VecNet Update

Tom Burkot on behalf of

The VecNet Consortium Institutions:

JAMES COOK UNIVERSITY AUSTRALIA

UNIVERSITY OF NOTRE DAME

UNIVERSITY OF OXFORD

PITTSBURGH SUPERCOMPUTING CENTER

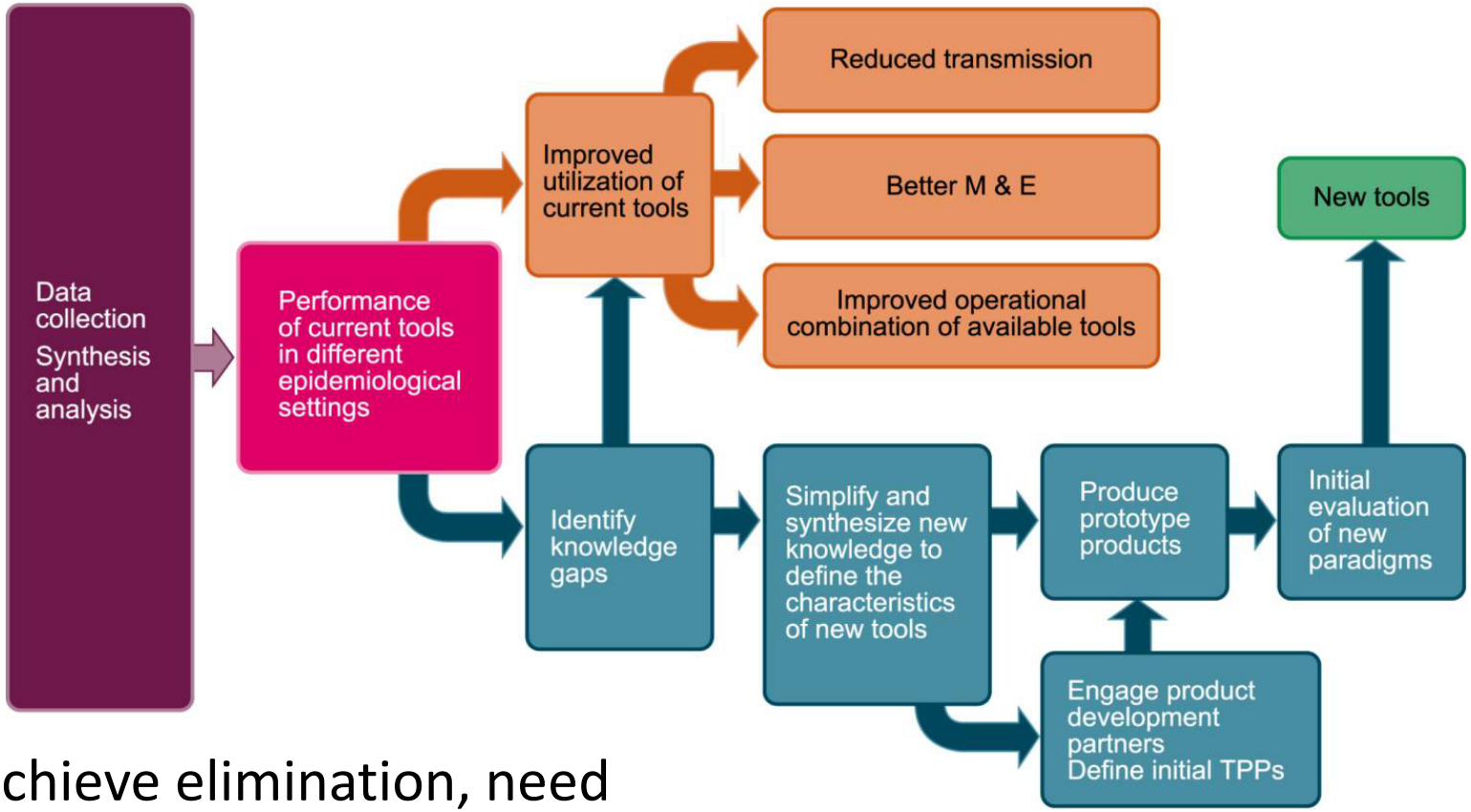
Johns Hopkins University
http://www.jhu.edu

Swiss TPH
Swiss Tropical and Public Health Institute
Schweizerisches Tropen- und Public Health-Institut
Institut Tropical et de Santé Publique Suisse

INTELLECTUAL VENTURES®

R. Farlow Consulting, LLC

malERA- A Research Agenda for Malaria Eradication: Vector Control



To achieve elimination, need

(1) to preserve the effectiveness of our current interventions,

(2) to develop new paradigm tools to exploit vulnerabilities in the vectors' biology. This requires

(3) assembling all data and (4) making it available for analyses

doi:10.1371/journal.pmed.1000401.g001

Mission Statement: To use spatially explicit data to understand and model the impacts of interventions on malaria transmission for control and eradication

Objectives

1. Establish a **Digital Library** of malaria-specific data,
2. Establish a **Modeling Platform**, and
3. **Create a CI to facilitate data analysis** on a temporal and spatially explicit scale to estimate the potential impact of vector control strategies

Stakeholders/user groups: Researchers, Malaria Control Program Managers, Product Developers, Policy makers and Funders

VECNet Transmission Simulator

https://www.vecnet.org/TS.html

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Favorites VECNet Page Safety Tools

Search Login Register

Vector Ecology & Control Network

Home | **Transmission Simulator** | Risk Mapper | Product Impact Evaluator (PIE) | CIFER | Tutorials Help

TUTORIALS
Transmission Simulator
Models

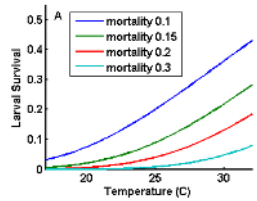
NEWS
New Model Added
Model Updated
Validation Tools

DIGITAL LIBRARY
Search
Publications
Data Archives

TOOLS
EMOD – IV/GG
Open Malaria - STPHI

$$H_{temp}+ = P_{rain}K_{temp}D_{cell}^2 - H_{temp}\left(\frac{\Delta t}{\tau_{temp}}\right)$$

$$\frac{1}{\tau_{temp}} = (5.1x10^{11}Pa)e^{\frac{-5628.1K}{T_K}} k_{tempdecay}\sqrt{\frac{.018kg/mol}{2\pi RT_K}}(1-RH)$$



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How to Submit Models

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VecNet

Vector-Borne Disease Network

Our Work

Though malaria remains both treatable and preventable, 350-500 million people worldwide are infected with the disease every year, with up to one million cases ending in death. Nearly 85 percent of the victims who die are younger than five years old.

