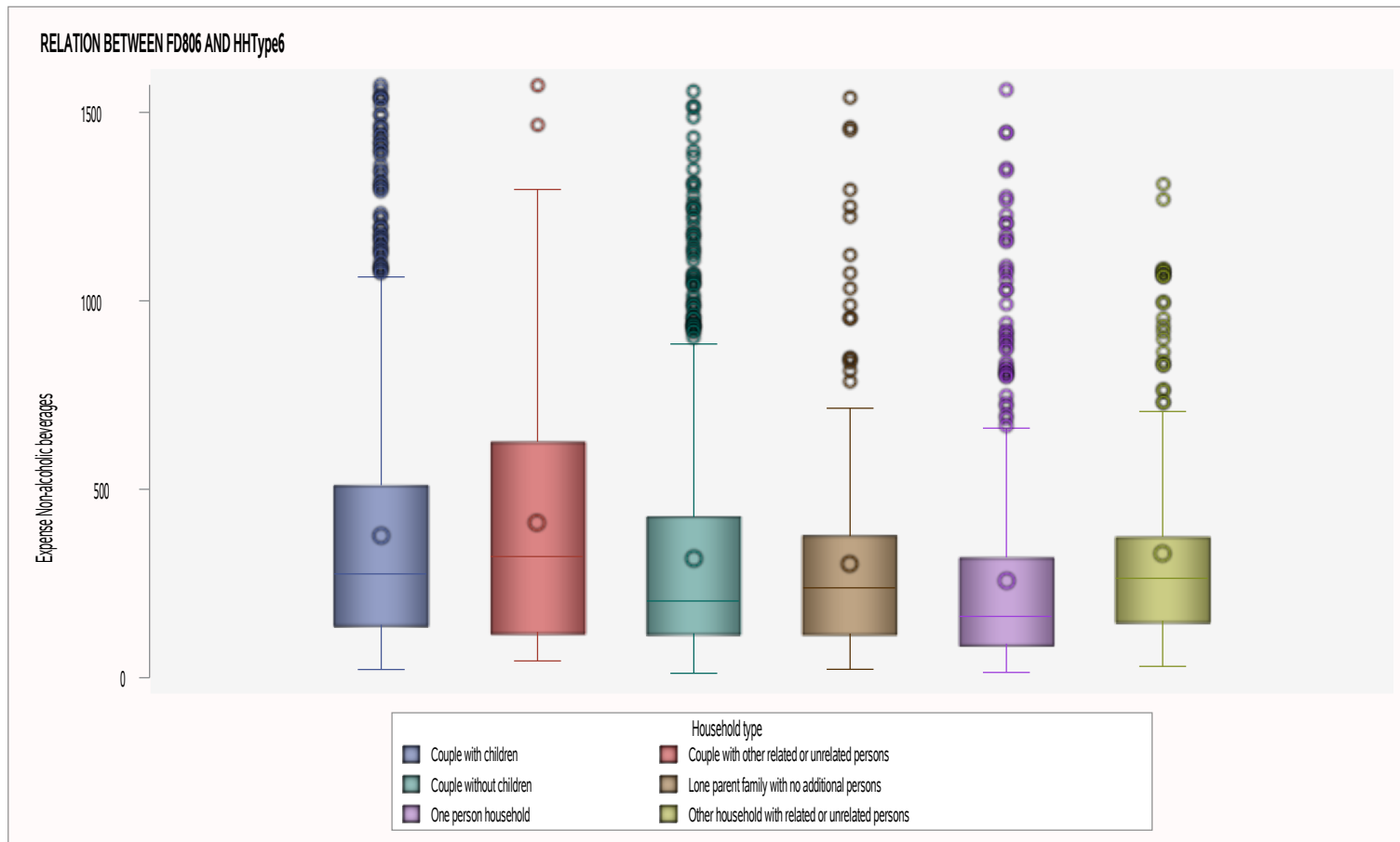


# BIVARIATE ANALYSIS OF HHType6 AND FD806 FOR ANA.MODEL1 RELATION BETWEEN FD806 AND HHType6

11:42 Saturday, November 20, 2021 1

## The MEANS Procedure

Analysis Variable : FD806 Expense Non-alcoholic beverages														
Household type	N Obs	N	N Miss	Minimum	Lower Quartile	Median	Mean	Upper Quartile	Maximum	Quartile Range	Coeff of Variation	Lower 95% CL for Mean	Upper 95% CL for Mean	Skewness
Couple with children	2457237	2457237	0	21.84	135.72	275.47	377.09	510.64	1573.00	374.92	85.91	376.69	377.50	1.46
Couple with other related or unrelated persons	557180	557180	0	44.55	116.87	321.54	409.09	626.08	1569.37	509.21	81.56	408.21	409.96	1.28
Couple without children	2206478	2206478	0	11.83	112.84	203.58	317.62	426.14	1556.41	313.30	91.54	317.23	318.00	1.66
Lone parent family with no additional persons	513225	513225	0	22.36	112.28	238.48	302.25	375.52	1536.76	263.24	88.73	301.51	302.98	1.81
One person household	1964999	1964999	0	14.08	85.45	162.76	257.47	319.02	1557.89	233.57	106.69	257.08	257.85	2.11
Other household with related or unrelated persons	429757	429757	0	30.16	146.64	263.90	327.27	373.84	1308.58	227.20	80.88	326.48	328.06	1.69



### One-way ANOVA Assumptions

In order to run a one-way ANOVA the following assumptions must be met:

1.The response of interest is continuous and normally distributed for each treatment group:

Normality test: PROC UNIVARIATE NORMAL and QQPlot for each group.

2.Treatment groups are independent of one another. Experimental units only receive one treatment,and they do not overlap.

3.There are no major outliers.

4.A check for unequal variances will help determine which version of a one-way ANOVA is most appropriate

(Levene's test, Null hypothesis: variances are equal between groups):

A .If variances are equal, then the assumptions of a standard one-way ANOVA are met.

B. If variances are unequal, then a Welch's one-way ANOVA is appropriate.

Normal Distribution?
Null hypothesis: sample has a normal distribution
CLT :
a.If it looks normal and each group have more than 30 observations
