

central_limit_theorem.R

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```
# central_limit_theorem.R
# Demonstration of central limit theorem in action

# Load necessary libraries
library(ggplot2)
library(psych)

##
## Attaching package: 'psych'

## The following objects are masked from 'package:ggplot2':
##
##    %+%, alpha

# Generate 100000 random observations
n <- 100000

# A single Poisson observation with lambda = 1
y1 <- rpois(n,1)

# Mean of 5 Poisson observations
y5 <- rpois(5*n,1)
y5 <- matrix(y5,n,5)
y5 <- apply(y5,1,mean)

# Mean of 10 Poisson observations
y10 <- rpois(10*n,1)
y10 <- matrix(y10,n,10)
y10 <- apply(y10,1,mean)

# Mean of 50 Poisson observations
y50 <- rpois(50*n,1)
y50 <- matrix(y50,n,50)
y50 <- apply(y50,1,mean)

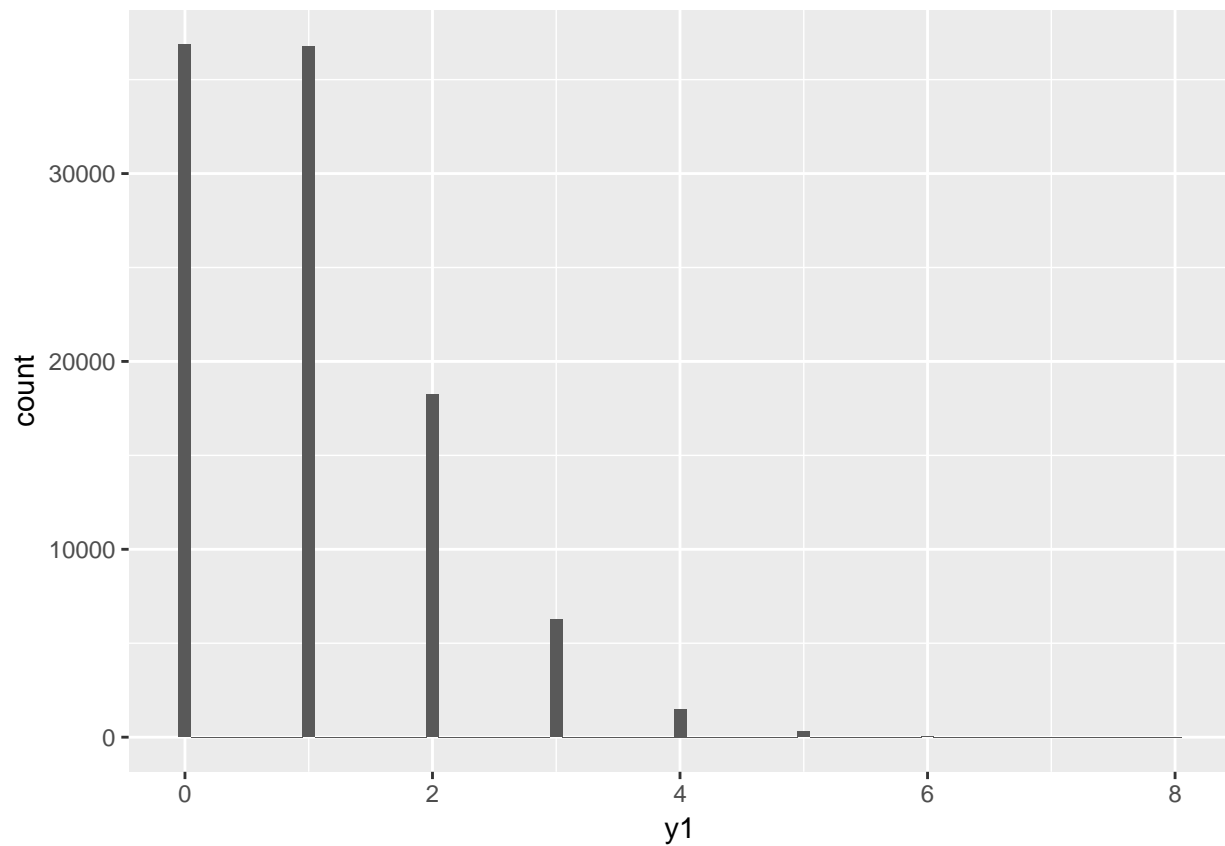
# Make data frame for ggplot2
plotdata <- as.data.frame(cbind(y1,y5,y10,y50))

