

PhD Course in Basic Biostatistics

Spring 2014

Part A – Method A analyzing the final non-verbal IQ

The IQ follows approximately a normal distribution (Figure 1). The mean IQ level in the active and placebo were compared using a two-sample t-test.

The prediction interval for the active was (77.0- 133.9) and for placebo (73.0- 129.1). The mean difference between the active and placebo (the effect) was 4.3 (-1.8-10.5), which is not statistical significant ($p=0.17$). Vitamin and mineral supplement increase the measured IQ between -1.8 and 10.5 units.

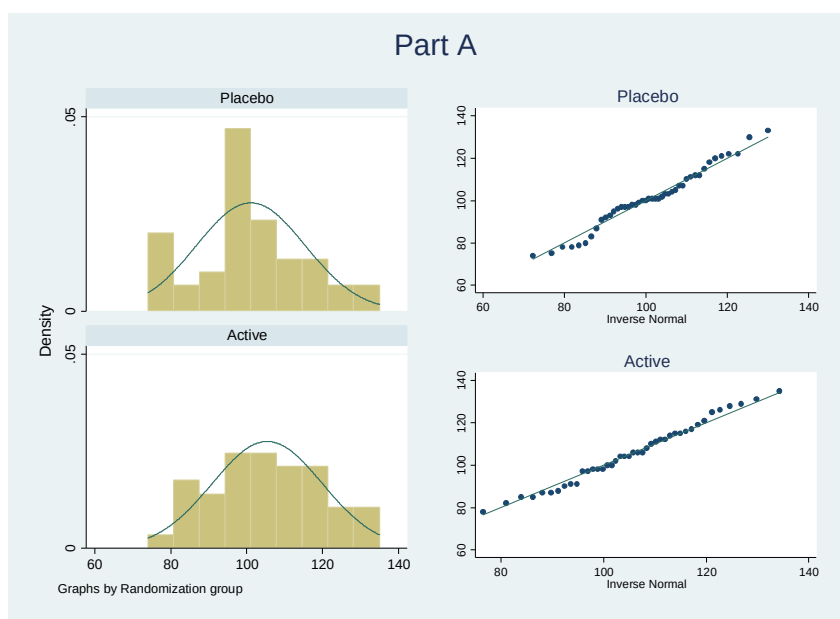


Figure 1. Histogram and QQ-plots of IQ at follow-up.

Part B – Method B analyzing the change in non-verbal IQ

The individual change in non-verbal IQ were computed as the absolute difference of the final non-verbal IQ minus the initial IQ, which is validated by the Bland-Altman plot (Figure 2) and QQ-plots of the difference (Figure 3). The mean difference in IQ level between the active and placebo were compared using a two-sample t-test.

The prediction interval for the change in the non-verbal IQ scores in the placebo group was (-17.8; 20.84). The mean difference in the change between the active and placebo was 2.4 (-1.5-6.3), which is not statistical significant ($p=0.23$). Vitamin and mineral supplement increase the measured IQ change between -1.5 and 6.3 units.

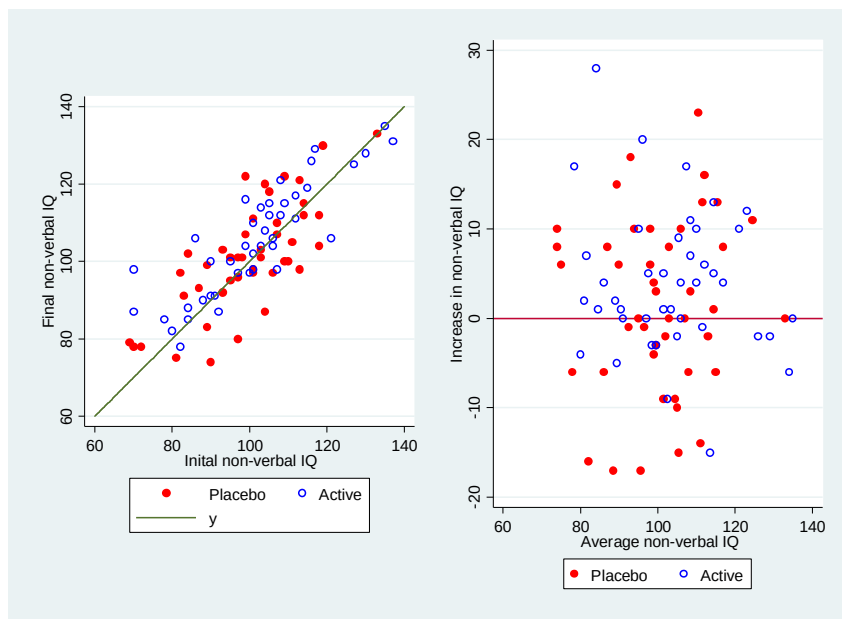


Figure 2. Scatter and Bland-Altman plots of final and initial IQ.

