

Bayesian models for detecting differential concentration in the male genital tract

Collaborators

Leena Choi (PhD 2005)

Thomas Ndovi (PhD 2005)

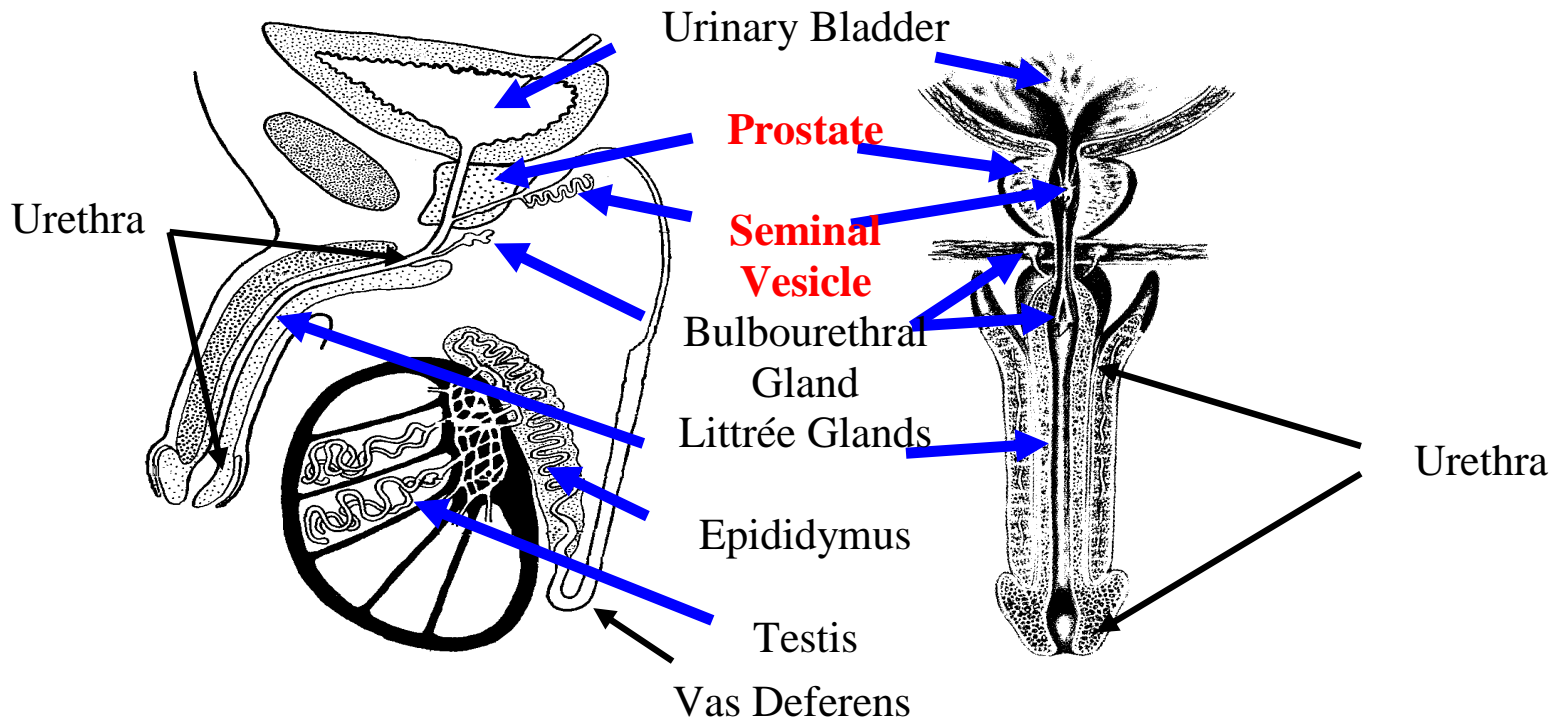
Craig Hendrix

Charles Rohde

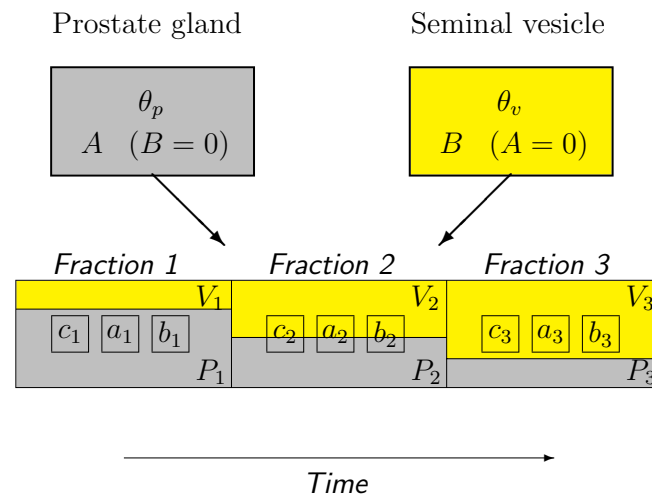


