
emodpy-tbhiv

Institute for Disease Modeling

Jan 28, 2022

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emodpy-tbhiv is a collection of Python scripts and utilities created to streamline user interactions with EMOD and idmtools for modeling measles. Much of the functionality is inherited from the [emod_api](#) and [emodpy](#) packages.

Additional information about how to use idmtools can be found at in [Welcome to idmtools](#). Additional information about EMOD TBHIV parameters for modeling tuberculosis can be found in [EMOD parameter reference](#).

See [Welcome to idmtools](#) for a diagram showing how idmtools and each of the related packages are used in an end-to-end workflow using EMOD as the disease transmission model.

EMODPY-TBHIV INSTALLATION

Follow the steps below to install emodpy-tbhiv.

1.1 Prerequisites

First, ensure the following prerequisites are met.

- Windows 10 Pro or Enterprise, Linux, or Mac
- Python 3.6 64-bit (<https://www.python.org/downloads/release>)
- A file that indicates the pip index-url:
 - Windows
 - Linux

In C:\Users\Username\pip\pip.ini, containing the following:

```
[global]
index-url = https://packages.idmod.org/api/pypi/pypi-production/simple
```

In \$HOME/.config/pip/pip.conf, containing the following:

```
[global]
index-url = https://packages.idmod.org/api/pypi/pypi-production/simple
```

1.2 Installation instructions

1. Open a command prompt and create a virtual environment in any directory you choose. The command below names the environment “v-emodpy-tbhiv”, but you may use any desired name:

```
python -m venv v-emodpy-tbhiv
```

2. Activate the virtual environment:

- Windows
- Linux

Enter the following:

```
v-emodpy-tbhiv\Scripts\activate
```

Enter the following:

```
source v-emodpy-tbhiv/bin/activate
```

3. Install emodpy-tbhiv packages:

```
pip install emodpy-tbhiv
```

If you are on Python 3.6, also run:

```
pip install dataclasses
```

If you are on Linux, also run:

```
pip install keyrings.alt
```

4. When you are finished, deactivate the virtual environment by entering the following at a command prompt:

```
deactivate
```


EMODPY_TBHIV

2.1 emodpy_tbhiv package

The emodpy-tbhiv module is intended to house scripts and tools that enable disease modelers to work more easily with the IDM EMOD TBHIV model.

2.1.1 Subpackages

emodpy_tbhiv.demographics package

Submodules

emodpy_tbhiv.demographics.TBHIVDemographics module

```
class emodpy_tbhiv.demographics.TBHIVDemographics(pop,  
                                                    nodes=None,  
                                                    idref='Gridded  
                                                    world  
                                                    grump2.5arcmin',  
                                                    base_file=None)
```

Bases: `emod_api.demographics.Demographics.Demographics`

This class is derived from emod_api.demographics' Demographics class so that we can set certain defaults for TBHIV in construction. Keen observers will note that SetDefaultProperties does not look like a TBHIV-specific function. But as we add other disease types the generalizations and specifics will become clearer. The architectural point is solid.

SetHIVCoInfectionDistribution()

Insert some notion of a default HIVCoInfection distribution.

SetHIVTBCoInfectionMortalityDistribution()

Insert some notion of a default HIVTBCoInfection Mortality distribution.

```
emodpy_tbhiv.demographics.TBHIVDemographics.fromBasicNode(lat=0,           lon=0,  
                                                            pop=1000000.0,  
                                                            name=1,  
                                                            forced_id=1,      im-  
                                                            plicit_config_fns=None)
```

This function creates a single-node TBHIVDemographics instance from the params you give it.

```
emodpy_tbhiv.demographics.TBHIVDemographics.fromData (pop=1000000.0,          file-  
name_male='Malawi_male_mortality.csv',  
file-  
name_female='Malawi_female_mortality.csv')
```

emodpy_tbhiv.interventions package

```
emodpy_tbhiv.interventions.purge_campaign_event (camp_event)
```

