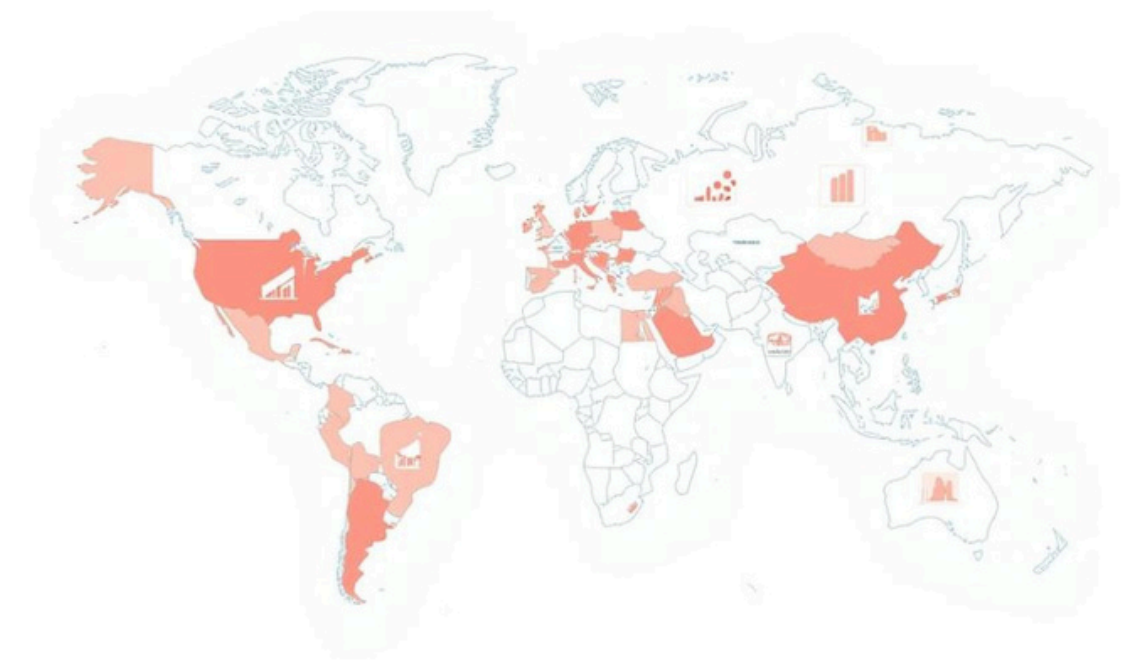
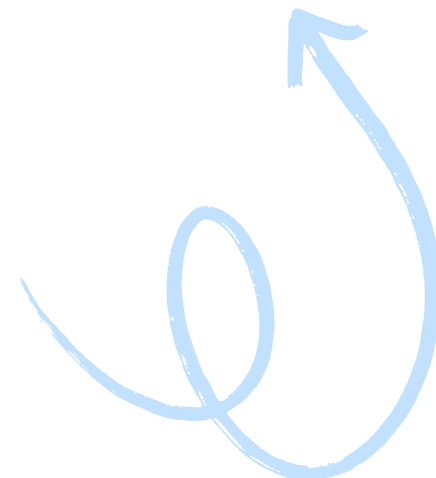


Global TB Analysis

Sector: Health Analytics

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TUBERCULOSIS

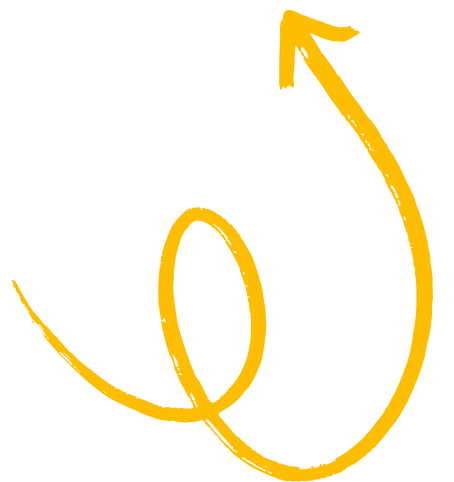
Newton School of Technology
Academic Year 2025-26

Introduction & Context

Analyzing Global TB Trends

Between 2000 and 2024, global tuberculosis incidence and mortality declined significantly. However, regional disparities persist, with certain WHO regions continuing to experience disproportionately high disease burden and elevated fatality rates. Uneven detection efficiency and treatment outcomes contribute to preventable mortality gaps.

