

Correlation between COVID-19 Death Growth with Number of Healthcare Facilities

Case Study : 34 Provinces in Indonesia

A short story behind the project.

There is a silver lining behind the pandemic.

2nd March 2020 the first COVID-19 suspect found in Indonesia. In the same month, WHO declared the COVID-19 outbreak as a global pandemic.

This pandemic has left sadness all over the world, Included Indonesia.

On the other hand, the pandemic has left lessons and reflections on various sectors, one of them is the public health sector.

The number of public healthcare facilities is a critical variable.



Photo by The Eye of Photography Magazine



Photo by NBC News

How is the condition of our healthcare facilities in the face of the pandemic?
Is there a correlation between the number of healthcare facilities and various COVID-19 metrics?

The Team



Helwis Liufandy

Semarang



Dzakiya Ishmatul

Surabaya



Maulana Kavaldo

Purworejo



Mutiara Ruci

Bandar Lampung



Khairul Gemilang

Sukabumi

A group of Indonesian youth who care about their beloved homeland
and have a great desire to contribute through data

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Objective of the project :

Find out the correlation between the COVID-19 death growth with the number of healthcare facilities in each province of Indonesia.

Experiment Design

Problem Statement

What is the correlation between the COVID-19 death growth with the number of healthcare facilities in each province of Indonesia?

Metrics

Correlation between the COVID-19 death growth and the number of healthcare facilities

Sample Data

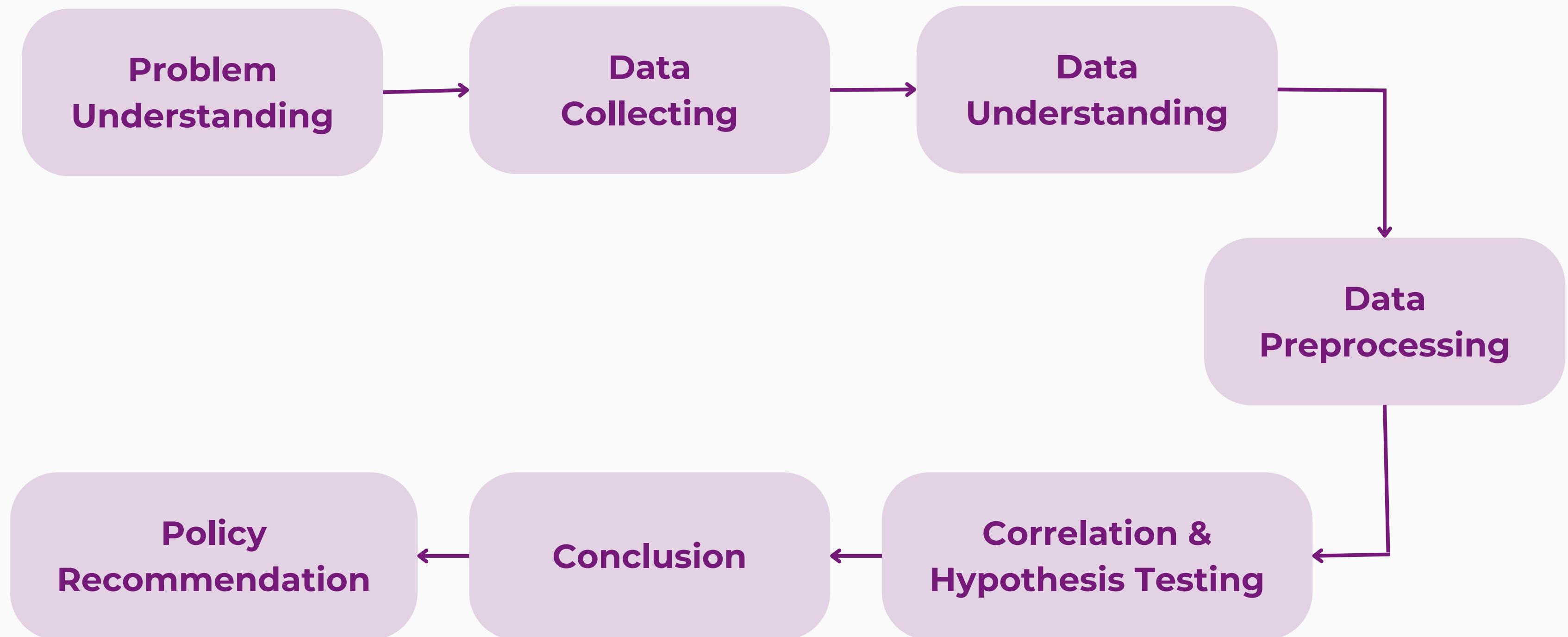
Public data of Indonesian COVID-19 and data of healthcare facilities in Indonesia

Hypothesis

H_0 : COVID-19 death growth does not have correlation with the number of healthcare facilities in each province of Indonesia.

