Homework 5 QMB 3200: Advanced and Quantitative Methods Fall 2019

Hypothesis testing T and Z tests

Submitted to
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Submitted by
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1. Introduction

The purpose of this report is to investigate the effectiveness of a dietary supplement in reducing the incidence and severity of colds, this project includes descriptive statistics for each variable and also hypothesis testing, Z tests and T tests, investigating the relation of variables. The data includes information regarding the gender, if the person a cold or not and how much time the person was sick, weigh, and if the person had the supplement.

2. Summarized data

The data of the report is below, summarize statistics, such as mean, , standard deviation and frequency, were used to describe the data for 4 different variables: female (gender), cold (if the person had a cold or not), day (the amount of days that the person was sick), supplement (if the person had the supplement of not).

Summarize statistics of the variable Days related to Cold (1)

	Sur	nmary of Colo	d
Days	Mean	Std. Dev.	Freq.
0	Ø	0	30
5	1	0	3
6	1	0	1
7	1	0	9
8	1	0	4
9	1	0	10
10	1	0	3
Total	.5	.50421948	60

It can be observed that half of the sample (30 people) did not have a cold, while the other had and from those who had a cold one third (10 people) were sick for the period of 9 days.

Summarize statistics of the variable Supplement related to Cold (2)

	Sur	nmary of Cold	
Supplement	Mean	Std. Dev.	Freq.
0	.63333333	.49013252	30
1	.36666667	.49013252	30
Total	.5	.50421948	60

It can be observed that half of the sample (30 people) did not took the supplement and from the people who did not took it, 63% had a cold, while other 30 people had the supplement and from those who had it 37% had a cold.

Summarize statistics of the variable Female related to Cold (3)

	Summary of Cold				
Female	Mean	Std. Dev.	Freq.		
0	.56666667	.50400693	30		
1	.43333333	.50400693	30		
Total	.5	.50421948	60		

It can be observed that half of the sample (30 people) are male and from those 57% had a cold, while the other 30 people are female and from those 43% had a cold.

Summarize statistics of the variable Supplement and Female related to Cold (4)

Means, Standard Deviations and Frequencies of Cold

	Fema			
Supplement	0	1	Total	
0	.73333333	.53333333	.63333333	
	.45773771	.51639778	.49013252	
	15	15	30	
1	.4	.33333333	.36666667	
	.50709255	.48795004	.49013252	
	15	15	30	
Total	.56666667	.43333333	.5	
	.50400693	.50400693	.50421948	
	30	30	60	

The population was divided into 4 subgroups, each with a population size of 15 people, these 4 groups are: Male x Did have the supplement, Male x Did not have the supplement, Female x Did not have the supplement. The table also contains data related to mean and standard deviation for each relation and it can be observed a difference between those who had the supplement and those who did not, but this will be further investigate using hypothesis testing.

Summarize statistics of the variable Cold related to Days (5)

	Summary of Days					
Cold	Mean	Std. Dev.	Freq.			
0	0	0	30			
1	7.8666667	1.4558641	30			
Total	3.9333333	4.0957467	60			

It can be observed that from the population who had a Cold the mean amount day that they were sick was 7.87 days, while the other half of the population was not sick.

Summarize statistics of the variable Supplement related to Days (6)

	Sui	nmary of Days	
Supplement	Mean	Std. Dev.	Freq.
0	5.3	4.1948244	30
1	2.5666667	3.5591876	30
Total	3.9333333	4.0957467	60

It can be observed that from the population who had the supplement the mean amount day that they were sick was 2.57 days and the standard deviation was 3.56, while the people who did not have the supplement the mean amount day that they were sick was 5.3 days and the standard deviation was 4.19.

Summarize statistics of the variable Female related to Days (7)

	Summary of Days				
 Female	Mean	Std. Dev.	Freq.		
0	4.2	3.9075524	30		
1	3.6666667	4.3258113	30		
Total	3.9333333	4.0957467	60		

It can be observed that from the male population that the mean amount day that they were sick was 4.20 days and the standard deviation was 3.90, while from the female population the mean amount day that they were sick was 3.67 days and the standard deviation was 4.33.

