**Policy vs. Pandemic:**

**A Comparative Analysis of Government Strategies and Covid-19 Outcomes**

**in**

**Australia, India, Brazil, and Vietnam**

**Authors**

Group 4

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**Key Research Questions:**

How do government responses and policies impact the trend in new COVID-19 cases and death rates in the countries in question?

1. How effective are the countries at implementing the policies to manage new Covid-19 infections and death rates?
2. How efficient are policies such as gathering limitations, workplace closures, and travel controls to manage new COVID-19 infections and death rates?
3. How efficient are policies such as contact tracing or mask requirements at managing new COVID-19 infections and death rates?
4. What impact do economic assistance policies have on the Covid-19 situation?

**Data Summary:**

To answer our research questions, we needed case data with details of new daily cases of COVID-19, and related age, health, and vaccination data so that we can explore the relationship between daily cases and age, health and vaccination status of the population; We also needed data with details of various common government responses and policies, and the time of imposing those policies on the populations of each country.

We chose to examine the responses in Australia, Brazil, India, and Vietnam so that we could examine the differences in responses in different countries

**Data source -** ***Our World in Data* :**

Our World in Data provided the first data set called ***owid-covid-data.csv*.** This dataset provides detailed and up-to-date information on new cases, cumulative cases, deaths, vaccinations for each county, and information about age and health issues. The only information it provides about implementing government policies is the *Stringency Index,* a composite number calculated from nine policies.

The Our World in Data website ([Coronavirus (COVID-19) Cases - Our World in Data](https://ourworldindata.org/covid-cases)) has a time-lapse visualisation of countries implementing their policies.

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**Data source -** ***Oxford COVID-19 Government Response Tracker* :**

The Blavatnk School of Government at the University of Oxford (<https://www.bsg.ox.ac.uk> ) provided our second data set called ***OxCGTR\_compact\_national.csv.*** This data set provided data on the variation in government responses to COVID-19. These data included policies for Schools Closing, Workplace Closing, Cancelling Public Events, Gathering Restrictions, Closing Public Transport, Staying Home, Internal Restrictions, and International Travel Controls. It reflects the policies that apply to the majority of people in a jurisdiction

The ordinal data are provided, assigning a number to the category of policy severity and the time frames during which each country imposed the policy.

*These data were prepared by:*

*Thomas Hale, Noam Angrist , Rafael Goldszmidt, Beatriz Kira, Anna Petherick , Toby Phillips, Samuel Webster, Emily Cameron-Blake , Laura Hallas, Saptarshi Majumdar, and Helen Tatlow. (2021). “A global panel database of pandemic policies (Oxford COVID-19 Government Response Tracker).” Nature Human Behaviour.* [*https://doi.org/10.1038/s41562-021-01079-8*](https://doi.org/10.1038/s41562-021-01079-8)*.*

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**Cleaned and Merge Datasets**

We cleaned both datasets and selected and merged the data columns we wished to use in our project.

**Dependent Variable(s)**

We are investigating the effect of government policies on the rate of new COVID-19 infections. We chose to use the number of *new infections smoothed per million people* to reduce the effect of the population differences between countries investigated. The approximate populations of the four countries under investigation are:

* Australia: Approximately 25 million
* Brazil: Approximately 213 million
* India: Approximately 1.38 billion
* Vietnam: Approximately 98 million

**Relevant Characteristics of the Countries Assessed**

**Australia**:

* + *Type of Government:* Australia is a federal parliamentary constitutional monarchy.
  + *Response to Government Instructions:* Generally, Australians tend to follow government instructions and have a strong sense of civic responsibility.
  + *General Health:* Australia has a high standard of healthcare, with a life expectancy of around 83 years.
  + *Diabetes:* Approximately 5% of the population has diabetes.
  + *Cardiovascular Problems:* Cardiovascular diseases are a leading cause of death, with about 30% of adults affected.
  + *Smoking:* Smoking rates have been declining; currently, around 13% of the population smokes.