Recent global efforts have contributed to declines in malaria-related sickness and death, but while the present available tools for controlling malaria are effective, they will not by themselves eliminate the disease. There is a need for new strategies to eliminate malaria.

VecNet

VecNet is a consortium of institutions assembled to address the need for new strategies to eliminate malaria, which requires an understanding of how interventions affect the transmission of the disease across different geographic areas where the mosquitoes that transmit malaria differ in their behavior.

Follow @VecNetNews

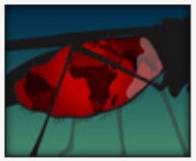
VecNet Beta Release

The VecNet website is currently in "Beta Release" during which new users have been invited to test the site's design and functionality. If you received an invitation to be a Beta Tester, please register here.

We welcome your input. If you have a question, please check the FAQ to see if it has already been answered.

Strategies to fight malaria

To achieve the methods of analyzing new strategies and combinations of strategies to control and eventually eliminate malaria, VecNet is curating a Digital Library containing entomological, epidemiological, demographic, intervention and climate data. This database will be used to interpret malaria transmission risks in terms of ecology and vector behavior through a Modeling Platform that contains multiple mathematical models. These models analyze the potential of emerging vector control tools by accessing data from the Digital Library to simulate



Transmission Simulator

The Transmission Simulator models changes in malaria transmission due to interventions or environmental changes.

www.vecnet.org

VecNet

About Tools Contact Us Log out

- Transmission Simulator
- Risk Mapper
- PIE
- CIFER
- Digital Library
- Data Warehouse Browser

VecNet

Vector-Borne Disease Network

Our Work

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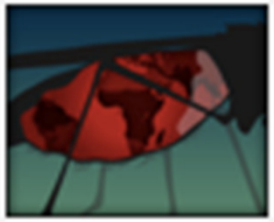
VECNet User Tools, DL and Warehouse



Transmission Simulator

The Transmission Simulator models changes in malaria transmission due to interventions or environmental changes.

(Researchers)

Risk Mapper

Risk Mapper compares the distribution of interventions to specific mosquito species and maps the intervention's effectiveness.

(NMCP)

PIE

The Product Impact Evaluator enables product developers to estimate the effect of new tools on malaria transmission, and to ask "what-if" questions about a tool's efficacy.

(Product Developers)

CIFER

The Computational Intervention portFolio EvaluatoR allows policy makers, funders, malaria control officials and product developers to compare the impact and value of different combinations of interventions in chosen locations.

(Funders/Policy Makers)

Digital Library

The Digital Library contains all available data on malaria vectors, published and unpublished.

Data Warehouse Browser

The Data Warehouse Browser is a secure way to access data to use with any of the Tools.

VecNet

About Tools Burkot

Digital Library

Search and Curate Documents and Data

BROWSE BY

- Author
- Journal
- Keyword
- Publisher
- Resource Type
- Location
- Species
- Subject

Solomon Islands

Go

Show/Hide Advanced Search

What is VecNet Digital Library?

VecNet Digital Library contains curated data, tagged citations, articles and reports on entomology, epidemiology, demography, climatology, and interventions to support the analysis of malaria eradication.

VecNet members can ingest, tag, curate, search, retrieve, display and version information in the digital library. All users are invited to browse the digital library. If you have information to contribute, or need assistance please contact us so a VecNet digital librarian can help you.

Contact us | FAQ | User Privacy Policy | Terms of Use

VecNet

VecNet

About Tools Burkot

Digital Library

Search and Curate Documents and Data

FILTER BY

- Author
- Journal
- Keyword
- Publisher
- Resource Type
- Location
- Species
- Subject

Search Digital Library Go

Show/Hide Advanced Search

Search Results

1 - 10 of 162

Sort by Relevancy Show 10 per page Update

« Previous 1 2 3 4 5 ... 16 17 Next »

1. Malaria in Honiara, Solomon Islands Vector studies

   Bell, D, Cameron, A, Fernando, M, Pholsyna, K, Foley, DH, Bakotee, B, Bryan, JH; Southeast Asian Journal of Troprical Medicine and Public Health 27(2), 372-377. (1996);

2. Malaria vector mosquitoes in the Solomon Islands

   Suzuki, H; Malaria research in the Solomon Islands, 104-113.;

3. The Fauna of Rennell and Bellona, Solomon Islands

   Wolff, T; Philosophical Transactions of the Royal Society of London. Series B, Biological Sciences 255(800), 321-343. (1969);

4. A new species of Anopheles from the Solomon Islands

   Belkin, JohnN, Schlosser, RJ; Journal of the Washington Academy of Sciences 34(8), 268-273. (1944);

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About Tools Burkot

Digital Library

Search and Curate Documents and Data

FILTER BY

- Author
- Journal
- Keyword
- Publisher
- Resource Type
  - Article 124
  - Dataset 13
  - Dataset: Climate/Weather 4
  - Dataset: Demography 2
  - Dataset: Entomological 7
  - more Resource Types»
- Location
- Species
- Subject

Search Digital Library Go

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Search Results

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Sort b ✓ Relevancy
Publish Date ▼
Publish Date ▲
Title
Date Uploaded ▼
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Date Modified ▼
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Show 10 per page Update

