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

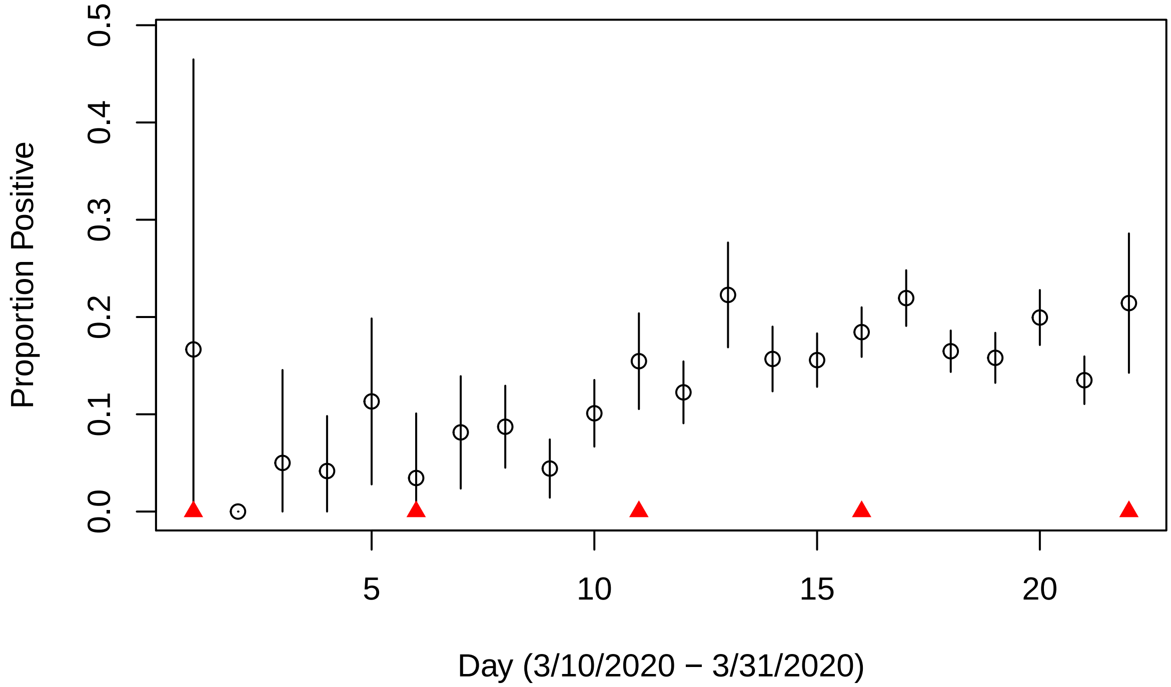
```
head(dta)  # start of series
```

```
##        date positive negative
## 1 3/10/2020        1        5
## 2 3/11/2020        0       13
## 3 3/12/2020        1       19
## 4 3/13/2020        2       46
## 5 3/14/2020        6       47
## 6 3/15/2020        1       28
```

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

```
##         date positive negative
## 17 3/26/2020      176      626
## 18 3/27/2020      192      973
## 19 3/28/2020      122      650
## 20 3/29/2020      153      614
## 21 3/30/2020      101      647
## 22 3/31/2020       27       99
```

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



Hyperparameter settings

```
r.hi
```

```
## [1] 0.5 0.5 0.5 0.5 0.5
```

```
sn.lo
```