Scientific objective

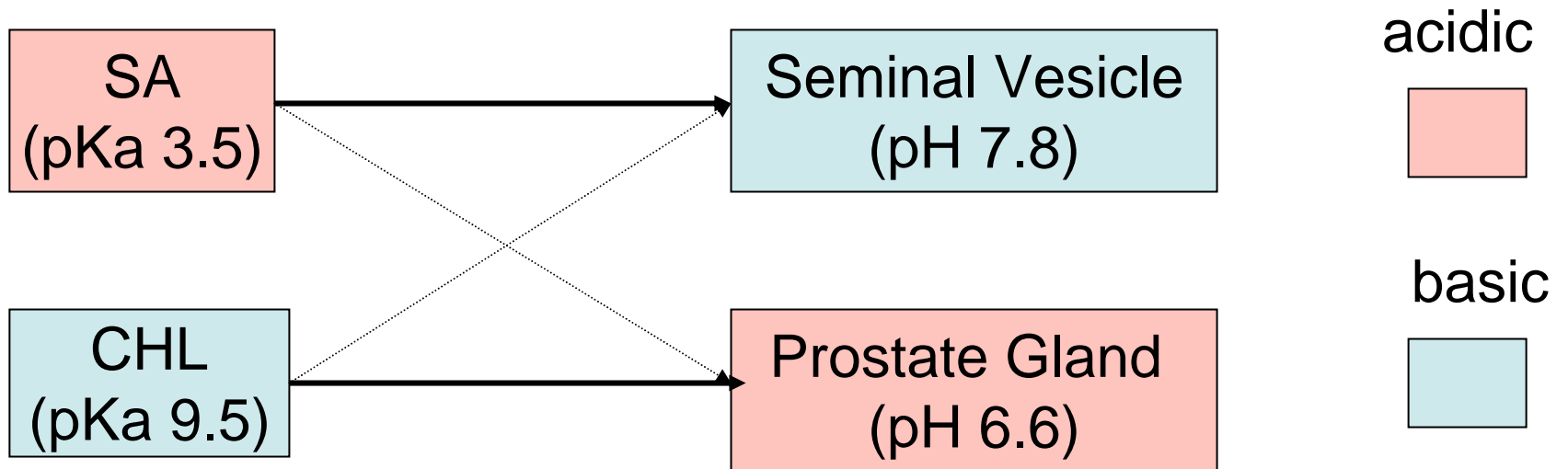
- To estimate differential drug concentration or viral loads in the prostate gland and seminal vesicle
 - Target antiretroviral therapies
- Direct measurement is invasive
- Indirect measurement



