Review of: "Measuring the efficacy of a vaccine during an epidemic"

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The health emergency caused by the COVID-19 pandemic has generated a crisis in healthcare systems that has never been seen before in recent public health history [1]. COVID-19 vaccines have been a fundamental tool in controlling the pandemic, preventing new infections, and avoiding severe forms of the disease. Existing vaccines have varying efficacy, which can be increased through the administration of booster doses [2]. Measuring the effectiveness of the vaccine is crucial to determine if it is safe and functional in preventing a disease. In this case, for COVID-19, it was done by measuring how much the probability of infection is reduced in a group of vaccinated people compared to unvaccinated individuals.

The manuscript “Measuring the efficacy of a vaccine during an epidemic” uses epidemiological models to ascertain vaccine efficacy during Phase III clinical trials, finding underestimated efficacy during infectious peaks. Written by equally contributing authors, Antonio Scala and Pierpaolo Cavallo, it was published in April 2023 as the first version of their Preprint. The article is solid and clear, as well as original and the result of clear scientific curiosity. Keeping that in mind, comments are directed at the authors being able to create an even more solid version of the manuscript as they venture towards submission for official Print Publication.

The authors’ introduction to the manuscript outlines the question that led them to start the study, whether varying vaccine efficacy results from different Phase III clinical trials could have been affected by differing environments rather than on the efficacy of the vaccines. This is because ideal conditions cannot be completely controlled during an outbreak. They distinguish between and define key terms in the study, including vaccine efficacy, vaccine effectiveness and reproductive number (R_0). However, the authors should provide a more detailed overview of the state of the art in predictive models.

To improve the clarity and specificity of the manuscript, it is suggested that the title be revised to explicitly indicate that it pertains to COVID-19 vaccines and their modeling in clinical trials. Additionally, authors should clarify whether the proposed model could be applied to future outbreaks, if at all. In the abstract, it is recommended that the term "COVID-19 pandemic" be used instead of "current pandemic", given that the article may be accessed in the future when this pandemic may no longer be considered "current". To avoid confusion, a clear distinction should also be made between the terms "pandemic" and "epidemic" throughout the manuscript.

To improve the overall flow of the manuscript, it is suggested that the Methods section be placed before the Results

section. This will provide readers with a better understanding of the methodology used to arrive at the results presented. Additionally, in their Methods section, the authors should provide more details about the mathematical models used and the specific COVID-19 vaccines that were studied within this model.

In addition to the aforementioned suggestions, it is recommended that authors also include a dedicated Limitations section within their manuscript. This section should gather the constraints and potential shortcomings discussed throughout the Methods and Conclusions sections of the paper, providing a clear overview of the study's limitations. Placing this section before the Conclusions not only adheres to stylistic conventions, but also enables the authors to present their final remarks in a more coherent and informative manner, with a full understanding of the study as a whole.

Importantly, the Abstract serves as the initial point of engagement for readers, yet it often lacks the necessary specificity to convey the authors' intentions. With an average length of 250 words, authors should strive to incorporate additional key differentiating information, particularly related to study design, to more effectively communicate the manuscript's objectives. Moreover, a distinct and informative title can further enhance the abstract's utility. Commendably, the manuscript's structure is otherwise well-constructed, featuring appropriately labeled and comprehensively explained graphs, as well as transparently documented methods and results, including potential methodological limitations.

The conclusions of the manuscript are based on the results and discussions found, they are appropriate, and do not include value judgements. It would be an asset to the manuscript to discuss in more depth the applicability of the model or the future steps the scientific community should take in regard to the authors' findings. Being that, for the sake of clarity, the findings uncovered with this manuscript, its limitations and future improvements should be discussed separately.

Overall, the authors developed a solid Preprint. By implementing these suggested revisions, the manuscript will become more precise and comprehensible, ensuring that readers can better understand the proposed modeling methodology and its potential applications in COVID-19 vaccine trials.

References

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