A DECISION ANALYTIC APPROACH TO ASSESSING POLICY TRADEOFFS IN MALARIA CONTROL IN LIBERIA

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Context:
Need for Evidence-based Decision-Making

Malaria is the leading cause of mortality and morbidity in Liberia with major economic consequences

- 40% of all outpatients, 18% of inpatient deaths
- 21,000 deaths among children<5 a year
- Entire population is at risk of malaria

A number of strategies are available including bed nets and indoor residual spraying for vector control and a variety of diagnostic strategies and drug therapies

However, it is often difficult for decision-makers to determine the **best combination of interventions given the constraints** within local health care delivery systems, as well as in vector control infrastructure (e.g. DDT debates)

MDAST: A Decision Analysis Tool

- MDAST = Malaria Decision Analysis Support Tool
- Multi-disciplinary approach: Medicine, Risk analysis, Environmental science, Economics, Entomology, etc.
- Implementation science: Scientific knowledge translated into actual practice within specific settings
- Rapid prototyping: Tool is constructed and modified iteratively in a quick turnaround cycle
- Currently, a prototype model is being developed for 3 countries in east Africa (i.e. Tanzania, Uganda, and Kenya)… looking for a country in west Africa to apply

Current Status of Malaria Control in Liberia

* Malaria Indicator Survey (MIS) in 2005
* LISGIS (2008 Population and Housing Census) in 2009

(1) Disease Treatment

- Only 3.2% of children under 5 with fever received first-line treatment for malaria
- Only 4% of pregnant women received treatment during pregnancy

(2) Vector Control

- Only 18% of HHs owned a "net"
- Only 2.6% of children under 5 slept under an ITN
- Only 4.3% of population were covered by IRS
- No up-to-date information on ACT or IPT coverage

Current Malaria Control Policy in Liberia: PMI

* President's Malaria Initiative (PMI): Target by 2010

(1) Disease Treatment

- 85% of children under 5 with suspected malaria receive treatment with an anti-malarial drug in accordance with national policies within 24 hrs of onset of symptoms
- 85% of pregnant women receive 2 or more doses of IPTs during pregnancy
- 85% of government health facilities have ACTs available

(2) Vector Control

- 90% of HHs nationwide own an ITN
- 85% of children under 5 nationwide sleep under an ITN
- 85% of pregnant women nationwide sleep under an ITN
- 85% of targeted houses are covered by IRS per year
- 85% of pregnant women and children <5 sleep under an ITN or in a house sprayed with IRS in the last 6 months

Limitation of the Plan

1. Lacks sufficient discussion among all stakeholders based on scientific knowledge from different disciplines
2. Lacks considerations about multiple aspects: health, environmental, and social impacts of each strategy
3. Lacks integrative approach of VC and DT
4. Lacks sustainability concerns

Project Objectives

1. Develop an "effective" and "practical" decision support tool to improve the implementation of malaria control strategies, including both vector control and disease management

2. To create an agenda for policy-relevant malaria research

Why Decision Analysis?