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

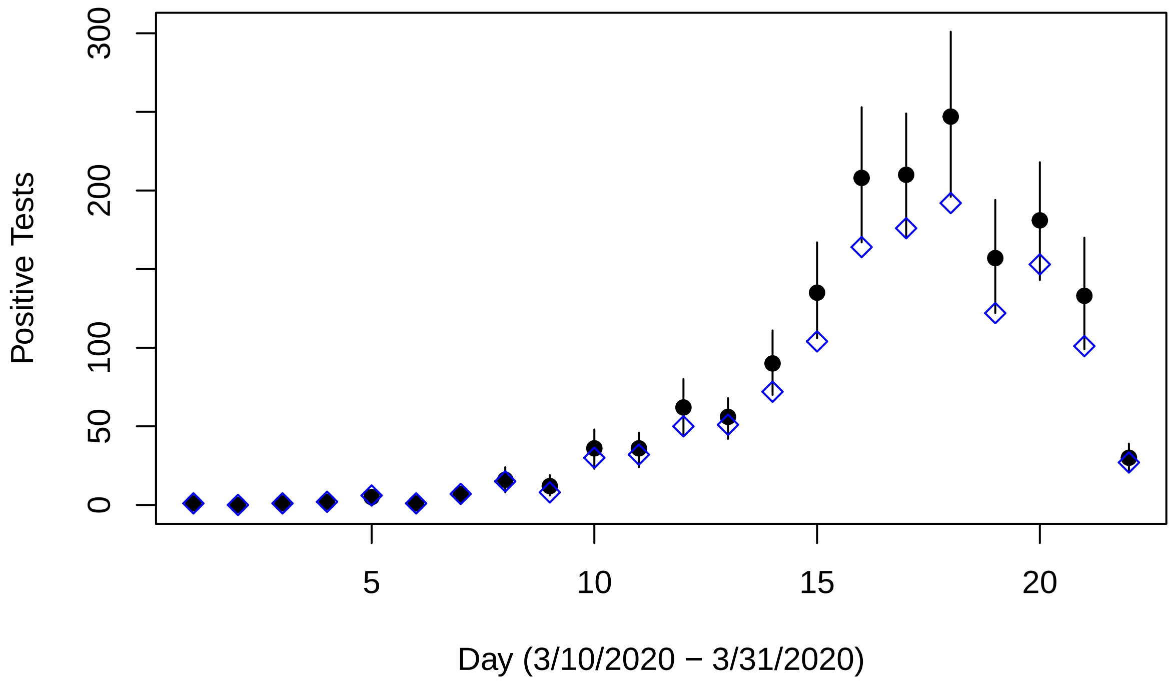
```
sn.hi
```

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

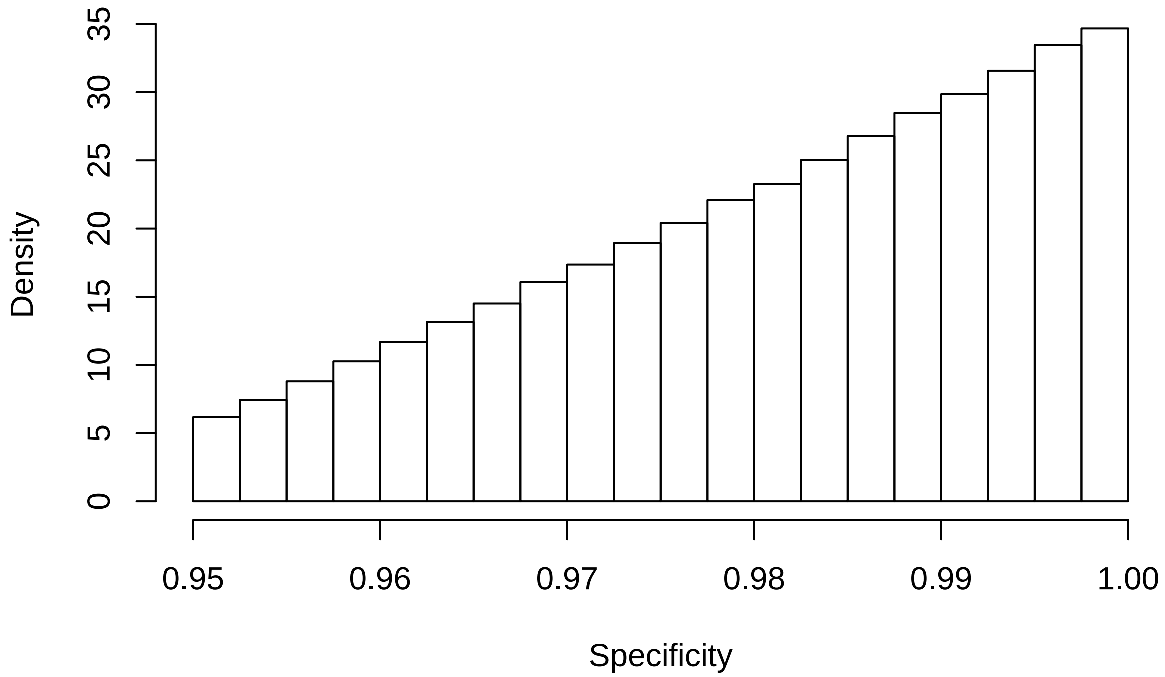
