Experiments

Colby Community College

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To control for food consumption, researchers ask all subjects to take the treatment pill immediately after a meal.

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Afterwards the blood pressure of each subject is measured.

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Example 4

A researcher swabs an existing colony of bacteria and wipes it on a growth plate.

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The positive control is used to detect any problems with the new treatment or how it is administered.

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A positive control can also be used to benchmark the results of the new treatment against existing treatments.

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Example 6

If researchers are looking into the effect of a drug on heart attack patients, they might split all the patients into high-risk and low-risk blocks. Then half of each block is assigned to the treatment group and half to the control group.

| 1 | | | | | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 |
| 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 |

| 1 | | | | | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 |
| 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 |

✓ Split into blocks Low-risk patients

| 1 | 2 | 3 | 5 | 7 | 11 | 12 |
|----|----|----|----|----|----|----|
| 13 | 14 | 15 | 16 | 17 | 18 | 20 |
| 24 | 25 | 26 | 27 | 31 | 34 | 36 |
| 39 | 41 | 42 | | | | |

High-risk patients

| 4 | 6 | 8 | 9 | 10 |
|----|----|----|----|----|
| 19 | 21 | 22 | 23 | 28 |
| 29 | 30 | 32 | 33 | 35 |
| 37 | 38 | 40 | | |

13

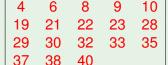
24

39

| 1 | | | | | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 |
| 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 |

Split into blocks Low-risk patients

2 3 5 7 11 12 14 15 16 17 18 20 25 26 27 31 34 36



High-risk patients

Randomly split each block in half

Control group

41

| 2 | 5 | 7 | 12 | 13 | 17 |
|----|----|----|----|----|----|
| 18 | 20 | 25 | 36 | 39 | 42 |

42

| 4 | 6 | 19 | 28 | 30 | 32 |
|----|----|----|----|----|----|
| 35 | 38 | 40 | | | |

Treatment group

| 8 | 9 | 10 | 21 | 22 | 23 |
|----|----|----|----|----|----|
| 29 | 33 | 37 | | | |

Experimental Design

A good experiment is built on four principles.

Controlling Researchers do their best to control for

differences in the treatment and control groups.

Randomization Sampling and assignment into treatment

and/or control groups are done randomly.

Replication A sufficiently large sample is used.

Blocking Researchers suspect that variables other than

the treatment may influence the response.

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Note

While blocking is a slightly more advanced topic, the statistical methods we discuss in this course can be extended to analyze such experiments.

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Example 8

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Suppose researchers want to test the effectiveness of a new treatment for cervical cancer. They decided to use a control group that receives no treatment.

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If there is no known effective treatment, then having a control group that receives no treatment may be ethical.

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Note

In practice, research groups are responsible to review boards which must weigh the ethical concerns of an experiment before any patients are treated.