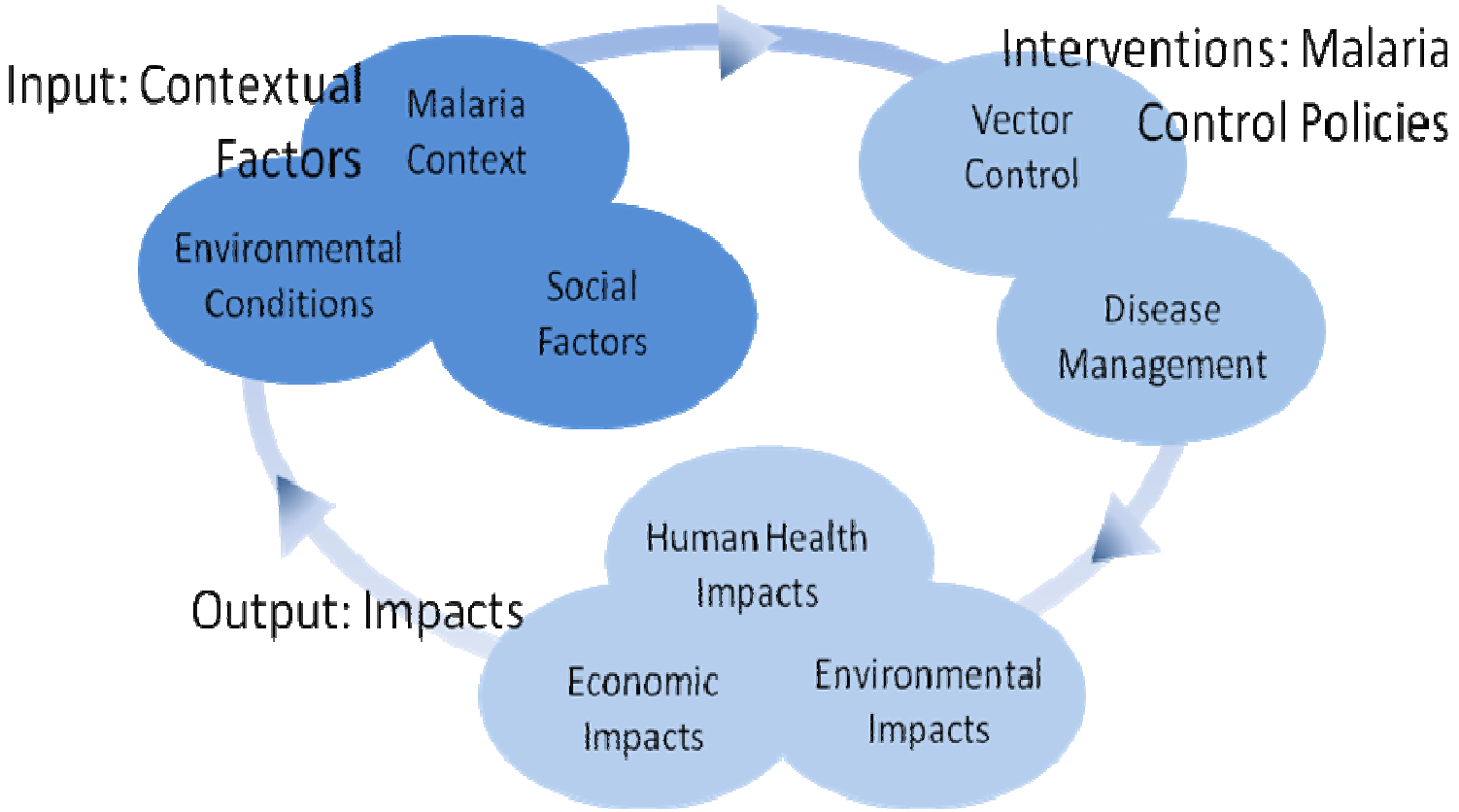
Five challenges to address malaria:

- **High Stakes Environment: Mistakes are very costly**
- **Multiple Actors at Multiple Scales: promote discussions**
- **Complex Tradeoffs: health, social, environmental aspects**
- **Dynamics, Interdependencies and Uncertainties**
- **Complex Human-Environment Interactions**

DA can bring together multiple perspectives and areas of expertise, thus fostering collaboration and dialogue

A Conceptual Model

Overall Goal of MDAST: Trace out ALL probable impacts of different combination of malaria control policies on multiple outcomes

