# What role can modelling play in advancing pediatric TB interventions?

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Key questions

- How can implementers help modelers build better models?
  - Example: pediatric TB mortality

- How can modelers help implementers plan better interventions?
  - Example: household contact management

Better
models

Better program
planning

Better
programmatic data
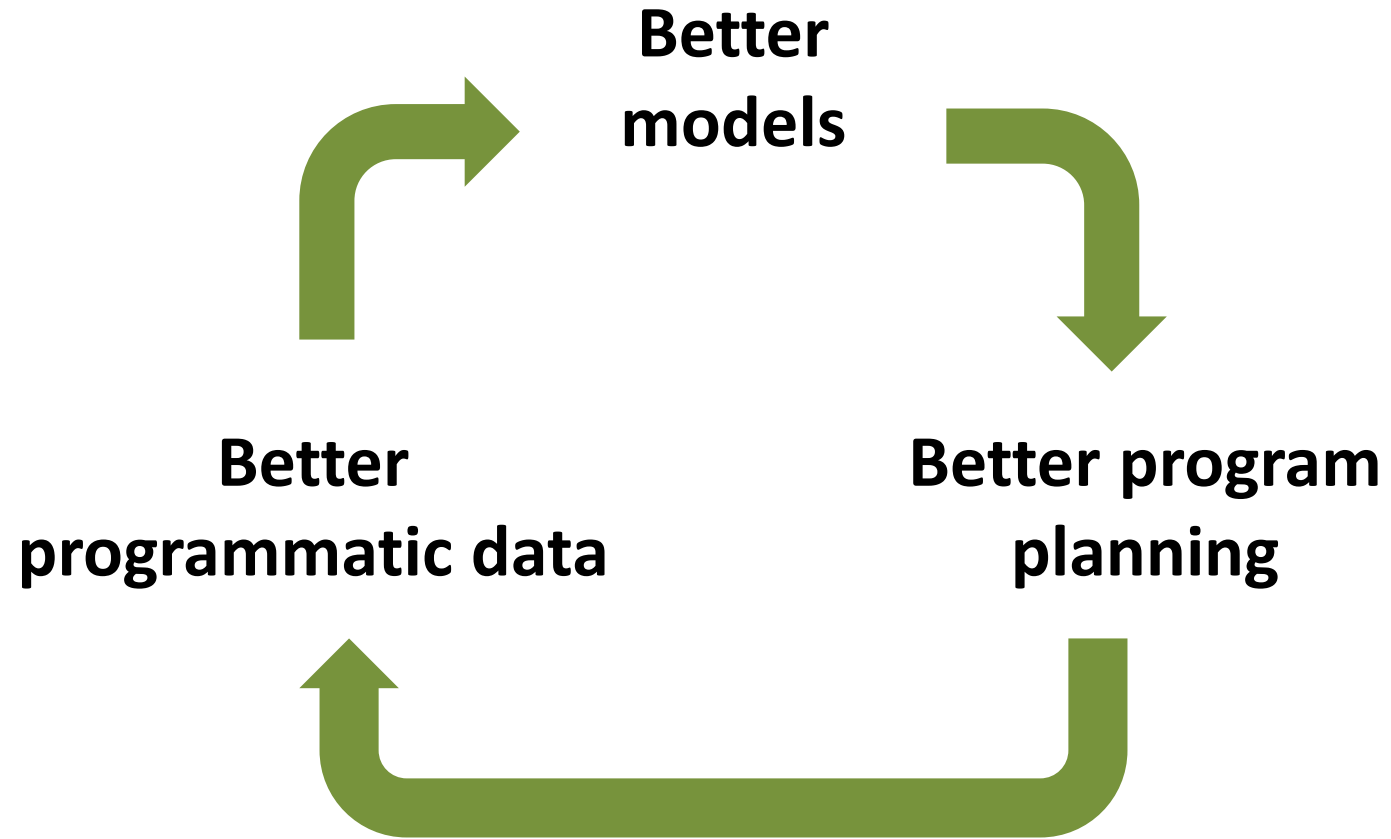
Acknowledgements

