

# IBM AICTE PROJECT

## Tracking Maternal Health Progress Toward SDG 3.1 CAPSTONE PROJECT

**Presented By:**

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# OUTLINE


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# Problem Statement

Sustainable Development Goal 3.1 aims to reduce the global and India's maternal mortality ratio (MMR) to less than 70 per 100,000 live births by 2030.

However, disparities in access to antenatal care, adolescent pregnancies, and lack of skilled birth attendants still result in high maternal deaths, particularly in low-income regions.

There is a need to track these indicators using data to generate insights and prioritize action.

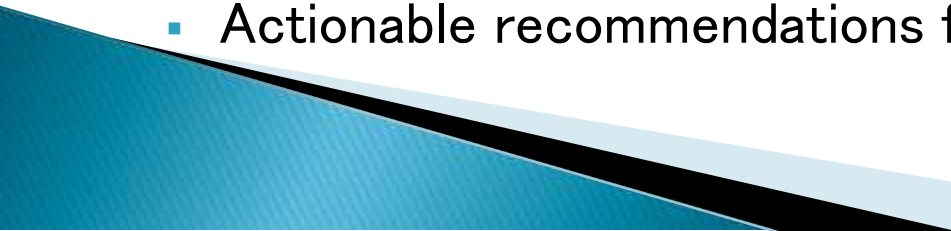


# Proposed Solution

**The proposed system uses AI-driven analysis of key health indicators such as:**

- Maternal Mortality Rate
- Antenatal care coverage
- Adolescent birth rate
- Skilled birth attendance
- Healthcare expenditure
- Institutional births (in the 5 years before the survey) (%)

**It provides:**

- Data visualizations (trends, maps, comparisons)
  - Regression-based MMR prediction
  - Insight into which factors most influence maternal health
  - Actionable recommendations for policy improvements
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# System Development Approach

- **IBM Cloud Lite Tools and Models Used:**

- IBM cloud lite services
- IBM Cloud Watsonx AI Studio– Data analysis + modeling
- IBM Cloud Watsonx AI runtime
- Cloud Object Storage – Dataset hosting
- Jupiter Notebook – Python-based analysis
- Watson Machine Learning model
- Linear Regression
- Random Forest Regressor
- **Libraries Required:**
- Pandas, Seaborn, Matplotlib, Scikit-learn

# End Users

- Government Health Departments
  - Policy Makers & Planners
  - Healthcare NGOs & Foundations
  - Researchers and Public Health Analysts
  - Rural Health Workers & ASHAs
  - Mobile Health App Developers
- 

# Algorithm & Deployment

## Algorithm Selection:

Linear Regression was chosen due to the continuous numerical nature of MMR and associated indicators.

## Data Input:

- Adolescent Birth Rate
- Antenatal Care (%)
- Skilled Birth Attendance (%)
- Maternal Mortality Rate (per 1lakh live births)
- Institutional births (in the 5 years before the survey) (%)

## Training Process:

- Data was split into training and testing sets (80:20 ratio)Model trained using scikit-learn
- The Random Forest model was trained using the training set.


Model performance was evaluated using:

- $R^2$  Score
- Mean Squared Error (MSE)