« Previous 1 2 3 4 5 … 16 17 Next »

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Full text search, filter searches, fully downloadable

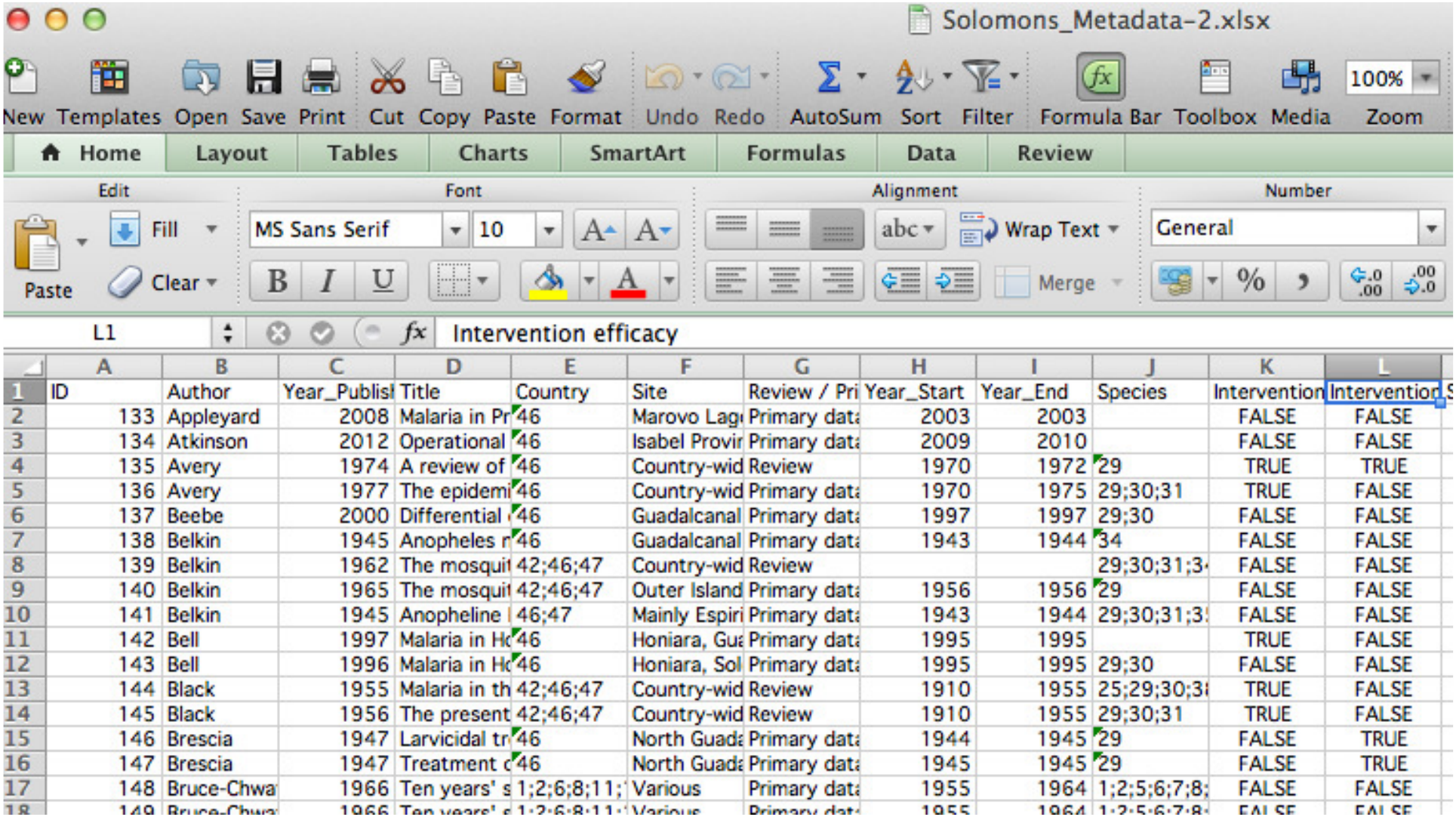
14. Solomon Islands Tagged Bibliographic Citations database

Title	Solomon Islands Tagged Bibliographic Citations database
Subject	Malaria
Creator	Russell, Tanya
Location	Solomon Islands, , Solomon Islands
Keyword	Solomons
Date Modified	2013-06-20

15. Summary of tags used in Solomon Islands Tagged Bibliographic Citations

Title	Summary of tags used in Solomon Islands Tagged Bibliographic Citations
Subject	Malaria
Creator	Russell, Tanya
Location	Solomon Islands, , Solomon Islands
Keyword	Solomons
Date Modified	2013-06-20

