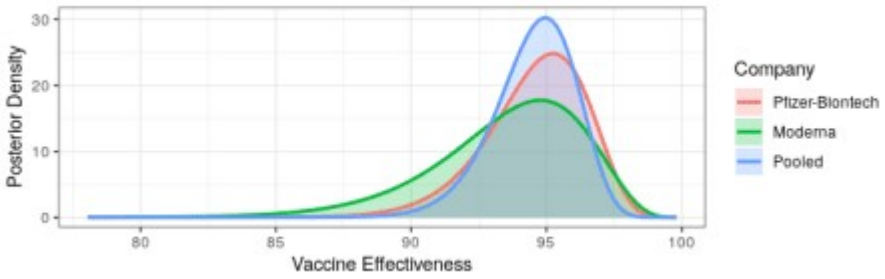
```
…qbeta(c(.025,.975),.700102,1)


# posterior pfizer
cases_treatment <- 8
cases_control <- 170 - cases_treatment
theta_ci <- qbeta(c(.025,.975),cases_treatment+.700102,cases_control+1)
rate_ratio_ci <- theta_ci / (1-theta_ci)

# effectiveness
100 * (1 - rate_ratio_ci)

xx <- (1:90)/500
yy <- sapply(xx, function(x) dbeta(x,cases_treatment+.
700102,cases_control+1))
xx <- 100 * (1 - xx / (1 - xx))
ggplot() +
  geom_area(aes(x=xx,y=yy)) +
  theme_bw() +
  xlab("Vaccine Effectiveness") +
  ylab("Posterior Density")

# posterior combined
cases_treatment <- 8 + 5
cases_control <- 170 + 95 - cases_treatment
theta_ci <- qbeta(c(.025,.975),cases_treatment+.700102,cases_control+1)
rate_ratio_ci <- theta_ci / (1-theta_ci)

# effectiveness
100 * (1 - rate_ratio_ci)

xx1 <- (1:90)/500
yy1 <- sapply(xx1, function(x) dbeta(x,cases_treatment+.
700102,cases_control+1))
xx1 <- 100 * (1 - xx1 / (1 - xx1))
ggplot() +
  geom_area(aes(x=xx1,y=yy1)) +
  theme_bw() +
  xlab("Vaccine Effectiveness") +
  ylab("Posterior Density")



# posterior moderna
cases_treatment <- 5
cases_control <- 95 - cases_treatment
theta_ci <- qbeta(c(.025,.975),cases_treatment+.700102,cases_control+1)
rate_ratio_ci <- theta_ci / (1-theta_ci)

# effectiveness
```

```
100 * (1 - rate_ratio_ci)
```

```
xx2 <- (1:90)/500
yy2 <- sapply(xx2, function(x) dbeta(x,cases_treatment+.
700102,cases_control+1))
xx2 <- 100 * (1 - xx2 / (1 - xx2))
ggplot() +
  geom_area(aes(x=xx2,y=yy2)) +
  theme_bw() +
  xlab("Vaccine Effectiveness") +
  ylab("Posterior Density")
```

```
df <- rbind(
  data.frame(xx=xx,yy=yy,Company="Pfizer-Biontech"),
  data.frame(xx=xx2,yy=yy2,Company="Moderna"),
  data.frame(xx=xx1,yy=yy1,Company="Pooled")
)
ggplot(df) +
  geom_area(aes(x=xx,y=yy,fill=Company),alpha=.25,position = "identity") +
  geom_line(aes(x=xx,y=yy,color=Company),size=1) +
  theme_bw() +
  xlab("Vaccine Effectiveness") +
  ylab("Posterior Density")
```



Both provide excellent protection. Really the only new information is that there is no meaningful difference in efficacy between the two, and hence no reason to prefer one over the other.

Some safety data was also reported:

> A review of unblinded reactogenicity data from the final analysis which consisted of a randomized subset of at least 8,000 participants 18 years and older in the phase 2/3 study demonstrates that the vaccine was well tolerated, with most solicited adverse events resolving shortly after vaccination. The only Grade 3 (severe) solicited adverse events greater than or equal to 2% in frequency after the first or second dose was fatigue at 3.8% and headache at 2.0% following dose 2.

This is really good, and maybe even a bit better than Moderna's reported profile. I honestly don't know how to square this with higher averse event rates in the phase II study, where a significant number of participants had fevers after the second dose.

There were 10 severe cases of which 1 was in the treatment arm. Pooling the data from the

Moderna and Pfizer studies, 7.1% of cases were severe in the treated arm versus 8.9% in the control. This difference is nowhere near significance though. So no real evidence yet that mRNA vaccines make illness milder should you be infected.