



SJMMA 2021 B 题

疫苗接种与影响预测

简介：在后疫情阶段，通过普及疫苗建立免疫屏障对整体复苏加速很关键，而在接种可及度、意愿、时间、人群流动等因素下，疫苗接种普及的周期、对景区/边境打开等场景的影响均存在不确定性，我们希望你结合公开信息和调研，对这些因子充分挖掘与分析，设计一套合理预测疫苗接种普及趋势与衡量其影响的模型。

背景：随着新冠疫苗的研发成功和安全有效保障，世界各国在逐步建立起免疫屏障（按新冠病毒传播系数计算，一般需要约70%-80%的人接种疫苗，可有效控制疫情传播），如以色列马上就要实现免疫屏障，英国接种速度在加快、40岁以上的人基本上完成接种，美国每日接种量也到400万剂的高量级水平。

当世界范围内的疫情得到显著控制，世界将会重新打开，这其中我国建立起免疫屏障的速度和影响也至关重要。虽然疫苗的产能和可及性都在提升、且我国疫苗接种的绝对量排在世界的第二位，但在我们较大的人口基数下，目前的疫苗接种率仅在4%左右，距构筑免疫屏障和一些发达经济体的覆盖度存在差距，而长期若未建立起免疫屏障将会面临更大的威胁。

我们希望你结合目前卫健委等官方机构公开的疫苗接种数据和调研，对影响疫苗普及度因子充分挖掘与分析，设计一套合理预测疫苗接种普及趋势与衡量其影响的模型。

*任务括号中是一些相关提示，你也可以用其他方式：

任务一：请分析可疫苗接种人群的空间，提出对人群分层优先级的建议方案。结合不同区域接种点位分布，社区、学校、商圈、企业等场景可及度，分别预测一二线、三四线和城乡镇接种情况



（可结合各省市卫健委不定期公布的接种信息和数据；并建议排除不适合人群：如其他疾病康复期、孕妇等；思考政策背后的考虑，如之前优先给年轻人接种是因为老年人外出少相对不容易感染；我国疫情防控主要任务为外防输入内防反弹，医生等易接触病毒人员多为年轻人；老年群体其他疾病发生率高，需更多临床研究数据支持）

任务二：结合全国主要景区、商圈等人口聚集场所客流的公开数据（尤其五一、十一、春节假期等），分析疫情对这些场景的影响、预测随疫苗普及的恢复情况；结合国内跨省市、国际人口流动的公开数据，分析疫情对差旅、旅行的影响、预测随疫苗普及的边界打开恢复情况

任务三：结合目前的政策、疫苗药剂产量供给、极端情况（如病毒变异）等外部因子，预测我国整体达到免疫屏障的周期与边际影响曲线。基于所建设的模型和其中因子，提出提升免疫屏障优化影响的建议方案。

提交：你的团队所提交的报告应包含 1 页“总结摘要”，其正文不可超过 20 页（总页数限于 21 页）。附录和参考文献应置于正文之后，不计入 21 页之限。



SJMMA2021 Problem B

Covid Vaccination Rate and Impact Prediction

Introduction: Establishing immune barrier through vaccine Inoculation is critical to end COVID-19 pandemic. Depending on factors such as inoculated accessibility, willingness, time, there are quite uncertainty around the popularization of the vaccination and its impact on the scene/boarder reopen . Please leverage the public information and research to fully analyze these different dimensions and factors, build a mathematic model to reasonably predict the trend of vaccination prevalence and measure its impact.

Background: With the successful development of covid vaccine and is effective safeguard, different countries gradually established the immune barrier (press will be coronavirus propagation coefficient calculation, generally need to about 70% to 80% of people are vaccinated, can effectively control the spread of the epidemic).For example, Israel is going to achieve the immune barrier, UK speeded up the vaccination rate, with more than 40 years old people basically inoculated. United States also reached a high level of vaccination with four million doses a day.

The speed of establishing immune barriers is crucial to controll the pandemic worldwide and reopen the world boarder. Although the vaccine production capacity and accessibility increased a lot, and our country vaccination rate ranked second in the world, our current vaccination rates is only 4% based on our large population, which is far away from the immune barrier and level ofsome developed countries. If not establishing long-term immune barrier, we will face a greater threat.



Please fully analyze the factors affecting the prevalence of vaccine based on the vaccination data and research published by the National Health Commission and other official institutions, and design a model that can reasonably predict the trend of vaccination prevalence and measure its impact.

Task 1: Please analyze the space of vaccinable populations and propose a plan for prioritizing the population. Combined with the distribution of vaccination sites in different regions and the accessibility of communities, schools, business districts and enterprises, the vaccination situation in different type of cities and towns can be predicted respectively)

Task 2: Based on the public data of passenger flow in major scenic spots and commercial areas and other population gathering places (especially the May Day, October Day and Spring Festival, etc.), please analyze the impact of the epidemic on these scenes and predict the recovery situation with the popularization of vaccine; Based on the public data of inter-provincial and international population mobility, please analyze the impact of the epidemic on travel and travel, and predicts the reopen of the border.

Task 3: Based on external factors such as current policy, vaccine production and supply, and extreme conditions (such as virus mutation), predict the period and marginal impact curve of China's overall immunization barrier. Based on the model and its factors, please propose suggestions to improve the effect of immune barrier optimization.

Submission: Your team report should contain a one-page "executive summary" with no more than 20 pages (total pages are limited to 21). Appendices and references should be placed at the end of the essay , not included in the 21-page limit.