

# MCMC Diagnostics

Tables 3, 5, and 7 Parameter Estimates

Cameron Adams

## Contents

<b>Table 3</b>	<b>2</b>
Cumulative Antibody Prevalence . . . . .	2
Cumulative antibody prevalence adjusted for test-bias (Se/Sp) . . . . .	11
Self-reported test positivity . . . . .	23
COVID-19 probable case . . . . .	30
<b>Table 5</b>	<b>37</b>
PD between non-whites and whites . . . . .	37
PD between non-whites and whites within age-groups . . . . .	41
<b>Table 7</b>	<b>47</b>
Antibody prevalence and mitigation . . . . .	47
Self-reported test positivity prevalence and mitigation . . . . .	60

This document contains MCMC diagnostic results for parameter estimates reported in Tables 3, 5, and 7 presented in *Impact of individual-level characteristics and virus mitigation behaviors on SARS-CoV-2 infection and seroprevalence in a large Northern California Bay Area cohort*.

Table 3 presents study region prevalence estimates for:

- Cumulative antibody prevalence
- Cumulative antibody prevalence adjusted for test-bias (Se/Sp)
- Self-reported test positivity
- COVID-19 probable case

Table 5 presents results from analyses comparing the prevalence of antibodies to the SARS-CoV2-2 spike protein in Round 3. Presence of such antibodies is indicative of previous natural SARS-CoV-2 infection or COVID-19 vaccination. Since infection rates are so low in our study, almost all of the prevalence of spike antibodies can be attributed to vaccination in Round 3.

Table 7 presents study region prevalence differences and prevalence ratios for the population-adjusted association between the binary mitigation variable and antibody prevalence and self-reported test positivity.

### **Table 3**

#### **Cumulative Antibody Prevlance**

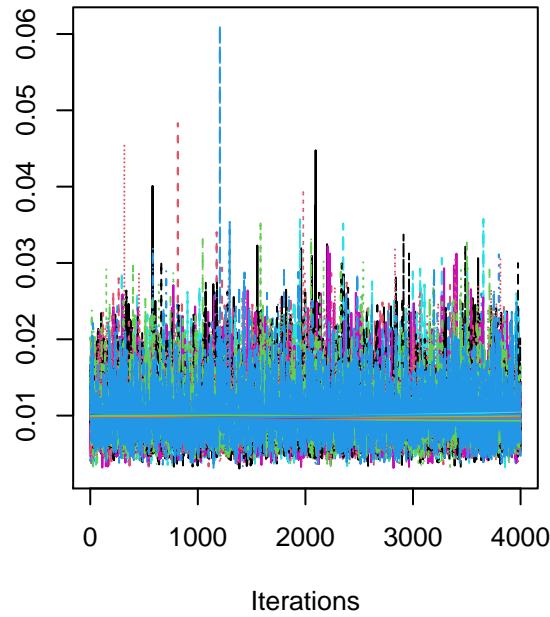
#### **Effective Sample Size**

Table 1: Effective Sample Size: Antibody prevalence

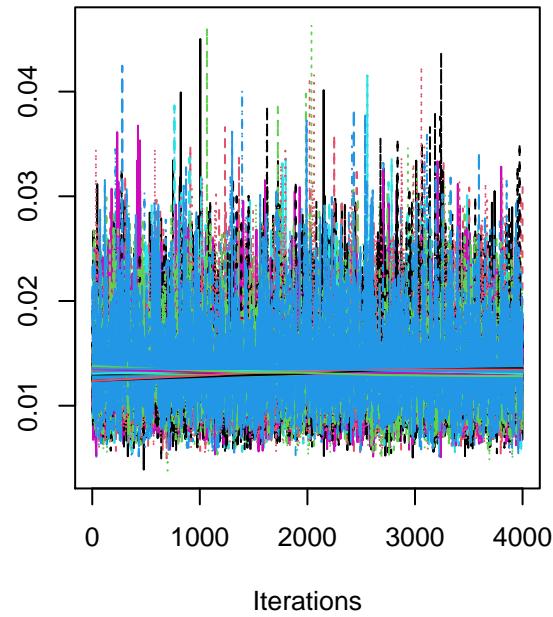
Round	ESS
Round 1	13100
Round 2	9706
Round 3	13300
Round 3 Spike	12830

## Trace plots

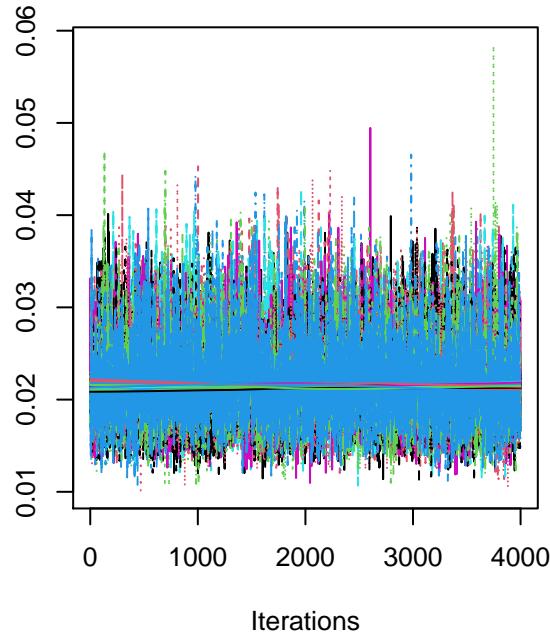
**Antibody prev – Round 1**



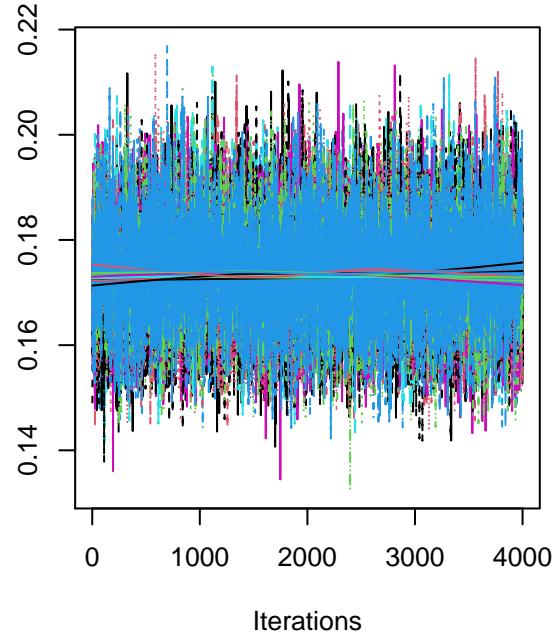
**Antibody prev – Round 2**



**Antibody prev – Round 3**

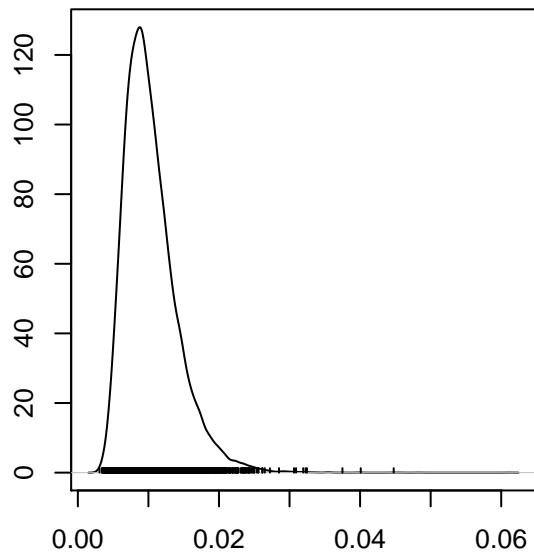


**Antibody prev – Round 3 Spike**



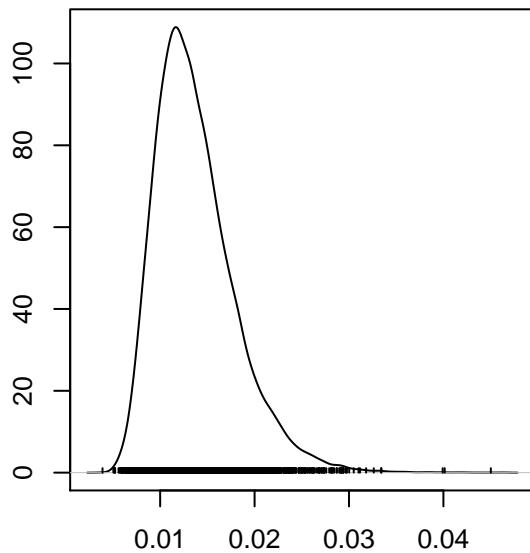
## Density plots

**Density plot: Antibody prev – Round**



N = 4000 Bandwidth = 0.0004329

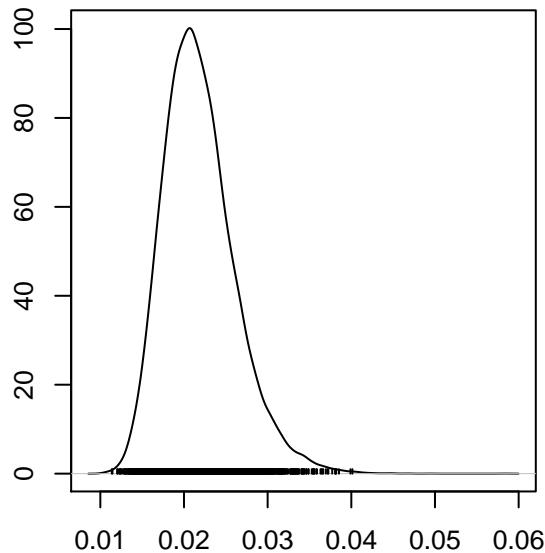
**Density plot: Antibody prev – Round**



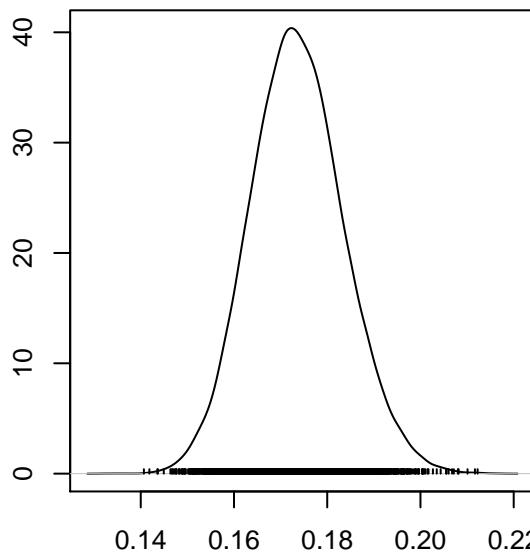
N = 4000 Bandwidth = 0.0005027

**Density plot: Antibody prev – Round**

**Density plot: Antibody prev – Round 3 $\xi$**

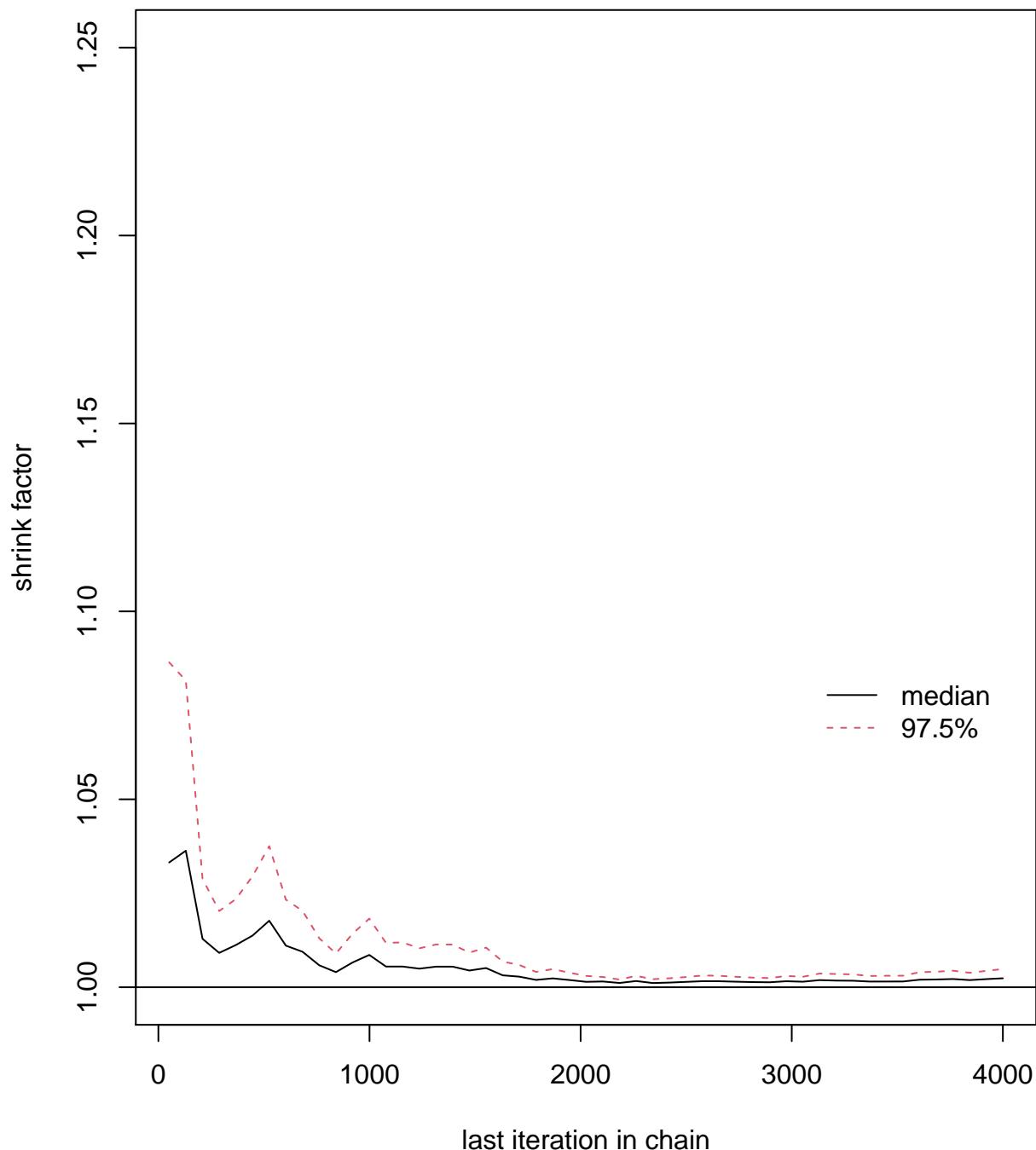


N = 4000 Bandwidth = 0.0005197

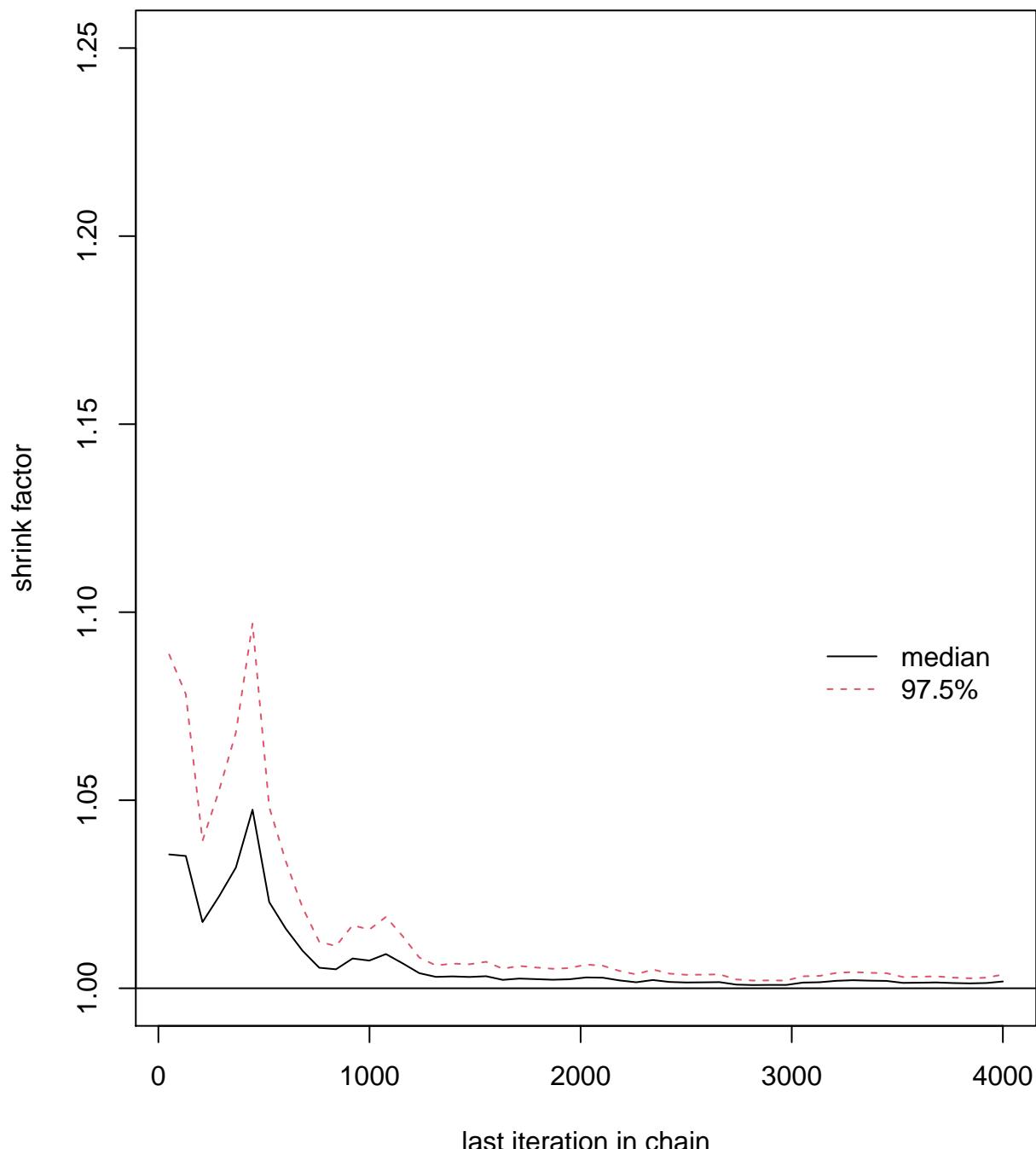


N = 4000 Bandwidth = 0.001263

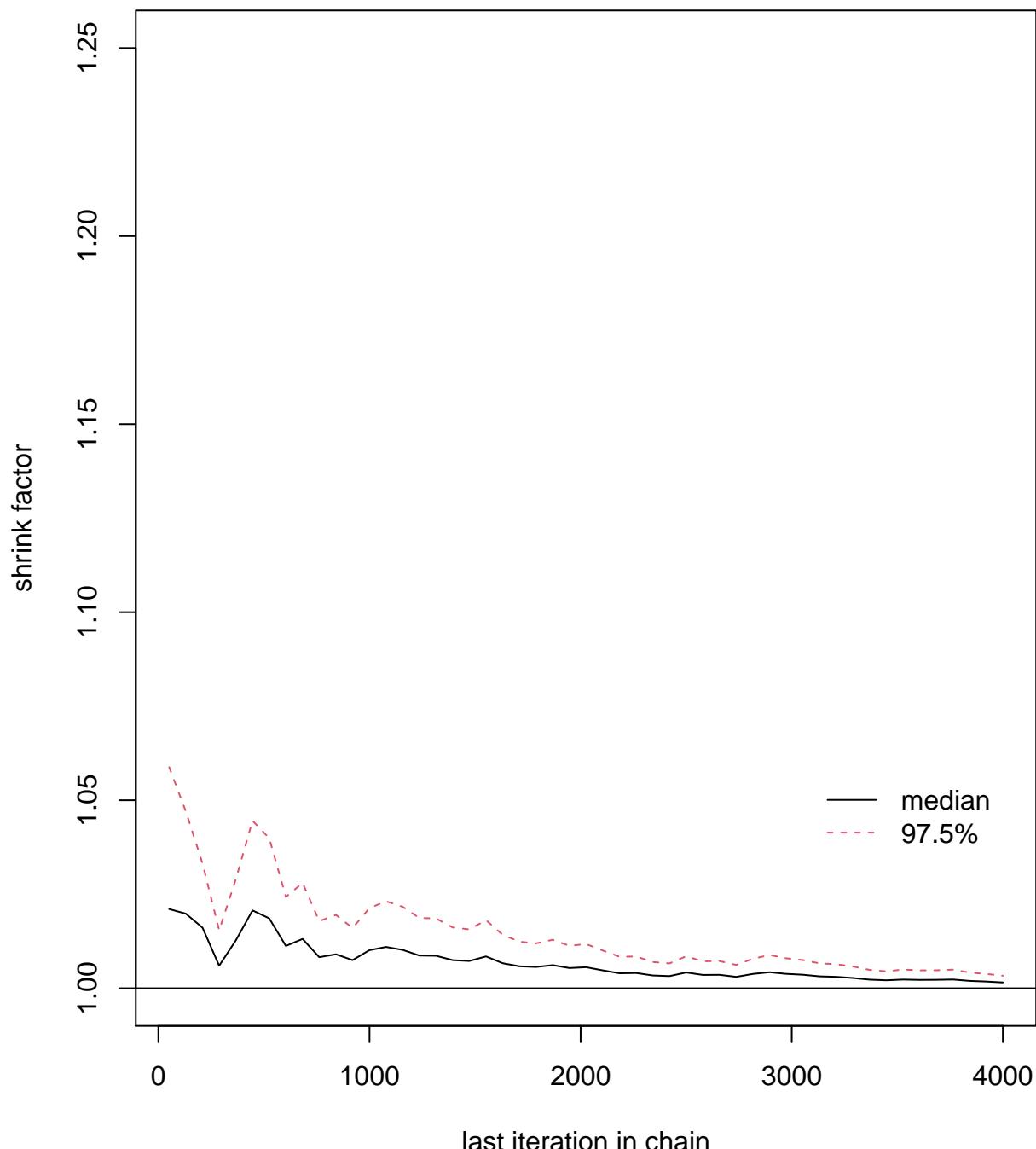
### Antibody prev – Round 1



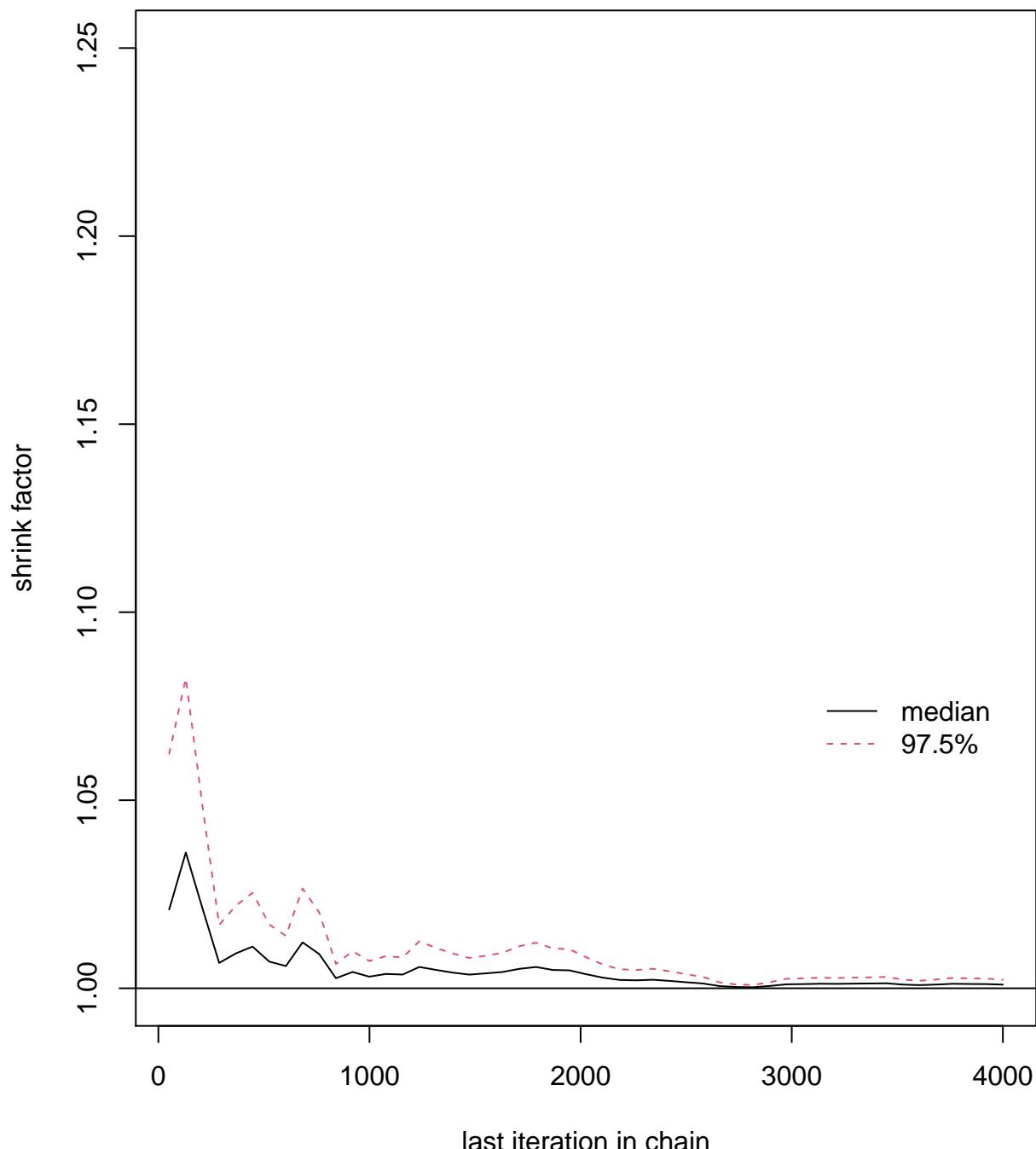
## Antibody prev – Round 2



### Antibody prev – Round 3

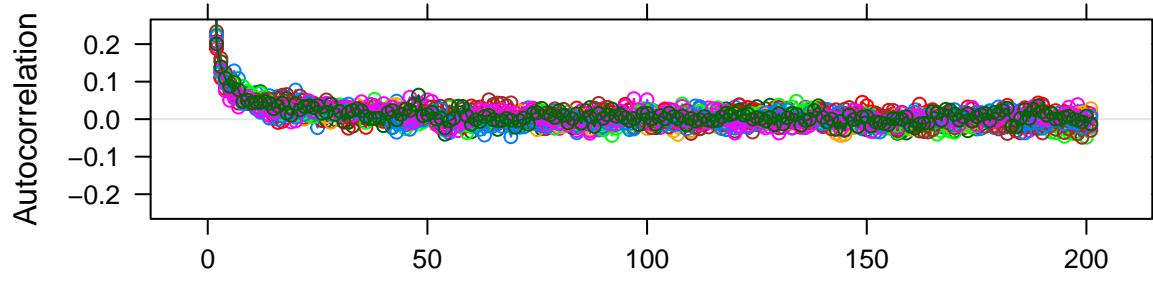


### Antibody prev – Round 3 Spike

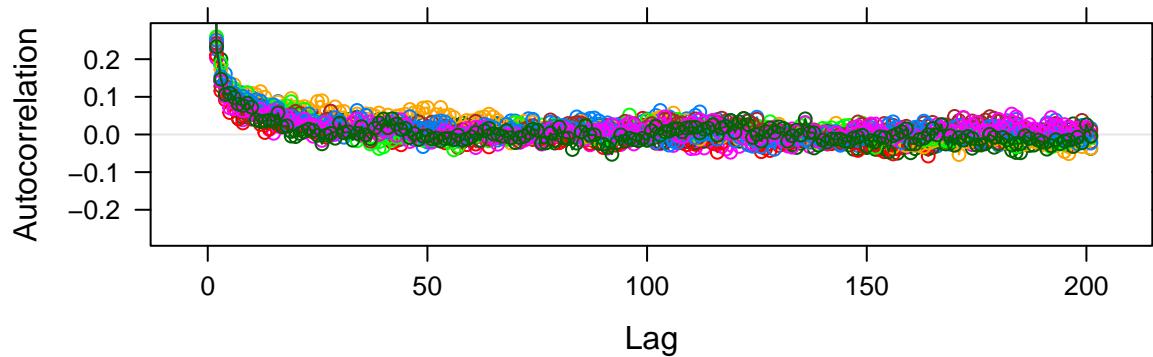


Autocorrelation plots

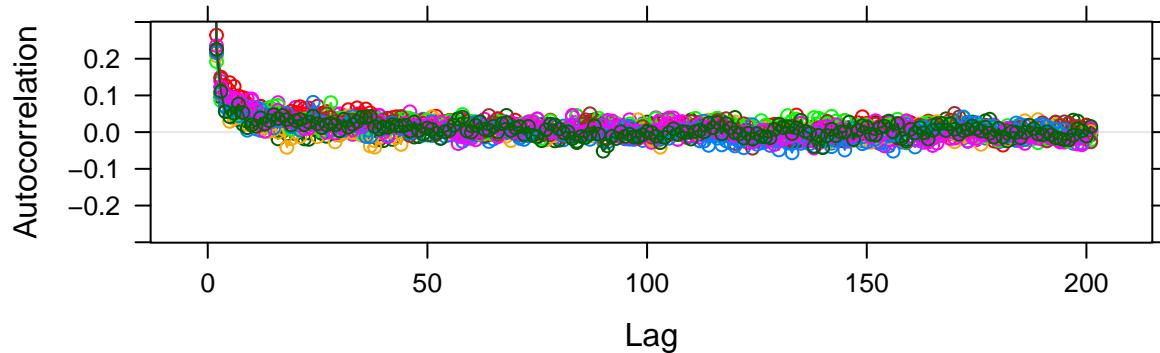
**ACF plot: Antibody prev – Round 1**



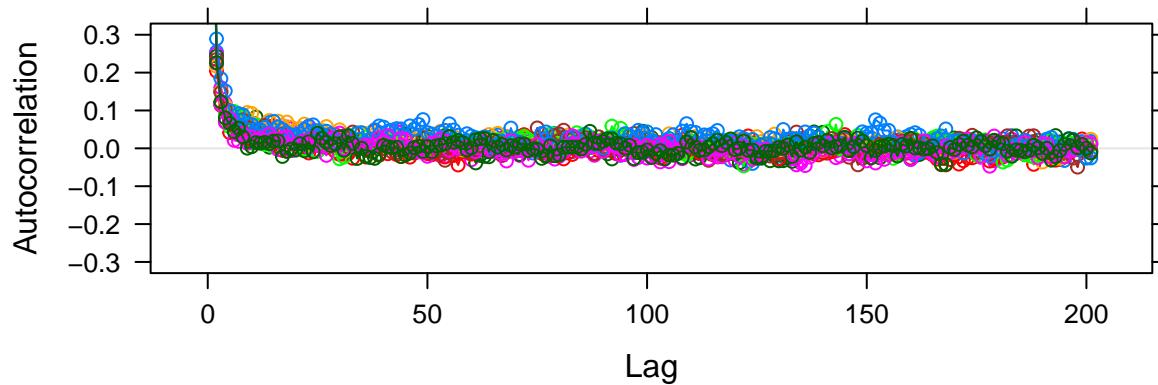
**ACF plot: Antibody prev – Round 2**



**ACF plot: Antibody prev – Round 3**



**ACF plot: Antibody prev – Round 3 Spike**



## Cumulative antibody prevalence adjusted for test-bias (Se/Sp)

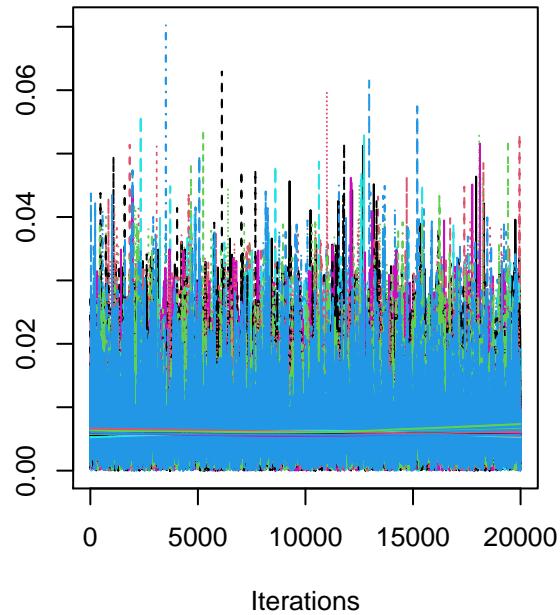
### Effective Sample Size

Table 2: Effective Sample Size: Antibody prevalence test bias

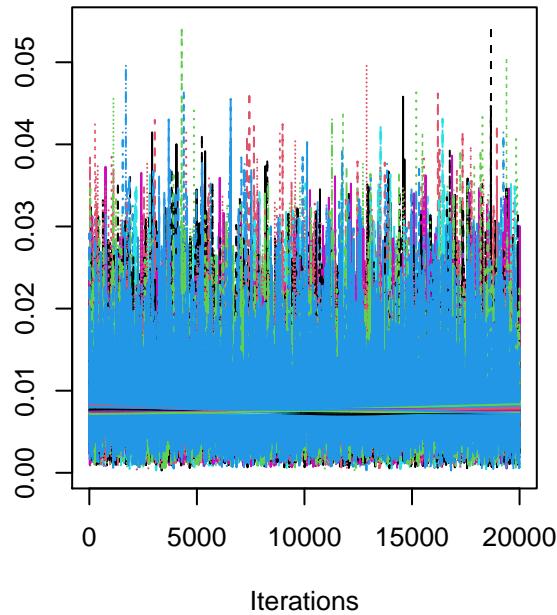
Round	ESS
Round 1	14147
Round 2	14609
Round 3	27250
Round 3 Spike	12830