16. NZ52000 Solomon Islands HendersonWeather station site description



	A	B	C	D	E	F	G	H	I	J	K	L
1	ID	Author	Year_Publisl	Title	Country	Site	Review / Pri	Year_Start	Year_End	Species	Intervention	Intervention
2	133	Appleyard	2008	Malaria in Pr	46	Marovo Lag	Primary data	2003	2003		FALSE	FALSE
3	134	Atkinson	2012	Operational	46	Isabel Provir	Primary data	2009	2010		FALSE	FALSE
4	135	Avery	1974	A review of	46	Country-wid	Review	1970	1972	29	TRUE	TRUE
5	136	Avery	1977	The epidemi	46	Country-wid	Primary data	1970	1975	29;30;31	TRUE	FALSE
6	137	Beebe	2000	Differential	46	Guadalcanal	Primary data	1997	1997	29;30	FALSE	FALSE
7	138	Belkin	1945	Anopheles r	46	Guadalcanal	Primary data	1943	1944	34	FALSE	FALSE
8	139	Belkin	1962	The mosquit	42;46;47	Country-wid	Review			29;30;31;3	FALSE	FALSE
9	140	Belkin	1965	The mosquit	42;46;47	Outer Island	Primary data	1956	1956	29	FALSE	FALSE
10	141	Belkin	1945	Anopheline	46;47	Mainly Espiri	Primary data	1943	1944	29;30;31;3	FALSE	FALSE
11	142	Bell	1997	Malaria in Ho	46	Honiara, Gua	Primary data	1995	1995		TRUE	FALSE
12	143	Bell	1996	Malaria in Ho	46	Honiara, Sol	Primary data	1995	1995	29;30	FALSE	FALSE
13	144	Black	1955	Malaria in th	42;46;47	Country-wid	Review	1910	1955	25;29;30;3	TRUE	FALSE
14	145	Black	1956	The present	42;46;47	Country-wid	Review	1910	1955	29;30;31	TRUE	FALSE
15	146	Brescia	1947	Larvicidal tr	46	North Guada	Primary data	1944	1945	29	FALSE	TRUE
16	147	Brescia	1947	Treatment c	46	North Guada	Primary data	1945	1945	29	FALSE	TRUE
17	148	Bruce-Chwa	1966	Ten years' s	1;2;6;8;11;	Various	Primary data	1955	1964	1;2;5;6;7;8;	FALSE	FALSE
18	149	Bruce-Chwa	1966	Ten years' s	1;2;6;8;11;	Various	Primary data	1955	1964	1;2;5;6;7;8;	FALSE	FALSE

46 Tags

(including location, vector behaviours, epidemiology, weather)

VecNet

About Tools Contact us Logout (burkot)

Transmission Simulator

Modeling malaria transmission and control

Home

MODEL OPTIONS

EMOD Expert

OpenMalaria Expert

Welcome to Transmission Simulator

Transmission simulator is an extensible modelling platform that allows web users access to complex models and high performance compute infrastructure. Quantitative analysis of the simulated output enables the use of data driven computer models as decision-making tools in efforts to test disease transmission hypotheses or to control or eradicate infectious diseases.

Currently VecNet users can use Transmission Simulator to run simulation-based experiments on two models: the Institute for Disease Modeling's EMOD Disease Transmission Kernel and the Swiss Tropical and Public Health Institute's OpenMalaria

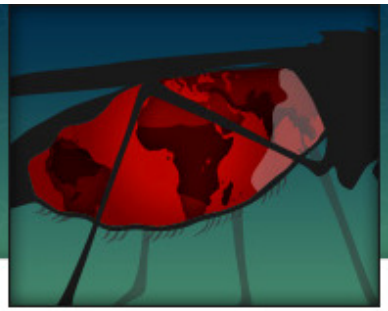
The **EMOD** malaria model couples a detailed description of the vector life cycle with a comprehensive, mechanistic representation of the intra host parasite and immune dynamics.

EMOD's vector transmission model can be run as a vector cohort model or as an individual mosquito model and facilitates modeling multiple vector species simultaneously. This allows for a mechanistic description of vector abundances and behavior through the effects of climate and weather on different preferred larval habitats. EMOD

OpenMalaria is an open source C++ program for simulating malaria epidemiology and the impacts of interventions against malaria on that epidemiology. It is based on microsimulations of *Plasmodium falciparum* malaria in humans, originally developed for simulating malaria vaccines. These models simulate the dynamics of malaria parasitaemia in the course of an infection, of transmission, of immunity, and of the processes leading to illness and death. The system is set up to simulate malaria in village, or district size human populations. The original models have been extended to include simulation of the

Transmission Simulator

Modeling malaria transmission and control using **EMOD Expert**



- Home
- EMOD Expert
- Experiments
- Runs

Selected Experiment: Solomon Islands Demo (change) / New Run / Select Template

Step 1 of 11: Select Template

Template is a set of recommended default settings for building EMOD simulations. EMOD model takes about 100 parameters, and *template* provides default values for all of then, weather files, demographics and migration files. You can change input parameters later.

Name/Description | Template Details

Priority Solomon Island Baseline
Priority Solomon Island Baseline

Kenya baseline (no interventions)
Western Kenya baseline without intervention

Next Step →

- Select Template
- Name
- Weather Data
- Date Parameters
- Vector Selection
- Vector Parameters
- Malaria Parameters
- Scaling Factors
- Interventions
- Sweeps
- Preview

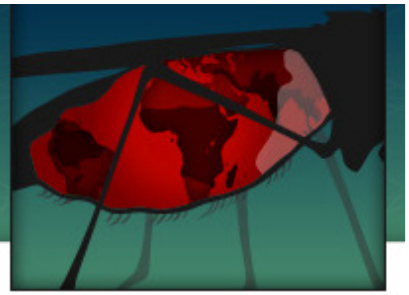
Template config.json:

Priority Baseline Config

```
{
    "parameters": {
        "Acquisition_Blocking_Immunity_Decay_Rate": 0.01,
        "Acquisition_Blocking_Immunity_Duration_Before_Decay": 90,
        "Age_Initialization_Distribution_Type": "DISTRIBUTION_SIMPLE",
        "Air_Migration_Roundtrip_Duration": 7,
        "Air_Migration_Roundtrip_Probability": 0.8,
        "Air_Temperature_Filename": "Honiara_temperature_daily10y.bin",
        "Air_Temperature_Offset": 0,
        "Air_Temperature_Variance": 2,
```

Transmission Simulator

Modeling malaria transmission and control using **EMOD Expert**



- Home
- EMOD Expert
- Experiments
- Runs

Selected Experiment: Solomon Islands Demo (change) / New Run / Weather Data

Step 3 of 11: Weather Data

Start Over

Select a weather data set to use for this run:

