



**Singapore Healthcare Management 2023**

# SURGICAL SYSTEMS RESPONSE TO COVID-19 PANDEMIC

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## Introduction

The outbreak of COVID-19 has posed significant challenges to many industries, including the healthcare sector. In response to the outbreak, healthcare institutions around the world have implemented policies in the hope of improving the surgical system efficiency under the pandemic.

## Objective

The study aims to understand the key factors influencing the surgical system efficiency under the COVID-19 pandemic in regional healthcare systems in order to derive valuable insights that can contribute to the resilience of surgical systems when faced with emerging infectious diseases. Insight will enable an improvement of patient outcomes and overall healthcare delivery in future pandemics.

## Methodology

A systems-level comparison of surgical institutions was conducted through the collection of quantitative data from 11 participating partners and Oxford Government Response Database (OxGRD), World Bank and WHO.

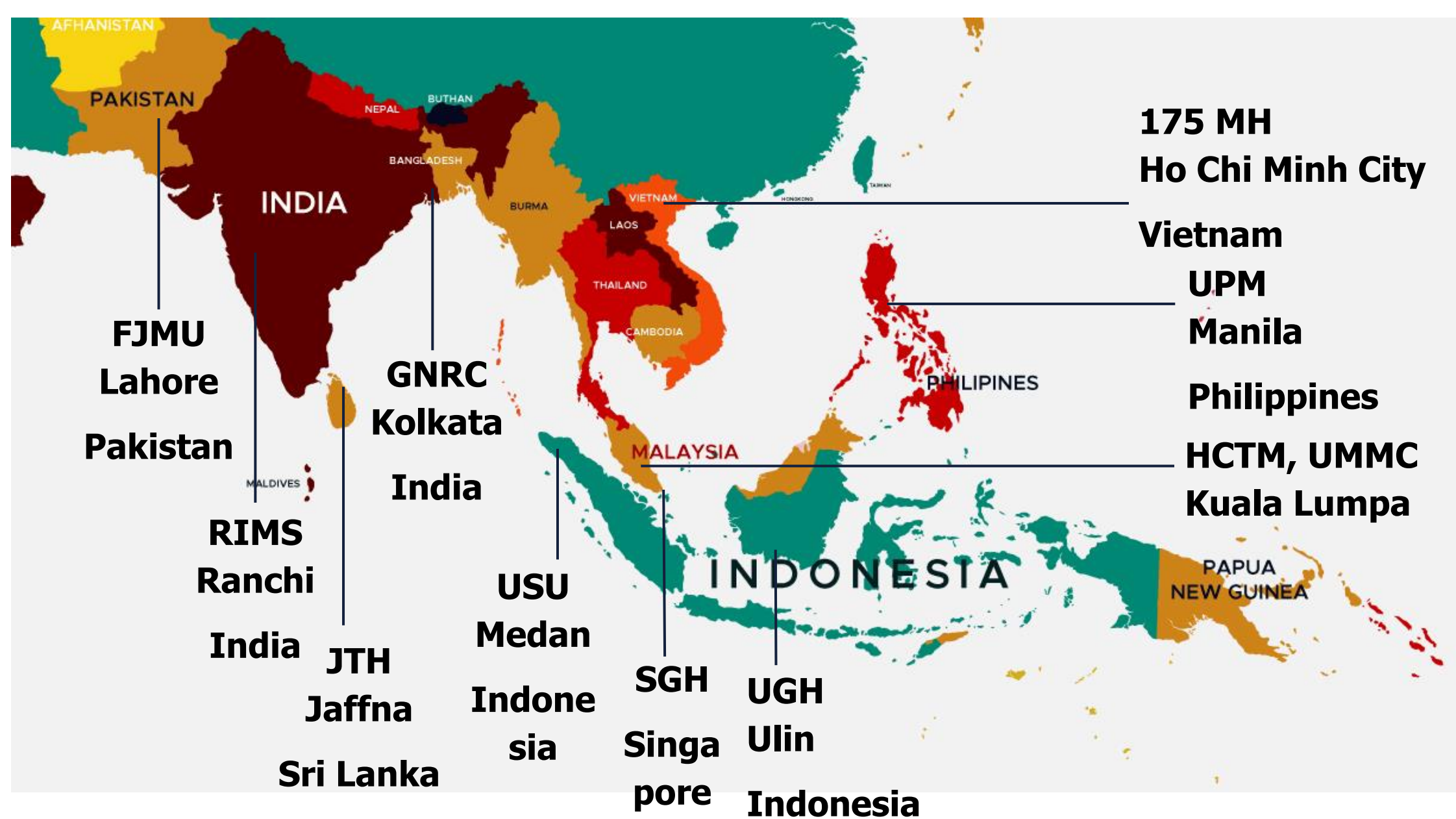


Fig 1. Map of participating partners

Descriptive analysis was used to understand the impact of the pandemic on surgical practice in different health systems.

**Outcomes:** Surgical systems productivity was compared via (surgical specific discharges, total surgery volume and healthcare workers infection rates) considering the available resources, pandemic severity, and government restrictions

**City and Hospital Response Index** was developed via adaptation from the OxGRD and Delphi method

**Data Envelopment Analysis (DEA)** was used to combine various inputs and outputs to measure the health system efficiency.

**Malmquist Index (MI)** based on DEA measures the productivity change of systems over time. Both national MI and institutional MI was constructed.

**Tobit Regression** was then used to identify the impact of various control measures on the productivity changes of health systems.

