# **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.

An experiment of a new acne treatment randomly assigns 300 patients into the following groups:

Treatment Group: Receives the treatment being tested.

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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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### Note

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

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### **Definition**

Researchers can first group individuals based on a suspected confounding variable into **blocks** and then randomize the cases within each block to the treatment groups. This is called **blocking**.

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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

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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

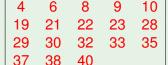
24

39

1													
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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.

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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

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.

Is this ethical?

Ethics in human experimentation is a very complicated topic, and there are multiple viewpoints on the use of placebos.

## Example 8

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.

#### Is this ethical?

No, there are existing, effective treatments for cervical cancer. It is unethical to withhold all treatment from a patient.

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#### Note

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.