MacPan Example

Installing MacPan

Clone/download the repository (from here) and install locally or use:

`remotes::install_github("bbolker/McMasterPandemic")` to install the package. You will need to first install the developer version of `bbmle` (`remotes::install_github("bbolker/bbmle")`) before installing `McMasterPandemic`.

Simulating data time series

MLi: Do we have a document of the basic model (e.g. the flow diagram, and what the states/compartments mean?)

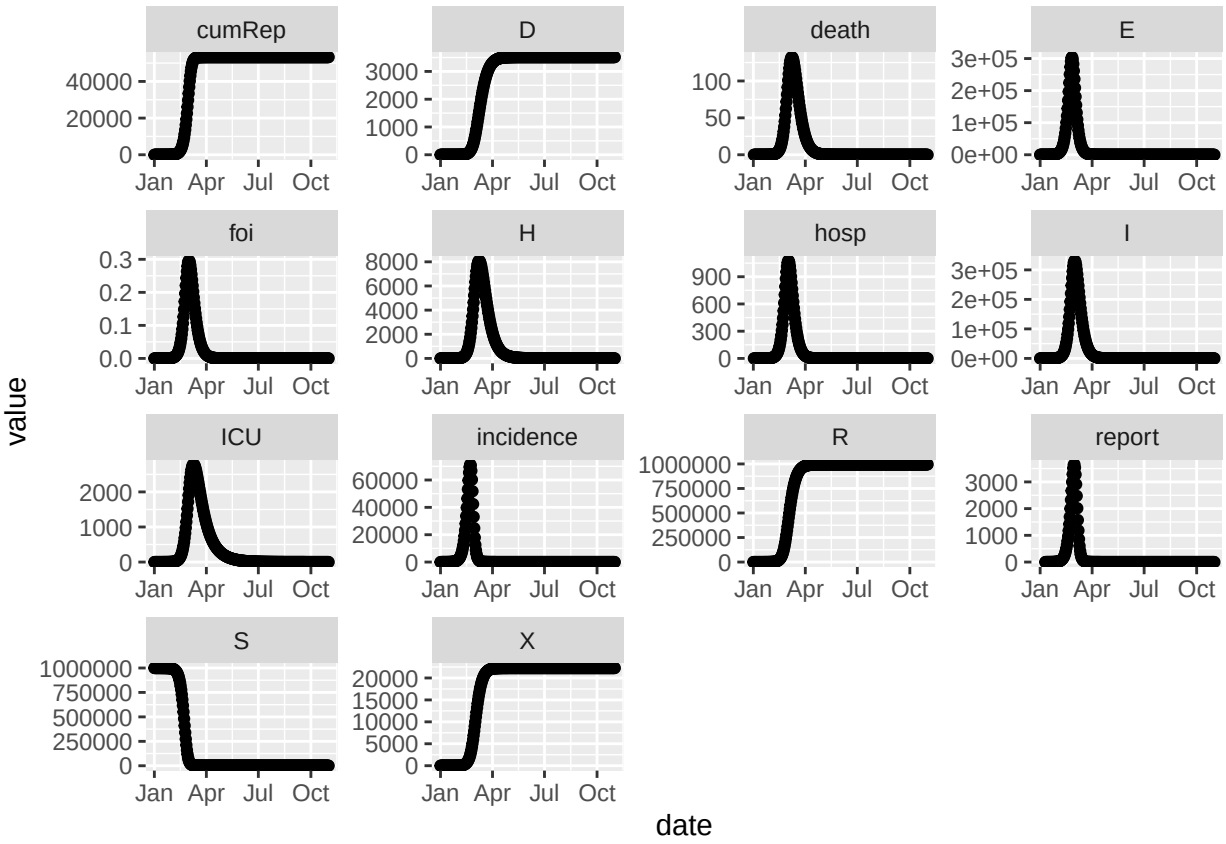
```
params <- read_params("ICU1.csv")

## Need to set up opt_pars because you need this for forecast_sim
opt_pars <- list(params=c(beta0=params[["beta0"]]))
simdat <- forecast_sim(p = unlist(opt_pars)
    , opt_pars = opt_pars
    , base_params = params
    , start_date = "2020-01-01"
    , end_date = "2020-11-01"
)
```

Plotting simulated time series

```
gg <- (ggplot(simdat, aes(x=date,y=value))
    + geom_point()
    + geom_line()
    + facet_wrap(~var,scale="free")
)

print(gg)
```



