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Solution to Exercise 8-3

Results

1. Analyze the data in order to see how the preliminary treatment with progesterone influences the difference in effect of high and low dose toxin?

From the Bland-Altman plots it seems that the absolute difference is an appropriate measure of the difference between and low dose toxin for both the progesterone and the control group. There were approximately the same variation in these absolute difference in the progesterone and the control group (F-test, p=0.75). The mean difference between high and low was for the progesterone group 3.6 (95% CI: 3.1-4.1). The mean difference between high and low was for the control group is 4.2 (CI: 3.6-4.7). There mean difference were not statistical significant different between progesterone group and control group (t-test, p=0.09).

2. Write a short conclusion containing information on size of the possible effect modification of the difference, and a discussion on the validity of the assumptions behind the statistical analysis.

We consider the effect of progesterone to be the absolute difference between the progesterone and the control group at low respectively high dose. There are thus potentially two effects of progesterone. The analysis in Question 1 shows that there was no statistical difference in the effect of progesterone at low and high dose of the toxin (no effectmodification).

3. Explain how you would analyze the data if you wanted to see if the response depends on the preliminary treatment with progesterone.

Note, the comparison of progesterone and the control group at low dose would quantify the effect of progesterone at low dose. Similarly, the comparison of progesterone and the control group at high dose would quantify the effect of progesterone at high dose. If we believe, as in Question 2, that the effect of progesterone is the same at low and high dose, then a comparison of the average value of low and high between the progesterone and the control group would quantify the same effect of progesterone in one analysis with an outcome that show less variation as compared to the outcome at low respectively high dose. The variation of these averages in the progesterone and the control group were however statistical significant different (p=0.03). The average outcome was for the progesterone group 17.9 (CI: 17.5-18.21) and for the control group 17.9 (CI: 17.0-18.8), which are not statistical significant different (approximate t-test, p=0.91).

Do file

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*******************************************************************
* Solution to Exercise 8-3.
*******************************************************************

cd "D:\Teaching\BasicBiostat\Exercises"

capture log close
log using "solution8-3.log",text replace

use toxin.dta,clear

* Q1 + Q2
twoway  ///
(scatter highdose lowdose if group==2,mco(red) msy(O)) ///
(scatter highdose lowdose if group==1,mco(blue) msy(x) ) ///
(function y=x, range(10 25) ) ///
, aspect(1) legend(ring(0) pos(5) label(1 "control") label(2 "Progsterone")) name(p1)

gene dif=highdose-lowdose
gene ave=(highdose+lowdose)/2
twoway  ///
(scatter dif ave if group==2,mco(red) msy(O)) ///
(scatter dif ave if group==1,mco(blue) msy(x) ) ///
,  legend(ring(0) pos(5) label(1 "control") label(2 "Progsterone")) scale(1.5) name(p2)

qnorm  dif  if group==2,mco(red) msy(O)  name(p3)
qnorm  dif  if group==1,mco(blue) msy(x)  name(p4)
graph combine p1 p2 p3 p4
graph export p8_3_1.png,replace
graph drop _all

sdtest dif,by(group)
ttest dif,by(group)
ranksum dif,by(group)

*Q3
* If belive that there is no effect of progsterone on the difference
* the we can look at the averages.
histogram ave,by(group,col(1)) name(p0)

qnorm  ave  if group==2,mco(red) msy(O)  name(p1)
qnorm  ave  if group==1,mco(blue) msy(x)  name(p2)
graph combine  p2 p1, col(1) name(p3)
graph combine p0 p3,col(2)
graph export p8_3_3.png,replace
graph drop _all

sdtest ave,by(group)
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```
ttest ave,by(group)
ttest ave, by(group) unequal
ranksum ave,by(group)

* otherwise we could look at the lowdose or the high dose values
ttest lowdose, by(group)
ttest highdose, by(group)

log close
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