The central question is: Which WHO regions should be prioritized for targeted TB intervention based on incidence burden, mortality rates, and detection gaps?



Data Overview

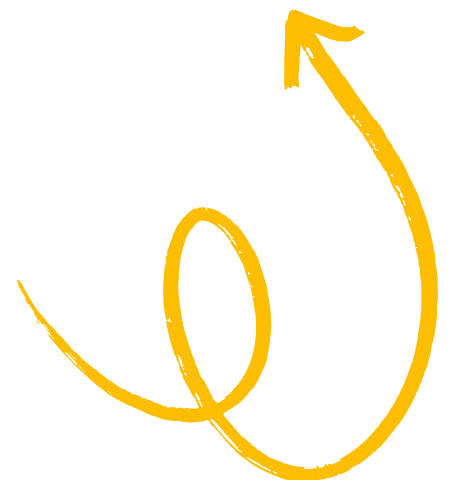
Sources and Scope([Data Link](#))

The analysis utilizes data from the WHO Global Tuberculosis Dataset covering 2000–2024, comprising 5,347 records across multiple regions, meticulously cleaned for accuracy and consistency in key variables.

Key Variables

The core variables used in the analysis include:

- TB Incidence (per 100,000 population)
- TB Death Rate (per 100,000 population)
- Detection Rate (%)
- Fatality Rate (%)
- Country, WHO Region, and Year



Data Preparation

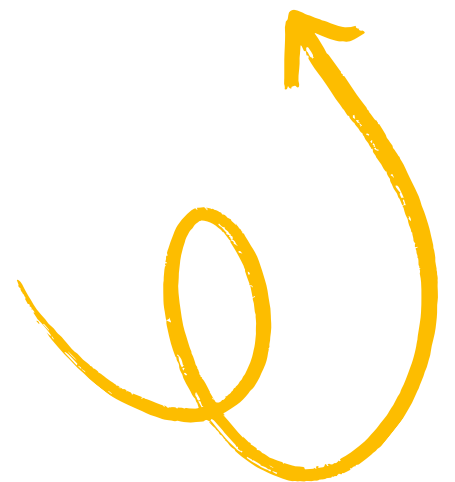
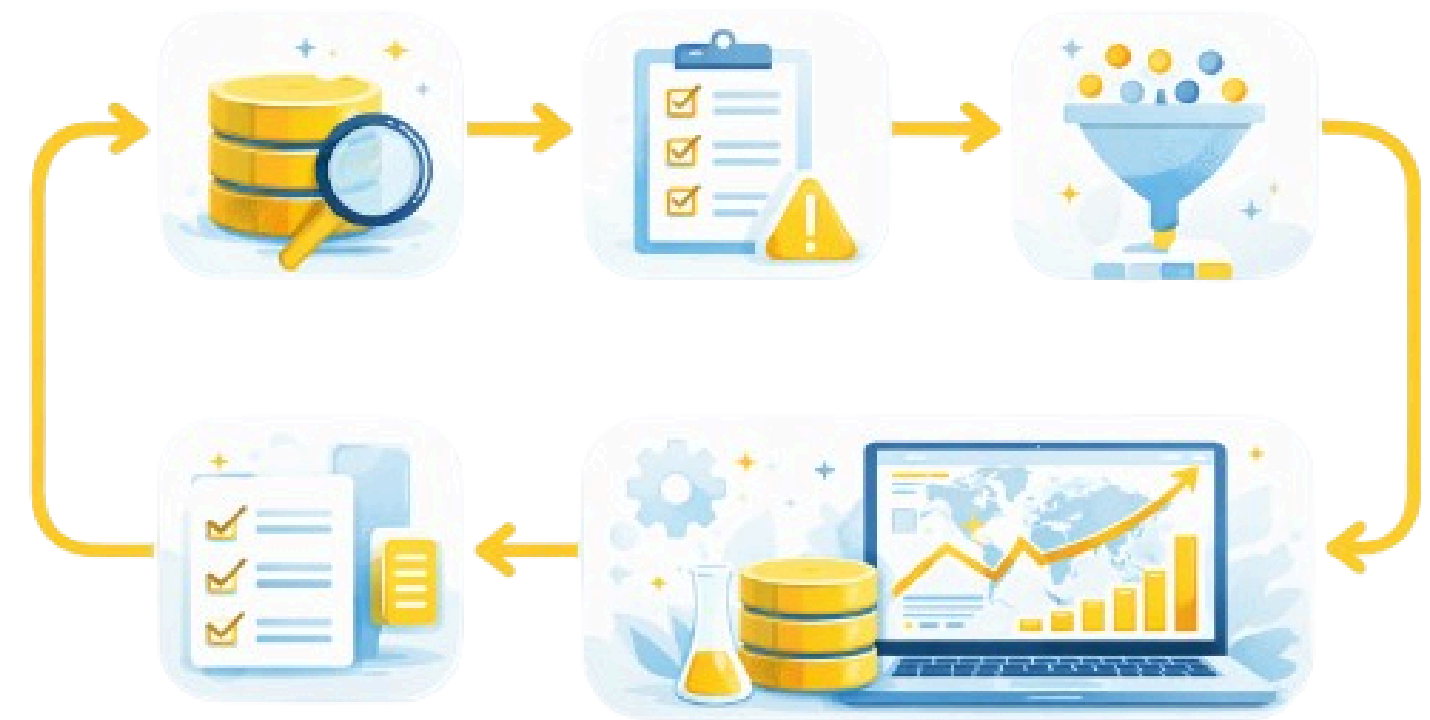
Cleaning and Validation Process

