By Ali Gharouni,

```
## [1] "2020-12-13 08:16:24 EST"
```

This is my a test for MacPan package.

1 Install and Play

```
# install remotes package if necessary:
while (!require(remotes)) {
    install.packages("remotes")
}

## Loading required package:  remotes

## install development version of bbmle:
if (!require("bbmle") || packageVersion("bbmle") < "1.0.23.5") {
    remotes::install_github("bbolker/bbmle")
}

## Loading required package:  bbmle
## Loading required package:  stats4

## install the target package and all its dependencies:
remotes::install_github("bbolker/McMasterPandemic",
                        dependencies = TRUE,
                        build_vignettes = TRUE
)

## Skipping install of 'McMasterPandemic' from a github remote, the
SHA1 (54095dc4) has not changed since last install.
##  Use 'force = TRUE' to force installation

library(McMasterPandemic)
library(ggplot2); theme_set(theme_bw())
library(cowplot)

library(directlabels)
library(zoo)

##
## Attaching package:  'zoo'
## The following objects are masked from 'package:base':
##
##    as.Date, as.Date.numeric

library(tidyverse)
```

```
## -- Attaching packages --------------------------------------- tidyverse
1.3.0 --
## v tibble  3.0.4     v dplyr  1.0.2
## v tidyr   1.1.2     v stringr 1.4.0
## v readr   1.3.1     v forcats 0.5.0
## v purrr   0.3.4
## -- Conflicts ------------------------------------------ tidyverse_conflicts()
--
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
## x dplyr::slice()  masks bbmle::slice()
## x tidyr::unpack() masks McMasterPandemic::unpack()
```

```
params <- read_params("ICU1.csv")

knitr::kable(round(t(summary(params)),2))
```

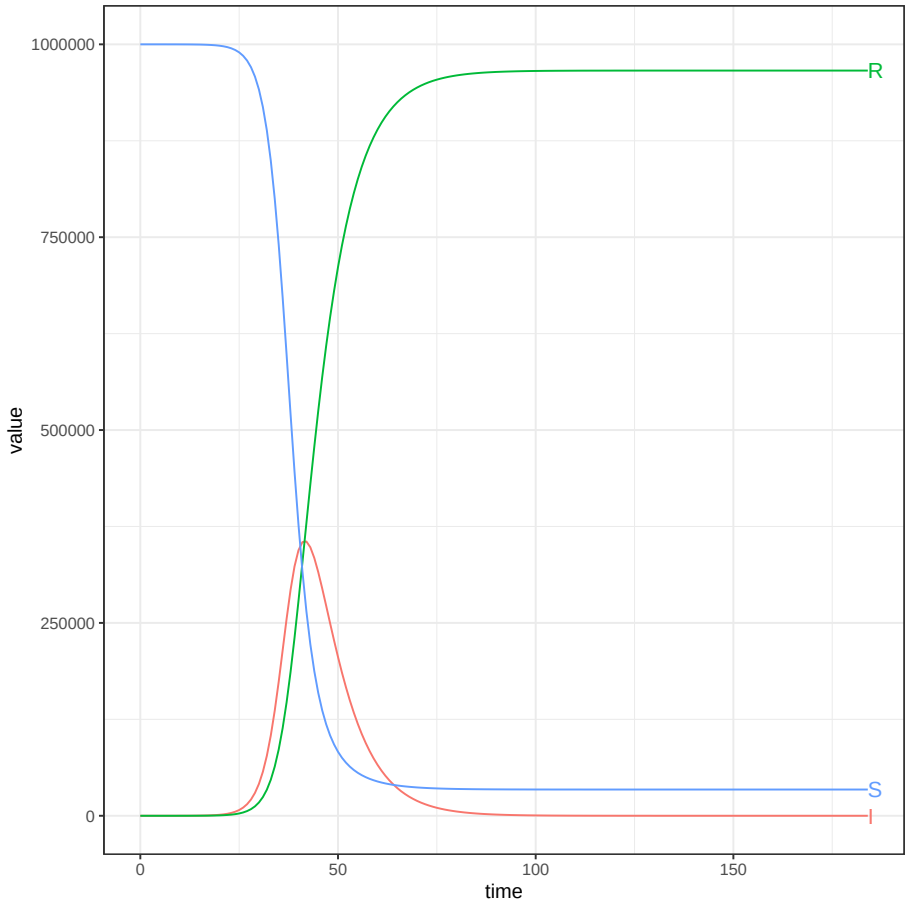
r0	R0	Gbar	CFR_gen	dbl_time
0.23	6.52	12.19	0.04	3.04

```
knitr::kable(round(t(get_R0(params, components=TRUE)),2))
```