b.If moderately skewed, each group must have more than 100 observations
*rule of thumb: If skewness is between -1 and -0.5 or between 0.5 and 1, the distribution is moderately skewed.
*if the sample size is over 2000, the Kolmogorov test should be used. If the sample size is less than 2000, the Shapiro test is better.

**The UNIVARIATE Procedure**  
**Variable: FD806 (Expense Non-alcoholic beverages)**

**Freq: WeightD**

Household type=Couple with children

Moments			
<b>N</b>	2457237	<b>Sum Weights</b>	2457237
<b>Mean</b>	377.092158	<b>Sum Observations</b>	926604804
<b>Std Deviation</b>	323.959134	<b>Variance</b>	104949.521
<b>Skewness</b>	1.45931195	<b>Kurtosis</b>	1.83638136
<b>Uncorrected SS</b>	6.07301E11	<b>Corrected SS</b>	2.57886E11
<b>Coeff Variation</b>	85.9098041	<b>Std Error Mean</b>	0.20666489

Basic Statistical Measures			
Location		Variability	
<b>Mean</b>	377.0922	<b>Std Deviation</b>	323.95913
<b>Median</b>	275.4700	<b>Variance</b>	104950
<b>Mode</b>	293.0500	<b>Range</b>	1551
		<b>Interquartile Range</b>	374.92000

**The UNIVARIATE Procedure**  
**Variable: FD806 (Expense Non-alcoholic beverages)**

**Freq: WeightD**

Household type=Couple with children

Tests for Location: Mu0=0				
Test	Statistic		p Value	
Student's t	t	1824.655	Pr >  t	<.0001
Sign	M	1228619	Pr >=  M	<.0001
Signed Rank	S	1.51E12	Pr >=  S	<.0001

Tests for Normality				
Test	Statistic		p Value	
Kolmogorov-Smirnov	D	0.159684	Pr > D	<0.0100
Cramer-von Mises	W-Sq	18814.1	Pr > W-Sq	<0.0050
Anderson-Darling	A-Sq	110124.9	Pr > A-Sq	<0.0050

Quantiles (Definition 5)	
Level	Quantile
100% Max	1573.00
99%	1469.40
95%	1145.04
90%	785.84
75% Q3	510.64
50% Median	275.47
25% Q1	135.72
10%	70.72
5%	51.74
1%	28.08
0% Min	21.84

**The UNIVARIATE Procedure**  
**Variable: FD806 (Expense Non-alcoholic beverages)**

**Freq: WeightD**

**Household type=Couple with children**

Extreme Observations					
Lowest			Highest		
Value	Freq	Obs	Value	Freq	Obs
21.84	3250	653	1540.64	1345	483
23.40	132	22	1540.76	776	396
24.96	186	161	1546.22	669	680
26.00	1093	172	1561.82	491	456
26.26	1144	636	1573.00	43	306

