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TB burden estimation
TB mortality

- **Vital Registration (VR)** records with ICD-10 coding of causes of death
- Estimation for countries with no VR data
  - **IHME**: Ecological modelling (41 covariates)
  - **WHO**: Mortality = incidence * case fatality
    - Incidence disaggregated by HIV and notification status
    - Case fatality derived from Bayesian model using direct mortality measurements
Can we measure TB incidence?

- Notification data *biased* under-diagnosis and under-reporting change over time
  - IHME (Seattle) - ecological modelling
    \[
    \log(\text{Notif}) = f(g_1(\text{Access}) + g_2(\text{Deaths}) + g_3(\text{HIV}) + g_4(\text{yr}))
    \]

- WHO
  - capture-recapture modelling
  - expert opinion elicited within standard analytical framework
Ecological v. CFR method: local discrepancies

LOG TB Death Rate Comparison: 2010

WHO Estimate v. IHME Estimate
Incidence - discrepancies

TB Incidence Rate Comparison: 2010

Country by country WHO Estimate v. IHME Estimate

WHO Estimate: TB, all forms (per 100,000)

IHME Estimate: TB, all forms (per 100,000)
TBHIV underestimated in the preliminary GBD dataset
China mortality and incidence (IHME)
India mortality and incidence

Mortality

Incidence
Indonesia incidence and mortality (IHME)

**Mortality**

**Incidence**
Prevalence - discrepancies

TB Prevalence (all forms) Comparison
In summary,

- Two independent estimation exercises (IHME, WHO) with globally consistent estimates of incidence and mortality
- Need to improve TB data at country level
  - Strengthen routine TB surveillance
  - Invest in sample *vital registration* systems (e.g. China, Indonesia) in more countries
  - Impact monitoring should be based on direct measurements