Technical Vignette to Accompany 'Towards reduction in bias in epidemic curves. . . '

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- There are five public files: This .Rmd document, two versions of its pdf output (Alberta and Philadelphia), and two csv files (three-columns: date, positive, negative) for Alberta and Philadelphia. respectively.
- Note the "switch" below to produce either AB or PH output.
- Note the "switch" below to echo the R commands or not in the pdf output.
- Note the "switch" below to additionally produce separate pdf files for manuscript figures.

```
## which jurisdiction
JRSDCT <- "AB"
#JRSDCT <- "PH"
```

```
SHOW.CODE <- F
### switch to T if want R code echoed in pdf output
```

```
MS.PLOTS <- T
### if true, some plots also output to separate pdf files
```

```
require(rjags)
require(MCMCvis)
```

Head and Tail of series

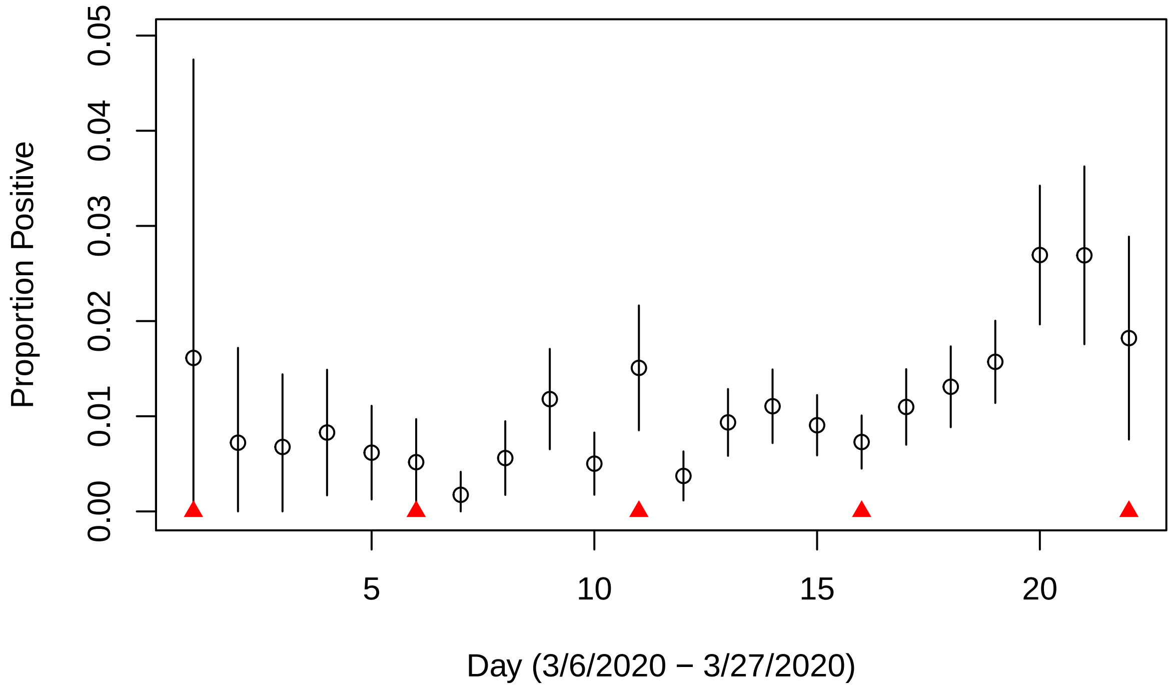
```
head(dta)  # start of series
```

```
##        date positive negative
## 1  3/6/2020        1       61
## 2  3/7/2020        2      275
## 3  3/8/2020        3      440
## 4  3/9/2020        6      718
## 5 3/10/2020        6      966
## 6 3/11/2020        5      961
```

```
tail(dta)  # end of series
```

```
##         date positive negative
## 17 3/22/2020       29     2613
## 18 3/23/2020       36     2713
## 19 3/24/2020       50     3131
## 20 3/25/2020       51     1842
## 21 3/26/2020       31     1121
## 22 3/27/2020       11      593
```

Proportion positive (Y^*/n time-series), with 95% confidence intervals, and knot indicators



Hyperparameter settings

```
r.hi
```

```
## [1] 0.15 0.15 0.15 0.15 0.15
```

```
sn.lo
```

```
## [1] 0.6 0.6 0.6 0.6 0.6
```

