Project 2 Report
MATH-2050 Applied Statistics
Hunter Stevens

Descriptive Statistics of the FEV index

	Age	FEV	Hgt	Sex	Smoke
count	654.000000	654.000000	654.000000	654.000000	654.000000
mean	9.931193	2.636780	61.143578	0.513761	0.099388
std	2.953935	0.867059	5.703513	0.500193	0.299412
min	3.000000	0.791000	46.000000	0.000000	0.000000
25%	8.000000	1.981000	57.000000	0.000000	0.000000
50%	10.000000	2.547500	61.500000	1.000000	0.000000
75%	12.000000	3.118500	65.500000	1.000000	0.000000
max	19.000000	5.793000	74.000000	1.000000	1.000000

FEV and Age

Null Hypothesis: Age has no bearing on FEV.
Hypothesis: As people get older and their lungs get larger their FEV will increase.

Overall Stats For Each Category

Group	Confidence Interval (CI)	Actual Mean
Boys aged 5-9	(2.0127, 2.1728)	2.0927
Boys aged 10-14	(3.1567, 3.4167)	3.2867
Boys aged 15-19	(4.0696, 4.5701)	4.3199
Girls aged 5-9	(1.9496, 2.1082)	2.0289
Girls aged 10-14	(2.8017, 2.9439)	2.8728
Girls aged 15-19	(2.7891, 3.1346)	2.9619
Boy smokers aged 10-14	(3.1478, 4.2038)	3.6758
Boy smokers aged 15-19	(3.6858, 4.2979)	3.9918
Girl smokers aged 10-14	(2.8696, 3.1769)	3.0232
Girl smokers aged 15-19	(2.5831, 3.0910)	2.8371
Boy nonsmokers aged 10-14	(3.1162, 3.3800)	3.2481
Boy nonsmokers aged 15-19	(4.2166, 4.8742)	4.5454
Girl nonsmokers aged 10-14	(2.7583, 2.9162)	2.8372
Girl nonsmokers aged 15-19	(2.9091, 3.3141)	3.1116

As we can see in these rows, as age increases the mean FEV also increases.

Boys aged 5-9	(2.0127, 2.1728)	2.0927
Boys aged 10-14	(3.1567, 3.4167)	3.2867
Boys aged 15-19	(4.0696, 4.5701)	4.3199

We can see the same patterns when looking at the same age groups for girls.

Girls aged 5-9	(1.9496, 2.1082)	2.0289
Girls aged 10-14	(2.8017, 2.9439)	2.8728
Girls aged 15-19	(2.7891, 3.1346)	2.9619

Conclusion:

As we can see in these charts, FEV increases with each subsequent age group among both boys and girls. There are very significant jumps among the boys and a significant jump between the first two groups for girls and a smaller jump among the last two.

Effects of Smoking on FEV

Null Hypothesis: Smoking does not affect FEV in any meaningful way.

Hypothesis: Smoking will reduce the lungs' capacity therefore causing lower FEV levels among smokers vs non-smokers.

Boys who smoke vs boys who don't smoke ages 10-14

Boy smokers aged 10-14	(3.1478, 4.2038)	3.6758
Boy nonsmokers aged 10-14	(3.1162, 3.3800)	3.2481

Boys who smoke vs boys who don't smoke ages 15-19

Boy smokers aged 15-19	(3.6858, 4.2979)	3.9918
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Girls who smoke vs girls who don't smoke ages 15-19

Girl smokers aged 15-19	(2.5831, 3.0910)	2.8371
Girl nonsmokers aged 15-19	(2.9091, 3.3141)	3.1116

Conclusion:

Looking at these numbers it seems difficult to determine conclusively that smoking causes FEV to decrease. As we see in both boys and girls in the 10-14 age range the FEV is slightly larger among smokers, but in the 15-19 age range there is a significant increase among non-smokers who are boys and a slight increase among non-smokers who are girls.

Remaining Thoughts:

It is worth noting that the jump in FEV among non-smokers in the highest age groups is a lot larger than the changes among smokers. Smoking might have a larger impact on FEV levels than we originally thought.

Hormone Levels

Null Hypothesis: None of the hormones will have any affect on secretion or ph levels.
Hypothesis: The hormones will change either ph or secretion levels, but the saline will not.

Hormone	Bilsecpr	Bilsecpt	Bilphpr	Bilphpt	Pansecpr	Pansecpt	Panphpr	Panphpt
Saline	12.273333	12.570000	1.386667	2.530000	2.666667	1.646667	2.170000	3.066667
APP	3.497143	2.311429	1.997143	1.562857	3.105714	0.891429	4.662857	3.057143
CCK	11.454182	14.226909	1.365455	3.523030	0.791515	0.569091	1.887879	2.504242
Secretin	14.571053	9.128947	1.981579	2.615789	3.157895	2.189474	3.276316	3.805263
VIP	12.694615	14.365385	1.579231	3.433077	0.955385	1.126923	2.125385	3.014615

There are small changes in the biliary ph levels and pancreatic secretions and ph levels. However, these changes are small compared to some of the other hormones being tested.

APP has a significant change on the pancreatic secretions and biliary secretions.

CCK has significant changes in the biliary categories, Secretin does as well.

VIP, we can see significant changes in biliary secretions and biliary ph levels.

Hormones vs placebo:

Bilsecpr P-value: 0.8190428536703919
Bilphpr P-value: 0.7684558345283068
Pansecpr P-value: 0.2760694251880216
Panphpr P-value: 0.7666923879681139

The p-value has been calculated for the different categories and as we see the changes are significant.

Conclusion:

We reject the null hypothesis, the hormones have an influence on secretion rates and the saline does not. Looking at the charts we can see big changes between the pre and post observations for all of the active hormones.