asymptomatic	pre-symptomatic	mild	severe
1.56	0.33	4.46	0.17

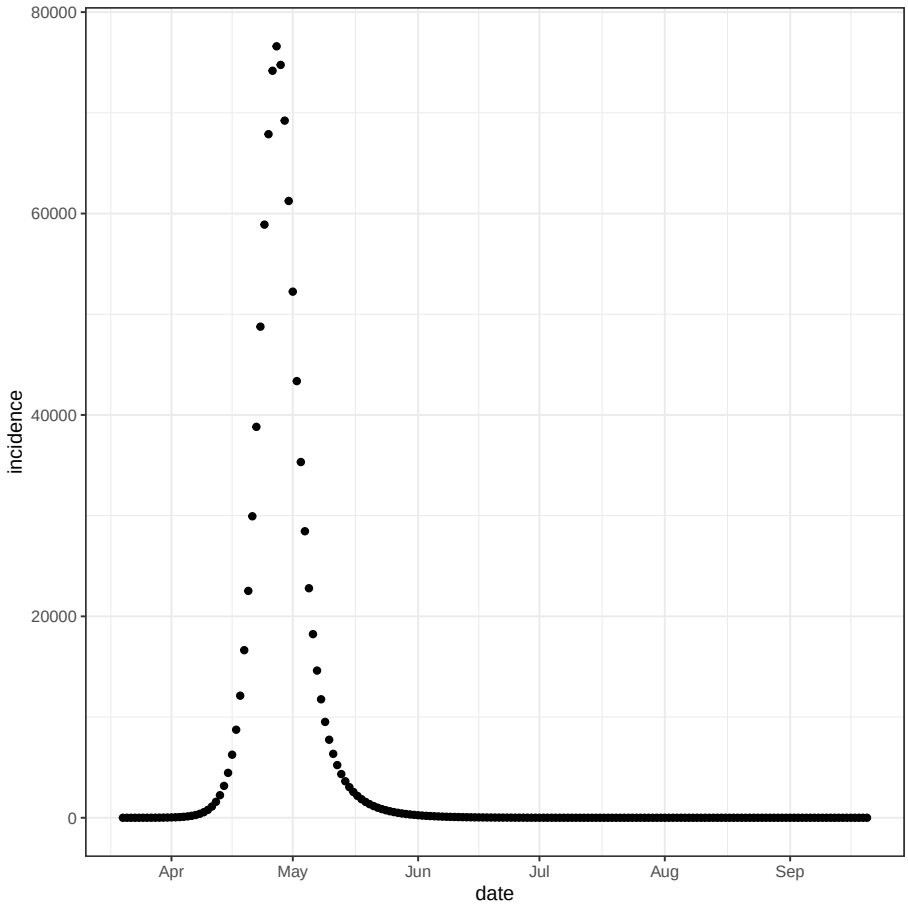
```
# A simple SIR model
library(deSolve)
unpack <- McMasterPandemic::unpack

sir.mod <- function(time,state,params){
    unpack(as.list(c(state,params)))
    dS.dt <- -beta*S*I/N0
    dI.dt <-  beta*S*I/N0-gamma*I
    dR.dt <-  gamma*I
    # return the rate of change
    dxdt <- c(dS.dt,dI.dt,dR.dt)
    return(list(dxdt))
}
sir.params <- c(N0=10^6, beta=0.5,gamma=1/7)
class(sir.params) <- "params_pansim"
# Set the initial state
sir.state_init <- c(S=sir.params[["N0"]],
                I=1,
                R=0)
##set the number of days for SIR simulation as simulation time of MacPan
```

```r
startdate <- as.Date("01-03-2020")
enddate <- as.Date("01-09-2020")
d <- seq(0,as.numeric(enddate-startdate),by=1)

sir.R0 <- sir.params[["beta"]]/sir.params[["gamma"]]

sir.out <- as.data.frame(
  ode(
    func=sir.mod,
    y=sir.state_init,
    times= d,
    parms=update(sir.params)
    ))

sir.out2 <- sir.out %>%
  pivot_longer(c(S,I,R), names_to = "compartment", values_to = "value")

gg1 <- (ggplot(data=sir.out2, aes(x=time,y=value,col=compartment))
    + geom_line()
    # + scale_y_log10(limits=c(0.1,sir.params[["N0"]]))
)
direct.label(gg1,"last.bumpup")
```