H_1 : COVID-19 death growth does have correlation with the number of healthcare facilities in each province of Indonesia.

Project Workflow



Data Sources

Public Data of Indonesian COVID-19

Collected by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University (JHU).

The data contains Indonesian COVID-19 metrics such as province, population, total cases, total recovered, total deaths, new cases, new recovered, new deaths, and so on.

Data of Healthcare Facilities in Indonesia

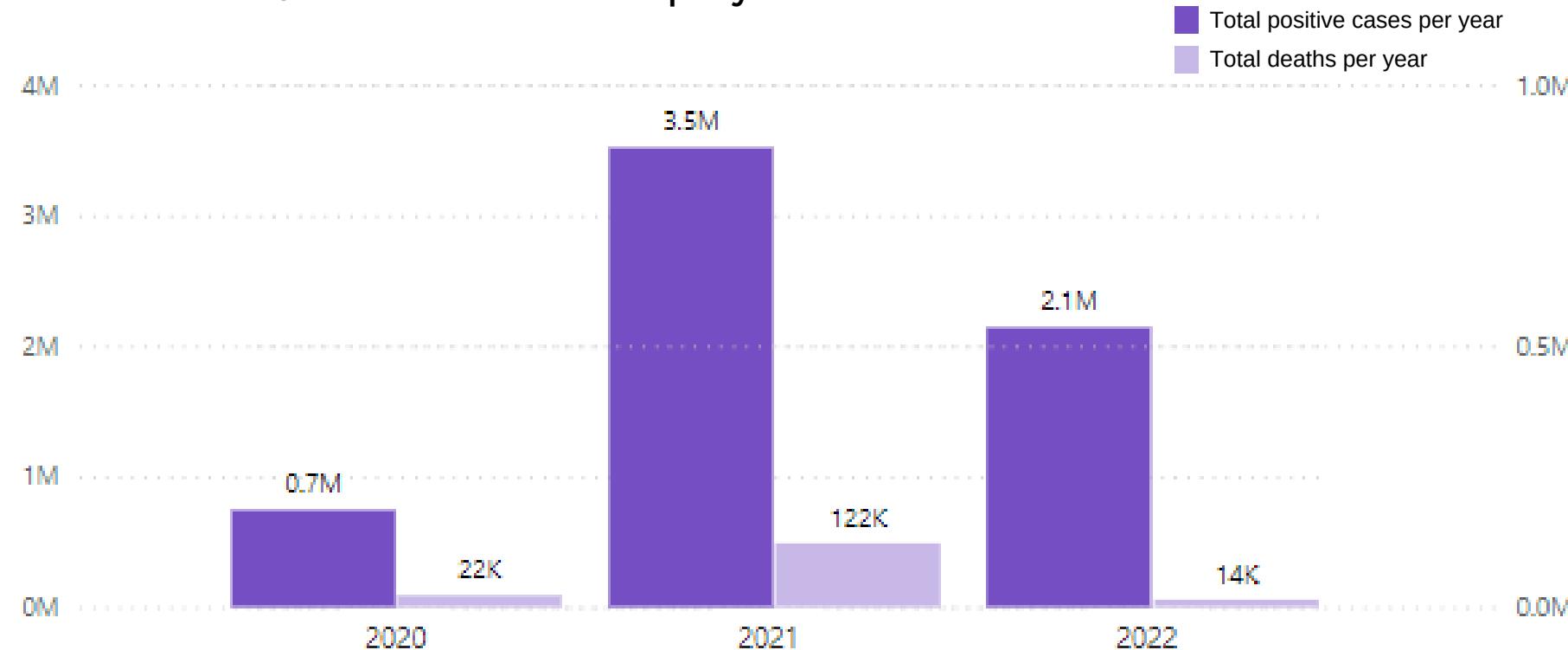
Collected from the report by the Ministry of health, Republic of Indonesia.

The dataset was collected from the healthcare report from 2019 to 2021 to see the number of healthcare facilities every year in each province of Indonesia. This dataset contains: provinces, hospitals, puskesmas, general practitioners, generic pharmacies, and primary care clinics.

