

Global Health Day

The Middle East and North Africa SARS-CoV-2 Surveillance System: Policy, Persistence & Transmission

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The COVID-19 global pandemic has disrupted the lives of millions and forced countries to devise public health policies to reduce the pace of transmission. In the Middle East and North Africa, falling oil prices, disparities in wealth, public health infrastructure, and proportion of refugee populations, have significantly increased the COVID-19 disease burden. In light of these mitigating factors, public health surveillance is particularly necessary to help leaders understand and implement effective disease control policies to reduce Sars-CoV-2 persistence and transmission.

The goal of this study is to provide advanced surveillance metrics, in combination with traditional surveillance, for COVID-19 transmission that account for shifts in the pandemic, week over week, speed, acceleration, jerk and persistence, to better understand country risk for explosive growth and those who are managing the pandemic successfully.

Existing surveillance coupled with our dynamic metrics of transmission will inform health policy to control the COVID-19 pandemic until an effective vaccine is developed. Using a longitudinal trend analysis study design, we extracted 30 days of COVID-19 data from public health registries. We use an empirical difference equation to measure the daily number of cases in the Middle East and North Africa as a function of the prior number of cases, the level of testing, and weekly shift variables based on a dynamic panel model that was estimated using the generalized method of moments (GMM) approach by implementing the Arellano-Bond estimator in R. The regression Wald statistic is significant ($\chi^2(5)=859.5$, $P < .001$). The Sargan test is not significant, failing to reject the validity of over identifying restrictions ($\chi^2(294)=16$, $P=.99$). Countries with the highest cumulative caseload of the novel coronavirus include Iran, Iraq, Saudi Arabia, and Israel with 530,380, 426,634, 342,202, and 303,109 cases respectively. Many of the smaller countries in MENA have higher infection rates than those countries with the highest caseloads. Oman has 33.3 new infections per 100,000 population while Bahrain has 12.1, Libya has 14, and Lebanon has 14.6. In order of most to least number of cumulative deaths since January 2020, Iran, Iraq, Egypt, and Saudi Arabia have 30,375, 10,254, 6,120, and 5,185 respectively. Israel, Bahrain, Lebanon, and Oman had the highest rate of COVID-19 persistence which are the number of new infections statistically related to new infections 7 days ago. Bahrain had positive speed, acceleration and Jerk signaling the potential for explosive growth.

In conclusion, static and dynamic public health surveillance metrics provide a more complete picture of pandemic progression across countries in MENA. While static measures capture data at a given point in time such as infection rates and death rates. By including speed, acceleration, jerk, and 7-day persistence, public health officials may design policy with an eye to the future. Iran, Iraq, Saudi Arabia, and Israel all demonstrated the highest rate of infections, acceleration, jerk, and 7-day persistence rates prompting public health leaders to increase prevention efforts.

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