**🧩 Project #2: COVID-19 Global Analysis — Final Summary**

**🎯 Goal**

The objective of this project was to **analyze the global impact of COVID-19** by examining trends in confirmed cases, deaths, recoveries, and vaccination progress. The analysis covers data cleaning, descriptive insights, time-series trends, advanced SQL queries, and an interactive Tableau dashboard for clear, impactful storytelling.

**📦 Dataset**

* **Source:** Our World in Data — owid-covid-data.csv
* **Scope:** Daily COVID-19 cases, deaths, vaccinations for all countries, regions, and continents from 2020 to 2024.

**✅ Tools & Technologies**

* **Python:** pandas, numpy, plotly for EDA and interactive charts.
* **SQL:** PostgreSQL for storing, cleaning, and aggregating COVID-19 data.
* **Tableau:** For building a polished, interactive dashboard.
* **Deliverables:** Cleaned CSV, Jupyter Notebook, SQL scripts, Tableau .twbx file, and key findings PDF.

**🔑 Key Project Steps**

**🔹 1️⃣ Data Cleaning & Preparation**

**Tasks Completed:**

* Verified **missing values** for cases, deaths, and vaccinations → handled with NaN or zero where appropriate.
* Ensured **date consistency** → converted to datetime in Python.
* Standardized **country names** and dropped duplicates.
* Reduced dataset to relevant columns: country, date, cases, deaths, vaccinations.
* Stored cleaned data in **PostgreSQL** for query practice.

**🔹 2️⃣ Descriptive Analysis**

**Key Insights:**

* 🌍 **Total confirmed cases worldwide:** **775,900,191**
* 🌍 **Total deaths worldwide:** **7,058,885**
* 🌍 **Total vaccinations worldwide:** **13,754,616,202**
* **Top 10 Countries by Total Cases & Deaths:**
  1. 🇺🇸 United States — 103,436,829 cases, 1,193,165 deaths
  2. 🇨🇳 China — 99,373,219 cases, 122,304 deaths
  3. 🇫🇷 France — 38,997,490 cases, 168,091 deaths
  4. 🇩🇪 Germany — 38,437,756 cases, 174,979 deaths
  5. 🇧🇷 Brazil — 37,511,921 cases, 702,116 deaths
  6. 🇰🇷 South Korea — 34,571,873 cases, 35,934 deaths
  7. 🇯🇵 Japan — 33,803,572 cases, 74,694 deaths
  8. 🇬🇧 UK — 24,974,629 cases, 232,112 deaths
  9. 🇷🇺 Russia — 24,268,728 cases, 403,188 deaths
  10. 🇹🇷 Turkey — 17,004,718 cases, 101,419 deaths
* 📈 **Highest single-day spike:** 177,772,819 new cases (Dec 25, 2022)
* 📈 **Average daily new cases:** ~1,948,100

**🔹 3️⃣ Time-Series & Trend Analysis**

**Key Trends Visualized:**

* **Global yearly cases:**  
  2020: 80,317,671  
  2021: 200,278,727  
  2022: 424,013,822  
  2023: 69,238,094  
  2024: 2,063,363 (YTD)
* **Vaccinations trend:**  
  2020: 7,147,010  
  2021: 8,071,561,189  
  2022: 2,703,126,698  
  2023: 75,771,266  
  2024: 1,203,277 (YTD)
* **Global mortality rate trend:**  
  2020: 2.36%  
  2021: 1.94%  
  2022: 0.95%  
  2023: 0.91%  
  2024: 0.91% (YTD)
* **Top 5 countries’ trends:** Comparative line charts for US, China, France, Germany, and Brazil.

**🔹 4️⃣ SQL & Data Engineering**

**Tasks:**

* Stored and queried daily COVID-19 stats in **PostgreSQL**.
* Practiced **GROUP BY**, **ORDER BY**, and window functions for rolling sums.
* Ensured realistic totals by excluding continents/regions in country-level sums.
* Generated clean **continent-level vaccination trends** using daily new vaccinations.

**🔹 5️⃣ Interactive Tableau Dashboard**

**Key Visuals & Features:**

* **KPI Tiles:** Global total cases, deaths, and vaccinations for quick glance.
* **Global Daily New Cases:** Interactive line chart.
* **Global Trend Line:** Dual-axis chart for total cases & deaths over time.
* **Mortality Rate Trend (Yearly):** Global and country-wise.
* **Top 10 Countries:** Horizontal bar chart by total cases.
* **Top Countries by Cases & Deaths:** Stacked bar chart.
* **World Map:** Total cases by country (color gradient).
* **Vaccination Progress per Continent:** Cumulative bar chart.
* **Vaccinations Over Time:** Global line chart.
* **Filters:** Date and country selection.

**Design Choices:**

* Blue: Cases
* Red/Orange: Deaths
* Green: Vaccinations
* Dark Red: Mortality Rate
* Consistent font, clean spacing, clear tooltips.

**📦 Deliverables**

✅ Cleaned CSV  
✅ Python Notebook (EDA, time series, charts)  
✅ SQL script (DDL + DML)  
✅ Tableau .twbx file  
✅ Final published interactive dashboard  
✅ 1-page PDF slide with **key insights**

**📈 Skills Practiced**

✔️ Advanced data cleaning & transformation  
✔️ Time-series trend analysis  
✔️ Interactive dashboards (Plotly & Tableau)  
✔️ Realistic SQL aggregations  
✔️ Storytelling with KPIs, maps, and dynamic filters

**👉 Outcome:**  
This end-to-end project demonstrates your ability to **handle messy real-world data**, build **practical business KPIs**, use **SQL for realistic queries**, and design an **executive-level dashboard** that explains **complex global trends clearly and visually**.