

Team 7 Executive Summary

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This research evaluates the impact of various COVID-19 policies implemented globally and assesses their efficacy in the fictitious country of Caladan. Our goal is to identify the least restrictive policies that still ensure the growth rate of COVID-19 cases is below 3% and the growth rate of COVID-19 deaths is below 1%, thereby suggesting optimal policy strategies for sustainable pandemic management.

The COVID-19 pandemic has forced governments around the world to implement a variety of policies to mitigate the virus's spread. This study critically analyzes these policies' effectiveness on 10 sample countries, including Russia, Sweden, Germany, the United Kingdom, South Korea, France, Italy, New Zealand, Canada, and Japan. This then allowed us to determine which of these policies can achieve controlled growth rates of cases and deaths in Caladan with minimal societal and economic disruption.

Caladan faces significant challenges due to COVID-19, prompting the need for policies that effectively manage the health crisis while considering economic and social impacts. The government's specified targets of maintaining death and case growth rates below 1% and 3% respectively serve as benchmarks for evaluating policy performance.

We utilized international COVID-19 policy and case data to build a comprehensive dataset applicable to Caladan. Data was prepared through rigorous cleaning, aggregation, and staging, employing tools like Azure Synapse and custom data pipelines to ensure analytical readiness. Data analysis was conducted using PowerBI, supported by GitHub for version control, facilitating transparent and reproducible research outputs.

Based on our visualizations, we decided on four policies: C2, C5, C6, and C7. Policy C2, the workplace closing requirements, was initially implemented at a restrictiveness level above 2, which showed a rapid decrease in case and death rates. Over time, as restrictions relaxed to around level 1.5, increases in rates were observed. Thus, a level 2 restrictiveness is recommended for balancing effectiveness with economic impacts.

Policy C5 was the public transportation closures. Initially highly restrictive, this policy significantly reduced transmission when implemented at level 1. As restrictions eased, the growth rates increased, supporting a continued level 1 restrictiveness.

The next policy is policy C6, the stay at home requirements. This policy was effective at a higher initial restrictiveness, which was reduced over time. The data supports maintaining a level 1 restrictiveness to effectively manage case and death growth rates.

The final policy we suggest is policy C7, the restrictions on internal movement. With the lowest correlation with cases and deaths growth rates, this policy is recommended at level 1, as it effectively contributes to managing the spread without significantly restricting internal movement.

Additionally, we implemented machine learning to calculate the correlation between the policies and the cases and deaths growth rates. We found that policy C2 (workplace closing) has the lowest correlation of -0.03 with cases growth rate. Policy C7 (restrictions on internal movement) has the lowest correlation of -0.07 with deaths growth rate. These policies are identified as the most unrestrictive because they have the least influence on both growth rates while aiming to achieve the goal of finding the most unrestrictive policies.

We also found a few policies that we do not recommend include policies C1 and H7. Policy C1 is the school closures. Although initially implemented at a high level of restrictiveness, the correlation with reducing cases and deaths was not sufficiently strong. Given the high societal impact of this policy, it is not recommended. Additionally, policy H7 (vaccinations), is not recommended. While vaccines significantly reduced death rates later in the pandemic, the lack of comprehensive data from the initial stages made it difficult to evaluate this policy's early effectiveness.

The study was synthesized by integrating external data sources, which provided additional insights into the economic consequences and public perception of the implemented policies. Due to the information not being available, Policy H7 required additional research to identify its restriction levels and for additional context for the scope of the project. This was adjusted throughout our project for continuity.

Future research should explore the longitudinal impacts of these policies on both public health and economic stability, incorporating more detailed data and perhaps machine learning techniques for predictive analytics.

Our findings recommend a strategic approach to pandemic policy in Caladan, advocating for moderate restrictiveness in workplace, public transportation, and stay-at-home policies to effectively control the spread of COVID-19 without undue disruption to daily life.

References

<https://github.com/OxCGRT/covid-policy-tracker/blob/master/documentation/codebook.md>

Appendix

Lily set up and managed group meetings, where we extracted data from the three sources, created the ODS with the 6 parquet files, created external tables connected to the parquet files within Synapse, and connected the Synapse SQL database to PowerBI. She created visuals where the team determined policies from those visuals and presented the visuals and the policy analysis with the team. Additionally, she and the team created the architecture diagram and contributed to the executive summary.

Riley was responsible for presenting the visuals with the team and writing part of the executive summary.

Daniel extracted data from the three sources and turned it into six Parquet files with the team. We set up tables in the Synapse SQL database and connected it to Power BI to make visuals. We used these visuals to understand how different policies affect things like death rates and growth in cases. Daniel also helped make and present the slides. We all worked together on these tasks, meeting regularly to make sure everyone was contributing as much as possible.

Dhruv extracted data from the three sources with the team, created ODS with 6 parquet files with the team, and created external tables within Synapse with the team. He also connected the Synapse SQL database to PowerBI and altered the schemas around until we found our final schema with the team, and created some visuals to determine policies from visuals. Additionally, he worked on creating many of the slides on the presentation and presented visuals with the team.

For challenge 1, Seok Hoon and the team collaborated to extract data from three sources. Subsequently, we transformed the extracted data into six Parquet files for challenge 2. Additionally, we established a connection between Synapse SQL database and Power BI to visualize the data. Using machine learning techniques, he computed the correlation between deaths, cases growth rates, and policies to determine their statistical significance. Finally, he shared the visualizations with the team.