# Print first 25 observations
plotdata[1:25,]

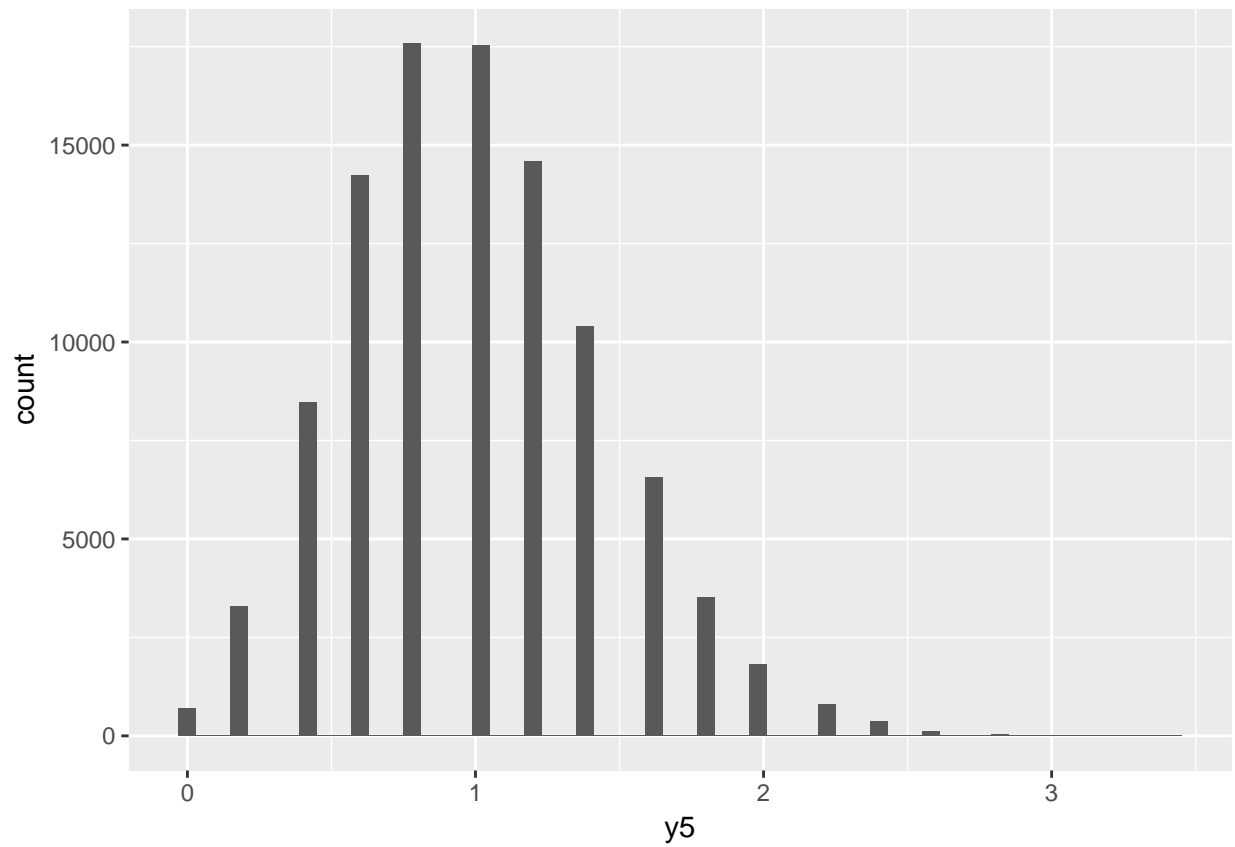
##      y1  y5 y10 y50
## 1    0 1.0 1.3 1.10
## 2    2 0.8 1.4 0.96
## 3    0 1.0 0.9 1.26
## 4    1 0.8 1.2 1.14
## 5    1 1.0 1.5 0.98
## 6    1 1.4 1.0 1.06
```

