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METADATA – BURDEN OF TOBACCO USE

Description	Smoking attributable mortality rate refers to the number of deaths, that could be attributed to tobacco use, expressed as deaths per 100.000 people. This measure estimates the part of the mortality burden that can be associated to smoking. Both the absolute number of deaths attributed to smoking and the mortality rate attributed to smoking are presented. The inclusion of rates allows for standardized comparisons across different regions, age groups and sex.
Rationale	Tobacco use has a huge impact on public health, contribution to a significant portion of preventable health burden worldwide. Understanding and quantifying this impact is essential for guiding public health interventions and policy. One way to measure this is through the calculation of the tobacco-attributable mortality? Smoking is associated with the burden of 35 diseases. The attributable burden is the portion of the disease burden that could be reduced by eliminating exposure to tobacco use. This is done by using comparative risk assessment methodology, where we calculate the PAF, population attributable fraction. The PAF represents the fraction that is associated with exposure to the risk factor, here smoking. Smoking exposure is estimated based on smoking prevalence (never, current or former smoker) and smoking behavior (cigarettes per day, packyears and time since quitting) in Belgium. To calculate this attributable burden, the PAF is multiplied with the disease burden, which can be expressed in terms of morbidity and mortality. The use CRA can be useful set up public health priorities.
Primary Data source	National data : • Smoking exposure from the Belgium Health Interview Survey by age, sex, and region for every wave. • Population data and mortality data from Statistics Belgium. International data : Relative Risk dataset from the Global Burden of Disease Study (Murray, 2024).
Indicator source	Estimate for smoking attributable deaths by age, sex and region from the Belgian Burden of Disease study, Sciensano
Periodicity	Yearly estimates from 2013
Calculation, technical definitions and limitations	The Comparative Risk Assessment (CRA) framework compares a current harmful risk factor in the population against a “counterfactual” exposure situation, where the selected risk factor is reduced to the so-called Theoretical Minimum Risk Exposure Level (TMREL), here zero tobacco use. This allows to estimate the proportion of the disease attributable to that risk factor or the Population-Attributable Fraction (PAF) (Murray et al., 2003; Plass et al., 2022). We present risk factor attributable burden from 2013 to the most recent reference year (2021) by region, sex, and age group, using a time series of data and present yearly estimates of risk-attributable burden. $$\text{PAF} = \frac{(P_{never} + P_{former} * RR_{former} + P_{current} * RR) - 1}{P_{never} + P_{former} * RR_{reduce} + P_{current} * RR}$$ P_{never} = prevalence of never smokers P_{former} = prevalence of former smokers $P_{current}$ = prevalence of current smokers RR = relative risk of to get disease depending on the intensity of smoking (cigarettes per day or pack years) RR_{former} = reduction in the relative risk among former smokers Smoking exposure data is retrieved from the BHIS which defines the following exposure indicators for smoking status and measures of frequency or intensity:

	• Current smokers is a combination of people who report smoking every day (daily smoker) and people who report smoking but not every day (occasional smoker) • Former smokers are people who report having smoked but have quit for any time • Never smokers are people who report never having smoked • Cigarettes per day is the number of cigarettes per day was recorded asked to those who reported daily smoking • Pack-years is calculated by multiplying duration times cigarettes per day/20 (one pack). The duration of smoking is the number of years a person has smoked; and is estimated for daily smokers by subtracting the age at initiation from the age at the time of the survey. Time since quitting is calculated by subtracting the sum of the age at the start of daily smoking and the duration of smoking from the age at the time of the survey. The attributable burden is calculated as the PAF multiplied with the burden, here deaths, due to a certain diseases. Causes of deaths data refer to the underlying cause which – according to the World Health Organization (WHO) – is "the disease or injury which initiated the train of morbid events leading directly to death, or the circumstances of the accident or violence which produced the fatal injury." These mortality data is made available by StatBel who are responsible for linking the death certificates to ICD codes. This data is used as the burden component in the multiplication with the PAF. Attributable deaths are the number of deaths that can be attributed to tobacco exposure. Results are stratified by age, sex and region. $$Attributable\ Deaths = Deaths * PAF$$ The results, tobacco associated deaths, remain estimates. Below some general limitations of this method : - self-reported data: smoking prevalence and intensity are derived from self-reported surveys, which may be subject to reporting bias, including underreporting of smoking behavior or misclassification of former and current smokers. - simplified assumptions: The CRA method assumes that reducing tobacco exposure to TMREL (zero tobacco use) would eliminate the attributable burden. In reality, other risk factors and variables, comorbidities, and environmental influences could contribute to the observed disease burden, leading to potential over-attribution of deaths to smoking. - relative risk estimates: RRs used in the model are derived from GBD, although extensive, these estimates remain global. These estimates may not fully capture variations across populations, regions, or subgroups, and may not account for other behavioral or genetic modifiers. - lag effect of smoking cessation: model accounts for reduced risk in former smokers but does not fully incorporate the time-lag effect of smoking cessation on disease risk reduction. As such, the attributable burden may be overestimated for former smokers who recently quit. - morbidity component: does not take account morbidity or non-fatal outcomes.
International comparability	Availability : yes, estimates are available and calculated by GBD for each country. Comparability : estimates are produced using the Belgian population, specific structure (age, sex, region) and Belgium smoking exposure. Also the mortality component is specific to the Belgian context. In regards to the mortality data, a limitation is the differences in the coverage of residents dying abroad or non-residents dying in the reported country which can slightly affect the comparability among countries. Variations in coding practices of causes of deaths between countries may affect the comparability of cause-specific mortality.

Reference list

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