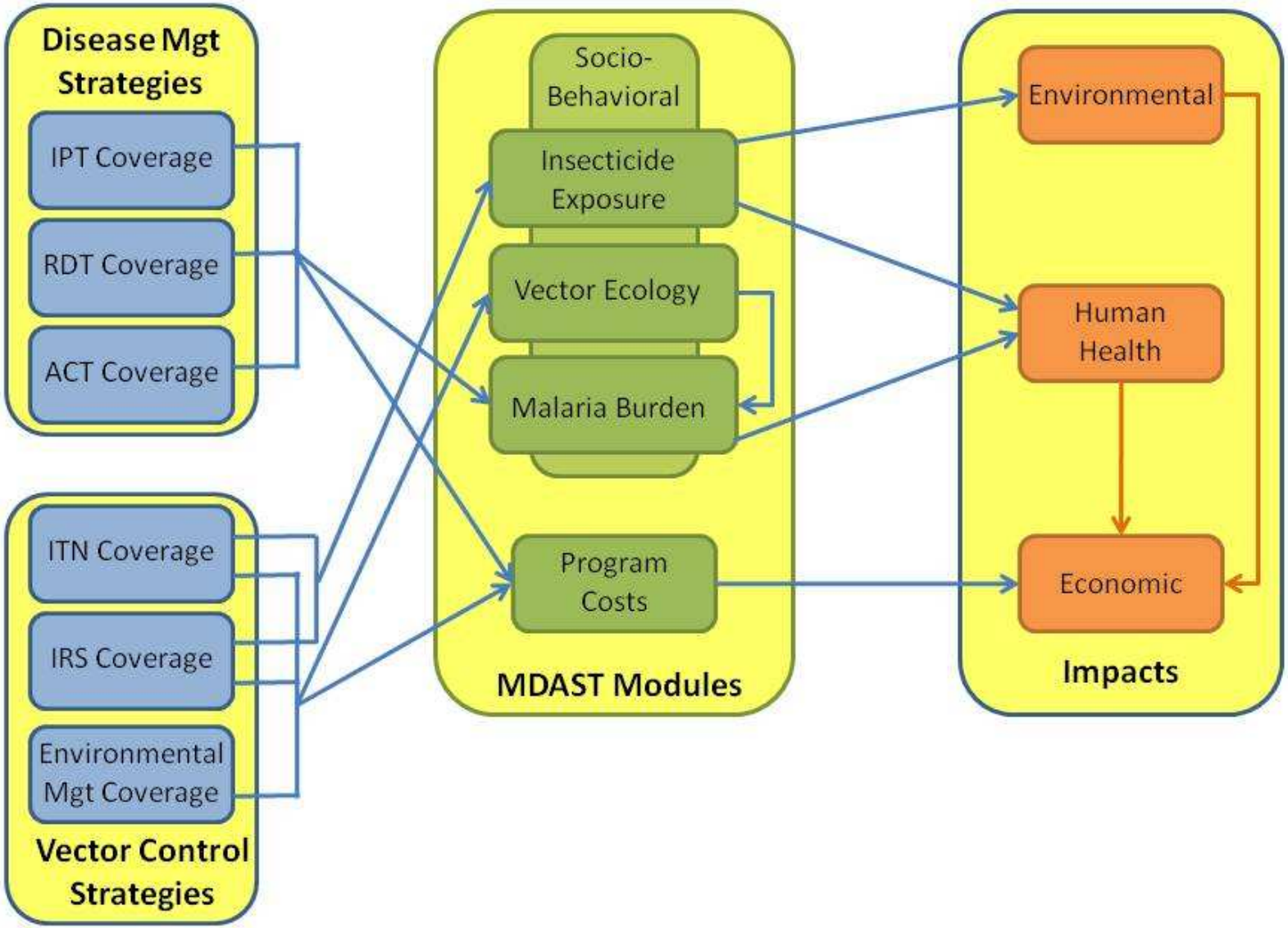


Prototype MDAST

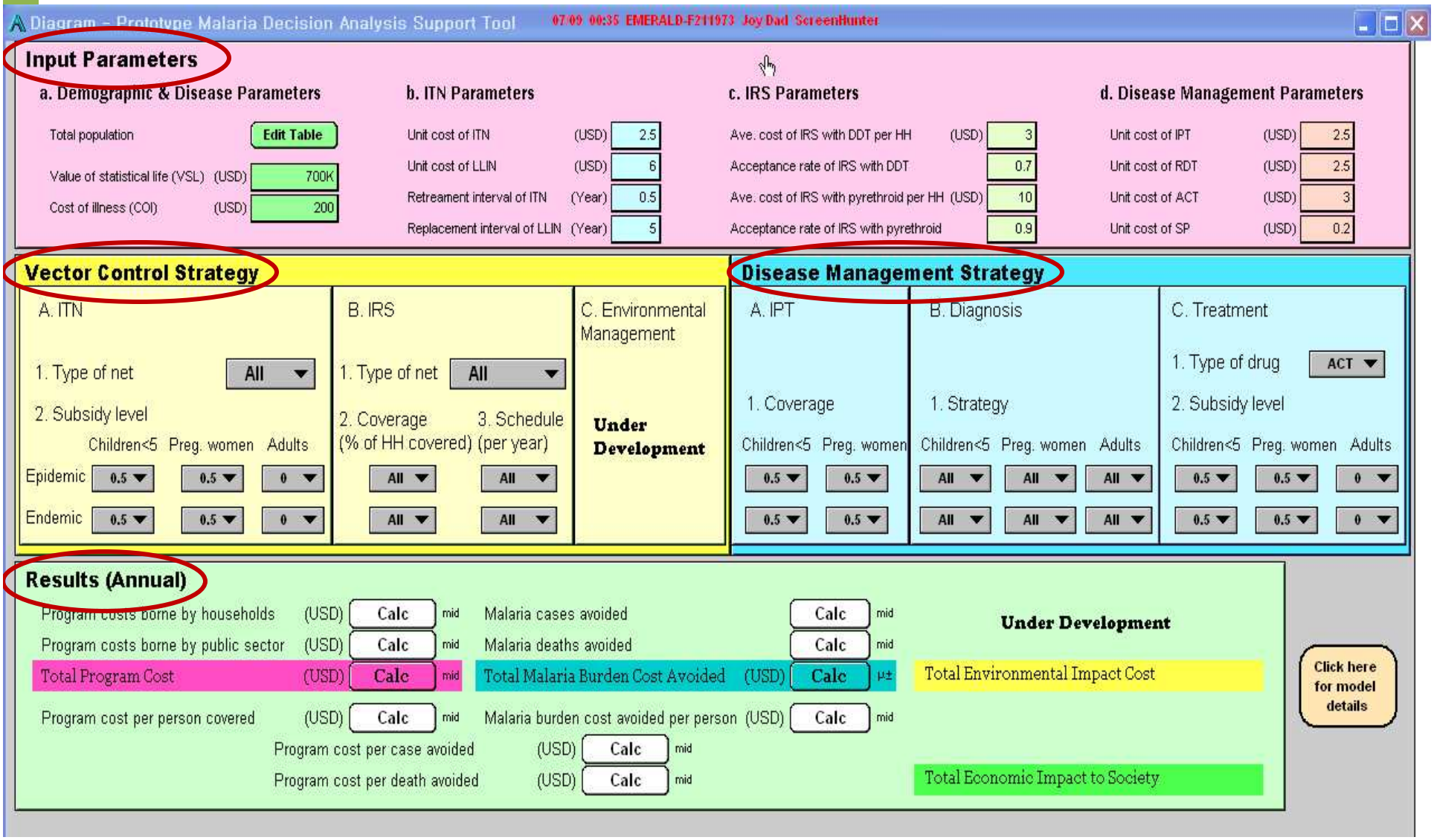
- Developed using Analytica® software: a visual tool for creating, analyzing, and communicating decision models

- Uses influence diagrams, which show causal linkages among:
  - Decisions
  - Uncertainty and chance events
  - Processes
  - Outcomes