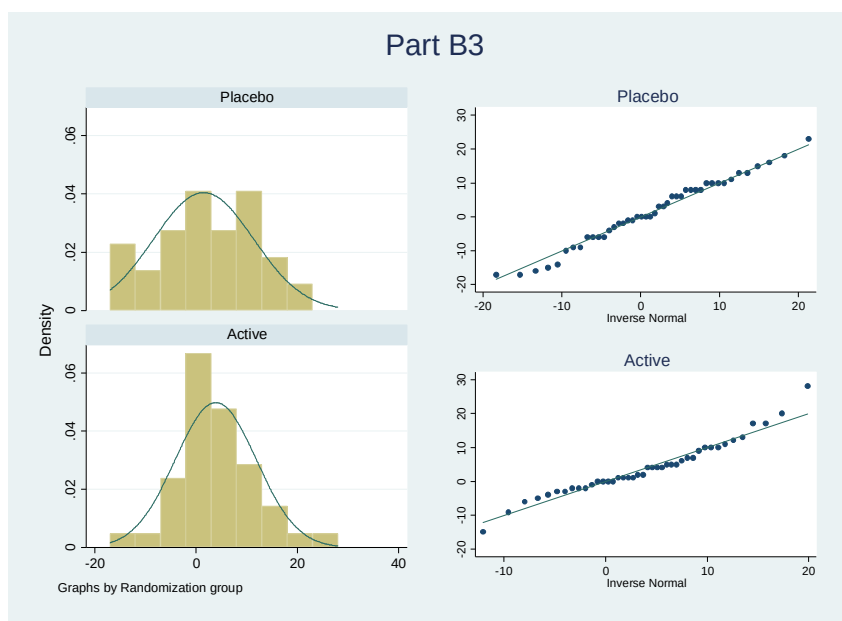


Figure 3. Histogram and QQ plots of the change in non-verbal IQ.

Part C - the final non-verbal IQ, adjusted linearly for initial non-verbal IQ scores

The final non-verbal IQ showed a linear dependency of initial IQ for both the active and placebo group (Figure 4). The linear regression models were validated using residual plots (Figure 5).

The prediction interval for the final non-verbal IQ scores in the placebo group for a child with an initial non-verbal IQ score equal to 100 is (81.9-120.9).

The slopes of the active and placebo can be assumed the same ($p=0.99$). The mean difference between the active and placebo group with the same initial non-verbal IQ score (the effect) is 2.8 (-0.9-6.5), which is not statistical significant by the two-sample t-test ($p=0.17$). Vitamin and mineral supplement increase the measured IQ between -0.9 and 6.5, comparing two children with the same initial non-verbal IQ score.

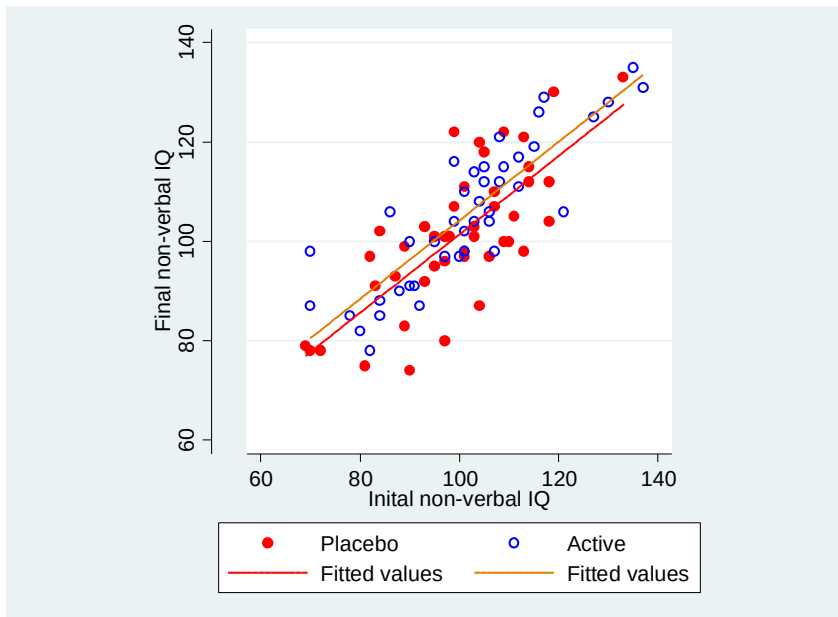
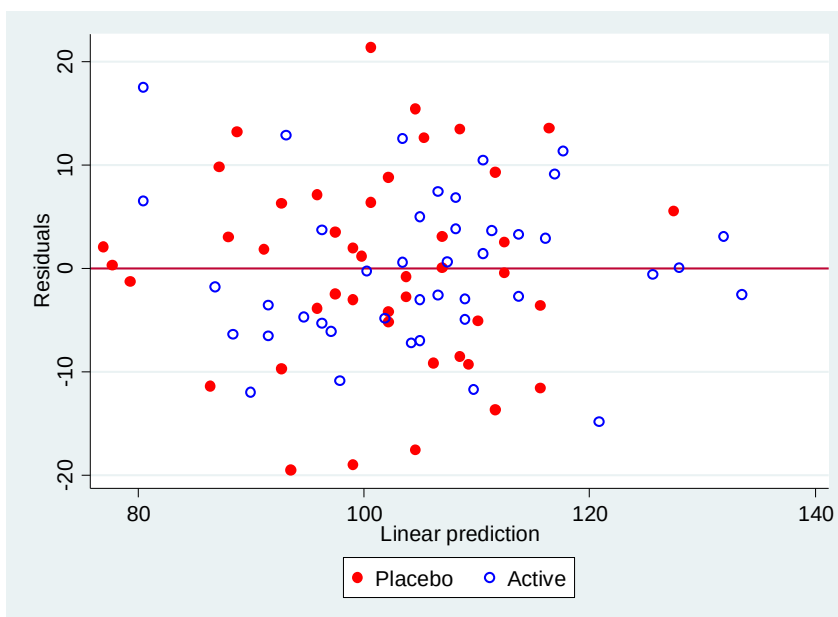


