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Contents lists available at ScienceDirect

Annals of Epidemiology

journal homepage: www.annalsofepidemiology.org

Predictors of COVID-19 susceptibility: insights from population-based self-reported survey during lockdown in the United States



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Purpose: With rapidly evolving nature of COVID-19 pandemic, there is still an inadequate understanding on whether there are clinical factors combined with life-style behaviors that may be useful to predict susceptibility. The study assessed predictor performance after selecting relevant symptom classifiers based on clinical utility.

Methods: An anonymous electronic survey was distributed through social media during the initial lockdown period in the US from April to June 2020. Stepwise logistic regression was used to identify predictors for COVID-19 susceptibility, defined as self-reported belief of infection based on symptoms without evidence of positive test results during lockdown. Selected classifiers were assessed for prediction performance using area under receiver operating characteristic (AUROC) curve analysis.

Results: A total of 130 participants were selected who reported COVID-19 susceptibility (2435 responded to survey) and were compared with 130 individuals reporting at least one pertinent symptom but with negative test

results (mean age: 45; 63% females). Final multivariable model showed significant associations with susceptibility for fever (OR:33.5; 95%CI: 3.9,85.9; $p=0.001$), body aches (OR:3.0; 95%CI:1.1,6.4; $p=0.026$), contact history (OR:2.7; 95%CI:1.1,6.4; $p=0.027$), and smoking (OR:3.3; 95%CI: 1.2,9.1; $p=0.022$) after adjusting for age, other symptoms, and comorbid conditions. The AUROC ranged from poor to fair (0.65 - 0.76) for cluster of symptoms but improved to a good model (AUROC=0.803) after inclusion of age and smoking tobacco.

Conclusions: Fever and body aches suggest association with COVID-19 susceptibility in the presence of demographic and lifestyle behaviors. Using other constitutional and respiratory symptoms with fever and body aches, the parsimonious classifier correctly predicts 80.3% of COVID-19 susceptibility. A larger cohort of respondents will be needed to study and refine classifier performance in future lockdowns and with expected surge of new variants of COVID-19 pandemic. The results also highlight the value of conducting self-reported symptom surveillance at a population-scale to provide insights to plan for subsequent waves of this and future pandemics.

Acknowledgments: SAR and XZ were supported by the Research Training Award for Cancer Prevention Post-Graduate Training Program in Integrative Epidemiology from the Cancer Prevention and Research Institute of Texas (grant number RP160097, PI: M. Spitz). HB and CA's work was supported by OT2HL158258 (PI: Vishwantha). Finally, this work was supported by the facilities and resources of the Dan L Duncan Comprehensive Cancer Center P30 CA125123.