

# Bayesian models for detecting differential concentration in the male genital tract

# Collaborators

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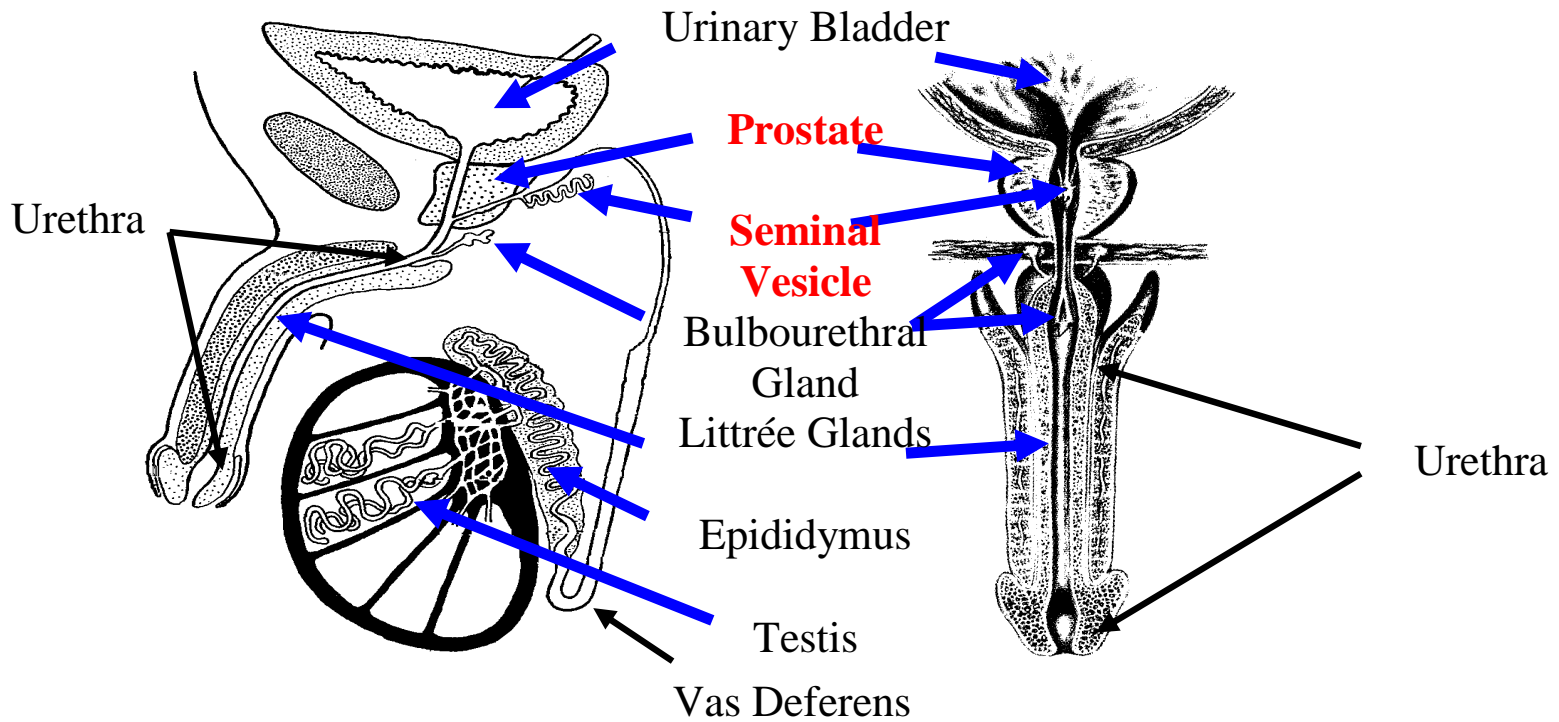
Craig Hendrix

