden of disease due to smoking in the region have yet to be quantified. Methods: The burden of lung cancer due to smoking for all countries in the WHO Western Pacific and South East Asian regions was calculated from the population attributable fractions (PAFs). Nationally representative sex-specific prevalences of smoking were obtained from the World Health Organization, MEDLINE and/or national government documents and hazard ratios (HR) for lung cancer due to smoking in Asian and non-Asian populations were obtained from published data. The HR and prevalence were then used to calculate PAFs for lung cancer deaths due to smoking, by gender and by country. Results: The national prevalence of smoking in the Asia Pacific region ranged from 18-65% in men and from 0-50% in women. The fraction of lung cancer deaths attributable to smoking ranged from 0-40% in Asian women and from 21-49% in Asian men. In ANZ, PAFs were as high as 80% for women and 68% for men. Future estimates of the burden of smoking-related lung cancer in Asia were obtained by assuming a continuation of current smoking habits in these populations. Extrapolating the higher HR from the ANZ region to Asia, resulted in an increase in the PAFs to 4-90% in women and from 62-85% in men. Conclusion: The current burden of lung-cancer due to smoking in the Asia-Pacific region is substantial accounting for up to 50% of deaths from the disease in men and up to 40% in women depending on the country. If current smoking habits in Asia remain unchanged then the number of people dying from smoking-related lung cancer over the next couple of decades is expected to double. It is known that the majority of lung cancer is due to smoking. This is the first paper to systematically compare current burdens of lung cancer deaths due to smoking in countries in the Western Pacific and South East Asia and by gender. Findings from this paper demonstrate the number of lung cancer deaths that could be prevented if the prevalence of smoking was eliminated.

Key Words: Smoking - lung cancer - population attributable fraction - Asia Pacific region
While smoking and lung cancer are undeniably linked, the World Bank Report on Smoking calls for more information on the burden of smoking attributable disease (Gajalakshimi et al., 2000). In particular, this is needed by gender and for lower- and middle-income countries where the majority of smoking related burden is experienced (Thun et al., 2008). An epidemiological tool to measure the impact of a particular exposure, such as smoking, on health outcomes is the population attributable fraction (PAF). Here, the PAF estimates the proportion of lung cancer that could be avoided if smoking were eliminated from the population. Although this is an unlikely scenario, the PAF provides valuable information regarding the magnitude of the disease burden due to an exposure and enables predictions to be made if the prevalence of the exposure were to change. This paper aims to provide information on the burden of lung cancer due to smoking in the Asia Pacific region using PAFs for lung cancer for all countries in the WHO Western Pacific and South East Asian regions.

This paper also aims to predict future burden of lung cancer in Asia using hazard ratios from ANZ where the epidemic of smoking has been experienced for much longer. Current and future estimates of lung cancer due to smoking are given by gender and by country.

Materials and Methods

Nationally representative prevalence of smoking, together with estimates of the hazard ratio (HR) and 95% confidence intervals (95% CI) for lung cancer deaths associated with smoking, was used to calculate PAFs. Region and sex-specific HRs (95%CI) were obtained from published data on smoking prevalence for each country, for both men and women, using the formula:

\[ \text{PAF} = \left(1 - \frac{1}{1 + \text{HR}}\right) \]

Future estimates of the burden of lung cancer due to smoking in Asia were calculated using current smoking prevalence and by extrapolating the HR for lung cancer from ANZ to Asia.

Results

In the 31 countries for which there were eligible data, the prevalence of smoking ranged from 0.2% to 49.9% in women and from 18.3% to 64.8% in men (Figure 1). Several countries out of the 31 in the WHO Asia Pacific region do not yet have nationally representative data for smoking prevalence. Data on national smoking prevalence is lacking for Bhutan, Brunei Darussalam, the Marshall Islands, Micronesia, North Korea, Timor-Leste and Kiribati. Although some of these countries have data on smoking, the results were not included in this report as the data is not nationally representative. Data on smoking prevalence from the Solomon Islands are not included in the figures but only in text here since the Solomon Islands are not included in the PAFs for lung cancer deaths attributable to smoking in women from Nauru. For men, PAFs ranged from 22% in Fiji to 49% of lung cancer deaths being attributable to smoking in South Korea. If these countries go on to have smoking epidemics similar to Australia and New Zealand, future projections show PAFs ranging from 4% to 90% of lung cancer deaths being attributable to smoking in women and 61% to 83% of deaths in men.