Summarize statistics of the variable Female and Supplement related to Days (8)

Means, Standard Deviations and Frequencies of Days	Means,	Standard	Deviations	and	Frequencies	of	Days
--	--------	----------	------------	-----	-------------	----	------

	Fema			
Supplement	0	1	Total	
0	5.9333333	4.6666667	5.3	
	3.8446004	4.5617457	4.1948244	
	15	15	30	
1	2.4666667	2.6666667	2.5666667	
	3.2263794	3.9761192	3.5591876	
	15	15	30	
Total	4.2	3.6666667	3.9333333	
	3.9075524	4.3258113	4.0957467	
	30	30	60	

The population was divided into 4 subgroups, each with a population size of 15 people, these 4 groups are: Male x Did have the supplement, Male x Did not have the supplement, Female x Did not have the supplement. The table also contains data related to mean and standard deviation for each relation to the variable Days and it can be observed that the people who had the supplement have a mean value smaller than those who did not have the supplement.

2. Z-test for association of variables and cold.

Z-test to check if cold is influenced by the supplement (9)

	Number of obs = Number of obs =			ons	t of proporti	wo-sample tes
Interval]	[95% Conf.	P> z	z	Std. Err.	Mean	Group
.8057739	.4608928			.0879815	.6333333	0
.5391072	.1942261			.0879815	.3666667	1
.5105344	.0227989			.1244246	.2666667	diff
		0.039	2.07	.1290994	under Ho:	
= 2.0656	Z =			op(1)	= prop(0) - pr = 0	diff = Ho: diff =
iff > 0) = 0.0194		389	ff != 0	Ha: d: Pr(Z > :		Ha: diff < Pr(Z < z) = 0

Assuming Ho: diff = 0, Ha: diff > 0, and α = 0.05. The null hypothesis is rejected as the p-value is equal to 0.0194 and α > 0.0194. We conclude that supplements affect the probability of getting a cold by decreasing the probability.

Z-test to check if cold is influenced by the supplement for males (10)

Two-sample tes	st of proport:	ions			Number of obs Number of obs	
Group	Mean	Std. Err.	Z	P> z	[95% Conf.	Interval]
0 1	.7333333 .4	.1141798 .1264911			.5095449 .152082	.9571217 .647918
diff	.3333333 under Ho:	.1704026 .180944	1.84	0.065	0006496	.6673162
diff =	= prop(0) - pr = 0	rop(1)			Z	= 1.8422
Ha: diff < Pr(Z < z) = 6	· -	Ha: di Pr(Z > z	.ff != 0 :) = 0. (2654		iff > 0) = 0.0327

Assuming Ho: diff = 0, Ha: diff > 0, and α = 0.05. The null hypothesis is rejected as the p-value is equal to 0.0327 and α > 0.0327. We conclude that supplements for men affects getting a cold by decreasing it the probability.

Z-test to check if cold is influenced by the supplement for females (11)

Two-sample tes	st of proport:	ions		0:	Number of obs	= 15
				1:	Number of obs	= 15
Group	Mean	Std. Err.	Z	P> z	[95% Conf.	Interval]
0	.5333333	.1288122			.280866	.7858007
1	.3333333	.1217161			.0947741	.5718926
diff	.2	.1772214			1473475	.5473475
	under Ho:	.180944	1.11	0.269		
diff =	= prop(0) - pr	rop(1)			Z	= 1.1053
Ho: diff =	= 0					
Ha: diff <	< 0	Ha: di	.ff != 0		Ha: d	iff > 0
Pr(Z < z) = 0	0. 8655	Pr(Z > z	() = 0.	2690	Pr(Z > z) = 0.1345

Assuming Ho: diff = 0, Ha: diff > 0, and $\alpha = 0.05$. The null hypothesis is retained as the p-value is equal to 0.1345 and $\alpha < 0.1345$. We conclude that there is not enough strong evidence to state that supplements for women by affects getting a cold by decreasing it the probability.

Z-test to check if cold is influenced by gender (12)

Two-sample test of proportions

0: Number of obs = 30 1: Number of obs = 30

Group	Mean	Std. Err.	Z	P> z	[95% Conf.	Interval]
0 1	.5666667 .4333333	.090472 .090472			.3893448 .2560114	.7439886 .6106552
diff	.1333333 under Ho:	.1279467 .1290994	1.03	0.302	1174377	.3841044

diff = prop(0) - prop(1)

Z = 1.0328

Ho: diff = 0

Ha: diff < 0

Ha: diff != 0 Pr(Z < z) = 0.8492 Pr(|Z| > |z|) = 0.3017 Pr(Z > z) = 0.1508

Ha: diff > 0

Assuming Ho: diff = 0, Ha: diff != 0, and $\alpha = 0.05$. The null hypothesis is retained as the p-value is equal to 0.3017 and α < 0.3017. We conclude that there is not enough strong evidence to state that gender differentiation affects getting a cold.