```
## 7  1 1.0 1.0 0.92
## 8  0 1.0 0.5 1.28
## 9  0 0.8 1.3 0.82
## 10 1 0.4 1.0 0.88
## 11 1 1.4 1.1 0.98
## 12 1 1.6 0.3 1.02
## 13 1 1.8 0.8 1.06
## 14 0 1.2 1.3 1.08
## 15 2 1.0 0.7 0.92
## 16 0 0.8 1.1 0.98
## 17 1 1.4 1.2 1.02
## 18 0 0.6 1.3 1.06
## 19 1 1.4 0.8 1.08
## 20 0 0.2 1.6 1.06
## 21 1 1.2 0.7 1.20
## 22 0 0.8 0.7 0.70
## 23 2 0.6 0.8 1.00
## 24 0 1.0 0.8 1.00
## 25 1 1.2 1.9 1.24
```

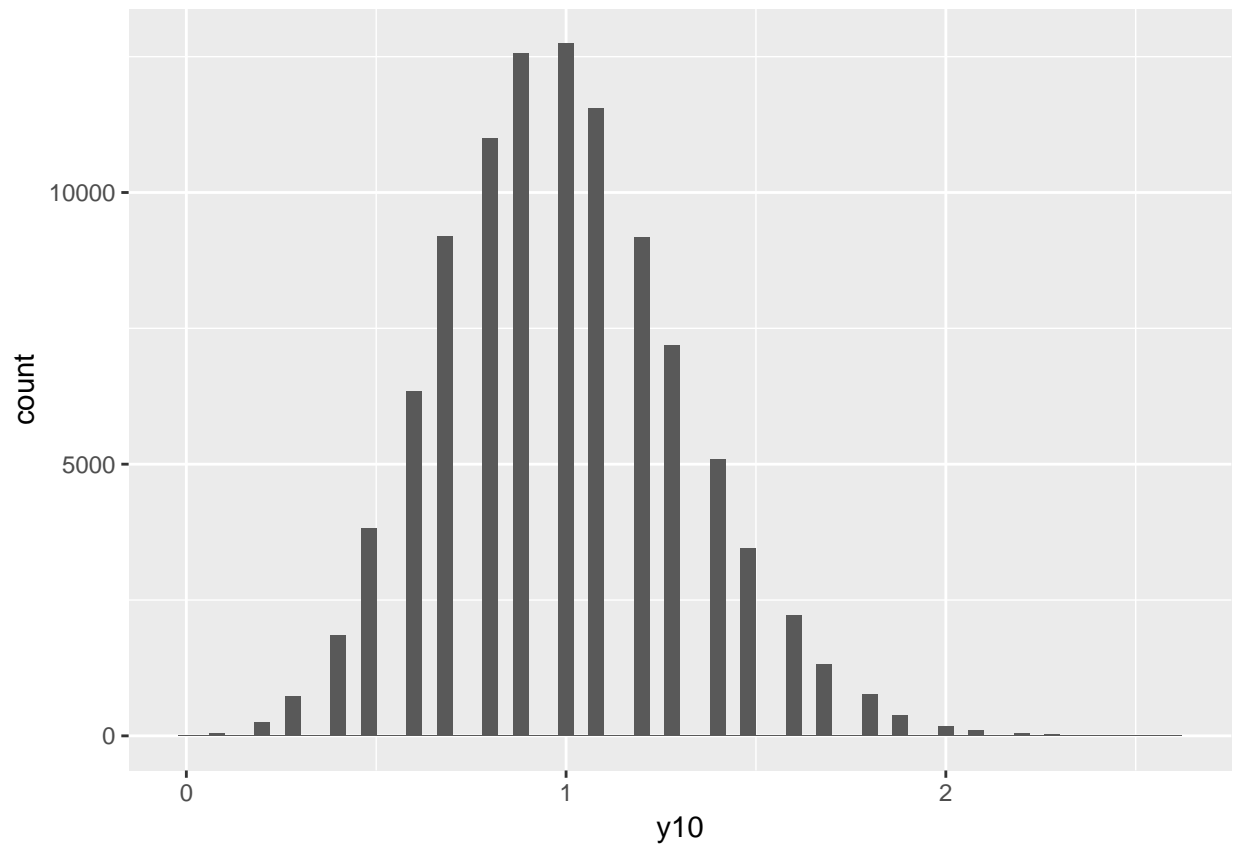
```
# Graphics using ggplot2
ggplot(plotdata,aes(y1))+
geom_histogram(binwidth=0.1)
```



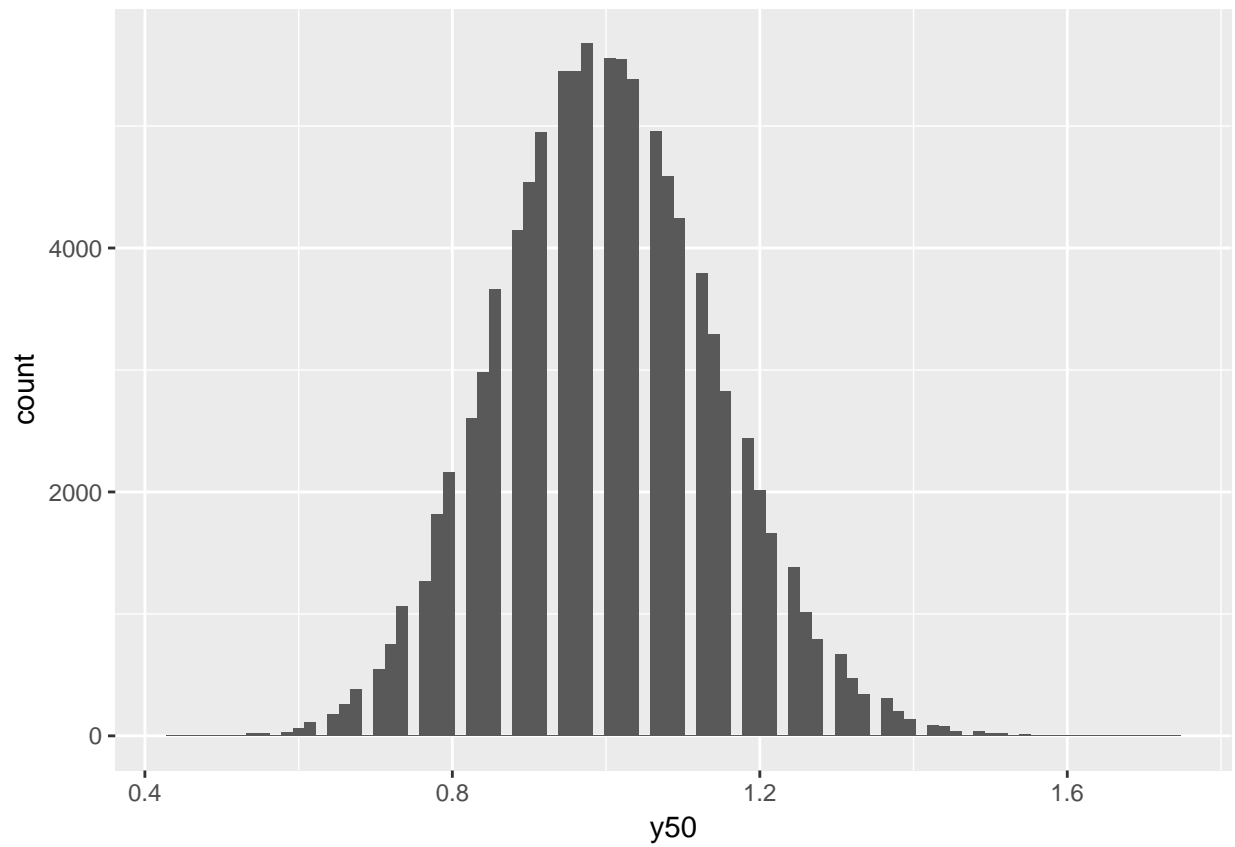
```
ggplot(plotdata,aes(y5))+
geom_histogram(binwidth=0.06)
```