Submodules

emodpy_tbhiv.interventions.active_diagnostic module

```
emodpy_tbhiv.interventions.active_diagnostic.ActiveDiagnostic (camp,          trig-  
ger_treatment_list,  
ac-  
tive_sensitivity=1.0,  
ac-  
tive_specificity=1.0,  
pos_event='TBTestPositive',  
treat-  
ment_fraction=1,  
start_day=0,  
duration=-  
1,          prop-  
erty_restrictions_list=[],  
nodeIDs=[],  
black_period=0,  
black_trigger='Blackout',  
event_name='TB  
Diagnosis Active  
Simple')  
:param TBD Note start_day is initialized as 1, recommend that this be aligned with the start of the simulation  
emodpy_tbhiv.interventions.active_diagnostic.new_intervention_as_file (camp,  
start_day=1,  
file-  
name=None)
```

emodpy_tbhiv.interventions.art module

```
emodpy_tbhiv.interventions.art.ART (camp, trigger_treatment_list, start_day=0, duration=-  
1,          property_restrictions_list=[],          nodeIDs=[],  
black_period=0,          black_trigger='Blackout',  
event_name='ART')  
:param TBD Note start_day is initialized as 1, recommend that this be aligned with the start of the simulation  
emodpy_tbhiv.interventions.art.new_intervention_as_file (camp, filename='art.json')
```

emodpy_tbhiv.interventions.bcg module

```
emodpy_tbhiv.interventions.bcg.BCG(camp, trigger_treatment_list, initial_efficacy=1.0, vaccine_take=1, age_take_decay=1.0, box_duration=365, immune_decay=3650, start_day=0, duration=- 1, property_restrictions_list=[], nodeIDs=[], black_period=0, black_trigger='Blackout', event_name='Vaccine Health Seeking')
```

BCG Vaccine :param TBD Note start_day is initialized as 1, recommend that this be aligned with the start of the simulation

```
emodpy_tbhiv.interventions.bcg.new_intervention_as_file(camp, filename=None)
```

emodpy_tbhiv.interventions.cd4diag module

```
emodpy_tbhiv.interventions.cd4diag.get_thresh(name, low, high, camp)
```

```
emodpy_tbhiv.interventions.cd4diag.get_threshes(group_names, camp)
```

```
emodpy_tbhiv.interventions.cd4diag.CD4Diag(camp, trigger_treatment_list, event_200='Below200', event_350='Below350', event_500='Below500', event_above_500='Above500', start_day=0, duration=- 1, property_restrictions_list=[], nodeIDs=[], black_period=0, black_trigger='Blackout', event_name='CD4 Diagnostic')
```

ART :param TBD Note start_day is initialized as 1, recommend that this be aligned with the start of the simulation

```
emodpy_tbhiv.interventions.cd4diag.new_intervention_as_file(camp, filename='cd4.json')
```

emodpy_tbhiv.interventions.diag_treat_neg module

```
emodpy_tbhiv.interventions.diag_treat_neg.DiagnosticTreatNeg(camp, trigger_treatment_list, base_sensitivity_smeapos=1.0, base_sensitivity_smeaneg=1.0, pos_event='TBTestPositive', neg_event='TBTestNegative', def_event='TBTestDefault', treatment_fraction=1, start_day=0, duration=- 1, property_restrictions_list=[], nodeIDs=[], black_period=0, black_trigger='Blackout', event_name='TB Diagnosis')
```

:param TBD Note start_day is initialized as 1, recommend that this be aligned with the start of the simulation

```
emodpy_tbhiv.interventions.diag_treat_neg.new_intervention_as_file(camp, file-  
                                                                    name='dtn.json')
```

emodpy_tbhiv.interventions.hiv_diag module

```
emodpy_tbhiv.interventions.hiv_diag.HIVDiagnostic(camp,      trigger_treatment_list,  
                                                    base_sensitivity=1.0,  
                                                    base_specificity=1.0,  
                                                    pos_event='HIVTestedPositive',  
                                                    neg_event='HIVTestedNegative',  
                                                    treatment_fraction=1,  
                                                    start_day=0,      duration=- 1,  
                                                    property_restrictions_list=[],  
                                                    nodeIDs=[],      black_period=0,  
                                                    black_trigger='Blackout',  
                                                    event_name='HIV Diagnostic')  
:param TBD Note start_day is initialized as 1, recommend that this be aligned with the start of the simulation  
emodpy_tbhiv.interventions.hiv_diag.new_intervention_as_file(camp,      file-  
                                                            name=None)
```