Z-test to check if cold is influenced by gender given that supplements are being taken (13)

Two-sample test of proportions

0: Number of obs = 15 1: Number of obs = 15

Group	Mean	Std. Err.	Z	P> z	[95% Conf.	Interval]
0 1	.4	.1264911 .1217161			.152082 .0947741	.647918 .5718926
diff	.0666667 under Ho:	.1755415 .175963	0.38	0.705	2773883	.4107217

diff = prop(0) - prop(1)

0.3789 z =

Ho: diff = 0

Ha: diff < 0

Ha: diff != 0 Pr(Z < z) = 0.6476 Pr(|Z| > |z|) = 0.7048

Ha: diff > 0 Pr(Z > z) = 0.3524 Assuming Ho: diff = 0, Ha: diff $\ != 0$, and $\alpha = 0.05$. The null hypothesis is retained as the p-value is equal to 0.7048 and $\alpha < 0.7048$. We conclude that there is not enough strong evidence to state that gender differentiation affects getting a cold given that the supplements are being taken.

Z-test to check if cold is influenced gender given that supplements are not being taken (14)

15	Number of obs =	0:		Two-sample test of proportions			
15	Number of obs =	1:					
[nterval]	[95% Conf.	P> z	Z	Std. Err.	Mean	Group	
.9571217	.5095449			.1141798	.7333333	0	
.7858007	.280866			.1288122	.5333333	1	
.5373737	1373737			.1721326	.2	diff	
		0.256	1.14	.175963	under Ho:		
1.1366	Z =			rop(1)	= prop(0) - pr = 0	diff =	
	Ha: di Pr(Z > z)	2557	iff != 0 z) = 0. 2	Ha: di Pr(Z > z		Ha: diff < Pr(Z < z) = 0	

Assuming Ho: diff = 0, Ha: diff != 0, and α = 0.05. The null hypothesis is retained as the p-value is equal to 0.2557 and α < 0.2557. We conclude that there is not enough strong evidence to state that gender differentiation affects getting a cold given that the supplements are not being taken.

3. T-test for association of variables and cold

T-test to check if cold duration is influenced by the supplement (15)

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	19	8.368421	.2560442	1.116071	7.830492	8.90635
1	11	7	.4861724	1.612452	5.91674	8.08326
combined	30	7.866667	.2658032	1.455864	7.323038	8.410295
diff		1.368421	.4982251		.3478532	2.388989
diff = Ho: diff =	= mean(0) - = 0	mean(1)		degrees	t of freedom	= 2.7466 = 28
	iff < 0) = 0.9948	Pr(Ha: diff != T > t) =	-		diff > 0 a) = 0.0052

Assuming Ho: diff = 0, Ha: diff > 0, and α = 0.05. The null hypothesis is rejected as the p-value is equal to 0.0052 and α > 0.0052. We conclude that there is strong evidence to state that supplements decrease the duration of a cold.

T-test to check if cold duration is influenced by the supplement for males (16)

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0 1	11 6	8.090909 6.166667	.3681538 .5426274	1.221028 1.32916	7.270611 4.771799	8.911207 7.561535
combined	17	7.411765	.3743506	1.543487	6.618177	8.205353
diff		1.924242	.6385125		.5632853	3.2852
diff =	= mean(0) - = 0	mean(1)		degrees	t of freedom	5.0250
	iff < 0) = 0.9956	Pr(Ha: diff != T > t) =	=		iff > 0) = 0.0044

Assuming Ho: diff = 0, Ha: diff > 0, and α = 0.05. The null hypothesis is rejected as the p-value is equal to 0.0044 and α > 0.0044. We conclude that there is strong evidence to state that supplements decrease the duration of a cold for men.