Changing parameters

MLi: Maybe use Zach's shinny app to play around with different parameters combinations. This is the way to manually change it via code.

```
print(summary(params))
```

```
##         r0         R0       Gbar    CFR_gen   dbl_time
##  0.2278149  6.5180089 12.1897402  0.0352000  3.0425898
```

```
## Change R0
newparams <- fix_pars(params, target=c(R0=2))

print(summary(newparams))
```

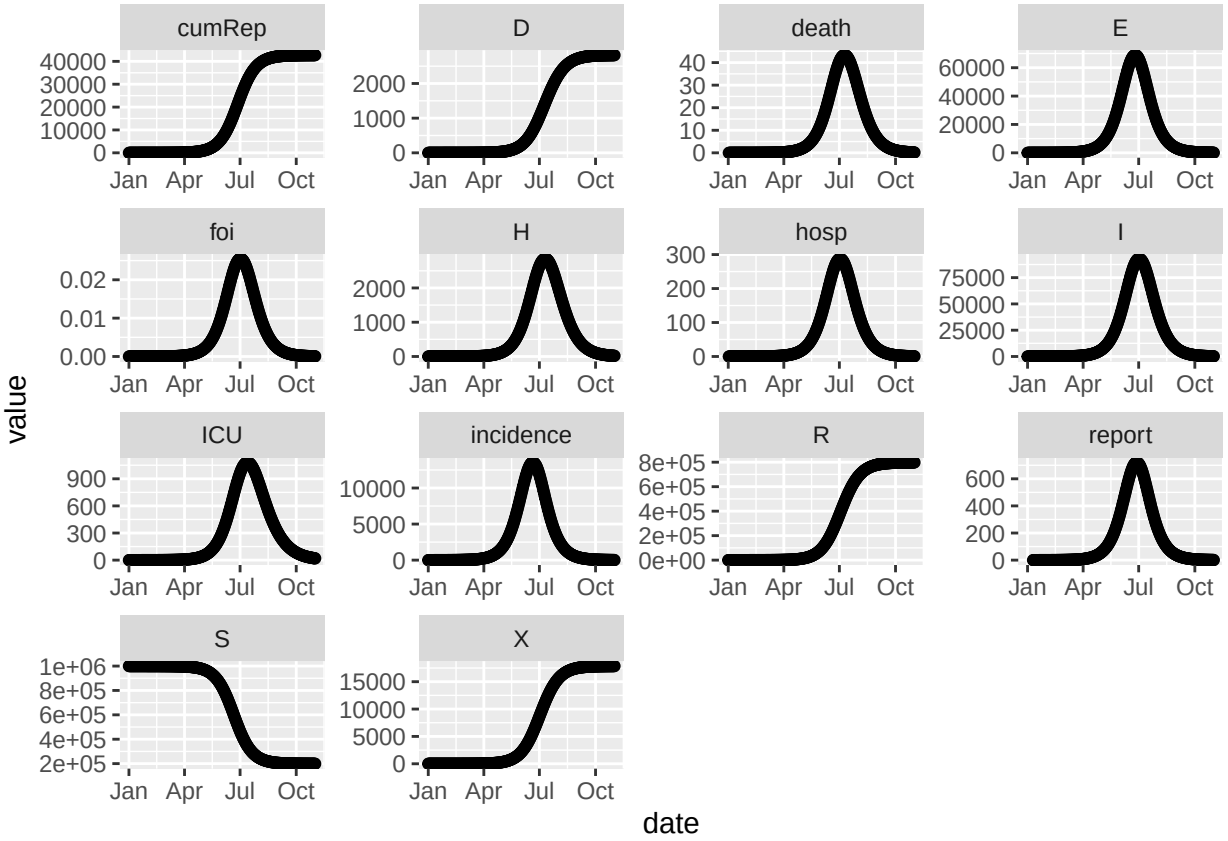
```
##          r0          R0        Gbar     CFR_gen    dbl_time
##  0.06649208  2.00002038 12.18974018  0.03520000 10.42450796
```

```
new_opt_pars <- list(params=c(beta0=newparams[["beta0"]]))

simdat2 <- forecast_sim(p = unlist(new_opt_pars)
    , opt_pars = new_opt_pars
    , base_params = newparams    ## change parameter set here!
    , start_date = "2020-01-01"
    , end_date = "2020-11-01"
)

print(gg %+% simdat2)
```

```
## Warning: Removed 11 rows containing missing values (geom_point).
```



Question: Extract the reported cases time series and use epigrowthfit to estimate little r. Double check if it is the same using the summary function in macpan.