emodpy_tbhiv.interventions.hiv_seeding module

```
emodpy_tbhiv.interventions.hiv_seeding.HIV(camp, time_offset=0, disease='HIV', reps=-  
                                             1, interval=1, start_day=0, nodeIDs=[],  
                                             event_name='HIV Incidence')  
emodpy_tbhiv.interventions.hiv_seeding.new_intervention_as_file(camp,      file-  
                                                                name='hiv.json')
```

emodpy_tbhiv.interventions.hsb module

```
emodpy_tbhiv.interventions.hsb.HSB(camp, trigger_treatment_list, output_event, probabil-  
                                     ity_per_step=1.0, start_day=0, duration=- 1, prop-  
                                     erty_restrictions_list=[], nodeIDs=[], black_period=0,  
                                     black_trigger='Blackout', event_name='HSB')  
:param TBD Note start_day is initialized as 1, recommend that this be aligned with the start of the simulation  
emodpy_tbhiv.interventions.hsb.new_intervention_as_file(camp,      file-  
                                                         name='hsb_diag.json')
```

emodpy_tbhiv.interventions.ramp_dtn module

```
emodpy_tbhiv.interventions.ramp_dtn.RampDTN(camp, trigger_treatment_list,
                                             ramp_time=30,
                                             base_sensitivity_smeapos=1.0,
                                             base_sensitivity_smeaneg=1.0,
                                             base_sensitivity_smeapos2=1.0,
                                             base_sensitivity_smeaneg2=1.0,
                                             treatment_fraction=1.0,
                                             treatment_fraction2=1.0,
                                             pos_event='TBTestPositive',
                                             neg_event='TBTestNegative', de-
                                             faulters_event='TBTestDefault',
                                             pos_event2='TBTestPositive',
                                             neg_event2='TBTestNegative', de-
                                             faulters_event2='TBTestDefault',
                                             start_day=0, duration=- 1, prop-
                                             erty_restrictions_list=[], nodeIDs=[],
                                             black_period=0, black_trigger='Blackout',
                                             event_name='RampDTN')
:param TBD Note start_day is initialized as 1, recommend that this be aligned with the start of the simulation
emodpy_tbhiv.interventions.ramp_dtn.new_intervention_as_file(camp, file-
                                                             name='ramp.json')
```

emodpy_tbhiv.interventions.resist_diag module

```
emodpy_tbhiv.interventions.resist_diag.ResistanceDiagnostic(camp, trig-
                                                             ger_treatment_list,
                                                             sensitivity=1.0,
                                                             specificity=1.0,
                                                             pos_event='TBMDRTestPositive',
                                                             neg_event='TBMDRTestNegative',
                                                             def_event='TBMDRTestDefault',
                                                             treat-
                                                             ment_fraction=1,
                                                             treat-
                                                             ment_fraction_negative_test=1,
                                                             start_day=0,
                                                             duration=- 1, prop-
                                                             erty_restrictions_list=[],
                                                             nodeIDs=[],
                                                             black_period=0,
                                                             black_trigger='Blackout',
                                                             event_name='TB Di-
                                                             agnosis MDR')
:param TBD Note start_day is initialized as 1, recommend that this be aligned with the start of the simulation
emodpy_tbhiv.interventions.resist_diag.new_intervention_as_file(camp, file-
                                                             name='resist_diag.json')
```

emodpy_tbhiv.interventions.smear_diag module

```
emodpy_tbhiv.interventions.smear_diag.SmearDiagnostic(camp, trigger_treatment_list,  
                                                         base_sensitivity_smearpos=1.0,  
                                                         base_sensitivity_smearneg=1.0,  
                                                         pos_event='TestPositiveOnSmear',  
                                                         treatment_fraction=1,  
                                                         start_day=0, duration=- 1,  
                                                         property_restrictions_list=[],  
                                                         nodeIDs=[], black_period=0,  
                                                         black_trigger='Blackout',  
                                                         event_name='TB    Diagnosis  
Smear Simple')
```