- Removed incomplete country–year records
- Standardized WHO region labels
- Converted key indicators to numeric format
- Validated fatality rate consistency
- Ensured time-series continuity (2000–2024)

Data Workflow

Raw WHO Dataset

- Cleaning & Validation
- KPI Construction
- Exploratory Analysis
- Interactive Dashboard



KPI Framework

Core Metrics and Regional Insights

Core Metrics

- Primary KPIs Used in Analysis:
- TB Incidence Rate (per 100k population)
 - TB Mortality Rate (per 100k population)
 - Detection Rate (%)
 - Fatality Rate (%)

Long-term change (2000–2024)

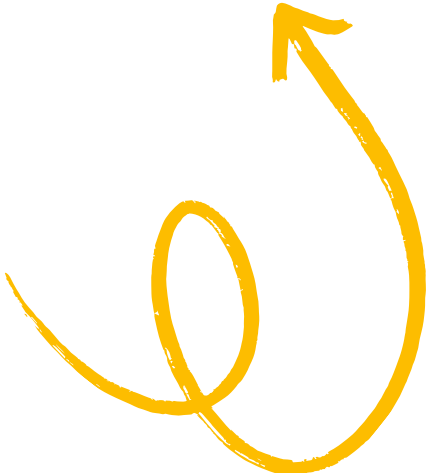
Between 2000 and 2024, global TB incidence declined by 47.92%, while mortality dropped by 73.11%, reflecting substantial progress in detection, treatment, and public health interventions.

Regional Highlights

In 2024, South-East Asia remains the **highest burden** region with the lowest detection rate in **Europe**, emphasizing the need for targeted strategies and resource allocation.

Formula Used

Incidence Change (2000–2024)	Mortality Change (2000–2024)	Detection Gap (2024)
$\frac{(\text{Global Avg Incidence 2024} - \text{Global Avg Incidence 2000})}{\text{Global Avg Incidence 2000}}$	$\frac{(\text{Global Avg Mortality 2024} - \text{Global Avg Mortality 2000})}{\text{Global Avg Mortality 2000}}$	$100 - \text{Global Avg Detection Rate (2024)}$



Key Insights

Global Progress

TB incidence declined by 47.92% and mortality by 73.11% (2000–2024).

Regional Disparities

South-East Asia (SEA) remains the highest-burden region.

