

Population Health Impact Model Web Application



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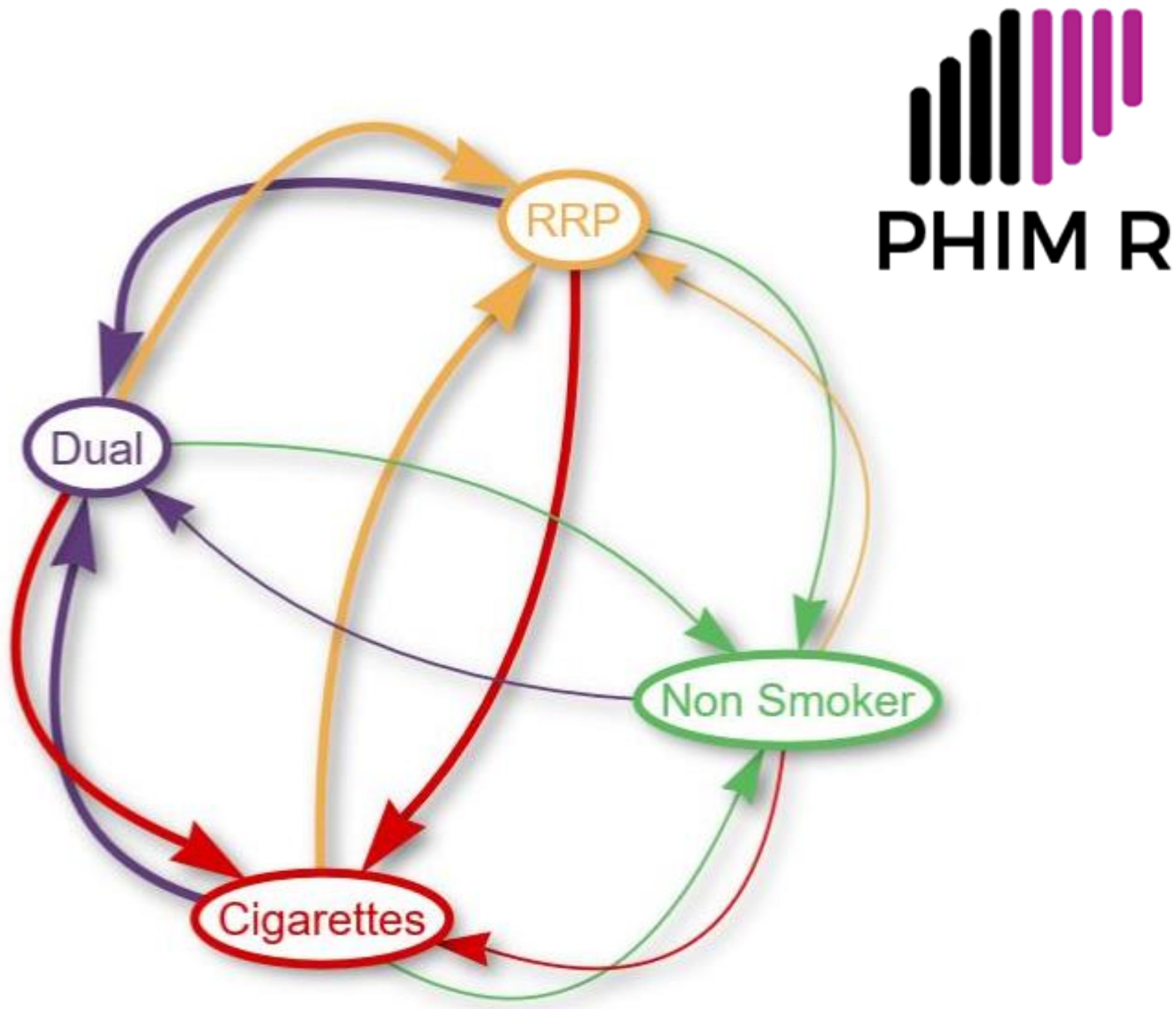
Population Health Impact Model (PHIM)

Smoking-related disease and mortality is a global public health issue. Tobacco harm reduction strategies aim to improve public health by encouraging smokers to quit smoking and by introducing reduced-risk tobacco and nicotine-containing products (RRP*) for smokers who would otherwise continue smoking. A lack of epidemiological data on long-term risks from RRP makes modeling the long-term population health impact necessary.