### Trace plots

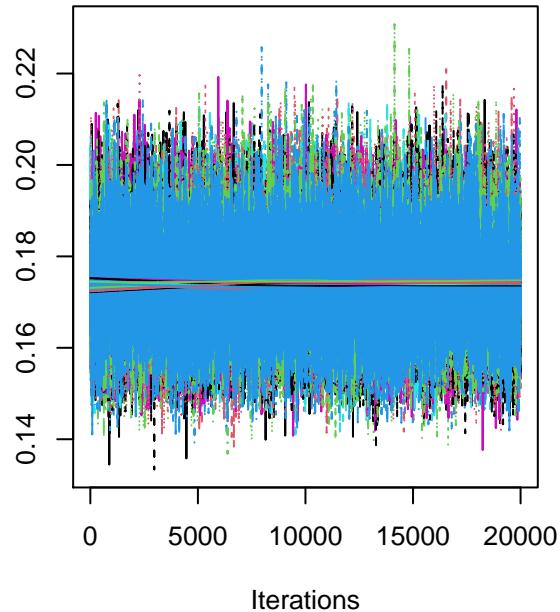
**Antibody prev test bias – Round 1**



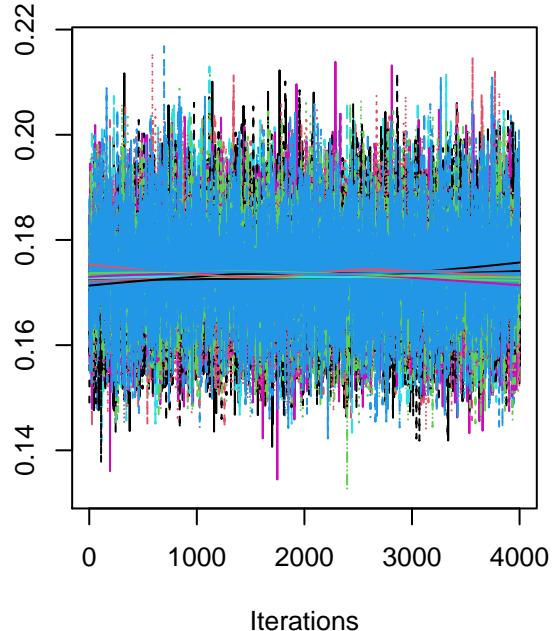
**Antibody prev test bias – Round 2**



**Antibody prev test bias – Round 3**

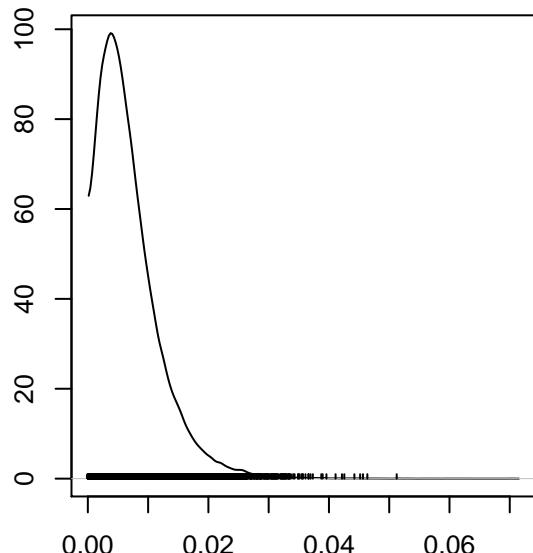


**Antibody prev test bias – Round 3 Sp**

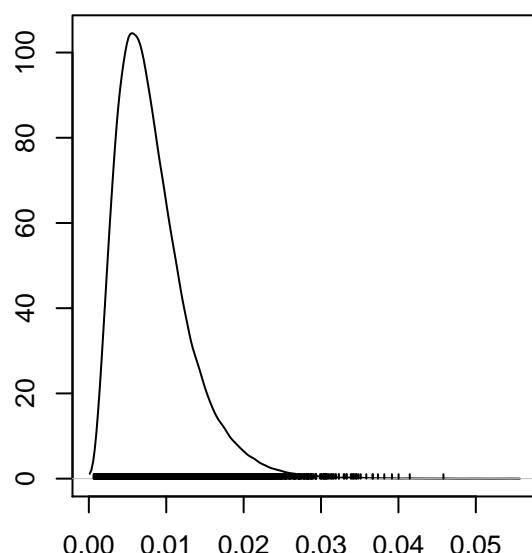


## Density plots

**Density plot: Antibody prev test bias – Rd**

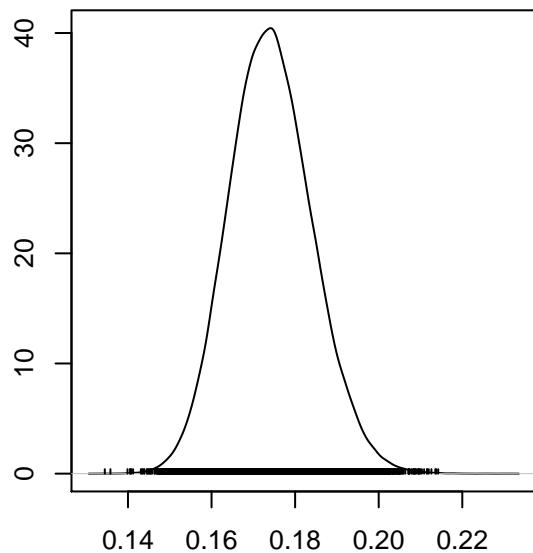


N = 20000 Bandwidth = 0.0004184

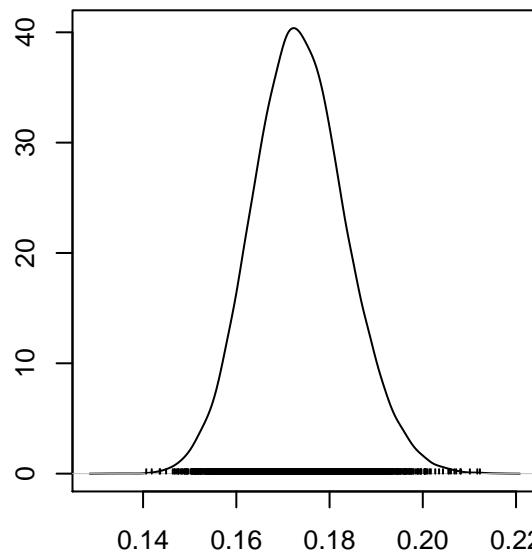


N = 20000 Bandwidth = 0.0003908

**Density plot: Antibody prev test bias – Rnsity plot: Antibody prev test bias – Roun**

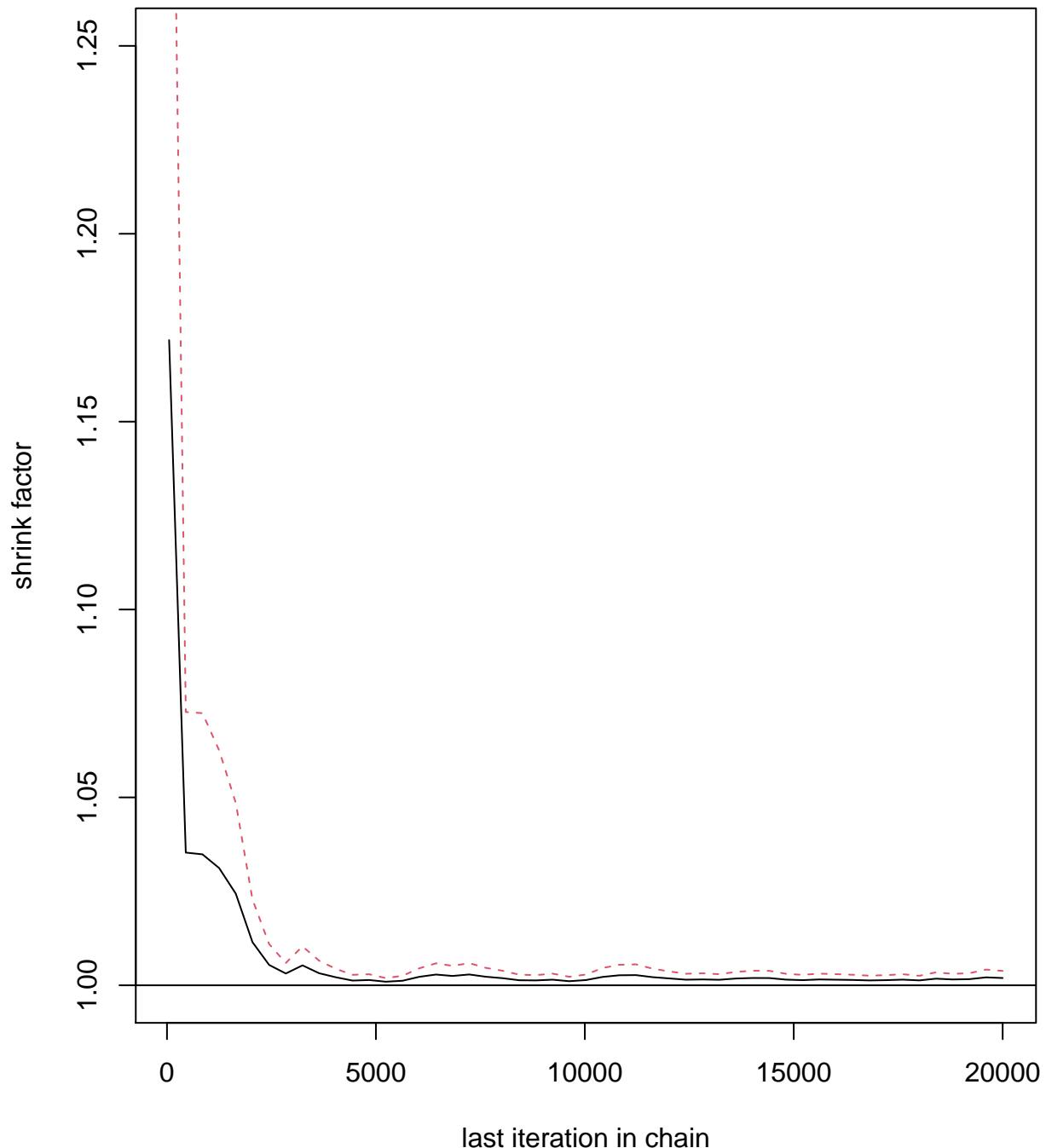


N = 20000 Bandwidth = 0.0009156

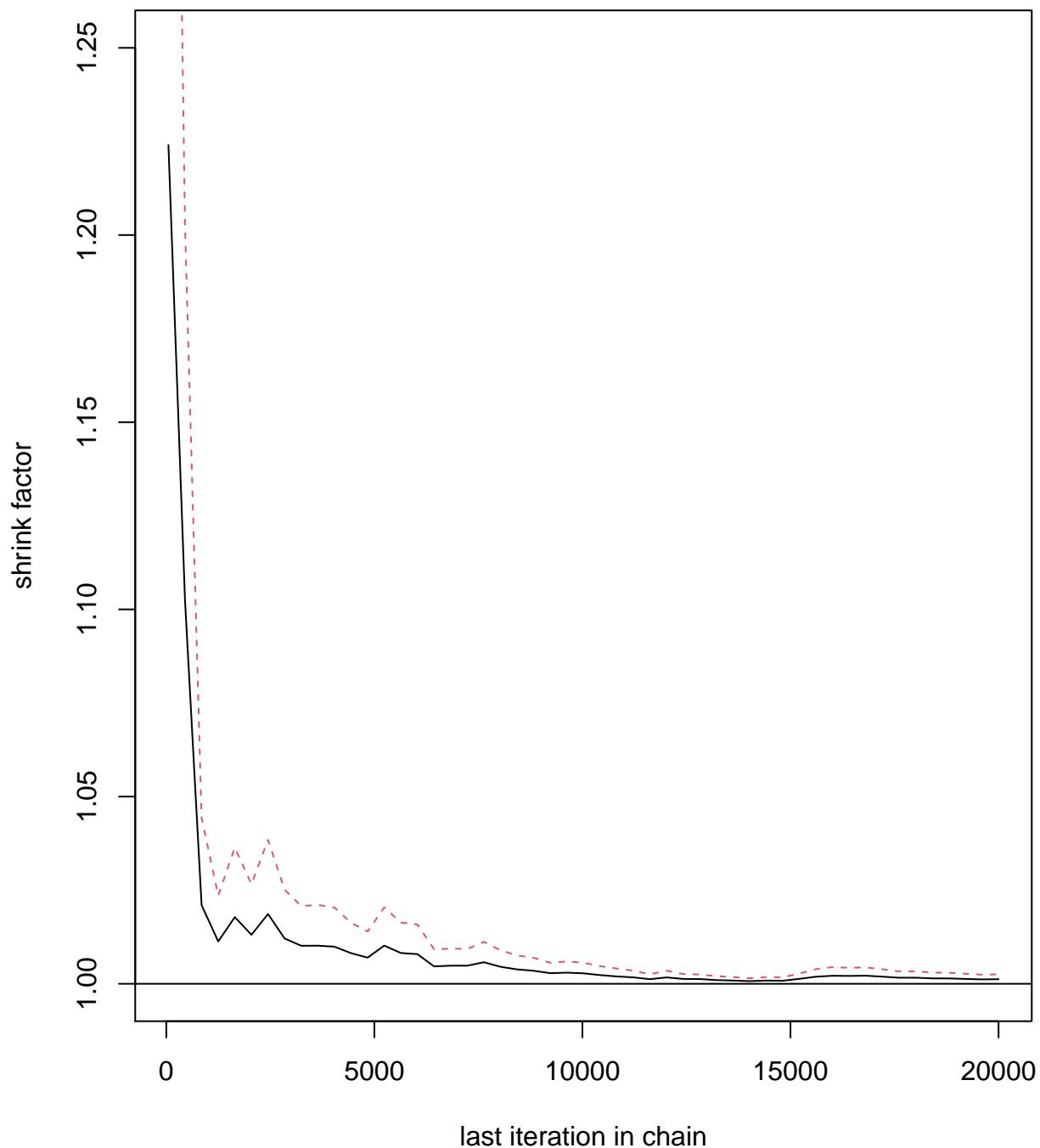


N = 4000 Bandwidth = 0.001263

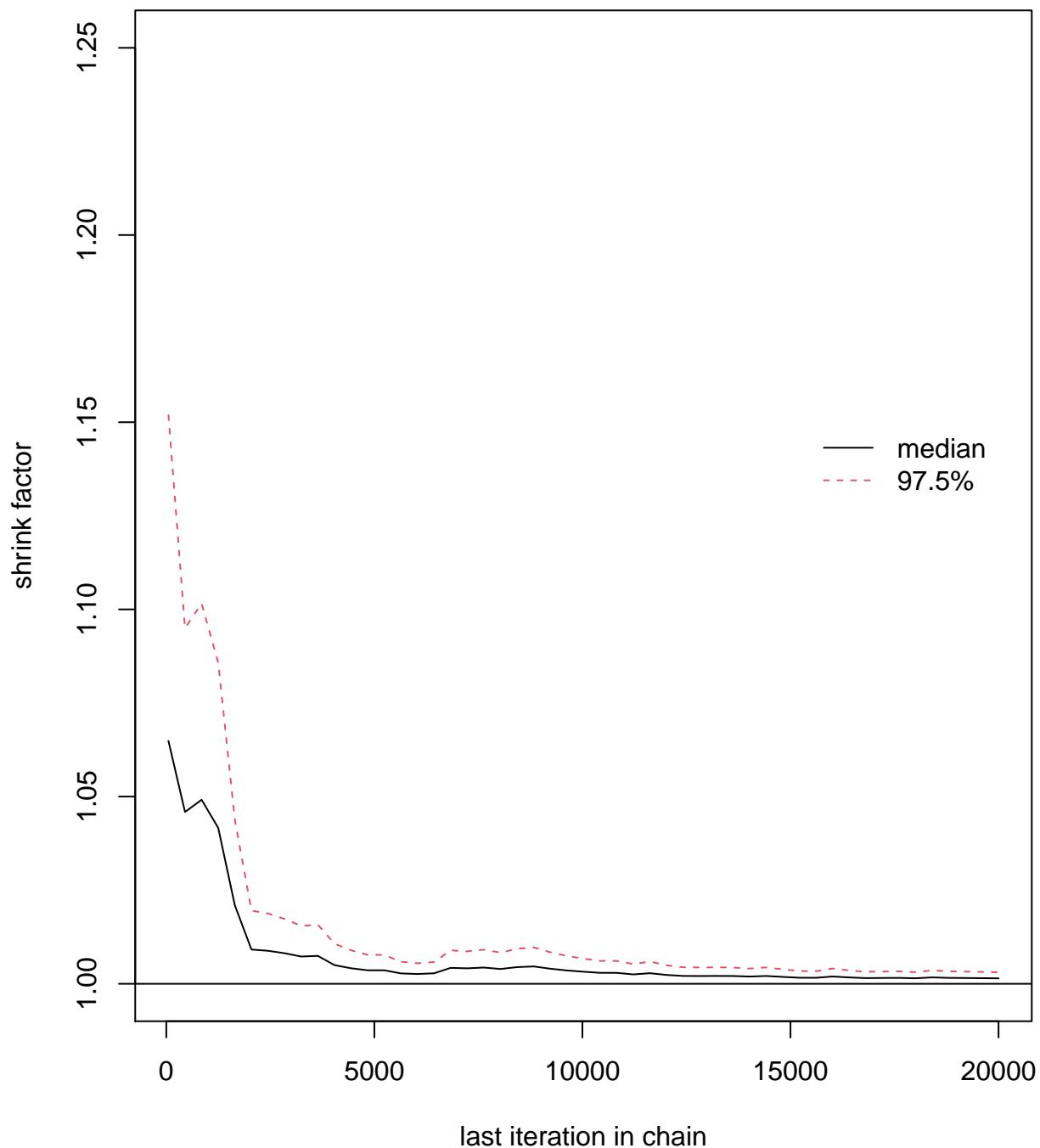
### Antibody prev test bias – Round 1



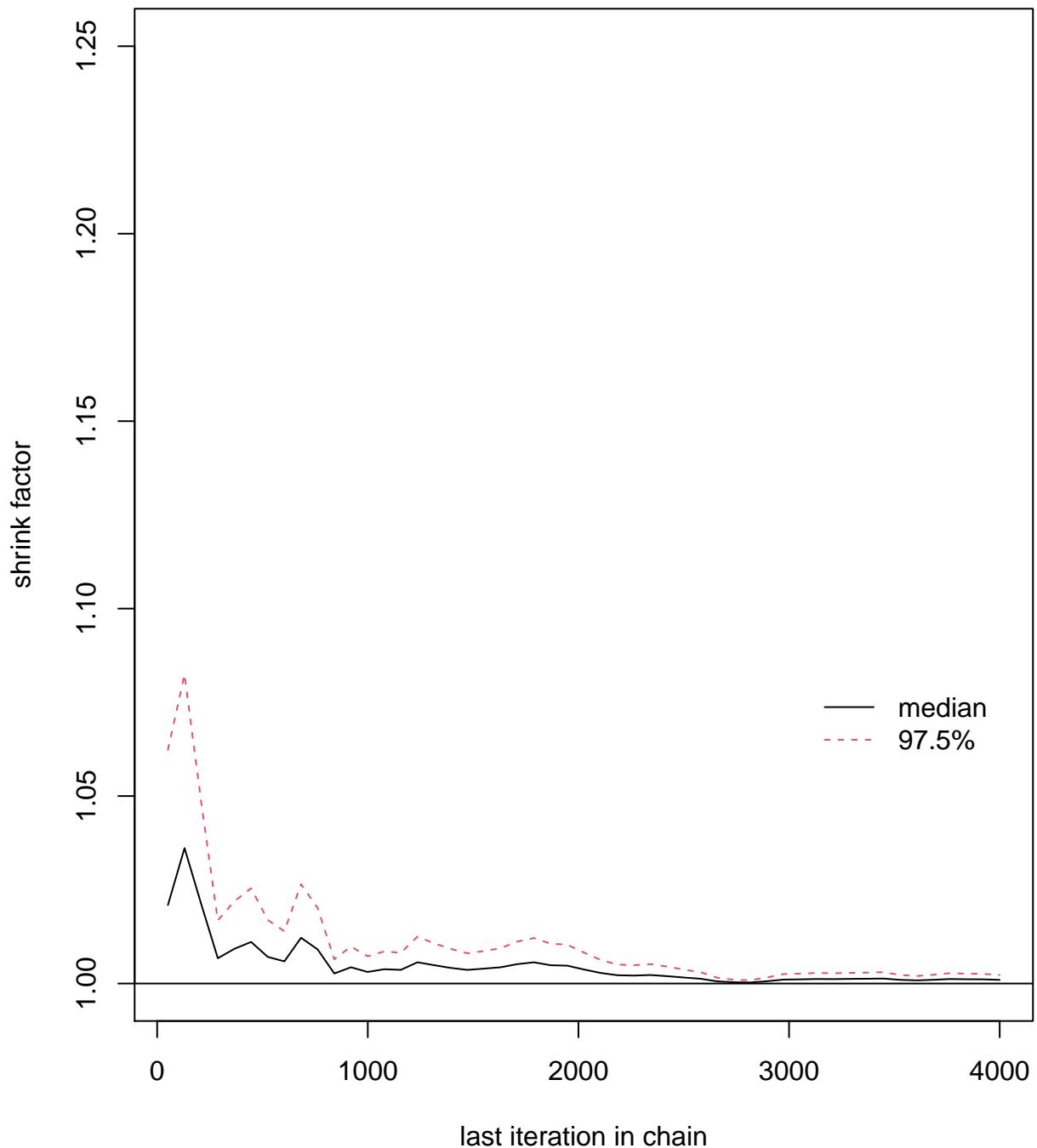
## Antibody prev test bias – Round 2



### Antibody prev test bias – Round 3

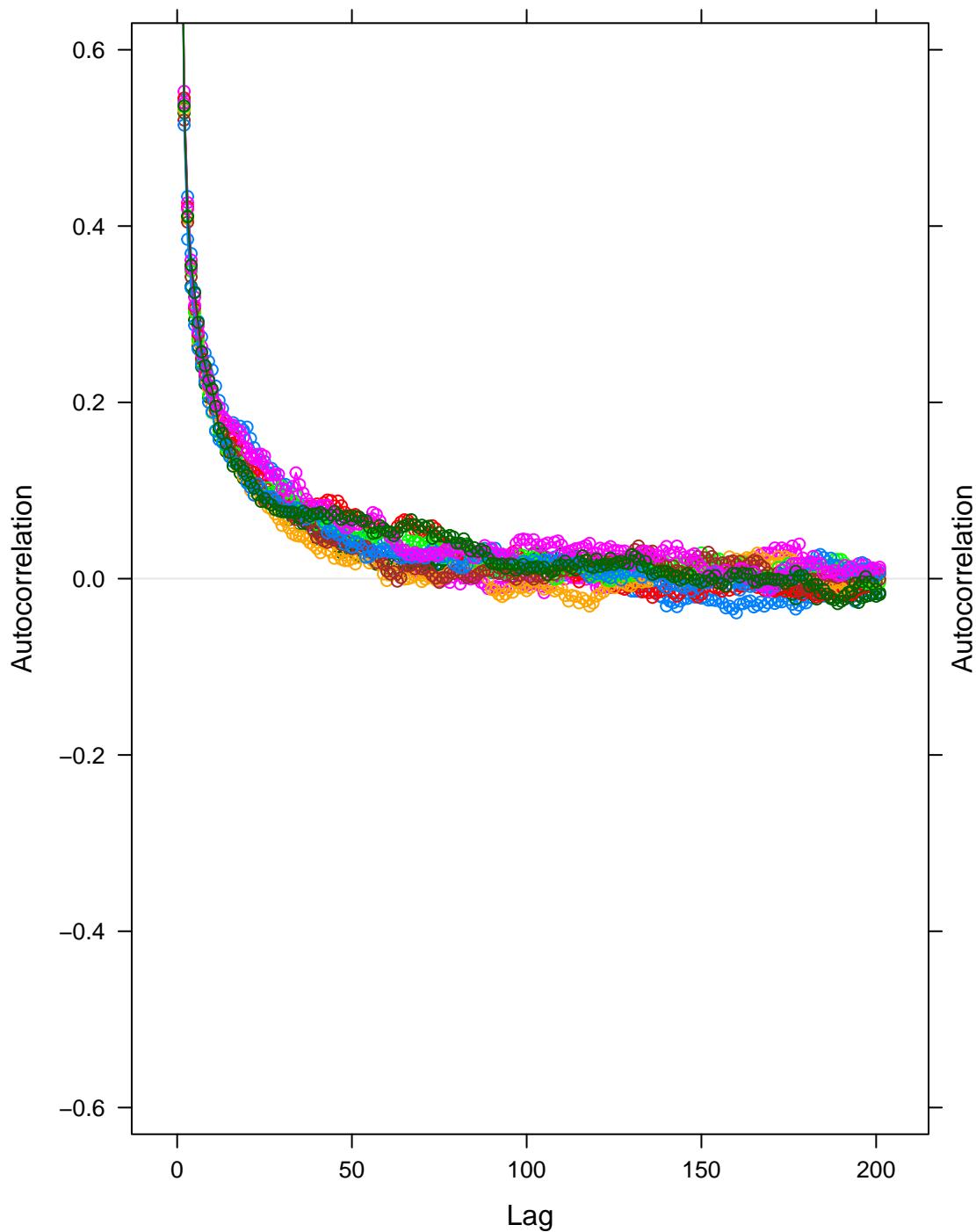


### Antibody prev test bias – Round 3 Spike

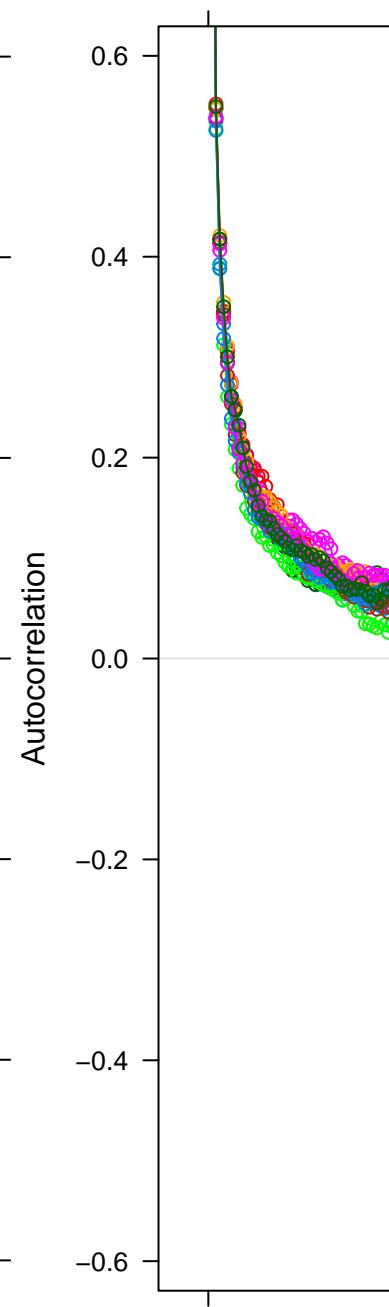


Autocorrelation plots

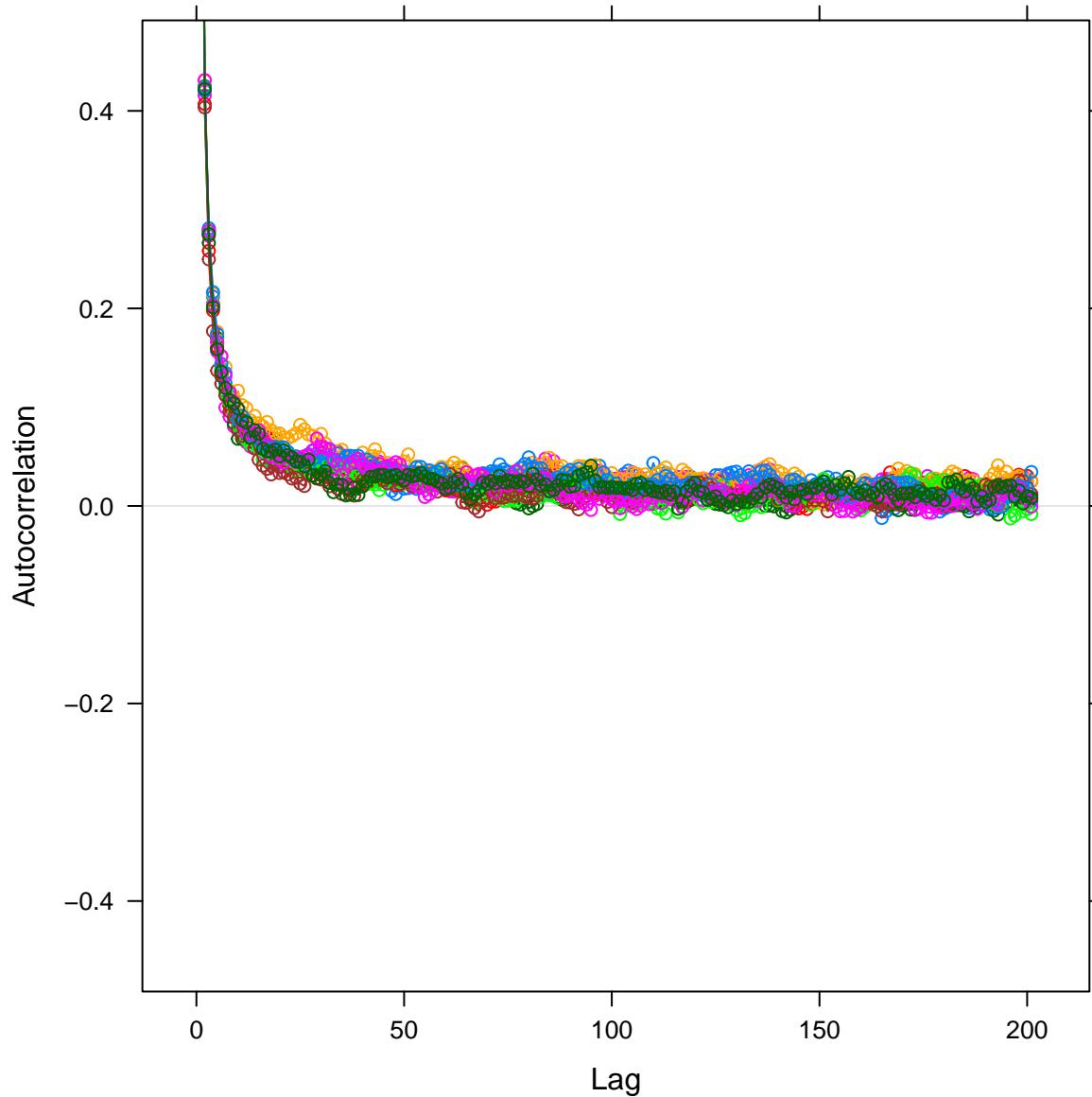
**ACF plot: Antibody prev test bias – Round 1**