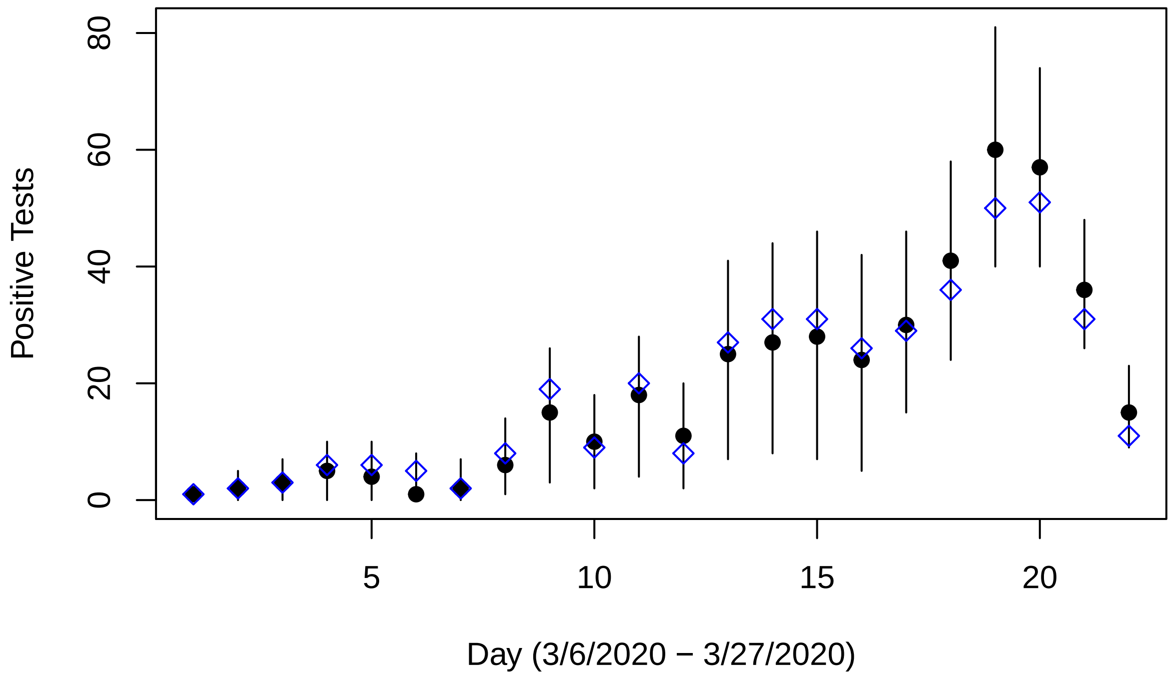
```
sn.hi
```

```
## [1] 0.9 0.9 0.9 0.9 0.9
```