Charles Rohde

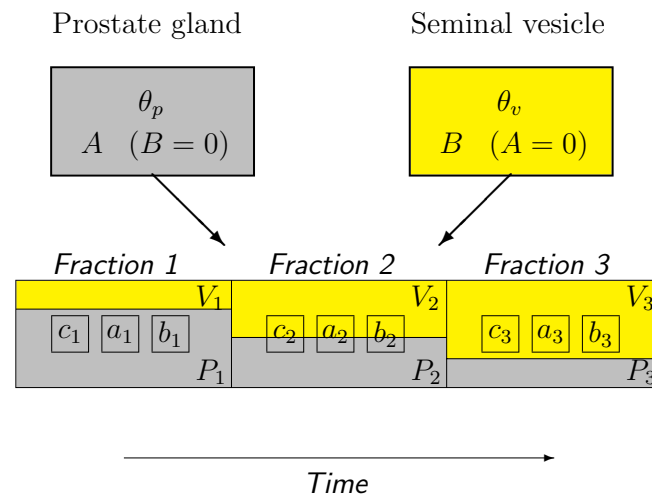


# Scientific objective

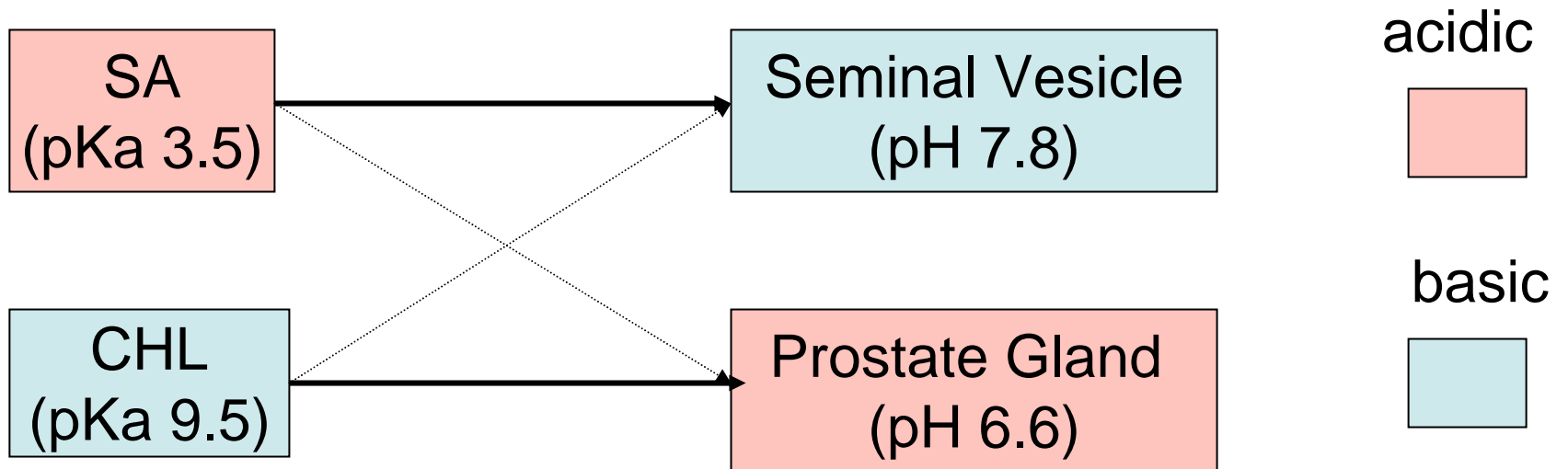
- To estimate differential drug concentration or viral loads in the prostate gland and seminal vesicle
  - Target antiretroviral therapies
- Direct measurement is invasive
- Indirect measurement