1. **Brazil**:
   * *Type of Government*: Brazil is a federal presidential republic.
   * *Response to Government Instructions*: *Compliance with government instructions can vary, but there have been challenges, especially during crises***.**
   * *General Health*: Healthcare varies across regions; life expectancy is around 75 years.
   * *Diabetes*: Approximately 10% of the population has diabetes.
   * *Cardiovascular Problems*: Cardiovascular diseases are a significant health concern.
   * *Smoking*: Smoking rates have been declining but are still relatively high at around 14%.
2. **India**:
   * *Type of Government*: India is a federal parliamentary democratic republic.
   * *Response to Government Instructions*: Response to government instructions can vary widely due to the country's diversity*.*
   * *General Health*: Healthcare access varies; life expectancy is around 69 years.
   * *Diabetes*: Around 9% of the population has diabetes.
   * *Cardiovascular Problems*: Cardiovascular diseases are a major health issue.
   * *Smoking*: Smoking rates vary by region but are generally higher, with about 21% of adults being smokers.
3. **Vietnam**:
   * *Type of Government*: Vietnam is a socialist republic with a single-party system.
   * *Response to Government Instructions*: The government's directives are typically followed, and there's a strong sense of collective responsibility.
   * *General Health*: Vietnam has improved healthcare, with a life expectancy of around 76 years.
   * *Diabetes*: Approximately 5% of the population has diabetes.
   * *Cardiovascular Problems*: Cardiovascular diseases are a significant concern.
   * *Smoking*: Smoking rates are relatively high, with around 23% of adults being smokers.

**Note**: The general response to government instructions varies significantly, which could contribute to government policies' effectiveness in reducing the COVID-19 infection rate.

**Key Metrics for Australia, Brazil, India, and Vietnam – Cases and Deaths:**

Let's begin by looking at the key metrics for Australia, Brazil, India, and Vietnam. These metrics include new cases, new deaths, total cases, and total smoothed total deaths per million population.

A graph showing the number of cases

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Examining total cases per million, we see a different perspective. Brazil led in total cases until the end of 2021, after which Australia took the lead in total cases, followed by other countries. This provides an overview of each country's overall scale of the pandemic.A graph showing the number of cases

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This chart shows new cases smoothed per million people. Australia has the highest rate of new cases, followed by Brazil, India, and Vietnam. This metric provides insights into the trend of new cases over time, accounting for fluctuations.

A graph with a line graph

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Now, let's explore total deaths per million. *Brazil has the highest rate, indicating a significant impact. Australia, India, and Vietnam follow. This metric offers insights into the overall severity of the pandemic's impact on mortality.*

A graph of a number of people

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**Brazil** led with the highest rate until the middle of 2022. Subsequently, Australia took the lead among other countries, reaching 8 new deaths per million at the beginning of 2023. This metric reflects the trend in new deaths over time, smoothed for enhanced visibility.

**Composite Indices Based on Government Policies:**

A graph of different colored bars

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* *Containment Health Index –* The CHI combines ‘lockdown’ restrictions and closures with measures such as testing policy and contact tracing, short-term investment in healthcare, and investments in vaccines). This composite measure is based on thirteen policy response indicators, including school closures, workplace closures, travel bans, testing policy, contact tracing, face coverings, and vaccine policy rescaled to a value from 0 to 100 (100 = strictest). If policies vary at the subnational level, the index is shown as the response level of the strictest sub-region.
* *Economic Support Index* – The ESI is scaled to represent the government’s economic support level, with a higher score indicating more significant economic support measures. This index helps in comparing how different countries respond economically to the pandemic, and it can be used to assess the effectiveness of these policies over time.
* *Government Response Index* - The GRI is typically represented as a score or a level, which allows for comparison across different countries and regions. Higher scores indicate a more robust and comprehensive government response to the pandemic.
* *Stringency Index -* is a composite measure that reflects the strictness of government measures in response to the COVID-19 pandemic. A higher Stringency Index value suggests that a country has implemented more stringent measures, such as lockdowns, travel restrictions, and other social distancing measures. In the context of the provided data,
* Note that these indices record the number and strictness of government policies and should not be interpreted as ‘scoring’ the appropriateness or effectiveness of a country’s response. A higher position in an index does not necessarily mean that a country's response is ‘better’ than others lower on the index.

*Take Aways:*

Australia has moderate values across the Containment Health Index, Economic Support Index, Government Response Index, and Stringency Index. Brazil showed slightly lower values, especially in Economic Support and Government Response. India exhibited higher scores in all indices, indicating more substantial governmental efforts. Vietnam demonstrated a balance, with moderate values across the indices.

**Stringency Index Versus New Cases:**

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| A graph of a graph  Description automatically generated with medium confidence | **Australia**  **New cases per million** are inversely correlated with the **Stringency Index**, as stringency increased from mid-2021. The higher the Stringency Index in **Australia**, the lower the number of new cases. |
| A graph of a graph of a graph  Description automatically generated with medium confidence | **Brazil**  With the strictest measures, the number of new cases per million **dropped** to < 200 per million. |
| A graph of a graph  Description automatically generated with medium confidence | **India**  India has the highest Stringency Index among the specified countries. This indicates that India has implemented more stringent measures in response to the COVID-19 pandemic. |
| A graph of a city  Description automatically generated | **Vietnam**  Rigorous movement controls in the early stages of the pandemic Restricted the number of new cases. |

