

# Package ‘shinySIR’

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**Type** Package

**Title** Interactive Plotting for Mathematical Models of Infectious Disease Spread

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**Description** Provides interactive plotting for mathematical models of infectious disease spread. Users can choose from a variety of common built-in ordinary differential equation (ODE) models (such as the SIR, SIRS, and SIS models), or create their own. This latter flexibility allows 'shinySIR' to be applied to simple ODEs from any discipline. The package is a useful teaching tool as students can visualize how changing different parameters can impact model dynamics, with minimal knowledge of coding in R. The built-in models are inspired by those featured in Keeling and Rohani (2008) <doi:10.2307/j.ctvc4gk0> and Bjornstad (2018) <doi:10.1007/978-3-319-97487-3>.

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**Encoding** UTF-8

**LazyData** true

**RoxygenNote** 6.1.1

**Depends** dplyr (>= 0.8.0.1), tidyr (>= 0.8.3), ggplot2 (>= 3.1.1), shiny (>= 1.3.2), deSolve (>= 1.2.1)

**Suggests** knitr (>= 1.22), rmarkdown (>= 1.12), testthat (>= 2.2.0)

**VignetteBuilder** knitr

**NeedsCompilation** no

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default_models	<i>Model help</i>
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**Description**

This function prints a list of all built in models, along with their parameter arguments and a short description.

**Usage**

```
default_models()
```

**Value**

data frame of model descriptions.

**Examples**

```
default_models()
```

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get_ics	<i>Get default initial conditions</i>
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**Description**

This function returns the default parameter vectors for a particular built-in model.

**Usage**

```
get_ics(model)
```

**Arguments**

model            name of the model to be solved. Examples include: SIR and SIR vaccination.

**Value**

named vector of default initial conditions.

---

get_name	<i>Get model display names</i>
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**Description**

This function gets the display name for any built-in model.

**Usage**

```
get_name(model)
```

**Arguments**

model            character specifying the name of the built-in model.

**Value**

character of the corresponding display name.

**Examples**

```
get_name(model = "SIR")
```

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get_params	<i>Get default parameters</i>
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**Description**

This function returns the default parameter vectors for a particular built-in model.

**Usage**

```
get_params(model)
```

**Arguments**

model                    name of the model to be solved. Examples include: SIR and SIR vaccination.

**Value**

list of default parameter vectors.

**Examples**

```
get_params(model = "SIR")
```

---

plot_model	<i>Plot model output. This function plots the output of a fitted model data frame.</i>
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**Description**

Plot model output. This function plots the output of a fitted model data frame.

**Usage**

```
plot_model(output, linesize, textsize, xlabel, ylabel, legend_title,
           levels, ...)
```

**Arguments**

output                    data frame output from solve\_eqns().  
 linesize                numeric value for line width in ggplot.  
 textsize                numeric value for textsize in ggplot.  
 xlabel                    character string for x axis label.  
 ylabel                    character string for y axis label.  
 legend\_title            character string for legend title.

levels	character vector of the variable names in the order they should be plotted. Default is to obtain the order from the initial conditions vector 'ics'.
...	extra arguments to be passed through to ggplot scale_colour_discrete e.g. 'labels' to change the legend names.

**Value**

ggplot object

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run_shiny	<i>Solve equations</i>
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**Description**

This function solves an ODE model using 'deSolve' and returns the output as a data frame.

**Usage**

```
run_shiny(model = "SIR", neweqns = NULL, ics = NULL, tstart = 0,
          timestep = 1, tmax = 365, parm0 = NULL, parm_names = NULL,
          parm_min = NULL, parm_max = NULL, sigfigs = 4, showtable = TRUE,
          linesize = 1.2, textsize = 14, xlabel = "Time",
          ylabel = "Number of individuals", legend_title = "Compartment", ...)
```

**Arguments**

model	name of the model to be solved. Examples of built-in models are: "SIR", "SIR vaccination". Default is "SIR".
neweqns	function specifying the equations of the user-defined model. Only to be used if a model is required that is not built-in. Default is NULL.
ics	named numeric vector specifying the initial conditions i.e. the initial values of all model variables. Default is c(S = 9999, I = 1, R = 0) for the SIR model.
tstart	numerical value of form c(tmin, tmax) indicating the time to start simulations. Default value is 0.
timestep	numerical value indicating time step be used when solving equations. Default value is 1/365.
tmax	numerical value indicating maximum time point to be considered.
parm0	named numeric vector of starting parameter values. Names must correspond to those used in the model equations.
parm_names	character vector of parameter names to be displayed in shiny menu. Must be in the same order as 'parm0'.
parm_min	named numeric vector of minimum parameter values.
parm_max	named numeric vector of maximum parameter values.
sigfigs	number of significant figures to round parameter input vectors. Default is 4.

showtable	logical TRUE/FALSE. Should the table of transformed parameters be shown? Only applies to built-in models. Default is TRUE.
linesize	numeric value for line width in ggplot output. Default is 1.2.
textsize	numeric value for textsize in ggplot output. Default is 14.
xlabel	character string for x axis plotting label. Default is "Time".
ylabel	character string for y axis plotting label. Default is "Number of individuals".
legend_title	character string for legend title. Default is "Compartment".
...	extra arguments to be passed through to ggplot scale_colour_discrete e.g. 'labels' to change the legend names.