Parameters of interest:  
 $\theta_p$  and  $\theta_v$



# Validation Study

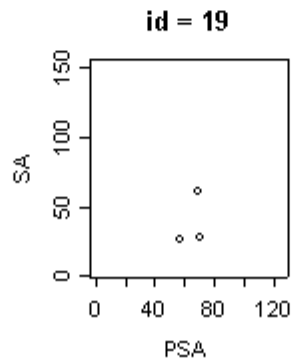
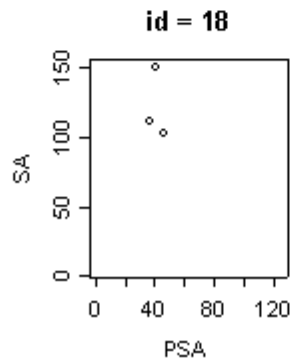
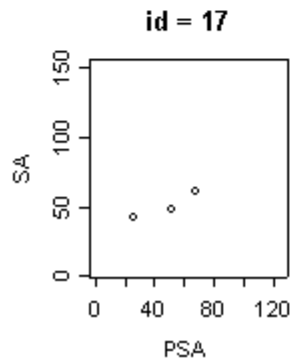
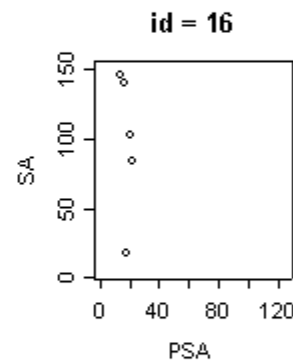
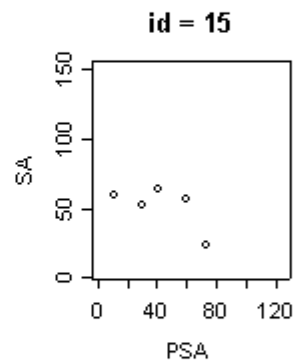
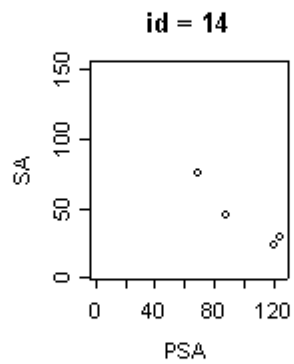
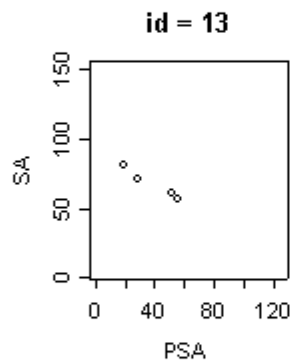
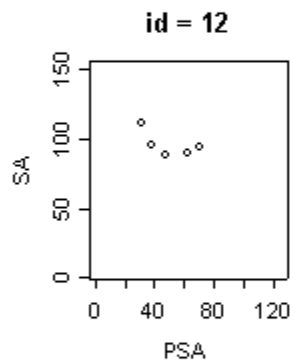
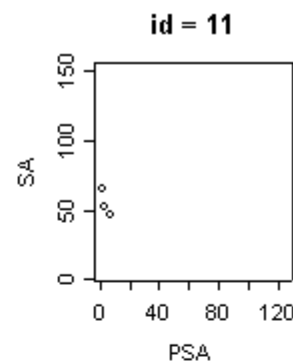
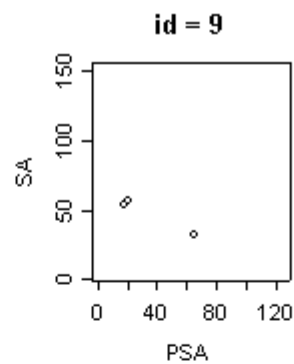
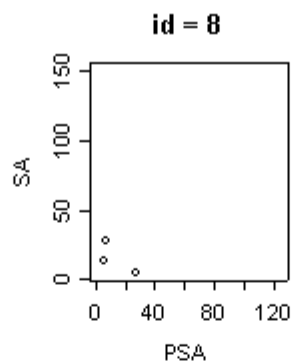
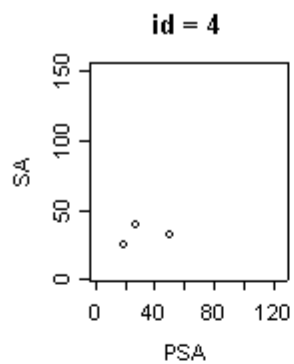
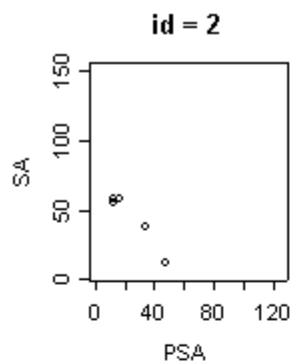