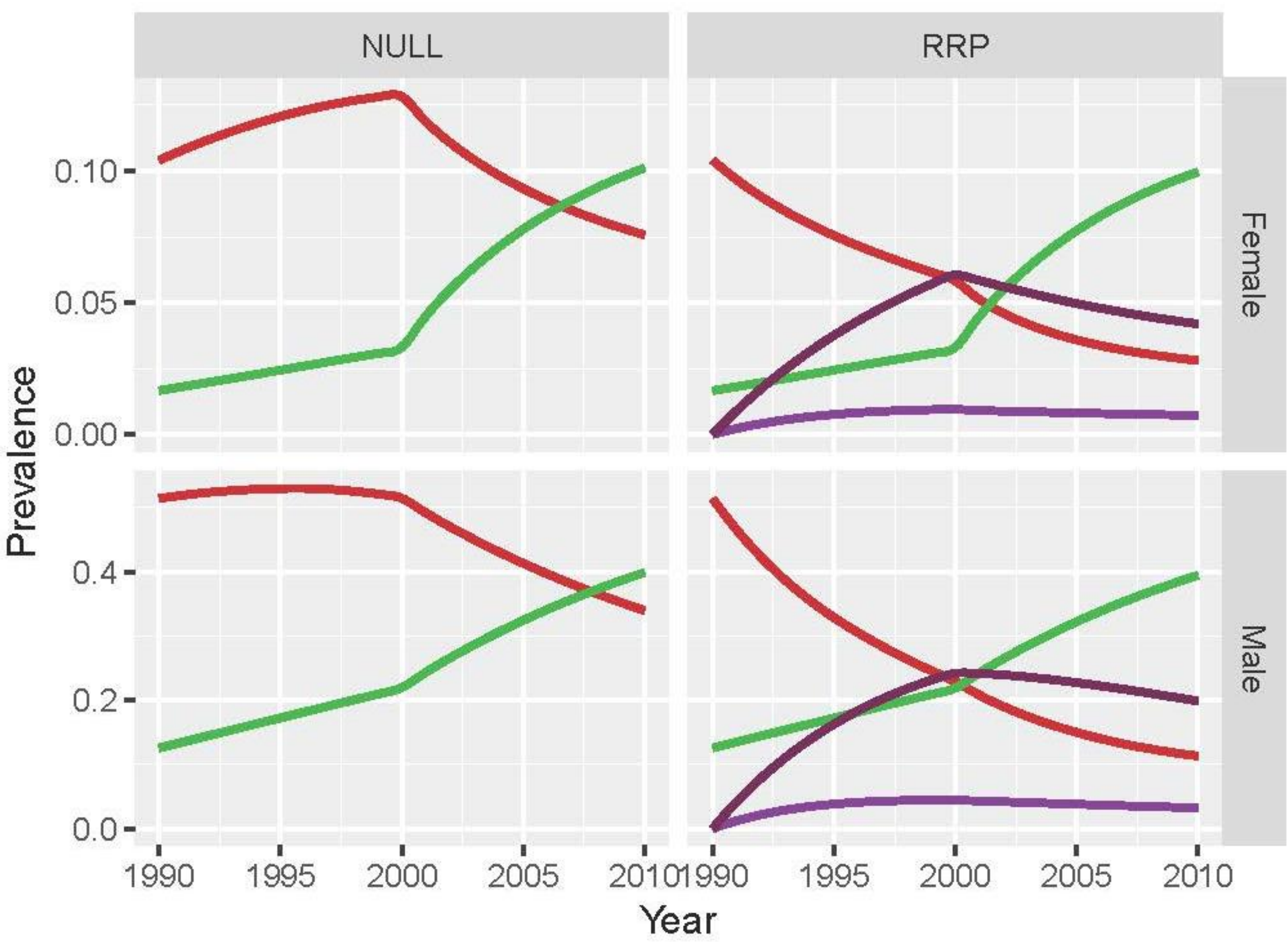
Philip Morris International (PMI) has developed the PHIM to estimate the long-term population health impact of introducing a new RRP into a market and is working to make a web version of this model (PHIM R) publicly available for free.

The PHIM is based on publicly available data on smoking prevalence and the relationship between smoking-related diseases and smoking status or other product usage. The PHIM R will allow users to evaluate the population health impact of introducing an RRP under many scenarios of interest.

* "Reduced-Risk Products" or "RRPs" is the term PMI uses to refer to products that present, are likely to present, or have the potential to present less risk of harm to smokers who switch to these products versus continued smoking.



Tobacco use prevalence – distribution of smoking habits



The prevalence component begins in a specified year with a group of individuals of a given sex and age range with a distribution of smoking habits representative of the national population.

The hypothetical population is followed over discrete time intervals (e.g., 20 years) divided into equal-length intervals (e.g., one-year intervals) for two scenarios:

- Null Scenario**, where no RRP is introduced.
Null Scenario covers never smokers, cigarette smokers, and former smokers.
- RRP Scenario**, where the RRP is introduced at a specific point in time (1990 in this case).
RRP Scenario covers RRP and dual users in addition to never smokers, cigarette smokers, and former smokers.

