

# Demystifying Hierarchical Models

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# Hierarchical Models Seem Magical

$$Y_{ij} \sim N(\mu_i, \sigma^2)$$
$$\mu_i \sim N(\nu, \delta)$$

is the same as:

$$Y_{ij} \sim N(\nu + \mu_i, \sigma^2)$$
$$\mu_i \sim N(0, \delta)$$

More standard:

$$Y_{ij} \sim N(\mu + \mu_i, \sigma^2)$$
$$\alpha_i \sim N(0, \delta)$$

If there are two people, there are three parameters, and that seems like magic!

## What Happens With 2 People and 3 Parameters?

```
source('jags/normJ.R')

## Loading required package: R2jags
## Loading required package: rjags
## Loading required package: coda
## Linked to JAGS 4.3.1
## Loaded modules: basemod,bugs
##
## Attaching package: 'R2jags'
## The following object is masked from 'package:coda':
##
##      traceplot
```

## What Happens With 2 People and 3 Parameters?

```
sub=rep(1:2,each=100)
tMu=c(8,12)
y=rnorm(200,tMu[sub],5)
dat=data.frame(sub,y)
prior=list("a"=10,"b"=10^2,'r1'=10^2,'r2'=10^2)
out=runM2a(dat,prior)
```

```
## module glm loaded

## Compiling model graph
##   Resolving undeclared variables
##   Allocating nodes
## Graph information:
##   Observed stochastic nodes: 200
##   Unobserved stochastic nodes: 5
##   Total graph size: 418
```

# What Happens With 2 People and 3 Parameters?

```
hist(alpha[,1])
```