Figure 4. Linear regression of the final non-verbal IQ against the initial non-verbal IQ for active and placebo, separately.



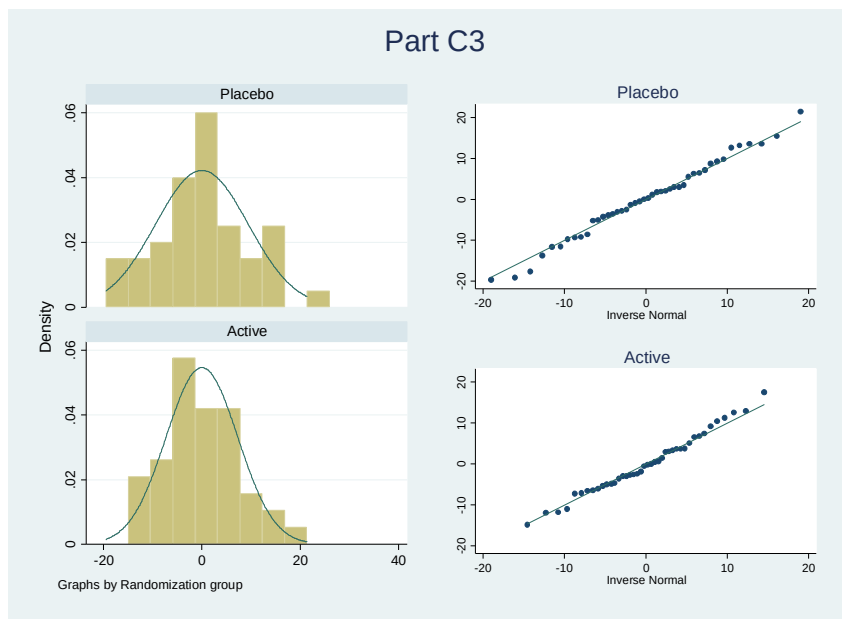


Figure 5. Residual plot of the linear regression of the final non-verbal IQ against the initial non-verbal IQ for active and placebo.

Part D - Strengths and weaknesses

The assumptions in the three methods for comparing the non-verbal IQ are different. The variation in outcome decreases with the methods A, B and C.

Part E – the blinded teacher

The guess of child were analyzed by the binomial distribution.

In the placebo group 33% (19-51%) guessed they had the active treatment, as compared to the active group where 36% (21-54%) guessed they had the active treatment. The difference 2% (-19-25%) is not statistical significant ($p= 0.80$).

Overall 35% (24-47%) guessed that they had the active treatment, which is statistical significant from the random chance of 50% ($p=0.01$).