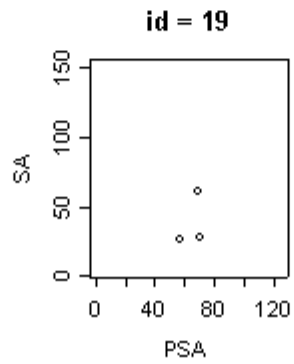
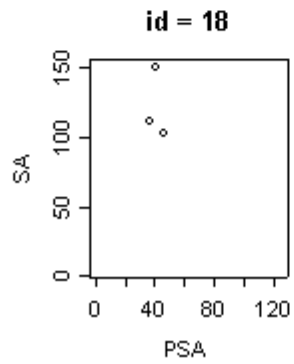
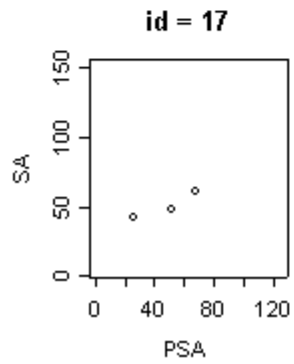
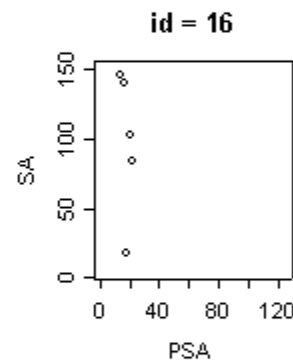
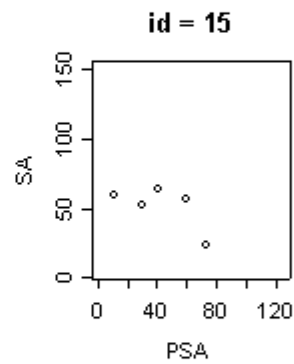
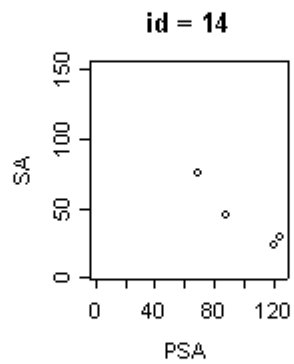
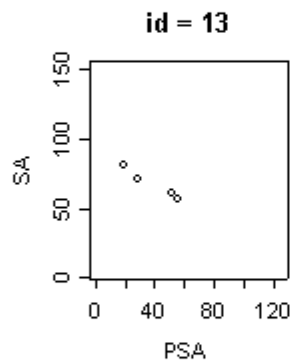
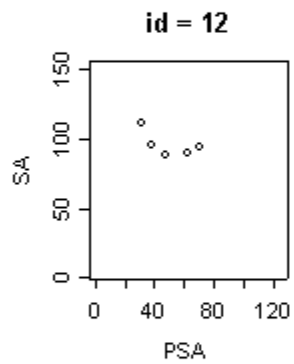
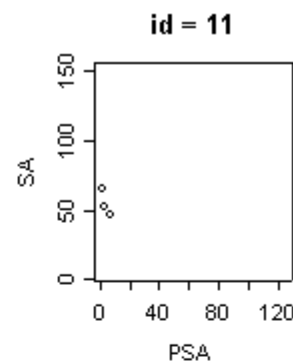
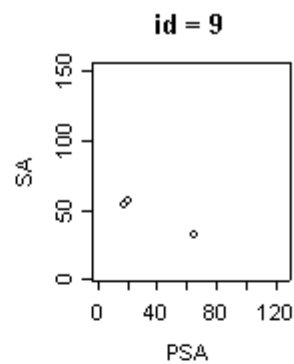
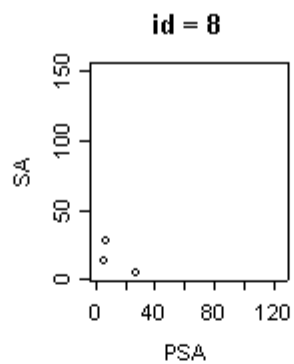
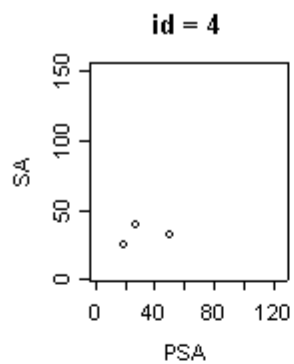
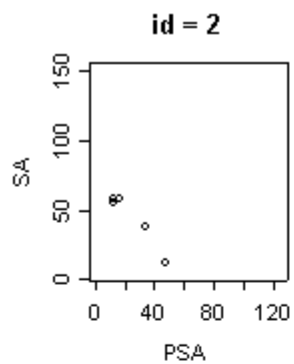
Fractionally collected ejaculate