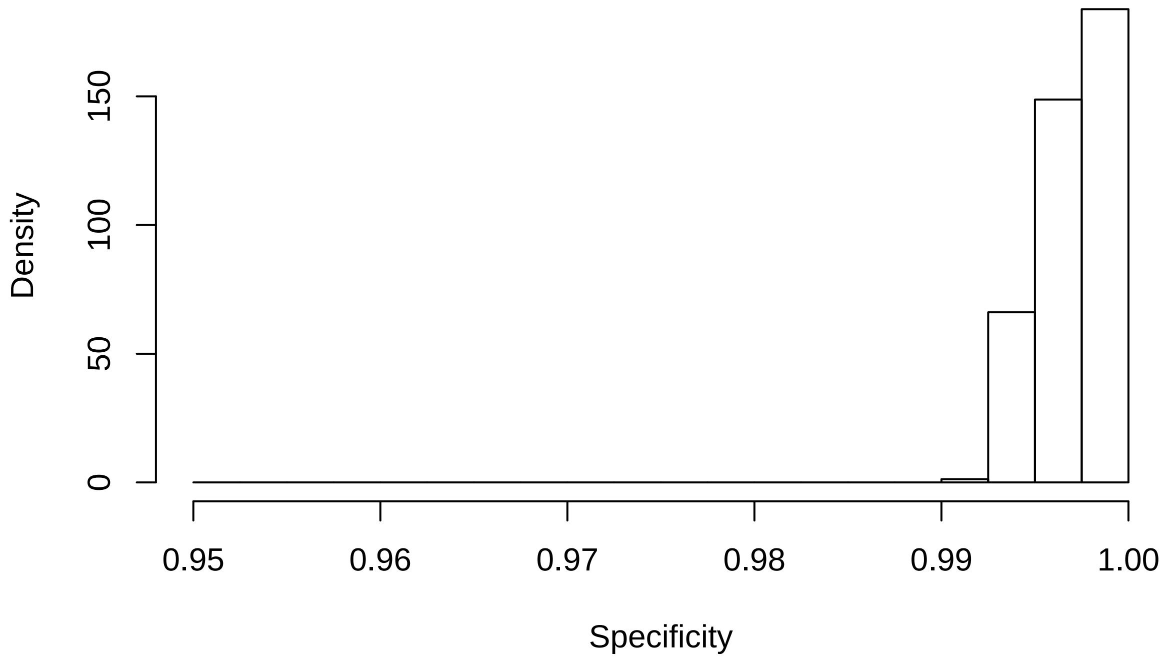
```
sp.lo
```

```
## [1] 0.95
```

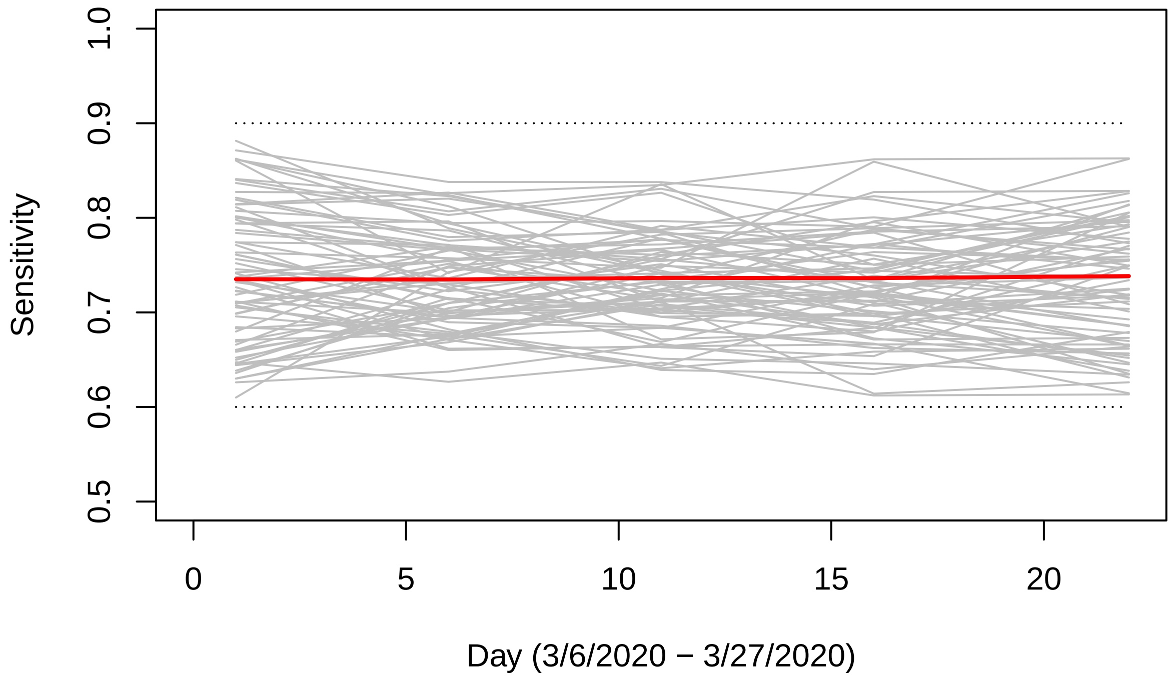
Adjusted daily positive tests



Specificity in testing pool (posterior distribution)