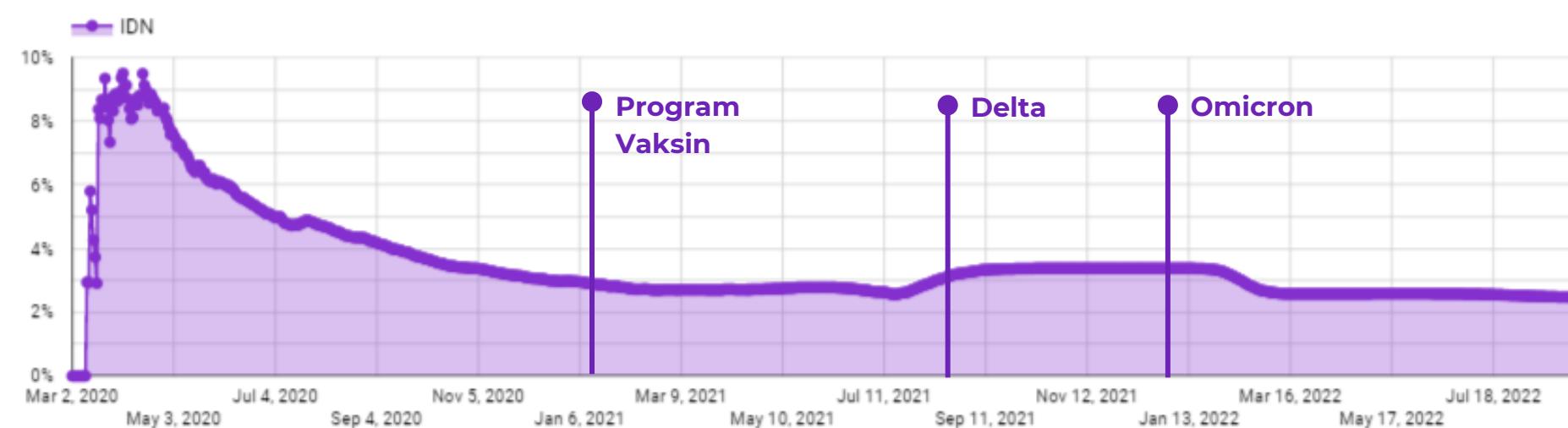
Findings & Insights

Indonesian COVID-19 on Numbers.

Total Positive Cases and Total Deaths per year



Steady decline case fatality rate in Indonesia



on period of March 2020 - September 2022:

6.48m total positive cases

159k total deaths

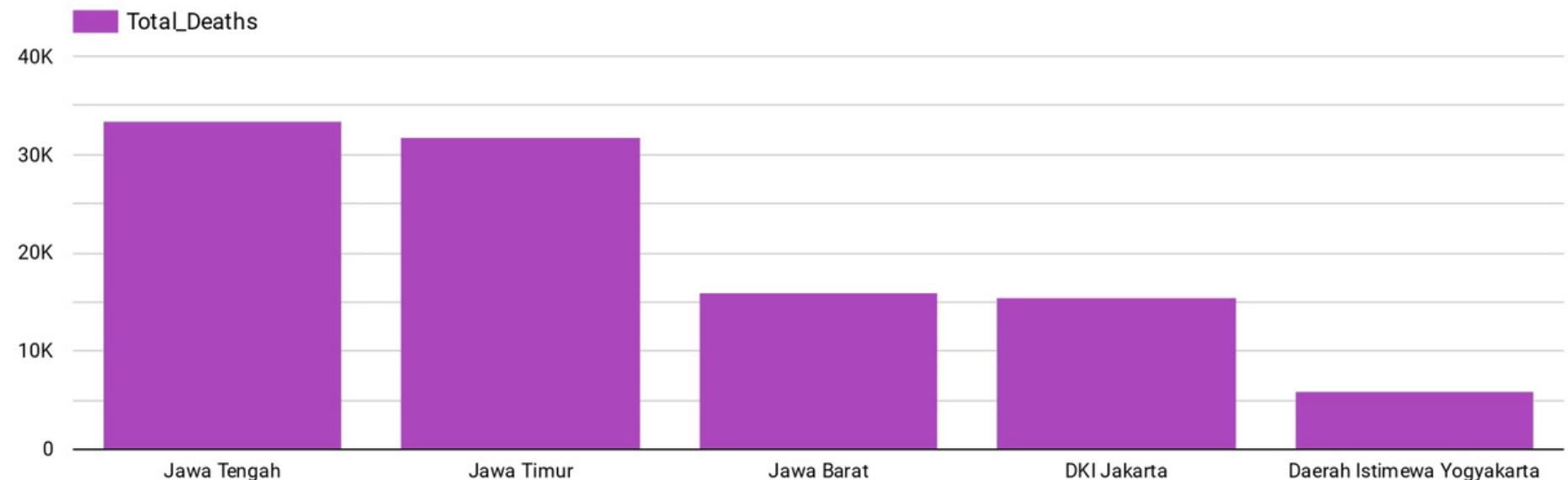
Indonesian highest total positive cases occurs in 2021 with 3.5m cases and highest total deaths occurs in the same year with 122k deaths.

