Compare equilibrium solution with Berkeley Madonna output

If the equilibrium solution in this package is correct then it should be an exact match to the output of the Berkeley Madonna (BM) model run to equilibrium. Here we check this by importing BM model output for a range of EIR and treatment levels, calculating the equivalent quantities using the internal equilibrium solution, and comparing the two with some simple plots.

Note that the BM output was produced using 164 age categories and 5 heterogeneity categories, and so the same values and breaks are used in the equilibrium solution.

All model states

Here we explore the proportion of individuals in each model state as a function of EIR and treatment. First, read in BM output.

```
## Loading malariaModelFit
```

```
## Warning in setup_ns_exports(pkg, export_all): Objects listed as exports,
## but not present in namespace: human_equilibrium_fast, plot_nice1
```

```r
# define treatment levels corresponding to BM output files
ft <- c("0.0", "0.2", "0.4")

# read in BM output as list
BM_list <- list()
for (i in 1:length(ft)) {
  name <- paste0("BM_output/BM_ft",ft[i],".csv")
  BM_list[[i]] <- read.csv(malariaModelFit_file(name))
}

# get EIR range
EIR <- BM_list[[1]]$EIRY_eq
```

Now simulate the same output directly from the equilibrium solution.

```r
# load parameters
age <- default_age()
h <- gq_normal(5)
p <- load_parameters("parameters_Griffin2014.txt")

# save solution to list
eqList <- list()
for (i in 1:length(ft)) {
  eqList[[i]] <- list()
  for (j in 1:length(EIR)) {
      eqList[[i]][[j]] <- human_equilibrium_cpp(EIR[j], as.numeric(ft[i]), p, age, h$nodes, h$weights)
  }
}

# save state proportions in array
stateNames <- c("S", "T", "D", "A", "U", "P")
m <- array(0, dim=c(length(ft), length(EIR), length(stateNames)))
```

```
for (i in 1:length(eqList)) {
  for (j in 1:length(eqList[[i]])) {
    m[i,j,] <- colSums(subset(eqList[[i]][[j]]$states, select=stateNames))
  }
}
```

We can eyeball the two solutions by overlaying lines from the BM solution (solid) and from the internal equilibrium solution (dashed):

