Thorsten Buch: Animal Breeding

Notation

$\vec{b_i} = (b_i^{ko}, b_i^{het}, b_i^{WT})$ – # of mice born from mother i

$\vec{b_i} \sim \text{Multinomial}\left(\frac{1}{4}, \frac{1}{2}, \frac{1}{4}; |b_i|\right), \quad |b_i| = b_i^{ko} + b_i^{het} + b_i^{WT}$

$\vec{l_i} = (l_i^{KO}, l_i^{het}, l_i^{wt})$ – # of mice survived the needed number of days after birth

$l_i^{ko} \sim \text{Bin}(b_i^{ko}; p^{ko})$

$l_i^{het} \sim \text{Bin}(b_i^{het}; p^{het})$

$l_i^{wt} \sim \text{Bin}(b_i^{wt}; p^{wt})$

Generally, $p^{genotype} = p(\text{mother mouse } i, \text{ \# days after birth, genotype})$.

For a given breeding, I believe, it does not depend on the mother mouse i, hence

$$p^{genotype} = p(\text{\# days after birth, genotype})$$

probability of one mouse offspring of [genotype] to survive the needed time → to be set later

$$L^{genotype}(k) := \sum_{i=1}^{k} l_i^{genotype}$$

total # mice survived by the time we need them

! Note: in this form, we assume all mothers gave birth at the same time

OR

that $p^{genotype}$ does not depend on the

# of days

Goal: find the smallest k:

$$P\left(L^{ko}(k) \geq N^{ko}, L^{hct}(k) \geq N^{hct}, L^{wt}(k) \geq N^{wt}\right) =$$

$$\geq 97.5\%$$

In the Chapter, $|b_i| \sim N(\mu, \sigma = 2.5)$.

Probably, we choose a different model or get the empirial distribution.