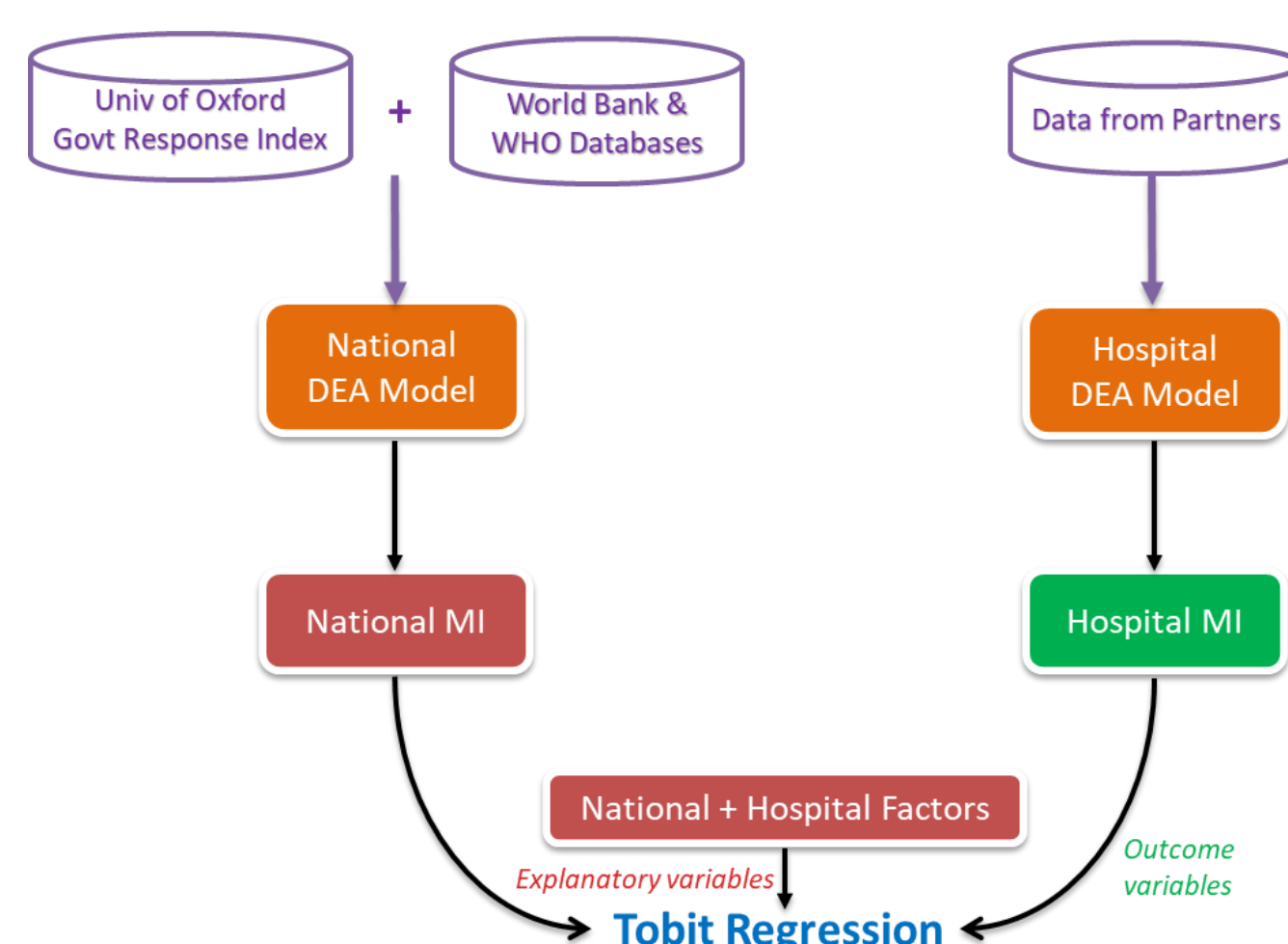


Figure 2: Multivariate Analysis Framework

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## Results

Most countries suffered from **low productivity in the beginning of the pandemic**. The surgical system efficiency was improved significantly and stayed at efficient situation for most countries after launching national and regional level pandemic containment policies.

**Government Response:** In the beginning of COVID-19 pandemic, all the governments increased response level rapidly. The response level fluctuated from June 2020 to December 2021 and gradually declines afterwards.

**City and Hospital Response index:** There were increase in City and Hospital Response Index from May 2021, possibly due to the Delta variant. Differences observed between Government and City Response Indices. City and hospital response deviates from national responses for some countries

**Total beds capacity, total number of doctors deployed for COVID response and national containment measures** are **positively correlated** with productivity improvements from the result of Tobit regression. These indicators potentially have a positive effect on the contagion containment effects and overall mortality from COVID-19.

This study suggests that for the resilience of surgical care against COVID-19 amongst the countries included in the study, effective institutional include **UPM, SGH and UMMC**.

