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Section 1

MANE 6313

Subsection 1

Week 8, Module B

Student Learning Outcome

- Select an appropriate experimental design with one or more factors,
- Select an appropriate model with one or more factors,
- Evaluate statistical analyses of experimental designs,
- Assess the model adequacy of any experimental design, and
- Interpret model results.

Module Learning Outcome

Describe new block generation technique.

Designing a Blocked Experiment

- Define a linear combination

$$L = \alpha_1 x_1 + \alpha_2 x_2 + \cdots + \alpha_k x_k$$

one generators

- We say that L is the defining contrast
- Represent the treatment levels (x_i) as 0 (low level) and 1 (high level) and $\alpha_i = 0$ or 1
- Choose an effect to confound with blocks → highest order interaction
- Calculate the quantity L mod 2 for each effect
- Examine a 2^3 example in two blocks

Two Block Example

$X_1 = A \quad X_3 = C$

$X_2 = B$

$L = \alpha_1 X_1 + \alpha_2 X_2 + \alpha_3 X_3 \quad (ABC)$

X_1	X_2	X_3	L	$L \bmod 2$
0	0	0	0	0
1	0	0	1	1
0	1	0	1	1
1	1	0	2	0
0	0	1	1	1
1	0	1	2	0
0	1	1	2	0
1	1	1	3	1

trl	A	B	C	ABC
(1)	−	−	−	−
a	+	−	−	+
b	−	+	−	+
ab	+	+	−	−
c	−	−	+	+
ac	+	−	+	−
bc	−	+	+	−
abc	+	+	+	+

$L \bmod 2 = 1$: a, b, c, abc

$L \bmod 2 = 0$: (1), ab, ac, bc

$ABC = +$: a, b, c, abc

$ABC = -$: (1), ab, ac, bc

Reconciling the Two Block Generation Methods

Summary

- Two techniques have been presented to design experiments in two blocks
- The block that contains (1) is the *principal block*
- If you can replicate the experiment, use *partial confounding* to improve your design. For each replicate, select a different effect to generate the blocks. Thus, some information is available for each variable (more difficult to correctly design and analyze).