Appendix – do file

```
*****
* Solution exam spring 2014.
*****

cd "D:\Teaching\BasalBiostat\Exam"

capture log close
log using Spring2014.log,text replace

use iq.dta,clear
codebook ,comp

*****
* Part A
*****
capture graph drop _all
hist nvfinal,by(group,col(1) legend(off)) norm legend(off) name(plotleft)
xtitle("")
qnorm nvfinal if group==0,title("Placebo") name(plot2) ytitle("")
qnorm nvfinal if group==1,title("Active") name(plot3) ytitle("")
graph combine plot2 plot3 ,name(plotright) col(1)
graph combine plotleft plotright ,title(" Part A") name(PartA)
graph export spring2014_PartA.wmf, replace
graph drop plotleft plotright plot2 plot3
graph drop PartA

centile nvfinal if(group==0), centile(2.5 97.5) meansd
centile nvfinal if(group==1), centile(2.5 97.5) meansd

sdtest nvfinal,by(group)
ttest nvfinal,by(group)

*****
* Part B
*****
generate nvdif=nvfinal-nvinit
generate nvave=(nvfinal+nvinit)/2

* Scatter of final again initial level.
twoway ///
    (scatter nvfinal nvinit if group==0, msy(0) mco(red)) ///
    (scatter nvfinal nvinit if group==1, msy(0h) mco(blue)) ///
    (function y=x, range(60 140)) ///
    ,aspect(1) legend(label(1 "Placebo") label(2 "Active"))
name(PartB1a,replace) ///
    xtit("Inital non-verbal IQ") ytit("Final non-verbal IQ")

* Bland-Altman plots
twoway ///
    (scatter nvdif nvave if group==0, msy(0) mco(red)) ///
    (scatter nvdif nvave if group==1, msy(0h) mco(blue)) ///
    ,legend(label(1 "Placebo") label(2 "Active")) name(PartB1b,replace) ///
    xtit("Average non-verbal IQ") ytit("Increase in non-verbal IQ") yline(0)
```

```

graph combine PartB1a PartB1b
graph export spring2014_PartB1.wmf, replace
graph drop PartB1a PartB1b

hist nvdif,by(group,col(1) legend(off)) norm legend(off) name(plotleft)
xtitle("")
qnorm nvdif if group==0,title("Placebo") name(plot2,replace) ytitle("")
qnorm nvdif if group==1,title("Active") name(plot3,replace) ytitle("")
graph combine plot2 plot3 ,name(plotright) col(1)
graph combine plotleft plotright ,title(" Part B3") name(PartB3, replace)
graph export spring2014_PartB2.wmf, replace
graph drop plotleft plotright plot2 plot3 PartB3

* Prediction interval in the placebo group.
centile nvdif if group==0, centile(2.5 97.5) meansd

* The effect of the intervention.
sdtest nvdif,by(group)
ttest nvdif,by(group)

*****
* Part C
*****
twoway ///
    (scatter nvfinal nvinit if group==0, msy(0) mco(red)) ///
    (scatter nvfinal nvinit if group==1, msy(0h) mco(blue)) ///
    (lfit nvfinal nvinit if group==0, lpa(1) lco(red)) ///
    (lfit nvfinal nvinit if group==1, lpa(1) co(blue)) ///
    ,aspect(1) legend(label(1 "Placebo") label(2 "Active")) name(PartC1) ///
    xtit("Initial non-verbal IQ") ytit("Final non-verbal IQ")
graph export spring2014_PartC1.wmf, replace
graph drop PartC1

* The prediction interval for the final non-verbal IQ scores in the placebo
* group for a child with an initial non-verbal IQ score equal to 100.
regress nvfinal nvinit if group==0
adjust nvinit=100,stdf ci
generate init100=nvinit-100
* The usual +/- 1.96 formula.
regress nvfinal init100 if group==0
di      "    PI    "%18.4f  _b[_cons]-1.96*e(rmse) %18.4f  _b[_cons]+1.96*e(rmse)
adjust init100=0,stdf ci

* A regression model for both the active and placebo.
regress nvfinal i.group##c.init100
predict hat,xb
predict resid,res

* Residual plots (with interaction).
twoway ///
    (scatter res hat if group==0, msy(0) mco(red)) ///
    (scatter res hat if group==1, msy(0h) mco(blue)) ///
    ,legend(label(1 "Placebo") label(2 "Active")) name(PartC2) ///
    yline(0)
graph export spring2014_PartC2.wmf, replace
graph drop PartC2

* Normality plots of residual (with interaction).

```

```

hist res,by(group,col(1) legend(off)) norm legend(off) name(plotleft) xtitle("")
qnorm res if group==0,title("Placebo") name(plot2) ytitle("")
qnorm res if group==1,title("Active") name(plot3) ytitle("")
graph combine plot2 plot3 ,name(plotright) col(1)
graph combine plotleft plotright ,title(" Part C3") name(PartC3,replace)
graph export spring2014_PartC3.wmf, replace
qnorm res,title("Part C4 Both")
graph export spring2014_PartC4.wmf, replace
graph drop plot2 plot3 plotleft plotright PartC3

regress nvfinal i.group init100
drop hat res
predict hat,xb
predict resid,res

* Residual and normality plots (without interaction).
twoway ///
    (scatter res hat if group==0, msy(0) mco(red)) ///
    (scatter res hat if group==1, msy(0h) mco(blue)) ///
    ,legend(label(1 "Placebo") label(2 "Active")) name(PartC5) ///
    yline(0)
graph export spring2014_PartC5.wmf, replace
qnorm res,title("Part C6 Both")
graph export spring2014_PartC6.wmf, replace
graph drop PartC5

*****
* Part E
*****
ci guess if(group==0), binom
ci guess if(group==1), binom
tabu group guess , row chi2 exact
cs guess group

ci guess,bin
bitest guess==0.5
logit guess nvinit
logit guess nvdif

log close