Measure drug and biomarkers

# Details

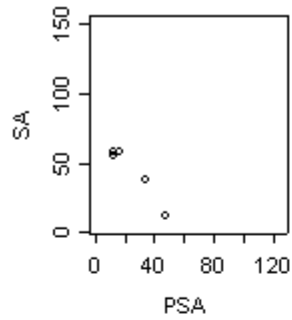
- We can measure the drug concentration in each fraction of ejaculate
- From the collected ejaculate, we cannot measure contribution from the prostate and seminal vesicle
- We can measure surrogates
  - PSA
  - Fructose



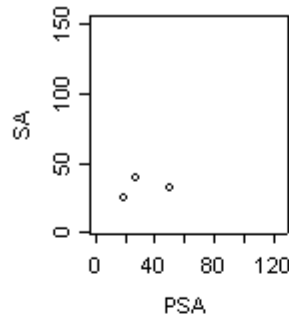




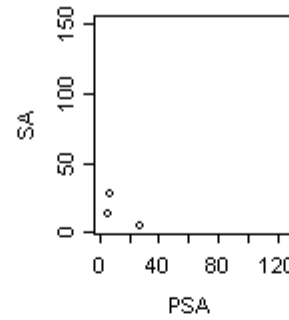
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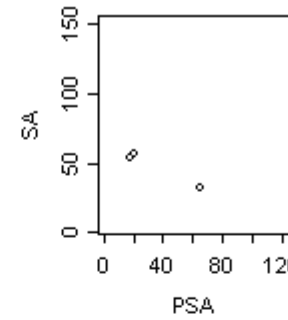
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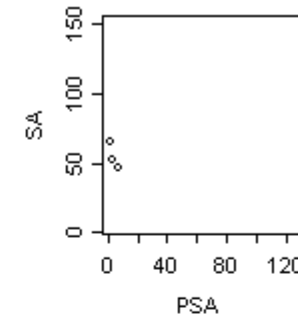
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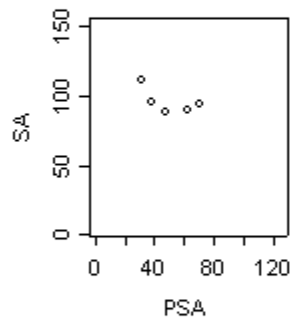