In 2022, total positive cases and total deaths have been falling down to 2.1m cases and 14k deaths.

The declining case fatality rate can be caused by community discipline in carrying out health protocols and vaccination programs.

Indonesian COVID-19 Death Growth

COVID-19 spread to every inch of area all over Indonesia.



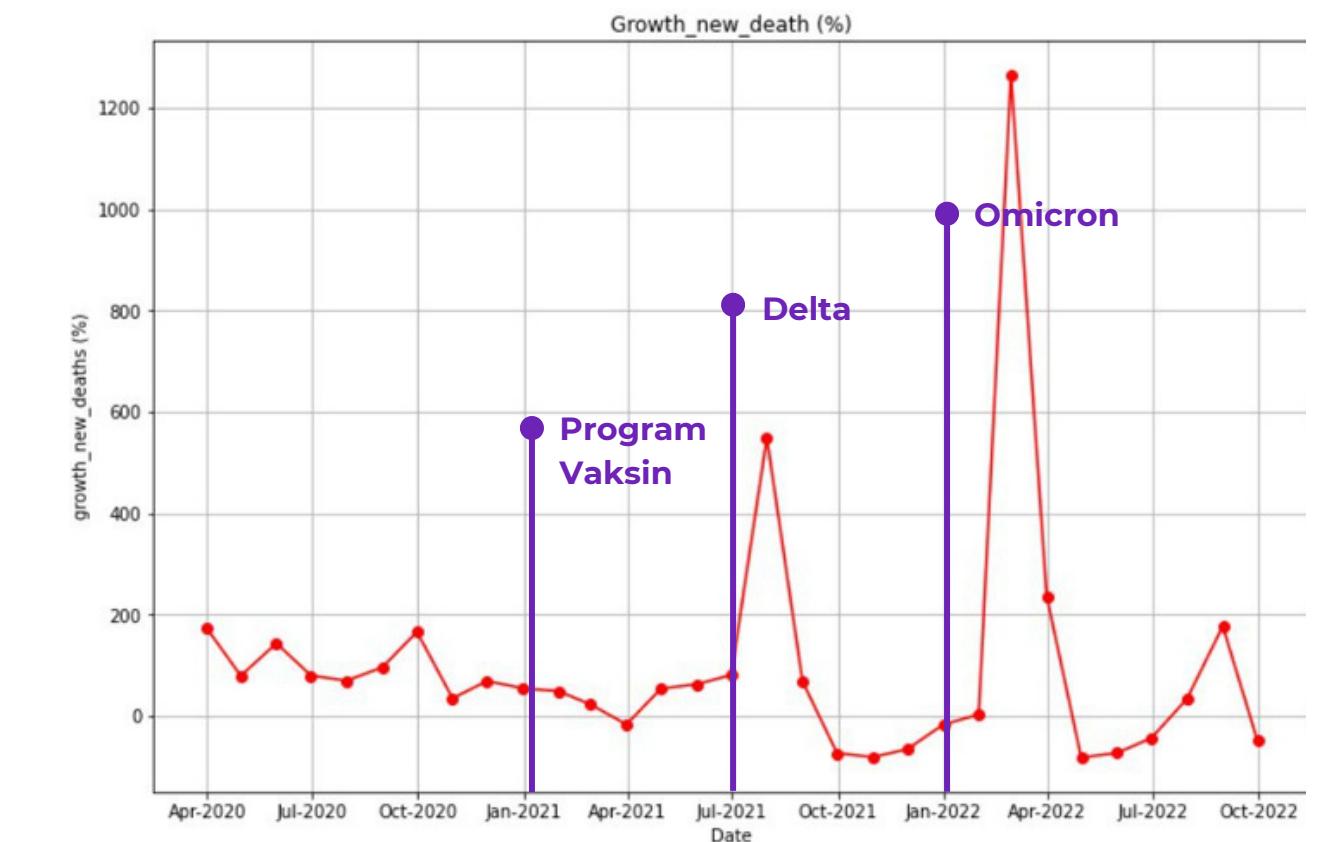
Central Java has the highest number of total deaths with 33k deaths and an 11.65% average case fatality rate. In other areas, DKI Jakarta has 1.4m total cases and leads the country in total cases.