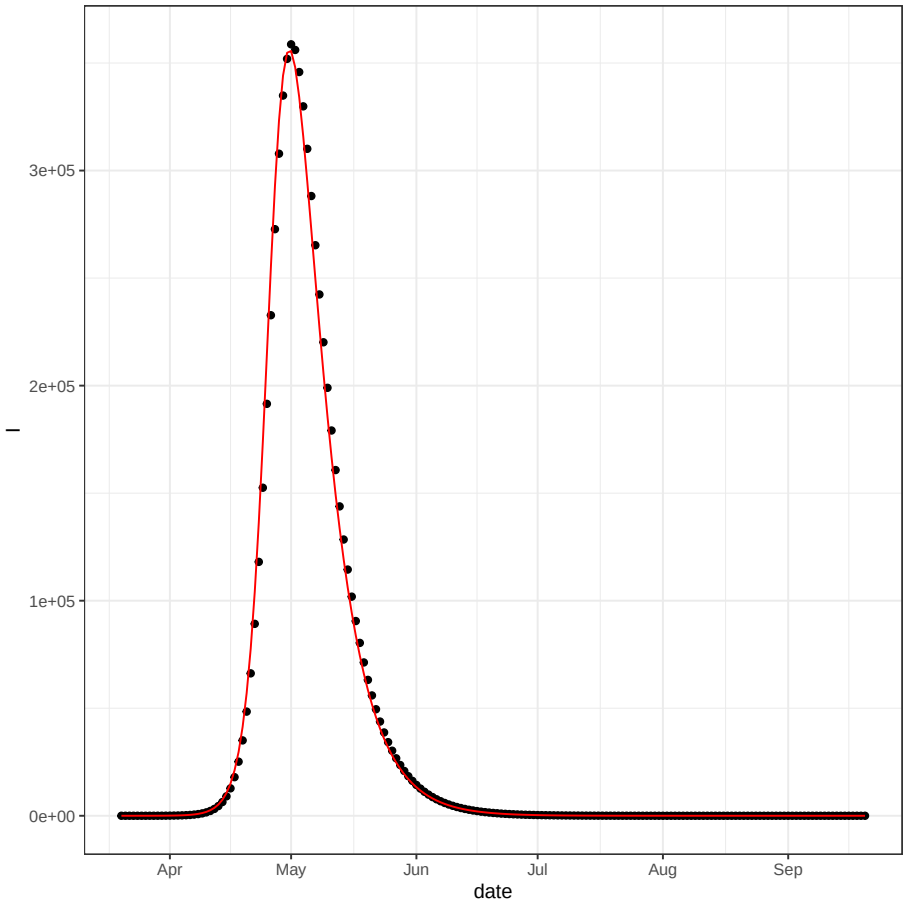



```
## update MacPan's params according to the SIR params
##
big_rate <- 20
params <- update(params, c(beta0=sir.params[["beta"]],
                           alpha=0, ## no asymptomatic
                           sigma=big_rate, ## very short latent period
                           ## would like this to -> Inf but can't
                           gamma_a=0,
                           mu=1,  ## all cases mild
                           gamma_m=sir.params[["gamma"]],
                           gamma_s=0,
                           ## try to skip presymptomatic period
                           gamma_p=big_rate
                           ))

pp <- params
```