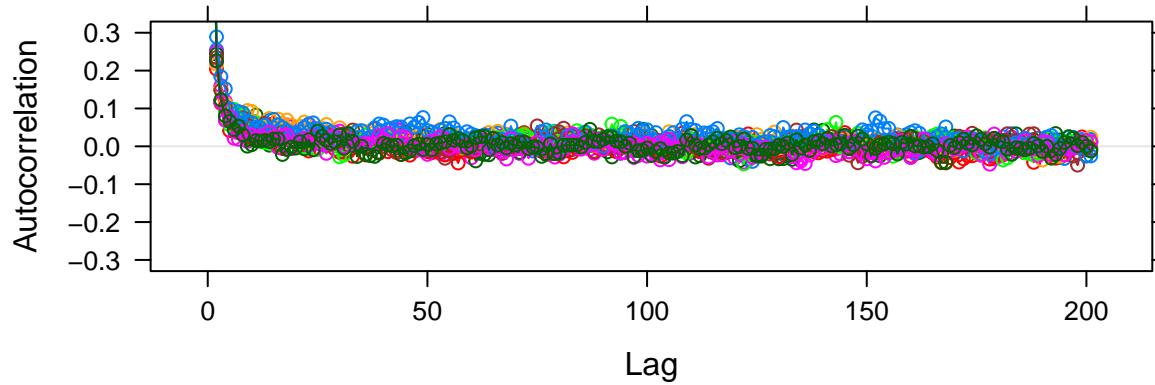
**ACF plot: An**



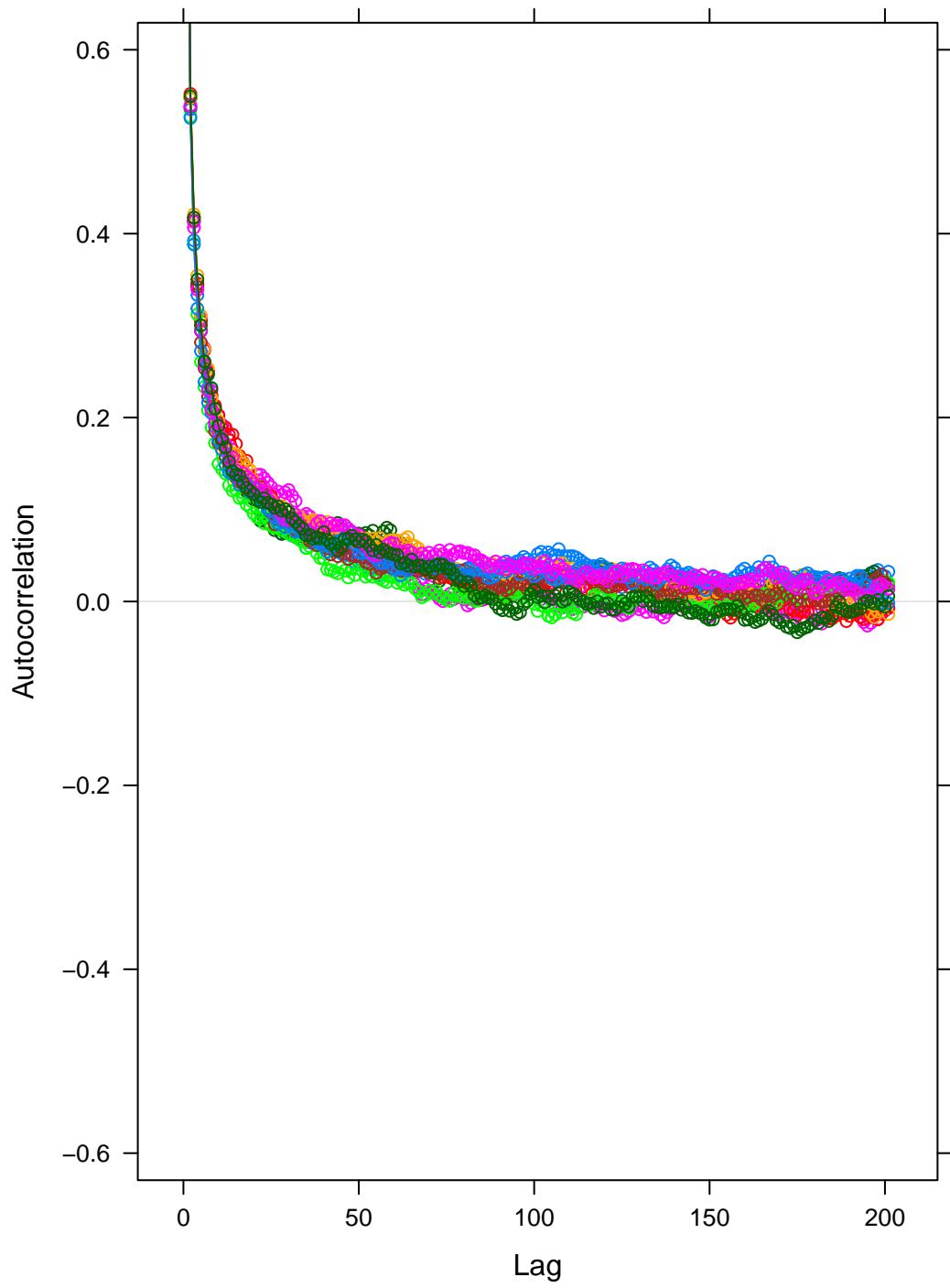
**ACF plot: Antibody prev test bias – Round 3**



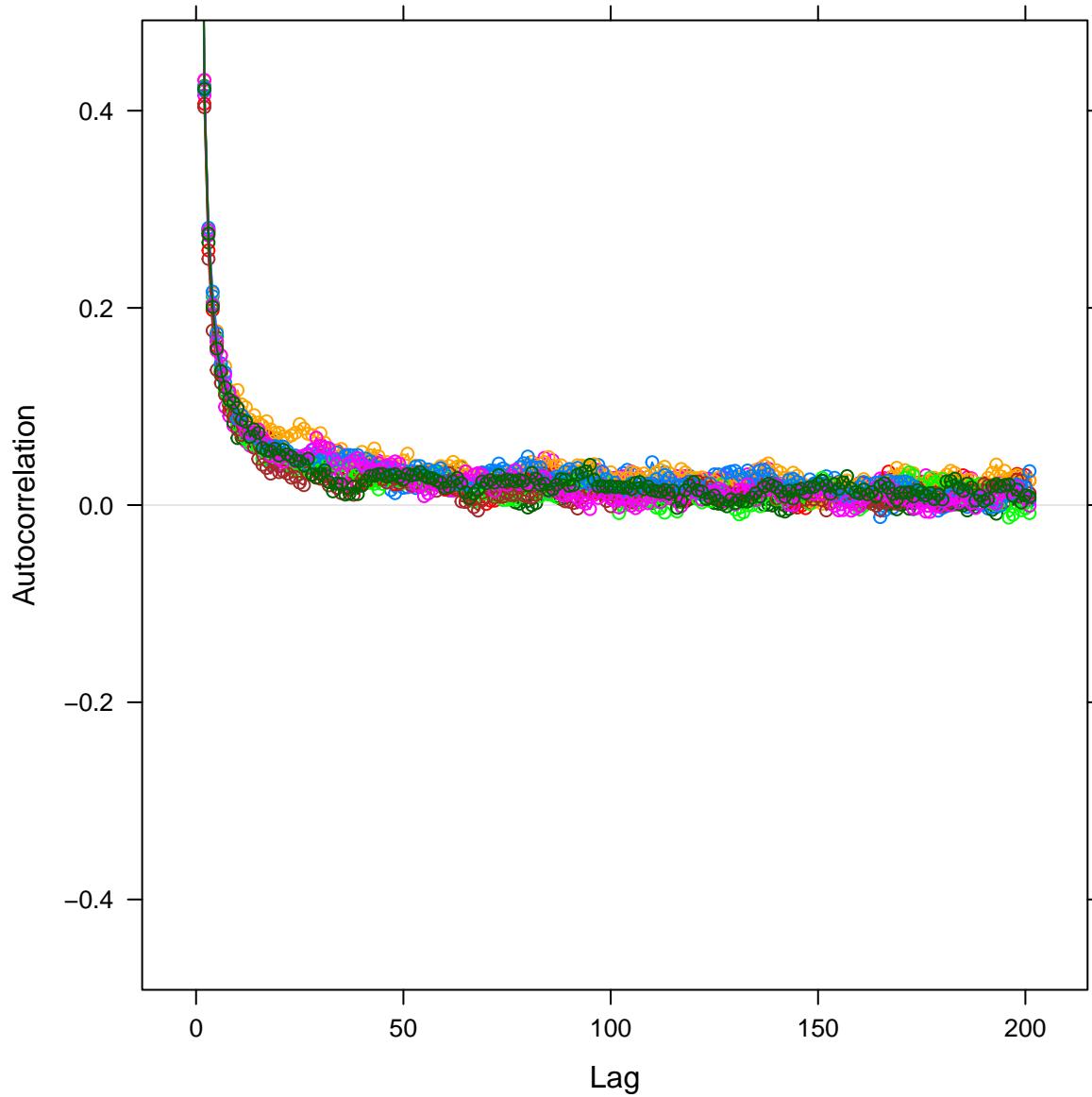
**ACF plot: Antibody prev test bias – Round 3 Spike**



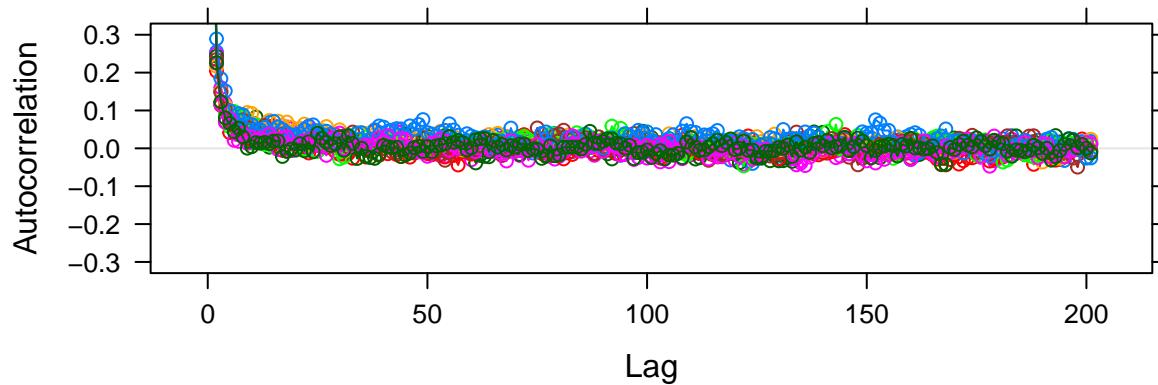
### ACF plot: Antibody prev test bias – Round 2



### ACF plot: Antibody prev test bias – Round 3



**ACF plot: Antibody prev test bias – Round 3 Spike**



## **Self-reported test positivity**

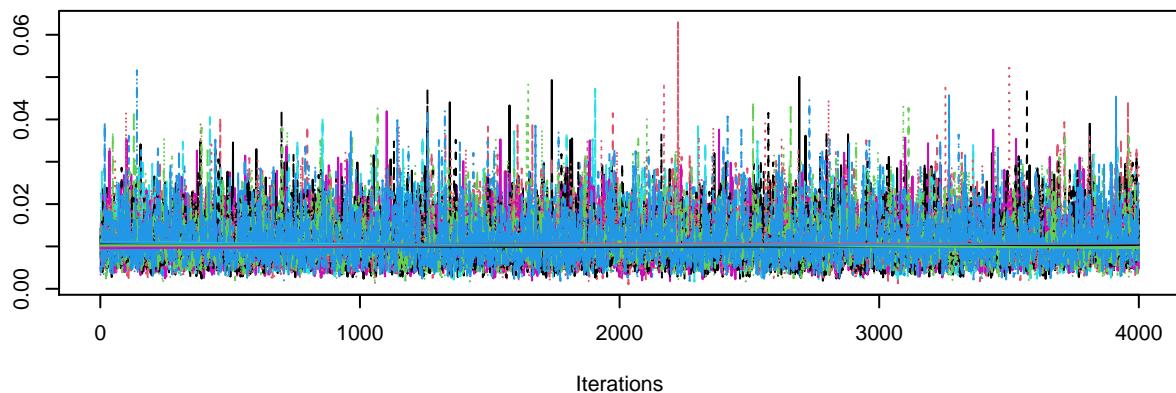
### **Effective Sample Size**

Table 3: Effective Sample Size: Self-reported test positivity

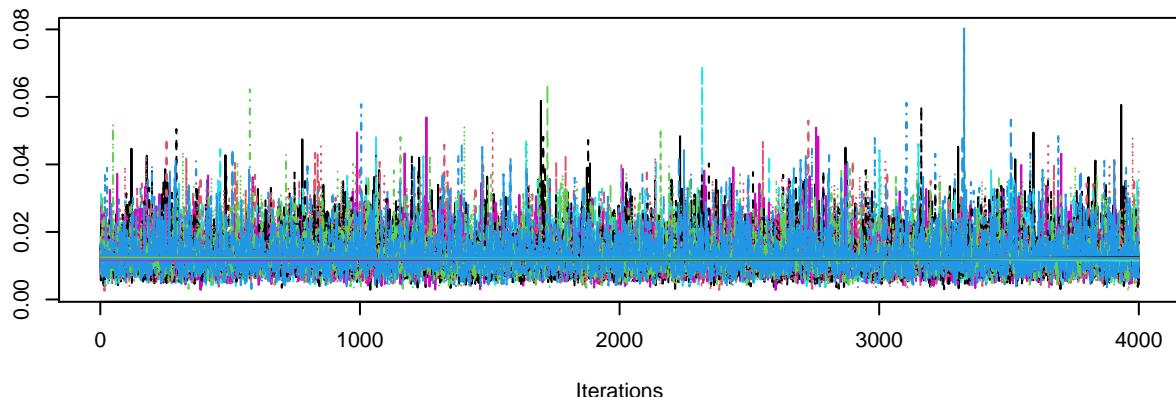
Round	ESS
Round 1	15144
Round 2	16921
Round 3	13432

## Trace plots

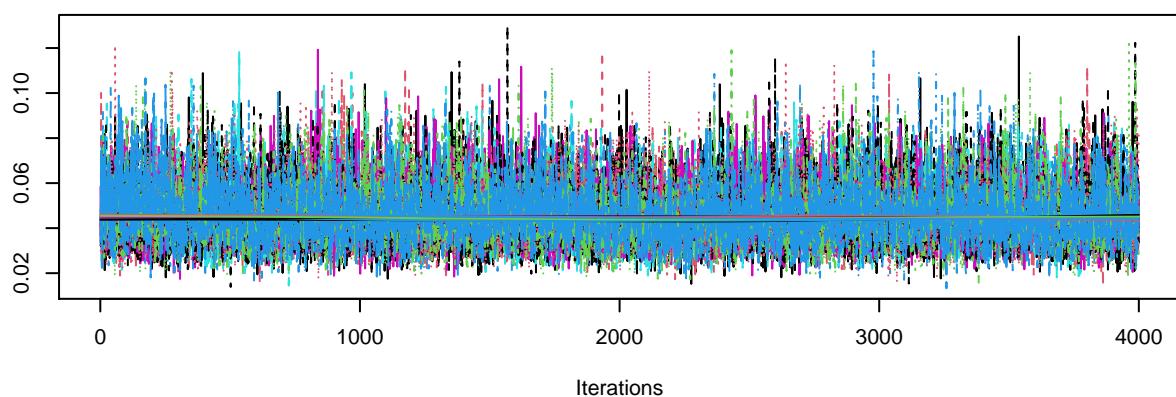
**Self-reported test positivity – Round 1**



**Self-reported test positivity – Round 2**

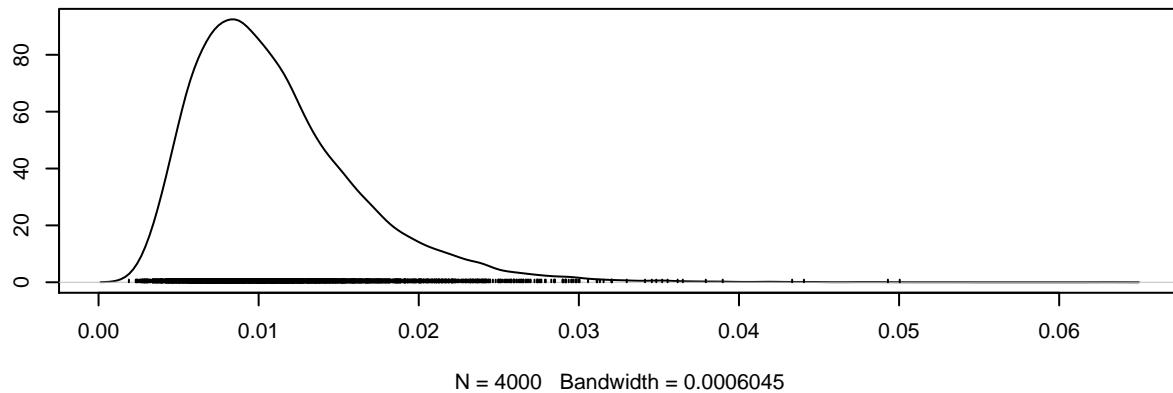


**Self-reported test positivity – Round 3**

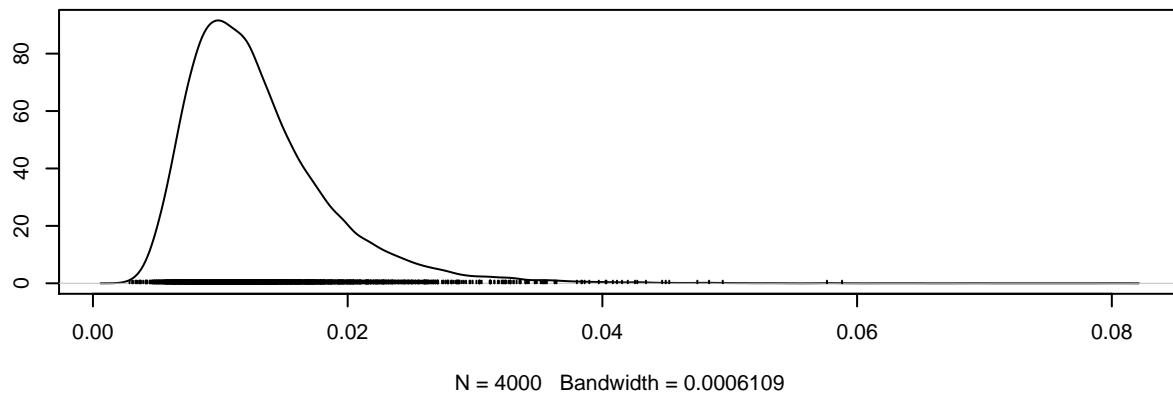


## Density plots

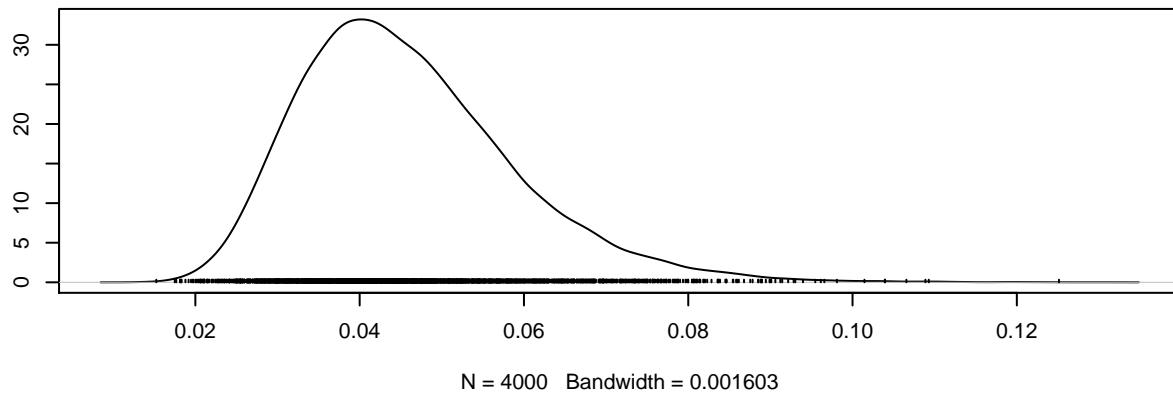
**Density plot: Self-reported test positivity – Round 1**



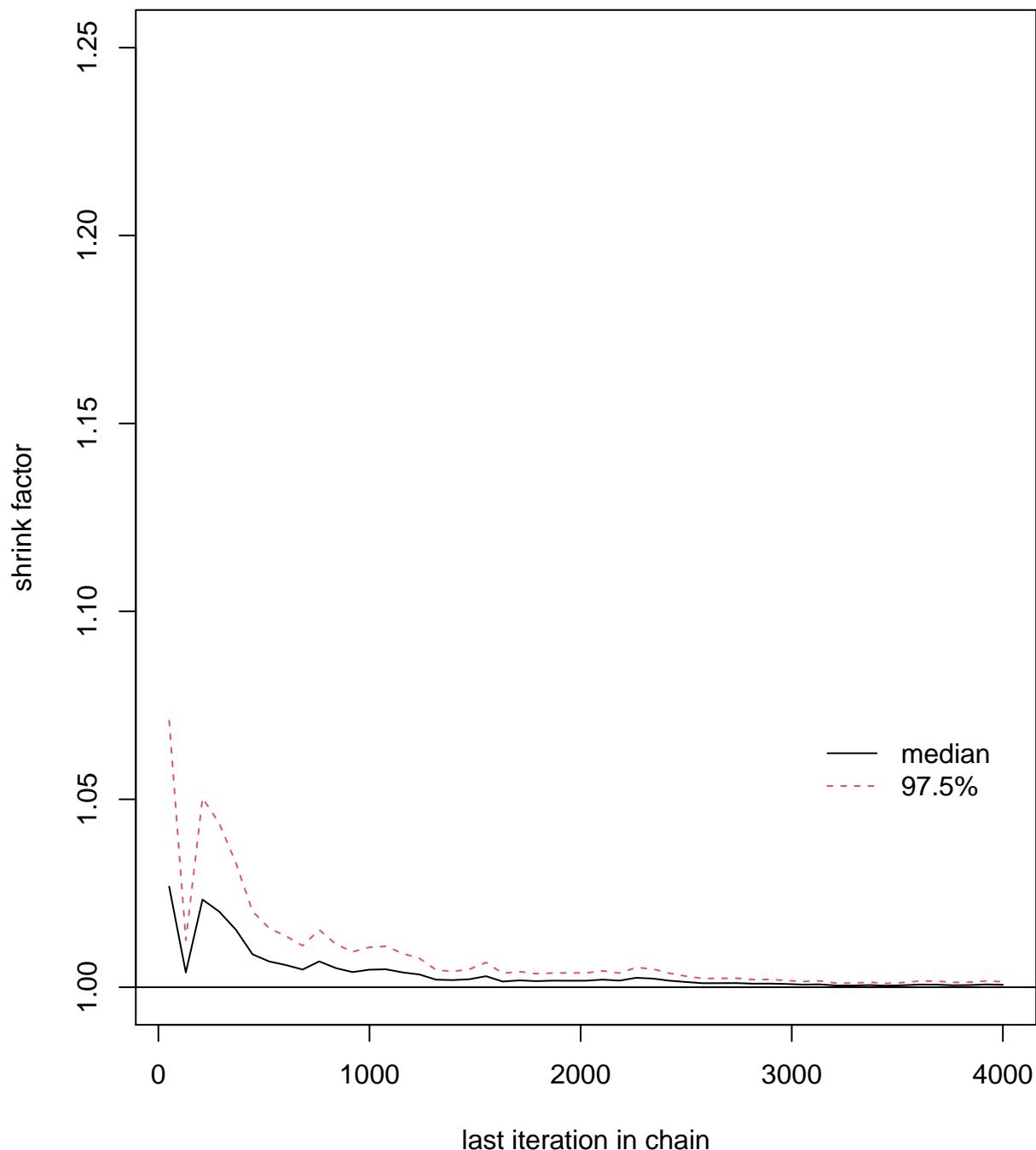
**Density plot: Self-reported test positivity – Round 2**



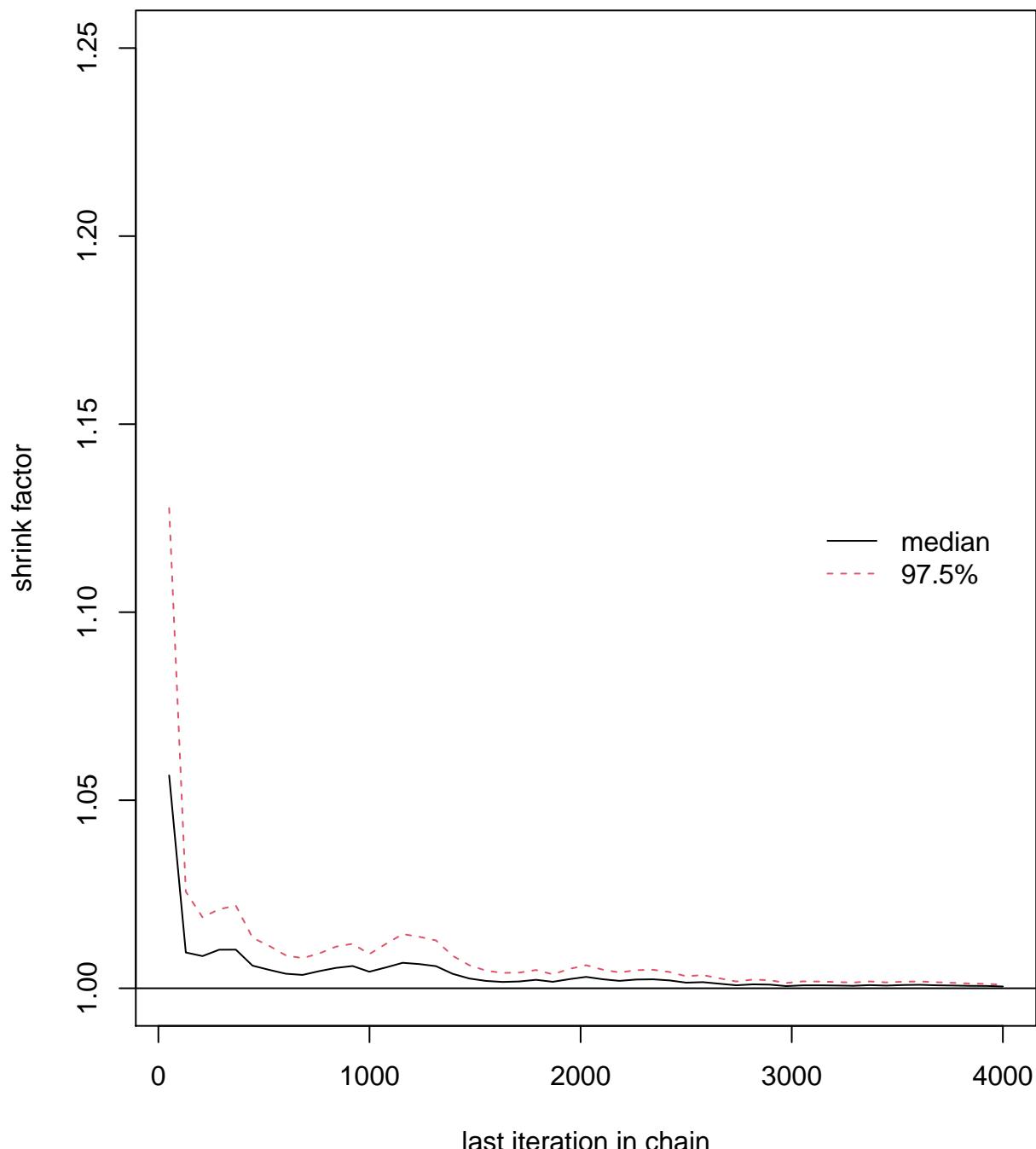
**Density plot: Self-reported test positivity – Round 3**



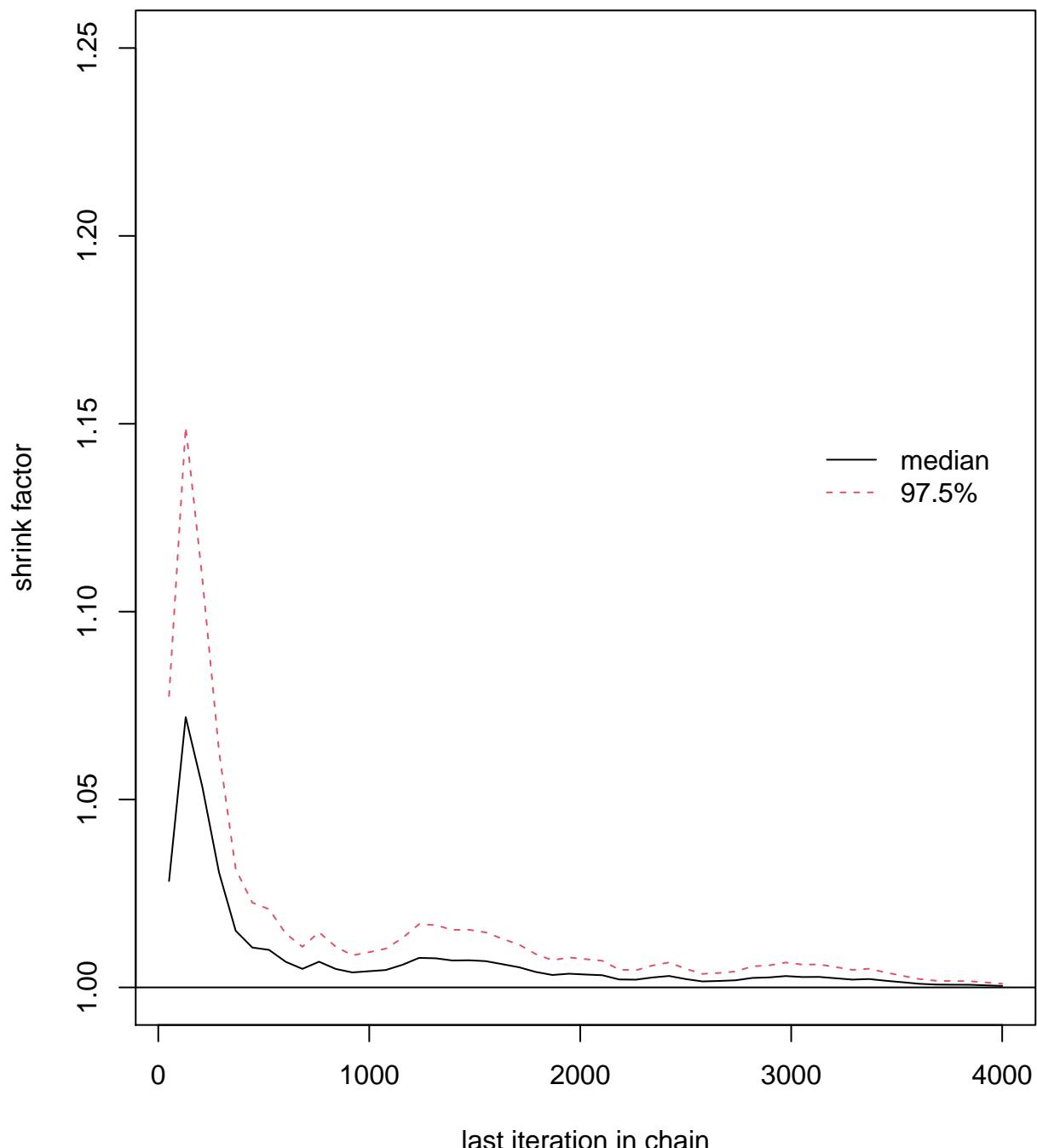
### Self-reported test positivity – Round 1



