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Estimating the risk of COPD incidence accounting for time-varying and sociodemographic risk-factors. A Markov state transition analysis of longitudinal PATH data

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	Tobacco Industry	E-cigarette & nicotine product industry (excluding pharma)	Pharma Industry
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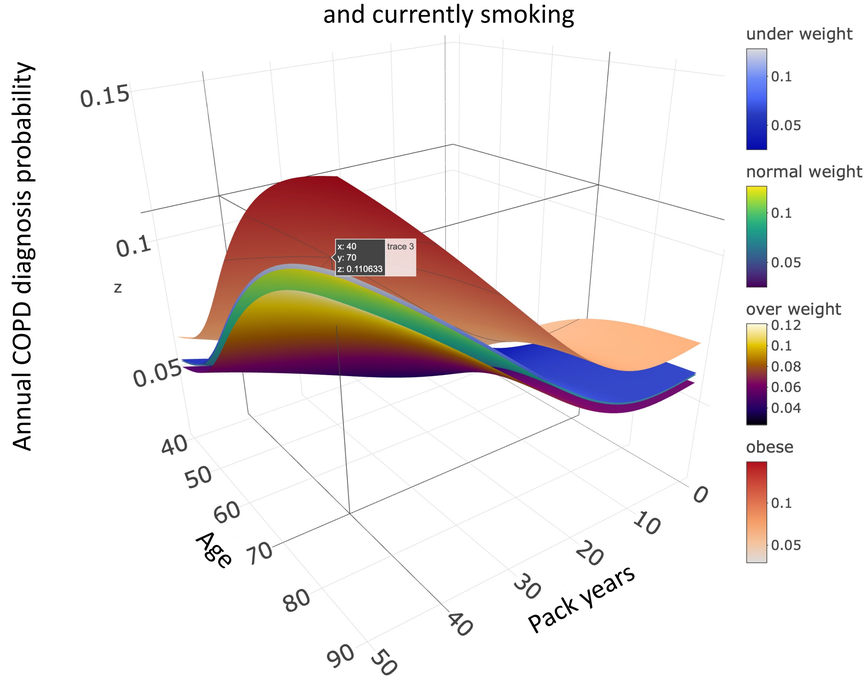
Background

- Chronic Obstructive Pulmonary Disease (COPD) is a leading cause of mortality, with cigarette smoking as its main driver
- While the relationship between smoking and COPD risk is well established, data on the time evolution of COPD risk as a function of smoking history and other time-varying exposures like BMI, and how it varies by race and education, is limited

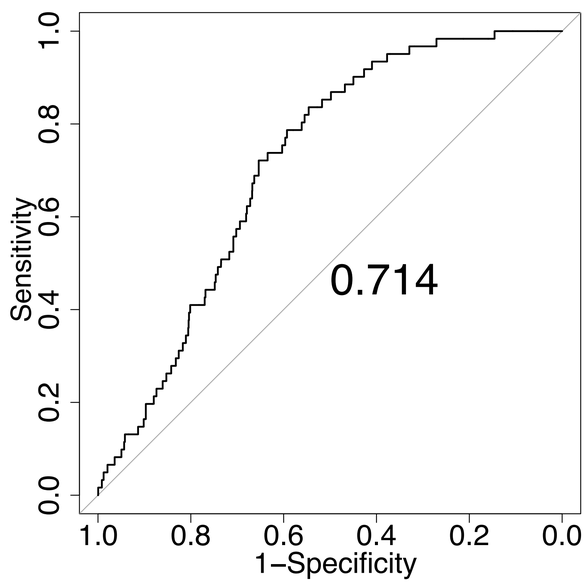
Methods

- Data from 5539 ever-smoking US adults with no prior history of COPD from the Population Assessment of Tobacco and Health study (PATH)
- Weighted Markov state transition analysis
- Outcome: self-reported COPD diagnosis (incidence)
- COPD diagnosis risk prediction model accounting for time-varying factors (age, smoking status, pack-years, and BMI) and sociodemographic characteristics (sex, race/ethnicity, and education)
- Model calibrated using PATH Waves 1–5 and validated using Waves 6–7
- Continuous covariates (age/pack-years) modeled using natural cubic splines
- Model prediction assessed with the Area under the curve (AUC) of the Receiver Operator Curve
- Using the model, we compute annual probabilities of COPD diagnosis as a function of individual covariates

Example. Model predicted annual probabilities of being diagnosed with COPD by age, pack-years, and BMI level for Hispanic females with some college education and currently smoking



Receiver Operator Curve of the model predicting COPD diagnoses between Waves 6 and 7, based on covariate values at Wave 6



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Results

- 651 participants self-reported COPD diagnoses during Waves 2-5
- The final model reproduces well the observed number of COPD diagnoses at each wave
- According to the model, COPD risk increases with age and pack-years
- Compared to males, females have a higher COPD incidence risk (HR 1.58)
- Former smokers have a lower COPD risk than current smokers (HR 0.46), even after controlling for pack-years
- COPD risk decreases monotonically with higher levels of education
- No significant associations were found with race-ethnicity (Non-Hispanic White, Non-Hispanic Black, Non-Hispanic Other, and Hispanic)
- COPD risk is highest among those classified as obese and lowest among those classified as overweight, but the differences were not statistically significant
- The model showed good discriminatory power with an AUC of 0.714 to predict individual risk between waves 6 and 7

Conclusions

- The resulting model reproduces well the observed COPD incidence in PATH
- The model can be used to identify individuals at high risk of COPD; however, further testing and validation are required before clinical use
- The model's annual probabilities of COPD incidence can inform simulation and health and economic models of COPD burden