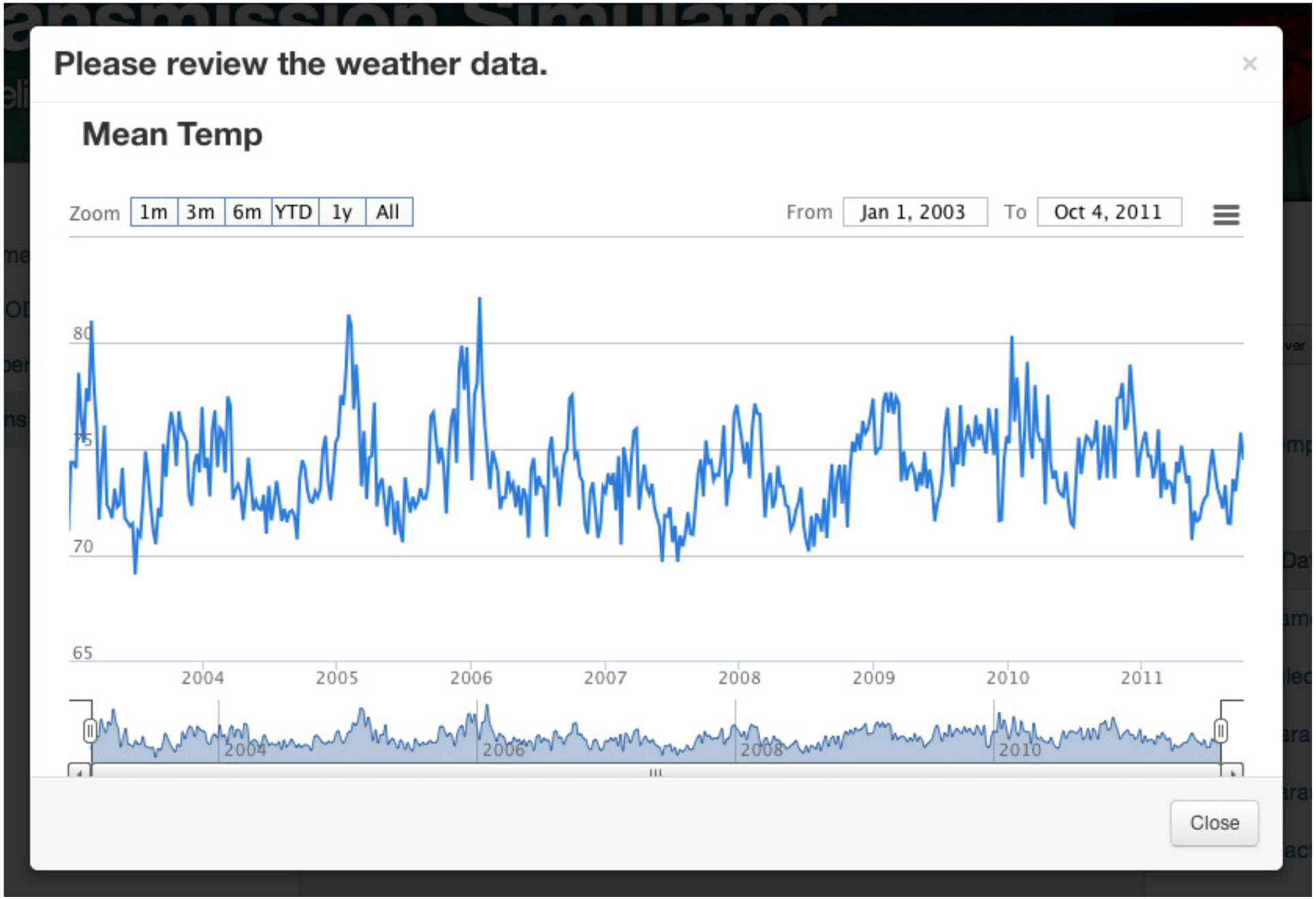
Honiara, Solomon Islands: 2003 - 2033

Note:
Weather data will be repeated as necessary for Simulations with durations longer than the duration of the weather data set.

Previous Step

Next Step

- Select Template
- Name
- Weather Data
- Date Parameters
- Vector Selection
- Vector Parameters
- Malaria Parameters
- Scaling Factors
- Interventions
- Sweeps
- Preview


Please review the weather data.
Mean Temp
Zoom
1m
3m
6m
YTD
1y
All
From
Jan 1, 2003
To
Oct 4, 2011
80
75
70
65
2004
2005
2006
2007
2008
2009
2010
2011
Close

Step 4 of 11: Date Parameters

Enter Start time (in days) of weather data to start the run and its duration in days.

Weather data's start date is: 2003-01-01.
Weather data's end date is: 2033-01-01.
Weather data's duration is: 10957 days.

Start time 0 days

2003-01-01

Simulation duration 10950 days

Note:
Weather data will be repeated as necessary for Simulations with durations longer than the duration of the weather data set.

Step 5 of 11: Vector Selection

Start Over

Drag or click on a Species in the lower box to add it to the Experiment. Drag Species within the Experiment (upper box) to reorder. If no appropriate Species exists, Create a new one.

Species selected for Experiment

farauti ✖

Previous Step

Next Step

Species available for selection

Create New Species

farauti+

+ *Template defined species.*

Select Temp

Name

Weather Da

Date Param

Vector Selec

Vector Para

Malaria Para

Scaling Fac

Intervention

Sweeps

Preview

Step 5 of 11: Vector Se

Drag or click on a Species in the low
within the Experiment (upper box) to
a new one.

Species selected for Experimer

farauti

Previous Step

Species available for selection

farauti+

+ *Template defined species.*

Anthropophily	0.95
Days Between Feeds	2.45
Indoor Feeding Fraction	0.16
Egg Batch Size	120
Adult Life Expectancy	5.75
Transmission Rate	0.4
Required Habitat Factor	1250000000.0
Aquatic Arrhenius 1	84200000000
Aquatic Arrhenius 2	8328
Infected Arrhenius 2	8336
Infected Arrhenius 1	117000000000
Immature Duration	2
Infectious Human Feed Mortality Factor	1.5
Habitat Type	BRACKISH SWAMP
Aquatic Mortality Rate	0.1
Acquire Modifier	0.1
Infected Egg Batch Factor	0.8

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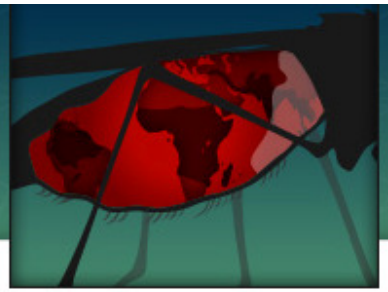
Sweeps

Preview

Transmission Simulator

Modeling malaria transmission and control using **EMOD Expert**



- Home
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Selected Experiment: Solomon Islands Demo (change) / New Run / Vector Parameters

Step 6 of 11: Vector Parameters

Start Over

Please customize the Vector Parameters.