```

Appendix – log file

```

-----
name: <unnamed>
log: D:\Teaching\BasalBiostat\Exam\Spring2014.log
log type: text
opened on: 10 Apr 2014, 08:59:10

.
.
. use iq.dta,clear
(IQ data)

. codebook ,comp
-----
Variable   Obs Unique      Mean   Min   Max   Label
-----
id          86      86      43.5    1    86   Unique identifier
group       86       2   .4883721    0     1   Randomization group
guess       72       2   .3472222    0     1   Guess of group
nvinit      86      46  100.5349   69   137   Initial non-verbal IQ
nvfinal     86      48  103.2093   74   135   Final non-verbal IQ
vbinit      86      43  88.77907   57   130   Initial verbal IQ
vbfinal     86      37  91.66279   63   126   Final verbal IQ
-----

.
.
. *****
. * Part A
. *****
. capture graph drop _all

. hist nvfinal,by(group,col(1) legend(off)) norm legend(off) name(plotleft) xtitle("")

. qnorm nvfinal if group==0,title("Placebo") name(plot2) ytitle("")

. qnorm nvfinal if group==1,title("Active") name(plot3) ytitle("")

. graph combine plot2 plot3 ,name(plotright) col(1)

. graph combine plotleft plotright ,title(" Part A") name(PartA)

. graph export spring2014_PartA.wmf, replace
(file D:\Teaching\BasalBiostat\Exam\spring2014_PartA.wmf written in Windows Metafile format)

. graph drop plotleft plotright plot2 plot3

. graph drop PartA

.
. centile nvfinal if(group==0), centile(2.5 97.5) meansd

      Variable |      Obs   Percentile      -- Normal, based on mean and std. dev.--
      +-----+-----+-----+ Centile      [95% Conf. Interval]
      +-----+-----+-----+-----+-----+
      nvfinal |      44      2.5      73.04022      65.75808      80.32235
      |      |      97.5      129.1416      121.8595      136.4237

. centile nvfinal if(group==1), centile(2.5 97.5) meansd

      Variable |      Obs   Percentile      -- Normal, based on mean and std. dev.--
      +-----+-----+-----+ Centile      [95% Conf. Interval]
      +-----+-----+-----+-----+-----+
      nvfinal |      42      2.5      76.98926      69.42972      84.5488
      |      |      97.5      133.8679      126.3083      141.4274

.
. sdtest nvfinal,by(group)

Variance ratio test
-----
      Group |      Obs      Mean      Std. Err.      Std. Dev.      [95% Conf. Interval]

```


Placebo	44	101.0909	2.157591	14.31184	96.73971	105.4421
Active	42	105.4286	2.23896	14.51012	100.9069	109.9502
combined	86	103.2093	1.562393	14.48904	100.1028	106.3158

ratio = sd(Placebo) / sd(Active) f = 0.9729
Ho: ratio = 1 degrees of freedom = 43, 41

Ha: ratio < 1 Ha: ratio != 1 Ha: ratio > 1
Pr(F < f) = 0.4637 2*Pr(F < f) = 0.9274 Pr(F > f) = 0.5363

. ttest nvfinal,by(group)

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]
Placebo	44	101.0909	2.157591	14.31184	96.73971 105.4421
Active	42	105.4286	2.23896	14.51012	100.9069 109.9502
combined	86	103.2093	1.562393	14.48904	100.1028 106.3158
diff		-4.337662	3.108357		-10.51897 1.843646

diff = mean(Placebo) - mean(Active) t = -1.3955
Ho: diff = 0 degrees of freedom = 84

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.0833 Pr(|T| > |t|) = 0.1665 Pr(T > t) = 0.9167

.

.

. *****

. * Part B

. *****

. generate nvdif=nvfinal-nvinit

. generate nvave=(nvfinal+nvinit)/2

.

. * Scatter of final again initial level.

. twoway ///

```
> (scatter nvfinal nvinit if group==0, msy(0) mco(red)) ///  
> (scatter nvfinal nvinit if group==1, msy(0h) mco(blue)) ///  
> (function y=x, range(60 140)) ///  
> ,aspect(1) legend(label(1 "Placebo") label(2 "Active")) name(PartB1a,replace) ///  
> xtit("Initial non-verbal IQ") ytit("Final non-verbal IQ")
```

.