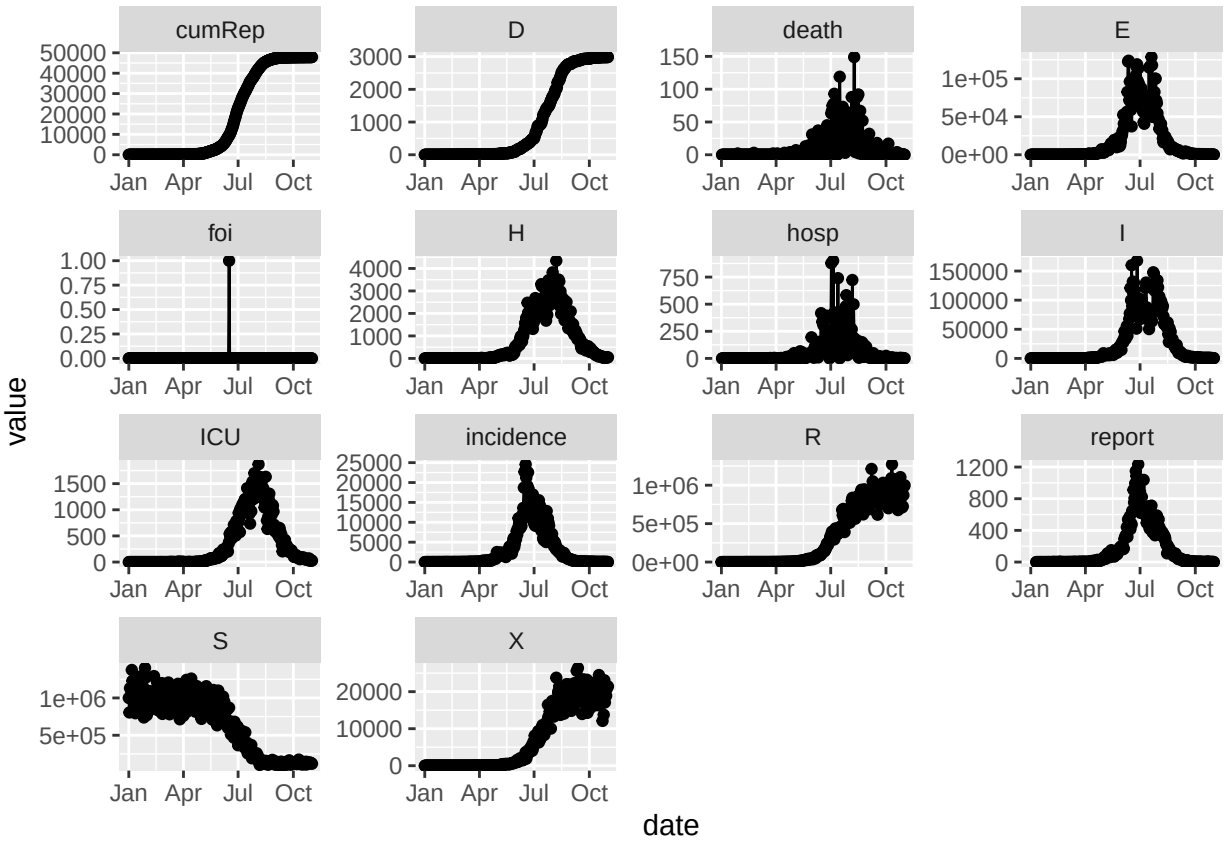
Adding Stochastic Noise

```
newparams2 <- update(newparams, obs_disp = 50, proc_disp=1)

simdat3 <- forecast_sim(p = unlist(new_opt_pars)
    , opt_pars = new_opt_pars
    , base_params = newparams2
    , stoch = c(proc=TRUE,obs=TRUE)
    , stoch_start = c(proc="2020-01-01",obs="2020-01-01")
    , start_date = "2020-01-01"
    , end_date = "2020-11-01"
)

print(gg %+% simdat3)
```

```
## Warning: Removed 11 rows containing missing values (geom_point).
```



Calibrating to simuated data

```
report_dat <- (simdat3
    %>% filter(var == "report")
)

## I am estimating beta0 only, you need to specify what parameters you want to estimate

opt_pars <- list(params = c(beta0=0.1))

fitmod <- calibrate_comb(data = report_dat
    , params = newparams2
    , opt_pars = opt_pars
    , use_DEoptim = FALSE ## We don't want to wait that long
    , debug_plot = FALSE ## TRUE to watch fitting process, don't do it in rmd
)

print(summary(fitmod))
```

```
##   start_date         r0       R0     Gbar CFR_gen dbl_time
## 1 2019-12-17 0.06028455 1.878001 12.18974  0.0352 11.49792
```

```
print(summary(newparams2))
```

```
##          r0          R0        Gbar     CFR_gen    dbl_time
##  0.06649208  2.00002038 12.18974018  0.03520000 10.42450796
```