Increased Fatality Risk

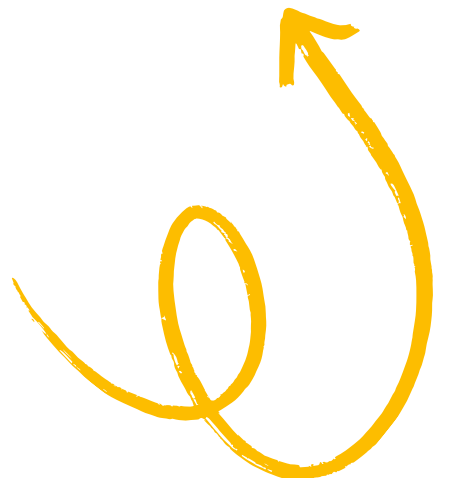
Africa (AFR) and Eastern Mediterranean (EMR) show higher fatality rates.

Detection–Outcome Link

Higher detection rates align with lower mortality.

Benchmark Region

Europe (EUR) has the lowest detection gap and stable control performance.



Detection vs Mortality

Method Used

Correlation analysis was conducted between:

- Detection Rate (%)
- TB Death Rate (per 100k population)
- Fatality Rate (%)

Strategic Implications

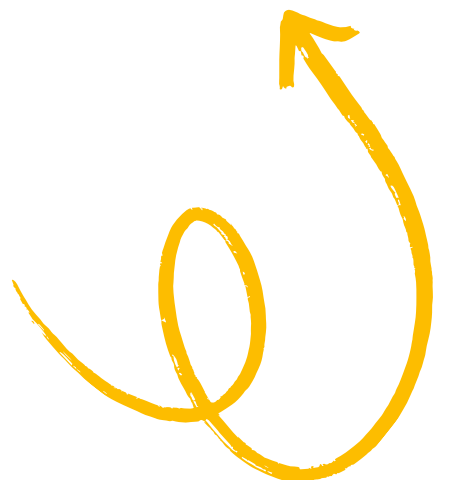
This analysis illustrates that enhancing **detection efforts** is not merely a metric but a critical life-saving intervention, shaping future strategies to combat tuberculosis effectively.

Correlation Insights

A strong **negative correlation** exists between detection rates and mortality, indicating that as detection rates improve, mortality rates decline significantly, emphasizing the importance of early diagnosis.

Strength of Relationship

The correlation coefficient indicates a strong inverse association, confirming that improvements in detection are statistically linked to reductions in mortality outcomes.



Dashboard Overview

Executive Snapshot

The dashboard presents key global TB indicators including:

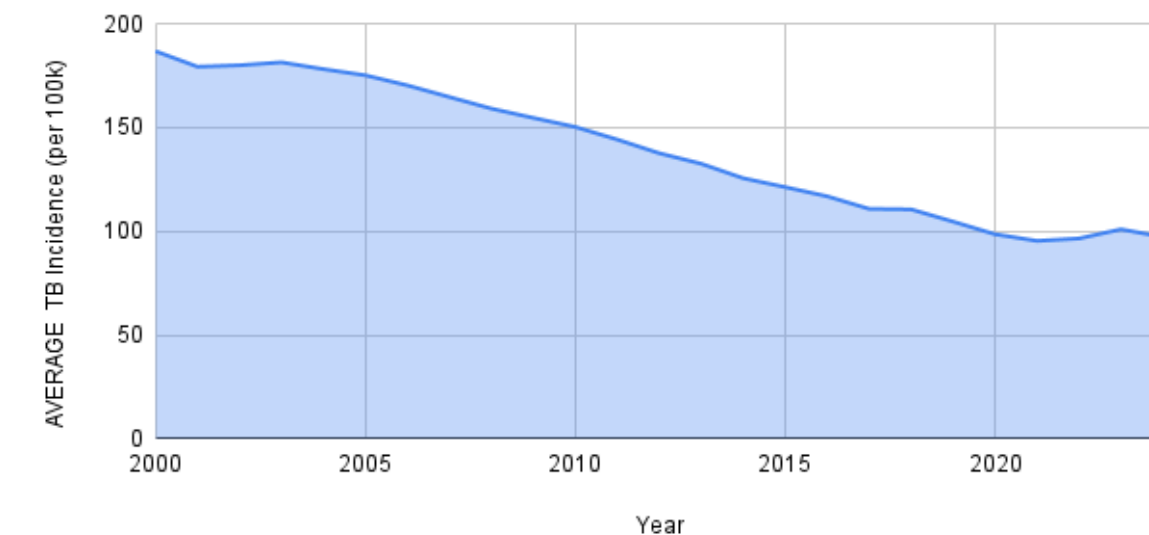
- Incidence Rate (2024)
- Death Rate (2024)
- Long-Term Change (2000–2024)
- Detection Gap
- Highest-Burden Region

These KPIs provide an immediate summary of global TB performance.