```
sp.lo
```

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

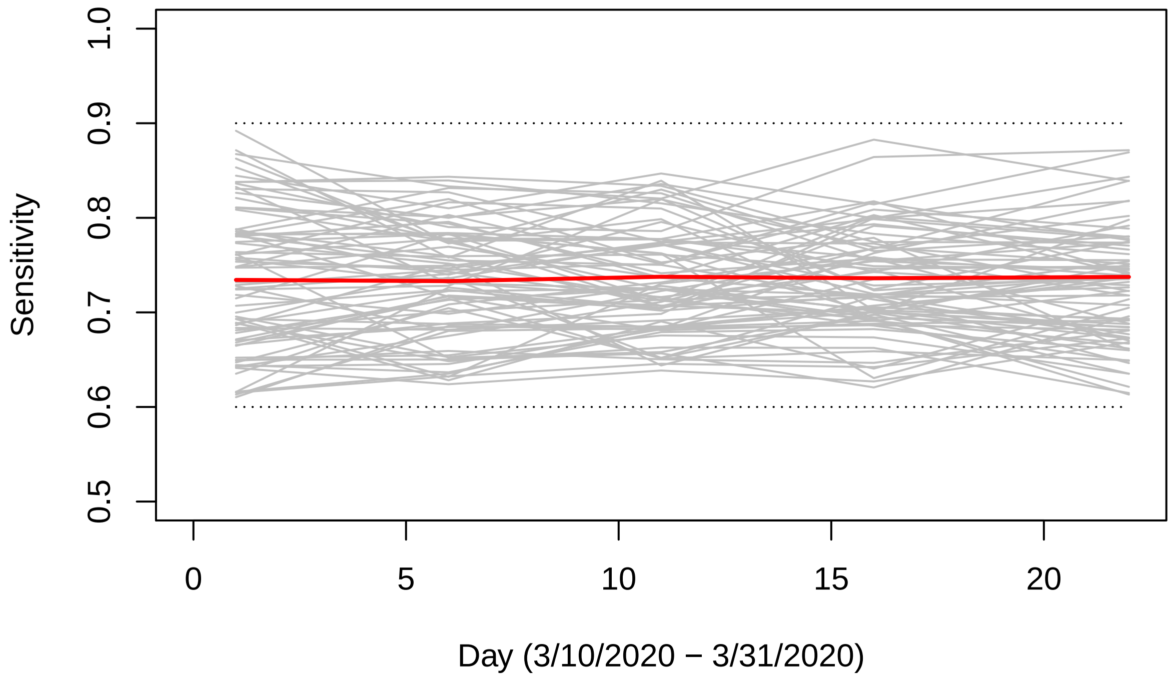
Adjusted daily positive tests



Specificity in testing pool (posterior distribution)