Helen Jenkins
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James Seddon
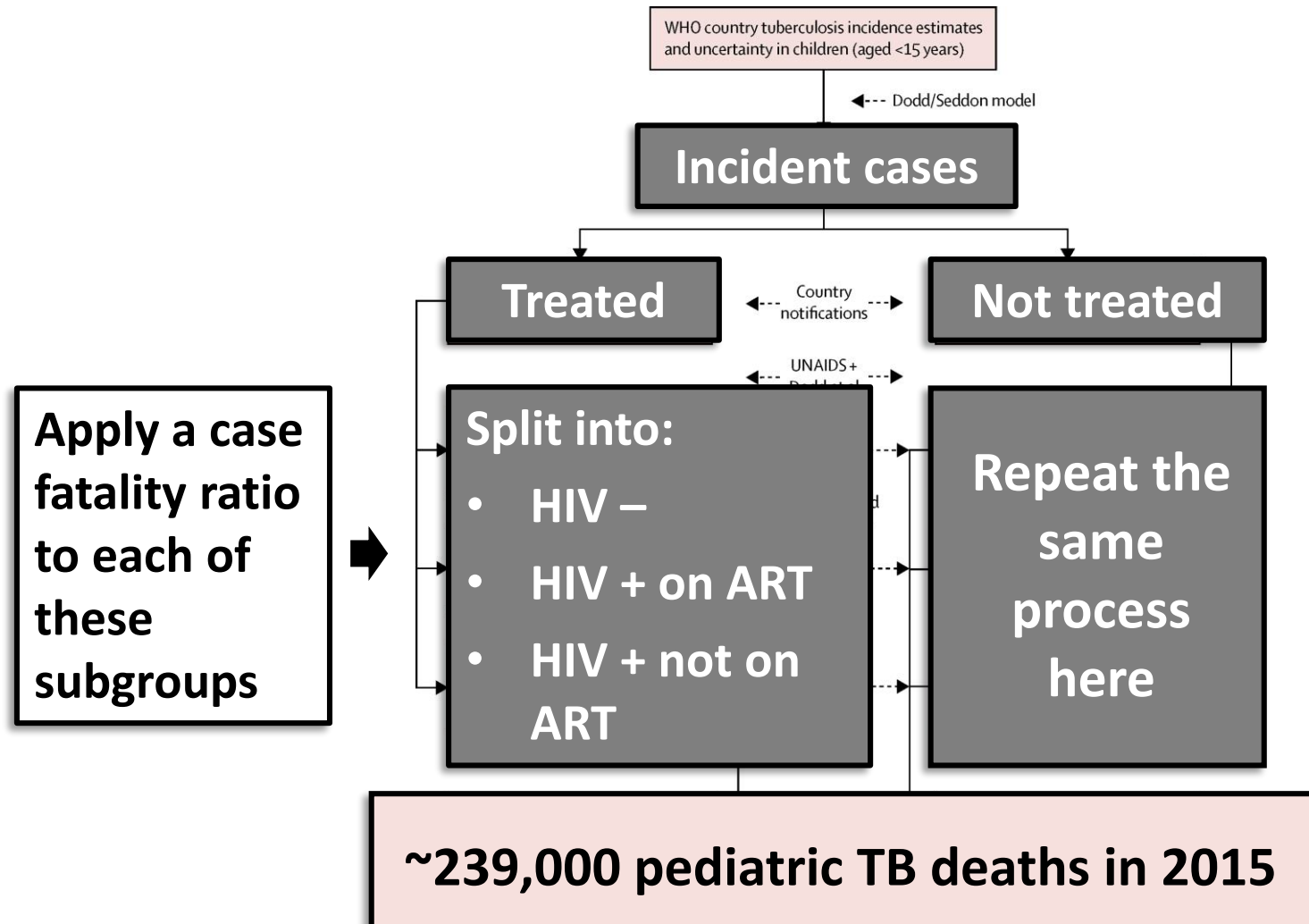Imperial College London

Pete Dodd
University of Sheffield

How can implementers help build better models?

- Understand bias and reliability of programmatic data sources

- Judge generalizability of parameter estimates

- Offer "sanity checks" (do the numbers make sense?)

- Especially important for pediatric TB since primary data are limited

Estimating pediatric TB deaths

WHO country tuberculosis incidence estimates and uncertainty in children (aged <15 years)

◄--- Dodd/Seddon model

Incident cases

◄-- Country
notifications --►

Treated

Not treated

◄-- UNAIDS+

Apply a case fatality ratio to each of these subgroups

Split into:
- HIV –
- HIV + on ART
- HIV + not on ART

Repeat the same process here

~239,000 pediatric TB deaths in 2015

Dodd PJ, Yuen CM, Sismanidis C, Seddon JA, Jenkins HE. Lancet Global Health 2017; 5(9):PE898-E906.

Parameter considerations informed by experience

- How many untreated children with TB are there?
  - Lack of notification to WHO = lack of treatment?

- How many children with TB have HIV?
  - Individual versus population relative risk

- Case fatality ratios for HIV+ children with TB
  - Generalizability of USA data to Africa
  - Expert opinion for untreated children

How can modelers help inform interventions?

- Estimates of burden / incidence / prevalence can help programs set diagnostic targets

- Impact projections can help programs choose between intervention strategies

Modeling the impact of contact management

- When a person is diagnosed with TB, his/her household members should be evaluated for TB

- Preventive therapy can be given to avoid development of TB
  - Most countries recommend for children <5 and PLHIV
  - 2018 WHO recommendations expand recommendation

Implementation of these recommendations globally is poor

What impact would ideal contact management have on pediatric TB?

