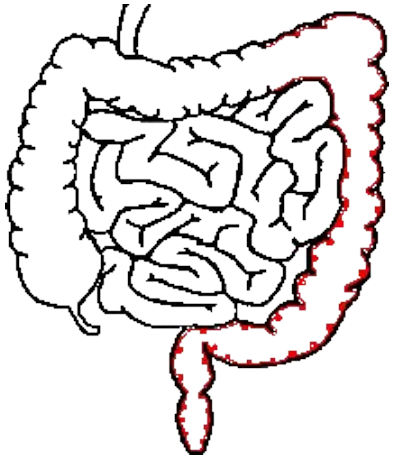
Ulcerative Colitis Treatment Data

Peyton Hall

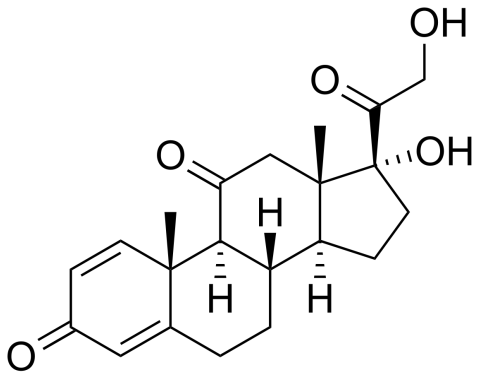
MNGI
DIGESTIVE HEALTH



Overall Question

How effective was Prednisone in rehabilitating from weight loss due to Ulcerative Colitis? That is, in the individual case of one patient, was it effective?

- Note: The effectiveness of Prednisone varies from patient to patient. Although one body may react in certain ways, others may react in alternative ways.



Prednisone Steroid Formula: $C_{21}H_{26}O_5$

Data

Fourteen observations were made:

- Two weeks worth of data (i.e. fourteen days / fourteen rows)
- Four values (columns) of data (i.e. "Date", "Weight", "Prednisone Dosage", & "Activity")

  -The first week, four 10MG pills were consumed orally.

  -The second week, three 10MG pills were consumed orally.

Date	Weight	Prednisone Dosage	Activity
02/24/2024	148.6	4 Pills (40MG)	*NA*
02/25/2024	150.2	4 Pills (40MG)	*NA*
02/26/2024	151.6	4 Pills (40MG)	Visited Gym
02/27/2024	152.4	4 Pills (40MG)	*NA*
02/28/2024	154.2	4 Pills (40MG)	*NA*
02/29/2024	156.6	4 Pills (40MG)	*NA*
03/01/2024	156.4	4 Pills (40MG)	Visited Gym
03/02/2024	158.0	3 Pills (30MG)	*NA*
03/03/2024	158.2	3 Pills (30MG)	*NA*
03/04/2024	158.8	3 Pills (30MG)	Visited Gym
03/05/2024	158.8	3 Pills (30MG)	*NA*
03/06/2024	157.4	3 Pills (30MG)	*NA*
03/07/2024	160.6	3 Pills (30MG)	Visited Gym
03/08/2024	158.4	3 Pills (30MG)	Visited Gym

Hypothesis Testing

Claim: The average weight gain rate was higher on 4 pills rather than 3.

Independent Variable:

- Prednisone dosage

  -Categories: 3 pills (30 MG) and 4 pills (40 MG)

Dependent Variable:

- Rate of weight gain

Hypothesis Testing

Step 1:

- Formulate the H_0 (i.e. $\mu f = \mu t$)
- Formulate the H_a (i.e. $\mu f > \mu t$)

  -Let f = average rate of change of weight on four pills

  -Let t = average rate of change of weight on three pills

$$H_0 : \mu f = \mu t \text{ vs } H_a : \mu f > \mu t$$

Step 2:

- Select the significance level (i.e. α = 0.05)

  -Indicates a 5% chance of rejecting the H_0 when it is actually true

Hypothesis Testing

```
 Paired t-test

data:  f and t
t = 2.2526, df = 5, p-value = 0.03702
alternative hypothesis: true mean difference is greater than 0
95 percent confidence interval:
 0.1300547       Inf
sample estimates:
mean difference
       1.233333
```

Step 3:

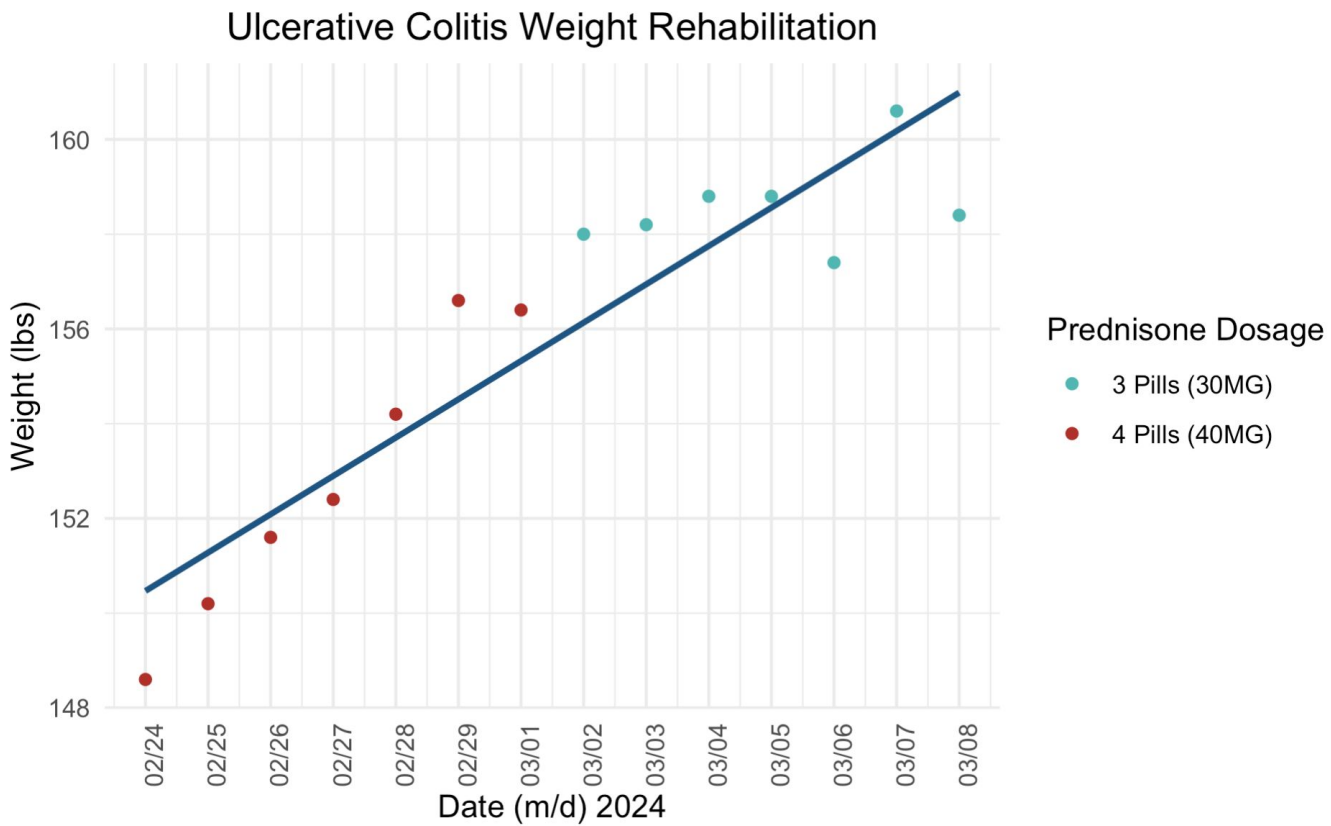
- Calculate data and test statistic

```
# average rate of change formula = (y2 - y1) / (x2 - x1)
# average rate of change = (weight2 - weight 1) / (time2 - time1)
f = c(1.6, 1.4, 0.8, 1.8, 2.4, -0.2)
t = c(0.2, 0.6, 0.0, -1.4, 3.2, -2.2)
```

Step 4:

- Conduct a paired t-test.
- Compare the mean rate of weight gain between the two groups.

```
# use paired t-test because there is a difference in medication per week
t.test(f, t, alternative = "greater", paired = TRUE) # (x,n,p)
```



Conclusion

There is significant evidence that the average rate of change for four pills is greater than the average rate of change for three pills.

Quod Erat Demonstrandum
Q.E.D.
Όπερ Εδει Δείξαι
Ό.Ε.Δ.