T-test to check if cold duration is influenced by the supplement for females (17)

Iwo-sample t test with equal variances

Group	0bs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0 1	8 5	8.75 8	.3133916 .6324555	.8864053 1.414214	8.008947 6.244022	9.491053 9.755978
combined	13	8.461538	.312463	1.126601	7.78074	9.142337
diff		.75	.6315565		6400465	2.140047
diff =	= mean(0) - = 0	mean(1)		degrees	t of freedom	

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0 Pr(T < t) = 0.8700 Pr(|T| > |t|) = 0.2600 Pr(T > t) = 0.1300

Assuming Ho: diff = 0, Ha: diff > 0, and α = 0.05. The null hypothesis is retained as the p-value is equal to 0.1300 and α < 0.1300. We conclude that there is not enough strong evidence to state that supplements decrease the duration of a cold for women.

T-test to check if cold duration is influenced by gender (18)

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0 1	17 13	7.411765 8.461538	.3743506 .312463	1.543487 1.126601	6.618177 7.78074	8.205353 9.142337
combined	30	7.866667	.2658032	1.455864	7.323038	8.410295
diff		-1.049774	.5085647		-2.091521	0080261
diff =	= mean(0) = 0	- mean(1)		degrees	t of freedom	= -2.0642 = 28
	iff < 0) = 0.0242	Pr(Ha: diff != T > t) =	_		iff > 0) = 0.9758

Assuming Ho: diff = 0, Ha: diff $\ != 0$, and $\alpha = 0.05$. The null hypothesis is rejected as the p-value is equal to 0.0484 and $\alpha < 0.0484$. We conclude that there is strong evidence to state that gender differentiation affects a cold duration.

T-test to check if cold duration is influenced by gender given that supplements are being taken (19)

Two-sample t test with equal variances

Err. Std. Dev. [95% Conf. Interva	Std. Err.	Mean	Obs	Group
274 1.32916 4.771799 7.5615	.5426274	6.166667	6	0
555 1.414214 6.244022 9.7559	.6324555	8	5	1
724 1.612452 5.91674 8.083	.4861724	7	11	combined
319 -3.706698 .04003	.8281319	-1.833333		diff
t = -2.21 degrees of freedom =		mean(1)	= mean(0) - = 0	diff = Ho: diff =
	Ha: diff != T > t) = (Pr(lff < 0 = 0.0271	

Assuming Ho: diff = 0, Ha: diff $\ != 0$, and $\alpha = 0.05$. The null hypothesis is retained as the p-value is equal to 0.0541 and $\alpha < 0.0541$. We conclude that there is not enough strong evidence to state that gender differentiation affects cold duration given that the supplements are being taken.

T-test to check if cold duration is influenced by gender given that supplements are not being taken (20)

Two-sample t test with equal variances

				•		•
Interval]	[95% Conf.	Std. Dev.	Std. Err.	Mean	Obs	Group
8.911207	7.270611	1.221028	.3681538	8.090909	11	0
9.491053	8.008947	.8864053	.3133916	8.75	8	1
8.90635	7.830492	1.116071	.2560442	8.368421	19	combined
.415065	-1.733247		.5091231	6590909		diff
-1.2946 17	t = of freedom =	degrees		mean(1)	= mean(0) - = 0	diff =
.ff > 0 = 0.8936			Ha: diff != T > t) =	Pr(iff < 0) = 0.1064	

Assuming Ho: diff = 0, Ha: diff \cdot != 0, and α = 0.05. The null hypothesis is retained as the p-value is equal to 0.2128 and α < 0.2128. We conclude that there is not enough strong evidence to state that gender differentiation affects cold duration given that the supplements are not being taken.

6. Conclusion

Based on the data, it is possible to conclude that cold duration is reduced by the supplement only for men, there is not strong evidence to say the same for women, and cold duration is affected by gender differentiation. Furthermore, it can be said that supplements decrease the probability of getting a cold and that gender is not a factor that affects getting a cold or not, but there is only strong evidence to say that the supplement decreases the probability of men getting a cold.

Appendix A: Do-file-for-Homework 2

```
*QMB 3200 Homework 5
*Name: Luiz Gustavo Fagundes Malpele
log using "C:\Users\luizg\Desktop\LogHW5.smcl"
import delimited "C:\Users\luizg\Desktop\supplement.csv"
*Question 1 - tabulate command
tabulate days, summarize(cold)
tabulate supplement, summarize(cold)
tabulate female, summarize(cold)
tabulate supplement female, summarize(cold)
tabulate cold, summarize(days)
tabulate supplement, summarize(days)
tabulate female, summarize(days)
tabulate supplement female, summarize(days)
*Question 2 - prtest var (if), by(vargroup)
prtest cold, by(female)
prtest cold, by(supplement)
prtest cold if female == 0, by (supplement)
prtest cold if female == 1, by (supplement)
prtest cold if supplement == 1, by (female)
prtest cold if supplement == 0, by (female)
*Question 3 - ttest var (if), by(vargroup)
ttest days if cold == 1, by (supplement)
ttest days if cold == 1 & female == 0, by (supplement)
ttest days if cold == 1 & female == 1, by (supplement)
```

```
ttest days if cold == 1, by (female)

ttest days if cold == 1 & supplement == 0, by (female)

ttest days if cold == 1 & supplement == 1, by (female)

log close
```