Epidemiology – relative risk (RR)

Tobacco use histories are used to estimate, for each individual, the RRs of chronic obstructive pulmonary disease (COPD), ischemic heart disease (IHD), lung cancer (LC), and stroke (STR) compared with those of never tobacco users at each year of each scenario.

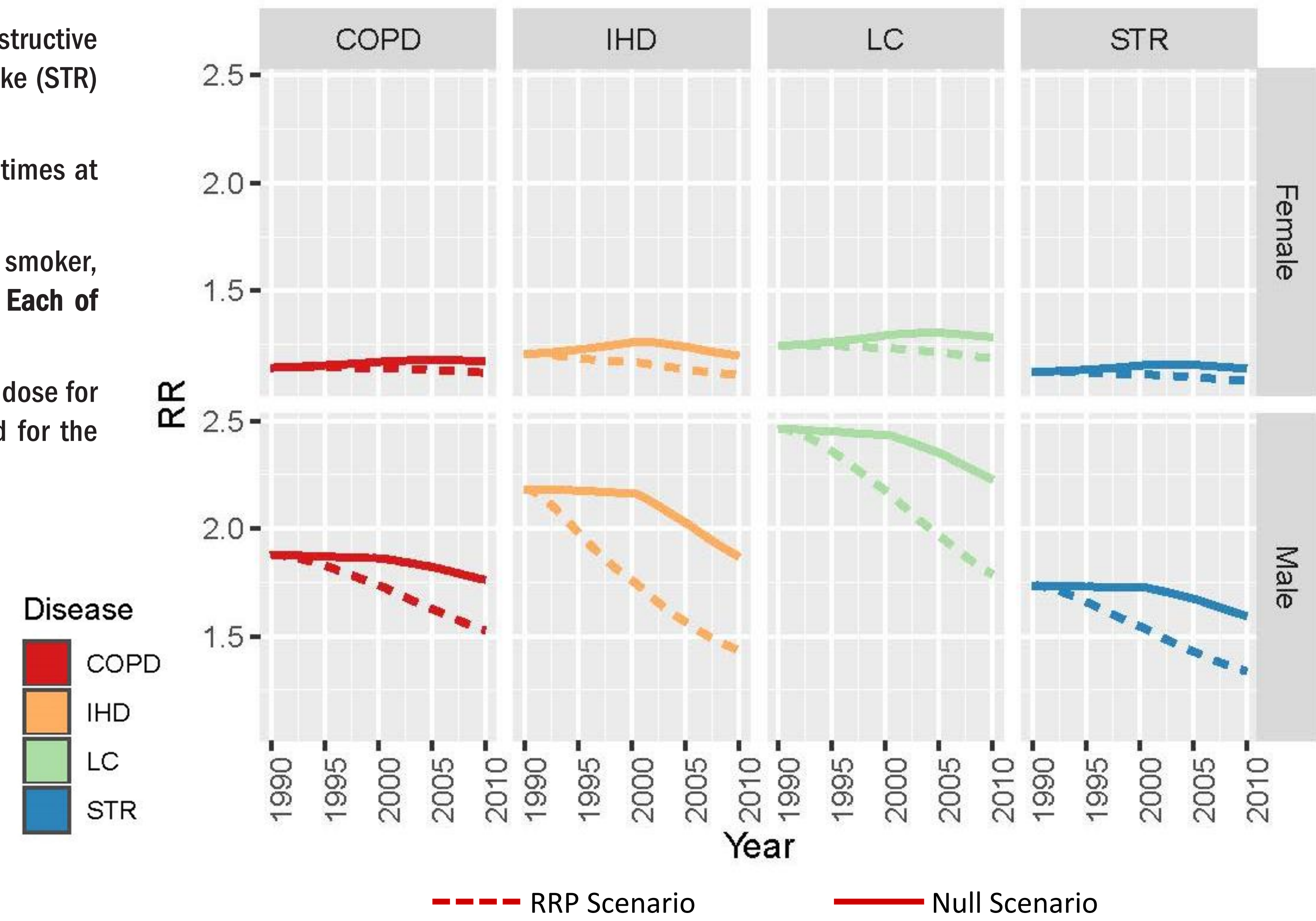
The RRP scenario allows for each individual to change tobacco use habits multiple times at each simulated year.

