# Hypothesis Testing

*Math 445, Spring 2017*

## Research Question

Does beer consumption increases human attractiveness to malaria mosquitoes?

### Motivation

> Malaria and alcohol consumption both represent major public health problems. Alcohol consumption is rising in developing countries and, as efforts to manage malaria are expanded, understanding the links between malaria and alcohol consumption becomes crucial. Our aim was to ascertain the effect of beer consumption on human attractiveness to malaria mosquitoes in semi field conditions in Burkina Faso.

### Methods

> We used a Y tube-olfactometer designed to take advantage of the whole body odour (breath and skin emanations) as a stimulus to gauge human attractiveness to *Anopheles gambiae* (the primary African malaria vector) before and after volunteers consumed either beer ($n = 25$ volunteers and a total of 2500 mosquitoes tested) or water ($n = 18$ volunteers and a total of 1800 mosquitoes).

## Results

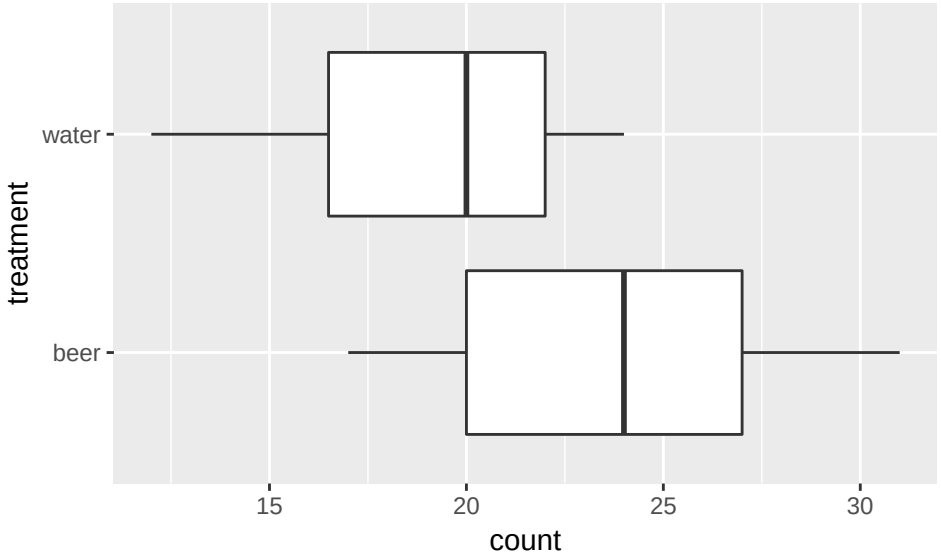
```
mosquitoes <- read.csv("../../data/mosquitoes_beer.csv")
head(mosquitoes)
```

```
##   treatment count
## 1      beer    27
## 2      beer    19
## 3      beer    20
## 4      beer    20
## 5      beer    23
## 6      beer    17
```

```
summary(mosquitoes)
```

```
##  treatment      count
##  beer :25   Min.   :12.00
##  water:18   1st Qu.:19.00
##             Median :21.00
##             Mean   :21.77
##             3rd Qu.:24.00
##             Max.   :31.00
```

```
library(ggplot2)
ggplot(mosquitoes, aes(x = treatment, y = count)) +
  geom_boxplot() +
  coord_flip()
```




```
library(dplyr)
trt_means <-
  mosquitoes %>%
  group_by(treatment) %>%
  summarise(avg = mean(count))
trt_means
```

```
## # A tibble: 2 × 2
##   treatment      avg
##      <fctr>    <dbl>
## 1      beer 23.60000
## 2     water 19.22222
```

**Key question:** Are the treatment groups really different or are the differences due to random chance?

## Permutation test