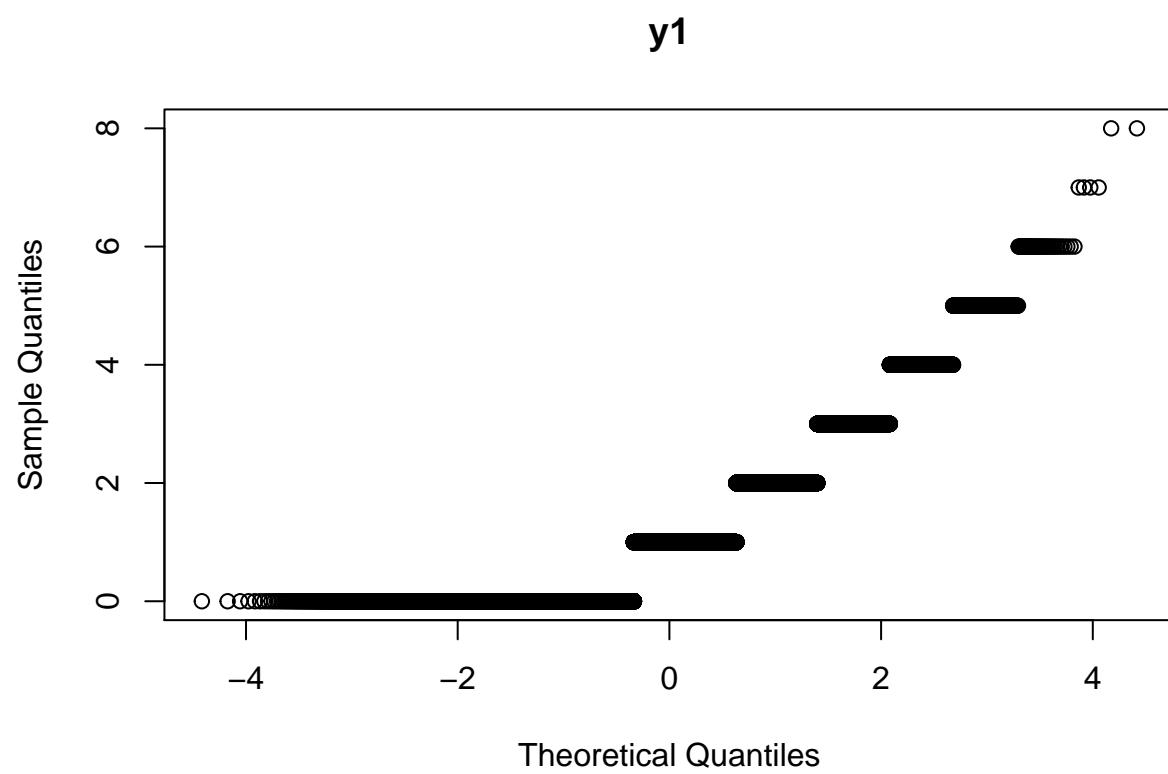
```
ggplot(plotdata,aes(y10))+  
geom_histogram(binwidth=0.04)
```



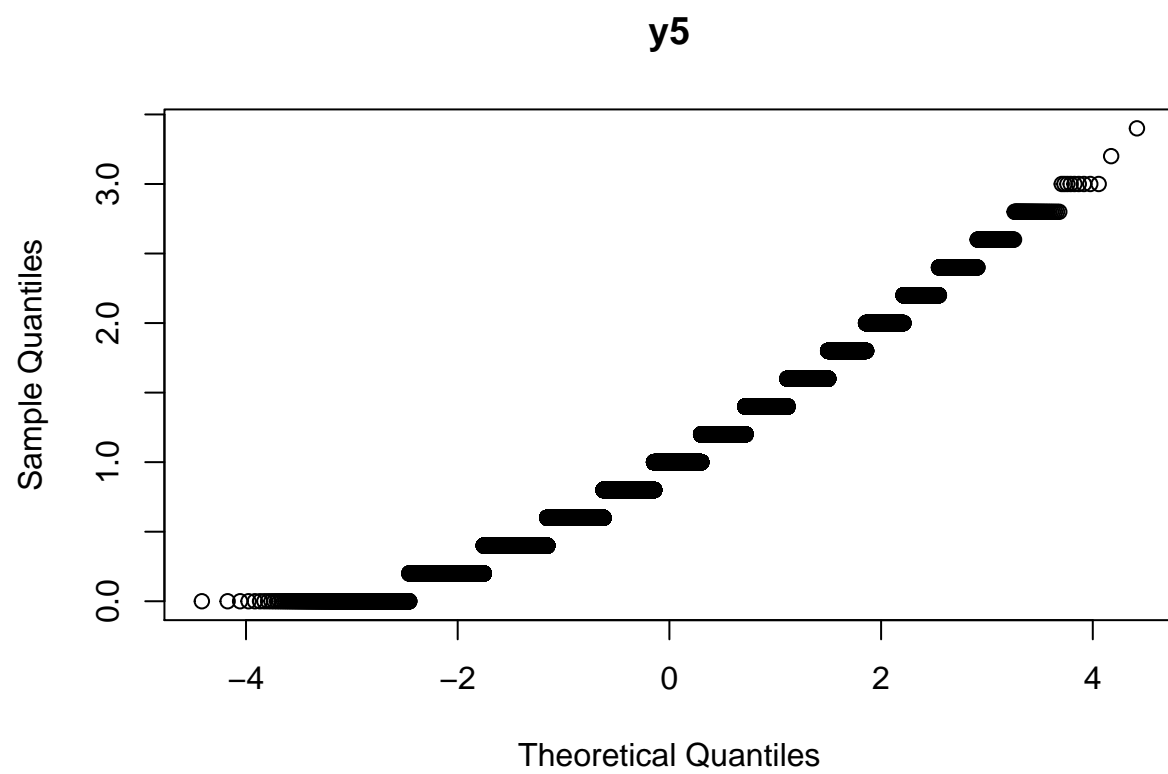
```
ggplot(plotdata,aes(y50))+  
geom_histogram(binwidth=0.015)
```



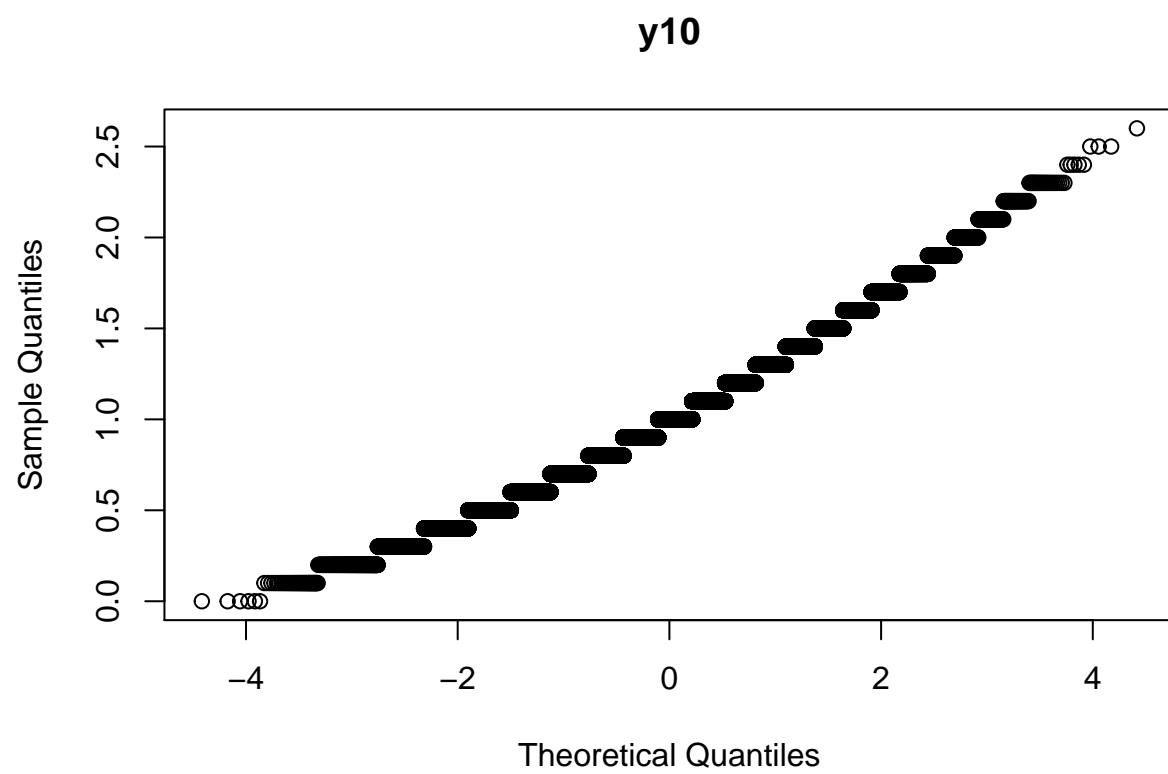
```
# Normal quantile plots  
qqnorm(y1,main="y1")
```



