IMMC 2022 Greater China Problem C (Autumn) (English 简体 繁體)
(For Teams of Junior Secondary School Only/初中组别专用/初中組別專用)

The risk and challenges of future outbreaks of other notifiable infectious diseases in the post-COVID-19 pandemic period

Have you noticed that the incidence of this year's flu season is significantly lower than in previous years? The COVID-19 pandemic has lasted for nearly two years. Non-pharmaceutical interventions (NPIs), such as wearing facial mask, using hand sanitizer, social distancing, travel restriction, contact tracing, mass testing, targeted quarantine, etc., have been demonstrated to be effective in containing the pandemic as well as reducing the risk of other notifiable infectious diseases (NIDs) (Xiao, 2021).

For example, in 2020, there were 5,806,728 NIDs (including COVID-19) cases (morbidity rate: 413.63 per 100,000 people) and 26,374 deaths (mortality rate: 1.88 per 100,000 people) in Mainland China. In 2019, there were 10,244,507 NIDs cases (morbidity rate: 733.57 per 100,000 people) and 25,285 NIDs-related deaths (mortality rate: 1.81 per 100,000 people) in Mainland China (National Health Commission, 2021). Similarly, in Guangdong Province of China, there were 657,684 NIDs (including COVID-19) cases (morbidity rate: 570.88/100,000 people) and 1,240 deaths (mortality rate: 1.08 per 100,000 people). As compared to 2019, the morbidity rate and mortality rate reduced by 59.72% and 5.41%, respectively. Whereas the morbidity rate and mortality rate in 2019 actually increased by 51.96% and 4.77% as compared to that of 2018.

Tasks

There is increasing evidence that the COVID-19 targeted NPIs reduced the risk of other NIDs. However, latest research and experts indicated that the susceptible population for other NIDs increased while COVID-19-targeted NPIs were in place, and thus might pose a greater risk of future outbreaks of NIDs after the COVID-19 targeted NPIs are relaxed (Zhang, 2021). **Please use real-world data and appropriate mathematical models to characterize and analyze the risk and challenges of future outbreaks of other notifiable infectious diseases in the post-COVID-19 pandemic period.**

Please refer to the following requirements and hints:

1. Please select ONE non-COVID-19 NID (such as influenza, plague, HIV, etc.) for your study.
2. Please select ONE Chinese province or city for your study (such as your province or city, Guangdong Province, Shenzhen, Hong Kong, Shanghai, etc.).
3. Public health data can be obtained from the national and local health commissions and centers for disease control and prevention (see some examples in the references).

4. Please be open-minded and innovatively use various conventional and non-conventional data that is related to the problem.

Submission

Your solution paper should include a 1-page Summary Sheet. The body cannot exceed 20 pages for a maximum of 21 pages with the Summary Sheet inclusive. The appendices and references should appear at the end of the paper and do not count towards the 21 pages limit.

References

Xiao, Jianpeng, Jiya Dai, Jianxiong Hu, Tao Liu, Dexin Gong, Xing Li, Min Kang et al. "Co-benefits of nonpharmaceutical intervention against COVID-19 on infectious diseases in China: A large population-based observational study." *The Lancet Regional Health-Western Pacific* 17 (2021). URL: https://doi.org/10.1016/j.lanwpc.2021.100282

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中国卫健委疾病预防控制局数据发布．URL: http://www.nhc.gov.cn/jkj/pqt/new_list.shtml

广东省卫健委数据发布．URL: http://wsjkw.gd.gov.cn/zwgk_tjxx/index.html

香港特别行政区卫生署健康统计数字．URL: https://www.chp.gov.hk/tc/statistics/submenu/26/index.html

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新冠疫情之后其他传染病的暴发风险和挑战

你是否发现今年的流感季发病率比往年明显减少？新冠疫情已经持续近两年，长期的防疫措施（包括佩戴口罩、使用洗手液、社交隔离、出行限制、接触追踪和数字健康码、大规模检测、定点封禁等）在控制新冠疫情的同时，亦在一定程度上帮助人们降低了感染其他传染病的风险（Xiao, 2021）。

例如，2020 年中国大陆地区共报告法定传染病（包括新冠）5806728 例，死亡 26374 人，报告发病率为 413.63/10 万，报告死亡率为 1.88/10 万；而 2019 年共报告法定传染病 10244507 例，死亡 25285 人，报告发病率为 733.57/10 万，报告死亡率为 1.81/10 万（中国卫健委, 2021）。类似地，广东省 2020 年全省共报告法定传染病（包括新冠）657684 例，死亡 1240 人，报告发病率为 570.88/10 万，死亡率为 1.08/10 万。与 2019 年相比，2020 年发病率和死亡率分别下降了 59.72%和 5.41%，而 2019 年的广东省统计数据较 2018 年发病率和死亡率分别上升了 51.96%和 4.77%（广东省卫健委, 2021）。