log close

Appendix B:Do-file-for-Homework 2

name: <unnamed>

log: C:\Users\luizg\Desktop\LogHW5.smcl

log type: smcl

opened on: 8 Oct 2019, 23:38:32

. import delimited "C:\Users\luizg\Desktop\supplement.csv"
(6 vars, 60 obs)

. tabulate days, summarize(cold)

	1	Sum	mary of Cold	
Days	1	Mean	Std. Dev.	Freq.
	-+			
0	1	0	0	30
5	1	1	0	3
6	1	1	0	1
7	1	1	0	9
8	1	1	0	4
9	1	1	0	10
10	1	1	0	3
	-+			
Total	1	.5	.50421948	60

. tabulate supplement, summarize(cold)

		Su		
Supplement		Mean	Std. Dev.	Freq.
	+-			
0		.63333333	.49013252	30
1		.36666667	.49013252	30
	+-			
Total	I	.5	.50421948	60

. tabulate female, summarize(cold)

		Summary of Cold				
Female	I	Mean	Std. Dev.	Freq.		
	-+-					
0	I	.56666667	.50400693	30		
1	I	.43333333	.50400693	30		
	-+-					
Total	I	.5	.50421948	60		

. tabulate supplement female, summarize(cold)

Means, Standard Deviations and Frequencies

> of Cold

		Fema			
Supplement		0	1	I	Total
	+-			-+-	
0		.73333333	.53333333	I	.63333333
		.45773771	.51639778	I	.49013252
		15	15	1	30

+			-+-	
1	. 4	.33333333	1	.36666667
1	.50709255	.48795004	1	.49013252
1	15	15	1	30
+-			-+-	
Total	.56666667	.43333333	I	.5
I	.50400693	.50400693		.50421948
1	30	30		60

. tabulate cold, summarize(days)

		Sun		
Cold	I	Mean	Std. Dev.	Freq.
	-+-			
0	1	0	0	30
1	1	7.8666667	1.4558641	30
	-+-			
Total	1	3.9333333	4.0957467	60

.

. tabulate suplemment, summarize(days)
variable suplemment not found
r(111);

. tabulate supplement, summarize(days)

		Su		
Supplement		Mean	Std. Dev.	Freq.
	+-			
0		5.3	4.1948244	30
1		2.5666667	3.5591876	30
	+-			

. tabulate female, summarize(days)

	1	Summary of Days				
Female	I	Mean	Std. Dev.	Freq.		
	+					
0	I	4.2	3.9075524	30		
1	I	3.6666667	4.3258113	30		
	+					
Total	I	3.9333333	4.0957467	60		

. tabulate supplement female, summarize(days)

Means, Standard Deviations and Frequencies

> of Days

	I	Fema			
Supplement	I	0	1	I	Total
	-+-			-+-	
0	I	5.9333333	4.6666667	I	5.3
	I	3.8446004	4.5617457	I	4.1948244
	1	15	15		30
	-+-			-+-	
1	I	2.4666667	2.6666667	I	2.5666667
	1	3.2263794	3.9761192		3.5591876
	١	15	15		30
	-+-			-+-	
Total	I	4.2	3.6666667	I	3.9333333
	I	3.9075524	4.3258113	I	4.0957467
	I	30	30	I	60
prtest supplement, by(cold)					

```
0: Number of obs = 30
Two-sample test of proportions
                           1: Number of obs =
                                         30
   Group | Mean Std. Err. z P>|z| [95% Conf. Interval]
-----
     0 | .6333333 .0879815
                               .4608928
                                      .8057739
     1 | .3666667 .0879815
                                .1942261
                                      .5391072
    diff | .2666667 .1244246
                               .0227989 .5105344
      | under Ho: .1290994 2.07 0.039
______
   diff = prop(0) - prop(1)
                                    z = 2.0656
 Ho: diff = 0
Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(Z < z) = 0.9806 Pr(|Z| > |z|) = 0.0389 Pr(Z > z) = 0.0194
. prtest female, by(cold)
Two-sample test of proportions
                           0: Number of obs = 30
                            1: Number of obs =
-----
   Group | Mean Std. Err. z P>|z| [95% Conf. Interval]
______
      0 | .5666667 .090472
                               .3893448 .7439886
     1 | .4333333 .090472
                               .2560114 .6106552
______
```