**Conclusion**:

* India has the highest Stringency Index among the specified countries. This indicates that India has implemented more stringent measures in response to the COVID-19 pandemic.
* The higher Stringency Index in India might be attributed to measures like lockdowns, restrictions on public gatherings, travel limitations, and other social distancing measures enforced by the government to control the spread of the virus. Brazil and Australia have relatively lower Stringency Indices compared to India. This suggests that these countries may have implemented fewer and less stringent measures in response to the pandemic during the specified period.
* The lower Stringency Index in Brazil and Australia could indicate a different approach to handling the pandemic, potentially involving less strict lockdowns or a phased approach to restrictions. It's essential to note that the interpretation of the Stringency Index should be considered. Within the broader context of each country's specific circumstances, government policies, and the evolving nature of the pandemic. The Stringency Index does not inherently imply the effectiveness or success of the measures; it simply reflects the stringency level of implemented policies. Countries might adopt diverse strategies based on their healthcare infrastructure, economic considerations, and the severity of the COVID-19 situation in their regions.

**Containment and Closure Policies**

To control and contain the spread of COVID-19, governments and health organisations worldwide implemented a range of policies worldwide implemented a range of policies, which can be broadly categorised as follows:

1. *School Closures*: Educational institutions were temporarily closed, from primary schools to universities. Remote learning and online platforms were widely adopted to continue education while minimising the risk of virus transmission among students and staff.
2. *Workplace Closures*: Non-essential businesses and workplaces were shut down, especially during the initial stages of the pandemic. Essential services like healthcare, food supply, and utilities continued under strict safety protocols.
3. *Cancelling Public Events*: Large-scale events, such as concerts, sports events, festivals, and conferences, were cancelled or postponed, preventing mass gatherings which are at high risk for spreading the virus.
4. *Restrictions on Gatherings*: Limits were placed on the number of people allowed to gather in public and private settings. This included restrictions on events like weddings, funerals, and religious gatherings.
5. *Public Transport Closures*: In some regions, public transportation systems were either shut down or operated with reduced capacity and increased safety measures to reduce the risk of spreading the virus in crowded buses, trains, and subways.
6. *Stay-at-Home Orders*: Governments issued stay-at-home orders or lockdowns, urging citizens to leave their homes only for essential activities like grocery shopping, medical needs, or exercise.
7. *Restrictions on Internal Movement*: Travel between different regions or states within a country was restricted, with checkpoints and mandatory quarantines in place to control the movement of potentially infected individuals.
8. *International Travel Controls*: Borders were closed, and international flights were significantly reduced or suspended. Arriving travellers often faced quarantine and testing requirements.

These policies varied in duration and strictness based on the severity of outbreaks in different regions. They played a crucial role in flattening the curve, i.e., slowing the infection rate to manage the strain on healthcare systems. We are providing visuals of plots of New Cases smooth per million population versus the time frames each policy was implemented and the severity of each implementation. We have selected examples from Australia, Brazil, India, and Vietnam.

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| **Examples of Control and Containment Policy Implementation** | | |
| A graph showing the number of cases  Description automatically generated | | **Brazil**  *C1M - School Closing*  0 = no measures  1 = recommend closing or all schools open with alterations resulting in significant differences compared to non-Covid-19 operations  2 = require closing (only some levels or categories, eg just high school or just public schools)  3 = require closing all levels |
| **Australia**  *C2M - Workplace Closing*  0 = No measures  1 = Recommend closing (or recommend work from home) or all businesses open with alterations resulting in significant differences compared to non-Covid-19 operation  2 = Require closing (or work from home) for some sectors or categories of workers  3 = Require closing (or work from home) for all-but-essential workplaces (eg grocery stores, doctors) | A graph showing a number of cases  Description automatically generated | |
| A graph showing the number of cases in vietnam  Description automatically generated | | **Vietnam**  C3M - Cancelling Public Events  0 = No measures  1 = Recommend cancelling  2 = Require cancelling |
| **Australia**  *C4M - Restrictions on Gatherings*  0 = No restrictions  1 = Restrictions on very large gatherings (the limit is above 1000 people)  2 = Restrictions on gatherings between 101-1000 people  3 = Restrictions on gatherings between 11-100 people  4 = Restrictions on gatherings of 10 people or less | A graph showing the spread of coronavirus  Description automatically generated | |
| A graph showing the number of cases  Description automatically generated | | **Brazil**  *C5M - Closing Public Transport*  0 = No measures  1 = Recommend closing (or significantly reduce volume/route/means of transport available)  2 = Require closing (or prohibit most citizens from using it) |
| **India**  *C6M – Stay-at-Home Requirements*  0 = No measures  1 = Recommend not leaving the house  2 = Require not leaving the house with exceptions for daily exercise, grocery shopping, and 'essential' trips  3 = require not leaving the house with minimal exceptions (eg allowed to leave once a week, or only one person can leave at a time, etc) | A graph of a normal life  Description automatically generated with medium confidence | |
| A graph showing the number of cases  Description automatically generated | | **India**  *C7M - Restrictions on Internal Movement*  0 = No measures  1 = Recommend not to travel between regions/cities  2 = Internal movement restrictions in place |
| **Vietnam**  *C8EV - International Travel Controls*  0 = No restrictions  1 = Screening arrivals  2 = Quarantine arrivals from some or all regions   1. = Ban arrivals from some regions   4 = Ban on all regions or total border closure | A graph of a line graph  Description automatically generated with medium confidence | |

