Central Asian SARS-CoV-2 Surveillance: A Longitudinal Trend Analysis

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Background

SARS-CoV-2, the virus that caused the COVID-19 global pandemic, has severely impacted Central Asia, resulting in a high caseload and deaths that varied by country in Spring 2020. The varying severity of the pandemic is explained by differences in prevention efforts in the form of public health policy, adherence to those guidelines, as well as socio-cultural, climate, and population characteristics. The second wave of the COVID-19 currently is breaching the borders of Europe. Public health surveillance is necessary to inform policy and guide leaders; however, existing surveillance explains past transmissions obscuring shifts in the pandemic, increases in infection rates, and the persistence in the transmission of COVID-19.

Objectives

The goal of this study is to provide enhanced surveillance metrics 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 and provides novel metrics to measure the transmission of disease.

Methods

Using a longitudinal trend analysis study design, we extracted 60 days of COVID-19 data from public health registries. We used an empirical difference equation to measure the daily number of cases in the Central Asia region 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.

Table 1. Weekly Central Asia SARS-CoV-2 Trends by Country
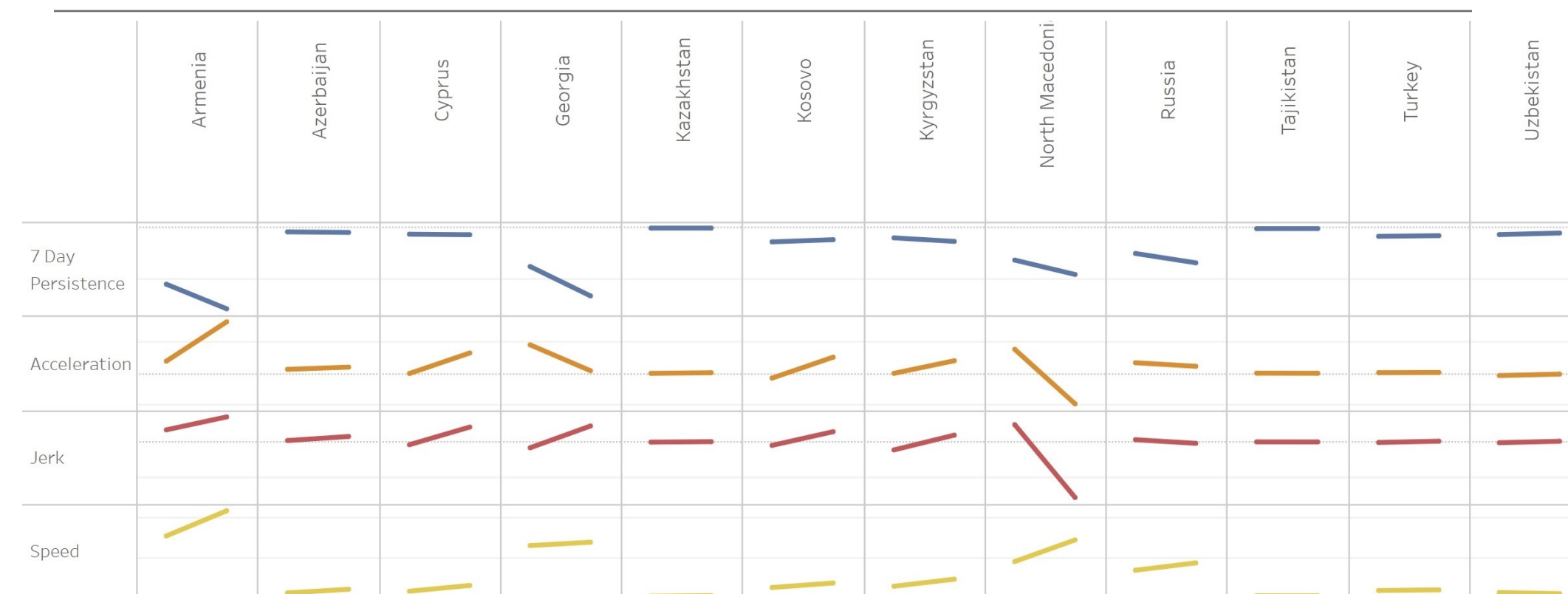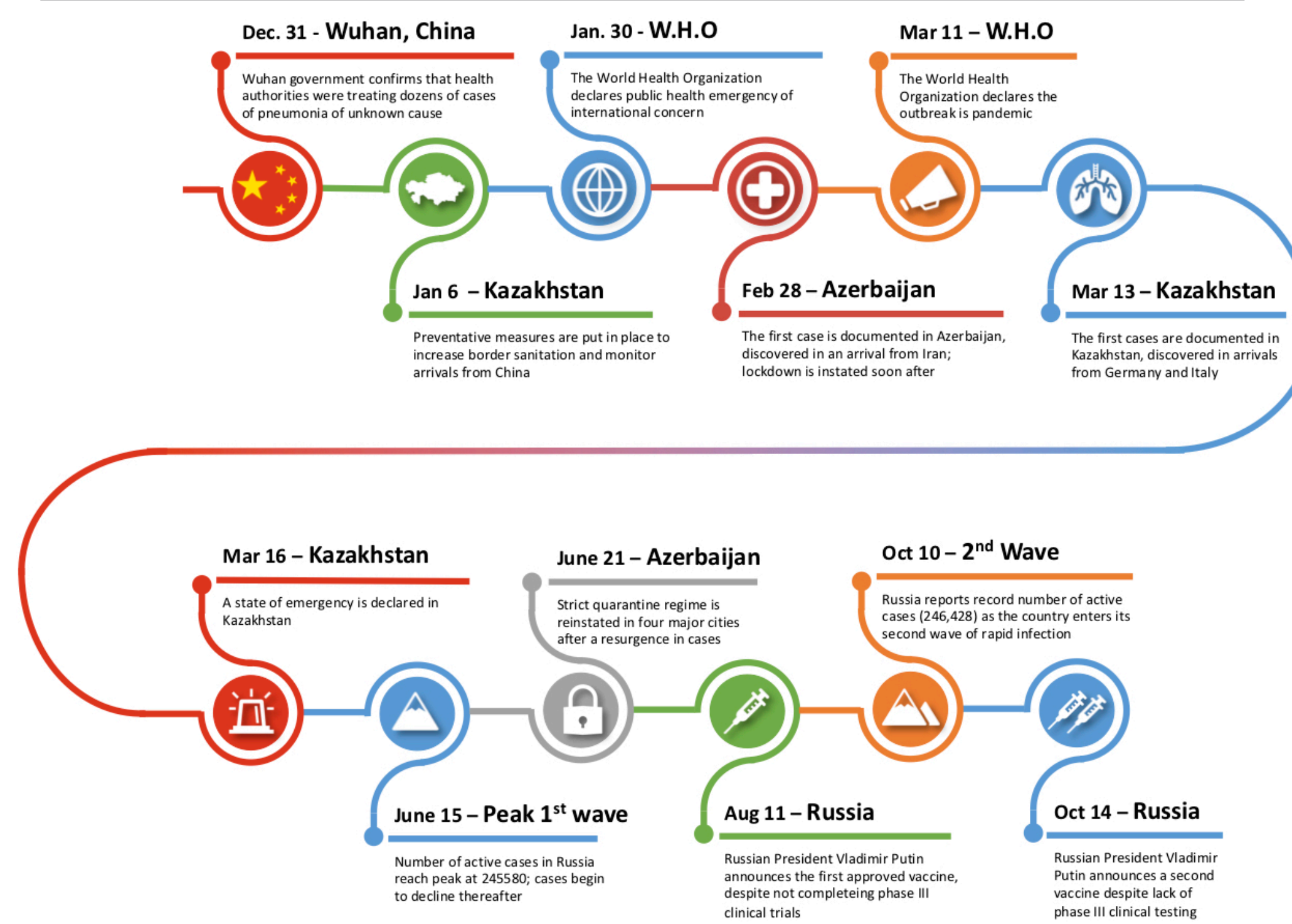