Egg Hatch Delay Distribution

EXPONENTIAL_DURATION

Egg Saturation At Oviposition

NO_SATURATION

- [x] Enable Temp Dep Feeding Cycle
- [ ] Enable Vector Aging
- [ ] Enable Vector Migration
- [ ] Enable Vector Migration Human
- [ ] Enable Vector Migration Local
- [ ] Enable Vector Migration Wind

HEG Fecundity Limiting

0

Mean Egg Hatch Delay

0

Range: 0 to 120

Mosquito Weight

1

Range: 1 to 2.14748e+009

Semipermanent Habitat Decay Rate

0.01

Range: 0.0001 to 100

Temporary Habitat Decay Factor

0.05

Range: 0.001 to 100

Vector Larval Rainfall Mortality

- Select Template
- Name
- Weather Data
- Date Parameters
- Vector Selection
- Vector Parameters
- Malaria Parameters
- Scaling Factors
- Interventions
- Sweeps
- Preview

Add a new vector species

1. Select a template

Default Species Settings

2. Name your vector

3. Set its behavior

Acquire Modifier

1

Range: 0.00 to 1.00

Adult Life Expectancy

10.0

Range: 0.00 to 730.00

Anthropophily

1

Range: 0.00 to 1.00

Aquatic Arrhenius 1

84200000000.0

Range: 0 to 1.00E+15

Aquatic Arrhenius 2

8328

Egg Batch Size

100.0

Range: 0.00 to 10000.00

Habitat Type

- [x] CONSTANT 0
- [ ] TEMPORARY_RAINFALL
- [ ] WATER_VEGETATION
- [ ] HUMAN_POPULATION
- [ ] BRACKISH_SWAMP

Select all that apply.

Immature Duration

1

Range: 0.00 to 730.00

Indoor Feeding Fraction

Close

Save

Step 7 of 11: Malaria Parameters

Please customize the Malaria Parameters.

Anemia Mortality Inverse Width
20
Range: 0.1 to 1e+06

Anemia Mortality Threshold
1.5
Range: 0 to 100

Anemia Severe Inverse Width
20
Range: 0 to 1,000,000

Anemia Severe Threshold
3
Range: 10 to 100

Antibody Csp Decay Days
90
Range: 1 to 3.40282e+038

Antibody Csp Killing Inverse Width
1.5
Range: 1e-006 to 1e+006

Fever Mortality Threshold
3
Range: 0 to 1,000

Fever Severe Inverse Width
10
Range: 0.1 to 1e+006

Fever Severe Threshold
1.5
Range: 0 to 10

Gametocyte Stage Survival Rate
1
Range: 0 to 1

Msp1 Merozoite Kill Fraction
0.5
Range: 0 to 1

Msp2 Merozoite Kill Fraction
0.5
Range: 0 to 1

Mean Sporozoites Per Bite
11
Range: 0 to 1000

Merozoites Per Hepatocyte
15000
Range: 0 to 3.40282e+038

Merozoites Per Schizont
16
Range: 0 to 1000

Base Gametocyte Fraction Male
0.2
Range: 0 to 1

Base Gametocyte Surviva Rate
0.01
Range: 0 to 10,000

Base Gametocyte Production Rate
0.02
Range: 0 to 1

Home
EMOD Expert
Experiments
Runs

Selected Experiment: Solomon Islands Demo (change) / New Run / Interventions

Step 9 of 11: Interventions

Start Over

Drag or click on an Intervention in the lower box to add it to the Experiment. Drag Interventions within the Experiment (upper box) to reorder. If no appropriate Intervention exists, Create a new one. **Note:** Interventions are optional.

Intervention(s) selected for Experiment

Previous Step

Next Step

Intervention(s) available for selection

Upload Campaign File

Create New

InsectKillingFence
Defined in template

Simple_Bednets_(predefined)
An intervention using Simple Bednets.

Insect_Killing_Fence_(predefined)
An intervention using an Insect killing Fence.

IRS_(predefined)
An IRS intervention.

Select Template
Name
Weather Data
Date Parameters
Vector Selection
Vector Parameters
Malaria Parameters
Scaling Factors
Interventions
Sweeps
Preview

Experiment: Solomon Islands

Run: Burkot - Solomon Island Analysis - Baseline

Outputs | Settings | View Results

- Daily EIR −
- Fever Prevalence +
- Infected: 1-2 +
- Infected: 10-20 +
- Infected: 2-3 +
- Infected: 20-30 +
- Infected: 3-4 +
- Infected: 30-40 +
- Infected: 4-5 +
- Infected: 5-10 +
- Infected: <1 +
- Infected: >40 +
- New Diagnostic Prevalence +
- Parasite Prevalence −

