DIGITAL HEALTH EXAMS

Use case: Specific problem description of all stake holders involved in this web app building.

Vaccination is the administration of a vaccine to help the immune system develop immunity from a disease.

Coronavirus disease (COVID-19) is an infectious disease caused by the SARS-CoV-2 virus and the COVID-19 vaccine helps protect against this virus which can be a serious or life-threatening illness. Everyone, everywhere, should have access to COVID-19 vaccines. Major progress has been made with the COVID-19 vaccination response, and it is critical to continue the progress, particularly for those most at risk of disease.

Here are some key stakeholders:

1. **Public Health Officials/Epidemiologists:**
    - Provide domain expertise on vaccination metrics, define key performance indicators, validate data interpretation and ensure meaningful comparisons across countries
2. **Data Scientists/Analysts:**
    - Handle data processing and cleaning, implement statistical analyses, design visualization strategies and maintain data pipeline from source to dashboard
3. **Healthcare Policy Makers:**
    - Define requirements for comparative analysis, specify needed metrics for decision-making, provide input on dashboard functionality and use insights for policy decisions
4. **Data Engineers:**
    - Set up data infrastructure, ensure proper data integration, handle automated data updates, and maintain data quality and consistency
5. **UI/UX Designers:**
    - Design intuitive interface, ensure accessibility, optimize user experience, create responsive layouts
6. **Quality Assurance Team:**
    - Test functionality, verify data accuracy, ensure cross-platform compatibility, performance testing
7. **End Users (could include):**
    - Healthcare administrators, Educational Institutions, International Organisations, Research institutions, media organisations, general public
8. **Data Providers:**
    - Source data owners, API providers, data validation teams and ensure data accuracy and timeliness

Each of these stakeholders would play a crucial role in ensuring the dashboard is accurate, useful, and maintainable.

Solution: Your pathway to finding the solution to the problem.

Addressing the need to track the progress of COVID-19 vaccination requires a comprehensive and collaborative approach. In the quest to develop an easy to use dashboard where COVID19 vaccination progress and coverage can be tracked, I came about this app. I worked with the COVID-19 vaccination dataset from Our World in Data(OWID), and used various analytic technique to gain insight into the COVID19 vaccination progress pattern and selected 15 countries with significant patterns. These were the countries I finally extracted their dataset and used for my work. With the dataset I had, I did the following:

Data Exploration and collection: I began by exploring the COVID-19 vaccination progress dataset from Our World in Data(OWID). I understood the general structure and variables in the data, analysed data structure and available metrics.

Data preparation: I cleaned and standardized country names and removed continental aggregates(World, Europe etc). I handled column name inconsistencies, convert dates to proper formats and filtered out missing values taking latest data point for the 15 selected countries.

Requirement analysis: I identified the visualization needs I wanted to achieve such as an overview of top performing countries amongst the selected countries, country to country comparison vaccination coverage analysis to determine which country has a better coverage of the COVID19 vaccine and a datailed data view. I also determined necessary user control and planned layer structrure.

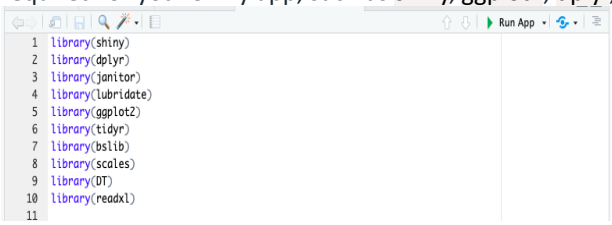
Data Visualisualization: I created visualization to illustrate the coverage and progress of COVID19 vaccination in selected countries. I used bar charts to compare these preogress in the countries.

Communication: I presented my results in a clear and concise manner, using the shinyapp dashboard that is also accessible to a non-technical audience.

IMPLEMENTATION: I used shiny in creating my code. Shiny is an Rpackage that allows you build interactive web applications directly from your R code. Necessary packages were loaded for data manipulation, visualization and UI components. I read the files, cleaned and formatted the data (filtering, grouping, columns and date format standardization,), created a dashboard layout with sidebar which defined three main components (Vaccination metric selection, Country comparison selection, Number of top countries to display) and organized visualizations in cards using layout_columns. Reactive data expressions were created to respond to user inputs, Handled data filtering and processing and Provide metric name formatting. I also created an interactive data table with detailed statistics of the selected countries.

The shinyapp I Created contains the;

- **Library and package imports**: This section is where i imported the necessary R libraries and packages required for your Shiny app, such as shiny, ggplot2, dplyr, etc



- **UI Section**: This defines the layout and visual elements of the app including creating input controls, adding output elements and defining the overall layout and structure of the app.

```r
vaccinations <- load_vaccination_data()

ui <- page_sidebar(
  title = "COVID-19 Vaccination Progress Comparison Dashboard",

  sidebar = sidebar(
    title = "Analysis Controls",

    selectInput("metric", "Vaccination Metric:",
                choices = c(
                  "Total Vaccinations" = "total_vaccinations_per_hundred",
                  "People Vaccinated" = "people_vaccinated_per_hundred",
                  "Fully Vaccinated" = "people_fully_vaccinated_per_hundred"
                ),
                selected = "total_vaccinations_per_hundred"),

    selectInput("compare_countries", "Select Countries to Compare:",
                choices = sort(unique(vaccinations$location)),
                multiple = TRUE,
                selected = head(unique(vaccinations$location), 3)),
```

- **Server Section:** This defines the logic and calculations that occur when the user interact with the app such as reading imputouts and generating outputs from the UI, Performing calculations and data manipulations.

```r
server <- function(input, output) {

  filtered_data <- reactive({
    req(input$metric, input$top_n)
    vaccinations %>%
      arrange(desc(!!sym(input$metric))) %>%
      head(input$top_n)
  })

  comparison_data <- reactive({
    req(input$compare_countries)
    vaccinations %>%
      filter(location %in% input$compare_countries)
  })

  get_metric_name <- function(metric) {
    case_when(
      metric == "total_vaccinations_per_hundred" ~ "Total Vaccinations per 100 People",
      metric == "people_vaccinated_per_hundred" ~ "People Vaccinated per 100 People",
      metric == "people_fully_vaccinated_per_hundred" ~ "People Fully Vaccinated per 100 People"
```

- **Runapp Section:** This starts the Shiny app using the shinyApp() function, passing in the UI and server sections as arguments.

A snippet of my barplots and datasets

- barplot: Shows top N countries by selected metric
- comparison_plot: Compares selected countries
- coverage_plot: Shows vaccination coverage status