Discussion

This is the first study which provides estimates for the current and future burden of lung cancer deaths caused by smoking for men and women in countries in the Asia Pacific region. Hazard ratios for lung cancer due to smoking differ between the Asia Pacific and ANZ because of the long lag time between exposure to smoking and lung cancer. Individuals in most countries of the Asia Pacific region have not been smoking as long, or as much (pack-years) as individuals in ANZ and hence current HRs are smaller for this region. Even if the prevalence of smoking were to stay the same in most countries in the Asia Pacific region, higher HRs will be observed as travel along this lag time is experienced. Hence, Australia and New Zealand currently have higher PAFs for lung cancer deaths due to smoking however it is likely to change in future as the PAFs for Asian countries grow.

Most countries in the Asia Pacific region have been experiencing a rise of their own epidemics of smoking, though some countries are observing decreasing rates such as Australia, Fiji, Hong Kong, Japan, Laos, Malaysia, New Zealand and Singapore (Corrao et al., 2000). Bangladesh, India and the Maldives had rates drop between 1980 and 1990 but in the last decade increasing smoking rates once again (Corrao et al., 2000). This study indicates that currently up to 80% of lung cancer deaths are attributable to smoking in these regions. Much of this excess mortality can be prevented if smokers quit now, though quitting is rare in low and middle-income countries (Jha et al., 2002). Importantly, while smoking prevalence is increasing in many countries in the Asia Pacific region, it is increasing even more so for women. This is particularly worrying given the greater risk of death from lung cancer due to smoking in women compared to men (Huxley et al., 2007).

This study also provides information on the predicted burden of lung cancer deaths caused by smoking for both women and men by country. For instance, South Korea is expected to experience an increase in lung cancer deaths due to smoking from 50% to 85% if they continue to smoke at the current rate. Information from this study may help inform country-specific health policies regarding lung cancer and tobacco control in the Western Pacific and South East Asian regions. This study also highlights that data on national smoking prevalence for about 27 years are needed to accurately predict future lung cancer attributable mortality.
millions of men and women in the Asia Pacific region are
affected by lung cancer (Parkin et al., 2005). Despite the
growth in smoking prevalence over the past few decades, it is
certain that reducing smoking prevalence would lead to a
reduction in lung cancer deaths over time.

Acknowledgements/ Funding

Martinus received support from a postdoctoral fellowship from
the Canadian Institutes of Health Research and a capacity grant
traineeship from the Australian National Health and Medical
Research Council. Rachel Huxley is supported by a Career Development Award
from the Heart Foundation of Australia. The sponsors had
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There are also limitations to estimating the burden of
cancer deaths due to smoking. First, prevalence data as well
as estimates of the hazard ratio often use only the simple
self-reported variable for smoking (yes/no) and as such,
differences in prevalence and also estimates of risk do not
take into account duration of smoking, amount smoked,
method of smoking, or passive smoking. Second, the previously
published hazard ratios were not able to take into
account the influence of potential confounding or
interacting variables such as income, air pollution (Du et
al., 1996; Liu et al., 1998; Hesketh et al., 2007; Gu et al.,
2009). A third limitation is that, although the estimates
of risk were adjusted for age, data on the prevalence of
smoking were not. Fourth, and last, the individual studies
in the APSCC used different methods to verify causes of
cancer deaths in two large WHO regions and by gender.
Information from this study may help inform country-specific health policies
regarding lung cancer and tobacco control in the Western Pacific and South East Asian regions.

In conclusion, this study uses HR from the largest study
in the Asia Pacific region.

Information on the burden of lung cancer due to smoking
is an ideal first step for countries aiming to curb their local
epidemics of smoking.

What this paper adds relates to the fact that the
prevalence of smoking is high and growing in low and
middle-income countries including the WHO Western
Pacific and South East Asian regions. More men than
women currently smoke. There is less information on the
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