**On a question I discussed in room 1:**

What’s the difference between *posterior\_samples()*, *fitted()* and *predict()*?

**Jumping forward to linear regression (next week)**

y = beta\_0 + beta\_1 \* x + epsilon

epsilon ~ N(mu = 0, sigma)

e.g. y = height, x = weight

so

y = N(mu = beta\_0 + beta\_1 \* x, sigma)

*fitted()* returns posterior samples of “mu = beta\_0 + beta\_1 \* x”, that’s the **mean response** (you can visualise this as the regression line)

*predict()* returns posterior samples of “y = N(mu = beta\_0 + beta\_1 \* x, sigma)”, that’s the **response** (including variation around the mean)

*posterior\_samples()* returns posterior samples of beta\_0 (probably called “b\_Intercept” in the resulting list) and beta\_1 (probably called “b\_weight” given the above example) and something called “\_lp” which we don’t need to worry about (for now). You can use the samples of the individual parameters to calculate samples of the mean response (what *fitted()* returns) by applying the linear equation. If you insert the mean response samples for mu in an *rnorm()* command you can generate what *predict()* returns. Let’s remember to try that next week!

**This week’s exercise is simpler**

y = Binomial(p, n)

With y as number of boys born in a sample of n, with p being the “true” proportion of boys born (say)

Here, the **mean response** is mu = p \* n, posterior samples of which are returned by *fitted()*

We can also express this at the proportions scale (officially the scale of the linear predictor, but this name only begins to make sense from linear regression onwards (next week)). At that scale, the **mean response** is mu = p, returned in the form of posterior samples by *fitted(…, scale = ‘linear’)*

*posterior\_samples()* returns posterior samples of p (probably called called “b\_Intercept”), so this is the same as returned by *fitted(…, scale = ‘linear’)*. The mean response of the binomial model without any predictors is just the parameter p!

*predict()* returns posterior samples of y, i.e. random variation in births given posterior samples of p (if the “true” proportion of boys born were 0.9 then there would still be a chance that a girl is born)

**Take home message:** In the binomial model (and in the normal model) without predictors, *posterior\_samples()* and *fitted()* essentially return the same thing.