## Self-reported test positivity – Round 2

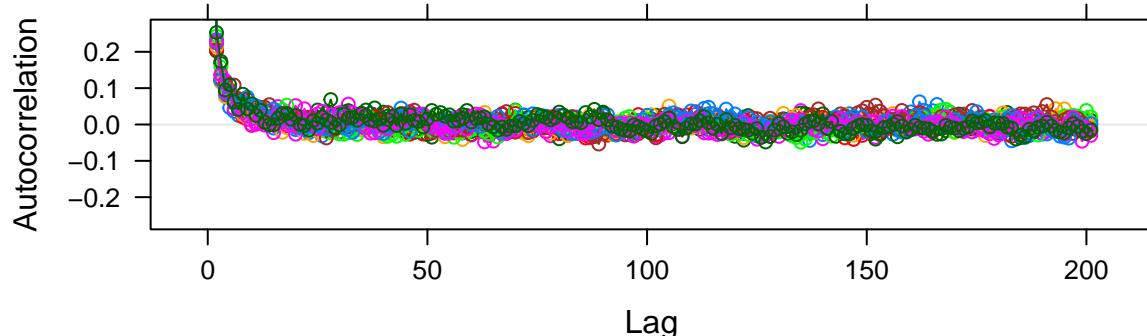


### Self-reported test positivity – Round 3

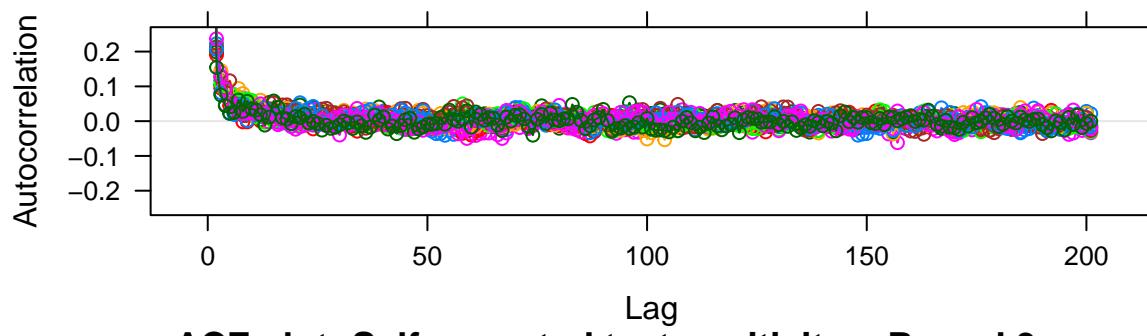


Autocorrelation plots

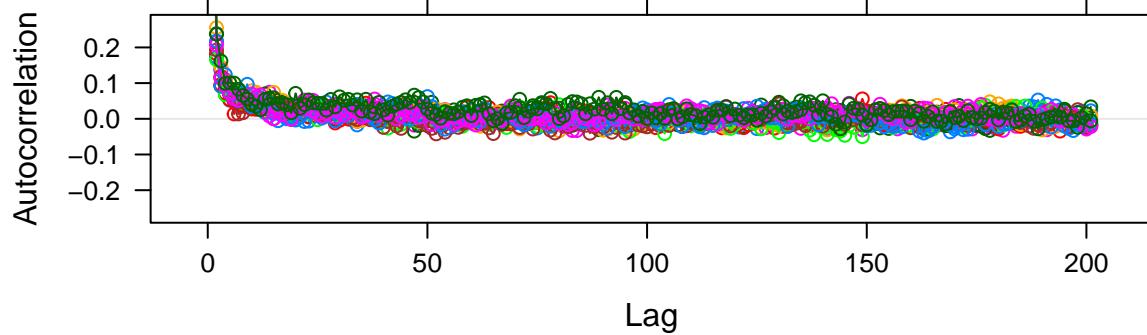
**ACF plot: Self-reported test positivity – Round 1**



**ACF plot: Self-reported test positivity – Round 2**



**ACF plot: Self-reported test positivity – Round 3**



## COVID-19 probable case

### Effective Sample Size

\begin{table}[H]

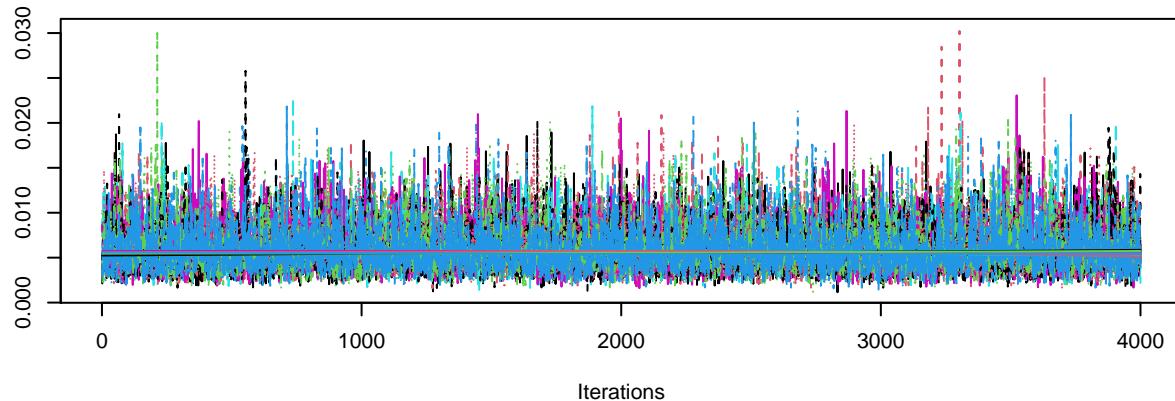
\caption{Effective Sample Size: covid\_prob test positivity}

Round	ESS
Round 1	13070
Round 2	11940
Round 3	11317

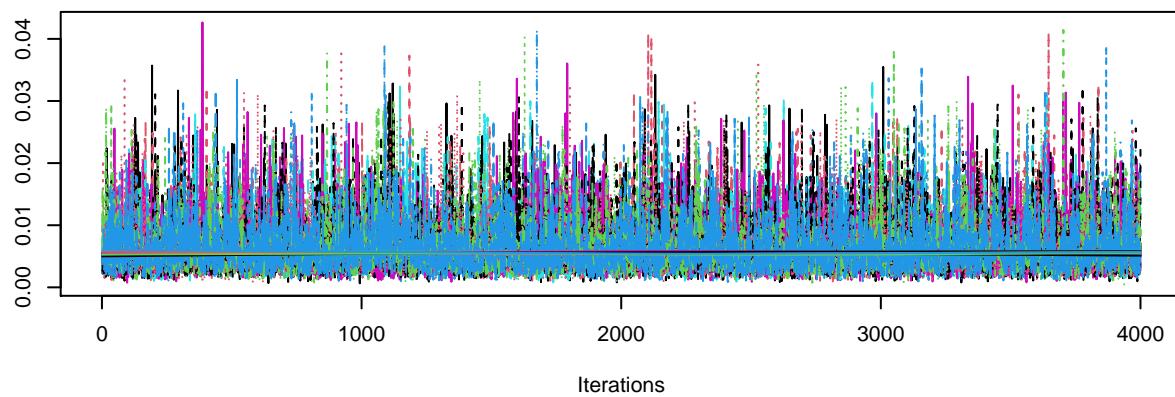
\end{table}

### Trace plots

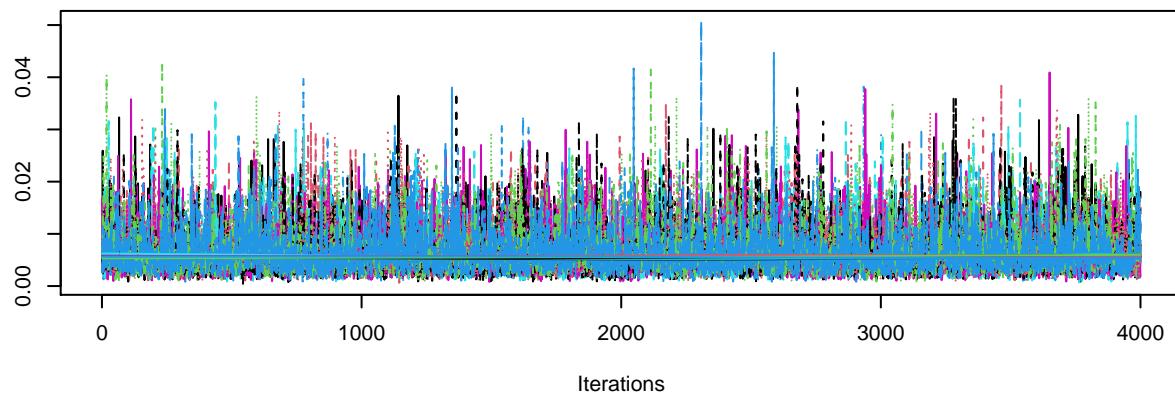
#### covid\_prob test positivity – Round 1



#### covid\_prob test positivity – Round 2

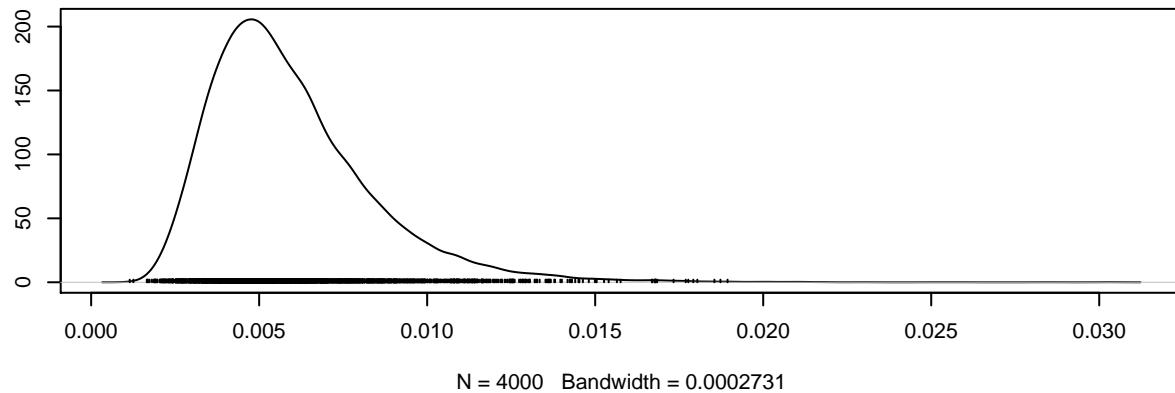


#### covid\_prob test positivity – Round 3

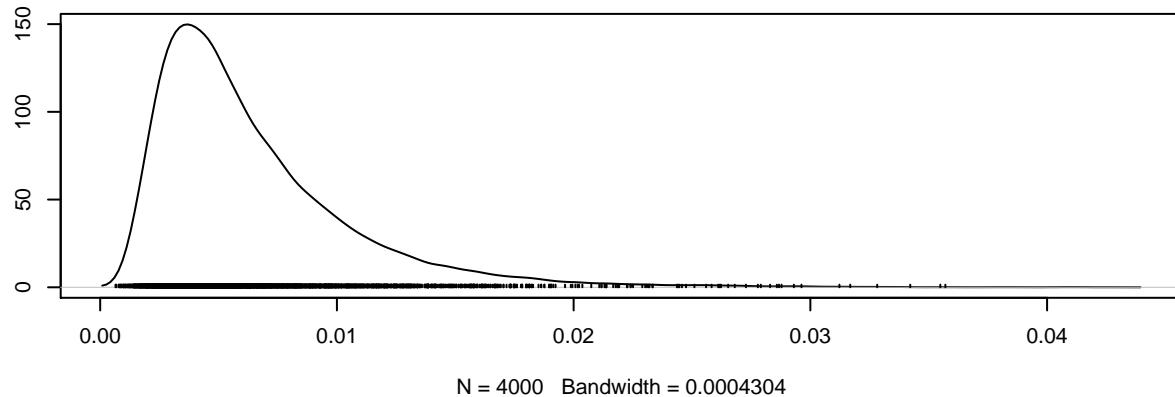


## Density plots

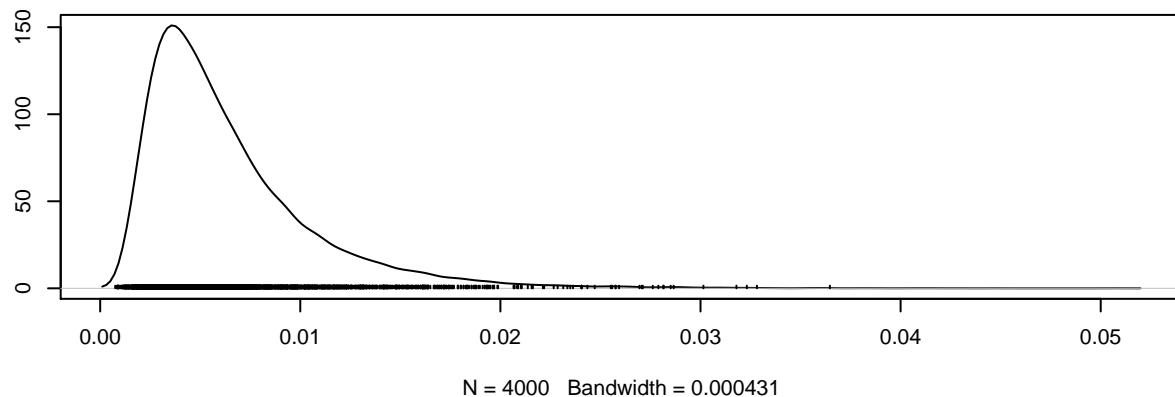
**Density plot: covid\_prob test positivity – Round 1**



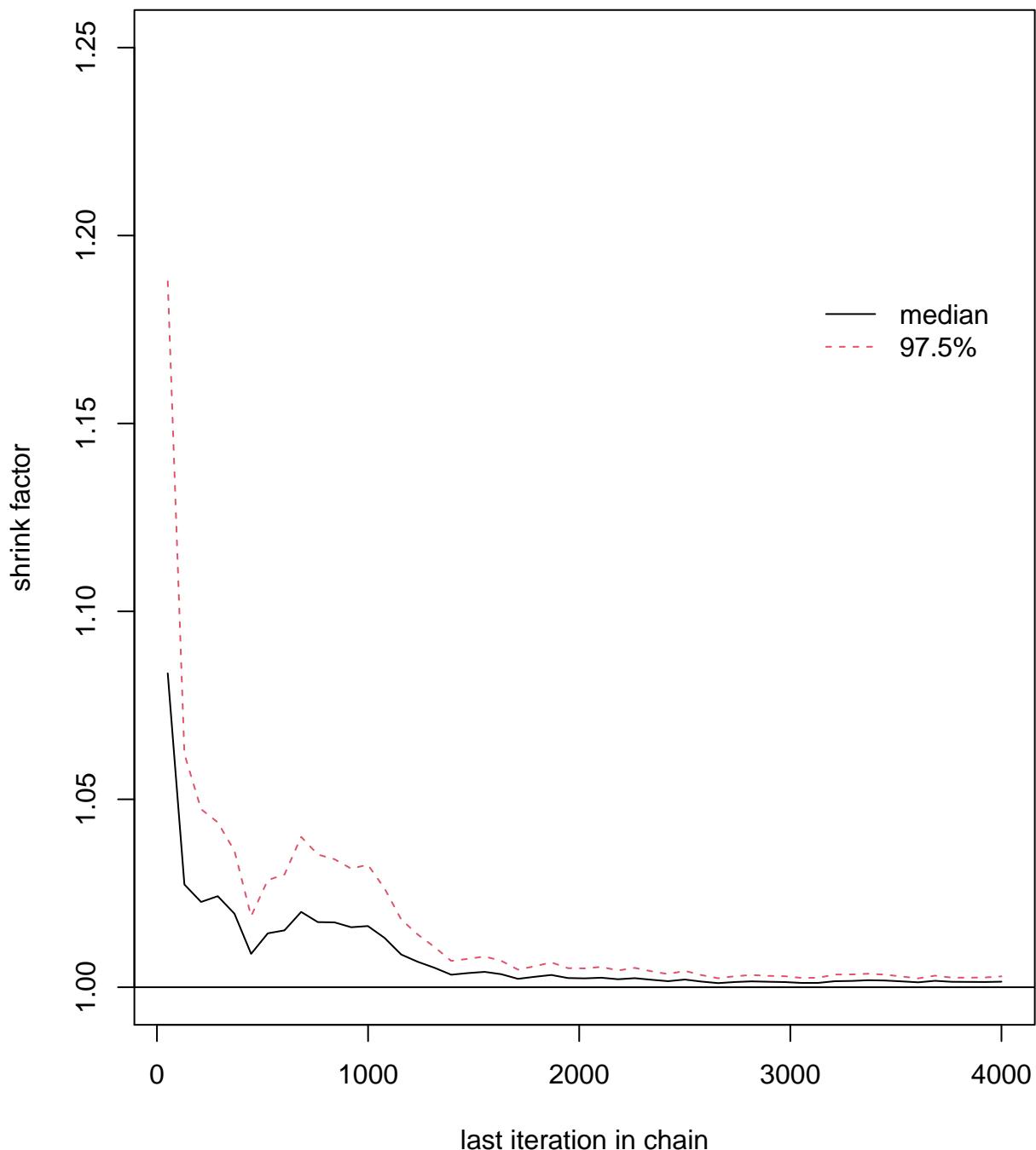
**Density plot: covid\_prob test positivity – Round 2**



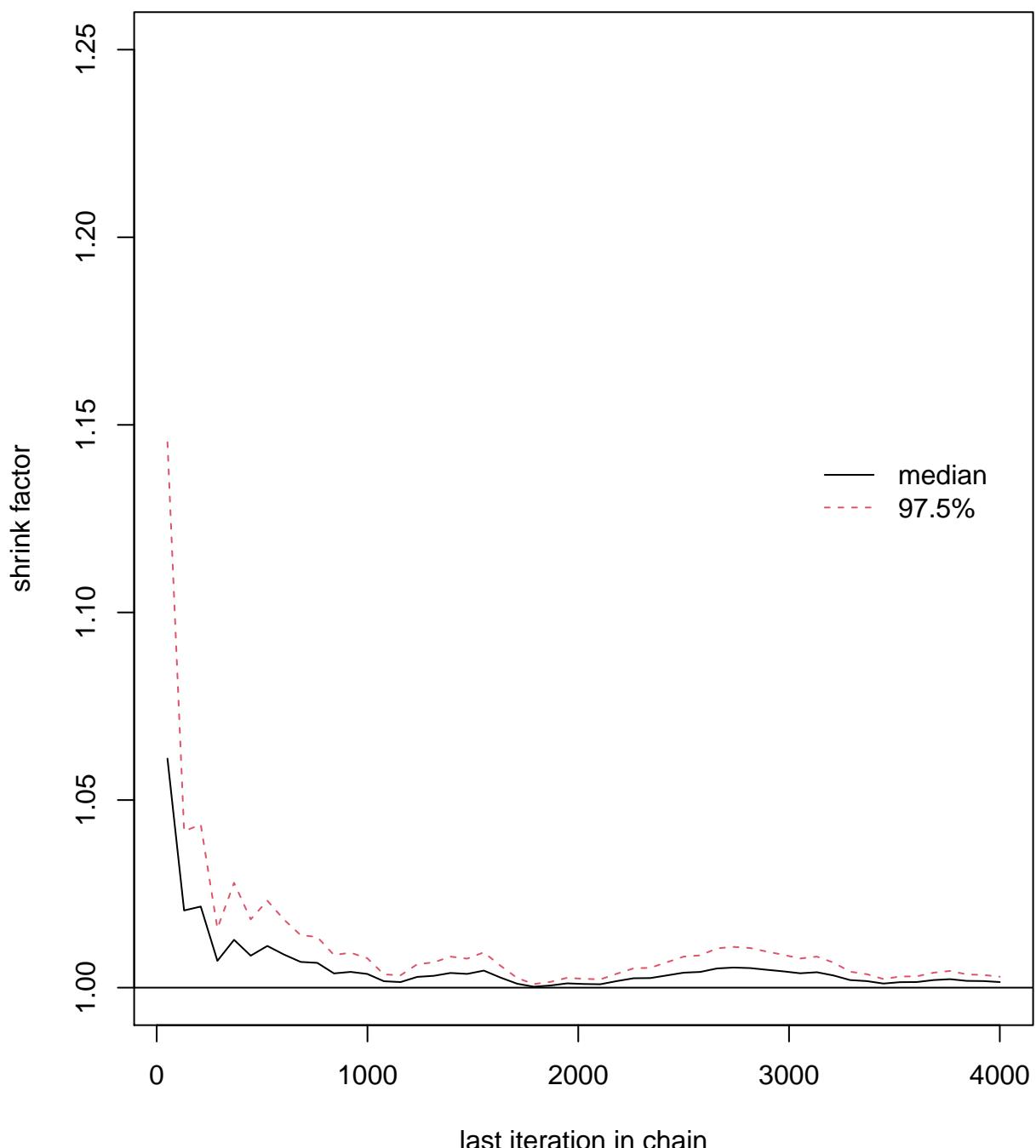
**Density plot: covid\_prob test positivity – Round 3**



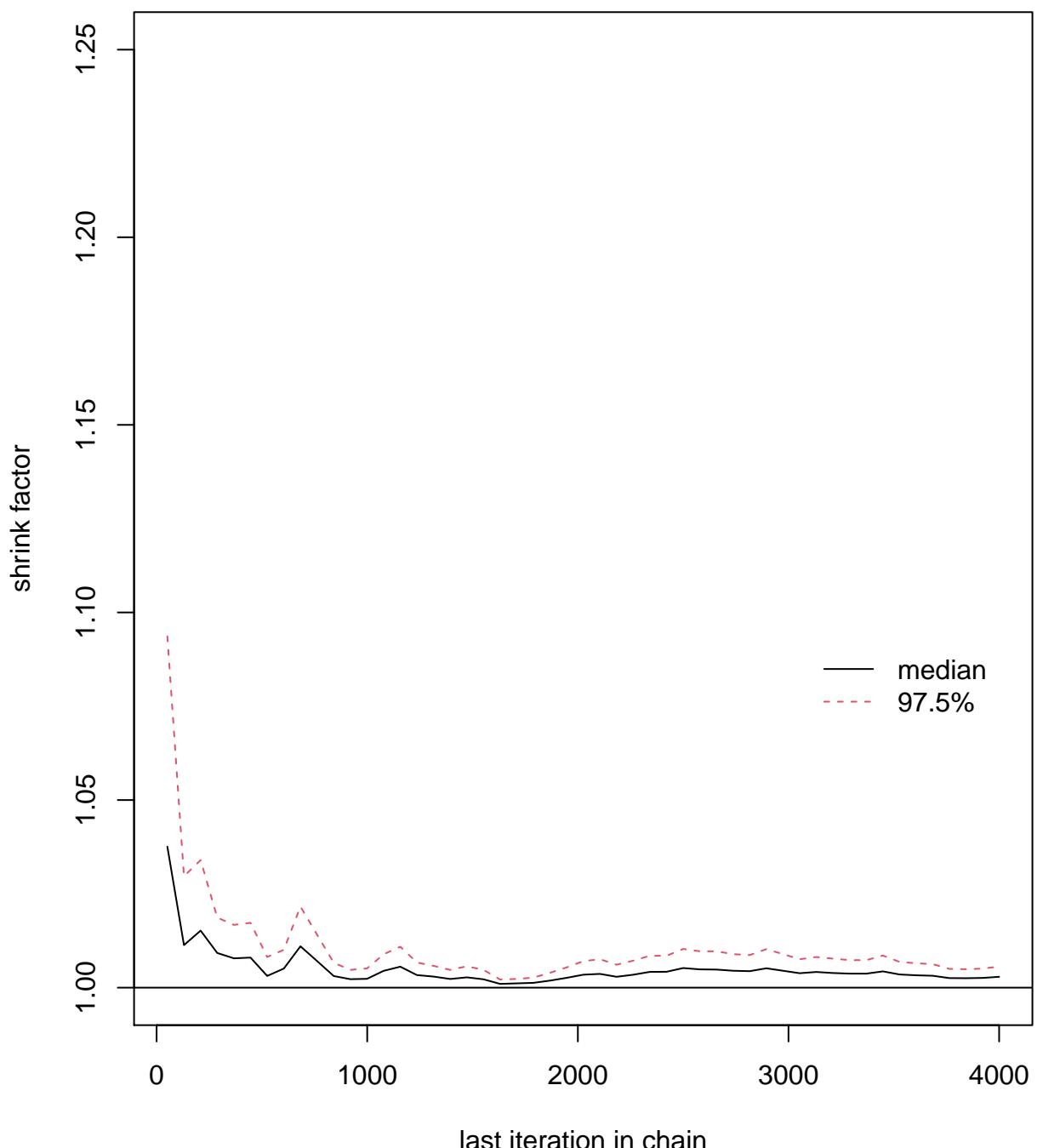
Gelman Diagnostic  
**covid\_prob test positivity – Round 1**



## covid\_prob test positivity – Round 2

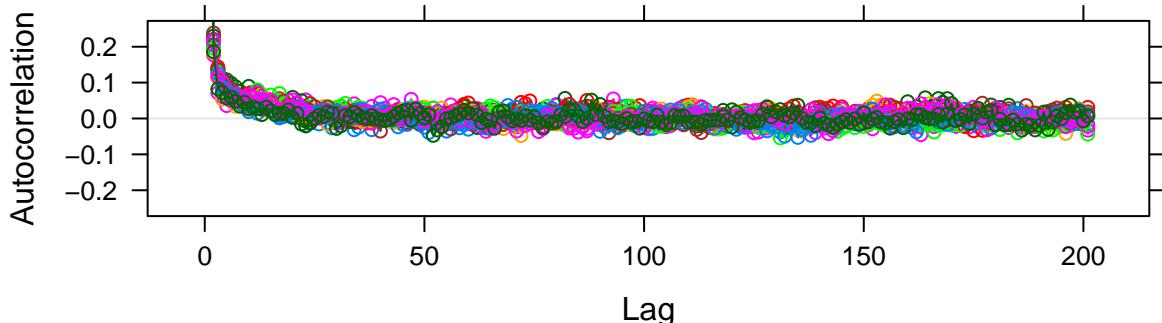


### covid\_prob test positivity – Round 3

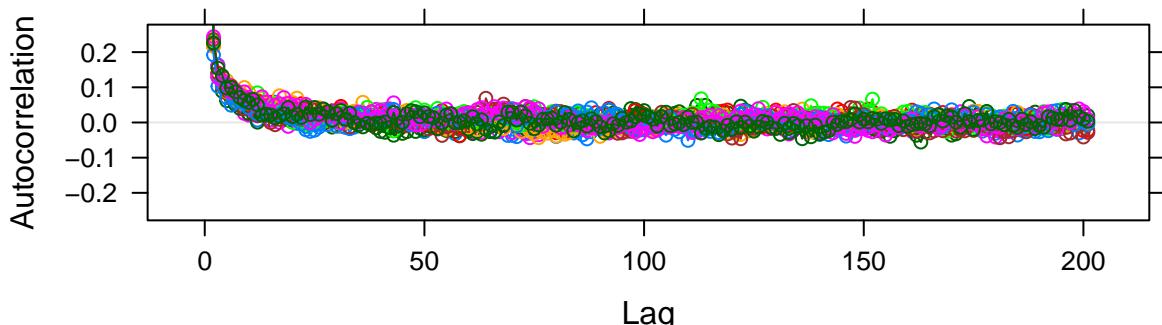


Autocorrelation plots

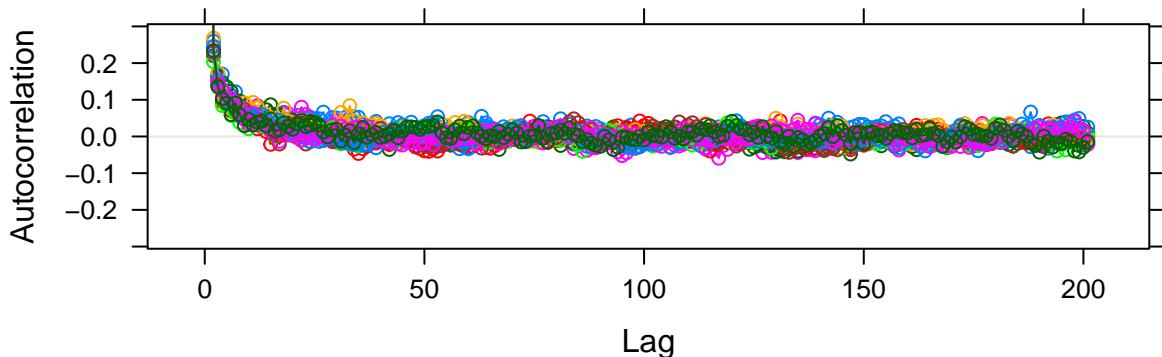
**ACF plot: covid\_prob test positivity – Round 1**



**ACF plot: covid\_prob test positivity – Round 2**



**ACF plot: covid\_prob test positivity – Round 3**



## Table 5

Table 5 presents results from analyses comparing the prevalence of antibodies to the SARS-CoV2-2 spike protein in Round 3. Presence of such antibodies is indicative of previous natural infection or vaccination.

Since infection rates are so low, almost all of the prevalence in spike antibodies can be attributed to vaccination in Round 3.