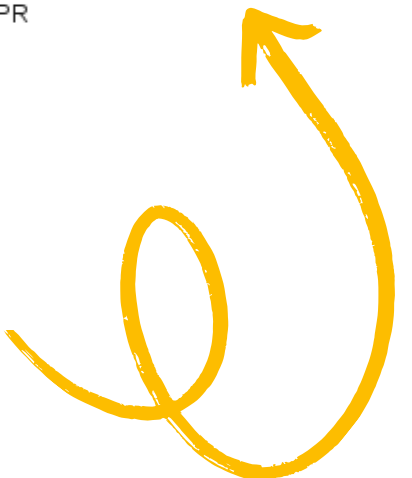
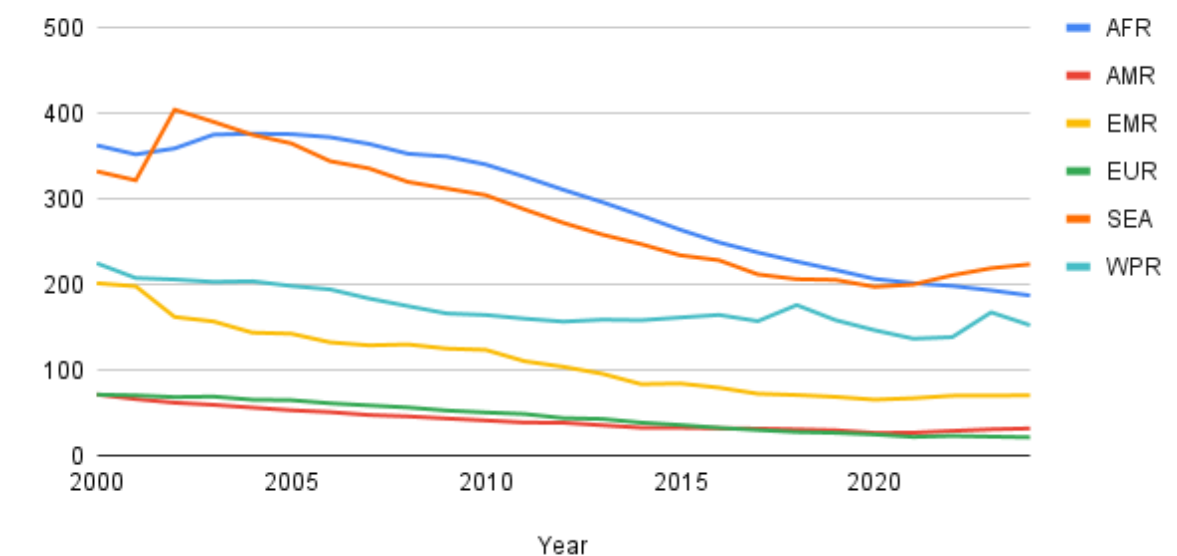
Regional & Trend Insights

- Regional burden comparison across WHO regions
- Identification of high-risk regions (e.g., SEA, AFR)
- Long-term incidence and mortality trends (2000–2024)
- Detection vs mortality relationship

AVERAGE TB Incidence (per 100k) vs. Year



Regional TB Incidence Trend (2000–2024)



Dashboard Insights

Regional Performance Snapshot

- Clear variation in TB burden across WHO regions
- SEA and AFR show highest incidence and mortality levels
- EUR demonstrates relatively low burden and stronger detection performance

High-Burden Country Focus (2024)