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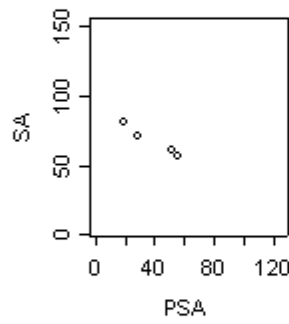
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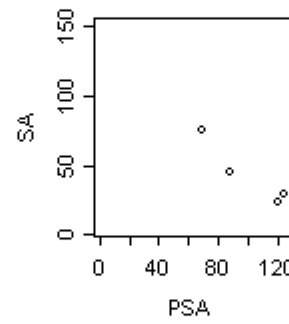
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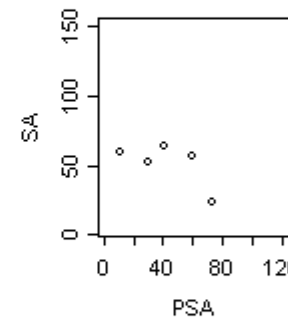
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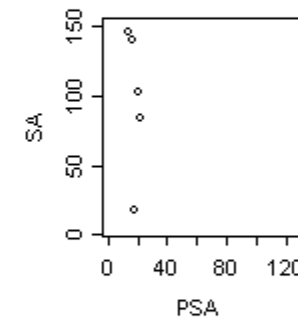
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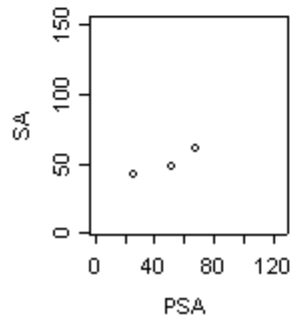
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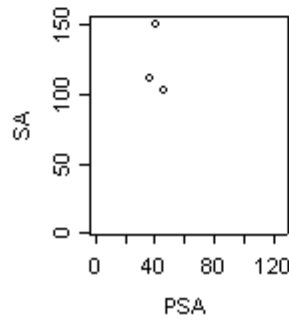
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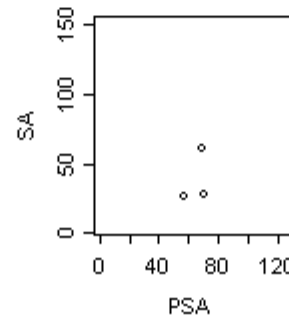
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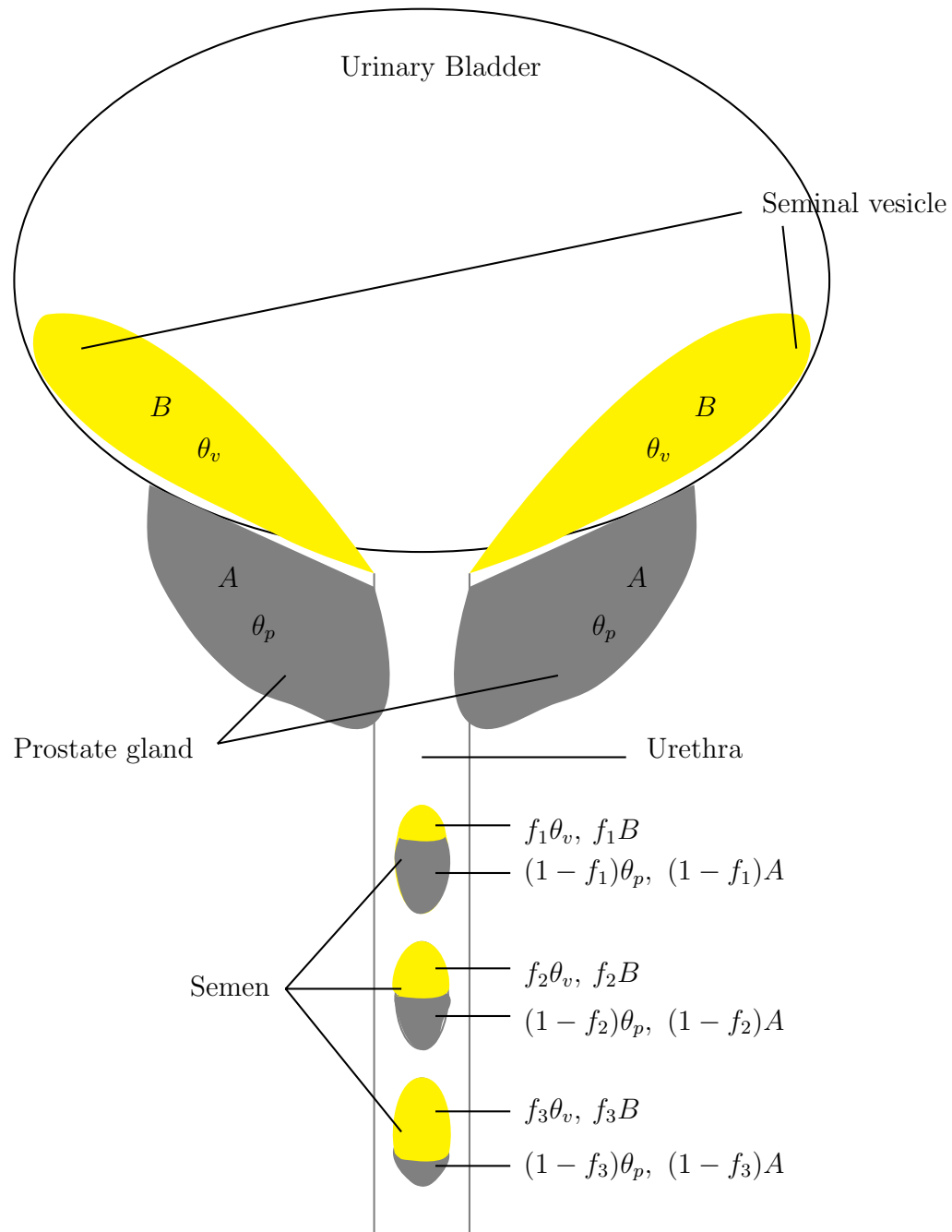