### PD between non-whites and whites

The first part of table 5 presents prevalence differences between each non-white race/ethnic group and whites, and all non-whites groups compared to whites:

- Prevalence differences
  - Two or more races vs. whites
  - Asian or Pacific Islander (api) vs. whites
  - American Indian or Alaskan Native or Other (ami\_other) vs. whites
  - Hispanic vs. whites
  - African-American or Black (aa\_black) vs. whites
  - All non-whites vs. whites

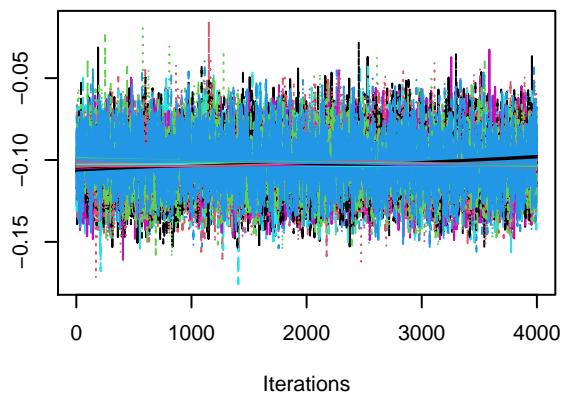
### Effective Sample Size

Table 4: Effective Sample Size: Round 3 Spike PD between race/eth groups and whites

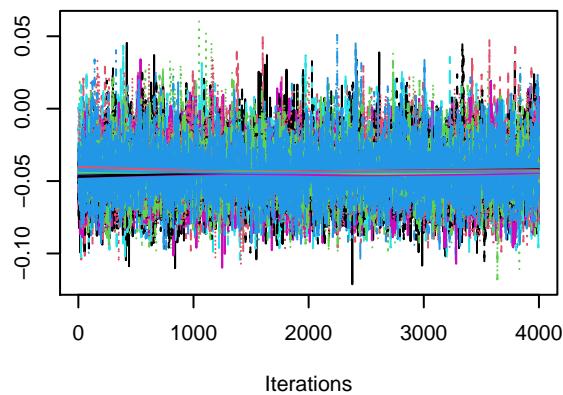
Race.eth	ESS
two_or_more	11069
api	15532
ami_other	7754
hispanic	20634
aa_black	6014
non_white	10229

### Trace plots

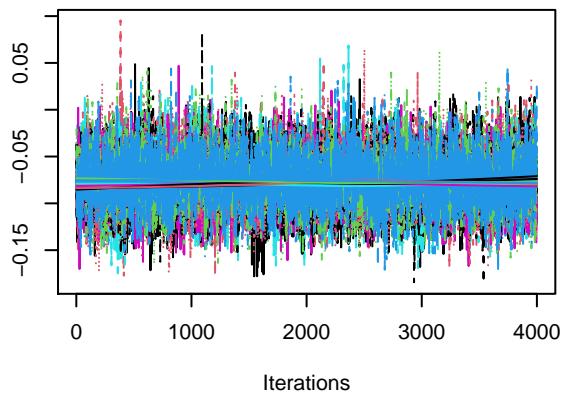
Trace of two\_or\_more



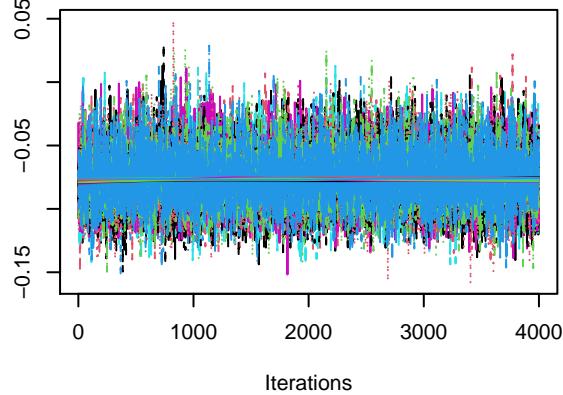
Trace of api



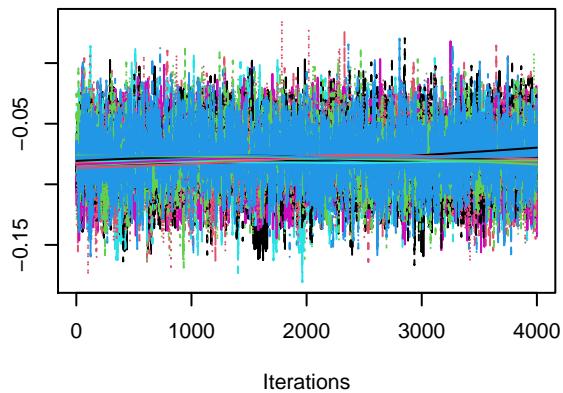
Trace of ami\_other



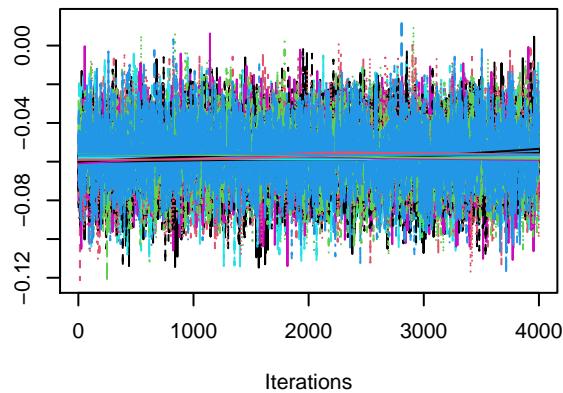
Trace of hispanic



Trace of aa\_black

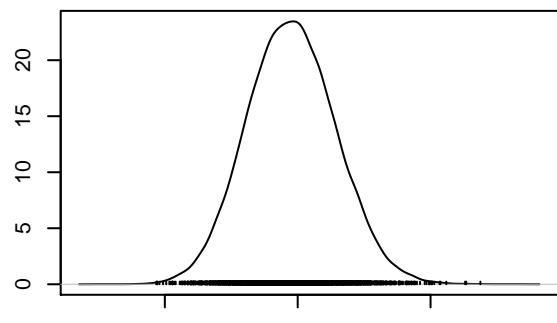


Trace of non\_white



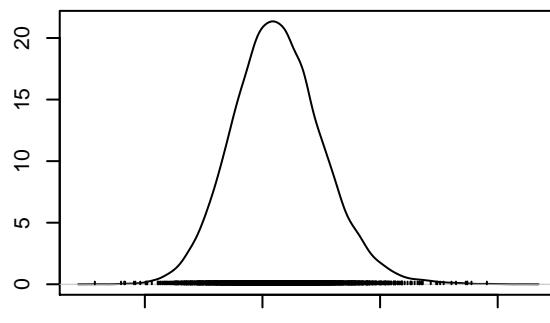
### Density plots

**Density of two\_or\_more**



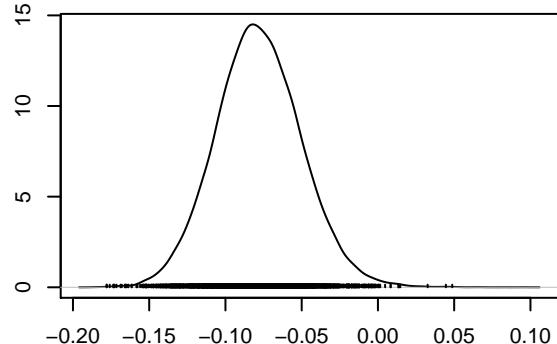
N = 4000 Bandwidth = 0.002124

**Density of api**



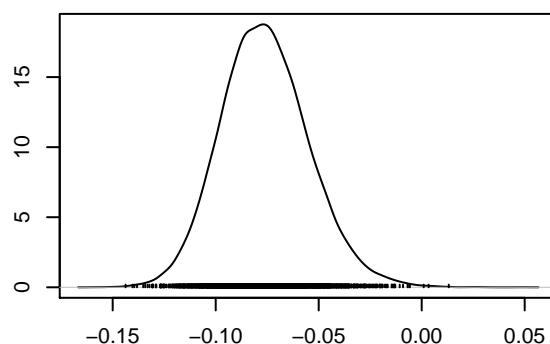
N = 4000 Bandwidth = 0.00237

**Density of ami\_other**



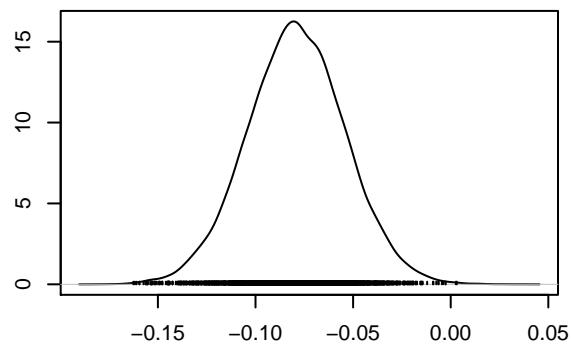
N = 4000 Bandwidth = 0.003523

**Density of hispanic**



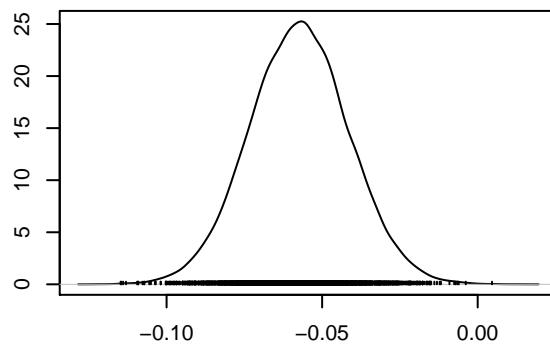
N = 4000 Bandwidth = 0.002692

**Density of aa\_black**



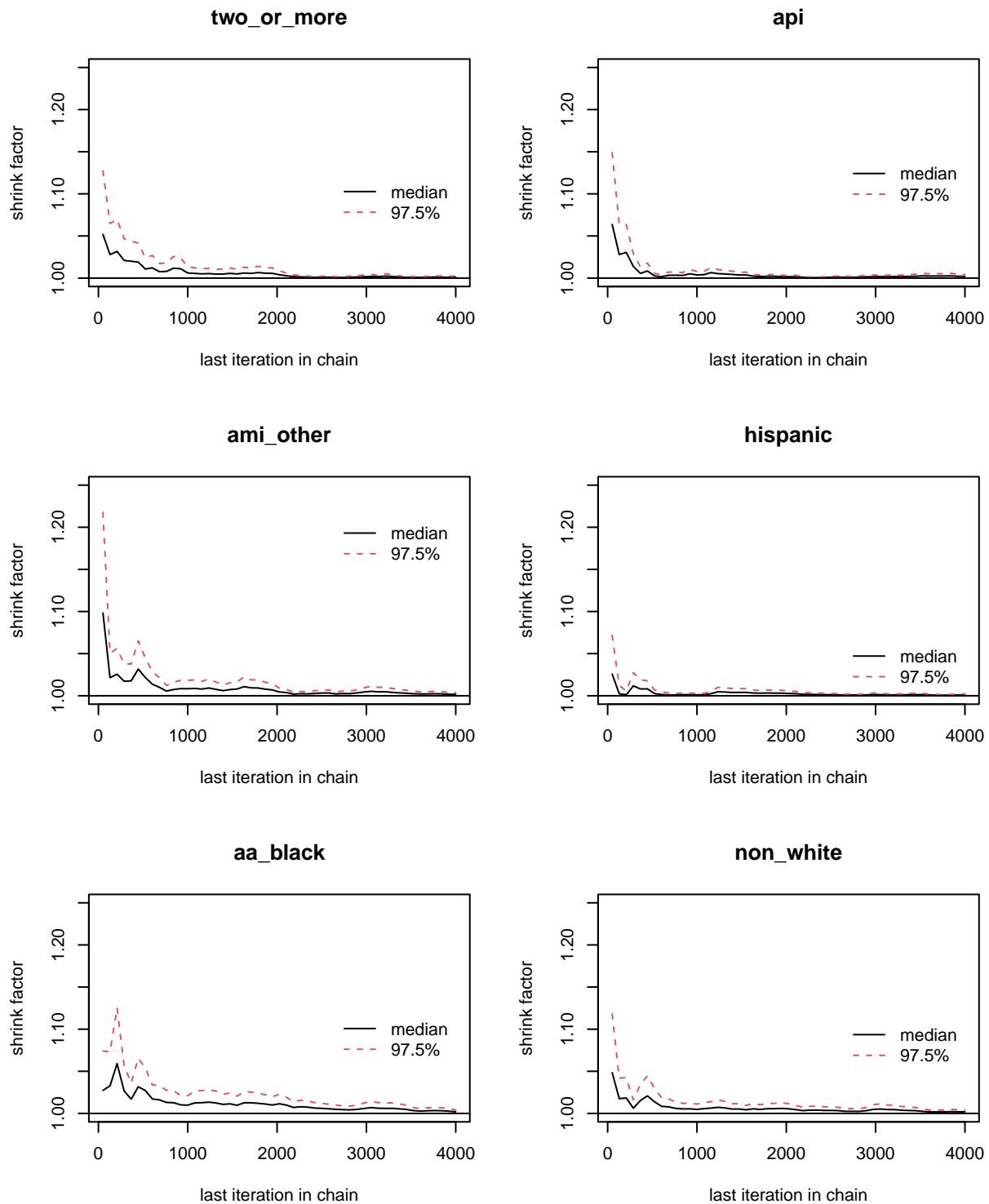
N = 4000 Bandwidth = 0.003161

**Density of non\_white**



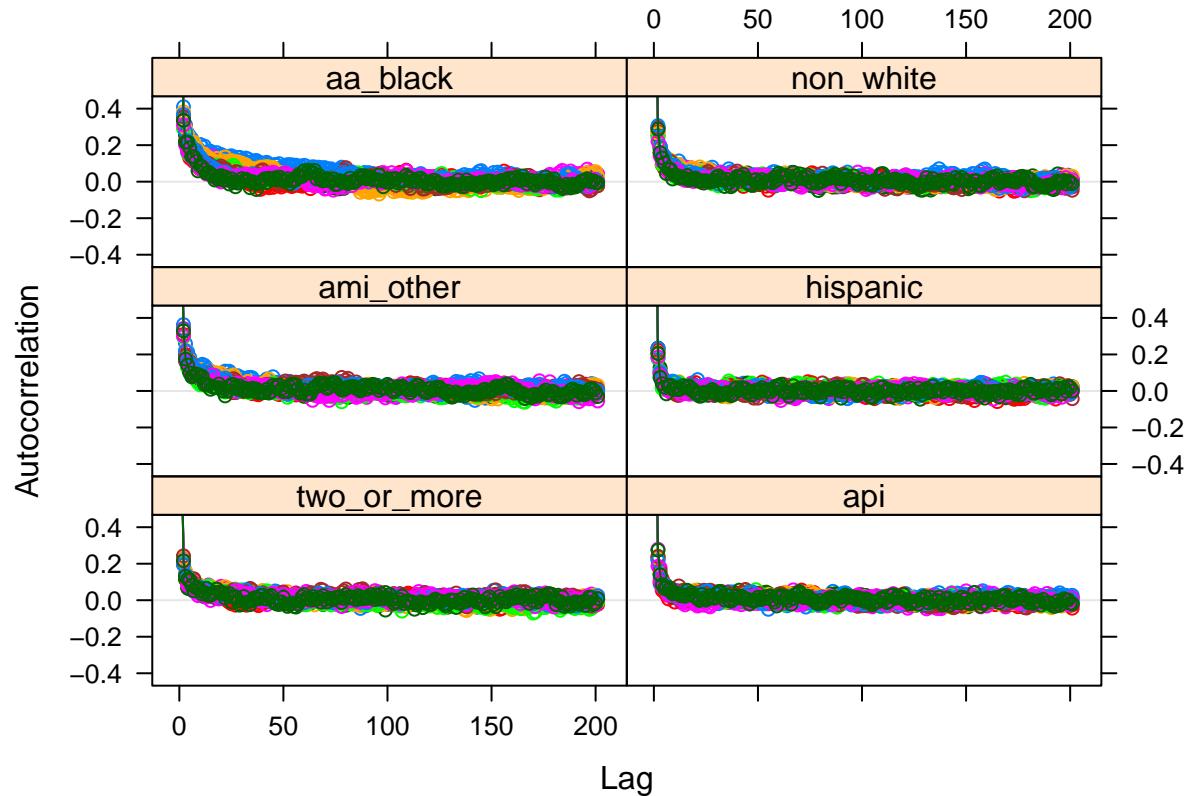
N = 4000 Bandwidth = 0.002024

### Gelman Diagnostic



### Autocorrelation plots

#### **ACF plot: Round 3 Spike PD between race/eth groups and whites**



#### **PD between non-whites and whites within age-groups**

The second part of table 4 presents prevalence differences between each non-white and whites (ref) within those aged race/ethnic group and whites, and all non-whites groups compared to whites within each age group:

- Prevalence difference - non\_white compared to white (ref) within age groups
  - 18-29 years
  - 30-44 years
  - 45-64 years
  - 65-74 years
  - 75 or more years

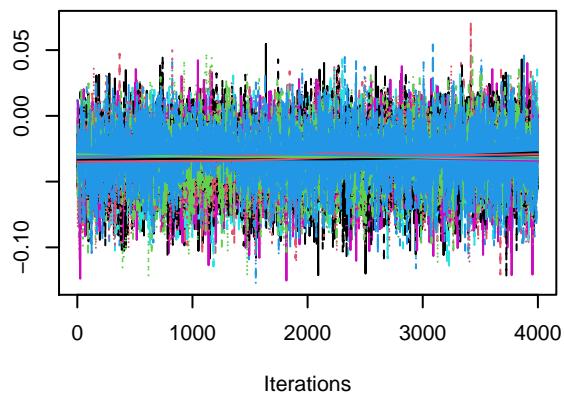
### **Effective Sample Size**

Table 5: Effective Sample Size: Round 3 Spike PD between race/eth groups and whites

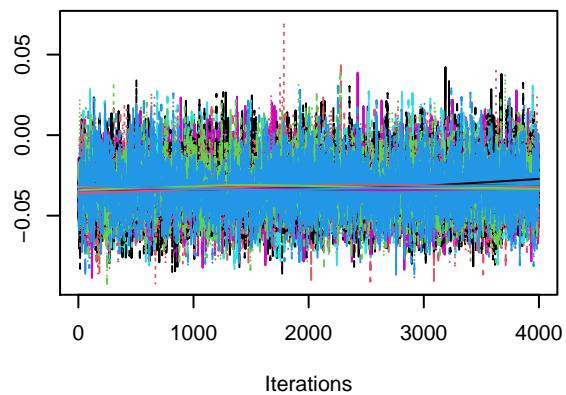
Race.eth	ESS
non_white_18_30	15222
non_white_30_45	9911
non_white_45_65	6821
non_white_65_75	5683
non_white_75	7425

### Trace plots

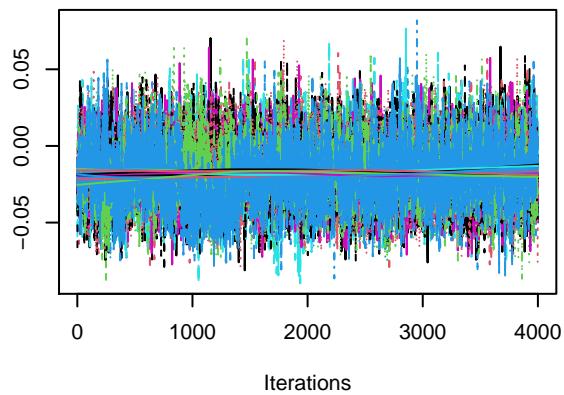
Trace of non\_white\_18\_30



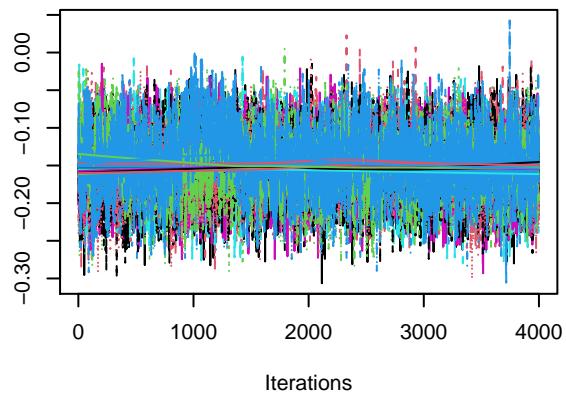
Trace of non\_white\_30\_45



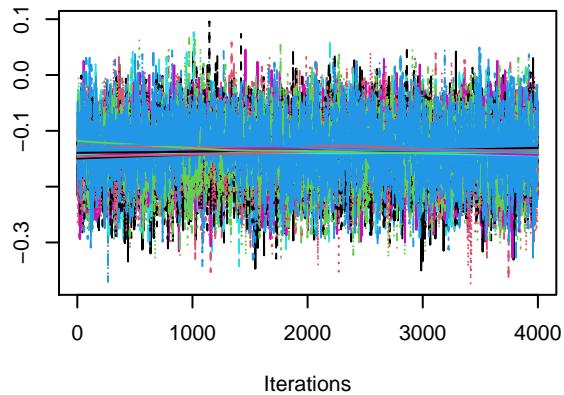
Trace of non\_white\_45\_65



Trace of non\_white\_65\_75

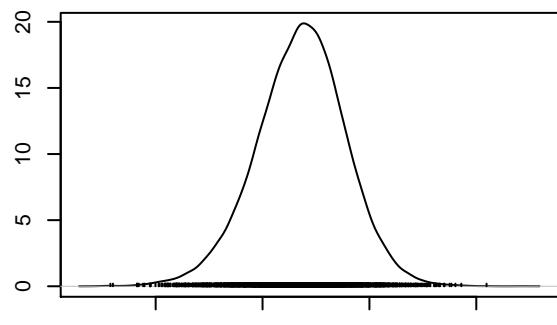


Trace of non\_white\_75



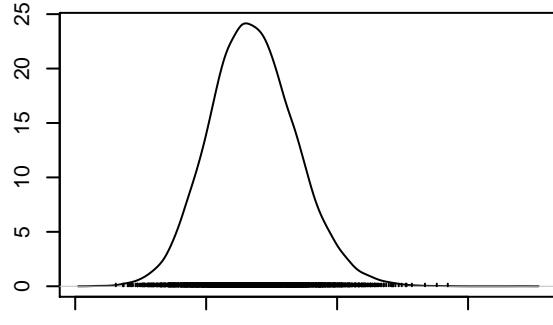
### Density plots

**Density of non\_white\_18\_30**



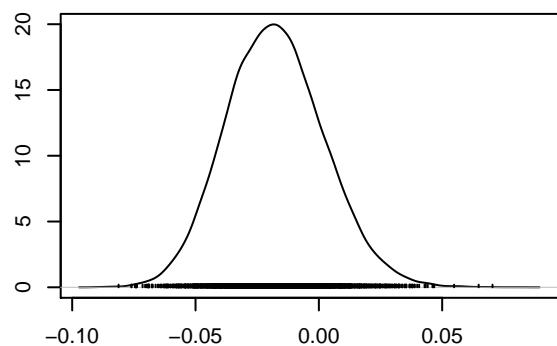
N = 4000 Bandwidth = 0.002582

**Density of non\_white\_30\_45**



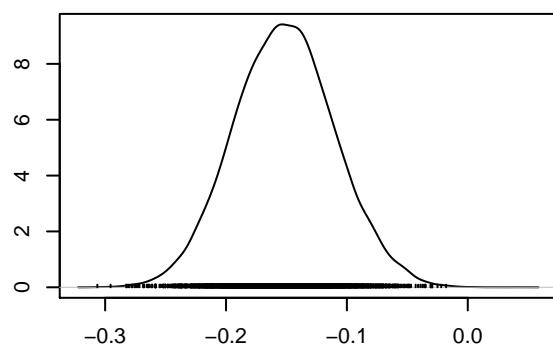
N = 4000 Bandwidth = 0.002095

**Density of non\_white\_45\_65**



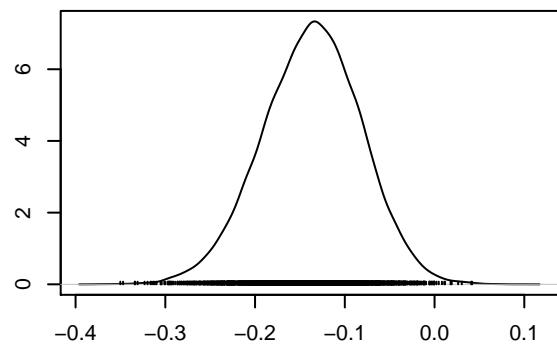
N = 4000 Bandwidth = 0.002527

**Density of non\_white\_65\_75**



N = 4000 Bandwidth = 0.005298

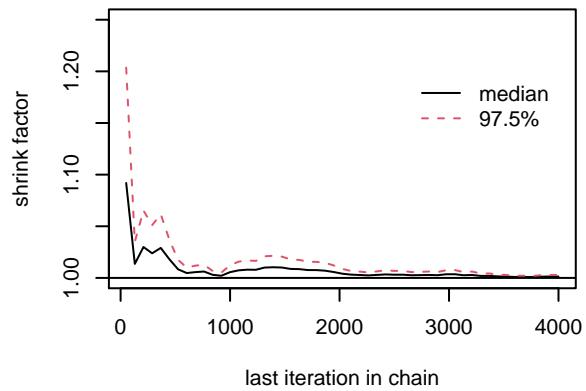
**Density of non\_white\_75**



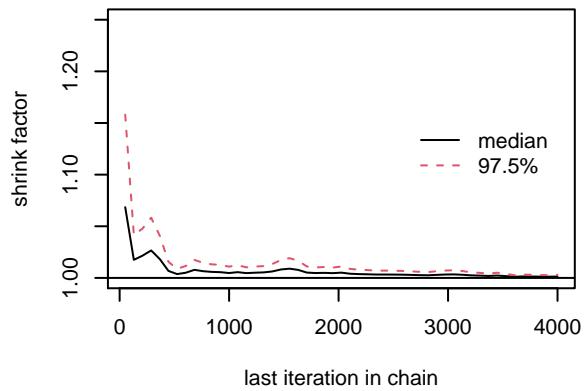
N = 4000 Bandwidth = 0.007017

### Gelman Diagnostic

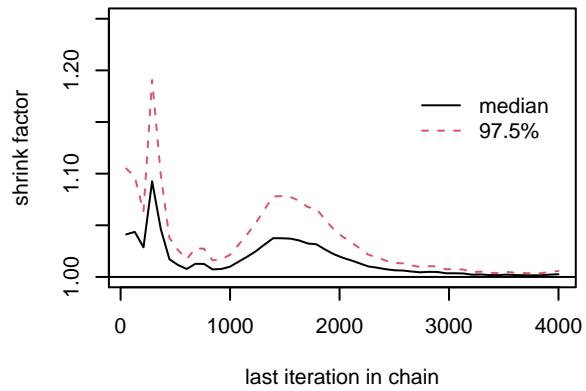
**non\_white\_18\_30**



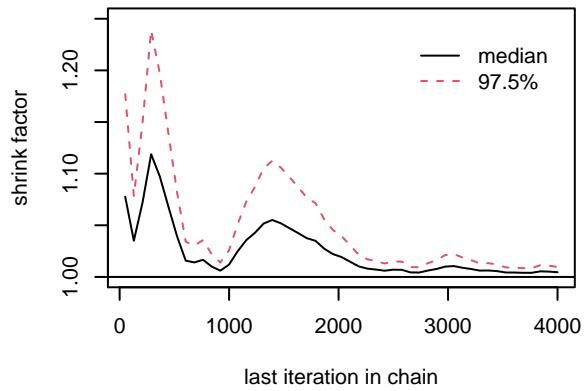
**non\_white\_30\_45**



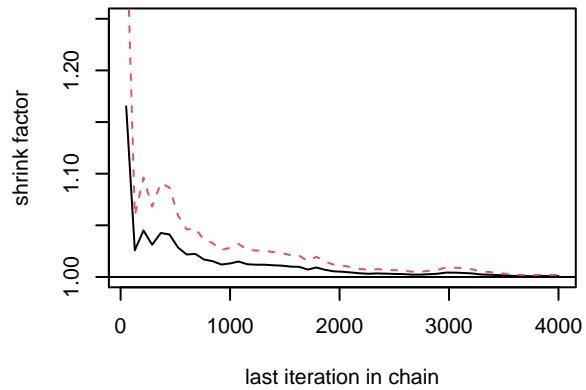
**non\_white\_45\_65**



**non\_white\_65\_75**

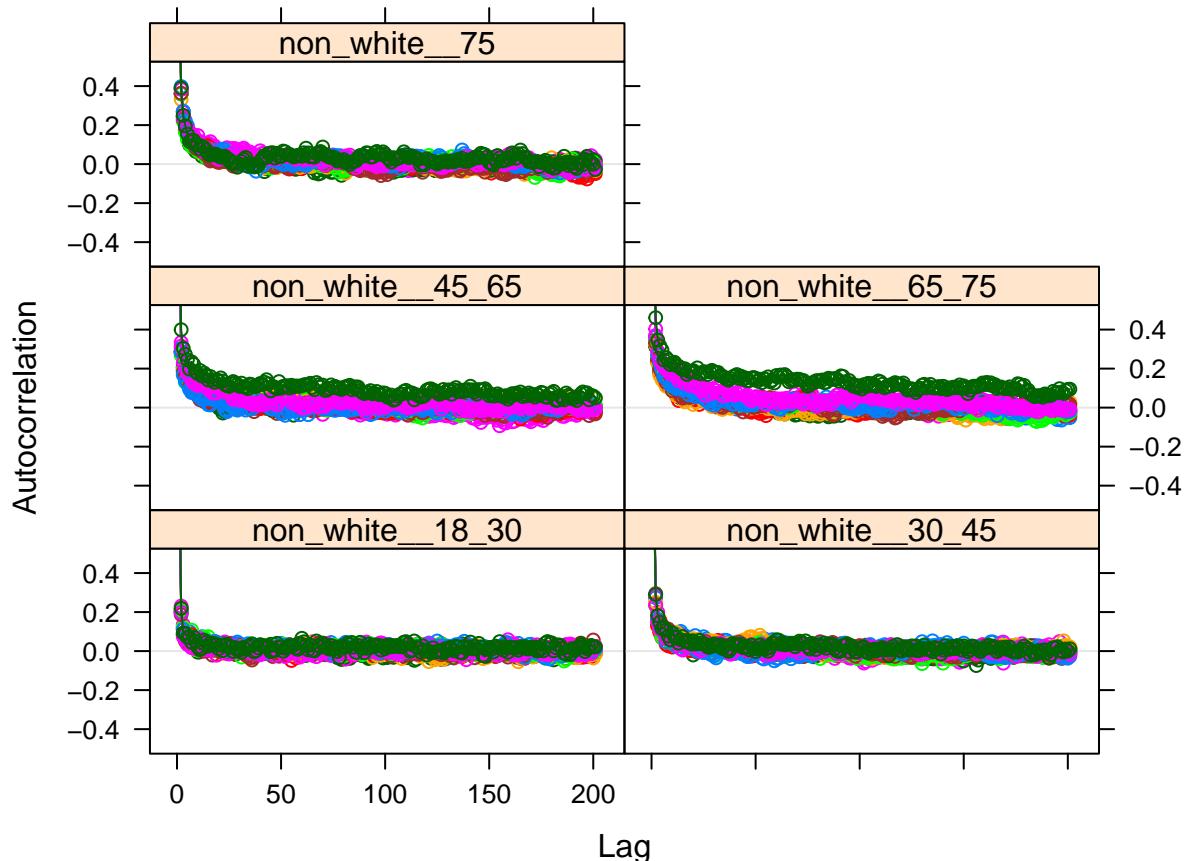


**non\_white\_75**



Autocorrelation plots

**plot: Round 3 Spike PD between non-whites and whites within age groups**



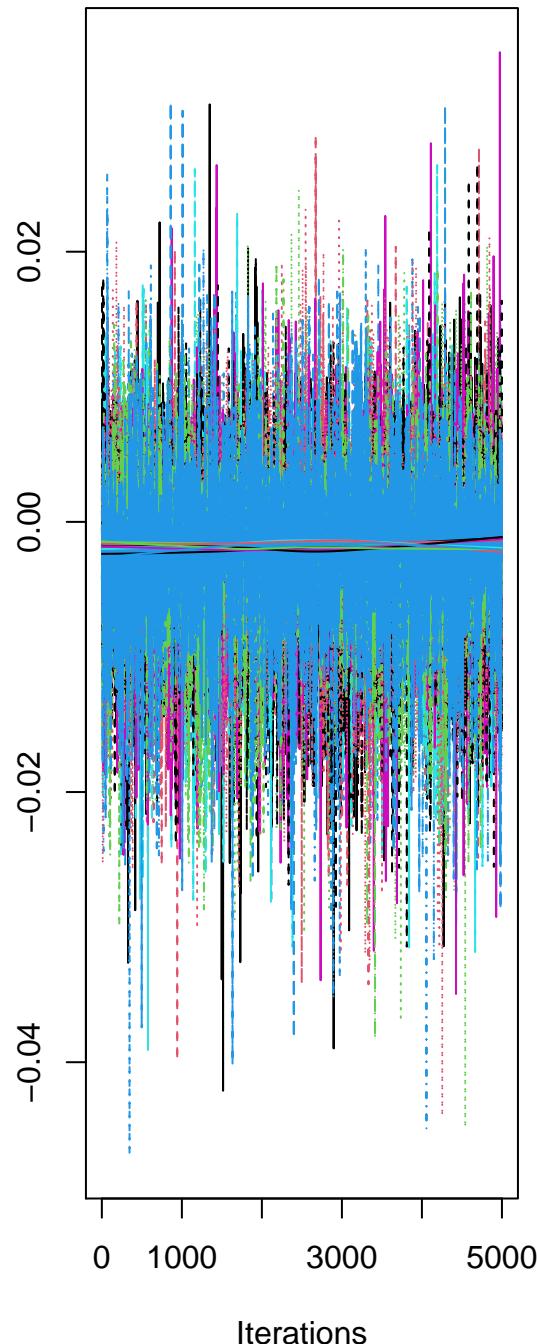
**Table 7**  
**Antibody prevalence and mitigation**  
**Effective Sample Size**

Table 6: Effective Sample Size: Antibody prev Mitigation

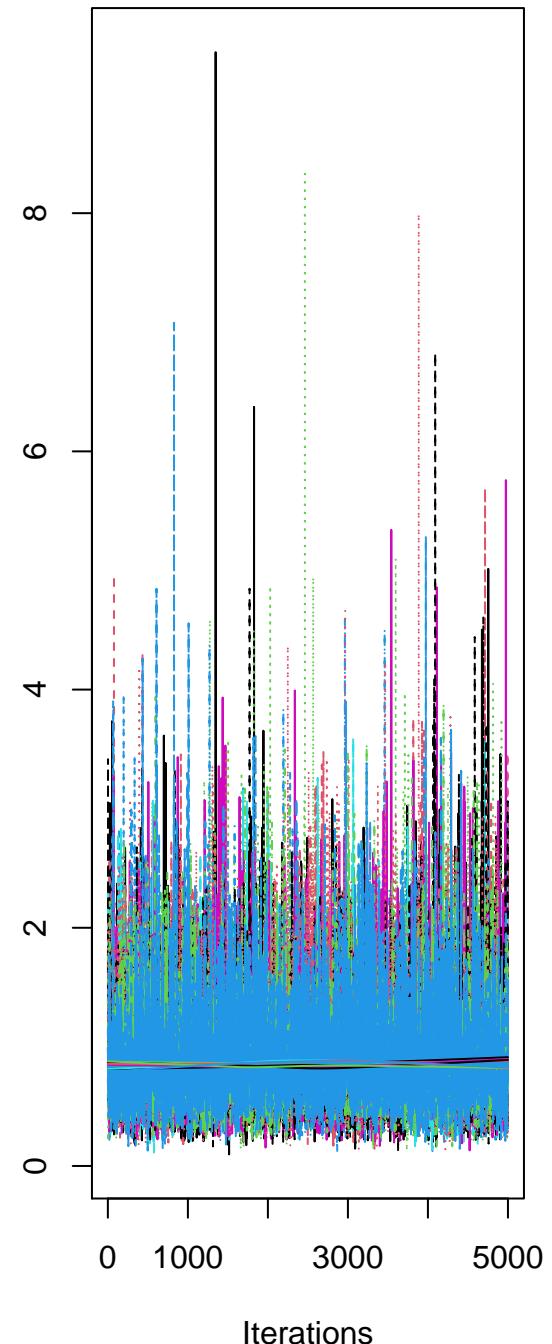
Round	Prev..Diff	Prev..Ratio
Round 1	14248	16276
Round 2	8120	10151
Round 3	13358	14106