. * Bland-Altman plots

. twoway ///

```
> (scatter nvdif nvave if group==0, msy(0) mco(red)) ///  
> (scatter nvdif nvave if group==1, msy(0h) mco(blue)) ///  
> ,legend(label(1 "Placebo") label(2 "Active")) name(PartB1b,replace) ///  
> xtit("Average non-verbal IQ") ytit("Increase in non-verbal IQ") yline(0)
```

. graph combine PartB1a PartB1b

. graph export spring2014_PartB1.wmf, replace

(file D:\Teaching\BasalBiostat\Exam\spring2014_PartB1.wmf written in Windows Metafile format)

. graph drop PartB1a PartB1b

.

. hist nvdif,by(group,col(1) legend(off)) norm legend(off) name(plotleft) xtitle("")

. qnorm nvdif if group==0,title("Placebo") name(plot2,replace) ytitle("")

. qnorm nvdif if group==1,title("Active") name(plot3,replace) ytitle("")

. graph combine plot2 plot3 ,name(plotright) col(1)

. graph combine plotleft plotright ,title(" Part B3") name(PartB3, replace)

```
. graph export spring2014_PartB2.wmf, replace
(file D:\Teaching\BasalBiostat\Exam\spring2014_PartB2.wmf written in Windows Metafile format)

. graph drop plotleft plotright plot2 plot3 PartB3

.
. * Prediction interval in the placebo group.
. centile nvdif if group==0, centile(2.5 97.5) meansd
```

Variable	Obs	Percentile	Centile	[95% Conf. Interval]	
nvdif	44	2.5	-17.84501	-22.8671	-12.82293
		97.5	20.84501	15.82293	25.8671

```
.
. * The effect of the intervention.
. sdtest nvdif,by(group)
```

Variance ratio test

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
Placebo	44	1.5	1.487972	9.870086	-1.500781	4.500781
Active	42	3.904762	1.237157	8.017692	1.406273	6.403251
combined	86	2.674419	.974987	9.041658	.7358832	4.612954

```
ratio = sd(Placebo) / sd(Active)          f = 1.5155
Ho: ratio = 1                             degrees of freedom = 43, 41

Ha: ratio < 1          Ha: ratio != 1          Ha: ratio > 1
Pr(F < f) = 0.9081     2*Pr(F > f) = 0.1837     Pr(F > f) = 0.0919

. ttest nvdif,by(group)
```

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
Placebo	44	1.5	1.487972	9.870086	-1.500781	4.500781
Active	42	3.904762	1.237157	8.017692	1.406273	6.403251
combined	86	2.674419	.974987	9.041658	.7358832	4.612954
diff		-2.404762	1.944455		-6.271523	1.461999

```
diff = mean(Placebo) - mean(Active)          t = -1.2367
Ho: diff = 0                             degrees of freedom = 84

Ha: diff < 0          Ha: diff != 0          Ha: diff > 0
Pr(T < t) = 0.1098     Pr(|T| > |t|) = 0.2196     Pr(T > t) = 0.8902

.
.
. *****
. * Part C
. *****
. twoway ///
> (scatter nvfinal nvinit if group==0, msy(0) mco(red)) ///
> (scatter nvfinal nvinit if group==1, msy(0h) mco(blue)) ///
> (lfit nvfinal nvinit if group==0, lpa(1) lco(red)) ///
> (lfit nvfinal nvinit if group==1, lpa(1) co(blue)) ///
> ,aspect(1) legend(label(1 "Placebo") label(2 "Active")) name(PartC1) ///
> xtit("Initial non-verbal IQ") ytit("Final non-verbal IQ")
(note: named style blue not found in class connectstyle, default attributes used)

. graph export spring2014_PartC1.wmf, replace
(file D:\Teaching\BasalBiostat\Exam\spring2014_PartC1.wmf written in Windows Metafile format)

. graph drop PartC1

.
```

```
. * The prediction interval for the final non-verbal IQ scores in the placebo
. * group for a child with an initial non-verbal IQ score equal to 100.
. regress nvfinal nvinit if group==0
```

Source	SS	df	MS	Number of obs =	44
Model	4973.04609	1	4973.04609	F(1, 42) =	54.47
Residual	3834.59027	42	91.2997683	Prob > F =	0.0000
				R-squared =	0.5646
				Adj R-squared =	0.5543
Total	8807.63636	43	204.828753	Root MSE =	9.5551

nvfinal	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
nvinit	.7892927	.1069453	7.38	0.000	.5734683 1.005117
_cons	22.48453	10.74775	2.09	0.043	.7947015 44.17437

```
. adjust nvinit=100, stdf ci
```

```
-----
Dependent variable: nvfinal      Command: regress
Covariate set to value: nvinit = 100
-----
```