ft = 0.0

ft = 0.2

ft = 0.4

3
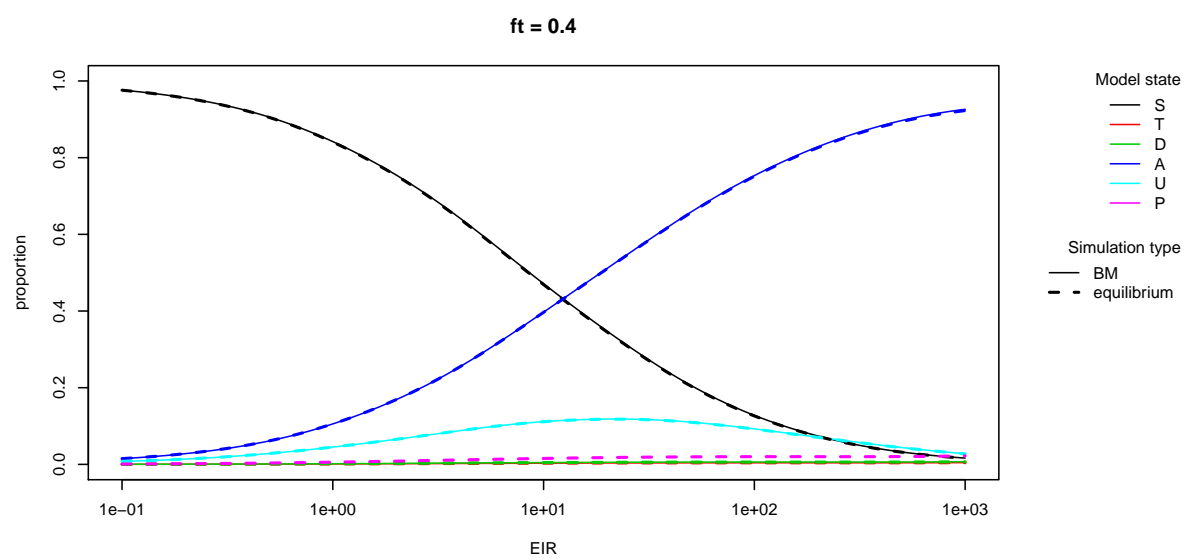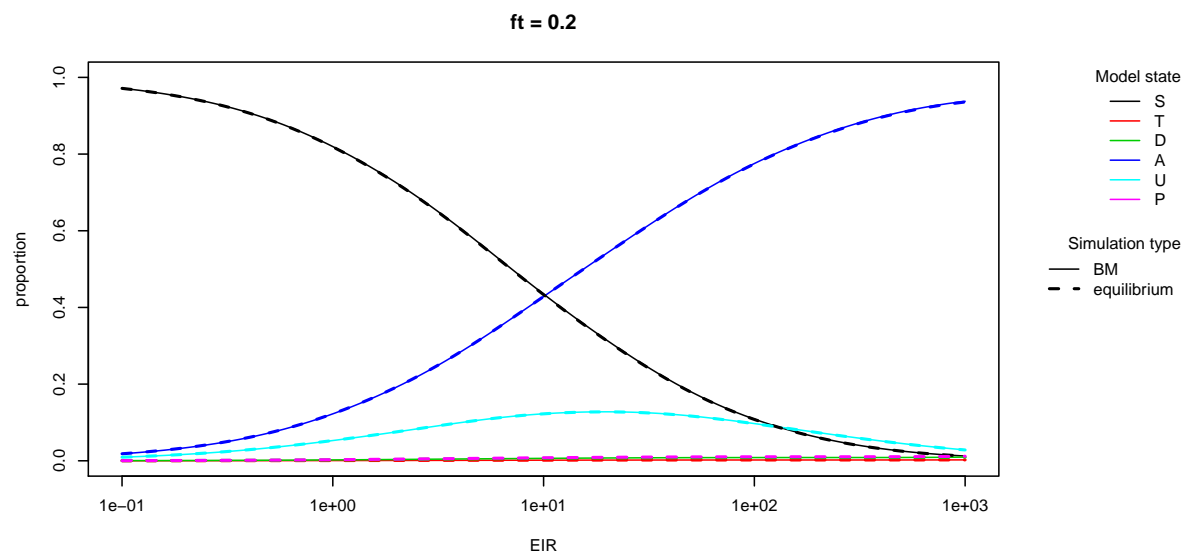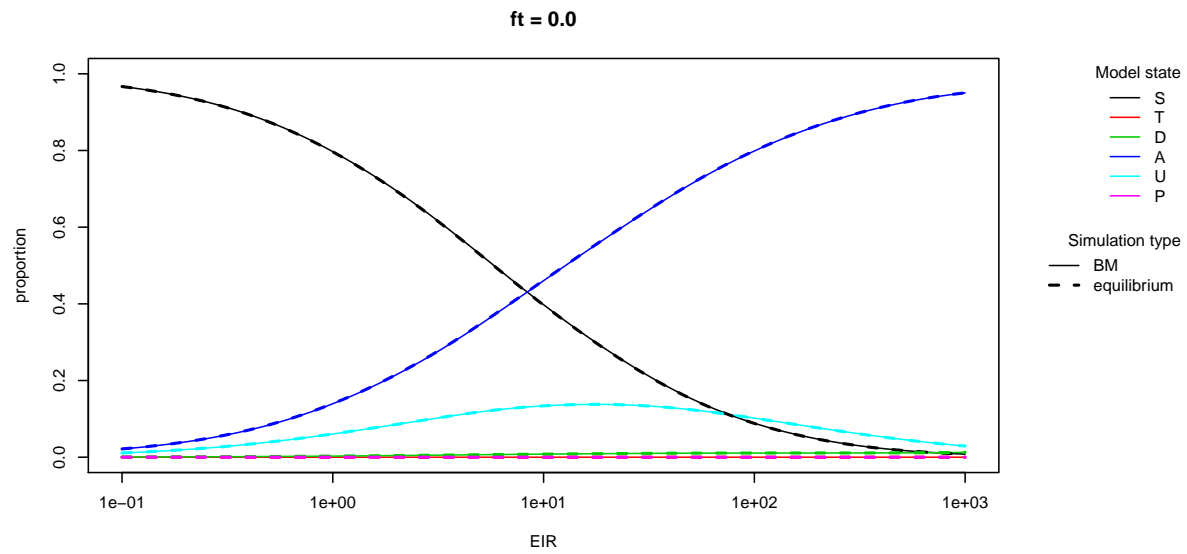
Some proportions are too small to see cleary, so here are equivalent plots for the diseased state only:

