Key - Linear Models IVR **Biometry**

Question 5.1

a. The indicator variable is named *TAME* where $TAME = 1$ if the pronghorn is in the "tame" group and $TAME = 0$ if it is in the "diet-curtailed" group.

b. The full model is $\mu_{GROWTH} = \alpha + \beta_1 TIME + \delta_1 TAME + \gamma_1 TAME * TIME$

c. The submodels for both groups are shown in the table below

Group	*Tame*=	Submodel (μ_{GROWTH} =)
Diet-curtailed	0	$= \alpha + \beta_1 TIME$
Tame	1	$= (\alpha + \delta_1) + (\beta_1 + \gamma_1) TIME$

d. Interpretations of the coefficients are listed below.

- α is the intercept of diet-curtailed (reference) group
- β_1 is the slope of diet-curtailed (reference) group
- δ_1 is the difference in intercept of tame and diet-curtailed groups (i.e., tame-dietcurtailed)
- γ_1 is the difference in slopes of tame and diet-curtailed groups (i.e., tame-dietcurtailed)

e. The models for the "parallel lines test" are shown below

$$H_O : \mu_{GROWTH|\ldots} = \alpha + \beta_1 TIME + \delta_1 TAME$$
$$H_A : \mu_{GROWTH|\ldots} = \alpha + \beta_1 TIME + \delta_1 TAME + \gamma_1 TAME * TIME$$

f. The models for the "equal-intercepts test" (assuming parallele lines) are shown below

$$H_O : \mu_{GROWTH|\ldots} = \alpha + \beta_1 TIME$$
$$H_A : \mu_{GROWTH|\ldots} = \alpha + \beta_1 TIME + \delta_1 TAME$$

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Question 5.2

a. The three required indicator variables are shown below

- $FOUR = 1$ if in the "four-day starved" group, $FOUR = 0$ otherwise
- $EIGHT = 1$ if in the "eight-day starved" group, $EIGHT = 0$ otherwise
- $STEEN = 1$ if in the "sixteen-day starved" group, $STEEN = 0$ otherwise

b. The full model is

$$\begin{aligned}\mu_{stomvol} = \alpha + \beta_1 intake + \delta_1 FOUR + \delta_2 EIGHT + \delta_3 STEEN \\ + \gamma_1 FOUR * intake + \gamma_2 EIGHT * intake + \gamma_3 STEEN * intake\end{aligned}$$

c. The sub-models for all four groups are shown in the table below

Group	$FOUR=$	$EIGHT=$	$STEEN=$	Submodel ($\mu_{stomvol} =$)
1-day starved	0	0	0	$= \alpha + \beta_1 intake$
4-day starved	1	0	0	$= (\alpha + \delta_1) + (\beta_1 + \gamma_1) intake$
8-day starved	0	1	0	$= (\alpha + \delta_2) + (\beta_1 + \gamma_2) intake$
16-day starved	0	0	1	$= (\alpha + \delta_3) + (\beta_1 + \gamma_3) intake$

d. Interpretations of the coefficients are listed below.

- α is the intercept of the 1-day starved (reference) group
- β_1 is the slope of the 1-day starved (reference)group
- δ_1 is the difference in the intercepts of the 4-day and 1-day starved groups
- γ_1 is the difference in the slopes of the 4-day and 1-day starved groups
- δ_2 is the difference in the intercepts of the 8-day and 1-day starved groups
- γ_2 is the difference in the slopes of the 8-day and 1-day starved groups
- δ_3 is the difference in the intercepts of the 16-day and 1-day starved groups
- γ_3 is the difference in the slopes of the 16-day and 1-day starved groups

e. Models for the "parallel lines test" are shown below

$$\begin{aligned}H_O &: \mu_{stomvol} = \alpha + \beta_1 intake + \delta_1 FOUR + \delta_2 EIGHT + \delta_3 STEEN \\ H_A &: \mu_{stomvol} = \alpha + \beta_1 intake + \delta_1 FOUR + \delta_2 EIGHT + \delta_3 STEEN \\ &\quad + \gamma_1 FOUR * intake + \gamma_2 EIGHT * intake + \gamma_3 STEEN * intake\end{aligned}$$

f. Models for the "equal-intercepts test" (assuming parallel lines) are shown below

$$\begin{aligned}H_O &: \mu_{stomvol} = \alpha + \beta_1 intake \\ H_A &: \mu_{stomvol} = \alpha + \beta_1 intake + \delta_1 FOUR + \delta_2 EIGHT + \delta_3 STEEN\end{aligned}$$