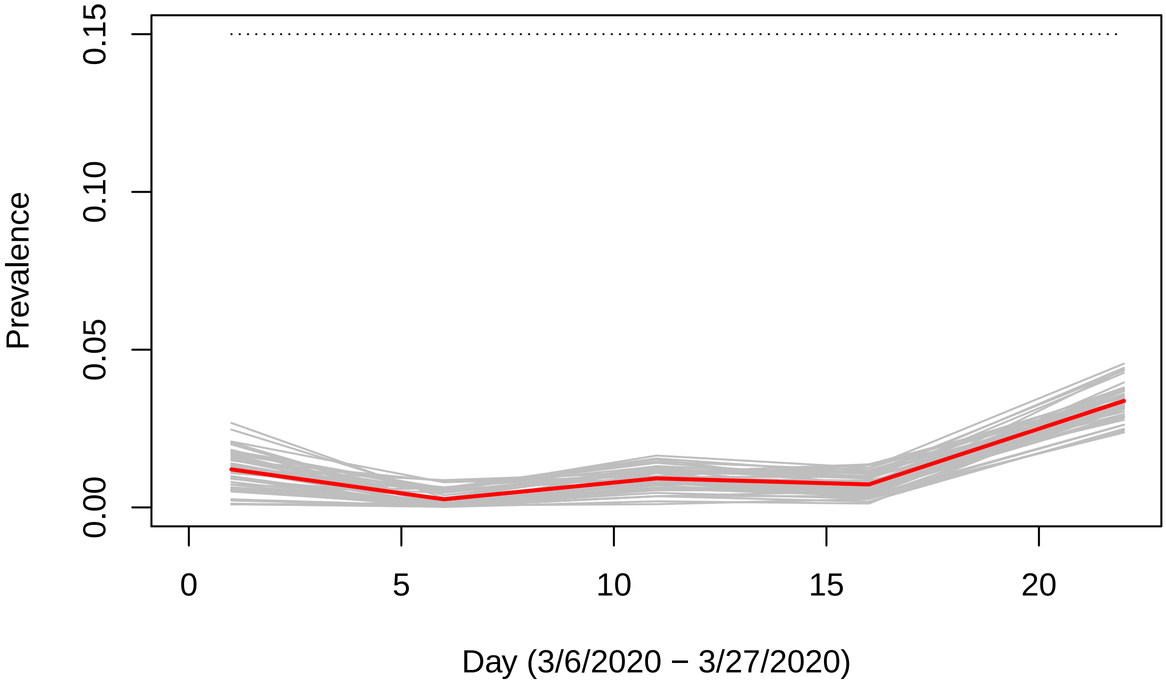


Sensitivity in testing pool (posterior mean and draws)

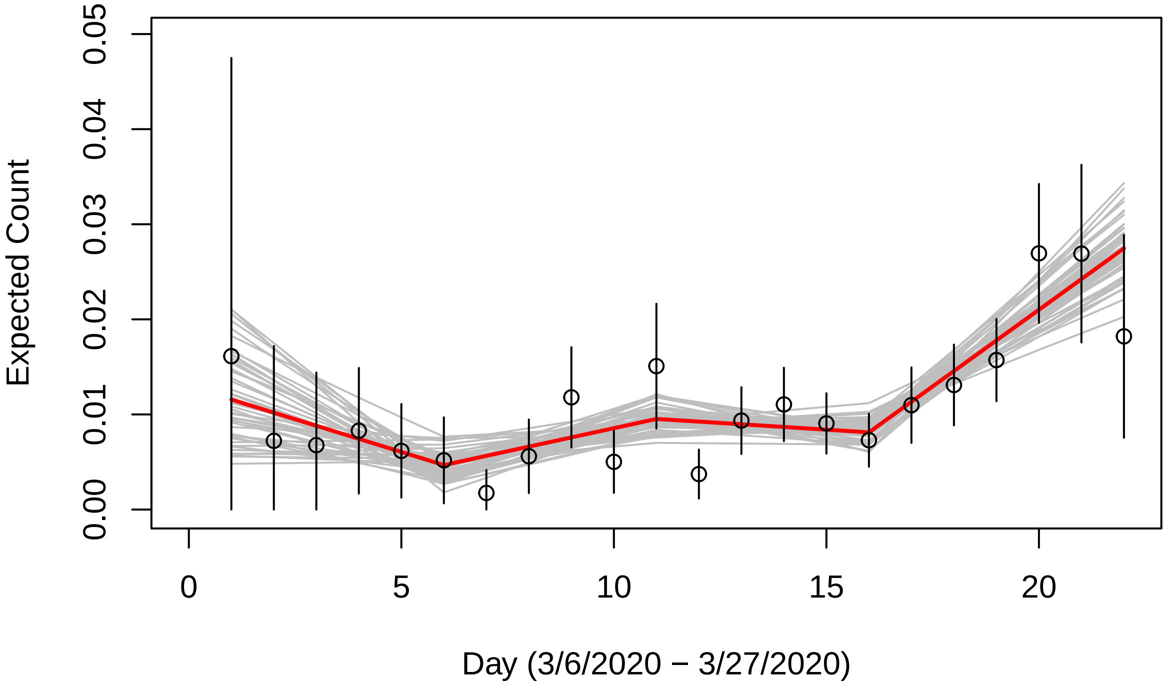


```
if (MS.PLOTS) {
pdf.PG(paste("figD_",JRSDCT,".pdf",sep=""),1,1, ttlspc=T)
plot(0,0, type="n", xlim=c(0,T.end), ylim=c(0.5,1),
     xlab=paste("Day (",dta$date[1]," - ",dta$date[T.end],")",sep=""),
     ylab="Sensitivity")

points(knts, sn.lo, type="l", lty=3)
points(knts, sn.hi, type="l", lty=3)

col.start.sn <- (1:(dim(mc.opt)[2]))[colnames(mc.opt)=="sn.kn[1]"]
for (i in ndx) {
  points(knts, mc.opt[i,col.start.sn:(col.start.sn+num.kn-1)],
         type="l", col="grey")
}

points(knts,
  apply(mc.opt[,col.start.sn:(col.start.sn+num.kn-1)], 2, mean),
  lwd=2, col="red",type="l")
graphics.off()
}
```