**The UNIVARIATE Procedure**  
**Variable: FD806 (Expense Non-alcoholic beverages)**

**Freq: WeightD**

**Household type=Couple with other related or unrelated persons**

Moments			
<b>N</b>	557180	<b>Sum Weights</b>	557180
<b>Mean</b>	409.085512	<b>Sum Observations</b>	227934265
<b>Std Deviation</b>	333.63924	<b>Variance</b>	111315.142
<b>Skewness</b>	1.28183958	<b>Kurtosis</b>	1.74708531
<b>Uncorrected SS</b>	1.55267E11	<b>Corrected SS</b>	6.20225E10
<b>Coeff Variation</b>	81.5573347	<b>Std Error Mean</b>	0.44697102

**The UNIVARIATE Procedure**  
**Variable: FD806 (Expense Non-alcoholic beverages)**

**Freq: WeightD**

Household type=Couple with other related or unrelated persons

Basic Statistical Measures			
Location		Variability	
Mean	409.0855	Std Deviation	333.63924
Median	321.5400	Variance	111315
Mode	657.3000	Range	1525
		Interquartile Range	509.21000

Tests for Location: Mu0=0				
Test	Statistic		p Value	
Student's t	t	915.2395	Pr >  t	<.0001
Sign	M	278590	Pr >=  M	<.0001
Signed Rank	S	7.761E10	Pr >=  S	<.0001

Tests for Normality				
Test	Statistic		p Value	
Kolmogorov-Smirnov	D	0.137284	Pr > D	<0.0100
Cramer-von Mises	W-Sq	2203.392	Pr > W-Sq	<0.0050
Anderson-Darling	A-Sq	16222.43	Pr > A-Sq	<0.0050

Quantiles (Definition 5)	
Level	Quantile
100% Max	1569.37
99%	1464.24
95%	1022.41
90%	775.63

**The UNIVARIATE Procedure**  
**Variable: FD806 (Expense Non-alcoholic beverages)**

**Freq: WeightD**

**Household type=Couple with other related or unrelated persons**

Quantiles (Definition 5)	
Level	Quantile
75% Q3	626.08
50% Median	321.54
25% Q1	116.87
10%	59.10
5%	52.00
1%	44.55
0% Min	44.55

Extreme Observations					
Lowest			Highest		
Value	Freq	Obs	Value	Freq	Obs
44.55	12589	725	1145.38	1539	767
52.00	21675	739	1191.01	60	709
52.26	36	745	1295.58	1523	759
55.44	16745	769	1464.24	12702	747
59.10	20541	765	1569.37	4907	734

**The UNIVARIATE Procedure**  
**Variable: FD806 (Expense Non-alcoholic beverages)**

**Freq: WeightD**

**Household type=Couple without children**

Moments			
<b>N</b>	2206478	<b>Sum Weights</b>	2206478
<b>Mean</b>	317.617514	<b>Sum Observations</b>	700816056
<b>Std Deviation</b>	290.741589	<b>Variance</b>	84530.6718
<b>Skewness</b>	1.65772878	<b>Kurtosis</b>	2.70480882
<b>Uncorrected SS</b>	4.09106E11	<b>Corrected SS</b>	1.86515E11
<b>Coeff Variation</b>	91.5382738	<b>Std Error Mean</b>	0.19572998

Basic Statistical Measures			
Location		Variability	
<b>Mean</b>	317.6175	<b>Std Deviation</b>	290.74159
<b>Median</b>	203.5800	<b>Variance</b>	84531
<b>Mode</b>	190.3400	<b>Range</b>	1545
		<b>Interquartile Range</b>	313.30000

Tests for Location: Mu0=0				
Test	Statistic		p Value	
<b>Student's t</b>	<b>t</b>	1622.733	<b>Pr &gt;  t </b>	<.0001
<b>Sign</b>	<b>M</b>	1103239	<b>Pr &gt;=  M </b>	<.0001
<b>Signed Rank</b>	<b>S</b>	1.217E12	<b>Pr &gt;=  S </b>	<.0001



**The UNIVARIATE Procedure**  
**Variable: FD806 (Expense Non-alcoholic beverages)**

**Freq: WeightD**

**Household type=Couple without children**

Tests for Normality				
Test	Statistic		p Value	
Kolmogorov-Smirnov	D	0.160741	Pr > D	<0.0100
Cramer-von Mises	W-Sq	21068.53	Pr > W-Sq	<0.0050
Anderson-Darling	A-Sq	120508.2	Pr > A-Sq	<0.0050

Quantiles (Definition 5)	
Level	Quantile
100% Max	1556.41
99%	1309.62
95%	934.96
90%	751.92
75% Q3	426.14
50% Median	203.58
25% Q1	112.84
10%	59.54
5%	49.14
1%	29.64
0% Min	11.83