Jump to: Choose a Channel

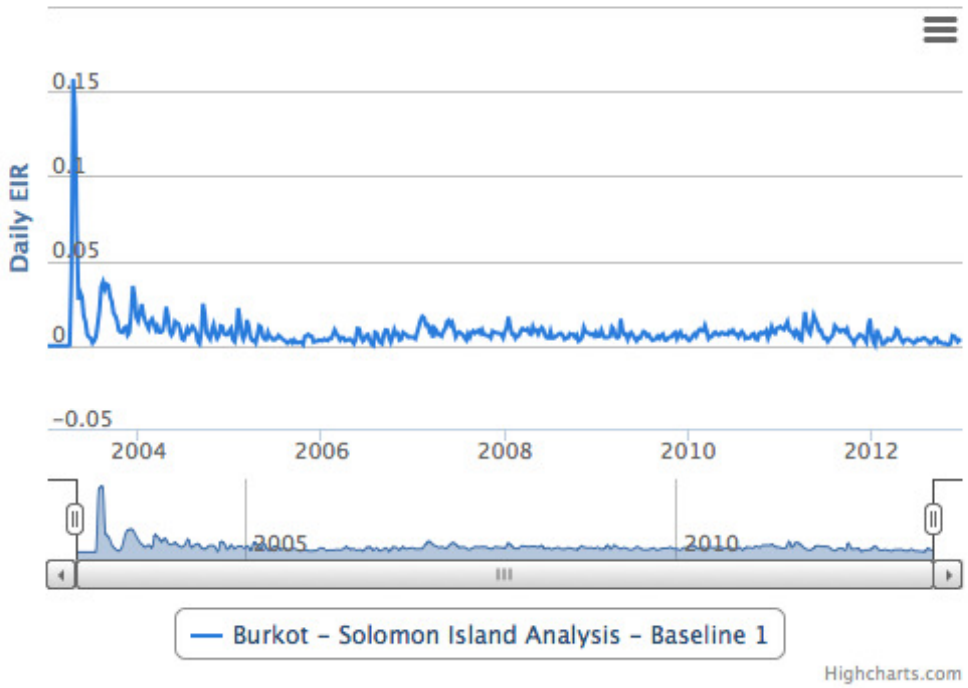
Results Selection Summary

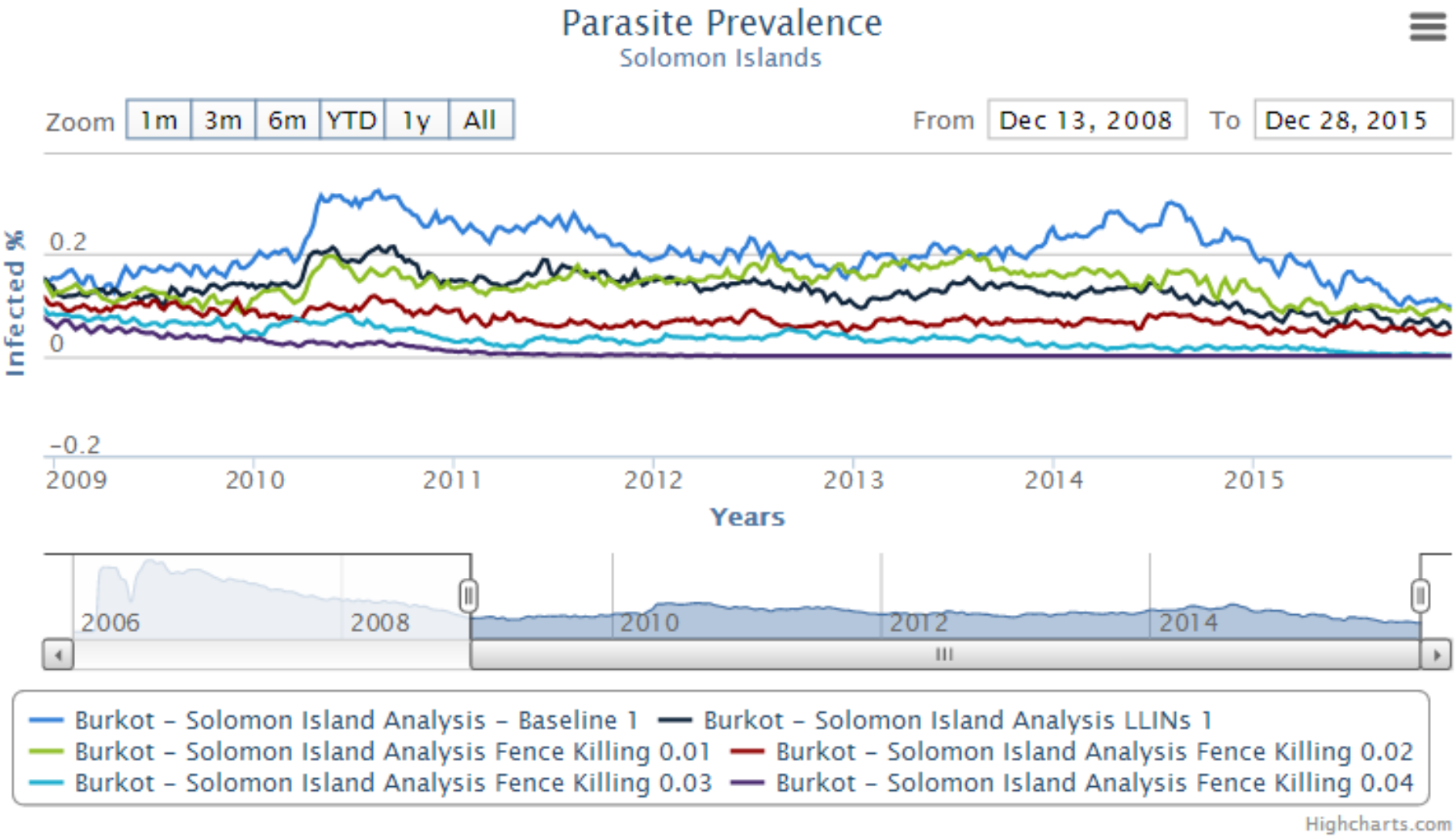
Selected Channels:

Daily EIR

Parasite Prevalence

Daily EIR




Parasite Prevalence
Solomon Islands
Zoom
1m
3m
6m
YTD
1y
All
From
Dec 13, 2008
To
Dec 28, 2015
Infected %
0.2
0
-0.2
2009
2010
2011
2012
2013
2014
2015
Years
2006
2008
2010
2012
2014
Burkot - Solomon Island Analysis - Baseline 1
Burkot - Solomon Island Analysis LLINs 1
Burkot - Solomon Island Analysis Fence Killing 0.01
Burkot - Solomon Island Analysis Fence Killing 0.02
Burkot - Solomon Island Analysis Fence Killing 0.03
Burkot - Solomon Island Analysis Fence Killing 0.04
Highcharts.com

VecNet

About Tools Contact us Logout (burkot)

Risk Mapper

Map the impact of vector control interventions

- Tool Overview
- Build Scenario
- Existing Scenarios

Risk Mapper / Existing Scenarios / Priority scenario 1 (Solomon Isl...