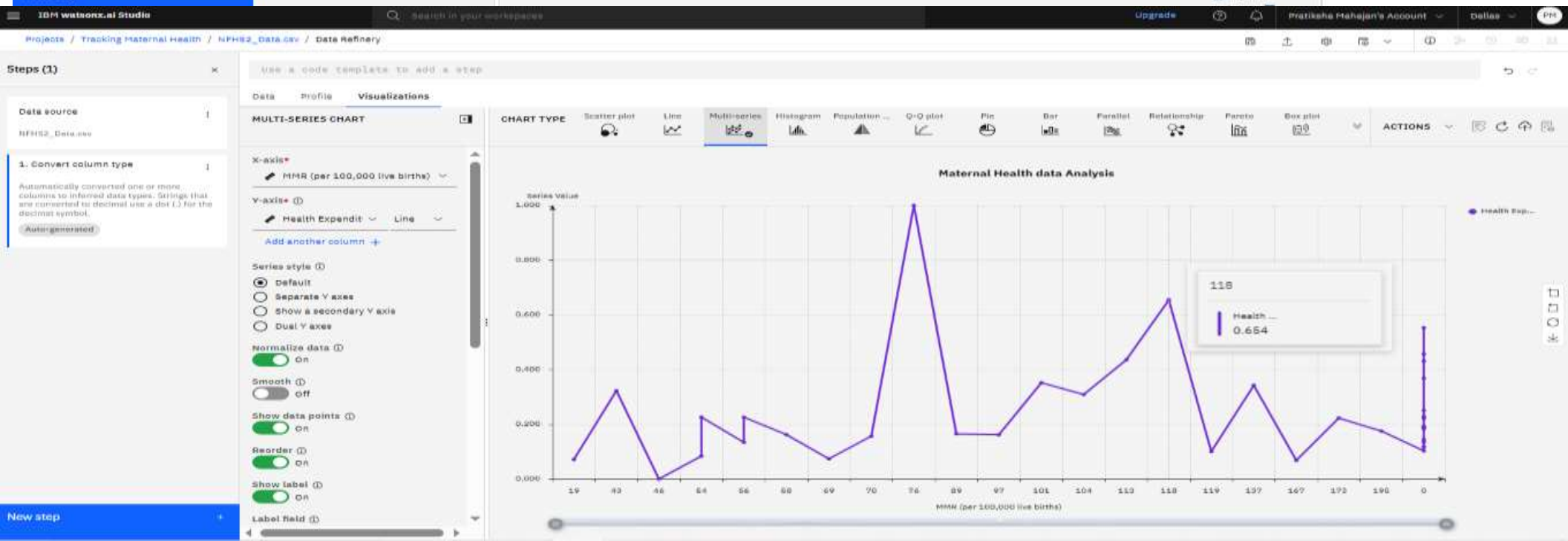
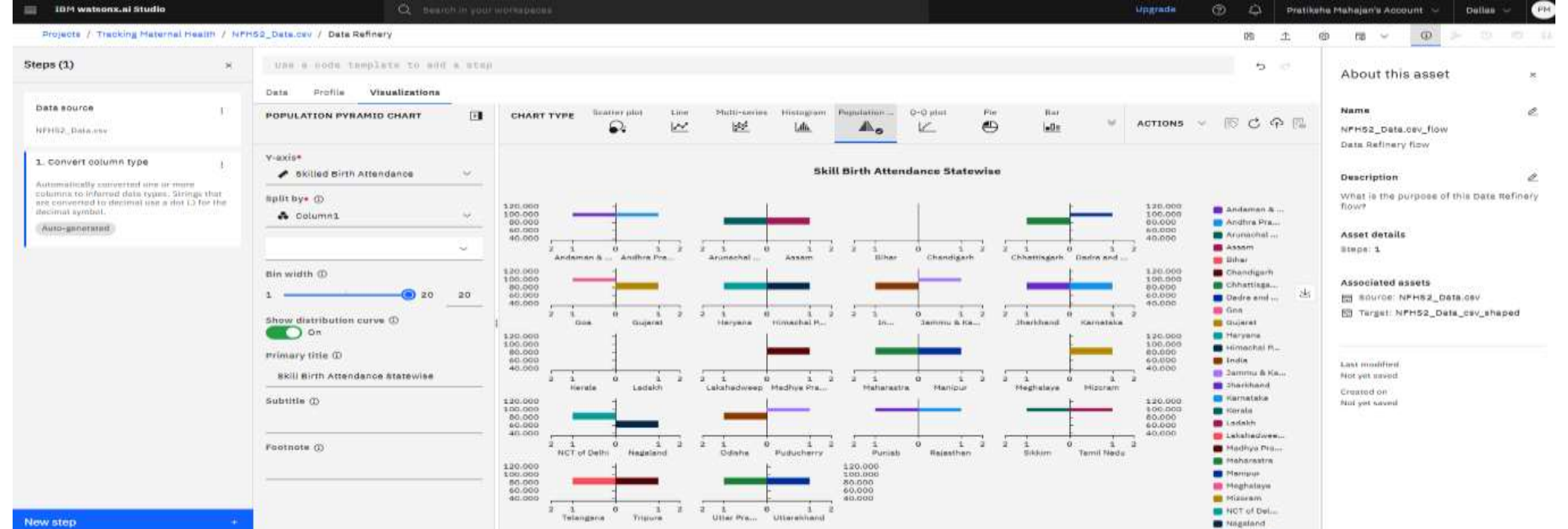
## Prediction Process:

