**Working title: Developing and validating an individual-level risk calculator for COVID-19 in the United States**

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**Keywords:**

Covid-19

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**Word count:**

**Abstract**

Background

PLACEHOLDER

Methods

PLACEHOLDER

Findings

PLACEHOLDER

Interpretation

PLACEHOLDER

Funding

PLACEHOLDER

**Introduction [CH]**

* Effective pandemic management needs accurate and equitable risk assessment and management.
* Impacts of COVID-19 vary drastically in different population segments. Science is imperfect and evolves daily.
* COVID-19 risk needs to consider geography, demographics, health condition, and health behaviors (adherence to public health guideline). The last element is often overlooked by many risk assessment tools and infectious disease forecasting models.
* In this paper, we developed and validated an individual COVID-19 risk calculator integrating user input with the best available information from the official report and peer-reviewed literature. We provided an open-source, web-based interactive risk calculator for general public consumption, and developed an Application Programming Interface (API) for easy integration with other decision support tools. We compared individual-level estimates with the UK-based Nexoid COVID-19 Survival Calculator and observed similar performance from the two calculators.
* Our risk calculator empowers individuals to understand their risk profiles and encourage health behaviors that reduce the individual and community COVID-19 risk such as social distancing, wearing masks, and getting the vaccine. On a policy level, our calculator allows risk stratification and effective management of population health. The risk score can be used to effectively allocate vaccine and other pandemic management resources.

**Methods**

**Risk calculator**

* Conceptual framework: data, major modules (exposure/susceptibility/risk characterization) [CH]
* Exposure module
  + Community transmission [EL]
    - Under-reporting
  + Symptomatic cases [EPR]
  + Efficacy of handwashing and PPE [CH]
* Susceptibility module [EL]
  + Hospitalization, ICU, deaths
  + Risk factors
* Risk characterization [CH]
  + Normalization to flu
  + Log-transformation
  + Semi-quantitative score

**Validation**

* Nexoid COVID-19 calculator [JS]
  + Exposure
  + Mortality
* OHDSI’s COVER app [EL]
  + Hospitalization/ICU/Death

**Results**

**Risk calculator**

* Compare exposure risk with prevalence rate [EPR]
* Under-reporting factor has come down over time [EL]
  + Risk scores have not, an objective measure against “pandemic fatigue”
* Web app and API availability [CH]

**Validation**

* Exposure risks in 19andMe and Nexoid [JS]
* Mortality risk in 19andMe and Nexoid [JS]
* Hospitalization/ICU/Death in 19andMe and COVER [EL]

**Discussion**

**Risk calculator**

* Can be used for vaccine allocation
* Living breathing sites that will continue to be updated

**Validation**

* Validation is needed for the public to gain confidence in risk calculators
* This validation study is made possible by digital technology (API) and data sharing by Nexoid

**Limitations**

* Ecological fallacy, unreported confounders for risk of severe health outcomes
* Certain exposure routes are hard to quantify, such as fleeing encounters, or exposure risk as a function of time, risk associated with different activities (going to gym/work/use public transit etc.)

**Conclusion**

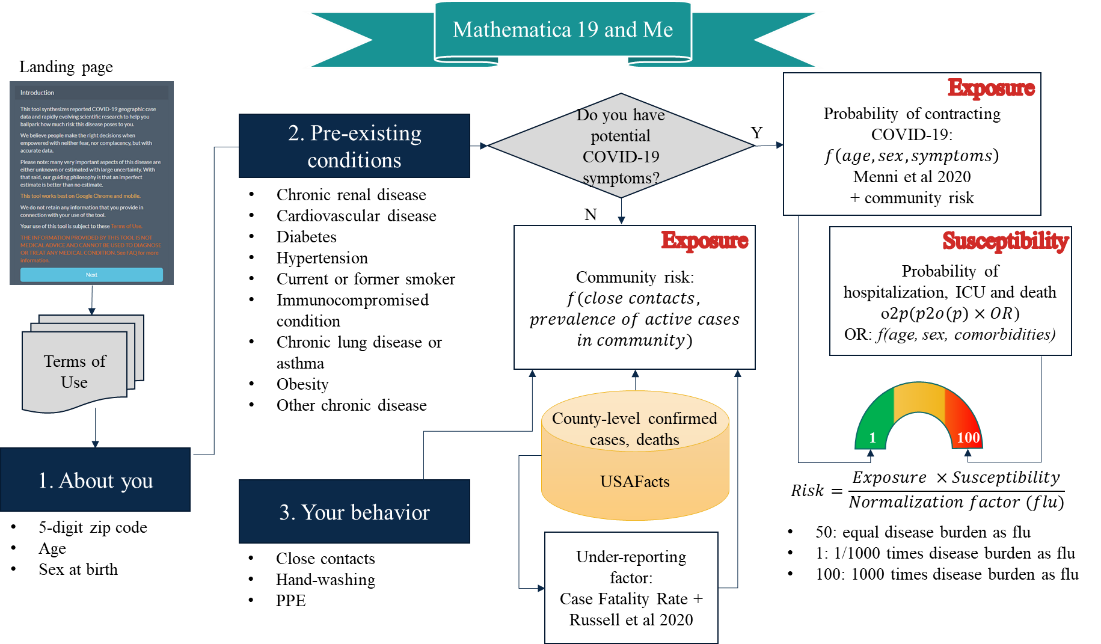
PLACEHOLDER

**Tables and Figures**

**Table 1**

PLACEHOLDER

**Figure 1**



**Data Sharing Statement**

Do we need one? Maybe! Other statements can go here, as necessary.

Yes, and we probably also need Code Sharing Statement somewhere

**References**