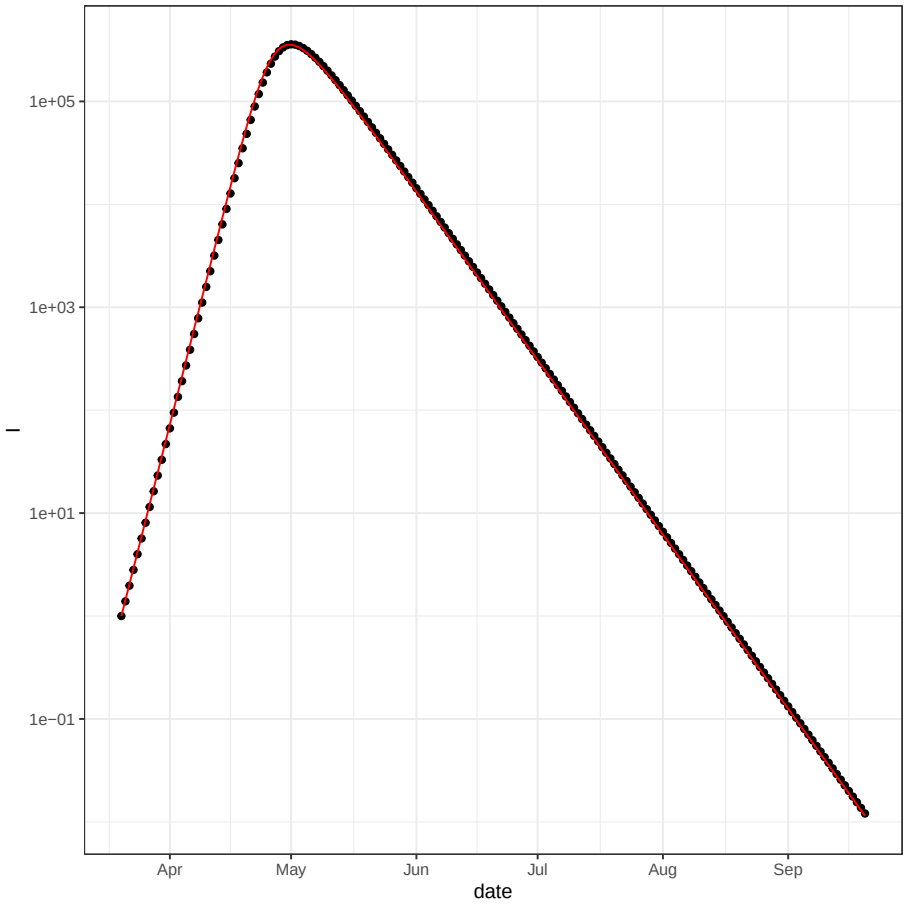
```
## pp <- fix_pars(params, target = c(R0 = sir.R0)) #not sure if I need to update Gbar=6?
state <- make_state(params=pp)
state[] <- 0
state[["S"]] <- 1e6
state[["Im"]] <- 1

summary(pp)

## Warning in log(r_last/r_nextlast):  NaNs produced

##       r0       R0     Gbar  CFR_gen dbl_time
##      NaN      NaN      NaN        0      NaN

sim0 <- run_sim(pp,state,
                start_date=startdate,
                end_date=enddate,
                use_ode=TRUE)

gg0 <- (ggplot(sim0,aes(x=date))
+ geom_point(aes(y=incidence))
)
print(gg0)
```




```
# combining the SIR and MacPan results also calculating incidences fr the SIR model
sim_combined <- sim0 %>% mutate(sir.S=sir.out[["S"]],
                                sir.I=sir.out[["I"]],
                                sir.S=sir.out[["R"]],
                                sir.incidence=sir.params[["beta"]]*sir.out[["S"]]*sir.out[['

gg01 <- (ggplot(sim_combined,aes(x=date))
+ geom_point(aes(y=I))
+ geom_line(aes(y=sir.I), color='red')
)
print(gg01)
```




```
print(gg01 + scale_y_log10())
```


1e+05
1e+03
1e+01
1e−01
I
Apr
May
Jun
Jul
Aug
Sep
date