Parameters of interest:
 θ_p and θ_v



Validation Study

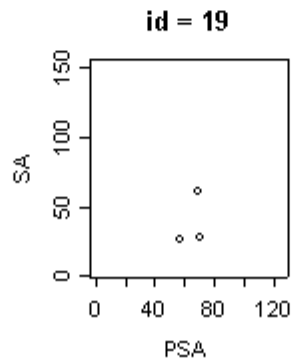
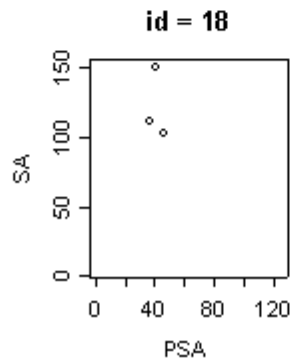
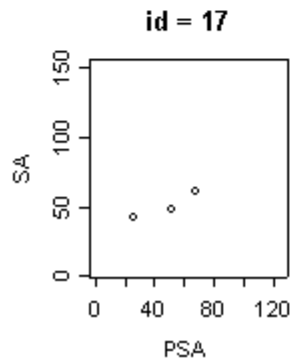
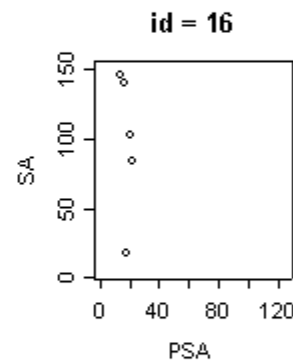
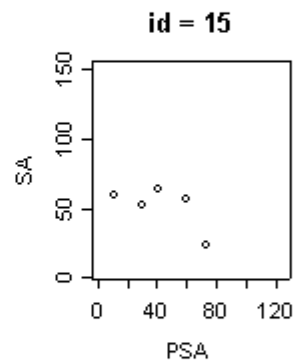
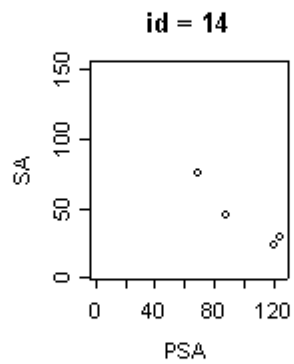
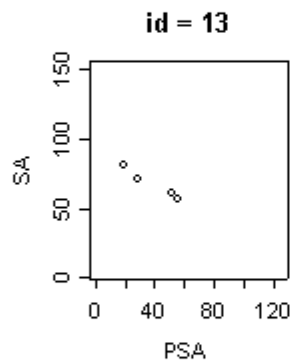
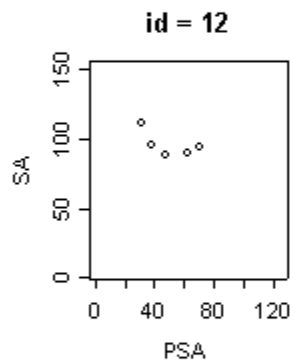
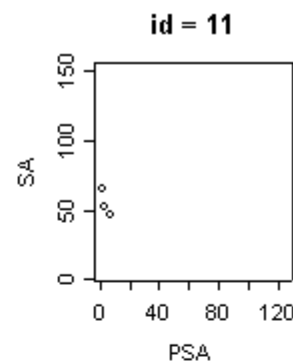
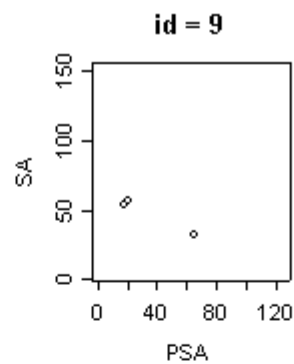
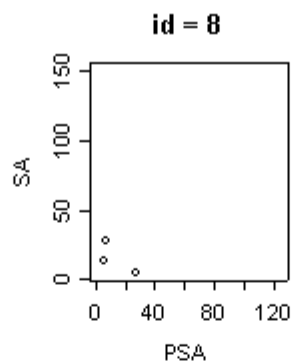
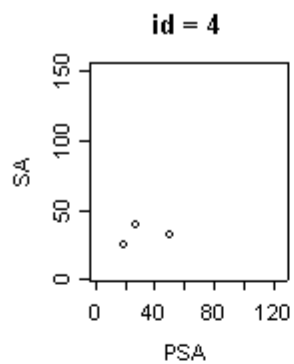
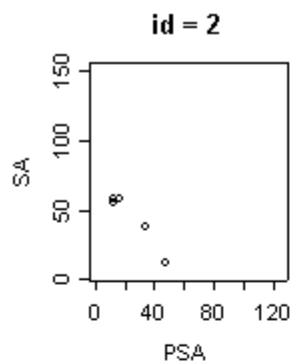