- Model predicts MMR from health indicators
- The model was deployed using IBM Watson Machine Learning (WML)

# Result (Output Image)

- Strongest predictors: Antenatal care and skilled birth attendance.
  - States with lower ANC/skilled attendance showed higher MMR.
  - watsonx ML model explained majority of the variance in MMR ( $R^2$  Score: 0.1757).
  - Time trend shows MMR decline in states with higher antenatal care
  - Correlation heatmap reveals strongest link between adolescent birth rate and high MMR
  - Regression model achieves  $MSE < 100$ , meaning reasonable prediction accuracy
  - Higher ANC visits are associated with lower MMR.
  - States like Kerala and Tamil Nadu have low MMR and high skilled birth attendance.
  - Bihar and Assam need focused improvement.
- 



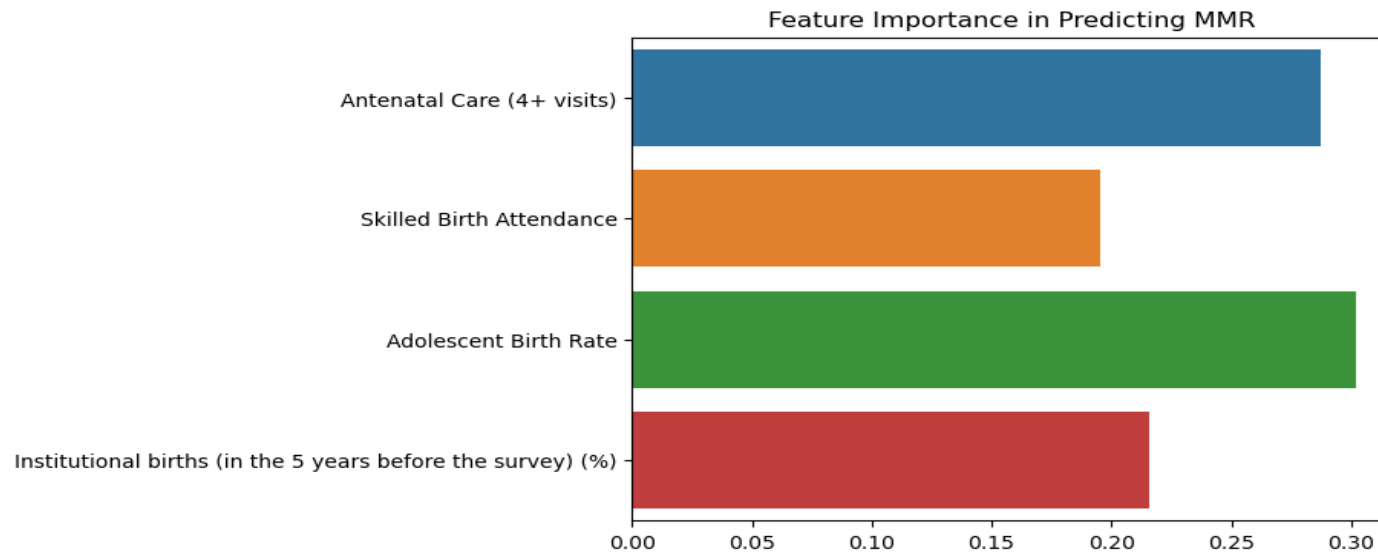


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Code

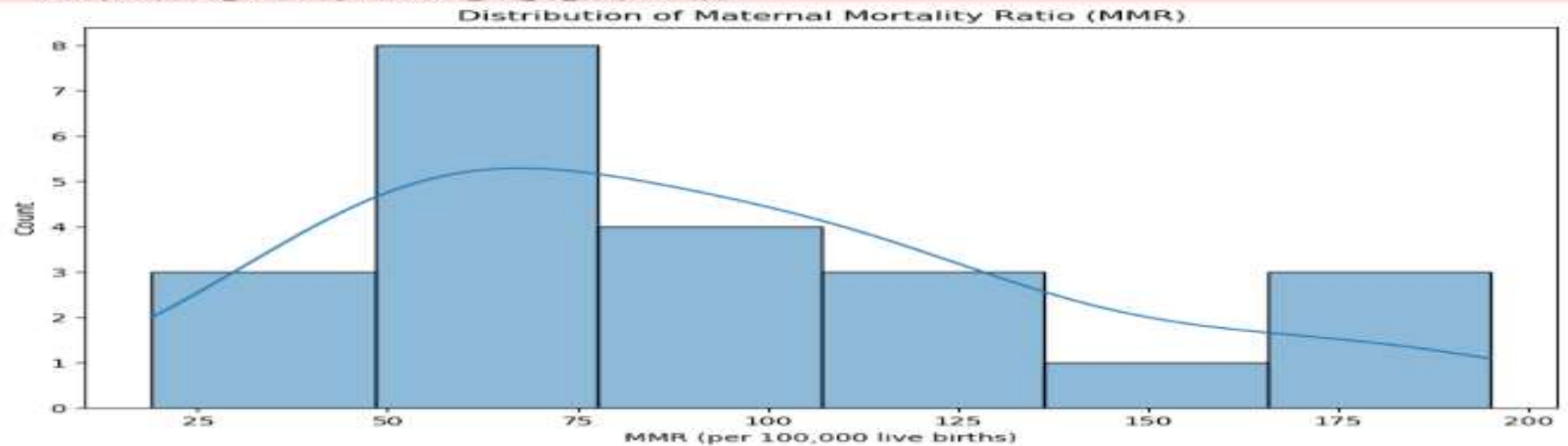
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np.ndarray is deprecated and will raise in a future version.  
order = pd.unique(vector)
```



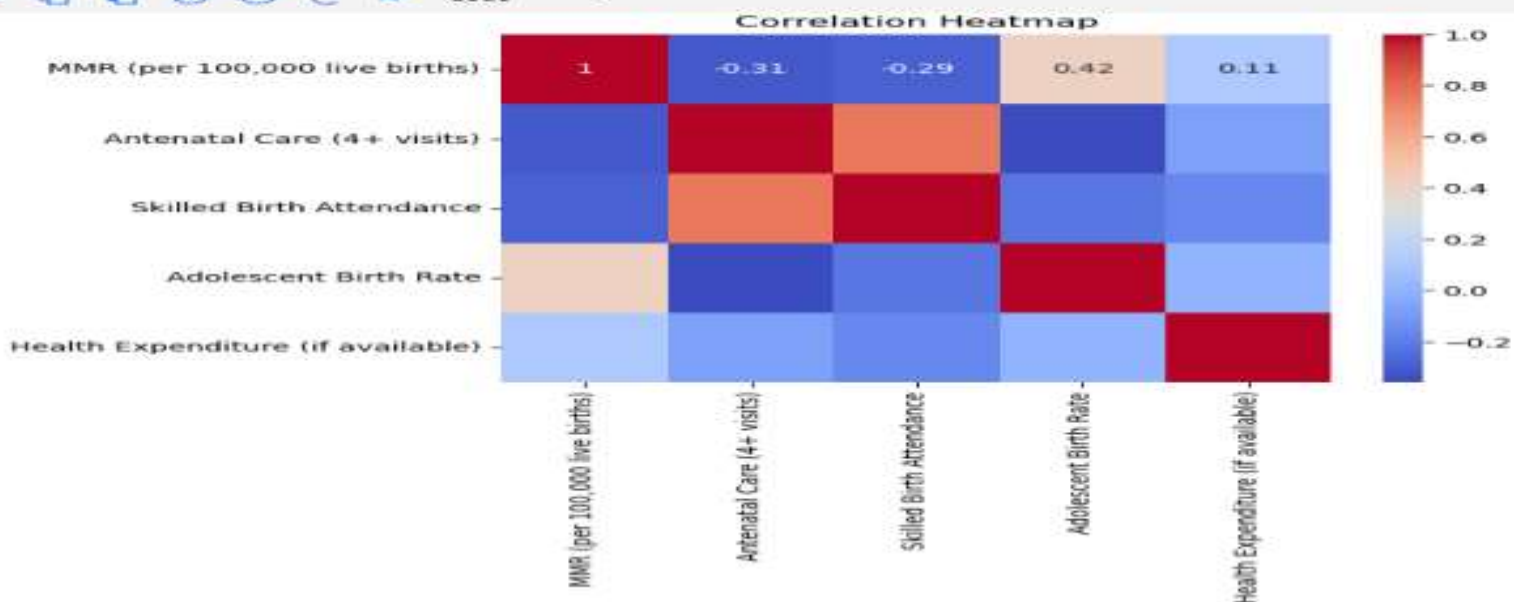
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Code