Trace plots

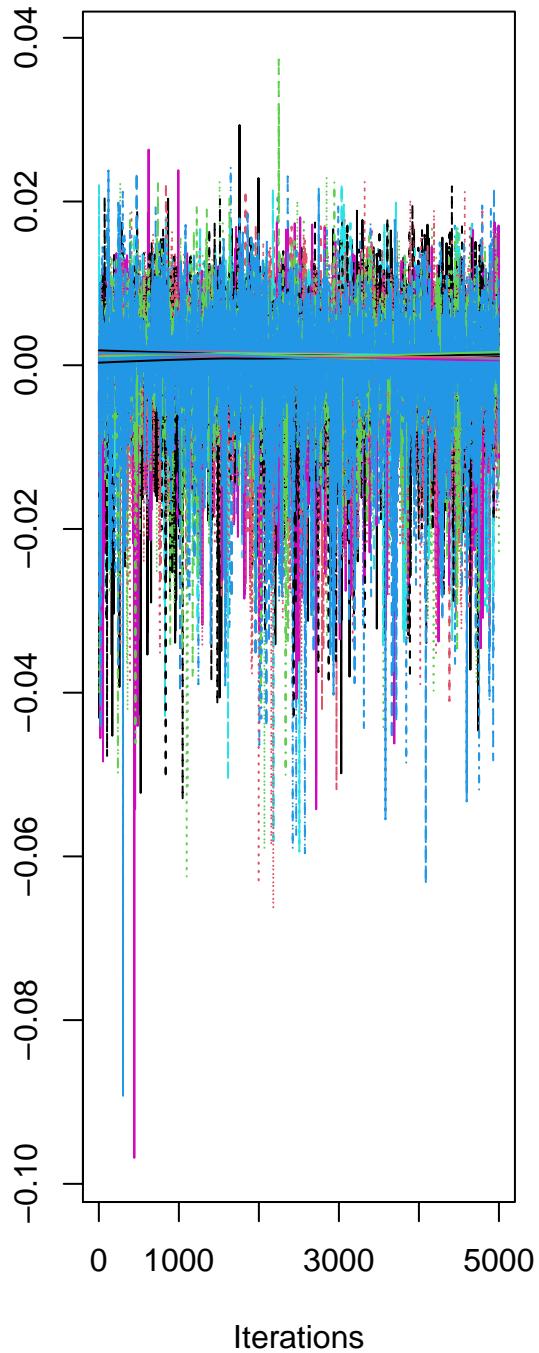
**Round 1**  
Trace of p\_avg\_mit\_PD



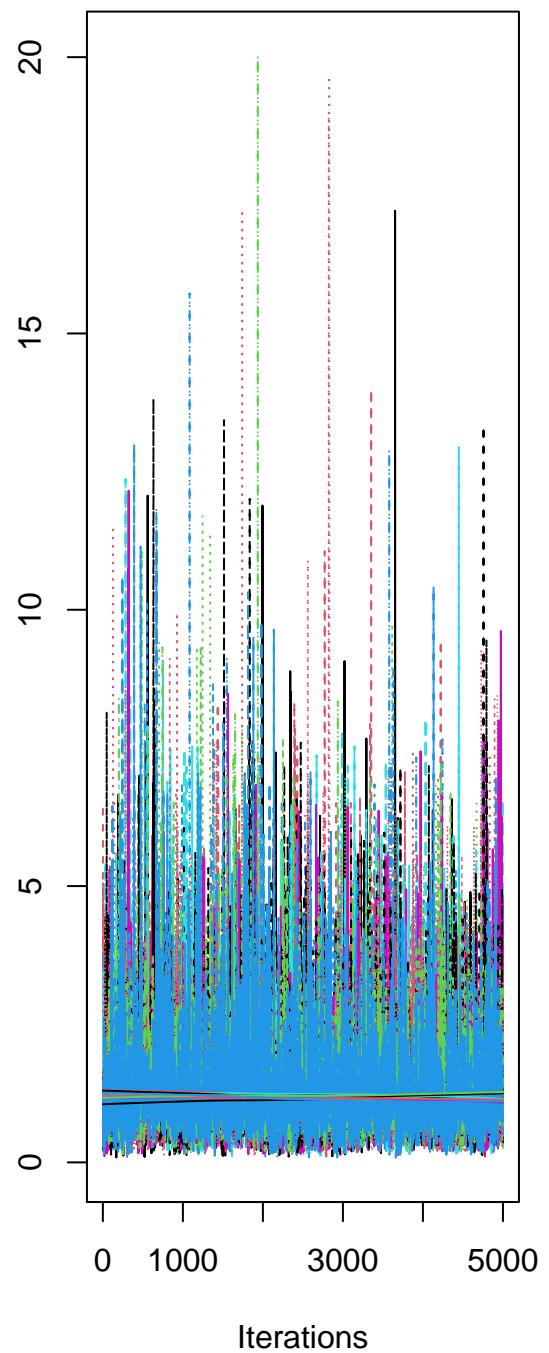
Trace of p\_avg\_mit\_PR



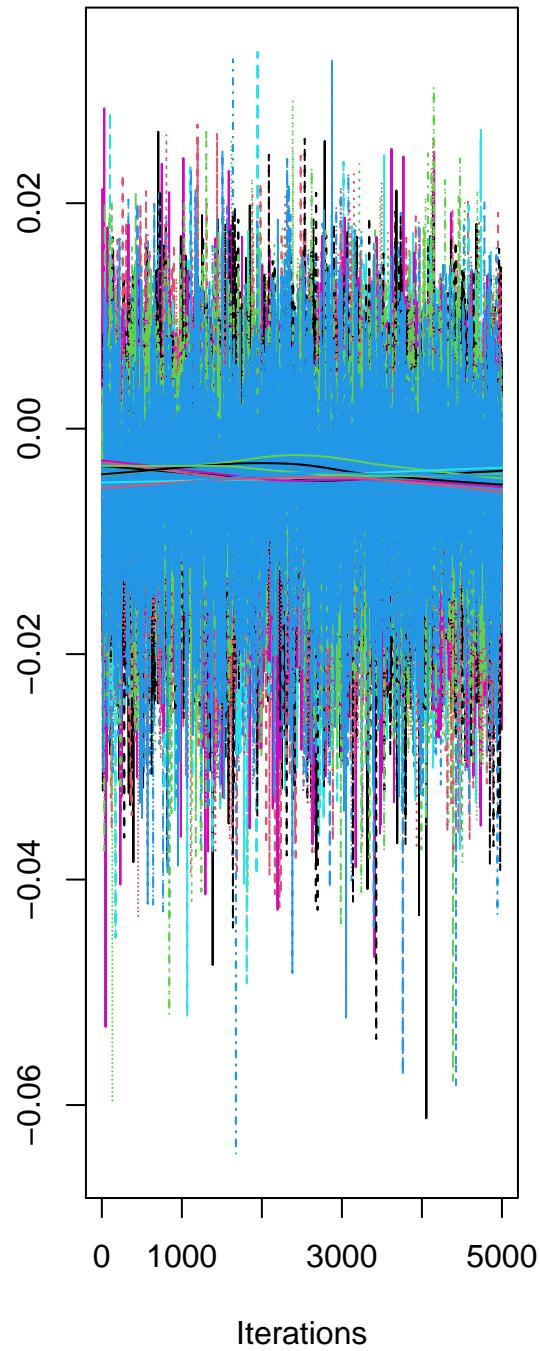
**Round 2**  
**Trace of p\_avg\_mit\_PD**



