Letter to Editor

Density of COVID-19 and mass population movement during long holiday: Simulation comparing between using holiday postponement and no holiday postponement

Dear Editor,

COVID-19 is a big pandemic at present and accepted as an emergency problem internationally. Several preventive measurements against COVID-19 have been used.[1,2] Control of population movement is a basic principle. The control of intercountry population movement is usually by border closure. For intracountry control, school/office closure is generally used. Another interest method is holiday postponement aiming at blocking of mass population movement from capital to rural areas within the country. The effect of holiday postponement has to be carefully considered since it can affect the epidemic characteristics in both capital and rural areas.

Here, the authors present data from simulation analysis for comparing between using holiday postponement (school/office still open) and no holiday postponement with the present situation in Thailand, the second country in the timelines of global COVID-19 pandemic. The scenario of Thai New Year festival, a 5-day long holiday period, in April is used as a model. The density of COVID-19 cases is calculated and compared. Based on the data on a 90-day period that COVID-19 already has been existed in Thailand, there are accumulated 272 patients at present (March 19, 2020) with 246 cases in Bangkok and 26 cases in rural areas. The average rate of case existence is equal to 272/90 or 3.02 cases/day (2.73 cases/day in Bangkok and 0.29 case/day in rural areas). The density of cases per area in Bangkok and other areas is equal to 246/1569 or 0.16 case/km^2 and 26/511551 or 0.00005 case/km^2, respectively. The density of cases per area in Bangkok and rural areas is equal to 246/8.28 or 29.71 cases/million population and 26/69.04 or 0.38 case/million population, respectively.

Mathematical linear modeling simulation is done based on the previously described primary data. For specific population movement dynamics during long holiday, the statistics in the previous year (2019) is referred to. During the 5-day period Thai New Year, the mass population movement from capital to rural areas is equal to 2 million persons. For modeling, the final density of COVID-19 cases is the focused studied parameter. The path probability is used for calculation for the final density of COVID-19 cases. For modeling, the density of cases per area at staring point is directly simulated with mass population movement. The final densities of COVID-19 cases in Bangkok and rural areas for scenario with and without holiday postponement are calculated by the formula presented in Table 1.

Applying the condition of Thai New Year, the final density of cases in Bangkok and rural areas will be equal to 259.65/8.28 or 31.36 cases/million population and 27.45/69.04 or 0.40 case/million population, respectively, in case if the holiday postponement is implemented and the final density of cases in Bangkok and rural areas will be equal to 259.65/6.28 or 41.34 cases/million population and 27.45/71.04 or 0.39 case/million population, respectively, in case if the holiday postponement is not implemented. Comparing between holiday and holiday postponement, a more density is expected in capital area. There is a more magnitude of chance in Bangkok than rural areas (131.8% vs. 97.5%). Therefore, holiday postponement, as a single control measurement, can make the worse situation in Bangkok and slightly improve the situation in rural areas. Based on this study,

Table 1: Formula in mathematical modeling calculation for final densities of COVID-19 cases in Capital and rural areas for scenario with and without holiday postponement

Alternative simulated scenario	Formula
Capital with holiday postponement	([(Starting population in Capital × corresponding average rate of case existence) × duration of holiday])/population in Capital
Capital without holiday postponement	([(Starting population in rural × corresponding average rate of case existence) × duration of holiday])/population in rural
Rural with holiday postponement	([(Starting population in Capital − population moving out) × corresponding average rate of case existence] × duration of holiday)/population in Capital
Rural without holiday postponement	([(Starting population in Capital ± population moving in) × corresponding average rate of case existence] × duration of holiday)/population in Capital

holiday postponement without any additional control measurement is not recommended.

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Conflicts of interest

There are no conflicts of interest.

Viroj Wiwanitkit[1,2], Beuy Joob[3]

[1]Department of Community Medicine, Dr. D.Y. Patil University, Pune, Maharashtra, India, [2]Department of Tropical Medicine, Hainan Medical University, Haikou, China, [3]Private Academic Consultant, Sanitation 1 Medical Academic Center, Bangkok, Thailand

Address for correspondence: Dr. Beuy Joob, Sanitation 1 Medical Academic Center, Bangkok, Thailand. E-mail: beuyjoob@hotmail.com

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REFERENCES

1. Khot WY, Nadkar MY. The 2019 novel coronavirus outbreak-A global threat. J Assoc Physicians India 2020;68:67-71.
2. Zhang L, Liu Y. Potential interventions for novel coronavirus in China: A systematic review. J Med Virol 2020;92:479-90.

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