Influence Diagram Illustrating MDAST Structure



Screenshot of Prototype MDAST



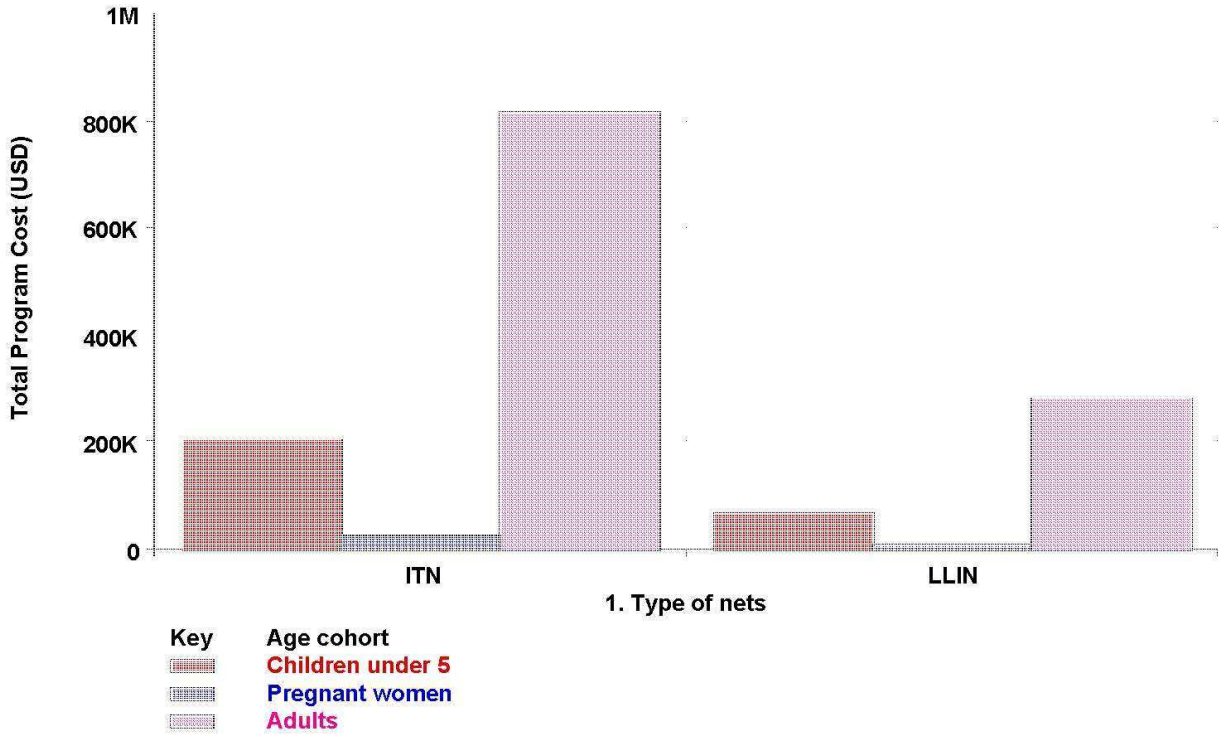
MDAST Output

Result - Total Program Cost *1*