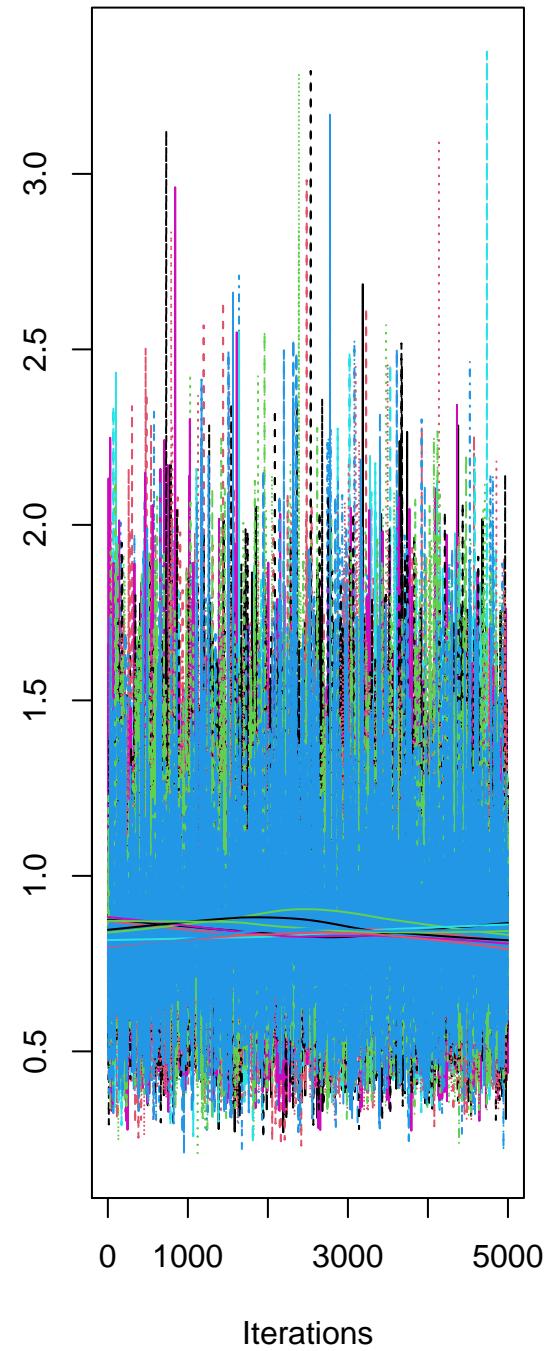
**Trace of p\_avg\_mit\_PR**



**Round 3**  
**Trace of p\_avg\_mit\_PD**



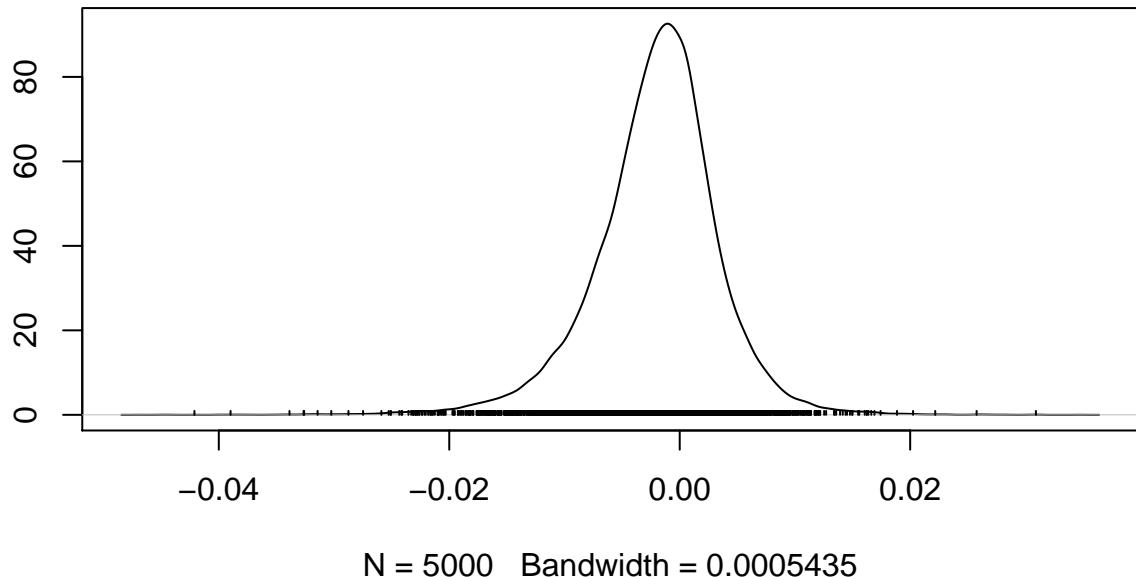
**Trace of p\_avg\_mit\_PR**



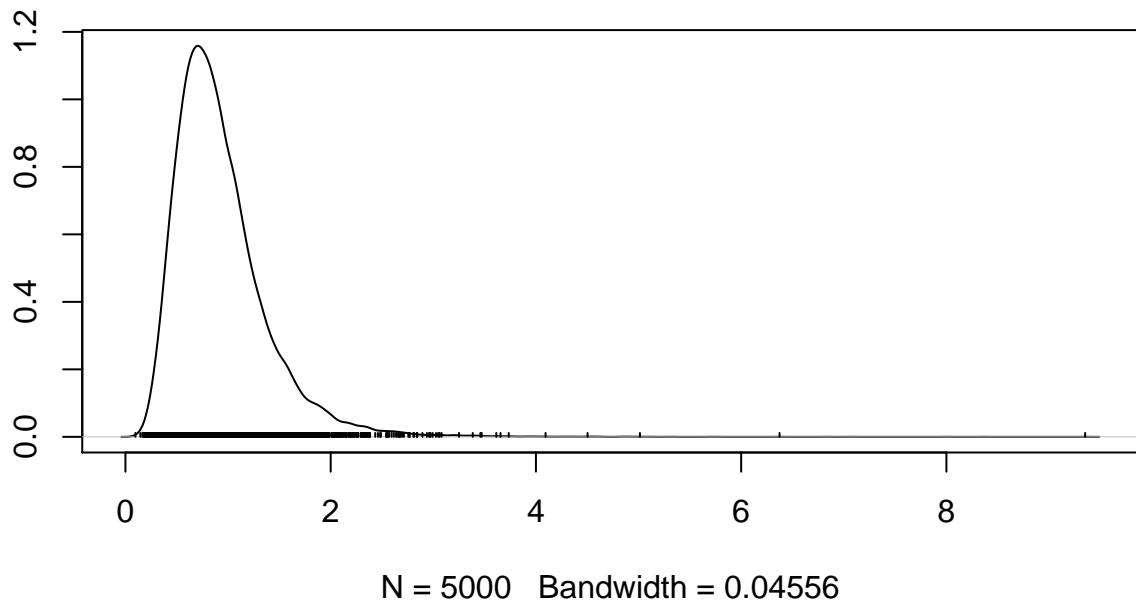
Density plots

**Round 1**

**Density of p\_avg\_mit\_PD**

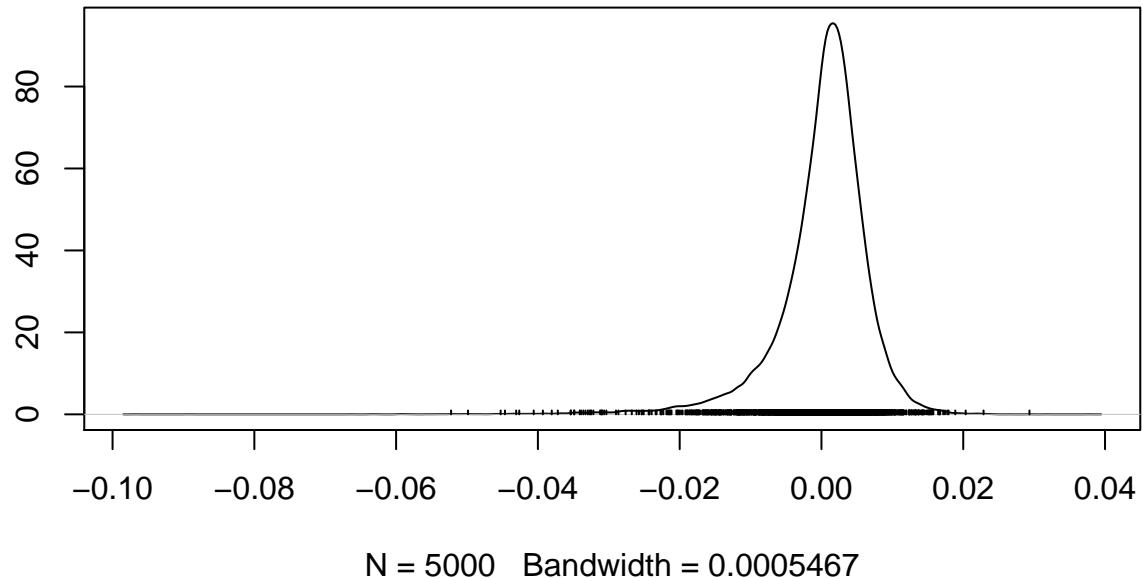


**Density of p\_avg\_mit\_PR**

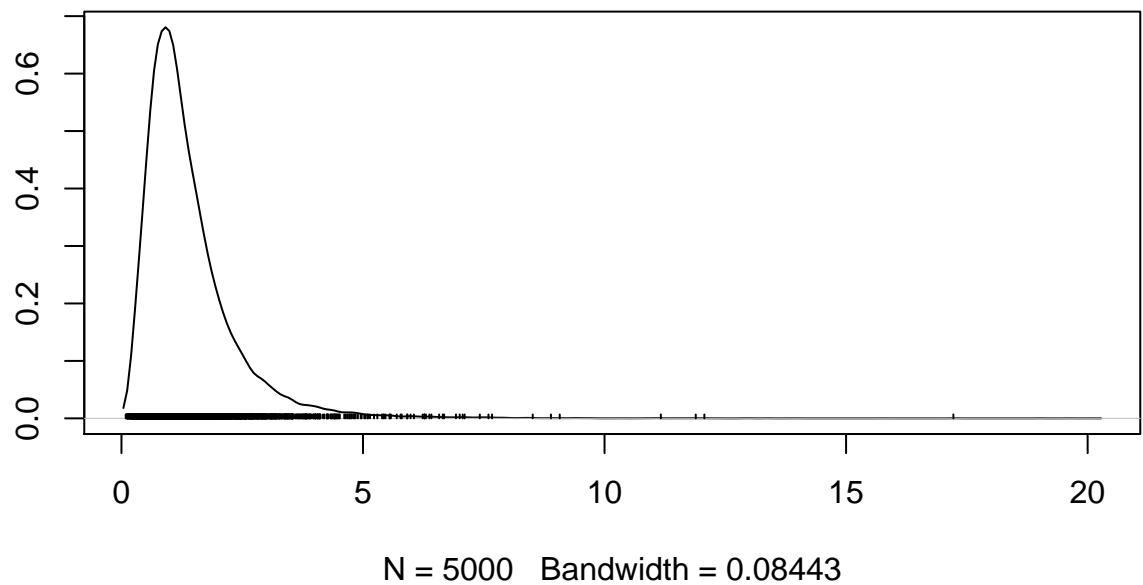


## Round 2

**Density of p\_avg\_mit\_PD**

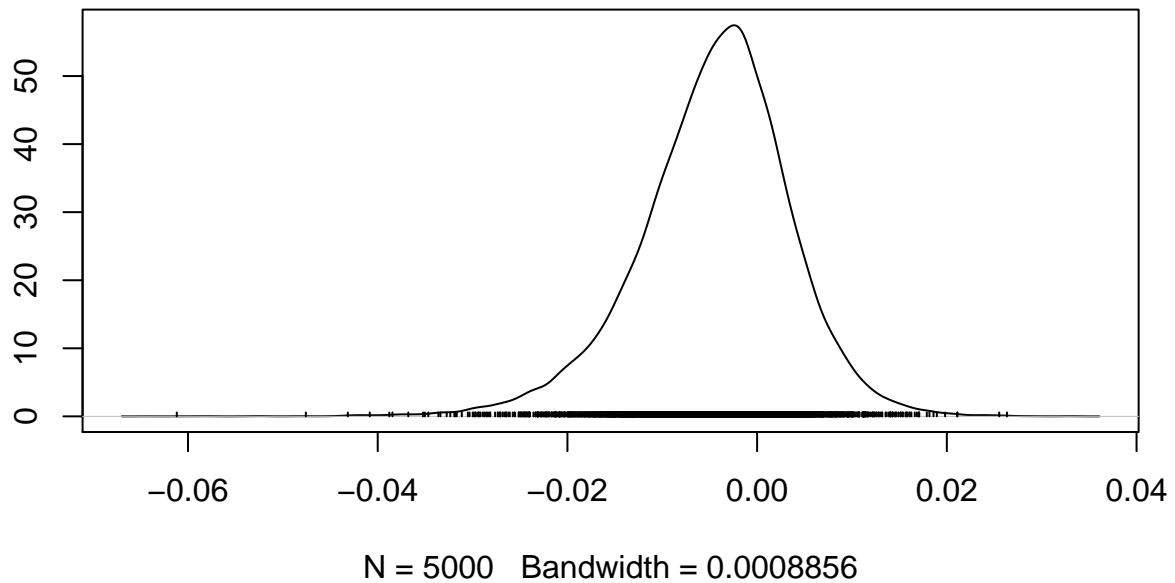


**Density of p\_avg\_mit\_PR**

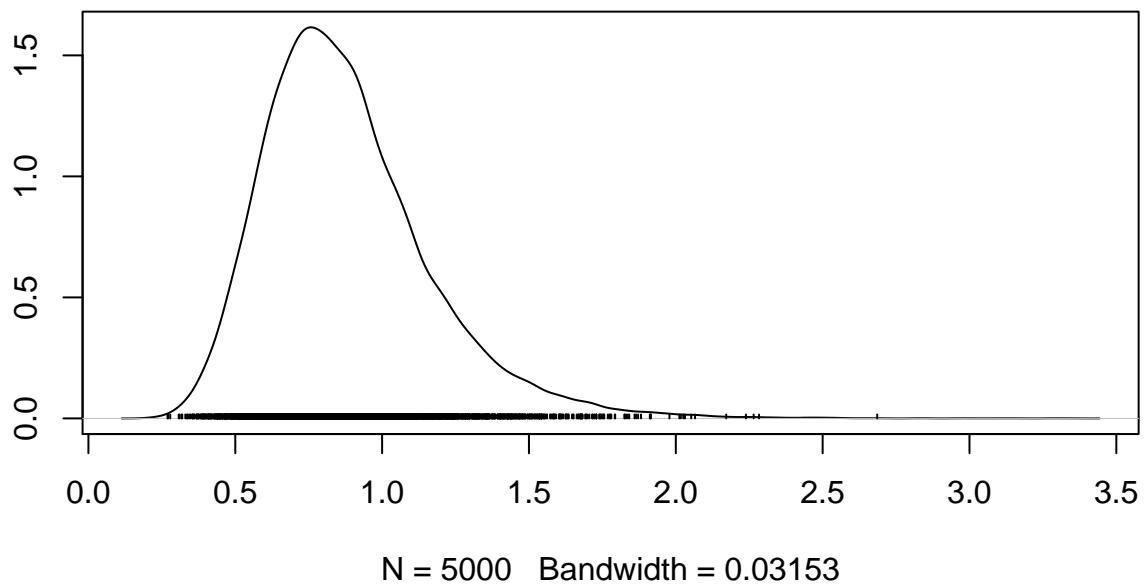


## Round 3

Density of p\_avg\_mit\_PD

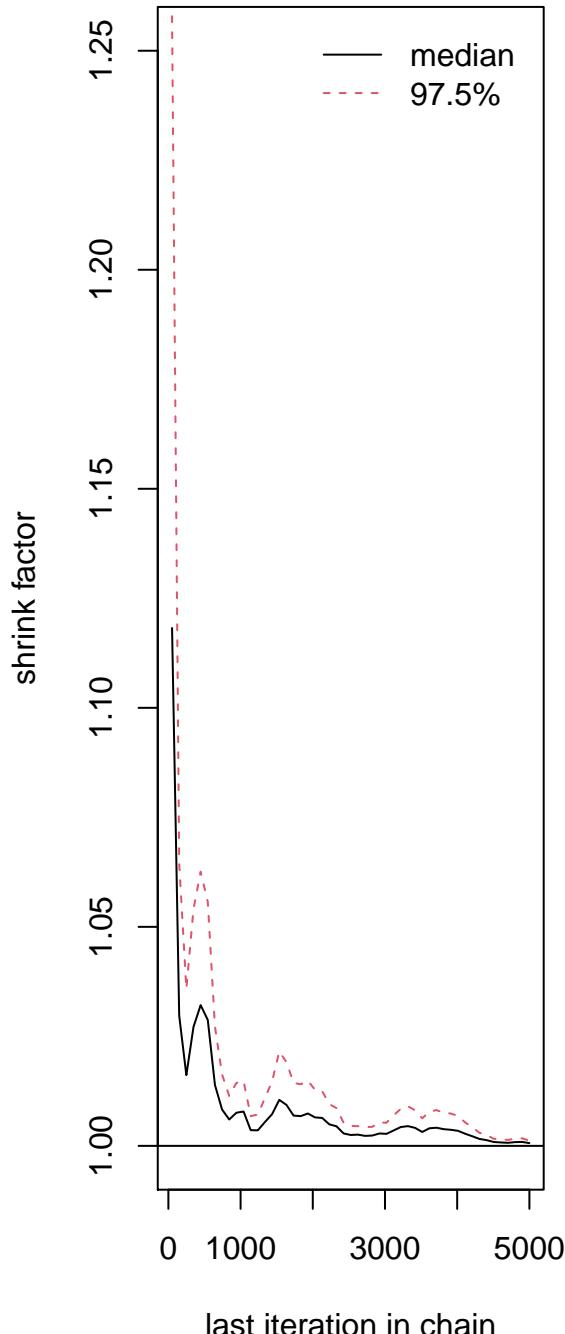


Density of p\_avg\_mit\_PR

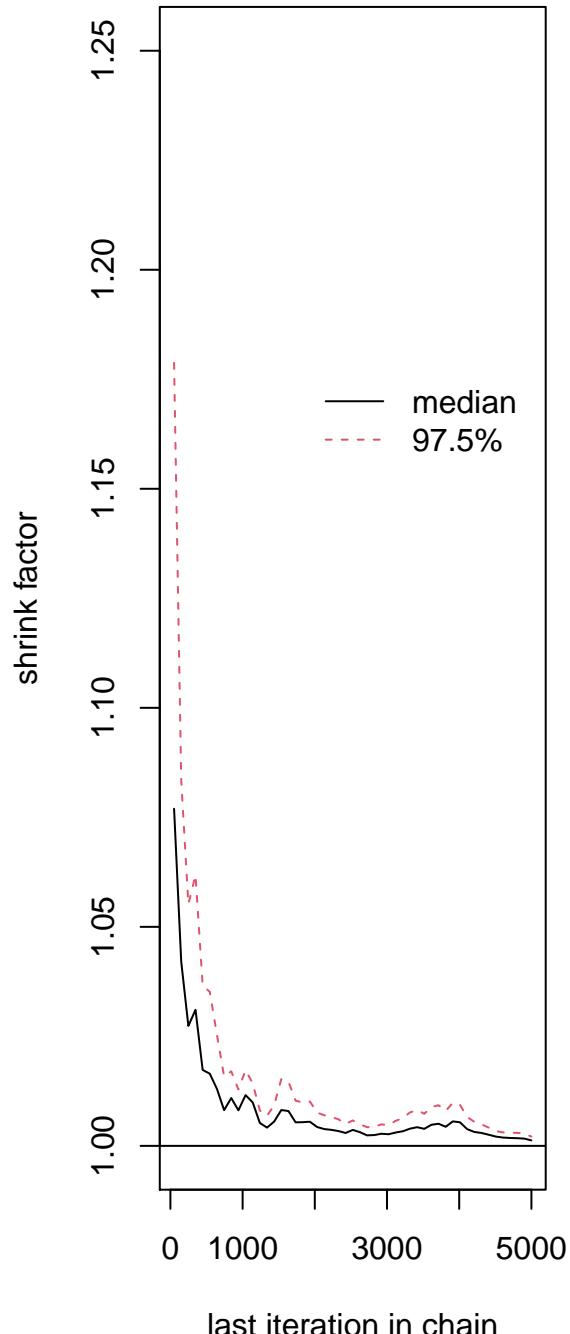


Gelman Diagnostic

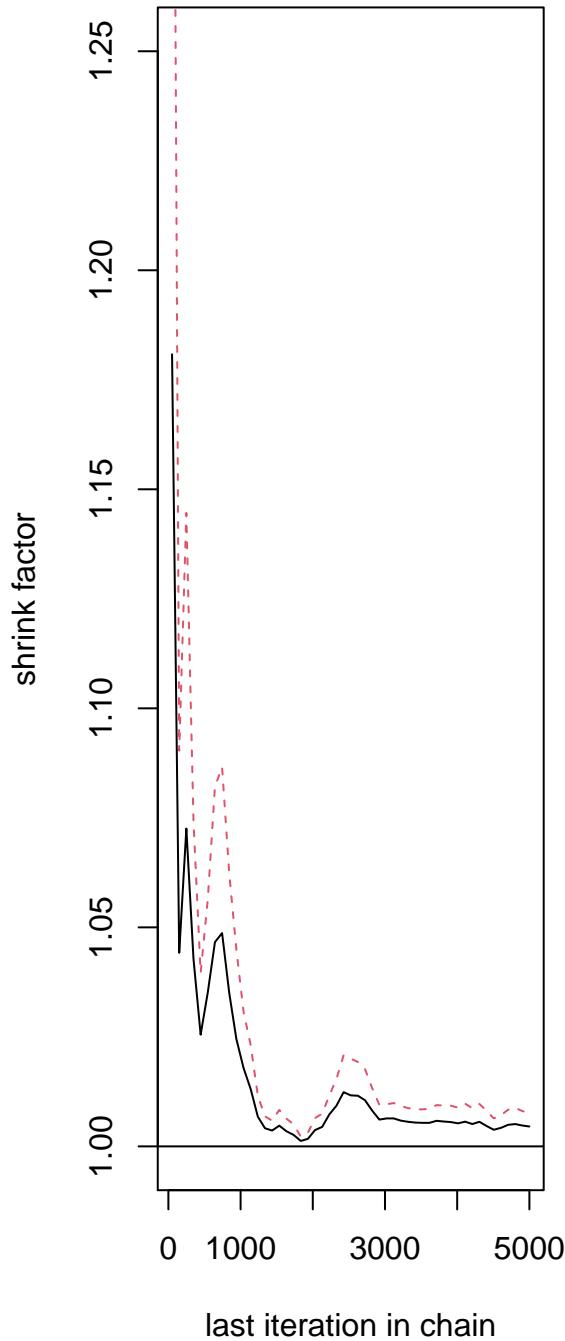
**Round 1**  
**p\_avg\_mit\_PD**



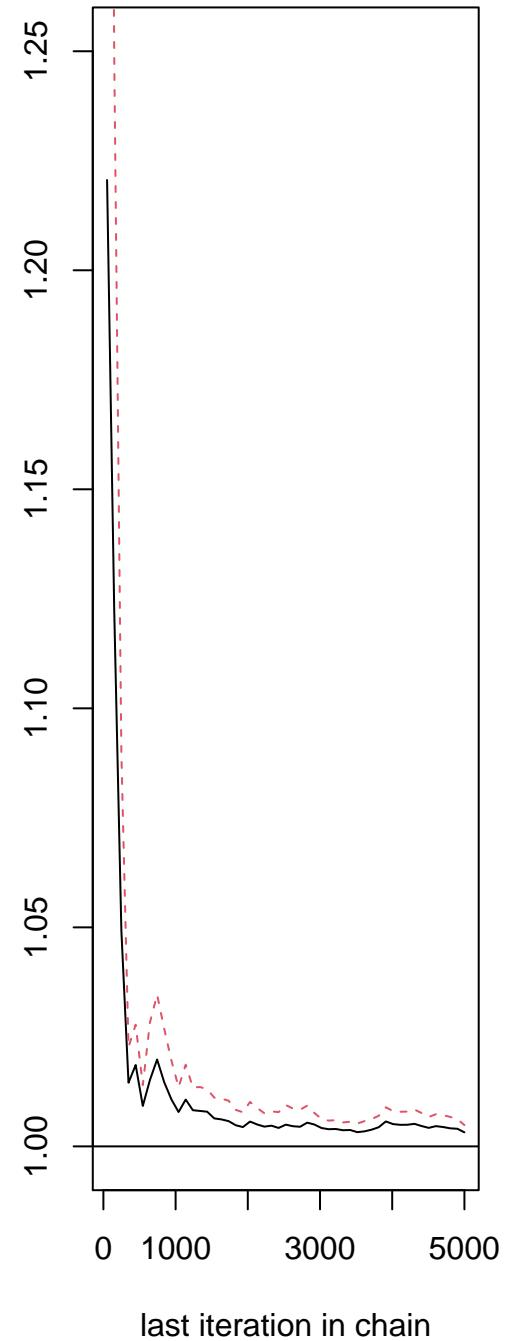
**p\_avg\_mit\_PR**



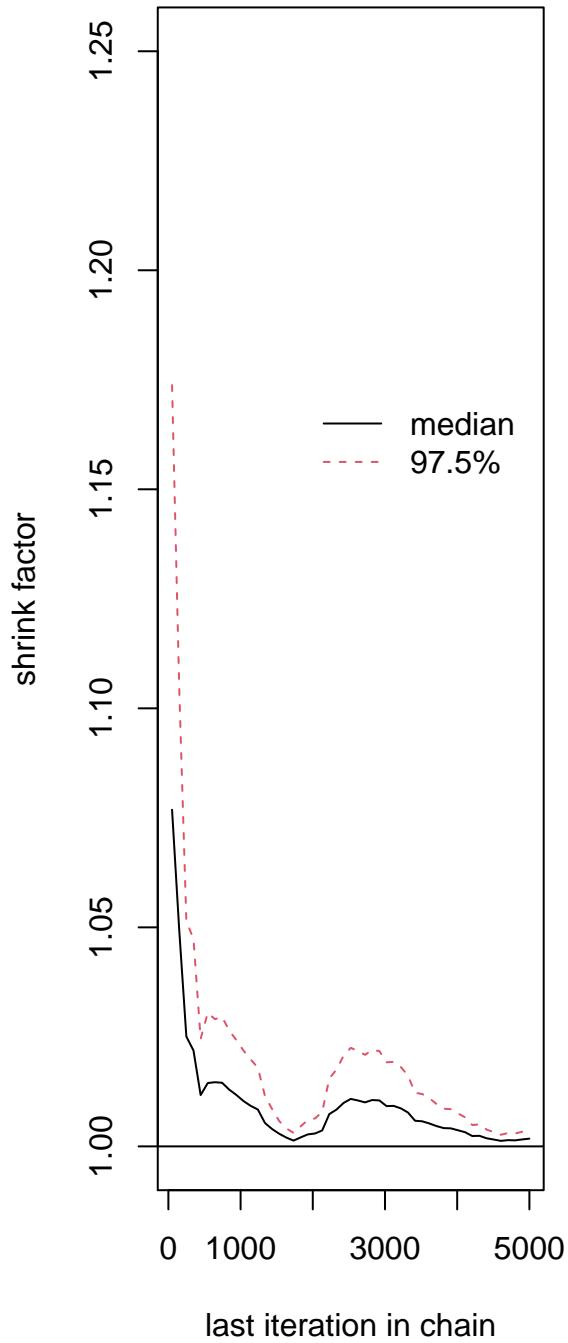
**Round 1**  
**p\_avg\_mit\_PD**



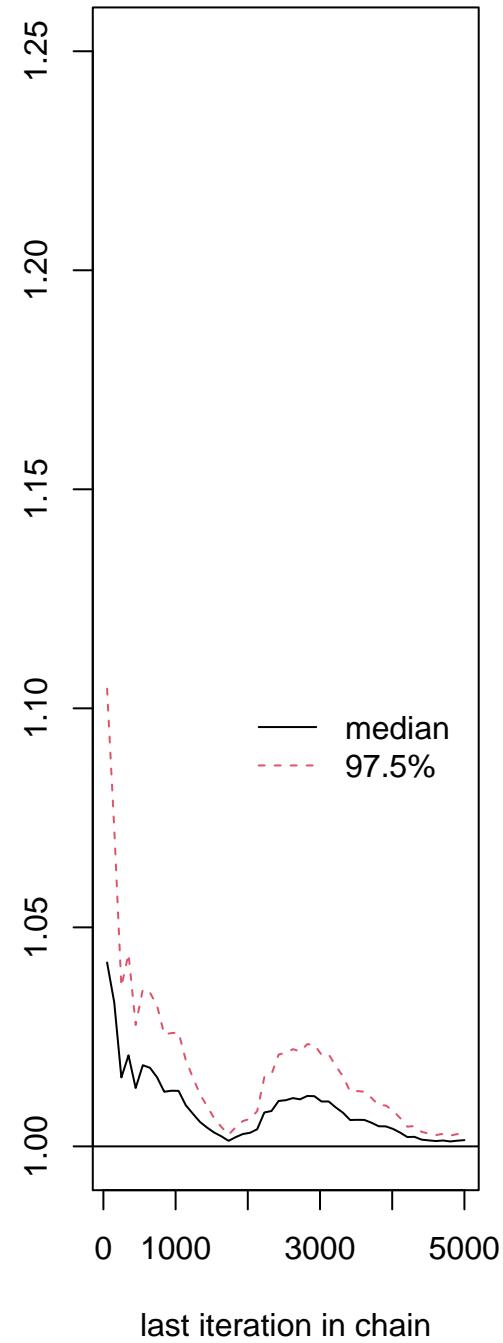
**p\_avg\_mit\_PR**



**Round 1**  
**p\_avg\_mit\_PD**

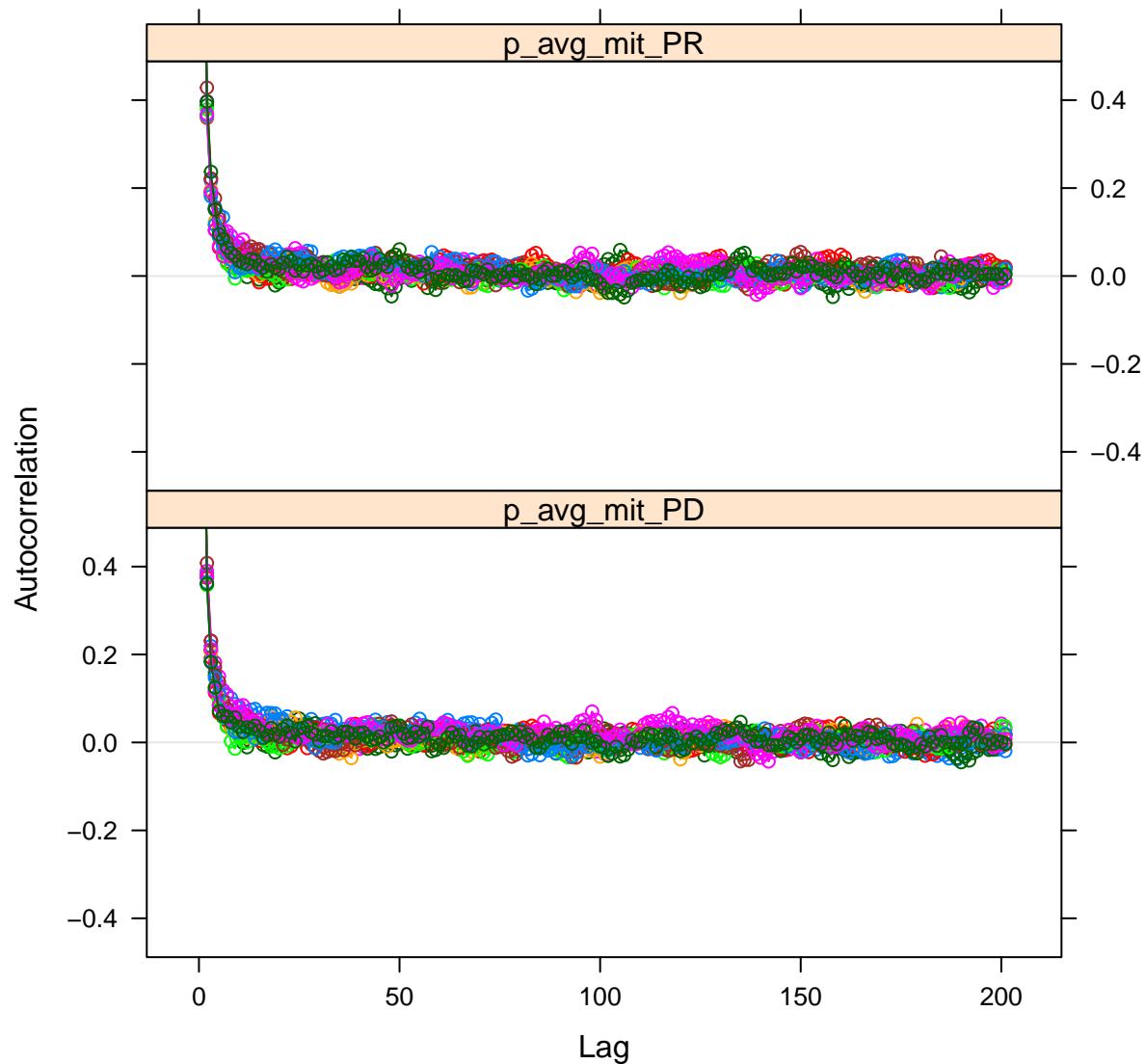


**p\_avg\_mit\_PR**

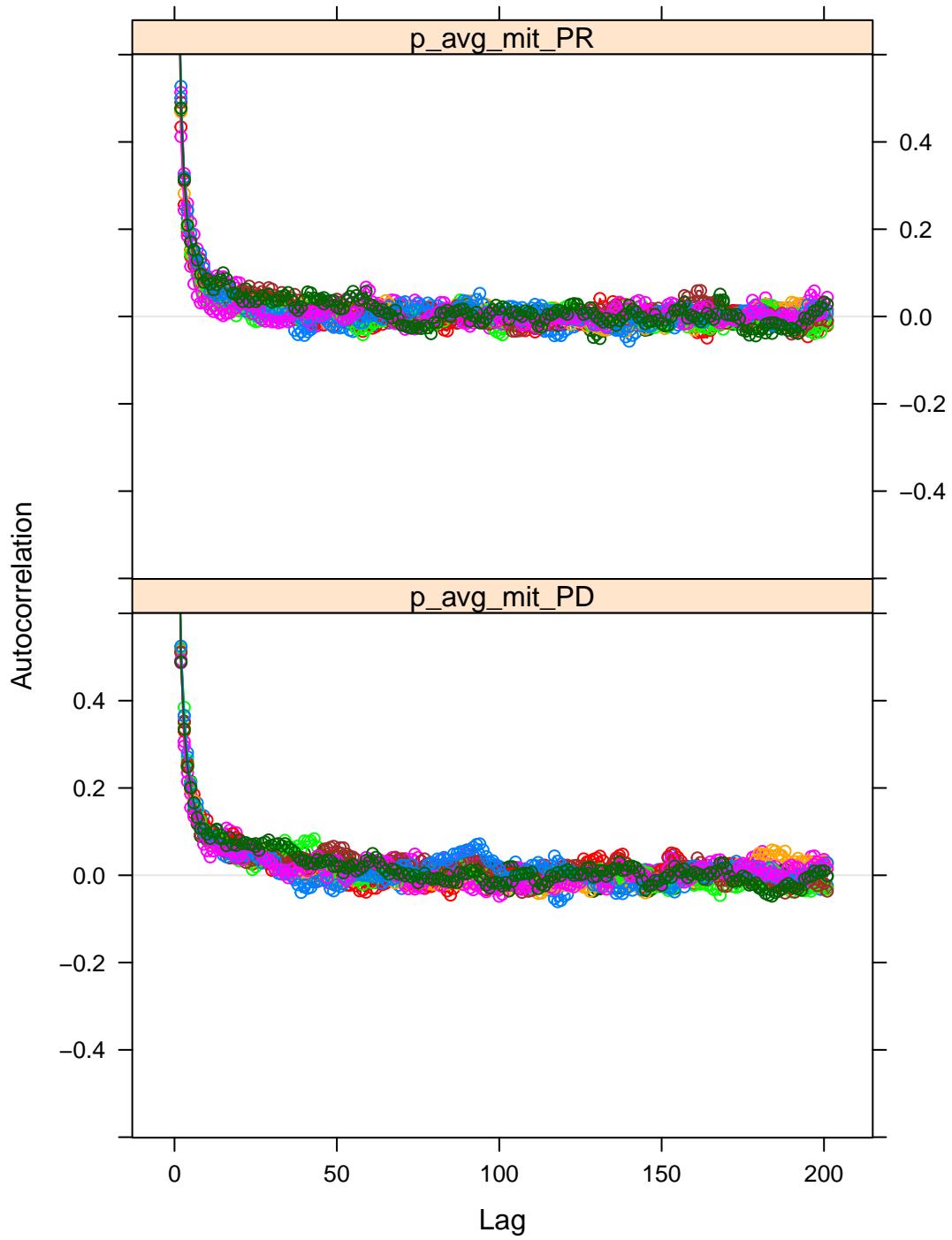


Autocorrelation plots

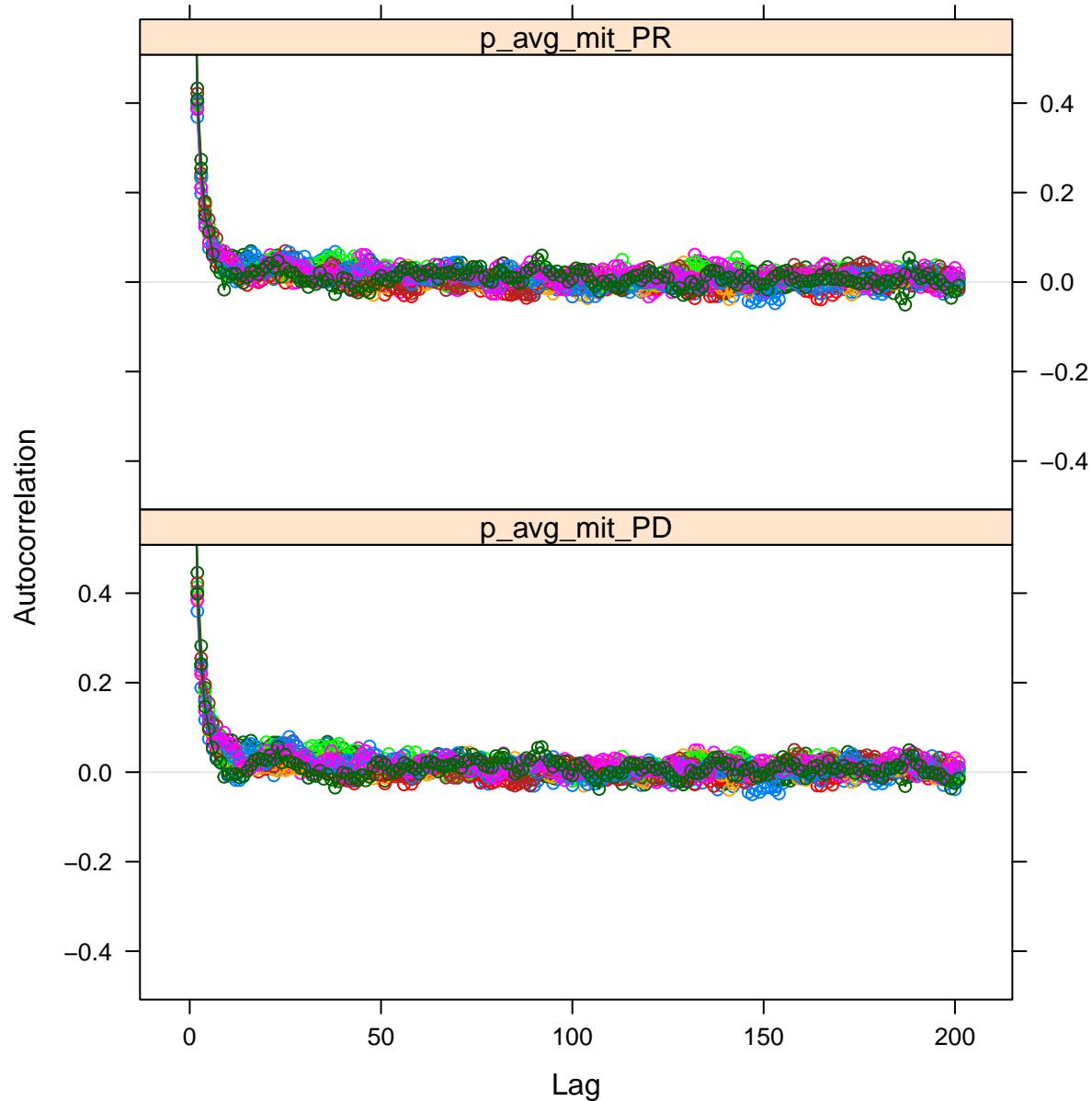
**ACF plot: Antibody prev ~ Mitigation – Round 1**



## ACF plot: Antibody prev ~ Mitigation – Round 2



### ACF plot: Antibody prev ~ Mitigation – Round 3



## Self-reported test positivity prevalence and mitigation

### Effective Sample Size

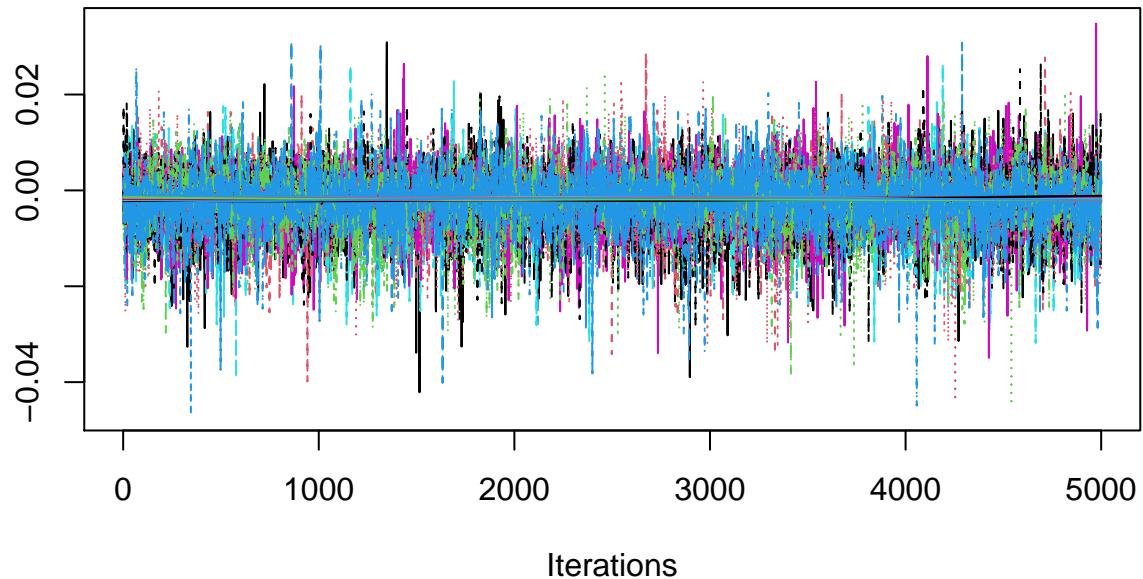
Table 7: Effective Sample Size: Antibody prev Mitigation

Round	Prev..Diff	Prev..Ratio
Round 1	14248	16276
Round 2	8120	10151
Round 3	13358	14106