**The UNIVARIATE Procedure**  
**Variable: FD806 (Expense Non-alcoholic beverages)**

**Freq: WeightD**

Household type=Couple without children

Extreme Observations					
Lowest			Highest		
Value	Freq	Obs	Value	Freq	Obs
11.83	3940	1110	1430.56	1379	1108
21.58	347	952	1485.65	5912	1186
21.84	1372	1370	1511.64	5649	1341
25.22	463	1187	1513.44	2134	1094
25.48	987	983	1556.41	1360	889

**The UNIVARIATE Procedure**  
**Variable: FD806 (Expense Non-alcoholic beverages)**

**Freq: WeightD**

Household type=Lone parent family with no additional persons

Moments			
<b>N</b>	513225	<b>Sum Weights</b>	513225
<b>Mean</b>	302.248729	<b>Sum Observations</b>	155121604
<b>Std Deviation</b>	268.197191	<b>Variance</b>	71929.7332
<b>Skewness</b>	1.80743776	<b>Kurtosis</b>	3.45271654
<b>Uncorrected SS</b>	8.38014E10	<b>Corrected SS</b>	3.69161E10
<b>Coeff Variation</b>	88.733935	<b>Std Error Mean</b>	0.37436938

**The UNIVARIATE Procedure**  
**Variable: FD806 (Expense Non-alcoholic beverages)**

**Freq: WeightD**

**Household type=Lone parent family with no additional persons**

Basic Statistical Measures			
Location		Variability	
Mean	302.2487	Std Deviation	268.19719
Median	238.4800	Variance	71930
Mode	54.0800	Range	1514
		Interquartile Range	263.24000

Tests for Location: Mu0=0				
Test	Statistic		p Value	
Student's t	t	807.3543	Pr >  t	<.0001
Sign	M	256612.5	Pr >=  M	<.0001
Signed Rank	S	6.585E10	Pr >=  S	<.0001

Tests for Normality				
Test	Statistic		p Value	
Kolmogorov-Smirnov	D	0.186172	Pr > D	<0.0100
Cramer-von Mises	W-Sq	4891.038	Pr > W-Sq	<0.0050
Anderson-Darling	A-Sq	28248.84	Pr > A-Sq	<0.0050

Quantiles (Definition 5)	
Level	Quantile
100% Max	1536.76
99%	1217.58
95%	849.05
90%	694.20

**The UNIVARIATE Procedure**  
**Variable: FD806 (Expense Non-alcoholic beverages)**

**Freq: WeightD**

**Household type=Lone parent family with no additional persons**

Quantiles (Definition 5)	
Level	Quantile
75% Q3	375.52
50% Median	238.48
25% Q1	112.28
10%	54.08
5%	44.86
1%	29.90
0% Min	22.36

Extreme Observations					
Lowest			Highest		
Value	Freq	Obs	Value	Freq	Obs
22.36	381	1693	1250.86	990	1666
24.96	1553	1652	1292.20	1554	1690
29.90	5372	1658	1449.41	505	1684
35.92	14896	1655	1456.00	442	1687
40.67	629	1558	1536.76	836	1713

**The UNIVARIATE Procedure**  
**Variable: FD806 (Expense Non-alcoholic beverages)**

**Freq: WeightD**

**Household type=One person household**

Moments			
<b>N</b>	1964999	<b>Sum Weights</b>	1964999
<b>Mean</b>	257.465002	<b>Sum Observations</b>	505918471
<b>Std Deviation</b>	274.692386	<b>Variance</b>	75455.907
<b>Skewness</b>	2.11090445	<b>Kurtosis</b>	4.28838971
<b>Uncorrected SS</b>	2.78527E11	<b>Corrected SS</b>	1.48271E11
<b>Coeff Variation</b>	106.691156	<b>Std Error Mean</b>	0.19595911

Basic Statistical Measures			
Location		Variability	
<b>Mean</b>	257.4650	<b>Std Deviation</b>	274.69239
<b>Median</b>	162.7600	<b>Variance</b>	75456
<b>Mode</b>	386.9000	<b>Range</b>	1544
		<b>Interquartile Range</b>	233.57000

Tests for Location: Mu0=0				
Test	Statistic		p Value	
<b>Student's t</b>	<b>t</b>	1313.871	<b>Pr &gt;  t </b>	<.0001
<b>Sign</b>	<b>M</b>	982499.5	<b>Pr &gt;=  M </b>	<.0001
<b>Signed Rank</b>	<b>S</b>	9.653E11	<b>Pr &gt;=  S </b>	<.0001