Priority scenario 1 (Solomon Islands). Universal bednet use

What would be the impact on malaria transmission if there is universal bednet use? Interventions applied: LLIN Coverage: 100%, Usage: 70%

See experiment in transmission simulator

Location: Solomon Islands

Interventions	Current Coverage	Simulated Future Coverage
LLIN	Not used	70%
IRS	Not used	0%

End of Baseline (Year 2021)
Selected EIR = (hover to select)

Annual EIR

Scenario Year **2031**
Selected EIR = (hover to select)

VecNet

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PIE: Product Impact Evaluator

design and evaluate new intervention products

- Tool Overview

MANAGE PORTFOLIO

- Build New Scenario

VIEW RESULTS

- EMOD Results
- OpenMalaria Results

PIE: Product Impact Evaluator

Tool Overview

The Product Impact Evaluator (PIE) facilitates users to ask defined questions about the impact of different interventions on vector control and malaria transmission at specific geographic locations. Product developers can use PIE to estimate the effect of novel vector control interventions on malaria transmission, and to ask "what-if" questions about a tool's efficacy.

PIE users can:

- Estimate the impact of new candidate tools on vector control and malaria transmission
- Develop and refine Target Product Profiles
- Explore implementation strategies for new products
- Conduct In-silico experiments to evaluate impact of varying product parameters which are needed for effectiveness
- Change the underlying assumptions of modes of actions of interventions as modified inputs in model simulations.

CIFER

Computational Intervention Portfolio Evaluator

- Home Page

MANAGE PORTFOLIO

- Build New Scenario

VIEW RESULTS

- CIFER Results
- EMOD Results
- OpenMalaria Results

CIFER

CIFER (the Computational PortFolio EvaluatoR), allows users (e.g., funders, policy makers, malaria control officials) to explore the impact of implementing different combinations of malaria control interventions in different locations.

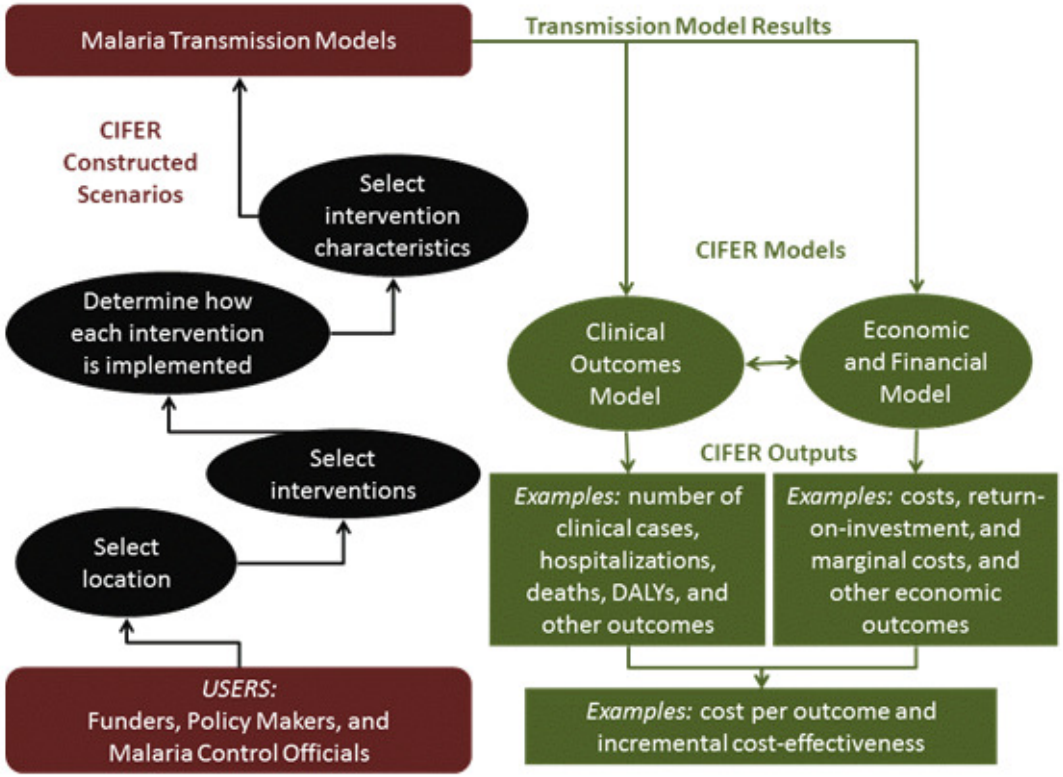

Figure 1 Schematic of how CIFER works

Current Status

Beta testing
Falciparum
Vector control interventions
Single model launch of OpenMalaria and EMOD

Next Steps (2014)

Drug-based Interventions
Multiple model simultaneous launch
User friendly, widely available

A bit later

Vivax models
Other vector borne diseases

VecNet

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VecNet – Vector-Borne Disease Network is a consortium of institutions developing new resources to aid in worldwide malaria elimination.

vecnet.org

VecNet

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Organization

The Vector-Borne Disease Network (VecNet) provides methods of analysing new strategies and combinations of strategies to control and eliminate malaria.

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Acknowledgments

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