Another graph shows the fluctuation of death growth in Indonesia.

Top 5 provinces by total deaths.

Location	Total Cases	Total Deaths	Fatality Rate (%)
Jawa Tengah	636409	33480	11.65
Jawa Timur	601534	31732	9.26
Jawa Barat	1173731	15937	3.33
DKI Jakarta	1412474	15493	4.01
Daerah Istimewa Yogyakarta	224307	5928	3.55

Average death growth by time series.



Public health development in Indonesia.

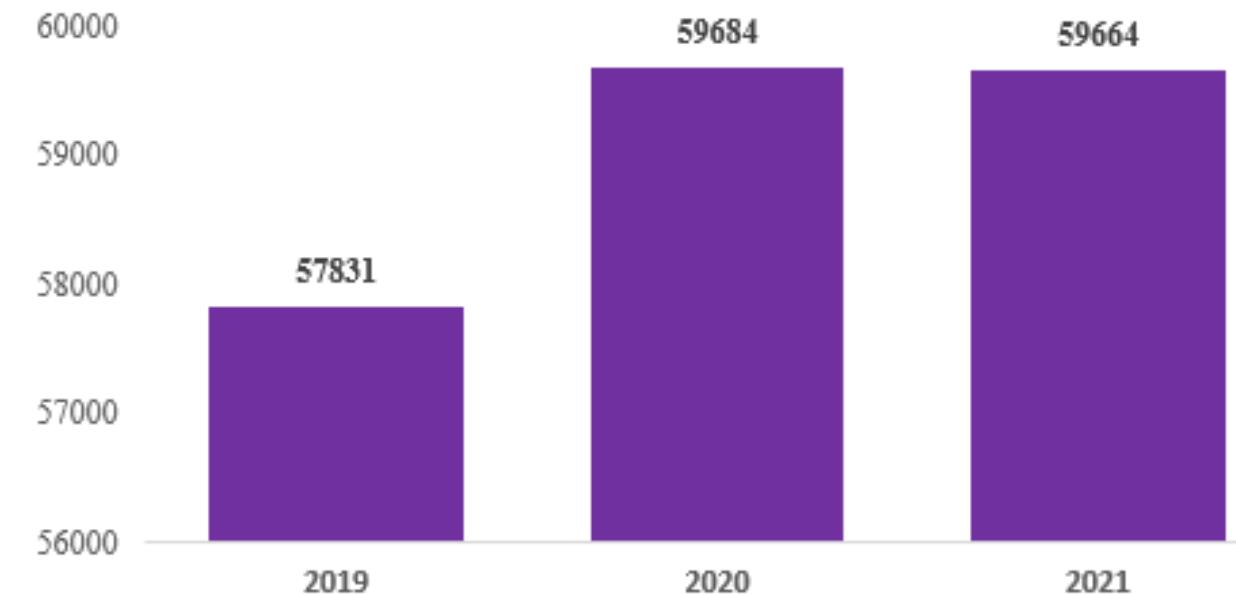
Challenge as an archipelagic country that has fourth largest population in the world

The government tries to fulfill public health needs, including building up healthcare infrastructure.