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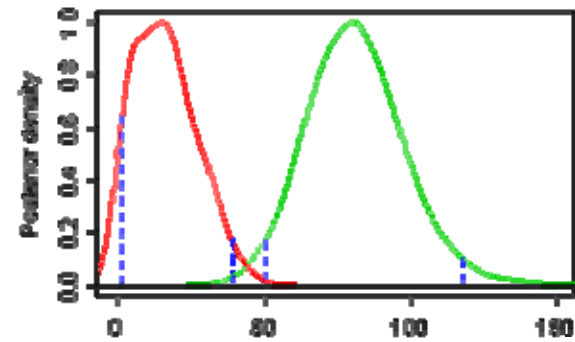
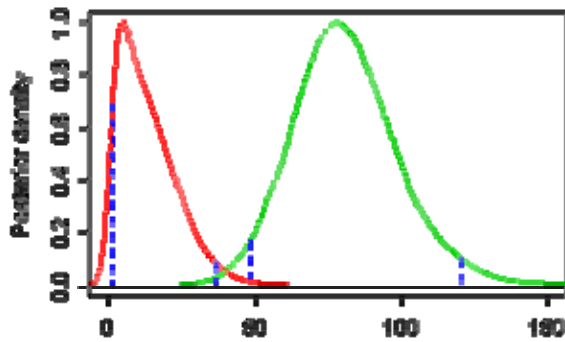
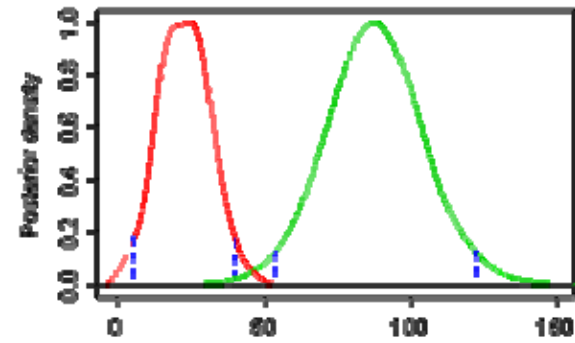
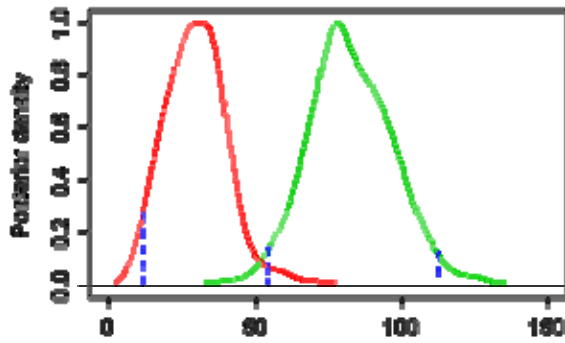
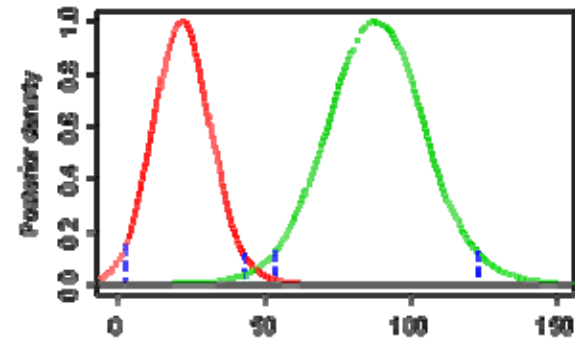
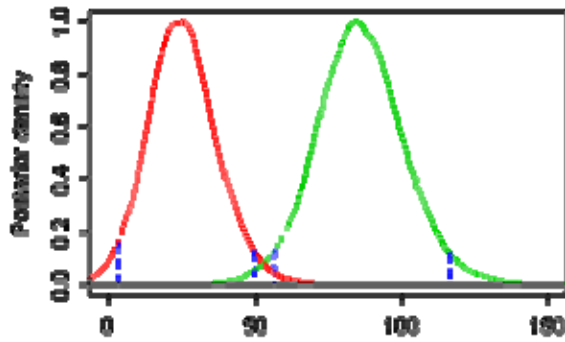




# Multilevel Model (cont'd)

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 $\theta_p$ and $\theta_v$



# Posterior distributions of $\theta_p / \theta_v$