Prevalence in testing pool (posterior mean and draws)

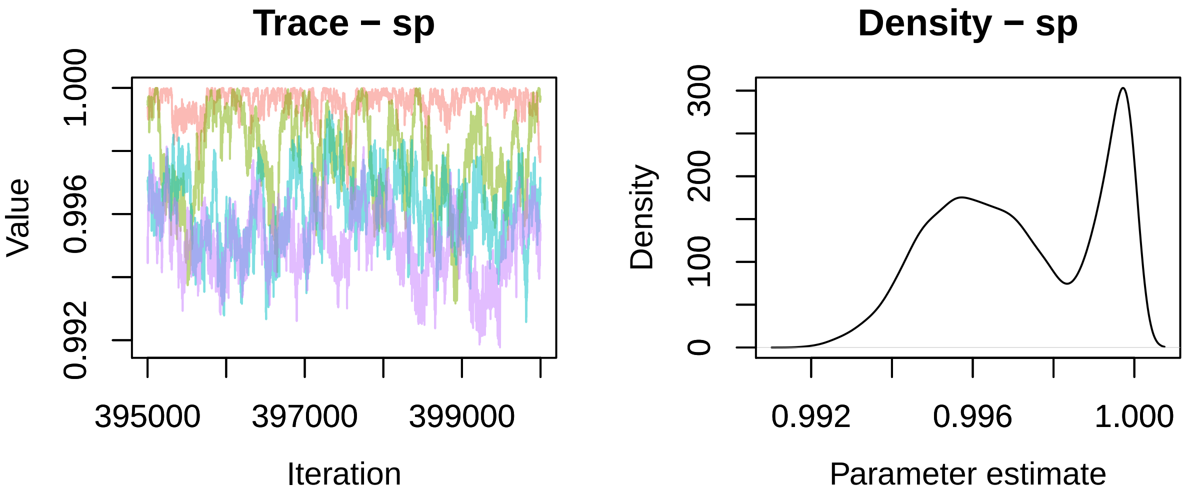


$E(Y^*/n) = r \times sens + (1-r) * (1-spec)$ (posterior mean and draws)