All	xb	stdf	lb	ub
	101.414	(9.66316)	[81.9128	120.915]

```
Key:  xb      = Linear Prediction
      stdf     = Standard Error (forecast)
      [lb , ub] = [95% Prediction Interval]
```

```
. generate init100=nvinit-100
```

```
. * The usual +/- 1.96 formula.
. regress nvfinal init100 if group==0
```

Source	SS	df	MS	Number of obs =	44
Model	4973.04609	1	4973.04609	F(1, 42) =	54.47
Residual	3834.59027	42	91.2997683	Prob > F =	0.0000
				R-squared =	0.5646
				Adj R-squared =	0.5543
Total	8807.63636	43	204.828753	Root MSE =	9.5551

nvfinal	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
init100	.7892927	.1069453	7.38	0.000	.5734683 1.005117
_cons	101.4138	1.441148	70.37	0.000	98.50545 104.3222

```
. di      "   PI   "%18.4f  _b[_cons]-1.96*(rmse) "%18.4f  _b[_cons]+1.96*(rmse)
PI          82.6858          120.1418
```

```
. adjust init100=0, stdf ci
```

```
-----
Dependent variable: nvfinal      Command: regress
Covariate set to value: init100 = 0
-----
```

All	xb	stdf	lb	ub
	101.414	(9.66316)	[81.9128	120.915]

```
Key:  xb      = Linear Prediction
      stdf     = Standard Error (forecast)
      [lb , ub] = [95% Prediction Interval]
```

```
. * A regression model for both the active and placebo.
```

```
. regress nvfinal i.group##c.init100
```

Source	SS	df	MS	Number of obs = 86			
Model	11820.6122	3	3940.20408	F(3, 82)	=	53.64	
Residual	6023.62031	82	73.4587843	Prob > F	=	0.0000	
				R-squared	=	0.6624	
				Adj R-squared	=	0.6501	
Total	17844.2326	85	209.932148	Root MSE	=	8.5708	

nvfinal	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
group						
Active	2.808528	1.853824	1.51	0.134	-.8793197	6.496375
init100	.7892927	.0959287	8.23	0.000	.5984599	.9801255
group#c.init100						
Active	.0023038	.127853	0.02	0.986	-.2520366	.2566442
_cons	101.4138	1.292694	78.45	0.000	98.84222	103.9854

```
. predict hat,xb
```

```
. predict resid,res
```

```
. * Residual plots (with interaction).
```

```
. twoway ///
```

```
> (scatter res hat if group==0, msy(0) mco(red)) ///
```

```
> (scatter res hat if group==1, msy(0h) mco(blue)) ///
```

```
> ,legend(label(1 "Placebo") label(2 "Active")) name(PartC2) ///
```

```
> yline(0)
```

```
. graph export spring2014_PartC2.wmf, replace
```

```
(file D:\Teaching\BasalBiostat\Exam\spring2014_PartC2.wmf written in Windows Metafile format)
```

```
. graph drop PartC2
```

```
. * Normality plots of residual (with interaction).
```

```
. hist res,by(group,col(1) legend(off)) norm legend(off) name(plotleft) xtitle("")
```

```
. qnorm res if group==0,title("Placebo") name(plot2) ytitle("")
```

```
. qnorm res if group==1,title("Active") name(plot3) ytitle("")
```

```
. graph combine plot2 plot3 ,name(plotright) col(1)
```

```
. graph combine plotleft plotright ,title(" Part C3") name(PartC3,replace)
```

```
. graph export spring2014_PartC3.wmf, replace
```

```
(file D:\Teaching\BasalBiostat\Exam\spring2014_PartC3.wmf written in Windows Metafile format)
```

```
. qnorm res,title("Part C4 Both")
```

```
. graph export spring2014_PartC4.wmf, replace
```

```
(file D:\Teaching\BasalBiostat\Exam\spring2014_PartC4.wmf written in Windows Metafile format)
```

```
. graph drop plot2 plot3 plotleft plotright PartC3
```

```
. regress nvfinal i.group init100
```