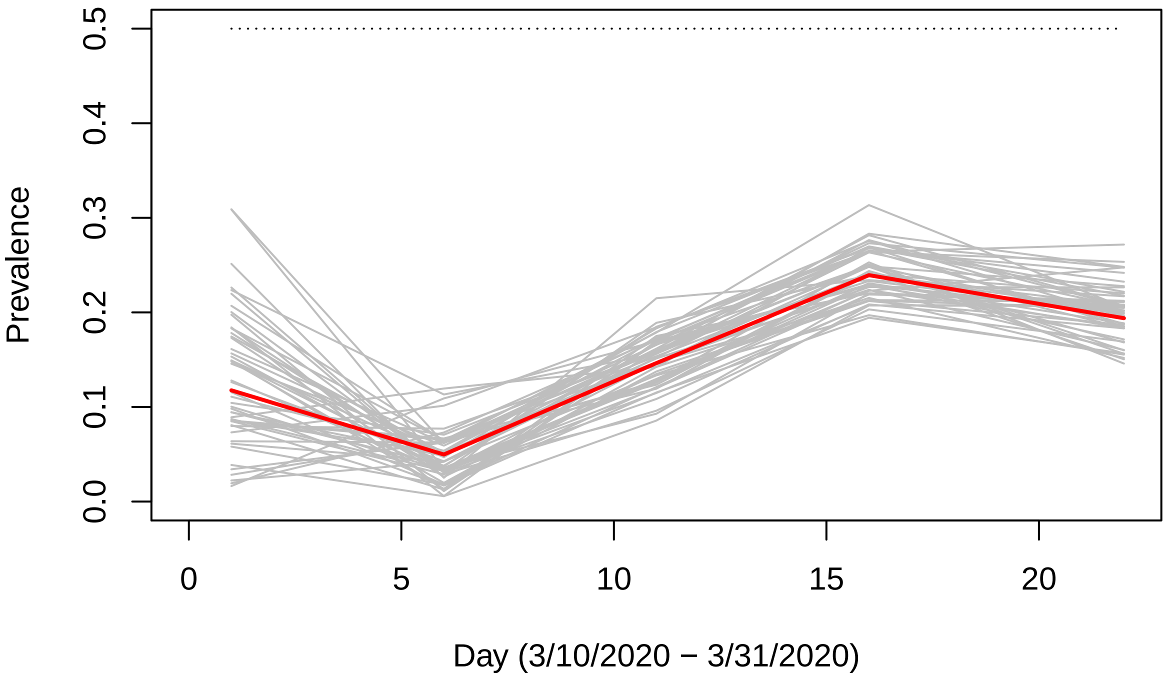


Sensitivity in testing pool (posterior mean and draws)