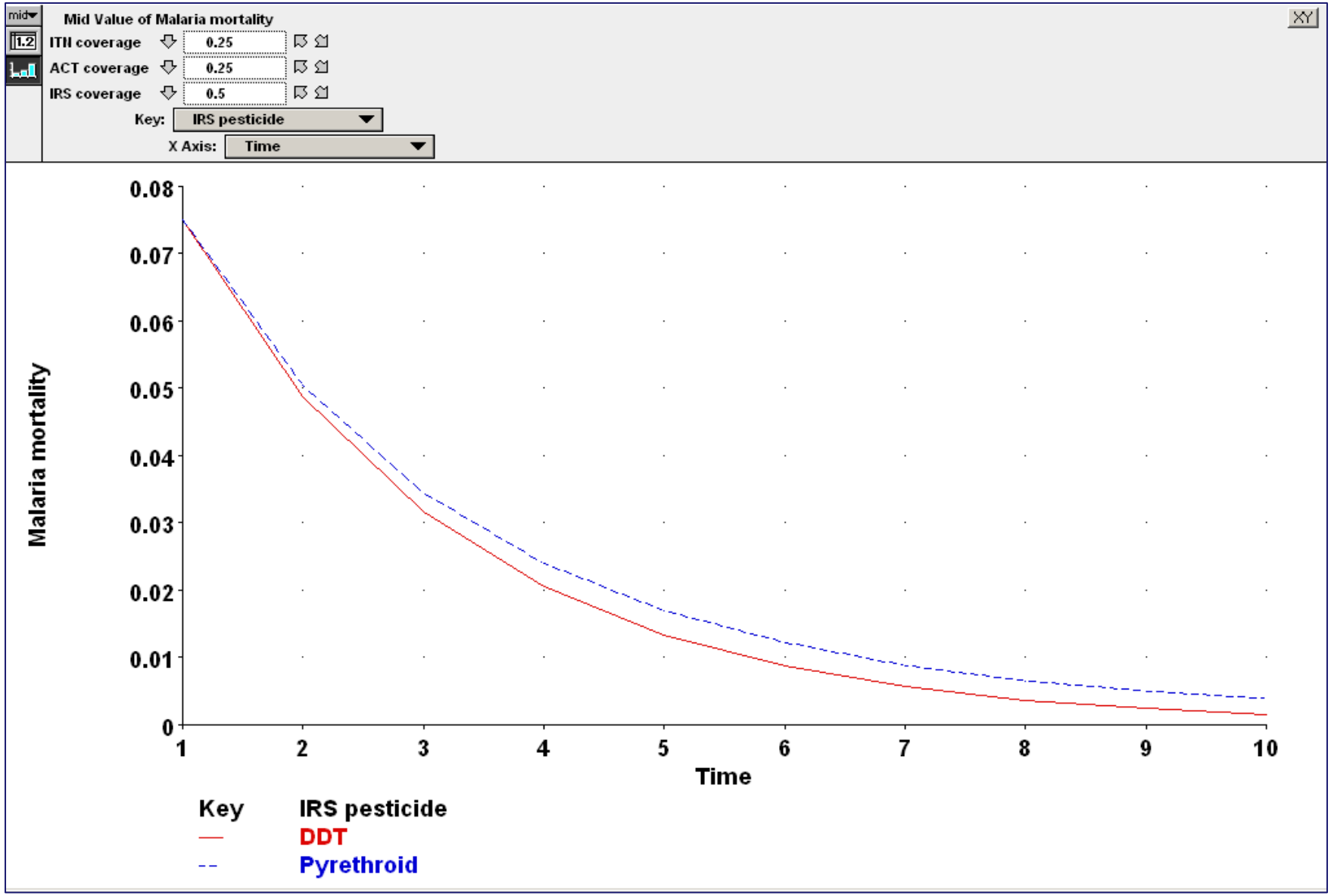
1. Type of insecticide ⇨ DDT
Net subsidy levels ⇨ 0.5
IRS coverage levels ⇨ 0.5

Key: Age cohort

X Axis: 1. Type of nets



MDAST Output (cont.)