diff | .1333333 .1279467 -.1174377 .3841044 | under Ho: .1290994 1.03 0.302

diff = prop(0) - prop(1) z = 1.0328

Ho: diff = 0

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0

Pr(Z < z) = 0.8492 Pr(|Z| > |z|) = 0.3017 Pr(Z > z) = 0.1508

. prtest cold, by(female)

Two-sample test of proportions 0: Number of obs = 30

1: Number of obs = 30

Group | Mean Std. Err. z P>|z| [95% Conf. Interval]

0 | .5666667 .090472 .3893448 .7439886

1 | .4333333 .090472 .2560114 .6106552

-

diff | .1333333 .1279467 -.1174377 .3841044

| under Ho: .1290994 1.03 0.302

 $diff = prop(0) - prop(1) \qquad z = 1.0328$

Ho: diff = 0

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0

Pr(Z < z) = 0.8492 Pr(|Z| > |z|) = 0.3017 Pr(Z > z) = 0.1508

. prtest supplement, by(supplement)

```
0: Number of obs = 30
Two-sample test of proportions
                         1: Number of obs =
                                      30
   Group | Mean Std. Err. z P>|z| [95% Conf. Interval]
______
     0 | 0
           1
     1 |
                 0
diff | -1 0
                                -1 -1
     | under Ho: .1290994 -7.75 0.000
_____
   diff = prop(0) - prop(1)
                                 z = -7.7460
 Ho: diff = 0
Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(Z < z) = 0.0000 Pr(|Z| > |z|) = 0.0000 Pr(Z > z) = 1.0000
. prtest cold, by(supplement)
Two-sample test of proportions
                         0: Number of obs = 30
                         1: Number of obs =
.-----
   Group | Mean Std. Err. z P>|z| [95% Conf. Interval]
______
     0 | .6333333 .0879815
                             .4608928 .8057739
     1 | .3666667 .0879815
                             .1942261 .5391072
```

```
.0227989 .5105344
     diff | .2666667 .1244246
        | under Ho: .1290994 2.07 0.039
                                              z = 2.0656
     diff = prop(0) - prop(1)
  Ho: diff = 0
                Ha: diff != 0
  Ha: diff < 0
                                            Ha: diff > 0
Pr(Z < z) = 0.9806 Pr(|Z| > |z|) = 0.0389 Pr(Z > z) = 0.0194
. prtest cold, by (female = 1)
by() does not contain a valid varname
r(198);
. prtest help
variable help not found
r(111);
. help prtest
. prtest cold if female = 0, by (supplement)
may not combine == and option by()
r(198);
. prtest cold if female == 0, by (supplement)
Two-sample test of proportions
                                   0: Number of obs = 15
                                    1: Number of obs =
                                                     15
-----
    Group | Mean Std. Err. z P>|z| [95% Conf. Interval]
______
```

```
0 | .7333333 .1141798
                          .5095449 .9571217
     1 | .4 .1264911
                               .152082 .647918
    diff | .3333333 .1704026
                              -.0006496 .6673162
      | under Ho: .180944 1.84 0.065
-----
    diff = prop(0) - prop(1)
                                   z = 1.8422
 Ho: diff = 0
 Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(Z < z) = 0.9673 Pr(|Z| > |z|) = 0.0654 Pr(Z > z) = 0.0327
. prtest cold if female == 1, by (supplement)
Two-sample test of proportions
                          0: Number of obs = 15
                           1: Number of obs =
                                        15
 ._____
   Group | Mean Std. Err. z P>|z| [95% Conf. Interval]
-----
     0 | .5333333 .1288122
                               .280866 .7858007
     1 | .3333333 .1217161
                               .0947741
diff | .2 .1772214
                              -.1473475 .5473475
      | under Ho: .180944 1.11 0.269
______
   diff = prop(0) - prop(1)
                                   z = 1.1053
 Ho: diff = 0
 Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
```

```
. prtest cold if supplement == 1, by (female)
                          0: Number of obs =
Two-sample test of proportions
                          1: Number of obs =
                                       15
______
   Group | Mean Std. Err. z P>|z| [95% Conf. Interval]
______
     0 | .4 .1264911
                              .152082 .647918
     1 | .3333333 .1217161
                              .0947741 .5718926
diff | .0666667 .1755415
                          -.2773883 .4107217
      | under Ho: .175963 0.38 0.705
______
   diff = prop(0) - prop(1)
                                z = 0.3789
 Ho: diff = 0
            Ha: diff != 0 Ha: diff > 0
 Ha: diff < 0
Pr(Z < z) = 0.6476 Pr(|Z| > |z|) = 0.7048 Pr(Z > z) = 0.3524
. prtest cold if supplement == 0, by (female)
                          0: Number of obs = 15
Two-sample test of proportions
                          1: Number of obs = 15
______
   Group | Mean Std. Err. z p>|z| [95% Conf. Interval]
_____
     0 | .7333333 .1141798
                          .5095449 .9571217
```