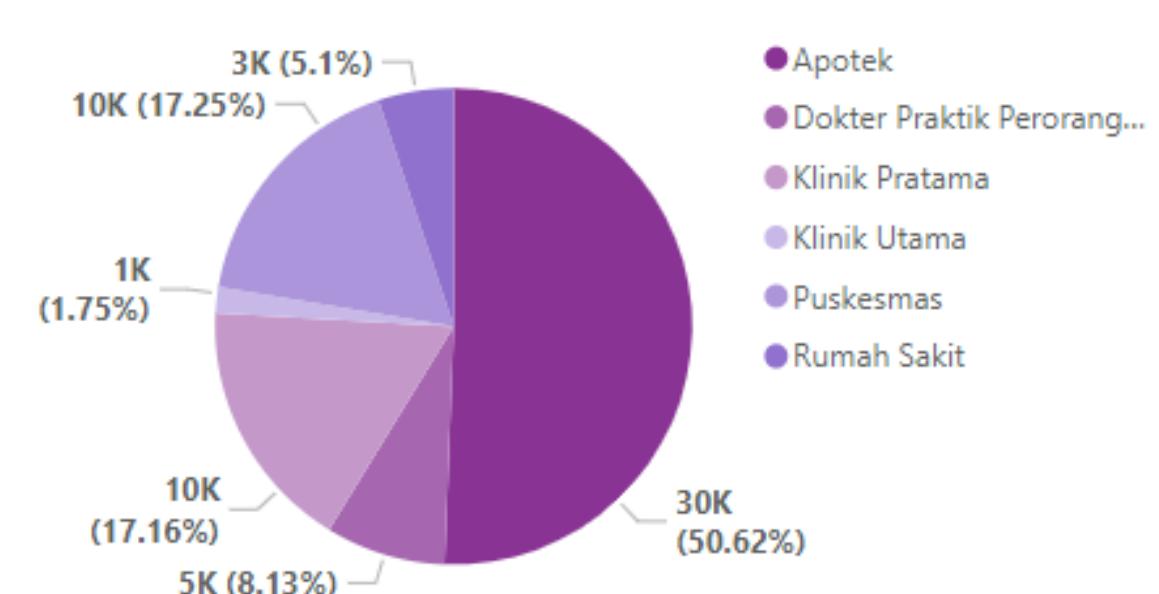
West Java has the highest number of healthcare facilities, while North Kalimantan has the lowest number of healthcare facilities.

Generic pharmacy has become the highest healthcare facilities with 50.62% from total.

The number of healthcare facilities in Indonesia/year.



The healthcare facilities by category.



The number healthcare facilities by province.

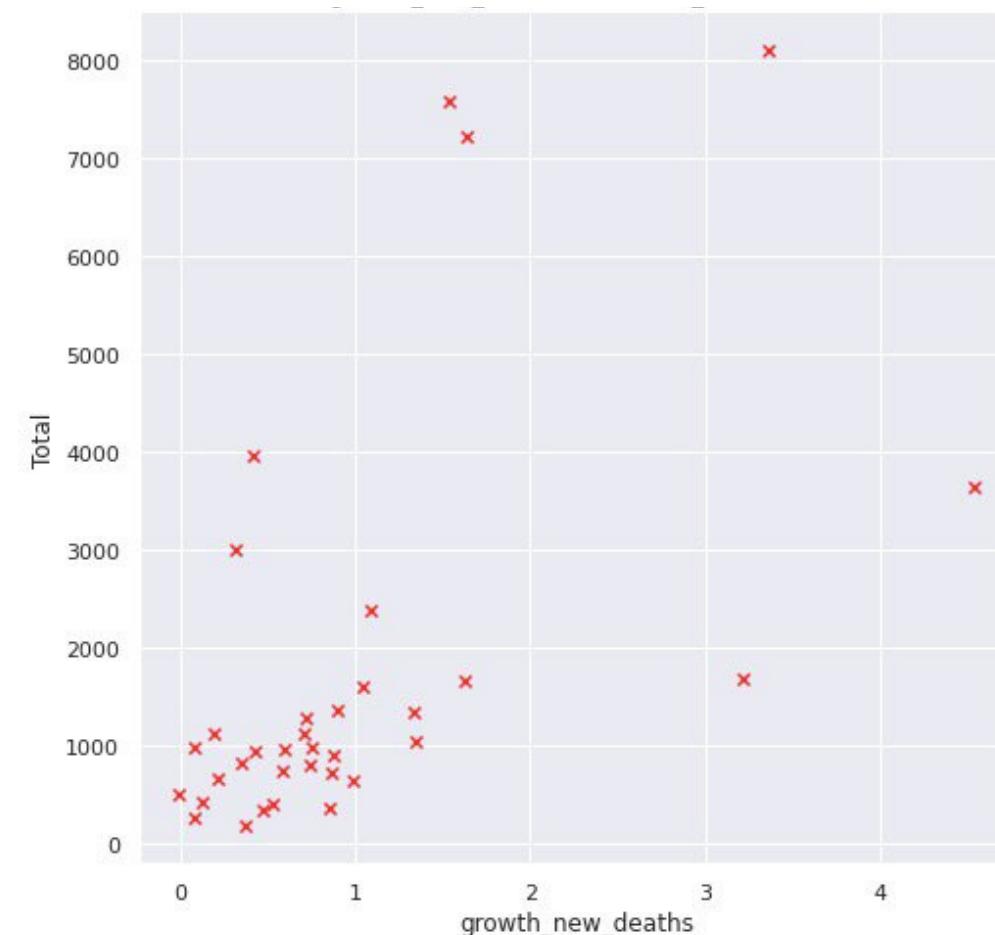
Provinsi	2019	2020	2021
Jawa Barat	7121	8092	8092
Jawa Tengah	7052	7571	7560
Jawa Timur	7161	7209	7283
•	•	•	•
Maluku Utara	362	345	352
Sulawesi Barat	281	270	281
Kalimantan Utara	193	191	194

There is a positive corr. between the number of healthcare facilities with the number of population in each provinces.