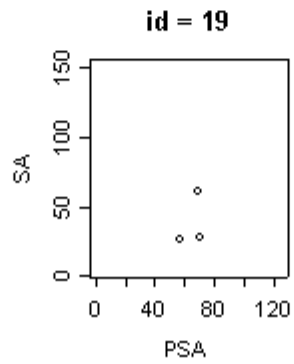
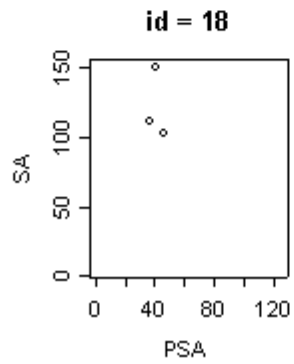
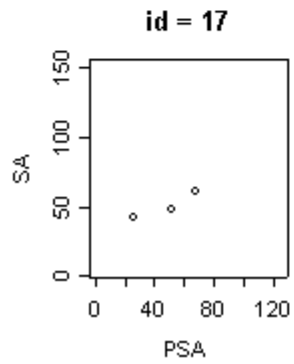
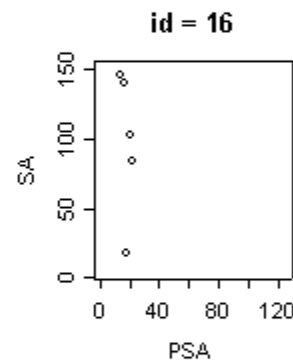
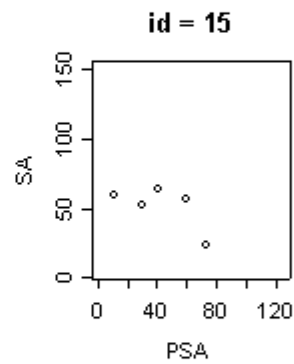
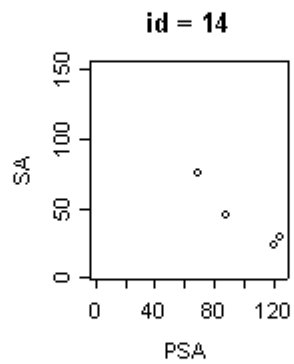
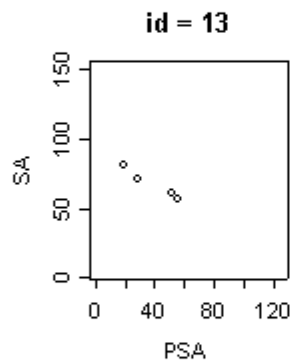
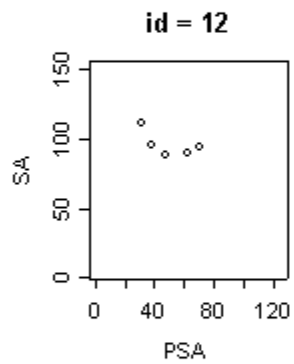
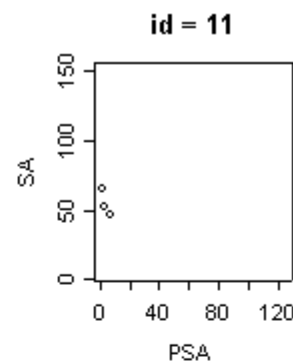
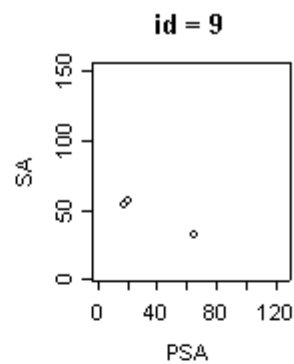
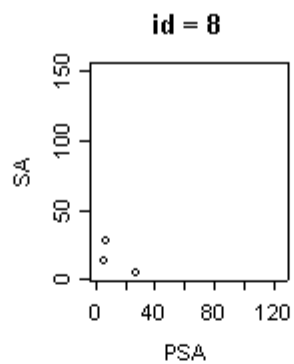
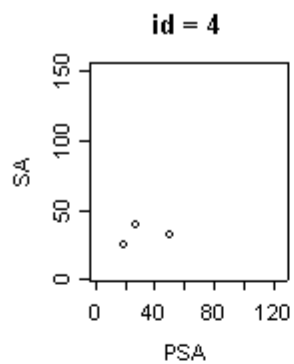
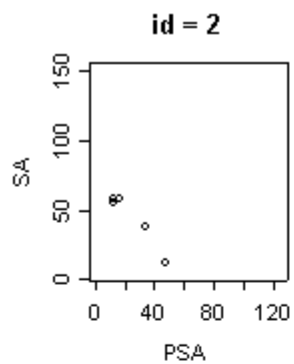
Fractionally collected ejaculate

