Proactive machine-learning-based approaches to vaccine hesitancy for a potential SARS-Cov-2 vaccine
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Background:
Polls in the US and France found a concerning share of respondents (50% and 26%, respectively) stating that they are not committed to receiving or simply saying they would not accept vaccination against SARS-CoV-2[1][2]. In this context, it is worth revisiting machine-learning approaches to predicting vaccine hesitancy - such as the one developed for MMR vaccination at the individual level by Bell et al.[4] amid Europe’s recent measles epidemic - as a first step of a proactive policy.

Proposed Methods and Expectations:
In the MMR case, using 44K child-healthcare records including vaccination data, a LASSO logistic regression based on a low number of attributes of the child and his or her family and community produced risk scores, making them readily interpretable by healthcare professionals. Since children are regularly the target population for immunization efforts, recent pediatric and school-age records, in concert with other social and medical features, could provide suitable input for algorithms estimating the probability of refusal of a SARS-Cov-2 vaccine for other members of a household. This is contingent upon data on acceptance and refusal being collected and paired with these inputs in areas where the vaccine will first be deployed (if developed), which gives another argument for such timely and organized data collection. Speculating about the future performance of a new model trained on truly “out of sample” data specific to a novel problem should be avoided. Benchmarks for success in terms of measures such as precision and recall, however, have to be set in light of the gravity of the issue and other available methods. Finally, any model trained with the aim of predicting vaccine hesitancy for a SARS-Cov-2 vaccine should be coupled with tailored communication policies tested as part of the first vaccination efforts.Cornwall, Science Mag, Jun 30, 2020
Peretti-Watel et al., The Lancet, May 20, 2020
Bell et al., IEEE ICHI, 2019

Key messages:
- Data on acceptance and refusal for the first (potential) SARS-Cov-2 vaccination campaigns should be collected and matched with health records to enable models predicting vaccine hesitancy.
- The output of machine learning models predicting vaccine hesitancy should be paired with tested policies respectfully communicating reliable information on vaccination.