In a given year, each individual is classified as a never tobacco user, current cigarette smoker, current RRP user, current dual user (RRP and cigarettes), or former tobacco user. **Each of these groups contributes an effect on the RR for the modeled population.**

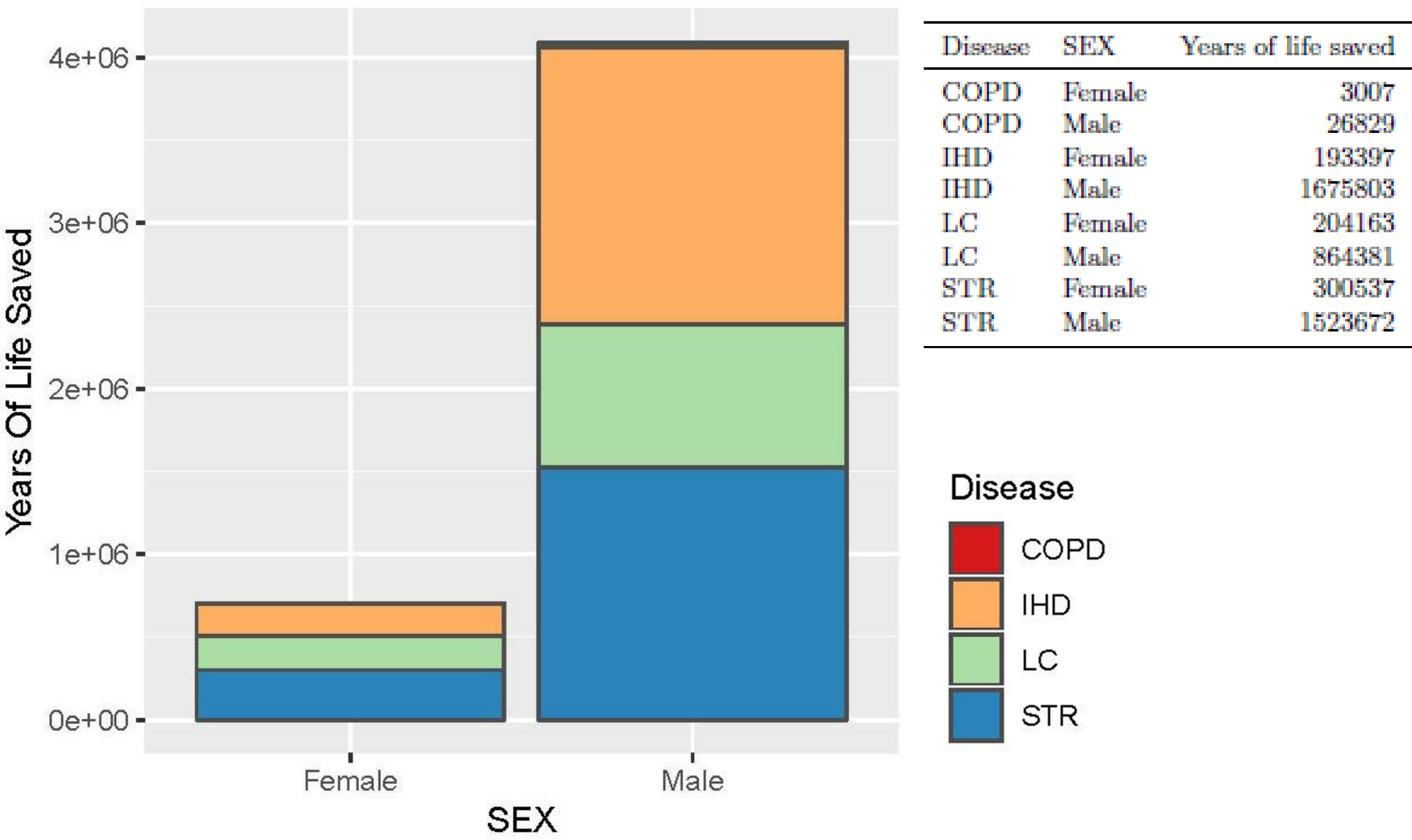
The estimation involves the negative exponential model, which requires the effective dose for current RRP use (f-value) and for dual use, and the RR for continued smoking and for the quitting half-life (H) for each disease, in order to calculate the excess RR over time:

$$RR_t = 1 + (RR_{cc} - 1) \left(f + (1 - f) \exp \left(\frac{-t \ln(2)}{H} \right) \right)$$

RR_t = RR at time t
 $(RR_{cc}-1)$ = excess RR from continued smoking
 f = effective dose associated with smoking status
 H = time after quitting when excess RR reaches half of that for continued smoking



Estimated years of life lost/saved



Based on average RR for each smoking-related disease, the proportion of smoking-attributable deaths can be calculated and converted to numbers using national mortality estimates for population. The model also compares the years of life lost between both scenarios and calculates the years of life saved as a result of introduction of the RRP, assuming a life expectancy of 75 years.

- The PHIM R is operational under following settings:**
- Simulation period of 20 years (e.g., 1990–2010), which covers the 10–79-year-old population of interest.
 - Age of starting product use is set at 16 years old, and the follow-up interval is one year.
 - The Null Scenarios (country-specific, currently available US, JA, IT, DE) are locked and verified, with the ability to add new country data.

All simulation results are produced in a PHIM R simulation report with raw data available for download.