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Commentary

## COVID-19: What we need from epidemiology to help informed policies

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Globally, shifting COVID-19 from a pandemic into an endemic phase is being highly debated due to various vaccination strategies, environmental factors, host population demographics, and the emergence of new SARS-CoV-2 variants with higher infectivity.[1] For an endemic stage to be achieved, the disease should be manageable within a given geographical area. Despite COVID-19 vaccination and evidence alluding to a slowdown in the spread, declaring the endemic phase as an endgame is still a matter of much conjecture. Only by proper interpretation of epidemiological indicators, a country limited by both political and resource constraints can have evidence-informed policy decisions for the control of COVID-19.

In *The Lancet Regional Health - Western Pacific*, Jayaraj and colleagues provide a comprehensive view of the COVID-19 situation in Malaysia for the past year by describing its spatiotemporal patterns based on various epidemiological indicators: time-varying reproduction number ( $R_t$ ), incidence rate, mortality rate, case fatality rate, test positive ratio, and testing rate, providing.[2] The article also demonstrates the characteristics of COVID-19 associated mortalities in Malaysia, which is similar to other existing studies showing vulnerable groups are mainly elderly and patients with co-morbidities.[3] Reporting single indicator alone will not suffice as it does not help in gauging the real outbreak situation. For example, case fatality rate can be influenced by time delay in detection and under-ascertainment of undetected cases, while a low testing rate can affect the total number of cases.[4] The authors have overcome this limitation by informing alongside the test positive ratio to reflect the testing capacity of the country.

In epidemiology,  $R_t$  is a retrospective method widely used to explain the transmissibility and control of disease over a given period of time.[5] By looking at the  $R_t$  of different geographical regions in Malaysia, the authors capture the spatial pattern of trans-

mission potentials of regions with different population densities and structures. While  $R_t$  can be a useful metric to guide the level of mitigation measures needed for specific areas, yet as Jayaraj and colleagues state, "the variability of policy shifts and intensification of restrictions across time makes it difficult to isolate the signals of change in transmissibility due to individual NPIs." It is challenging to evaluate the efficacy of containment policies when a simple model is used to reflect a complex situation.[6] Moreover,  $R_t$  is sensitive to noise in data source, cluster outbreak and population structure, assuming every individual has an equal probability of infecting another person in the given population. This assumption obscures the individual-level variations in exposure risk when the presence of super-spreader will significantly increase the infected population in a short period of time. With Jayaraj and colleagues' work as the reference, future researchers can consider fitting a model to accommodate realistic disease dynamics which includes the heterogeneous mixing of individuals (super-spreaders, behavioural factors due to COVID-19 fatigues and active young asymptomatic patients).[7]

Even a basket of epidemiological parameters may not answer the real pressing question: when and what intervention is required to achieve control. Additional work is required to develop a more robust epidemiological framework to capture the different levels of interventions with the disease-transmission dynamic.[8] That as mentioned by Jayaraj and colleagues, "publication of epidemiological indicators across the world remains diverse and scarce." Many studies barely scratched the surface by oversimplifying the concept. A culture of data sharing, active discussion on evidence-based control measurements and statistical analysis to quantify the indicators across regions is essential for researchers and decision-makers to understand and manage the disease in an effective way.[9,10]

To conclude, the control of COVID-19 requires concerted efforts by governments, health experts, mathematicians, and the public. Insights gained from well-designed epidemiological studies will al-

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low policymakers to understand the latest pandemic development and plan for timely interventions. There is no one-size-fits-all approach in this ever-changing situation thus relying on any indicator without expert guidance can lead to unwarranted consequences.

### Author contributions

All authors contributed equally to this commentary.

### Declaration of Competing Interest

We declare no competing interests.

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