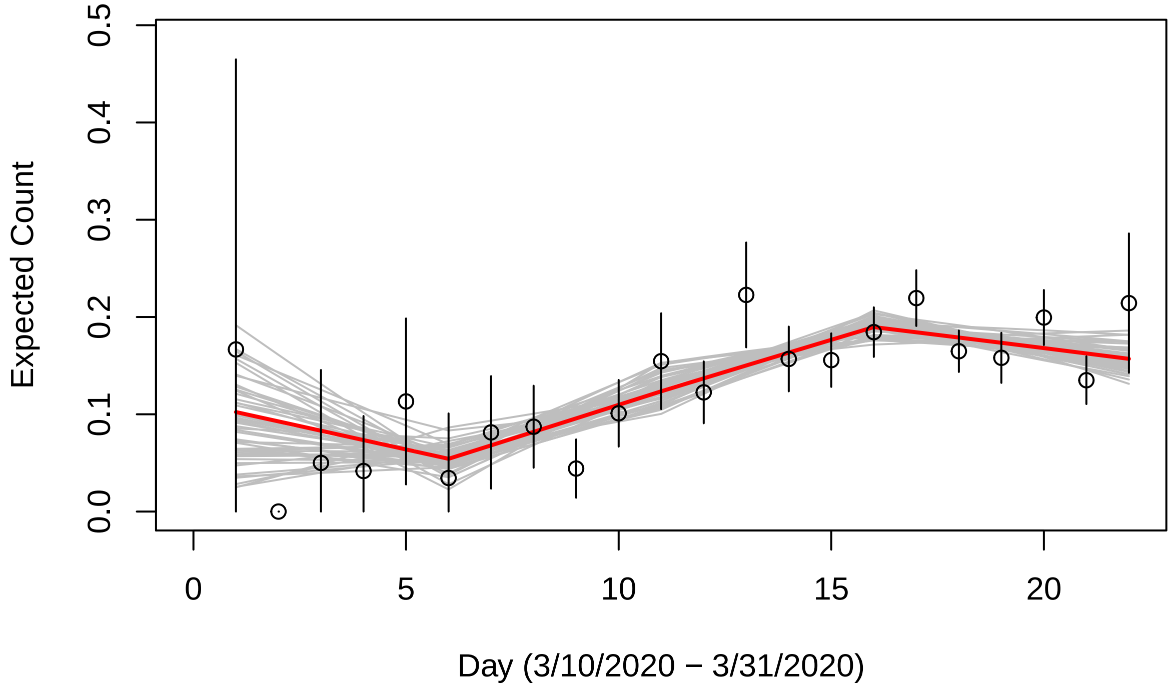


```
if (MS.PLOTS) {
pdf.PG(paste("figD_",JRSDCT,".pdf",sep=""),1,1, ttlspc=T)
plot(0,0, type="n", xlim=c(0,T.end), ylim=c(0.5,1),
     xlab=paste("Day (",dta$date[1]," - ",dta$date[T.end],")",sep=""),
     ylab="Sensitivity")

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)

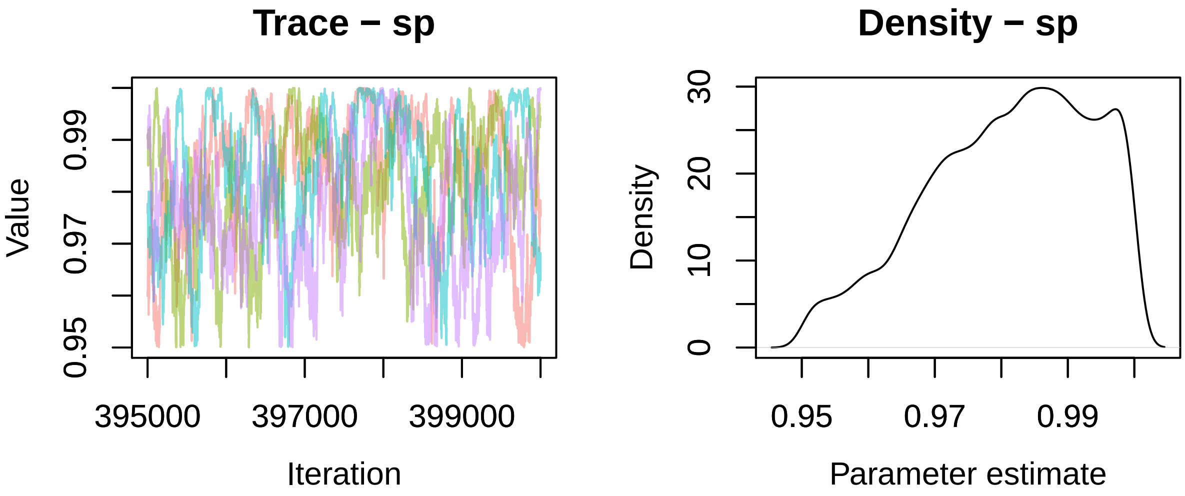


$E(Y^*/n) = r \times sens + (1 - r) * (1 - spec)$ (posterior mean and draws)

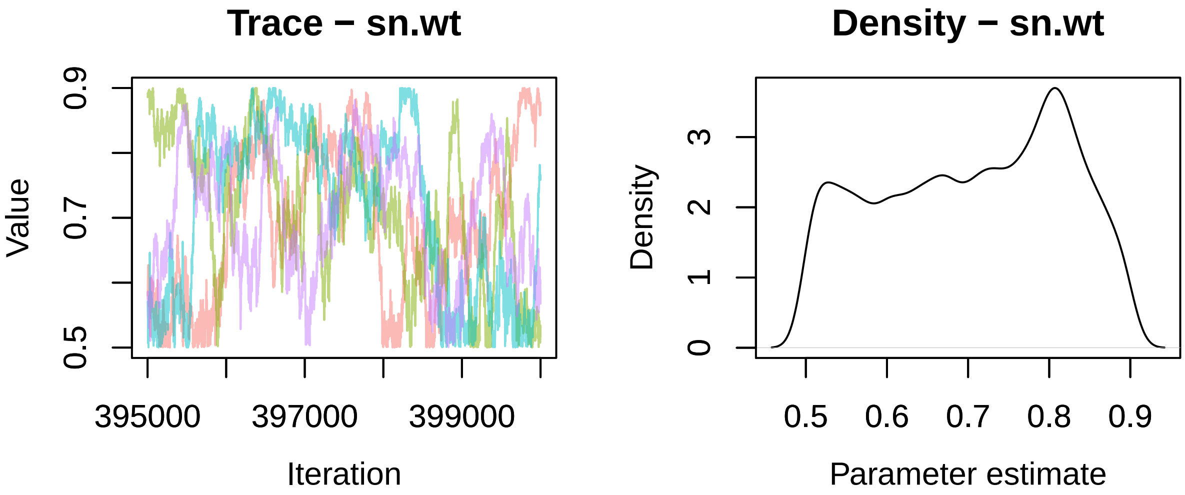


Some clues about MCMC numerical performance