Pr(Z < z) = 0.8655 Pr(|Z| > |z|) = 0.2690 Pr(Z > z) = 0.1345

```
1 | .5333333 .1288122
                             .280866 .7858007
______
    diff | .2 .1721326
                                -.1373737 .5373737
      | under Ho: .175963 1.14 0.256
   diff = prop(0) - prop(1)
                                      z = 1.1366
 Ho: diff = 0
           Ha: diff != 0 Ha: diff > 0
 Ha: diff < 0
Pr(Z < z) = 0.8721 Pr(|Z| > |z|) = 0.2557 Pr(Z > z) = 0.1279
ttest days if cold == 1, by (supplement)
Two-sample t test with equal variances
 Group | Obs Mean Std. Err. Std. Dev. [95% Conf. Interval]
______
    0 | 19 8.368421 .2560442 1.116071 7.830492 8.90635
       11 7 .4861724 1.612452 5.91674 8.08326
______
combined | 30 7.866667 .2658032 1.455864 7.323038 8.410295
            1.368421 .4982251
  diff |
                                 .3478532 2.388989
 ______
  diff = mean(0) - mean(1)
                                      t = 2.7466
Ho: diff = 0
                            degrees of freedom = 28
           Ha: diff != 0
                                    Ha: diff > 0
 Ha: diff < 0
Pr(T < t) = 0.9948 Pr(|T| > |t|) = 0.0104 Pr(T > t) = 0.0052
```

```
. ttest days if cold == 1, by (female)
Two-sample t test with equal variances
_____
> -----
 Group | Obs Mean Std. Err. Std. Dev
> .
> [95% Conf. Interval]
______
> -----
   0 | 17 7.411765 .3743506 1.543487
  6.618177
        8.205353
   1 | 13 8.461538 .312463 1.126601
  7.78074
        9.142337
______
> -----
combined | 30 7.866667 .2658032 1.455864
> 7.323038
        8.410295
_____
 diff |
          -1.049774 .5085647
 -2.091521
        -.0080261
_____
> -----
 diff = mean(0) - mean(1)
  t = -2.0642
Ho: diff = 0
                          degre
```

```
Ha: diff < 0
                    Ha: diff != 0
 Ha: diff > 0
Pr(T < t) = 0.0242 Pr(|T| > |t|) = 0.0484
> Pr(T > t) = 0.9758
. ttest days if cold == 1, by (female)
Two-sample t test with equal variances
 Group | Obs Mean Std. Err. Std. Dev. [95% Conf. Interval]
______
    0 | 17 7.411765 .3743506 1.543487 6.618177 8.205353
    1 | 13 8.461538 .312463 1.126601 7.78074 9.142337
______
combined | 30 7.866667 .2658032 1.455864 7.323038 8.410295
______
            -1.049774 .5085647
                                    -2.091521 -.0080261
  diff |
  diff = mean(0) - mean(1)
                                          t = -2.0642
Ho: diff = 0
                               degrees of freedom = 28
            Ha: diff != 0
 Ha: diff < 0
                                       Ha: diff > 0
Pr(T < t) = 0.0242 Pr(|T| > |t|) = 0.0484 Pr(T > t) = 0.9758
. ttest days if cold == 1 & female == 0, by (female)
1 group found, 2 required
r(420);
```