```
/opt/conda/envs/Python-RT24.1/lib/python3.11/site-packages/seaborn/_oldcore.py:1119: FutureWarning: use_inf_as_na op  
instead.  
with pd.option_context('mode.use_inf_as_na', True):
```







## SCATTER PLOT CHART

X-axis\*

MMR (per 100,000 live births)

Y-axis\*

Antenatal Care (4+ visits)

Color map ⓘ

Adolescent Birth Rate

Size map ⓘ

Health Expenditure (if available)

Shape map ⓘ

Under-five mortality rate (per 1,000 live births)

Fit line ⓘ

None

Gradient Bubble ⓘ

Off

Minimum Bubble Size ⓘ

20

## CHART TYPE

Scatter plot

Line

Multi-series

Histogram

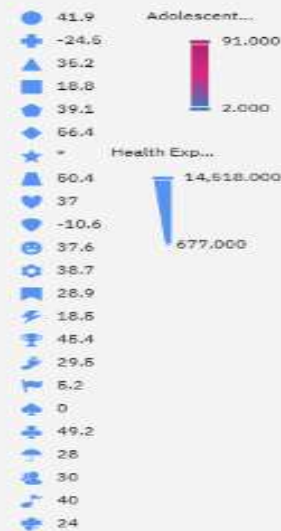
Population ...

Q-Q plot


Pie

Bar


ACTIONS




# Conclusion

- Maternal health outcomes improve with better antenatal coverage and education
  - ML models can help predict high-risk regions
  - System provides data-driven evidence to support policy makers and health planners
  - Challenge: Limited or inconsistent data from some regions
- 

# Future Scope

- Expand the system to global scale using WHO datasets
  - Add more ML models (e.g., Random Forest, XGBoost)
  - Deploy as a dashboard or app for local healthcare workers
  - Integrate with mobile platforms for real-time community-level input
- 

# References

- AI Kosh Dataset – SDG Indicators
  - National Family Health Survey (NFHS)  
( <https://rchiips.org/NFHS/> )
  - Use: Data on maternal health, antenatal visits, skilled birth attendance, etc.
  - Ministry of Health and Family Welfare (MoHFW), Government of India  
(<https://www.mohfw.gov.in/>)
  - Use: National health mission policies, SDG 3.1 progress data
- 



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