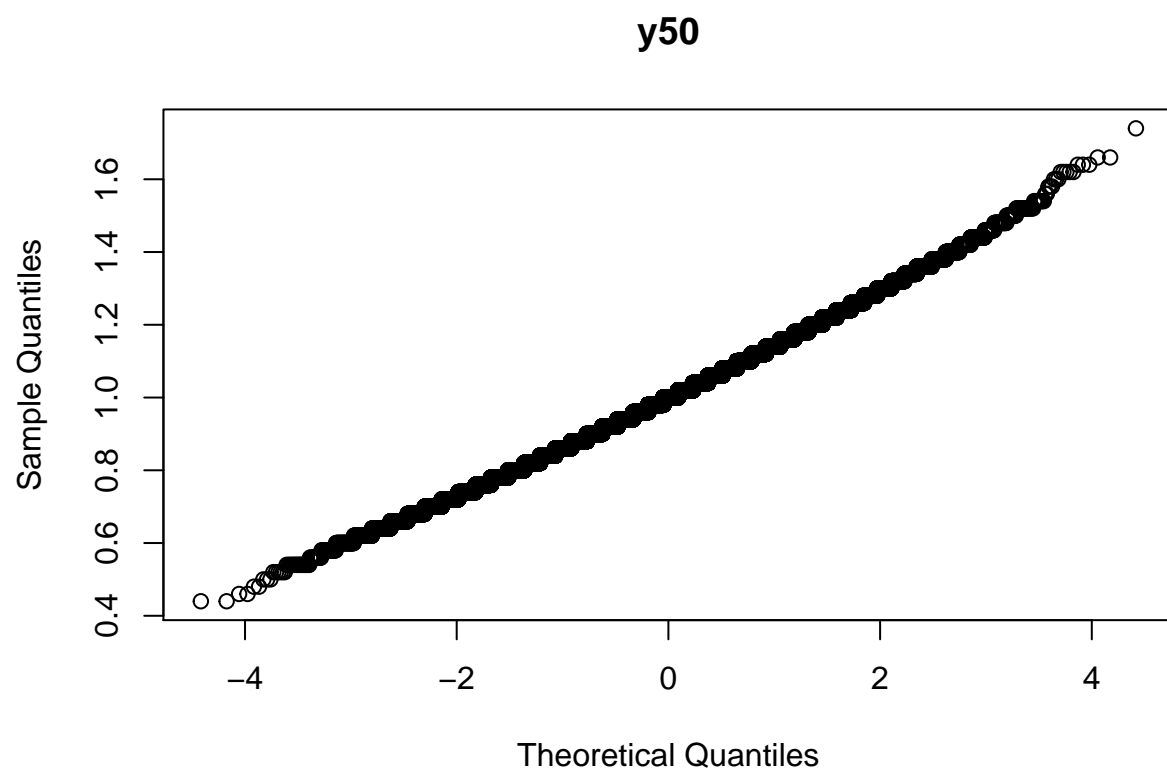
```
qqnorm(y5,main="y5")
```



```
qqnorm(y10,main="y10")
```



```
qqnorm(y50,main="y50")
```

```
# Descriptive statistics
```

```
describe(plotdata)
```

```
##      vars      n mean  sd median trimmed  mad  min  max range skew kurtosis
## y1      1 1e+05    1 1.00      1    0.87 1.48 0.00 8.00    8.0 0.99    0.95
## y5      2 1e+05    1 0.45      1    0.98 0.59 0.00 3.40    3.4 0.44    0.17
## y10     3 1e+05    1 0.32      1    0.99 0.30 0.00 2.60    2.6 0.33    0.12
## y50     4 1e+05    1 0.14      1    1.00 0.15 0.44 1.74    1.3 0.15    0.05
##      se
## y1    0
## y5    0
## y10   0
## y50   0
```