Table 2. Timeline of Major Events in Central Asia

Results

COVID-19 transmission rates were tracked for the weeks of 9/30-10/06 and 10/07-10/13 in Central Asia. The region averaged 11,730 new cases per day for the week ending in 10/06 and 14,514 for the week ending in 10/13. Infection rates increased across the region from 4.74 per 100,000 in the population to 5.66. Infection rates varied by country. Russia and Turkey had the highest seven-day moving averages in the region, at 9,836 and 1,469 respectively for the week of 10/06 and 12,501 and 1,603 respectively for the week of 10/13. Russia has the fourth highest speed in the region and continues to have positive acceleration. Armenia is experiencing explosive growth of COVID-19. The region overall is experiencing increases in seven-day moving average of new cases, infection, rate and speed, with continued positive acceleration and no sign of a reversal in sight.

Conclusions

The rapidly evolving COVID-19 pandemic requires novel dynamic surveillance metrics in addition to static metrics to effectively analyze pandemic trajectory and control spread. Policymakers need to know the magnitude of transmission rates, how quickly they are accelerating, and how previous cases are impacting current caseload due to a lag effect. These metrics applied to Central Asia suggest that the region is trending negatively, primarily due to minimal restrictions in Russia. Russia already has the fourth highest number of cases in the world and current metrics suggest Russia will continue in that trajectory.

How would you describe the importance of your work to a lay person with no background in population health?

This model allows you to measure the dynamics of the pandemic and predict where new outbreaks might occur. This allows national leaders to make safe policy decisions.

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