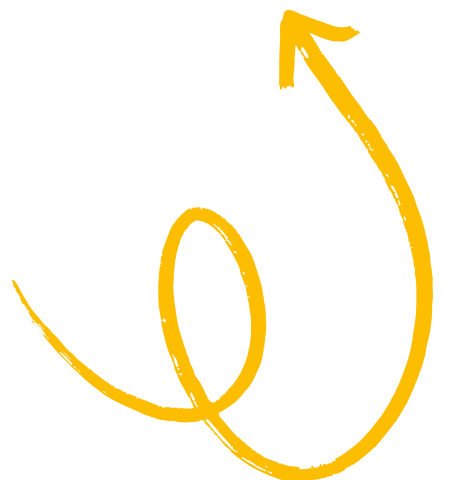
- A small group of countries contributes disproportionately to global TB incidence
- Targeted interventions in these countries can significantly impact global reduction

Detection & Outcome Patterns

- Regions with higher detection rates show lower fatality outcomes
- Detection gaps remain concentrated in high-burden regions
- Early diagnosis strongly influences mortality reduction

Decision-Support Value

- Enables region-wise comparison
- Tracks long-term trends (2000–2024)
- Identifies priority regions and countries for intervention



Strategic Recommendations

Region-Specific and Global TB Priorities

SEA Initiatives

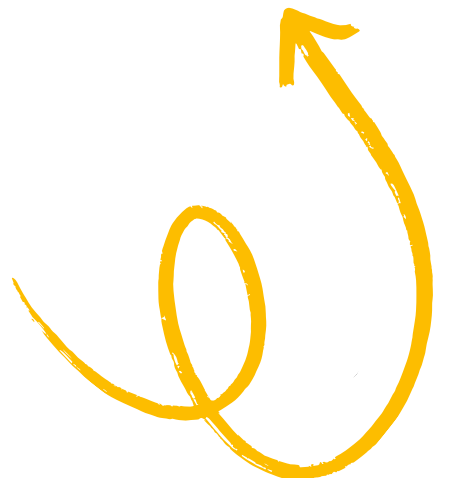
To combat high TB rates, SEA should **expand early screening** and diagnostics through mobile units and community testing, increasing access to timely interventions for vulnerable populations.

AFR Improvements

In the AFR region, efforts should focus on **improving treatment access** and ensuring a consistent drug supply, enhancing patient adherence to therapy and reducing fatality rates.

Global Strategies

A global approach must aim to **close the 23.9% detection gap** using digital surveillance and real-time tracking, optimizing resource allocation and effectively targeting interventions.



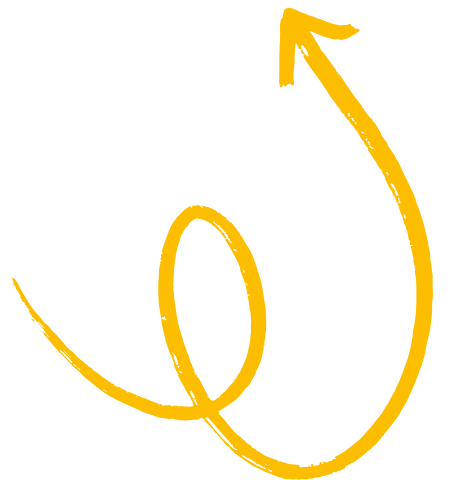
Impact and Strategic Value

The “So What?” — Measurable Impact

Strengthening TB detection in high-burden regions could reduce TB deaths by 20–30% through earlier diagnosis and timely treatment. Improved case detection would lower fatality rates and accelerate progress toward long-term TB reduction targets.

Why Should Stakeholders Approve This?

This analysis enables targeted resource allocation to the most vulnerable regions, improving efficiency and minimizing wastage. By focusing on detection as a high-impact intervention lever, stakeholders can maximize public health outcomes and return on investment while aligning with the WHO End TB Strategy.



Limitations & Future Scope

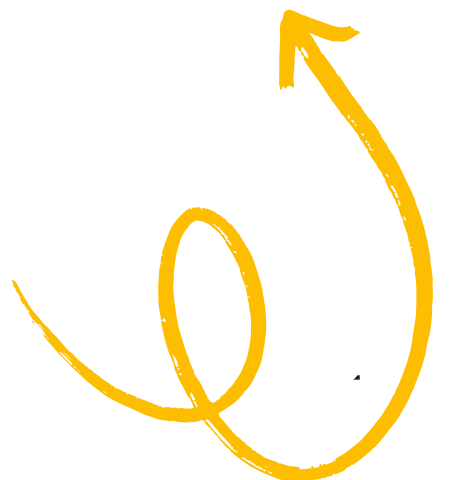
Analyzing Data Challenges and Opportunities