**Health Policies Efficiency:**

The countries that used the face-covering and contact tracing policies by the end of 2023, had a significant influence on the decline in the number of fatalities per million due to the heavy restrictions placed on wearing masks and getting tested. With Brazil, India and Vietnam having open public testing and Australia, implementing testing for anyone who showed symptoms.

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A map of the world

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India throughout the years had  the best health policy efficiency during Covid, keeping transmission of infection low which worked greatly in keeping the total and new death cases low, followed by Vietnam, Australia, and then Brazil.

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**Vaccinations and Economic Assistant Impact:**

Over the time series, each country exhibited distinct trends in daily new vaccinations per million. Generally, all countries experienced peaks around mid-2021 to early 2022.

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| A graph showing the growth of a stock market  Description automatically generated | | **Australia**  New Vaccinations Smoothed per Million over time between January 2021 and January 2023 |
| **Brazil**  New Vaccinations Smoothed per Million over time between January 2021 and January 2023 | A graph showing the growth of a stock market | |
|  | | **India**  New Vaccinations Smoothed per Million over time between January 2021 and January 2023 |
| **Vietnam**  New Vaccinations Smoothed per Million over time between January 2021 and January 2023 |  | |

To gain insights into the vaccination rollout, we explored two key variables: the percentage of the population living in extreme poverty and hospital beds per 1,000 people.

India stands out with the highest percentage of the population living in extreme poverty (21.2%) and the lowest number of hospital beds per 1,000 people (0.53).

During the study period, Brazil received the highest emergency investment in healthcare, totalling 152,598,230,724.82 USD, while Australia received the highest investment in vaccines (4,703,229,757.98 USD).

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Economic Assistance Impact

By the end of the period, Brazil recorded the highest number of deaths, exceeding 3000 deaths for every million people, despite having the highest emergency investment in healthcare.

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**Total Vaccinations Over Time**

Vietnam had the highest total vaccinations per hundred people (270.24), while India had the lowest (155.31). However, when examining fully vaccinated people per hundred, Australia, Brazil, and Vietnam surpassed 80%, with India slightly behind at 67% as of December 2022.

Noteworthy differences were observed in the total boosters administered per hundred. Australia led with 75%, whereas India lagged with only 15%.

**Conclusions**:

* Vaccination Peaks: All countries experienced vaccination peaks around mid-2021 to early 2022, indicating a common period of accelerated vaccination efforts.
* Economic Disparities: India, with the highest population living in extreme poverty, faced unique challenges in its vaccination rollout.
* Healthcare Infrastructure: India also exhibited the lowest number of hospital beds per 1,000 people, underscoring the potential strain on healthcare infrastructure.
* Investment Disparities: Brazil received the highest emergency healthcare investment, while Australia led in vaccine-specific investments, highlighting distinct priorities. Despite high emergency healthcare investment, Brazil faced challenges in reducing mortality rates, emphasising the complex interplay of factors in the healthcare landscape.
* Vaccination Coverage: Vietnam achieved the highest total vaccinations per hundred people, while Australia, Brazil, and Vietnam had similar rates of fully vaccinated individuals, contrasting with India's lower percentage.
* Booster Disparities: Notable differences in booster administration were observed, with Australia leading at 75%, emphasising variations in countries' approaches to addressing evolving health concerns.

**Key Takeaways**:

* Divergent Economic Impact: Economic conditions influence vaccination strategies, with variations
* Infrastructure Challenges: Disparities in healthcare infrastructure may impact a country's ability to manage vaccination campaigns effectively.
* Regional Strategies: Each country adopts unique vaccination strategies, reflected in booster administration rates.
* Global Collaboration: The study underscores the importance of global collaboration to address health disparities and ensure comprehensive vaccination coverage.
* Policy Implications: Policymakers should consider economic and healthcare infrastructure factors when formulating effective vaccination strategies.