Warner and Mendez, "How Much of the Future Mortality Toll of Smoking Can Be Avoided?"

<u>Supplemental material</u>: Explanation of why MPRPM (the Maximum Possible Reduction in Premature Mortality deriving from future tobacco control interventions) is lower if the smoking initiation rate declines or the cessation rate increases as a result of past tobacco control measures (the paper's sensitivity analysis, presented in Figure 2)

For our status-quo analysis, we assumed continuation of the annual smoking initiation rate effective in 2018 (7.8%) and the most recent estimate of the annual permanent smoking cessation rate (4.35%; Mendez D, Tam J, Giovino GA, et al. Has smoking cessation increased? Nicotine Tob Res 2017;19:1418–24. doi:10.1093/ntr/ntw239). The initiation rate has been falling rapidly in recent years, and the cessation rate has increased. It is reasonable to assume that these beneficial trends could persist into future years as a result of the cumulative effects of past tobacco control initiatives. Indeed, the cessation rate was derived from earlier years' experience, suggesting that it could well be higher as of 2018. The sensitivity analysis tests the impact on MPRPM of assuming a lower initiation rate and/or higher cessation rate.

With either or both a lower initiation rate or higher cessation rate – and, again, assuming that these are attributable to past tobacco control interventions – the future burden of smoking (life years lost, LYL) would be lower than projected in our status-quo scenario. The future burden of *past* smoking, however, would be unchanged. (This is our no-future-smoking scenario.) As a result, the MPRPM – the difference between the two, the amount of the future burden of smoking that can be reduced by future tobacco control interventions – would decline. Because the future burden of past smoking is unchanged, the MPRPM is now a smaller percentage of the total future burden of smoking.

Mathematically, this result can be characterized as follows:

LYLSQ = Life-years lost due to smoking under the status-quo scenario

LYLNFS = Life-years lost due to smoking under the no-future-smoking scenario

Then

$$MPRPM = LYLSQ - LYLNFS$$

$$MPRPM\% = \frac{MPRPM}{LYLSQ} = \frac{LYLSQ - LYLNFS}{LYLSQ} = 1 - \frac{LYLNFS}{LYLSQ}$$

LYLNFS is constant and always less than or equal to LYLSQ. If initiation declines or cessation goes up, LYLSQ goes down and so does the MPRPM and the MPRPM%.

Consider a simple example. Suppose that the future burden of smoking under status-quo assumptions is 100 LYL. Suppose that the future burden of past smoking (LYL under the no-future-smoking scenario) is 60 LYL. In this situation, MPRPM would equal 40 LYL (100-60), which would be 40% of total future LYL (40÷100).

Warner KE, Mendez D. *Tob Control* 2021; 30:456–459. doi: 10.1136/tobaccocontrol-2019-055530

Now assume a lower initiation rate or a higher cessation rate, reflecting the trends in these two variables in recent years, resulting from past tobacco control. That would reduce the future burden of smoking. Suppose that it reduced that future burden from 100 LYL to 80 LYL. The MPRPM would now be 20 LYL (80-60), 25% of the total future LYL (20÷80).

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