ft = 0.0

ft = 0.2

ft = 0.4
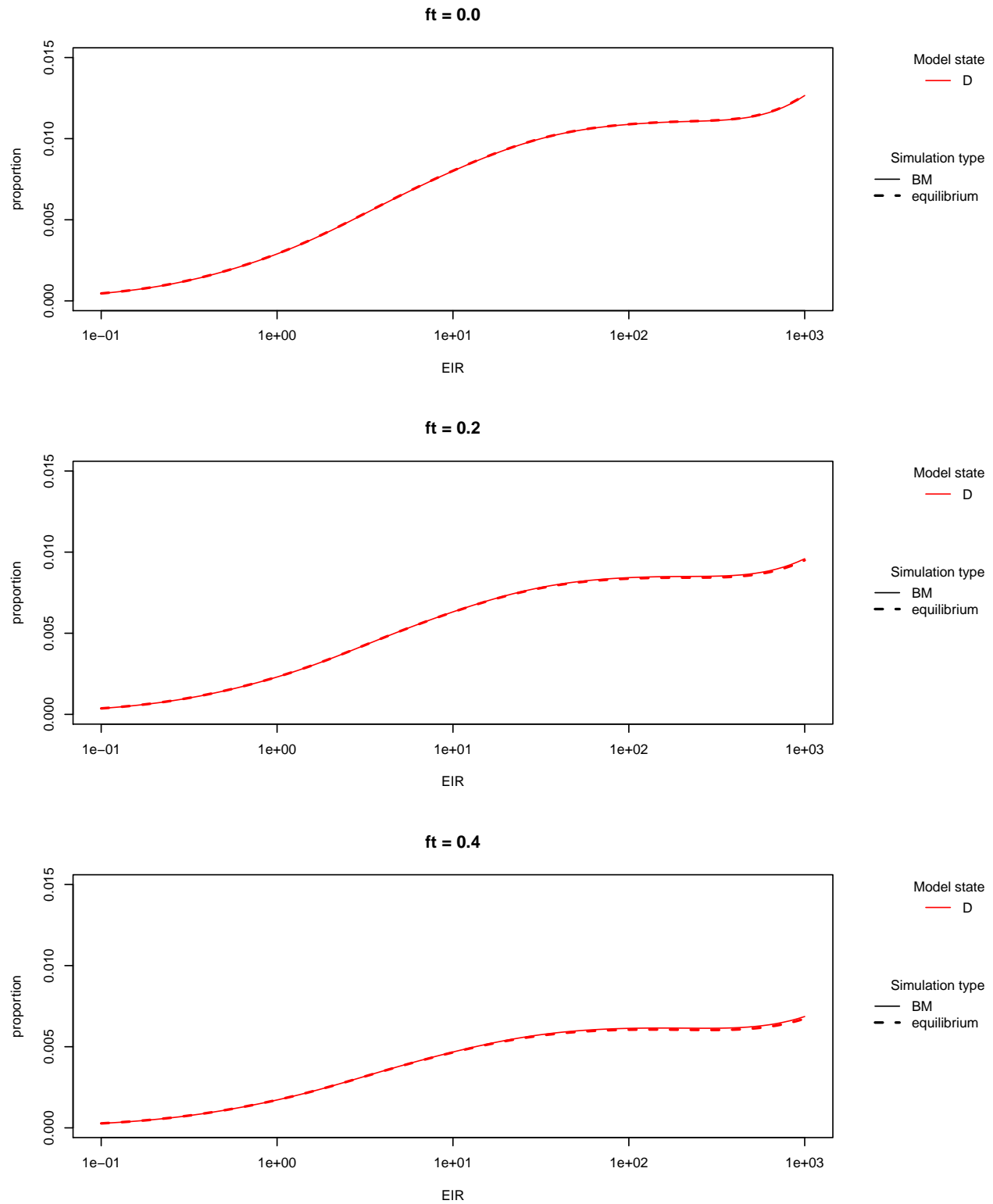
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