**Project Report: Addressing High Maternal Mortality Rates Using Data**

**Subtitle: A Data-Driven Approach to Improving Maternal Health**

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**Date:** November 18th, 2024

**1. Title Page**

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**2. Introduction**

**About SDG 3**

Sustainable Development Goal 3 (SDG 3) focuses on ensuring healthy lives and promoting well-being for all ages. A key component of this goal is reducing maternal mortality rates globally. This aligns with Target 3.1, which aims to reduce the global maternal mortality ratio to fewer than 70 per 100,000 live births.

**Problem Definition**

Maternal mortality rates remain disproportionately high in underserved regions due to:

* Limited access to healthcare facilities.
* Poor distribution of medical resources.
* Insufficient actionable data for policymakers.

**Purpose of the Report**

This report proposes a data-driven solution to address these challenges. By designing a relational database, analysing data with SQL, and visualizing insights in Microsoft Excel, it demonstrates how data can guide informed decision-making to improve maternal health outcomes.

**3. Methodology**

**Step 1: Problem Understanding**

To address the challenges in maternal healthcare, we started by identifying key issues in access to and quality of healthcare services. This involved:

1. **Regions with Low Healthcare Access**
   * Determining regions with insufficient medical facilities, high population-to-hospital ratios, and inadequate healthcare access levels.
   * Identifying regions where maternal mortality rates are above average, potentially due to lack of access.
2. **Hospitals' Capacity and Performance**
   * Assessing hospital capacity in terms of beds, staff, and resources to handle patient volume.
   * Evaluating hospital performance based on service availability, usage, and patient outcomes.
3. **Maternal Health Services Provided**
   * Collecting data on essential maternal healthcare services such as prenatal care, skilled birth attendance, and postnatal services.
   * Identifying gaps in service delivery that may contribute to maternal mortality.

**Step 2: Data Design**

The solution was built on a relational database to systematically organize and store data. Key design steps included:

1. **Entity Identification**
   * Identifying core entities like **Regions**, **Hospitals**, and **Patients** to model the healthcare ecosystem.
2. **Database Schema Creation**
   * Developing a schema to represent relationships between entities, such as hospitals linked to regions and patients linked to hospitals.
3. **Data Population**
   * Populating the database with realistic sample data to simulate real-world scenarios.
   * Ensuring data fields capture critical metrics such as healthcare access level, hospital capacity, and patient demographics.

**Step 3: Data Analysis**

The database was queried using SQL to extract and analyze data. Key analyses included:

1. **Healthcare Access Levels**
   * Identifying regions categorized as low, medium, or high access based on population and available facilities.
2. **Hospital Utilization Patterns**
   * Calculating hospital occupancy rates and identifying underutilized facilities.
   * Evaluating the distribution of hospital resources relative to population needs.
3. **Insights into Maternal Health**
   * Analysing the relationship between healthcare access and maternal outcomes, highlighting areas for intervention.
   * Uncovering trends in resource allocation and service delivery.

**Step 4: Visualization**

Analysed data was imported into Microsoft Excel to create an interactive dashboard, enabling stakeholders to explore findings dynamically. Key visualization features included:

1. **Pivot Tables**
   * Summarizing data by region, hospital capacity, and healthcare access level for quick analysis.
2. **Charts and Graphs**
   * Visualizing hospital capacity, patient distribution, and access disparities using bar charts, line graphs, and pie charts.
3. **Interactive Dashboard**
   * Adding dropdowns to filter data by region or hospital, providing actionable insights tailored to stakeholder needs.

This methodology ensured a structured, data-driven approach to addressing maternal healthcare challenges under SDG 3.

**4. Database Design**

**Entity-Relationship Diagram (ERD)**

The ERD visualizes the relationships between key entities:

* **Regions** (e.g., Region ID, Name, Population, Access Level).
* **Hospitals** (e.g., Hospital ID, Name, Region, Capacity).
* **Patients** (e.g., Patient ID, Age, Gender, Hospital ID).

*(Attach ERD Diagram in Appendices.)*

**Database Schema**

CREATE TABLE regions (

id INT AUTO\_INCREMENT PRIMARY KEY,

name VARCHAR (100),

population INT,

healthcare\_access\_level ENUM ('Low', 'Medium', 'High')

);

CREATE TABLE hospitals (

id INT AUTO\_INCREMENT PRIMARY KEY,

name VARCHAR(100),

region\_id INT,

capacity INT,

FOREIGN KEY (region\_id) REFERENCES regions(id)

);

CREATE TABLE patients (

id INT AUTO\_INCREMENT PRIMARY KEY,

name VARCHAR(100),

age INT,

gender ENUM('Male', 'Female'),

hospital\_id INT,

FOREIGN KEY (hospital\_id) REFERENCES hospitals(id)

);

**Sample Data**

| **Region ID** | **Region Name** | **Population** | **Access Level** |
| --- | --- | --- | --- |
| 1 | Region A | 500,000 | Low |
| 2 | Region B | 750,000 | Medium |
|  |  |  |  |

| **Hospital ID** | **Hospital Name** | **Region ID** | **Capacity** |
| --- | --- | --- | --- |
| 1 | Health Center 1 | 1 | 50 |
| 2 | Health Center 2 | 2 | 120 |

**5. Data Analysis**

**SQL Queries**

Include SQL queries for:

* **Data Retrieval**:

sql

Copy code

SELECT name, population, healthcare\_access\_level

FROM regions

WHERE healthcare\_access\_level = 'Low';

* **Insights Generation**:

sql

Copy code

SELECT r.name AS Region, COUNT(h.id) AS Hospitals, SUM(h.capacity) AS Total\_Capacity

FROM regions r

JOIN hospitals h ON r.id = h.region\_id

GROUP BY r.name;

**Key Findings**

Summarize insights:

* Region A has low healthcare access with only two hospitals serving a population of 500,000.
* Over 60% of hospitals in underserved regions operate below capacity.

**6. Data Visualization in Excel**

**Dashboard Overview**

Include screenshots of your Excel dashboard, showing:

* Charts for hospital capacity vs. patient distribution.
* Pivot tables summarizing healthcare access levels.

**Key Features**

* Interactive dropdowns for filtering by region or hospital.
* Visualizations of patient demographics and service availability.

**7. Recommendations**

Provide actionable recommendations based on data insights:

* Increase the number of hospitals in regions with low access levels.
* Optimize resource allocation by redistributing hospital capacity.
* Use data to track maternal health improvements over time.

**8. Challenges and Limitations**

Discuss any challenges:

* Limited access to real-world data necessitated the use of simulated sample data.
* Time constraints limited the scope of analysis to specific regions.

**9. Conclusion**

* Restate the importance of addressing maternal healthcare challenges under SDG 3.
* Highlight how the proposed solution demonstrates the potential of data-driven decision-making.

**10. Appendices**

* **A. ERD Diagram**  
  Attach the full diagram.
* **B. SQL Scripts**  
  Provide all SQL scripts for schema creation, data insertion, and analysis.
* **C. Dashboard Instructions**  
  Step-by-step guide for navigating the Excel dashboard.
* **D. Pitch Deck**  
  Provide the link to your pitch deck presentation (e.g., Canva, Gamma).