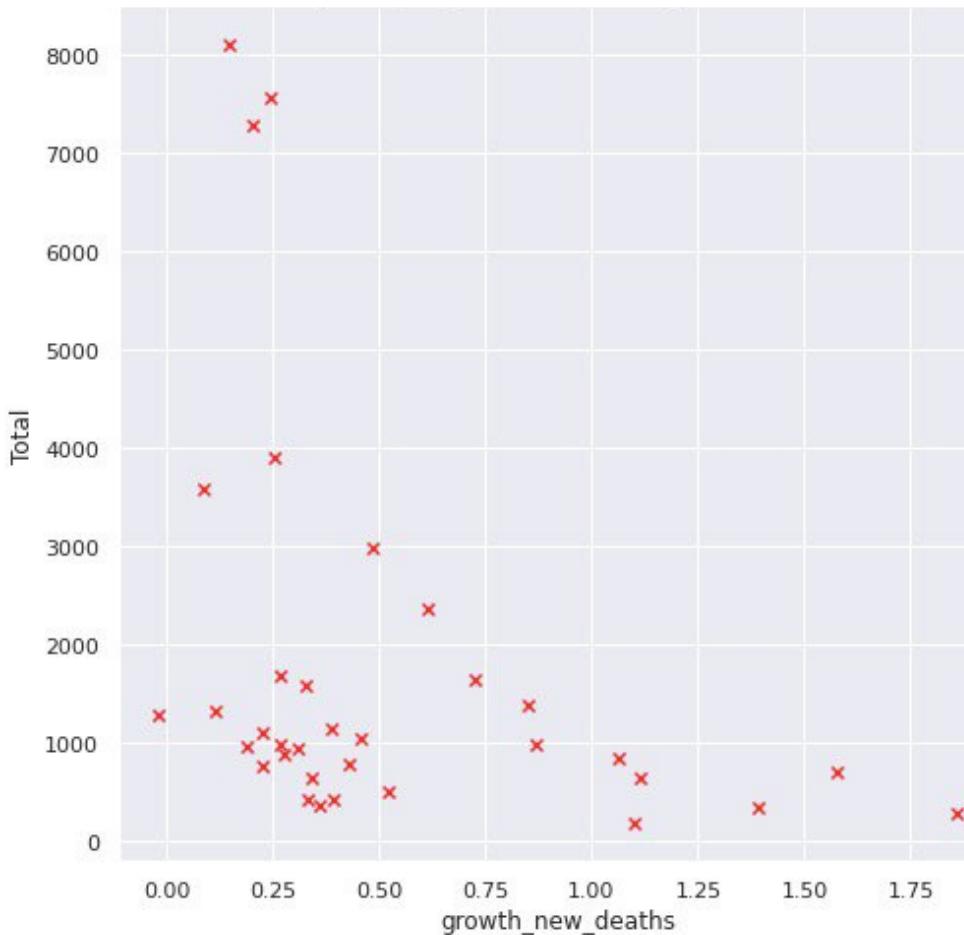
The Correlation: Main Result

Growth Death by Total Healthcare

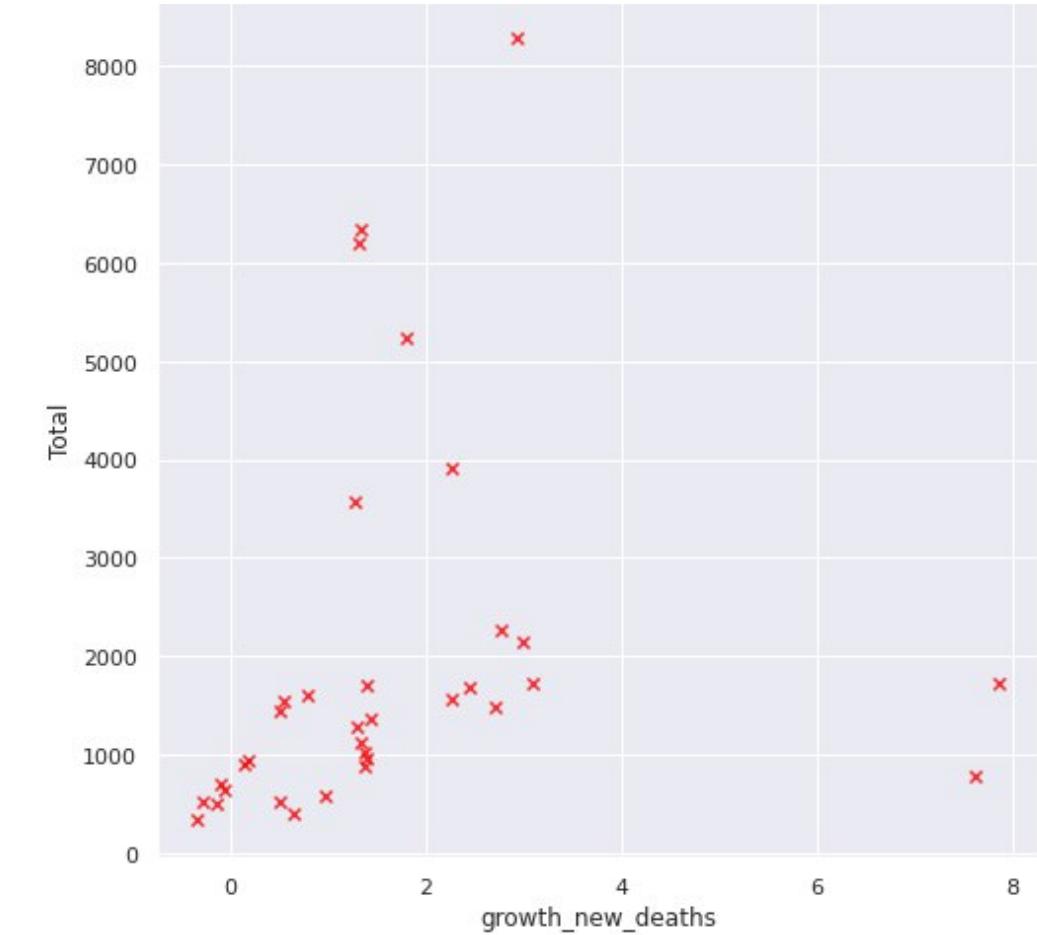
2020



2021



2022



There is a **strong positive correlation** ($r = 0.56$) between both variables, means the higher growth death occurs in the provinces that have a higher number of healthcare facilities, and vice versa.

There is a **moderate negative correlation** ($r=-0.36$), which means the higher death growth occurs in the provinces that have a lower number of healthcare facilities, and vice versa.

The result indicates that there is **no correlation** ($pval = 0.32$)* between the number of healthcare facilities and the death growth in 2022.

*) p-value less than 0.05 indicates rejecting H₀ means there is a correlation between both variables.

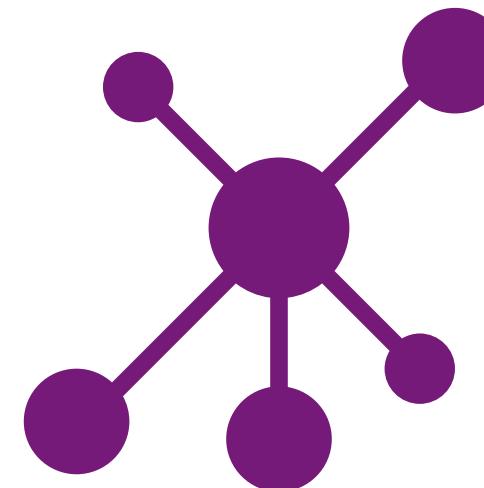
The Correlation: Side Note

We suspect that there is another **variable (x)** that becomes a **confounding variable** that affects both variables studied.

Journal from Pubmed Central also explained that the low number of healthcare facilities in an area could indicate a lack of recording/diagnosis of COVID-19 victims.

In 2021, vaccination program that helped flatten the death curve. This indicates that the vaccination program in provinces with a high number of healthcare facilities has been effective in suppressing the death growth.

Policy Recommendation



Distribute evenly
healthcare facilities



Optimize digital health
transformation



Make a data-driven policy

**"A wise man should consider that health
is the greatest of human blessings,
and learn how by his thought to derive
benefit from his illnesses."**

Hippocrates