**Value**

data frame of model solutions in long format.

**Examples**

```
run_shiny(model = "SIR")
```

---

```
seir.app
```

*Launch a shiny-app simulating the seasonal SEIR model*

---

**Description**

#' This launches an app running the SEIR model i.e. a model incorporating latency and seasonal forcing in transmission.

**Usage**

```
seir.app
```

**Format**

An object of class shiny.appobj of length 5.

**Details**

Launch app for details

**Examples**

```
## Not run: seir.app
```

---

`seirs.app`*Launch a shiny-app simulating the SEIRS model*

---

**Description**

This launches an app running the SEIRS model i.e. a model incorporating latency and loss of immunity.

**Usage**`seirs.app`**Format**

An object of class `shiny.appobj` of length 5.

**Details**

Launch app for details

**Examples**

```
## Not run: seirs.app
```

---

`SIR`*SIR model*

---

**Description**

These equations describe the classic SIR model with no births or deaths.

**Usage**`SIR(t, y, parms)`**Arguments**

<code>t</code>	numeric vector of time points.
<code>y</code>	numeric vector of variables.
<code>parms</code>	named vector of model parameters.

**Value**

equation list

---

`SIRbirths`*SIR model with demography*

---

**Description**

These equations describe the classic SIR model with equal births and deaths.

**Usage**

```
SIRbirths(t, y, parms)
```

**Arguments**

<code>t</code>	numeric vector of time points.
<code>y</code>	numeric vector of variables.
<code>parms</code>	named vector of model parameters.

**Value**

equation list

---

`SIRS`*SIRS model*

---

**Description**

These equations describe the classic SIRS model without births or deaths.

**Usage**

```
SIRS(t, y, parms)
```

**Arguments**

<code>t</code>	numeric vector of time points.
<code>y</code>	numeric vector of variables.
<code>parms</code>	named vector of model parameters.

**Value**

equation list

---

SIRSBirths	<i>SIRS model with demography</i>
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---

**Description**

These equations describe the classic SIRS model with equal birth and death rates.

**Usage**

SIRSBirths(t, y, parms)

**Arguments**

t	numeric vector of time points.
y	numeric vector of variables.
parms	named vector of model parameters.

**Value**

equation list

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SIRSVaccination	<i>SIRS model with vaccination at birth</i>
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---

**Description**

These equations describe the classic SIRS model with equal birth and death rates and vaccination at birth.

**Usage**

SIRSVaccination(t, y, parms)

**Arguments**

t	numeric vector of time points.
y	numeric vector of variables.
parms	named vector of model parameters.

**Value**

equation list

---

 SIRvaccination

*SIR model with vaccination at birth*


---

**Description**

These equations describe the classic SIR model with births and deaths, constant population size, and (optional) vaccination at birth.

**Usage**

SIRvaccination(t, y, parms)

**Arguments**

t	numeric vector of time points
y	numeric vector of variables
parms	named vector of model parameters.

**Value**

equation list

---

SIS

*SIS model*


---

**Description**

These equations describe the classic SIS model with no births or deaths.

**Usage**

SIS(t, y, parms)

**Arguments**

t	numeric vector of time points
y	numeric vector of variables
parms	named vector of model parameters.

**Value**

equation list

---

SISbirths	<i>SIS model with demography</i>
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---

**Description**

These equations describe the classic SIR model with equal births and deaths.

**Usage**

```
SISbirths(t, y, parms)
```

**Arguments**

t	numeric vector of time points.
y	numeric vector of variables.
parms	named vector of model parameters.

**Value**

equation list

---

solve_eqns	<i>Solve equations</i>
------------	------------------------

---

**Description**

This function solves an ODE model using 'deSolve' and returns the output as a data frame.

**Usage**

```
solve_eqns(eqns, ics, times, parms)
```

**Arguments**

eqns	name of the model to be solved. Examples include: SIR and SIR vaccination.
ics	named numeric vector specifying the initial conditions i.e. the initial values of all model variables.
times	numerical vector indicating the time points at which the equation should be solved.
parms	named numeric vector of parameter values.

**Value**

data frame of model solutions in long format.

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