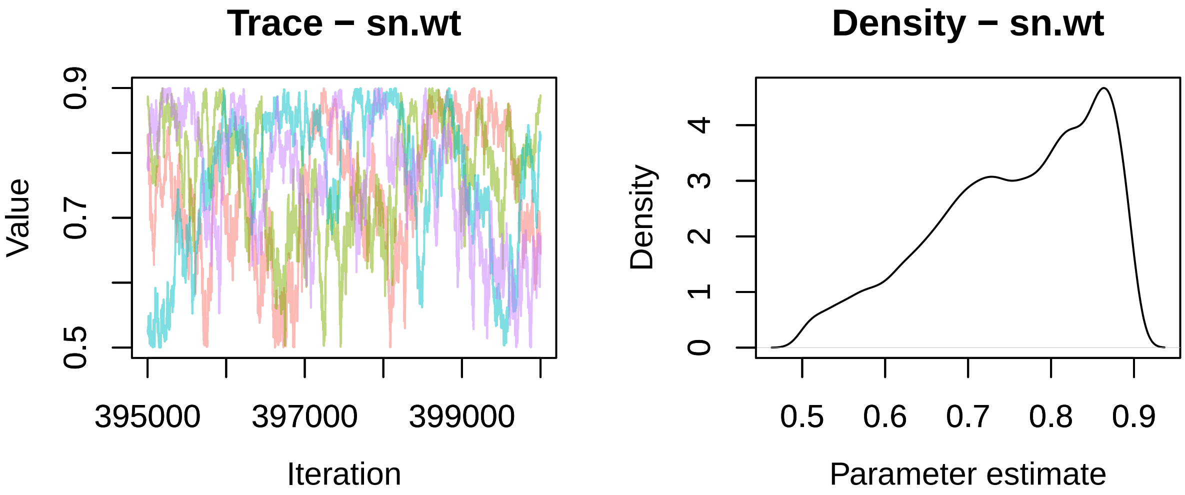


Some clues about MCMC numerical performance

```
MCMCtrace(opt.JAGS, params="sp", pdf=F)
```



```
MCMCtrace(opt.JAGS, params="sn.wt", pdf=F)
```



```
MCMCsummary(opt.JAGS, params="sp")
```

```
##         mean          sd      2.5%       50%    97.5% Rhat n.eff
## sp 0.9972062 0.002033311 0.9934424 0.9971814 0.999954 2.73 12269
```

```
MCMCsummary(opt.JAGS, params="sn.kn")
```

```
##               mean         sd      2.5%       50%     97.5% Rhat  n.eff
## sn.kn[1] 0.7350775 0.06691689 0.6232664 0.7308379 0.8650010    1 268767
## sn.kn[2] 0.7347717 0.05611043 0.6368958 0.7320895 0.8449025    1 208377
## sn.kn[3] 0.7364389 0.05148116 0.6414402 0.7354924 0.8385708    1 124740
## sn.kn[4] 0.7362086 0.05475999 0.6385351 0.7343735 0.8428179    1  84222
## sn.kn[5] 0.7383877 0.06700753 0.6246440 0.7349296 0.8664369    1  78706
```

```
MCMCsummary(opt.JAGS, params="r.kn")
```

```
##                mean          sd         2.5%         50%      97.5% Rhat
## r.kn[1] 0.012047994 0.007109043 6.874656e-04 0.011684745 0.02709576 1.54
## r.kn[2] 0.002581179 0.002489939 3.601088e-05 0.001600873 0.00826866 2.17
## r.kn[3] 0.009210991 0.003494209 2.424321e-03 0.009374064 0.01550139 1.82
## r.kn[4] 0.007290613 0.003092047 1.579697e-03 0.007294986 0.01292531 2.01
## r.kn[5] 0.033767114 0.005258096 2.404442e-02 0.033577931 0.04451041 1.22
##          n.eff
## r.kn[1] 128548
## r.kn[2] 145251
## r.kn[3]  33665
## r.kn[4]  30237
## r.kn[5]  60724
```

```r
MCMCsummary(opt.JAGS, params="y")
```

```
##             mean        sd 2.5% 50% 97.5% Rhat  n.eff
## y[1]   0.9512531  0.685132    0   1     2 1.91 776352
## y[2]   2.1508569  1.419213    0   2     5 1.38 179163
## y[3]   2.9411700  1.844370    0   3     7 1.53 124260
## y[4]   4.8912831  2.865913    0   5    10 1.94  71230
## y[5]   4.2909281  3.317457    0   4    10 2.67 179310
## y[6]   2.4721438  2.823617    0   1     8 2.67 222383
## y[7]   2.2966250  1.895633    0   2     7 1.65 140497
## y[8]   6.7109231  3.724769    1   6    14 1.99  44952
## y[9]  14.8797275  6.603743    3  15    26 2.19  26404
## y[10]  9.8316075  4.405578    2  10    18 1.70  46851
## y[11] 17.2453162  6.329350    4  18    28 1.93  29684
## y[12] 10.6327381  4.630779    2  11    20 1.58  46082
## y[13] 25.0367556  9.359721    7  25    41 2.08  25088
## y[14] 27.0224969 10.238391    8  27    44 2.19  21505
## y[15] 27.6870300 10.988876    7  28    46 2.17  22810
## y[16] 23.9750144 10.223442    5  24    42 2.07  26030
## y[17] 30.1794150  8.370464   15  30    46 1.88  30521
## y[18] 41.0295494  8.872692   24  41    58 1.69  34120
## y[19] 59.7394169 10.832149   40  60    81 1.57  36833
## y[20] 56.8610544  8.612546   40  57    74 1.54  40964
## y[21] 36.5040413  5.746914   26  36    48 1.31  58481
## y[22] 15.4063994  3.424147    9  15    23 1.10 104174
```