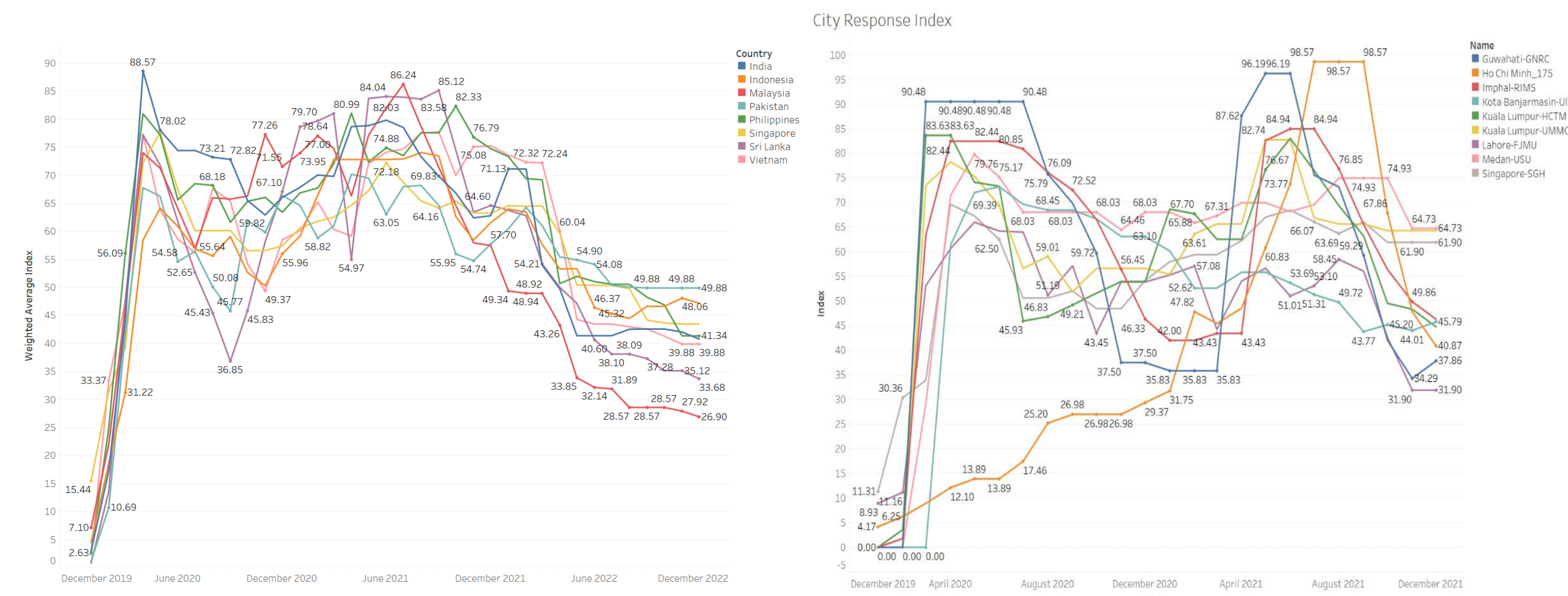


Fig 3. Government Response Index

Fig 4. City Response Index

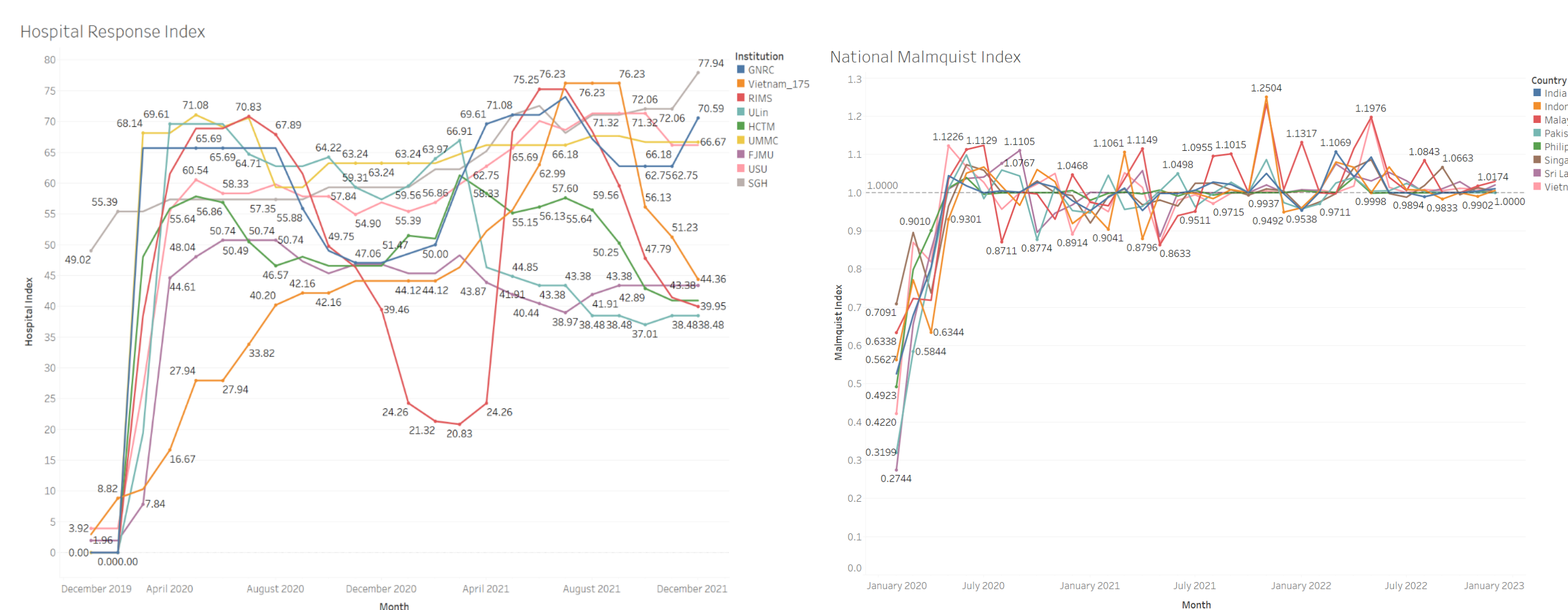


Fig 5. Hospital Response Index

Fig 6. National Malmquist Index

## Conclusion

These findings can inform healthcare institutions in their effort preserve healthcare capacity for pandemic response and maintain quality surgical services.

## Limitations and Future work

The method falls short due to the small number of institutions and missing values. Other methods that have been exploring include stochastic frontier analysis which accounts for noise and missingness in the data.