Source	SS	df	MS	Number of obs = 86			
Model	11820.5884	2	5910.2942	F(2, 83)	=	81.44	
Residual	6023.64416	83	72.574026	Prob > F	=	0.0000	
				R-squared	=	0.6624	
				Adj R-squared	=	0.6543	
Total	17844.2326	85	209.932148	Root MSE	=	8.519	

nvfinal	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
---------	-------	-----------	---	------	----------------------	--

```

      group |
Active | 2.809531 1.841795 1.53 0.131 -.8537241 6.472787
init100 | .7905896 .0630347 12.54 0.000 .6652162 .915963
_cons | 101.4143 1.284552 78.95 0.000 98.85941 103.9693
-----

. drop hat res

. predict hat,xb

. predict resid,res

.
. * Residual and normality plots (without interaction).
. twoway ///
> (scatter res hat if group==0, msy(0) mco(red)) ///
> (scatter res hat if group==1, msy(0h) mco(blue)) ///
> ,legend(label(1 "Placebo") label(2 "Active")) name(PartC5) ///
> yline(0)

. graph export spring2014_PartC5.wmf, replace
(file D:\Teaching\BasalBiostat\Exam\spring2014_PartC5.wmf written in Windows Metafile format)

. qnorm res,title("Part C6 Both")

. graph export spring2014_PartC6.wmf, replace
(file D:\Teaching\BasalBiostat\Exam\spring2014_PartC6.wmf written in Windows Metafile format)

. graph drop PartC5

.
.
. *****
. * Part E
. *****
. ci guess if(group==0), binom

      Variable |      Obs      Mean   Std. Err.      -- Binomial Exact --
      +-----+-----+-----+-----+ [95% Conf. Interval]
      guess |      36   .3333333   .0785674   .1855618   .5097025

. ci guess if(group==1), binom

      Variable |      Obs      Mean   Std. Err.      -- Binomial Exact --
      +-----+-----+-----+-----+ [95% Conf. Interval]
      guess |      36   .3611111   .0800538   .2082229   .537791

. tabu group guess , row chi2 exact

+-----+
| Key |
+-----+
| frequency |
| row percentage |
+-----+

Randomizat |      Guess of group
ion group |      Placebo      Active |      Total
+-----+-----+-----+
Placebo |      24      12 |      36
|      66.67   33.33 | 100.00
+-----+-----+-----+
Active |      23      13 |      36
|      63.89   36.11 | 100.00
+-----+-----+-----+
Total |      47      25 |      72
|      65.28   34.72 | 100.00
+-----+-----+-----+

Pearson chi2(1) = 0.0613 Pr = 0.804
Fisher's exact = 1.000
1-sided Fisher's exact = 0.500

```

```
. cs guess group
```

	Randomization group		
	Exposed	Unexposed	Total
Cases	13	12	25
Noncases	23	24	47
Total	36	36	72
Risk	.3611111	.3333333	.3472222
	Point estimate		[95% Conf. Interval]
Risk difference	.0277778		-.1920656 .2476212
Risk ratio	1.083333		.5745588 2.04263
Attr. frac. ex.	.0769231		-.7404659 .5104351
Attr. frac. pop	.04		
	chi2(1) =		0.06 Pr>chi2 = 0.8045

```
. ci guess,bin
```

Variable	Obs	Mean	Std. Err.	-- Binomial Exact -- [95% Conf. Interval]	
guess	72	.3472222	.0561074	.2388128	.4686328

```
. bitest guess==0.5
```

Variable	N	Observed k	Expected k	Assumed p	Observed p
guess	72	25	36	0.50000	0.34722
Pr(k >= 25) = 0.996845 (one-sided test)					
Pr(k <= 25) = 0.006387 (one-sided test)					
Pr(k <= 25 or k >= 47) = 0.012775 (two-sided test)					

```
. logit guess nvinit
```

```
Iteration 0: log likelihood = -46.491128
Iteration 1: log likelihood = -46.490848
Iteration 2: log likelihood = -46.490848
```

```
Logistic regression               Number of obs   =          72
                                LR chi2(1)         =           0.00
                                Prob > chi2         =          0.9811
Log likelihood = -46.490848       Pseudo R2        =          0.0000
```

guess	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
nvinit	.0003916	.0165442	0.02	0.981	-.0320345	.0328177
_cons	-.6707894	1.68805	-0.40	0.691	-3.979306	2.637727

```
. logit guess nvdif
```

```
Iteration 0: log likelihood = -46.491128
Iteration 1: log likelihood = -45.595381
Iteration 2: log likelihood = -45.592493
Iteration 3: log likelihood = -45.592493
```

```
Logistic regression               Number of obs   =          72
                                LR chi2(1)         =           1.80
                                Prob > chi2         =          0.1800
Log likelihood = -45.592493       Pseudo R2        =          0.0193
```

guess	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
nvdif	-.0365167	.0278009	-1.31	0.189	-.0910055	.0179721
_cons	-.553739	.2549191	-2.17	0.030	-1.053371	-.0541068

. .
. log close
 name: <unnamed>
 log: D:\Teaching\BasalBiostat\Exam\Spring2014.log
 log type: text
closed on: 10 Apr 2014, 08:59:29
