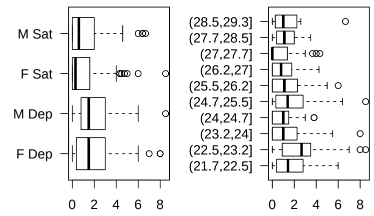
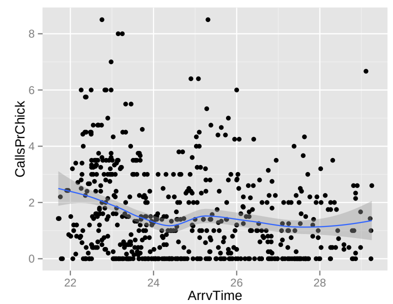
Owl Data

Biologists observer 27 nests of barn owls.
Response: Number of Calls
Predictors:
Size of brood (1 to 7)
Sex of parent(245 female, 354 male)
Food "Treatment" (satiated vs deprived)
Arrival Time (21.7 to 29.2 hours)

Explore Owl Data





Possible interaction between treatment and gender.

Fit Owl Data

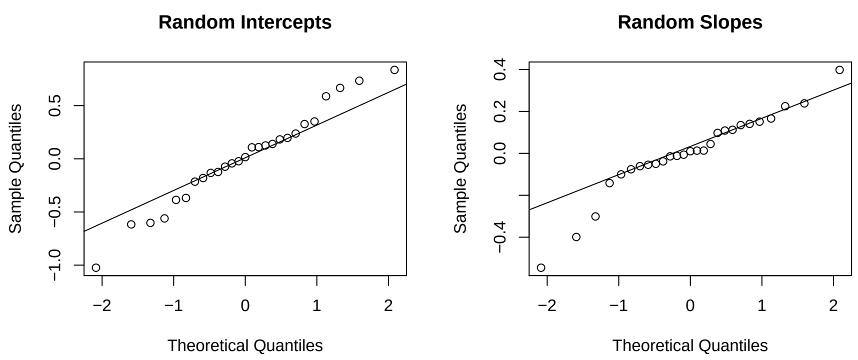
```
fit1 <- glmer(Ncalls ~ offset(log(BroodSize)) + FoodTrt *
    SexParent + bs(cTime, df = 5) + (1 | Nest), data = owls,
    family = poisson)
fit2 <- glmer(Ncalls ~ offset(log(BroodSize)) + FoodTrt *
    SexParent + bs(cTime, df = 5) + (1 + cTime | Nest),
    data = owls, family = poisson)
fit3 <- glmer(Ncalls ~ offset(log(BroodSize)) + FoodTrt *
    SexParent + SexParent * bs(cTime, df = 5) + (1 + cTime |
    Nest), data = owls, family = poisson)
xtable(anova(fit1, fit2, fit3), digits = c(0, 0, 0, 0, 0,
    0, 1, 0, 4))
```

	Df	AIC	BIC	logLik	deviance	Chisq	Chi Df	Pr(>Chisq)
fit1	10	4851	4895	-2416	4831			
fit2	12	4697	4750	-2337	4673	157.7	2	0.0000
fit3	17	4658	4733	-2312	4624	49.2	5	0.0000

Evidence that slopes vary from nest to nest. Large interaction.

Random Effects?

```
par(mfrow = c(1, 2))
qqnorm(ranef(fit3)$Nest[, 1], main = "Random Intercepts")
qqline(ranef(fit3)$Nest[, 1])
qqnorm(ranef(fit3)$Nest[, 2], main = "Random Slopes")
qqline(ranef(fit3)$Nest[, 2])
```



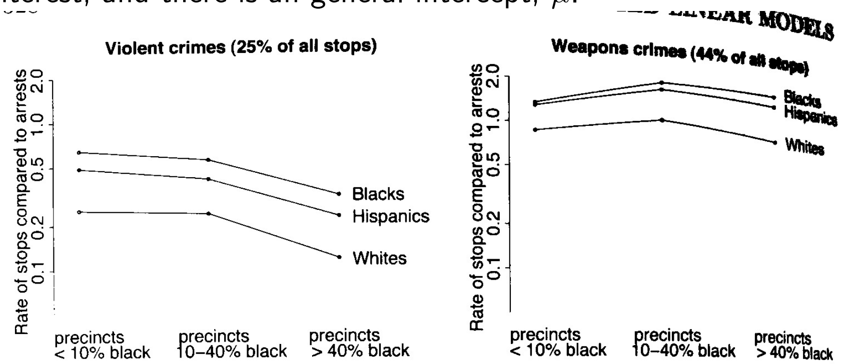
May not be "Gaussian" errors. Are we missing a predictor?

Gelman §15.1 Traffic Stops

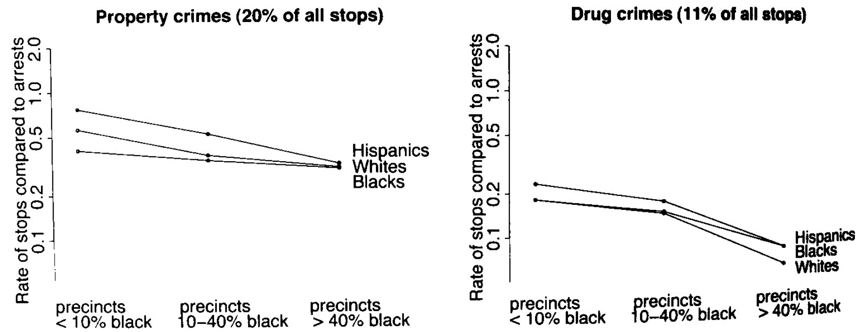
We don't have access to the data. The Poisson Mixed Model:

$$y_i \sim \text{Poisson}(u_i e^{X_i\beta+\epsilon_i}), \quad \epsilon_i \sim N(0,\sigma_\epsilon^2)$$

Their example adds random effects $[\beta_p \sim N(0,\sigma_p^2)]$ for Precints and (indep of) and extra overdispersion. Race effects, α_e are of interest, and there is an general intercept, μ.



Gelman Frisk 2



Gelman Storable Votes §15.2

Multinomial is like 2 logistic regressions:

$$\text{invlogit}[\Pr(y_i > 1) \; = X_i\boldsymbol{\beta}; \;\; \text{invlogit}[\Pr(y_i > 2) \; = X_i\boldsymbol{\beta} - c_2$$

or

$$y_i = \begin{cases} 1 & \text{if } z_i < c_{1.5} \\ 2 & \text{if } z_i \in (c_{1.5}, c_{2.5}) \\ 3 & \text{if } z_i > c_{2.5} \end{cases} ; \quad z_i \sim \text{logistic}(x_i, \sigma^2)$$

Use Normal distributions for each of $c_{j1.5},\; c_{j,2.5}, \log(\sigma_j)$ to allow varying cutoffs and variances for each student. Estimate $\sigma_{1.5}, \sigma_{2.5}, \mu_{\log(\sigma)}, \sigma_{\log(\sigma)}$ from the data.
Figure 15.6 looks at optimal versus observed strategies for 2, 3, 6 player games.

Social Networks §15.3

How many people do you know?
If you know 2 Nicoles out of 358K in the US, we compute size of your network as:

$$\frac{2}{358000} \times 280000000 = 1560$$

Cross check with other names.
But there are "clumps" of data (JayCees), so we need overdispersed Poisson.
Additional analysis looks at selective memory, positive/negative experiences and residuals.