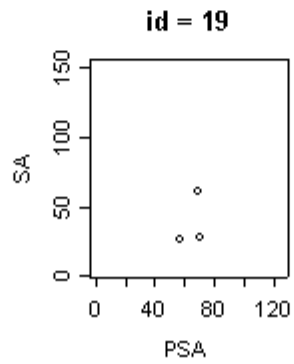
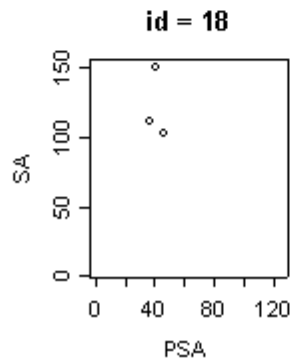
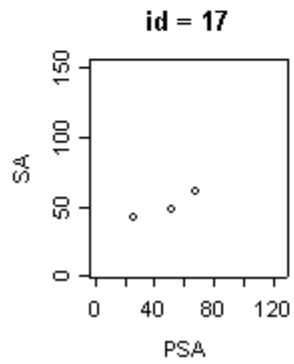
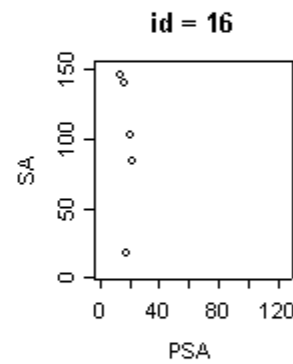
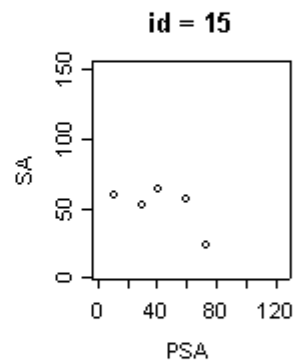
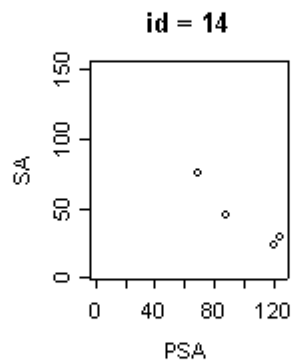
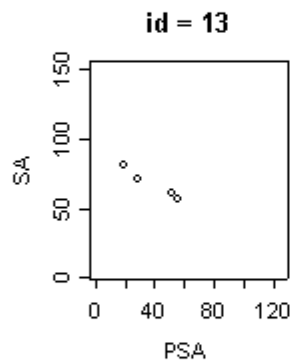
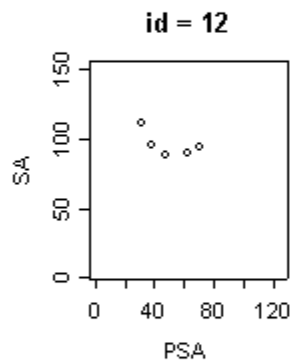
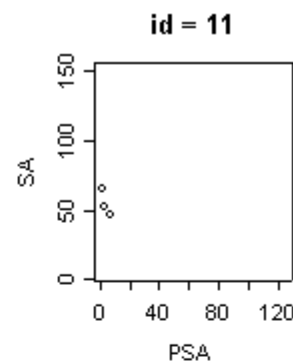
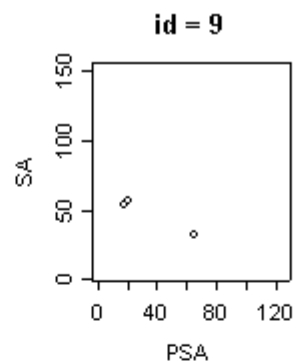
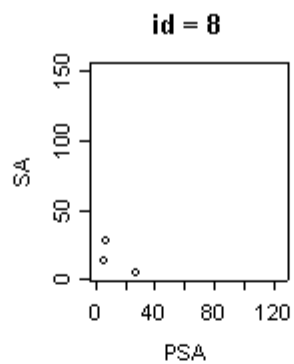
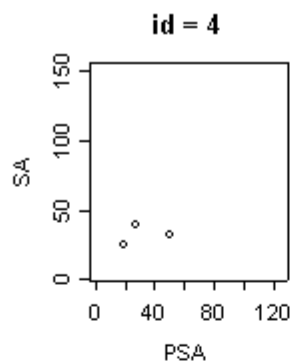
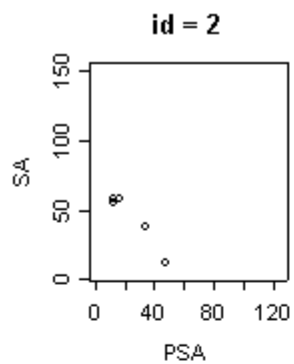
Measure drug and biomarkers