> es of freedom = 28

```
. help ttest
. ttest days if female == 0, by (female)
1 group found, 2 required
r(420);
. ttest days if cold == 1, by (female if female == 0)
by() does not contain a valid varname
r(198);
. ttest days if cold == 1, by (female) [if female ==0]
option [ not allowed
r(198);
. ttest help
variable help not found
r(111);
. help ttest
. ttest days if cold == 1, by (supplements)
variable supplements not found
(error in option by())
r(111);
. ttest days if cold == 1, by (supplement)
Two-sample t test with equal variances
  Group | Obs Mean Std. Err. Std. Dev. [95% Conf. Interval]
```

0	19	8.368421	.2560442	1.116071	7.830492	8.90635
1	11	7	.4861724	1.612452	5.91674	8.08326
+ -						
combined	30	7.866667	.2658032	1.455864	7.323038	8.410295
+ -						
diff		1.368421	.4982251		.3478532	2.388989
 -						
diff = me	ean(0) -	mean(1)			t	= 2.7466
Ho: diff = 0				degrees	of freedom	= 28
₩a. diff	< n		۳a. diff ا	0	Ha: d	iff > 0
					Pr(T > t	
		th equal var				
- Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
+						
0	11	8.090909	.3681538	1.221028	7.270611	8.911207
					4.771799	
+ -						
combined						
+ -						
diff		1.924242	.6385125		.5632853	3.2852

```
diff = mean(0) - mean(1)
                                       t = 3.0136
Ho: diff = 0
                              degrees of freedom = 15
               Ha: diff != 0
 Ha: diff < 0
                                      Ha: diff > 0
Pr(T < t) = 0.9956 Pr(|T| > |t|) = 0.0087 Pr(T > t) = 0.0044
. ttest days if cold == 1 & female == 1, by (supplement)
Two-sample t test with equal variances
 Group | Obs Mean Std. Err. Std. Dev. [95% Conf. Interval]
______
    0 | 8 8.75 .3133916 .8864053 8.008947 9.491053
    1 | 5 8 .6324555 1.414214 6.244022 9.755978
______
combined | 13 8.461538 .312463 1.126601 7.78074 9.142337
______
           .75 .6315565
 diff |
                                  -.6400465 2.140047
______
 diff = mean(0) - mean(1)
                                         t = 1.1875
Ho: diff = 0
                             degrees of freedom = 11
 Ha: diff < 0
                   Ha: diff != 0
                                      Ha: diff > 0
Pr(T < t) = 0.8700 Pr(|T| > |t|) = 0.2600 Pr(T > t) = 0.1300
. ttest days if cold == 1, by (female)
Two-sample t test with equal variances
```

_

_		Mean				
0	17	7.411765	.3743506	1.543487	6.618177	8.205353
		8.461538				
		7.866667				
		-1.049774				
-						
diff = m	ean(0) -	- mean(1)			t	= -2.0642
Ho: diff = 0				degrees	of freedom	= 28
						11.55
Ha: diff			Ha: diff !=		На: с	
Pr(T < t) =	0.0242	Pr(T > t) =	0.0484	Pr(T > t	c) = 0.9758
. ttest days	if cold	d == 1 & supp	element == 0,	by (female)		
Two-sample t	test w	ith equal var	iances			
		Mean			_	_
-						
		8.090909				
		8.75				
		8.368421				
diff		6590909	.5091231		-1.733247	.415065

diff = mean(0) - mean(1) t = -1.2946

Ho: diff = 0 degrees of freedom = 17

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0

Pr(T < t) = 0.1064 Pr(|T| > |t|) = 0.2128 Pr(T > t) = 0.8936

. ttest days if cold == 1 & supplement == 1, by (female)

Two-sample t test with equal variances

- Group		Mean			[95% Conf	-
-	1					
0	1 6	6.166667	.5426274	1.32916	4.771799	7.561535
1	1 5	8	.6324555	1.414214	6.244022	9.755978
	+					
combined		7		1.612452		8.08326
_	T					
diff	I	-1.833333	.8281319		-3.706698	.0400312

diff = mean(0) - mean(1) t = -2.2138

Ho: diff = 0 degrees of freedom = 9

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0

Pr(T < t) = 0.0271 Pr(|T| > |t|) = 0.0541 Pr(T > t) = 0.9729