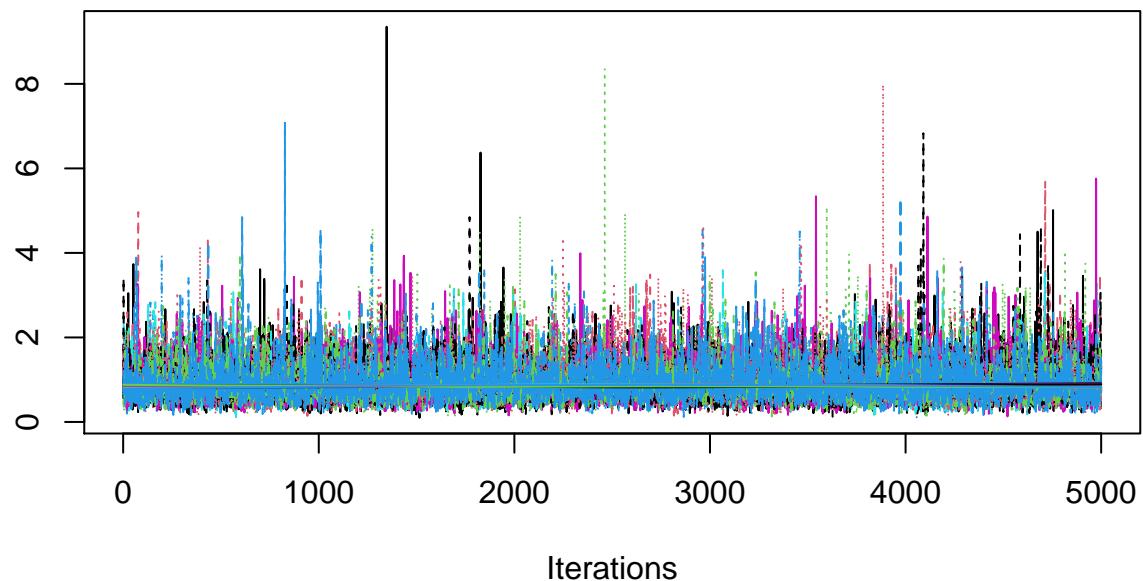
Trace plots

**Round 1**

**Trace of p\_avg\_mit\_PD**

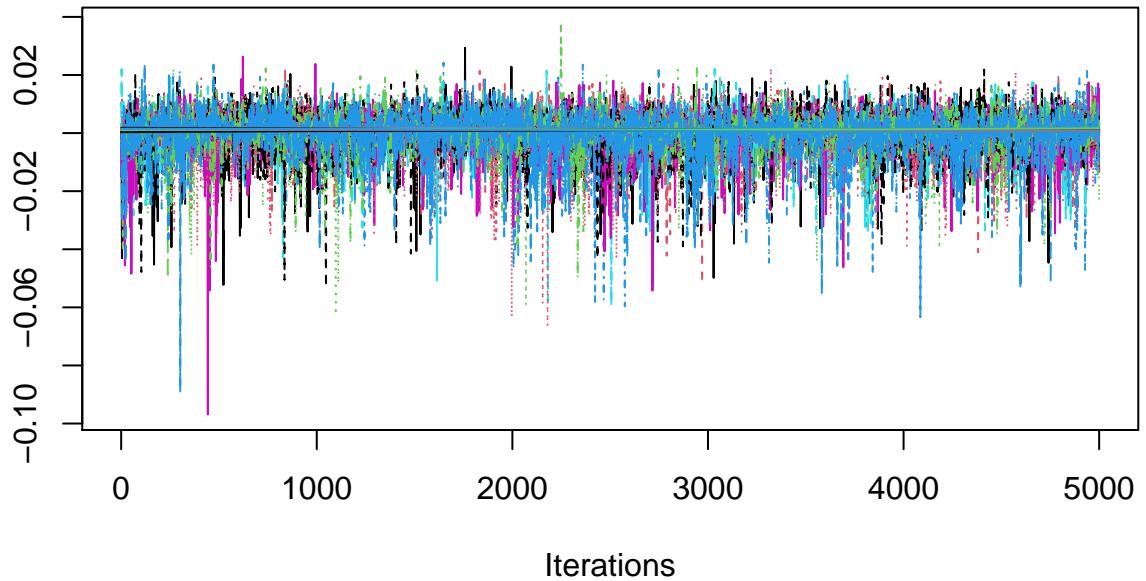


**Trace of p\_avg\_mit\_PR**

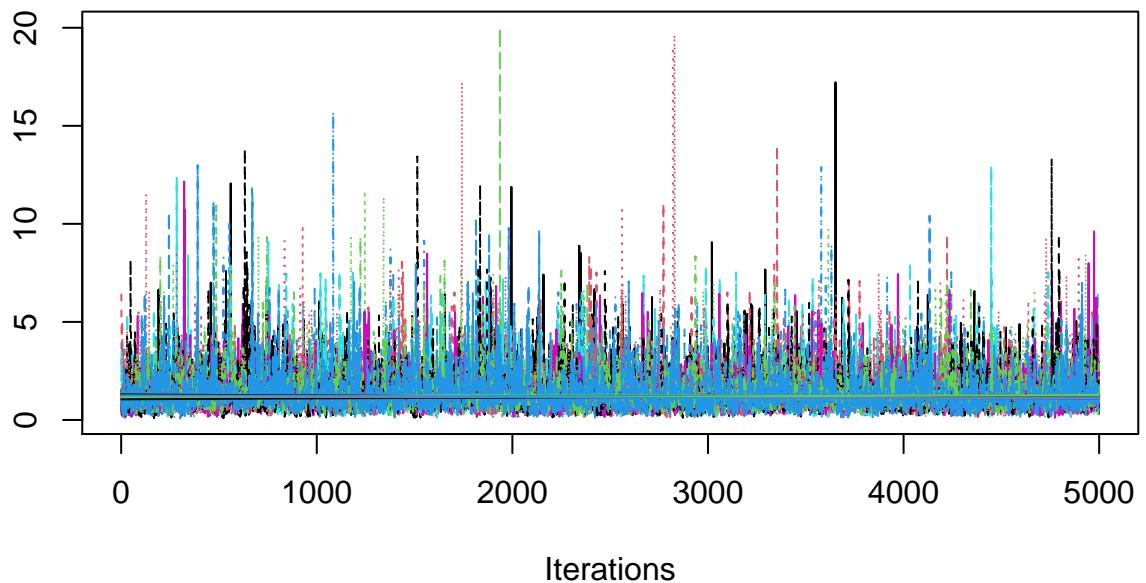


## Round 2

Trace of p\_avg\_mit\_PD

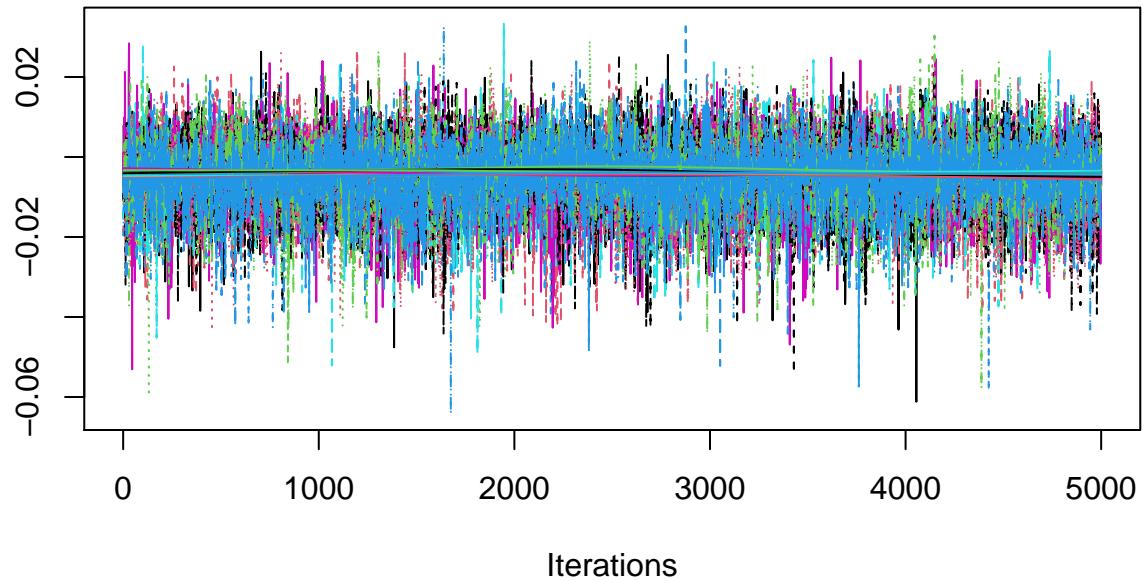


Trace of p\_avg\_mit\_PR

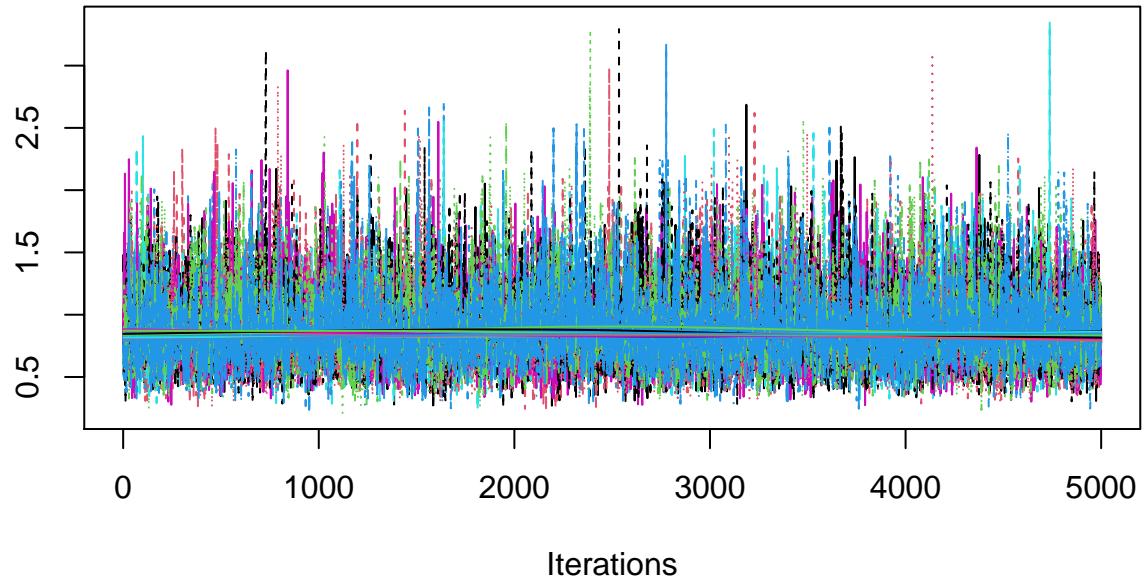


## Round 3

Trace of p\_avg\_mit\_PD



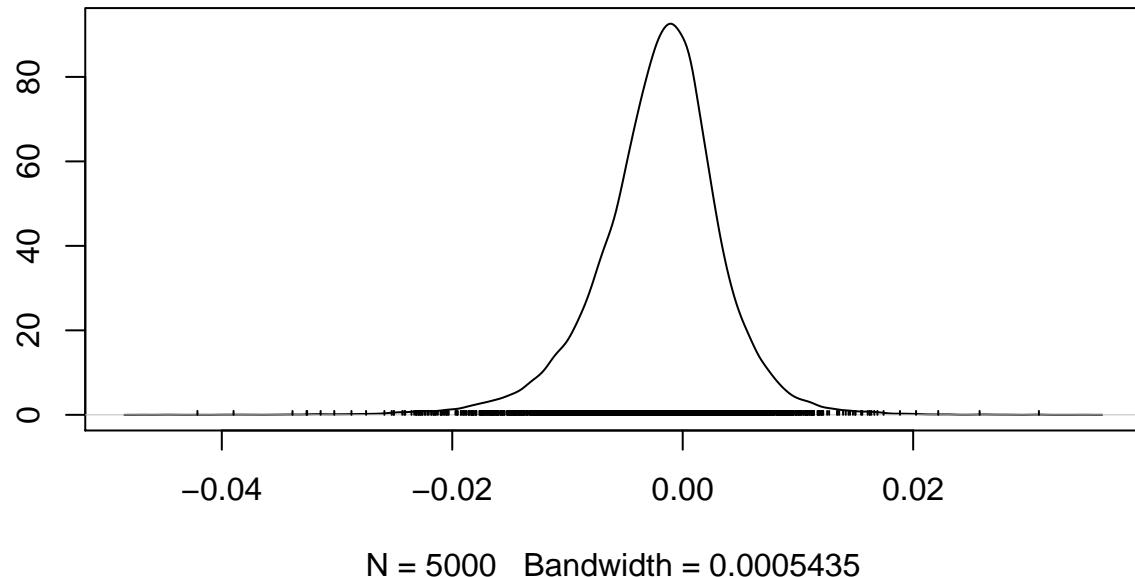
Trace of p\_avg\_mit\_PR



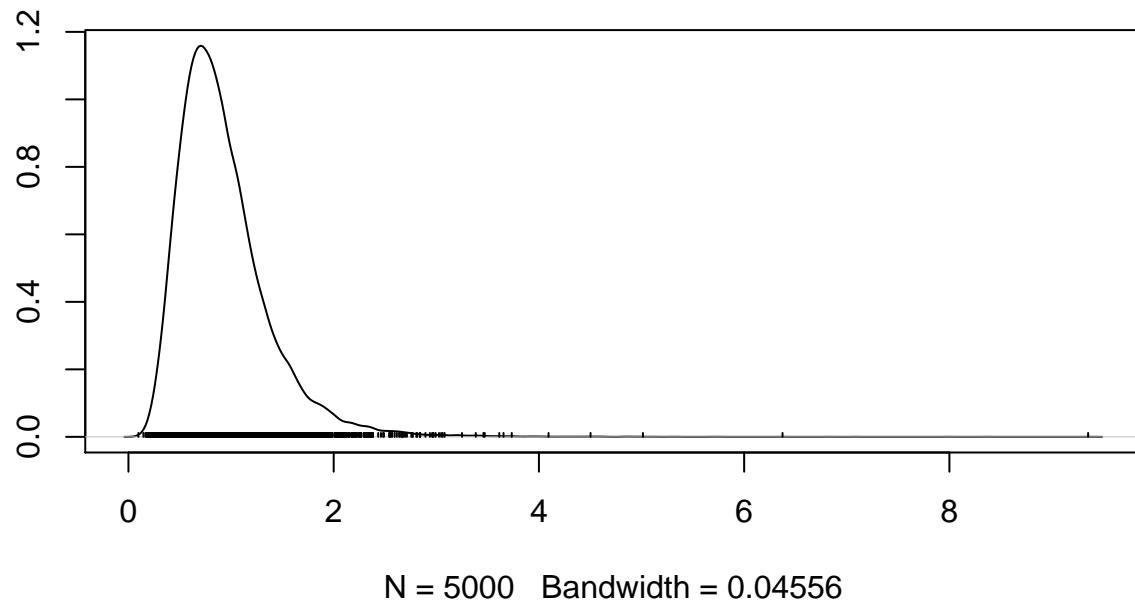
Density plots

**Round 1**

**Density of p\_avg\_mit\_PD**

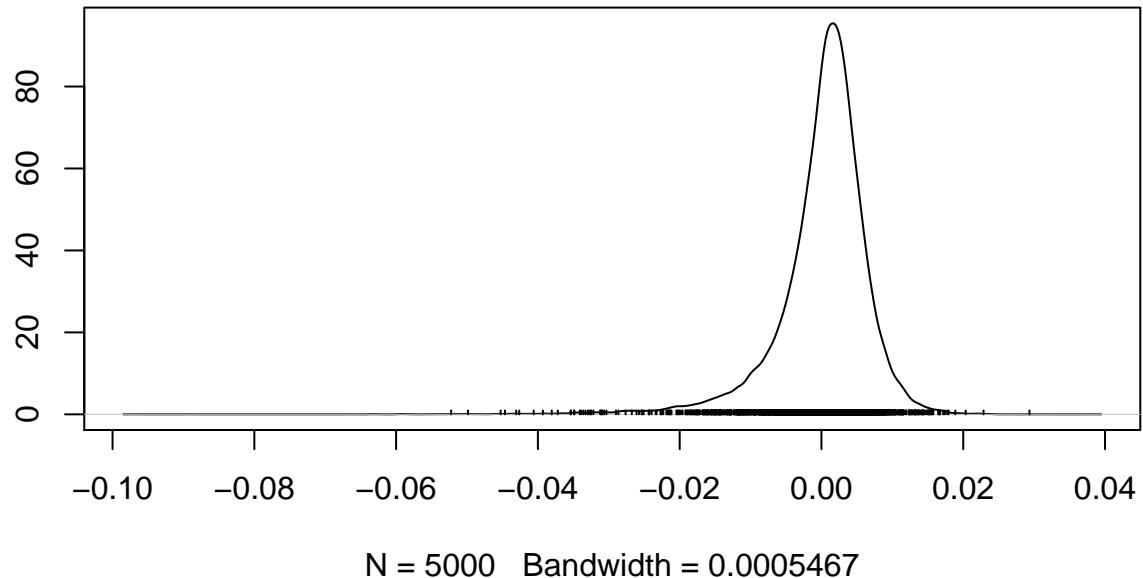


**Density of p\_avg\_mit\_PR**

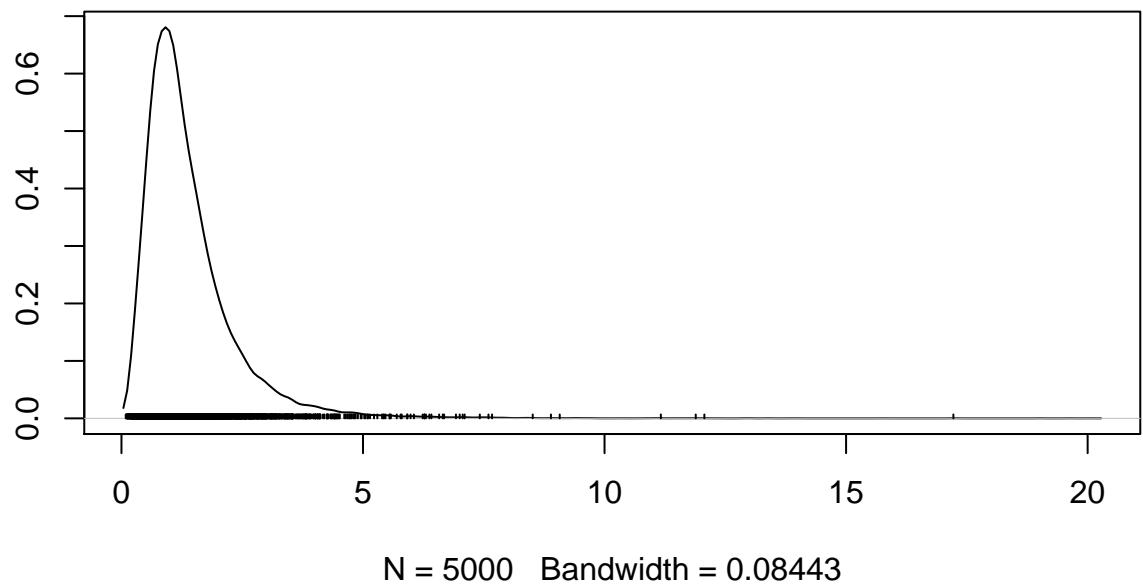


## Round 2

**Density of p\_avg\_mit\_PD**

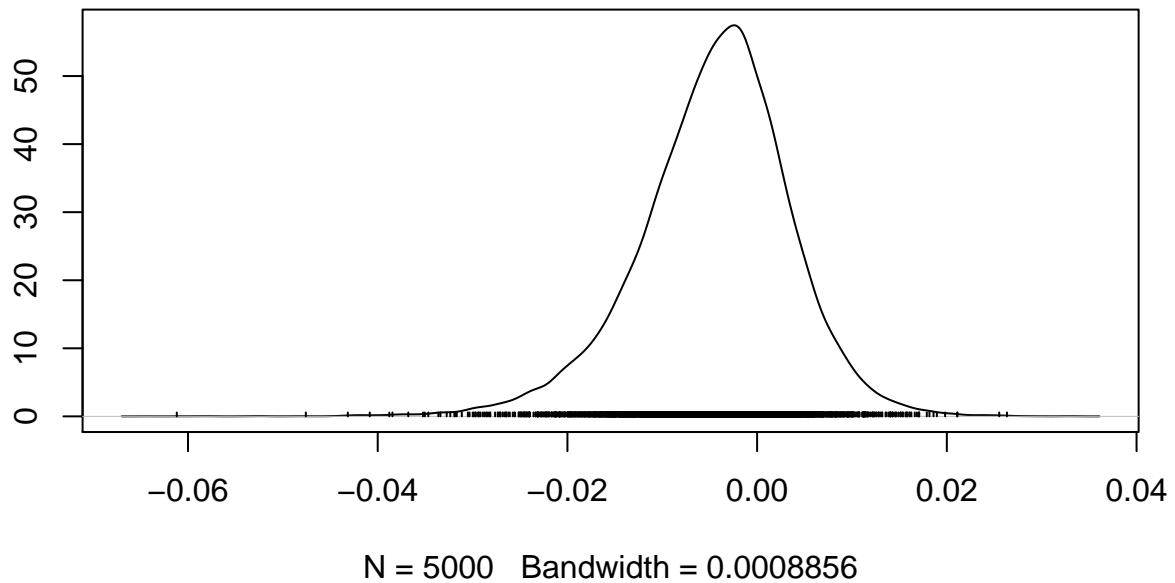


**Density of p\_avg\_mit\_PR**

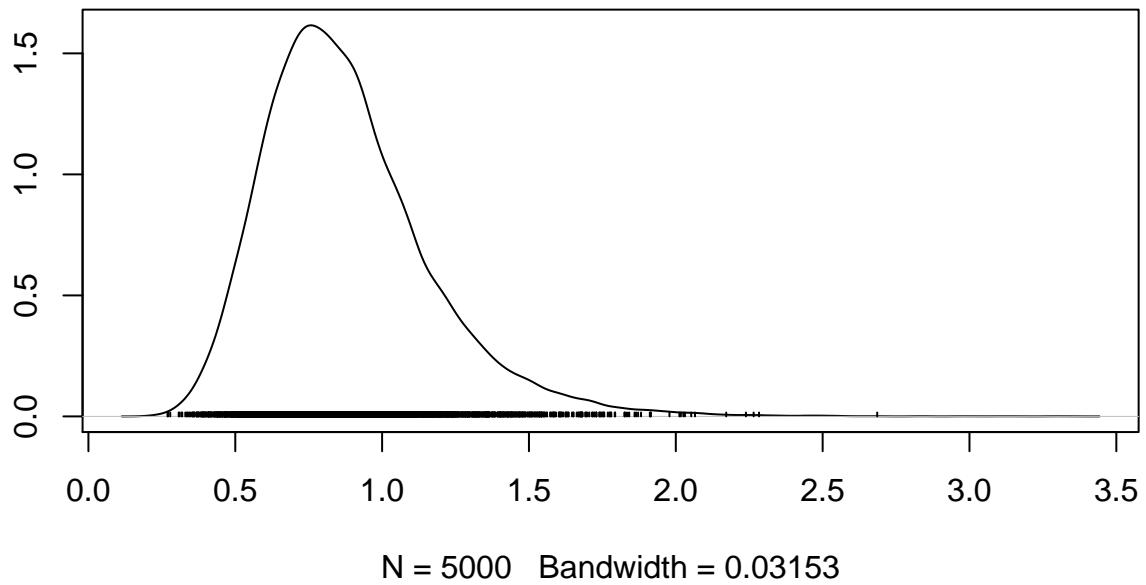


## Round 3

Density of p\_avg\_mit\_PD

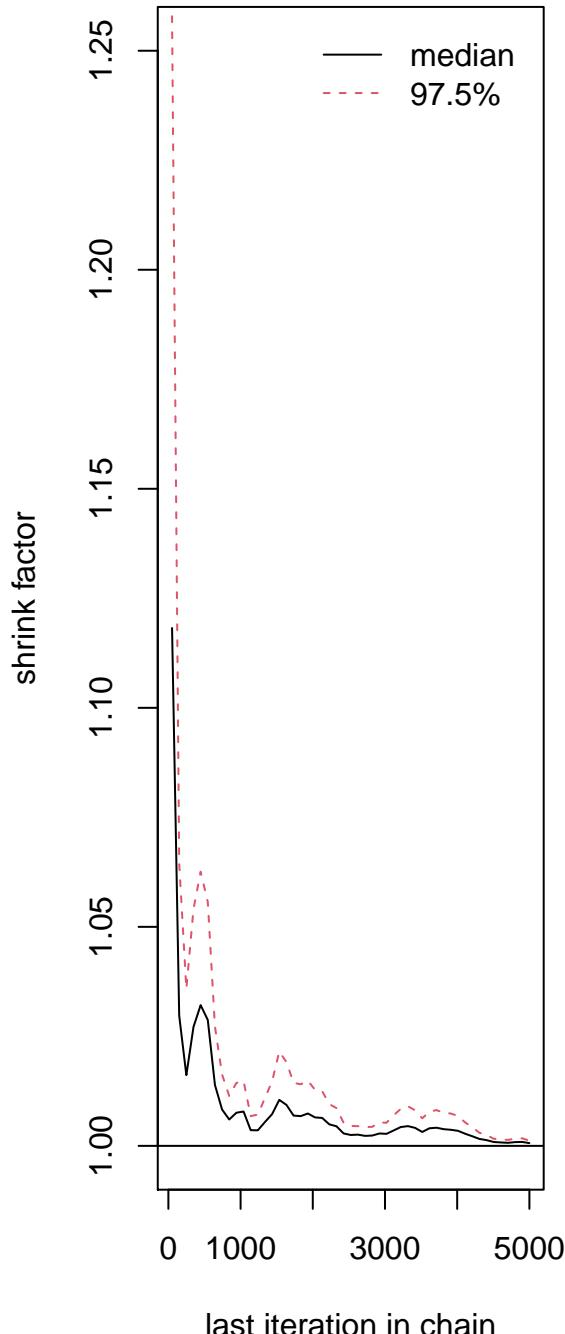


Density of p\_avg\_mit\_PR

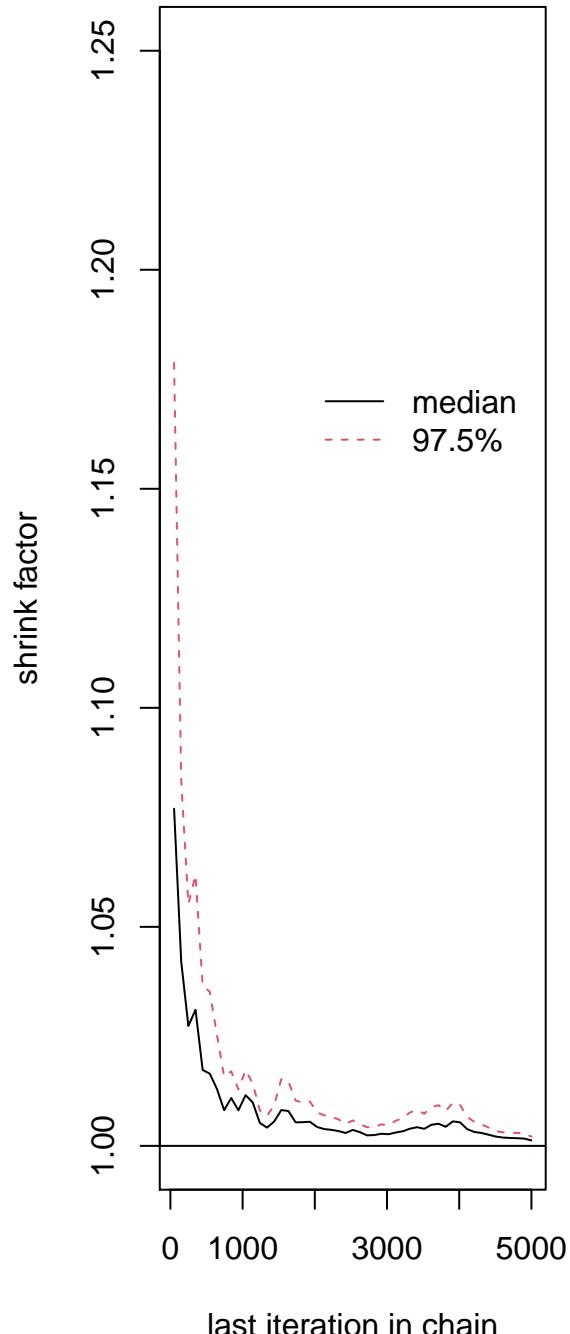


Gelman Diagnostic

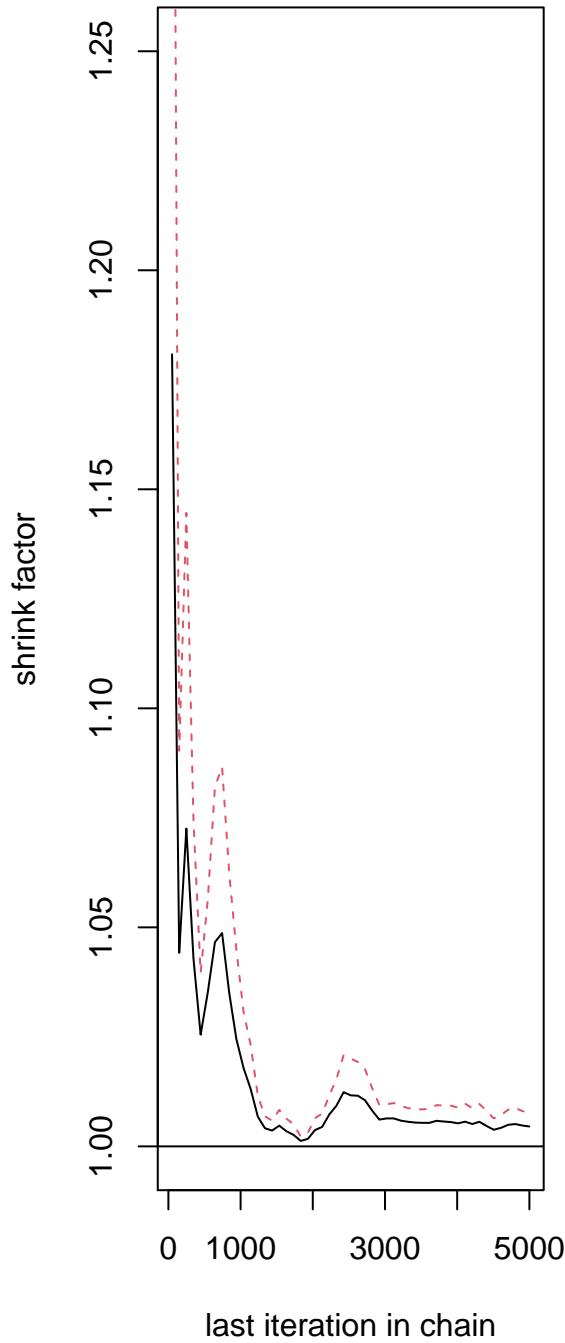
**Round 1**  
**p\_avg\_mit\_PD**



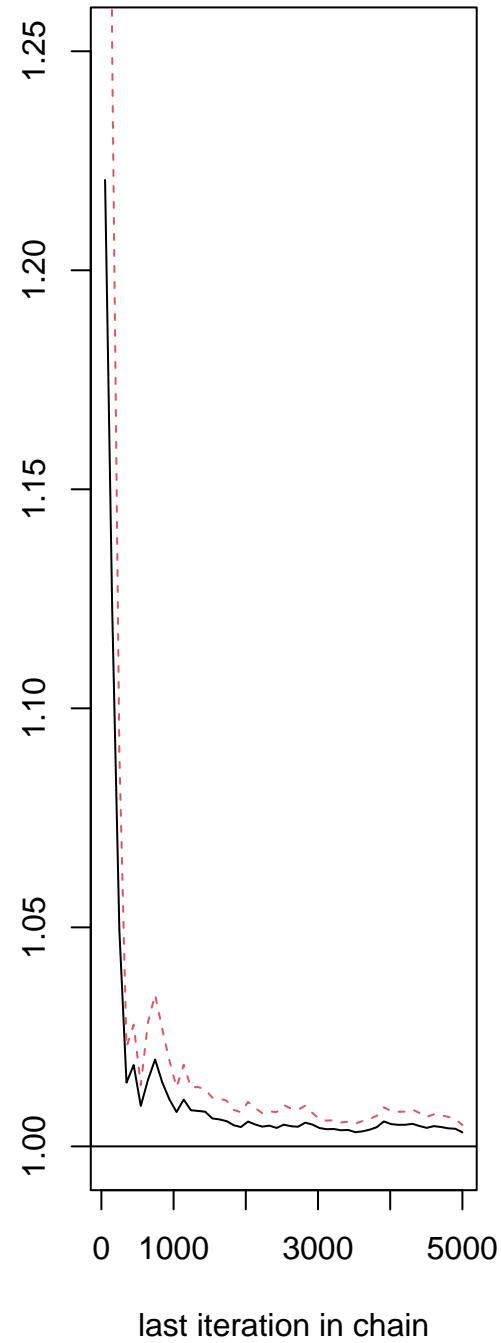
**p\_avg\_mit\_PR**



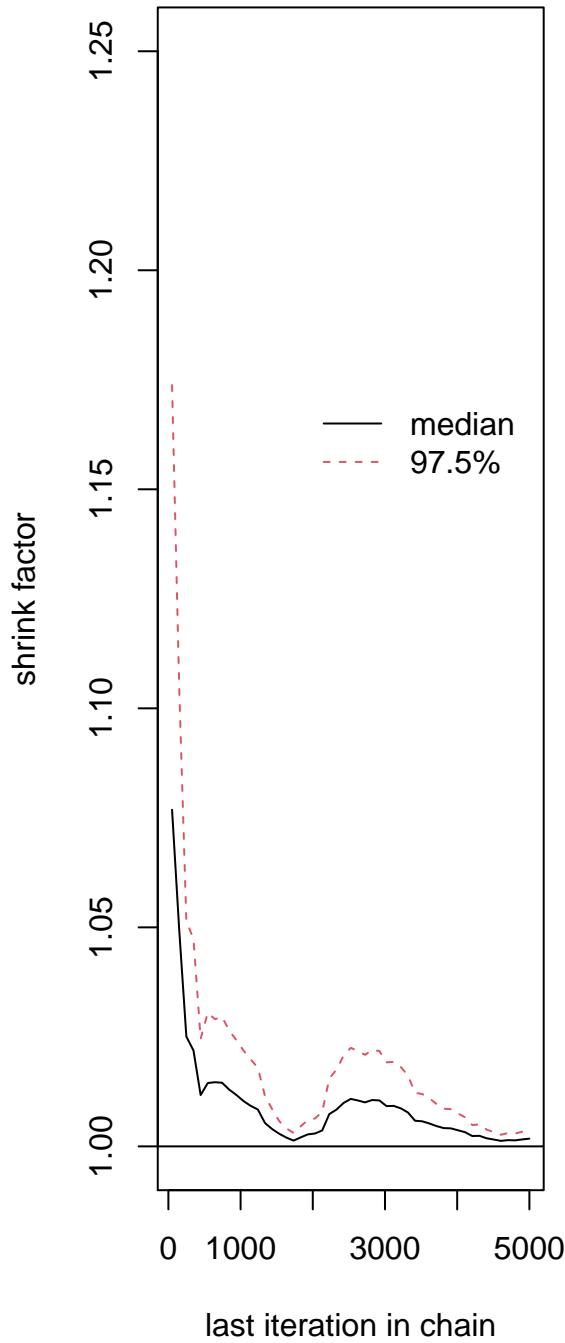
**Round 1**  
**p\_avg\_mit\_PD**



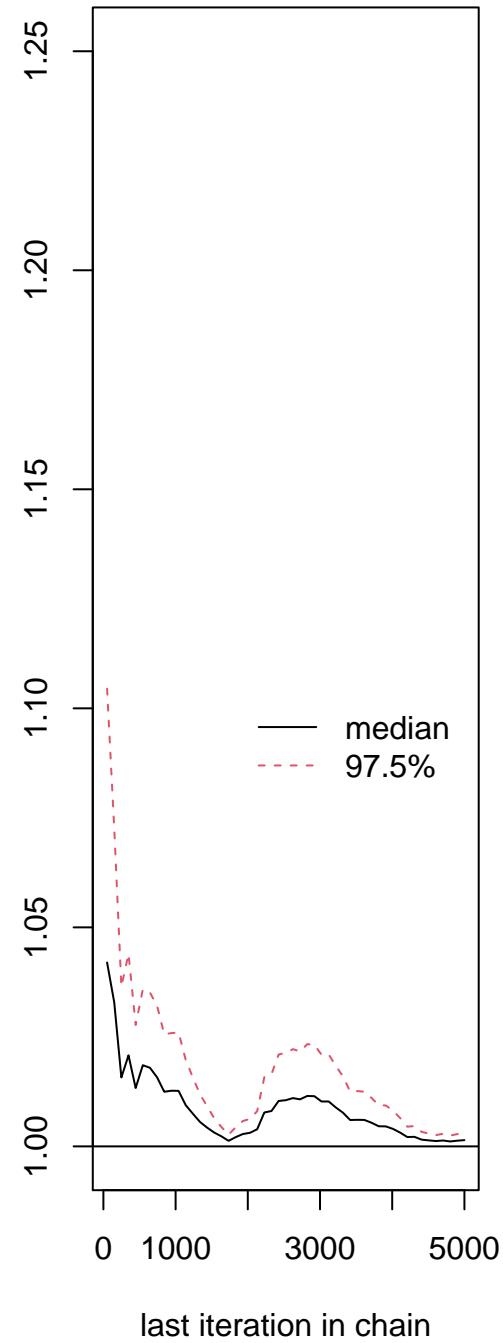
**p\_avg\_mit\_PR**



**Round 1**  
**p\_avg\_mit\_PD**

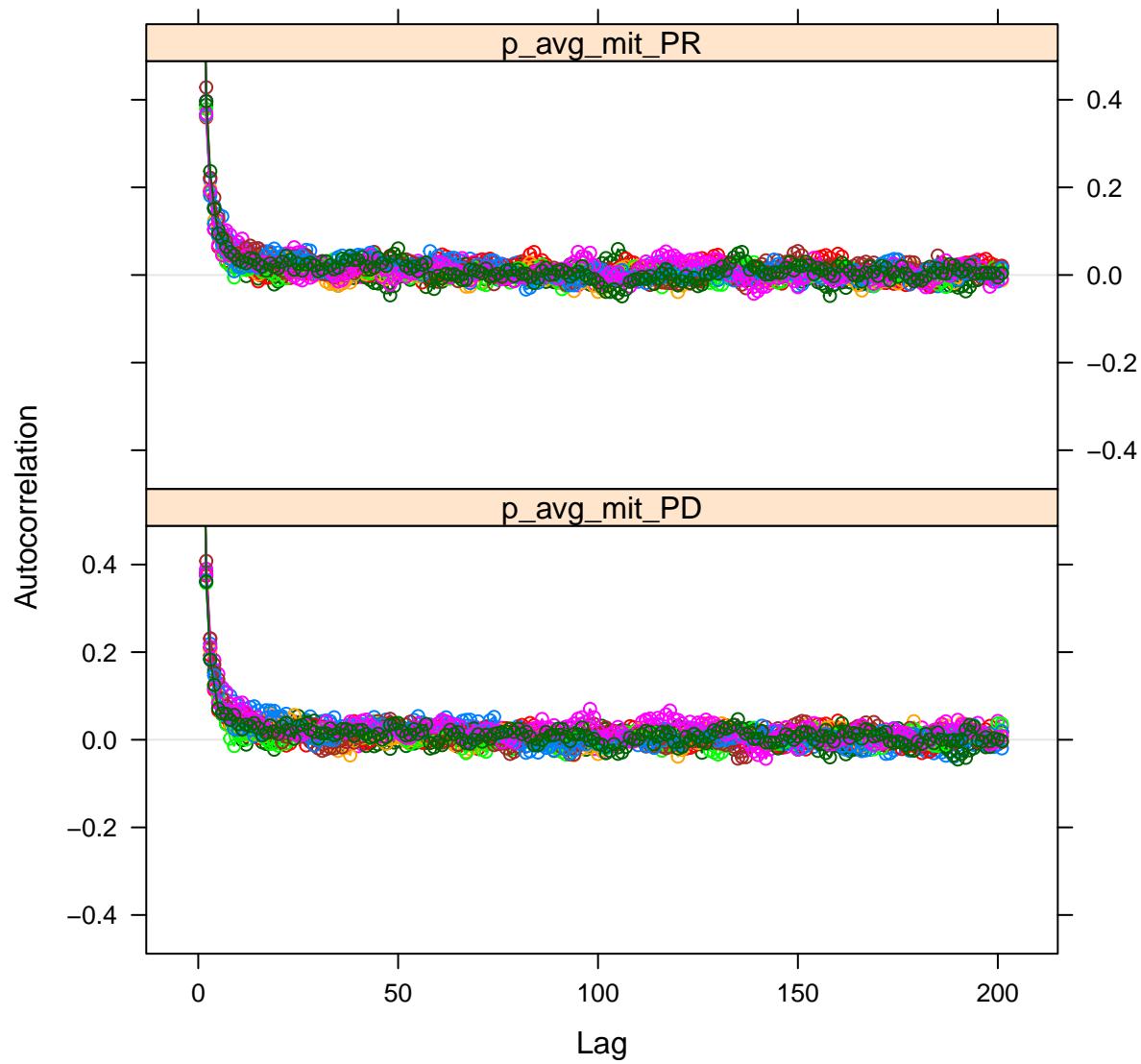


**p\_avg\_mit\_PR**

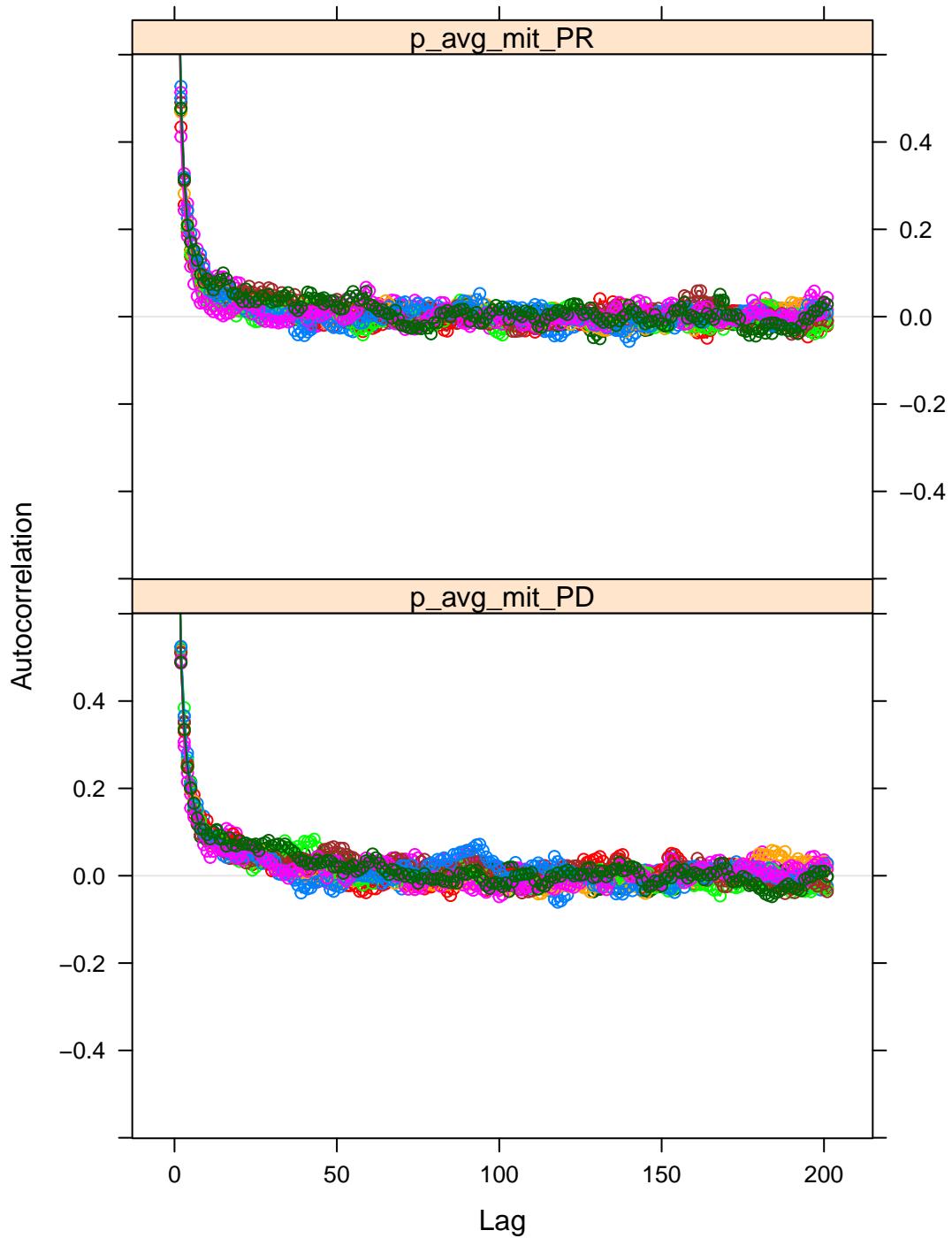


Autocorrelation plots

**ACF plot: Antibody prev ~ Mitigation – Round 1**



## ACF plot: Antibody prev ~ Mitigation – Round 2



### ACF plot: Antibody prev ~ Mitigation – Round 3