Dodd PJ, Yuen CM, Becerra MC, Revill P, Jenkins HE, Seddon JA. Lancet Global Health, in press.
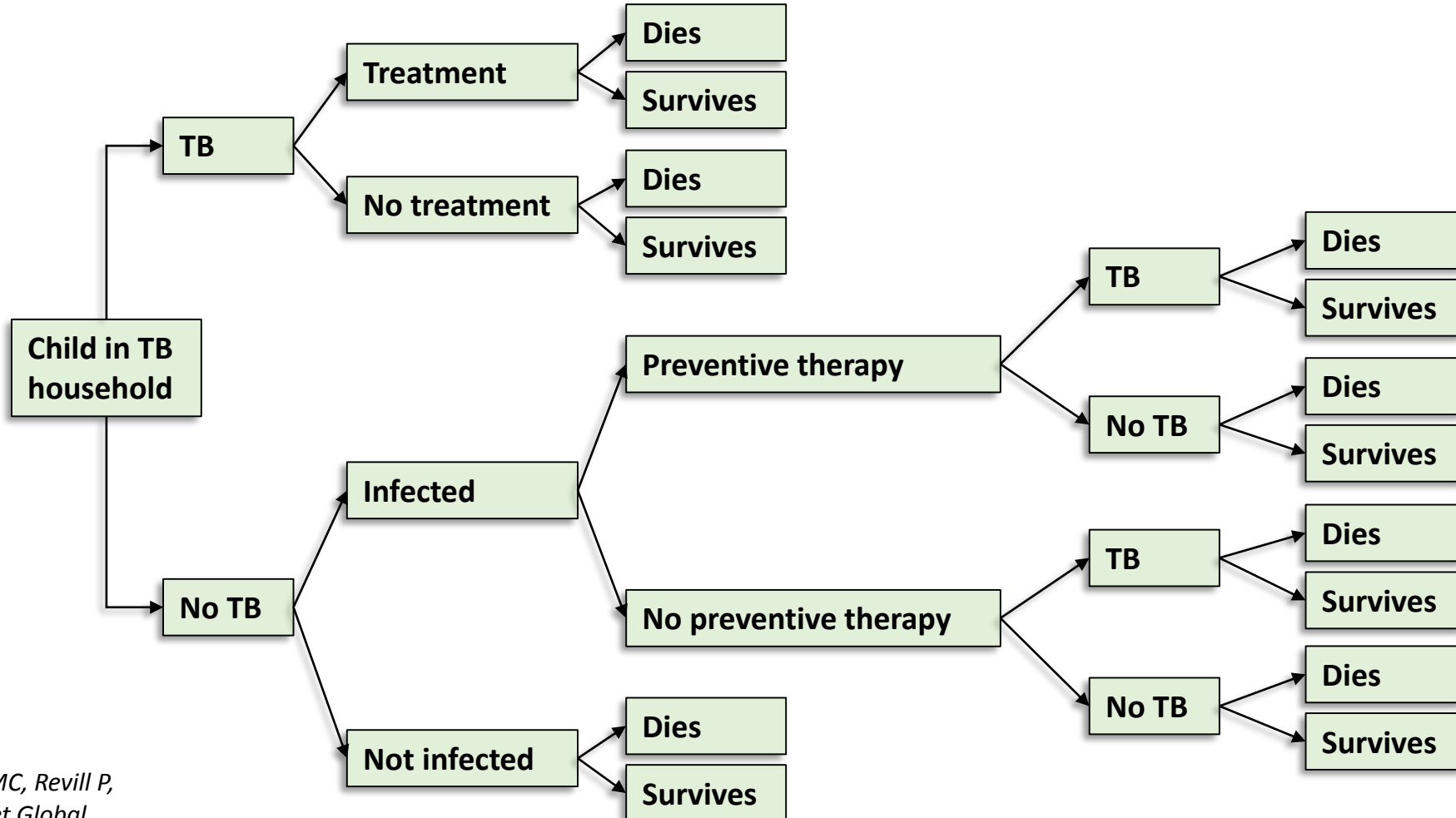
Impact of two contact management strategies

- Evaluate all children, give preventive therapy to those <5 and those with HIV
  - 66,700 (75% UI 59,790 – 72,370) cases averted
  - 103,600 (75% UI 94,480 – 111,900) deaths averted

- Evaluate all children, give preventive therapy to those <5, those with HIV, and others who are TST+
  - 159,500 (75% UI 147,000 – 170,900) cases averted
  - 108,400 (75% UI 98,800 – 116,700) deaths averted

Presenting results that programs can use

- Using an expanded preventive therapy strategy, averting 1 case requires:
  - Visiting 32 households (75% UI 30 – 35)
  - Screening 52 children (75% UI 47 – 56)
  - Giving 33 courses of preventive therapy (75% UI 30 – 35)

Where can modeling help programs? (Just a few ideas)

- Pediatric TB burden by country and type:
  - Need to know what to expect in terms of overall burden, type (e.g. meningitis), drug resistance

- Impact of different diagnostic practices on improving pediatric case detection
  - Radiography, Xpert Ultra, stool, gastric aspirate

- Economic impact of pediatric TB interventions

Thank you