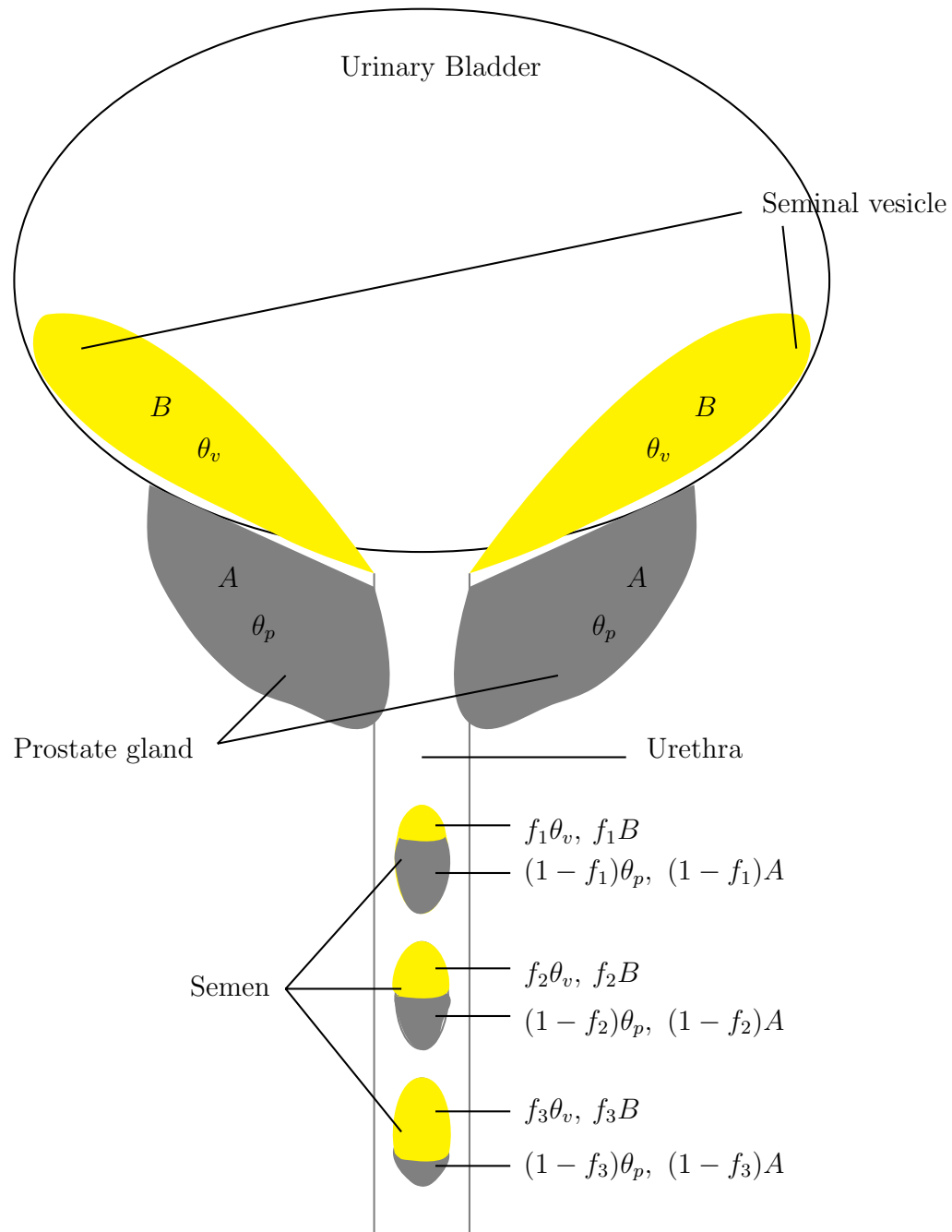
Details

- We can measure the drug concentration in each fraction of ejaculate
- From the collected ejaculate, we cannot measure contribution from the prostate and seminal vesicle
- We can measure surrogates
 - PSA
 - Fructose