:param TBD Note start_day is initialized as 1, recommend that this be aligned with the start of the simulation

```
emodpy_tbhiv.interventions.smear_diag.new_intervention_as_file(camp,      file-  
                                                                name='smear_diag.json')
```

emodpy_tbhiv.interventions.tb_treat_basic module

```
emodpy_tbhiv.interventions.tb_treat_basic.TBDrugTreatment(camp,      trig-  
                                                         ger_treatment_list,  
                                                         drug_name='DOTS',  
                                                         inactivation_rate=0,  
                                                         mortality_rate=0,  
                                                         clearance_rate=0,  
                                                         resistance_rate=0,  
                                                         relapse_rate=0,      re-  
                                                         duced_transmit=1.0,  
                                                         start_day=0,      treat-  
                                                         ment_duration=180,  
                                                         duration=- 1, prop-  
                                                         erty_restrictions_list=[],  
                                                         nodeIDs=[],  
                                                         black_period=0,  
                                                         black_trigger='Blackout',  
                                                         event_name='TBDrugTreatment')
```

:param TBD Note start_day is initialized as 1, recommend that this be aligned with the start of the simulation

```
emodpy_tbhiv.interventions.tb_treat_basic.new_intervention_as_file(camp, file-  
                                                                name=None)
```

emodpy_tbhiv.interventions.tbhiv_treat module

```
emodpy_tbhiv.interventions.tbhiv_treat.TBHIVDrugTreatment (camp,          trigger_treatment_list,
                                                             drug_name,          latent_multiplier=1.0,
                                                             active_multiplier=1.0,
                                                             start_day=0,
                                                             duration=- 1,  property_restrictions_list=[],
                                                             nodeIDs=[],
                                                             black_period=0,
                                                             black_trigger='Blackout',
                                                             event_name='TBHIVDrugTreatment')
    :param TBD Note start_day is initialized as 1, recommend that this be aligned with the start of the simulation
emodpy_tbhiv.interventions.tbhiv_treat.new_intervention_as_file (camp,          file-
                                                                  name='tb_drug_treat.json')
```

emodpy_tbhiv.interventions.triggered_pvc module

```
emodpy_tbhiv.interventions.triggered_pvc.TPVC (camp,  trigger_treatment_list,  property_to_change,
                                                  final_prop_value,
                                                  revert=0,          daily_prob=1,
                                                  start_day=0,      duration=- 1,
                                                  property_restrictions_list=[],
                                                  nodeIDs=[],      black_period=0,
                                                  black_trigger='Blackout',
                                                  event_name='PropertyValueChanger')
    Triggered Property Value Changer :param TBD Note start_day is initialized as 1, recommend that this be aligned
    with the start of the simulation
emodpy_tbhiv.interventions.triggered_pvc.new_intervention_as_file (camp,  file-
                                                                    name='tpvc.json')
```

emodpy_tbhiv.interventions.vaccine module

```
emodpy_tbhiv.interventions.vaccine.Vaccine (camp,          trigger_treatment_list,          initial_efficacy=1.0,
                                              vaccine_take=1,
                                              vtype='AcquisitionBlocking',
                                              box_duration=365,  immune_decay=3650,
                                              start_day=0,  duration=- 1,  property_restrictions_list=[],
                                              nodeIDs=[],
                                              black_period=0,  black_trigger='Blackout',
                                              event_name='Vaccine')
    :param TBD Note start_day is initialized as 1, recommend that this be aligned with the start of the simulation
emodpy_tbhiv.interventions.vaccine.new_intervention_as_file (camp,          file-
                                                                name='vaccine.json')
```

emodpy_tbhiv.reporters package

Submodules

emodpy_tbhiv.reporters.plugin module

```
class emodpy_tbhiv.reporters.plugin.Report_TBHIV_ByAge (name: str = 'Report_TBHIV_ByAge',  
Enabled: bool = True,  
Reports: list = <factory>,  
dll_file: str = 'libreport_TBHIV_ByAge.dll')  
  
Bases: emodpy.reporters.base.CustomReporter  
  
name: str = 'Report_TBHIV_ByAge'  
dll_file: str = 'libreport_TBHIV_ByAge.dll'  
configure_report (max_age_yrs, min_age_yrs, start_year, stop_year, events=None)
```


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