Chapter 4

Michael Fryer

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1 Load Howell Data

```
data("Howell1")
d <- Howell1
```

1.1 Filter data to only adults (18 and over)

```
d <- d[d$age >= 18,]
```

2 Model Creation

We will use prior simulation to create a model for this dataset.

2.1 Define our first model using R's formula syntax (p. 88)

```
set.seed(42)
m4.1 <- quap(
  alist(
    height ~ dnorm(mu, sigma),
    mu ~ dnorm(178, 20),
    sigma ~ dunif(0, 50)
  ),
  data=d
)
```

3 Linear prediction (p. 97)

Again create a model for the data.

```
set.seed(42)
N <- 100

xbar <- mean(d$weight)
m4.3 <- quap(
  alist(
    height ~ dnorm(mu, sigma),
    mu <- a + b * (weight - xbar),
    a ~ dnorm(178, 20),
    b ~ dlnorm(0, 1),
    sigma ~ dunif(0, 50)
```

```
    ),
    data=d
)
```

Using the created model, we will simulate heights to find out our uncertainty. Then plot the results.

```
# Adding mu uncertainty
weight.seq <- seq(from=25, to=70, by=1)
mu <- link(m4.3, data=data.frame(weight=weight.seq))
mu.mean <- apply(mu, 2, mean)
mu.PI <- apply(mu, 2, PI, prob=0.89)
# Adding a prediction interval (prediction uncertainty due to std uncertainty)
sim.height <- sim(m4.3, data=list(weight=weight.seq))
height.PI <- apply(sim.height, 2, PI, prob=0.89)

# Plot raw data
plot(height ~ weight, data=d, col=col.alpha(rangi2, 0.7))
# Plot MAP line
lines(weight.seq, mu.mean)
# Plot HPDI region for line
shade(mu.PI, weight.seq)
# Plot PI region for simulated heights
shade(height.PI, weight.seq)
```