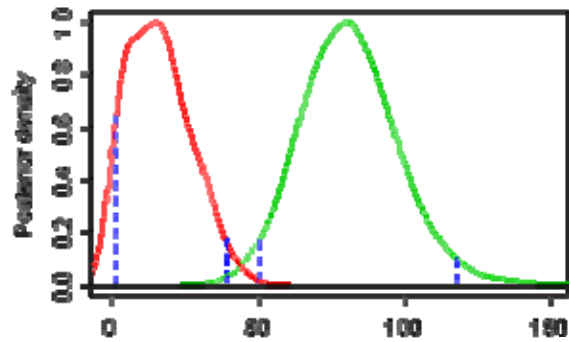
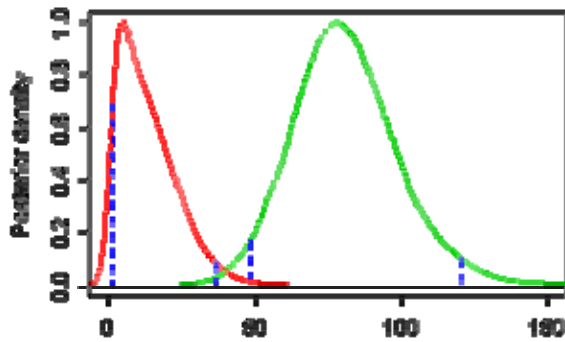
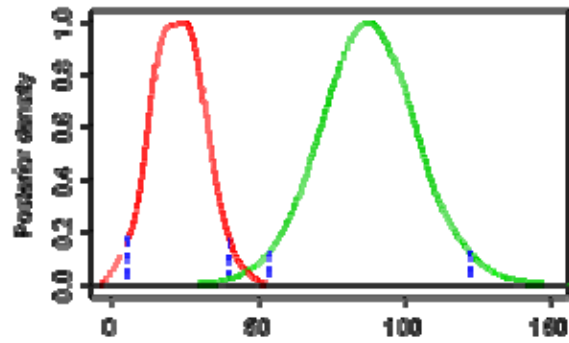
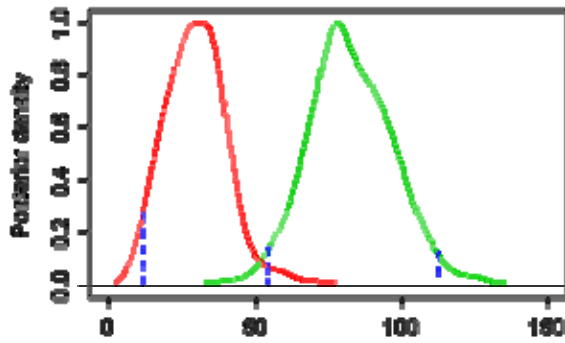
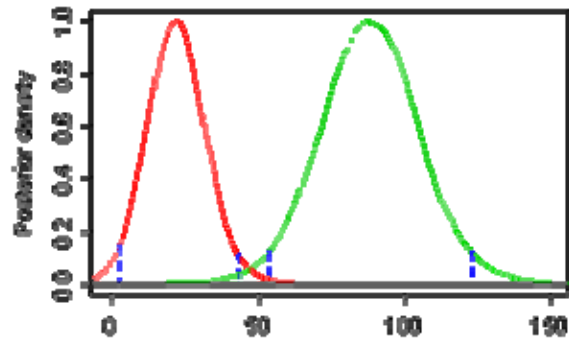
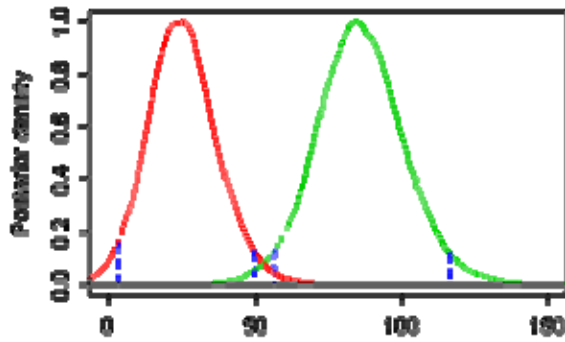




Multilevel Model (cont'd)

| | |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Structural part | $a_{ij} = A_i(1 - f_{ij}) + e_{1j}$ $b_{ij} = B_i f_{ij} + e_{2j}$ $c_{ij} = \theta_{pi}(1 - f_{ij}) + \theta_{vi} f_{ij} + e_{3j}$ |
| Observed data | $a_{ij} \sim N\{A_i(1 - f_{ij}), \sigma_1^2\}$ $b_{ij} \sim N\{B_i f_{ij}, \sigma_2^2\}$ $c_{ij} \sim N\{\theta_{pi}(1 - f_{ij}) + \theta_{vi} f_{ij}, \sigma_3^2\}$ |
| Random effects | $A_i \sim N\{A, \sigma_A^2\}, B_i \sim N\{B, \sigma_B^2\}$ $\theta_{pi} \sim N\{\theta_p, \sigma_p^2\}, \theta_{vi} \sim N\{\theta_v, \sigma_v^2\} \rightarrow \rho$ $f_{ij} \sim \text{Beta}\{\alpha, \beta\}$ |
| Priors | $\theta_p \text{ and } \theta_v$ <p>Others</p> |

Posterior distributions of θ_p and θ_v



Posterior distributions of θ_p / θ_v