```
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 0.9813063 0.01307969 0.9538476 0.9835113 0.9992984 1.05  5623
```

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

```
##              mean         sd      2.5%       50%     97.5% Rhat  n.eff
## sn.kn[1] 0.7343099 0.06667226 0.6231582 0.7299431 0.8643840    1 133517
## sn.kn[2] 0.7330602 0.05586780 0.6361699 0.7301299 0.8432467    1  84347
## sn.kn[3] 0.7376731 0.05139902 0.6424392 0.7367892 0.8394895    1  38510
## sn.kn[4] 0.7361323 0.05440962 0.6389208 0.7343497 0.8421278    1  22334
## sn.kn[5] 0.7374728 0.06681934 0.6241011 0.7340590 0.8656243    1  22056
```

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

```
##              mean         sd        2.5%       50%     97.5% Rhat  n.eff
## r.kn[1] 0.11760756 0.06633477 0.019937958 0.1074833 0.2728788 1.00 242991
## r.kn[2] 0.04973049 0.02701684 0.004598765 0.0480637 0.1067044 1.03  26483
## r.kn[3] 0.14635052 0.02512067 0.096968855 0.1466417 0.1951909 1.02  13466
## r.kn[4] 0.23937141 0.02520671 0.191540445 0.2388636 0.2894854 1.01  12537
## r.kn[5] 0.19385626 0.02841384 0.140366002 0.1930442 0.2509176 1.01  14644
```

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

```
##            mean        sd 2.5% 50% 97.5% Rhat  n.eff
## y[1]    1.182773 0.4363090    1   1     2 1.00 897979
## y[2]    0.413330 0.6836820    0   0     2 1.00 632474
## y[3]    1.333242 0.8777754    0   1     3 1.02 255416
## y[4]     2.551369  1.3775639    0   2     6 1.01  71270
## y[5]     5.178836  2.0036692    1   5     9 1.03  16384
## y[6]     1.109942  0.8654785    0   1     3 1.05 136010
## y[7]     6.743406  2.4361340    2   7    11 1.03  14508
## y[8]    15.887893  4.0870337    8  16    24 1.03  10901
## y[9]    12.092114  3.4754310    6  12    19 1.01  21573
## y[10]  35.616891  6.5576110   23  36    48 1.02  11043
## y[11]  35.540850  5.7072232   24  36    46 1.02  11286
## y[12]  62.383171  9.0753433   45  62    80 1.02  11366
## y[13]  55.969820  6.5441773   42  56    68 1.02   9590
## y[14]  90.272395 10.6726102   70  90   111 1.02  11334
## y[15] 135.692329 15.5160521  106 135   167 1.01  11886
## y[16] 208.923166 22.0135907  167 208   253 1.01  12233
## y[17] 209.714237 20.0201316  171 210   249 1.02   9972
## y[18] 247.291637 27.0646556  196 247   301 1.01  10765
## y[19] 157.149333 18.3940746  122 157   194 1.01  11139
## y[20] 180.662687 19.3556184  143 181   218 1.02   9515
## y[21] 133.335991 18.3429322   99 133   170 1.01  12287
## y[22]  30.489700  4.3253181   22  30    39 1.01  15771
```