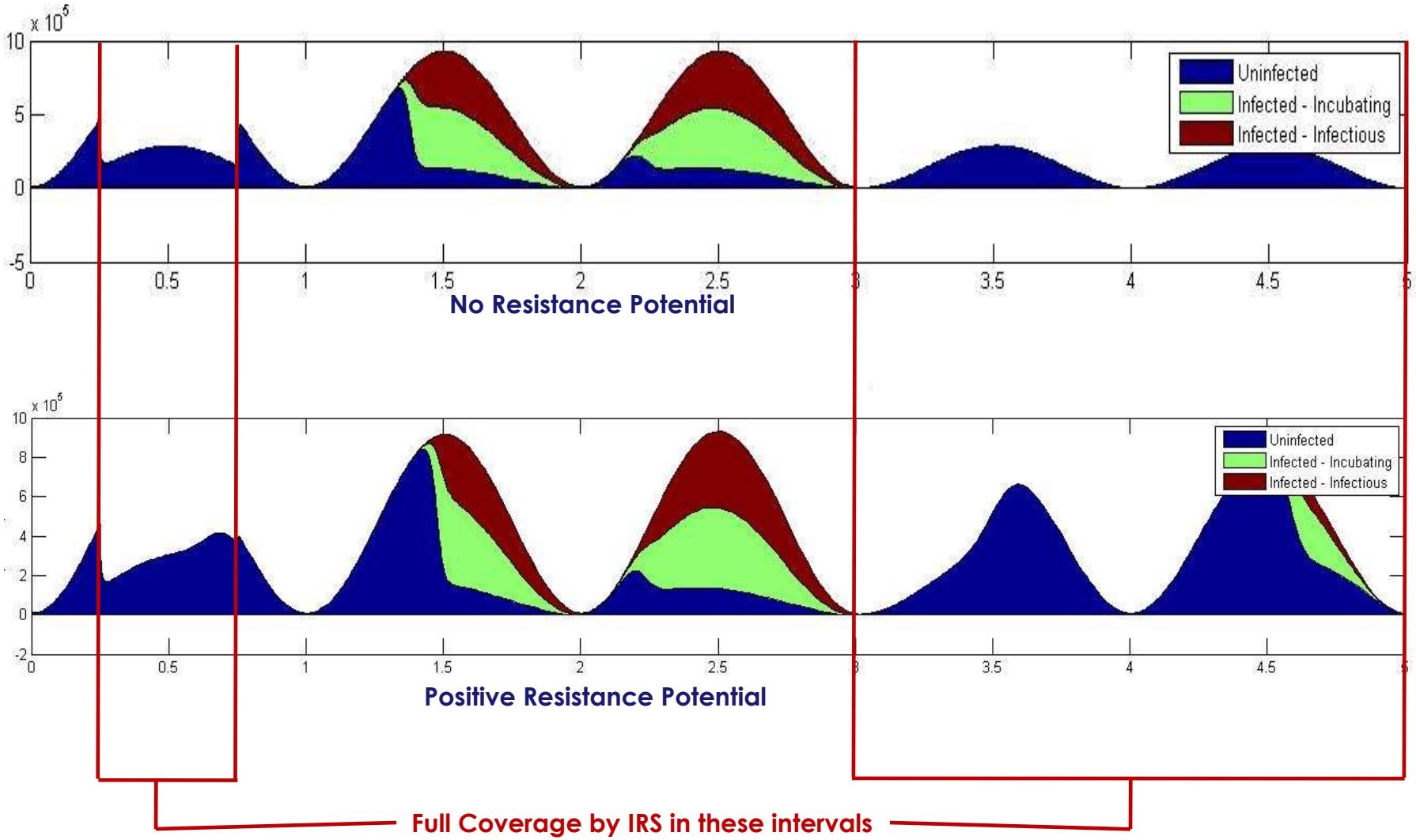


Advancing the Tool

- More accurate sub-models
- Scale
- Data
  - Infection characteristics
  - Vector abundance and genetics

Example of More Detailed Submodel: Vector Ecology and Insecticide Resistance

Mosquito Abundance and Infection Pattern Over Time (in years)



Future Steps for Use of the Tool

- **Engage stakeholders through structured interviews**:
  - on available control strategies, their health, social, and environmental consequences
  - coordination and discussion across different sectors

- Conduct **stakeholder workshops** for testing, training and refinement of the prototype model….then, fostering a policy dialogue among stakeholders

- Use MDAST for **value of information analyses** to identify key knowledge gaps and create policy-relevant research agenda (what data would be beneficial in reducing uncertainty?)

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