Data Gaps

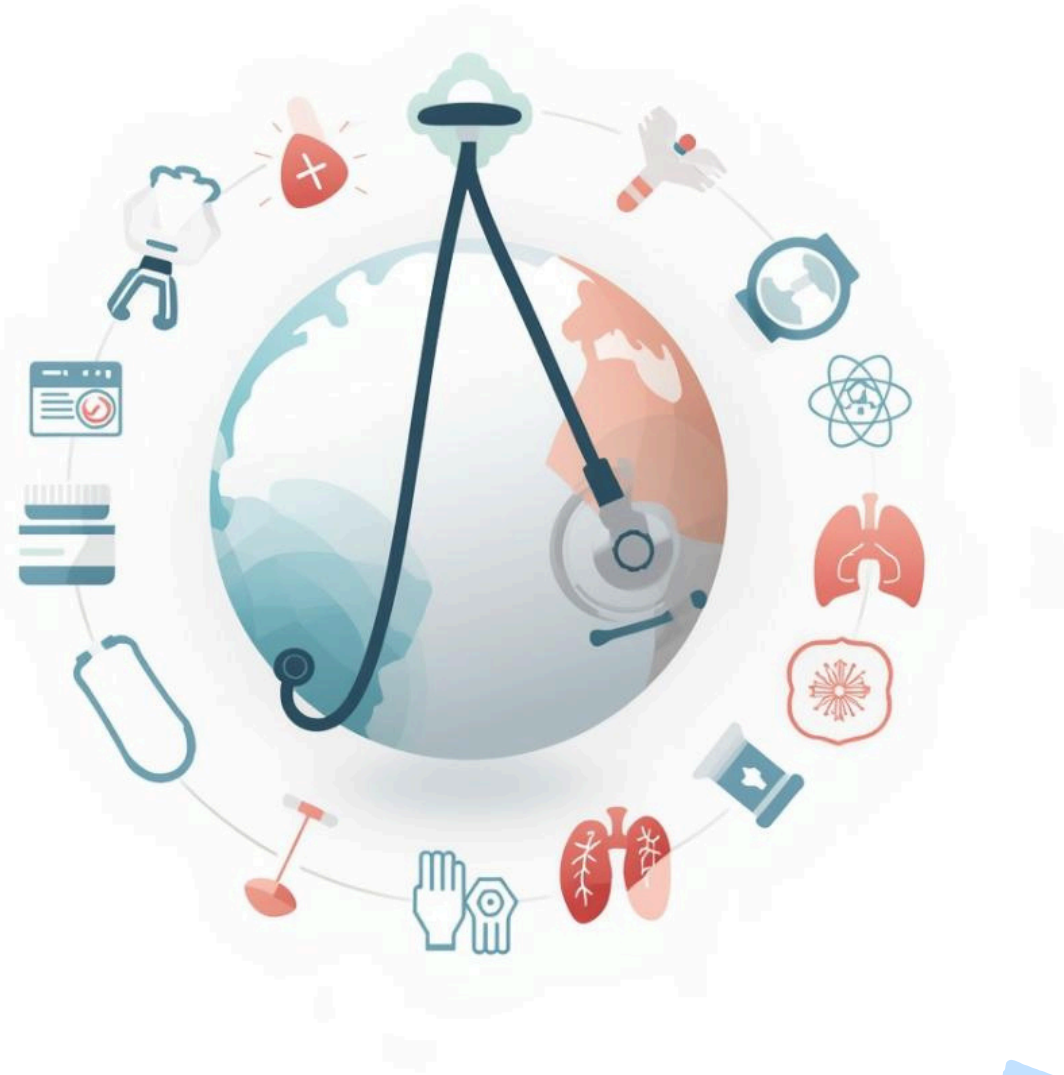
Incomplete data for some countries restricts comprehensive analysis and may lead to inaccurate conclusions about TB trends and intervention effectiveness across different regions.

Future Directions

Future plans include integrating healthcare spending data and developing predictive models, allowing for deeper country-level analysis and the incorporation of real-time data updates for improved insights.



Thank You



Data-Driven Insights for Change