任务

越来越多的文献在世界各国和地区发现了新冠防疫措施降低了其他传染病的风险。然而，亦有研究和专家表示，长期的防疫措施使得整个人们长期没有接触到传染病，从而对各类传染病的易感染性较高。一旦防疫措施彻底放开，各类传染病也很有可能紧接着爆发，届时各个地区的公共卫生系统将面临挑战（Zhang, 2021）。**请参赛的同学们利用真实数据和有效的数学模型对该问题进行探讨，描述和分析新冠疫情之后其他传染病的暴发风险和挑战。**

请参照如下要求和提示：

1. 请选取一种非新冠的传染病进行研究（例如流感、鼠疫、艾滋病等）。
2. 请选取一个中国省份或城市进行研究（例如你所在的省市、广东省、深圳市、香港、上海等）。
3. 公共卫生数据可在国家和各省市的卫健委及疾控中心网站获取（请参见参考文献）。
4. 请保持思维开阔，灵活利用各类传统和非传统的相关数据。

提交

你团队的解决方案论文应包括 1 页的摘要。正文不能超过 20 页，含摘要最多 21 页。附录和参考资料应出现在正文之后，不算在 21 页的限制之内。

参考文献

Xiao, Jianpeng, Jiya Dai, Jianxiong Hu, Tao Liu, Dexin Gong, Xing Li, Min Kang et al. "Co-benefits of nonpharmaceutical intervention against COVID-19 on infectious diseases in

China: A large population-based observational study." *The Lancet Regional Health-Western Pacific* 17 (2021). URL: https://doi.org/10.1016/j.lanwpc.2021.100282

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中国卫健委．“2020年全国法定传染病疫情概况．”（2021）URL: http://www.nhc.gov.cn/jkj/s3578/202103/f1a448b7df7d4760976fea6d55834966.shtml.

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中国卫健委疾病预防控制局数据发布．URL: http://www.nhc.gov.cn/jkj/pqt/new_list.shtml

广东省卫健委数据发布．URL: http://wsjkw.gd.gov.cn/zwgk_tjxx/index.html

香港特别行政区卫生署健康统计数字．URL: https://www.chp.gov.hk/tc/statistics/submenu/26/index.html

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新冠疫情之後其他傳染病的暴發風險和挑戰

你是否發現今年的流感季發病率比往年明顯減少？新冠疫情已經持續近兩年，長期的防疫措施（包括佩戴口罩、使用洗手液、社交隔離、出行限制、接觸追蹤和數字健康碼、大規模檢測、定點封禁等）在控制新冠疫情的同時，亦在一定程度上幫助人們降低了感染其他傳染病的風險（Xiao, 2021）。

例如，2020 年中國大陸地區共報告法定傳染病（包括新冠）5806728 例，死亡 26374 人，報告發病率為 413.63/10 萬，報告死亡率為 1.88/10 萬；而 2019 年共報告法定傳染病 10244507 例，死亡 25285 人，報告發病率為 733.57/10 萬，報告死亡率為 1.81/10 萬（中國衛健委, 2021）。類似地，廣東省 2020 年全省共報告法定傳染病（包括新冠）657684 例，死亡 1240 人，報告發病率為 570.88/10 萬，死亡率為 1.08/10 萬。與 2019 年相比，2020 年發病率和死亡率分別下降了 59.72%和 5.41%，而 2019 年的廣東省統計數據較 2018 年發病率和死亡率分別上升了 51.96%和 4.77%（廣東省衛健委, 2021）。

任務

越來越多的文獻在世界各國和地區發現了新冠防疫措施降低了其他傳染病的風險。然而，亦有研究和專家表示，長期的防疫措施使得整個人們長期沒有接觸到傳染病，從而對各類傳染病的易感染性較高。一旦防疫措施徹底放開，各類傳染病也很有可能緊接著爆發，屆時各個地區的公共衛生系統將面臨挑戰（Zhang, 2021）。請參賽的同學們利用真實數據和有效的數學模型對該問題進行探討，描述和分析新冠疫情之後其他傳染病的暴發風險和挑戰。

請參照如下要求和提示：

1. 請選取一種非新冠的傳染病進行研究（例如流感、鼠疫、艾滋病等）。
2. 請選取一個中國省份或城市進行研究（例如你所在的省市、廣東省、深圳市、香港、上海等）。
3. 公共衛生數據可在國家和各省市的衛健委及疾控中心網站獲取（請參見參考文獻）。
4. 請保持思維開闊，靈活利用各類傳統和非傳統的相關數據。

提交

你團隊的解決方案論文應包括 1 頁的摘要。正文不能超過 20 頁，含摘要最多 21 頁。附錄和參考資料應出現在正文之後，不算在 21 頁的限制之內。

參考文獻

Xiao, Jianpeng, Jiya Dai, Jianxiong Hu, Tao Liu, Dexin Gong, Xing Li, Min Kang et al. "Co-benefits of nonpharmaceutical intervention against COVID-19 on infectious diseases in China: A large population-based observational study." *The Lancet Regional Health-Western*

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廣東省衛健委數據發布．URL: http://wsjkw.gd.gov.cn/zwgk_tjxx/index.html

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