**The UNIVARIATE Procedure**  
**Variable: FD806 (Expense Non-alcoholic beverages)**

**Freq: WeightD**

**Household type=One person household**

Tests for Normality				
Test	Statistic		p Value	
Kolmogorov-Smirnov	D	0.199652	Pr > D	<0.0100
Cramer-von Mises	W-Sq	29015.43	Pr > W-Sq	<0.0050
Anderson-Darling	A-Sq	165709.1	Pr > A-Sq	<0.0050

Quantiles (Definition 5)	
Level	Quantile
100% Max	1557.89
99%	1230.11
95%	915.33
90%	599.04
75% Q3	319.02
50% Median	162.76
25% Q1	85.45
10%	50.70
5%	34.39
1%	20.54
0% Min	14.08

**The UNIVARIATE Procedure**  
**Variable: FD806 (Expense Non-alcoholic beverages)**

**Freq: WeightD**

**Household type=One person household**

Extreme Observations					
Lowest			Highest		
Value	Freq	Obs	Value	Freq	Obs
14.08	15313	2018	1346.28	5467	2127
15.08	1520	2154	1354.61	1683	2058
20.54	4062	1917	1444.43	1311	1818
20.80	8060	1722	1447.85	46	1943
21.28	7665	1892	1557.89	759	1975

**The UNIVARIATE Procedure**  
**Variable: FD806 (Expense Non-alcoholic beverages)**

**Freq: WeightD**

**Household type=Other household with related or unrelated persons**

Moments			
<b>N</b>	429757	<b>Sum Weights</b>	429757
<b>Mean</b>	327.270551	<b>Sum Observations</b>	140646810
<b>Std Deviation</b>	264.683575	<b>Variance</b>	70057.3949
<b>Skewness</b>	1.6888428	<b>Kurtosis</b>	2.62426534
<b>Uncorrected SS</b>	7.61371E10	<b>Corrected SS</b>	3.01076E10
<b>Coeff Variation</b>	80.8760747	<b>Std Error Mean</b>	0.40375277

**The UNIVARIATE Procedure**  
**Variable: FD806 (Expense Non-alcoholic beverages)**

**Freq: WeightD**

**Household type=Other household with related or unrelated persons**

Basic Statistical Measures			
Location		Variability	
Mean	327.2706	Std Deviation	264.68358
Median	263.9000	Variance	70057
Mode	141.5000	Range	1278
		Interquartile Range	227.20000

Tests for Location: Mu0=0				
Test	Statistic		p Value	
Student's t	t	810.5717	Pr >  t	<.0001
Sign	M	214878.5	Pr >=  M	<.0001
Signed Rank	S	4.617E10	Pr >=  S	<.0001

Tests for Normality				
Test	Statistic		p Value	
Kolmogorov-Smirnov	D	0.189182	Pr > D	<0.0100
Cramer-von Mises	W-Sq	4031.699	Pr > W-Sq	<0.0050
Anderson-Darling	A-Sq	23929.75	Pr > A-Sq	<0.0050

Quantiles (Definition 5)	
Level	Quantile
100% Max	1308.58
99%	1266.72
95%	1062.90
90%	706.42



**The UNIVARIATE Procedure**  
**Variable: FD806 (Expense Non-alcoholic beverages)**

**Freq: WeightD**

Household type=Other household with related or unrelated persons

Quantiles (Definition 5)	
Level	Quantile
75% Q3	373.84
50% Median	263.90
25% Q1	146.64
10%	77.48
5%	53.30
1%	30.16
0% Min	30.16

Extreme Observations					
Lowest			Highest		
Value	Freq	Obs	Value	Freq	Obs
30.16	12248	2308	1077.70	2800	2216
35.97	838	2230	1083.16	644	2241
45.60	6607	2322	1086.02	10294	2260
52.00	1422	2313	1266.72	1518	2317
53.30	8041	2224	1308.58	3082	2325

Null hypothesis: equal variances

a.If variances are equal, then a pooled t-test is appropriate

b.If variances are unequal, then a Satterthwaite (also known as Welch's) test is appropriate

## The GLM Procedure

Class Level Information		
Class	Levels	Values
HHType6	6	Couple with children Couple with other related or unrelated persons Couple without children Lone parent family with no additional persons One person household Other household with related or unrelated persons

Number of Observations Read	2327
Number of Observations Used	2327
Sum of Frequencies Read	8128876
Sum of Frequencies Used	8128876

## The GLM Procedure

Dependent Variable: FD806 Expense Non-alcoholic beverages

Frequency: WeightD

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	19929588843	3985917768.6	44894.3	<.0001
Error	8.13E6	721717540999	88784.485543		
Corrected Total	8.13E6	741647129841			

R-Square	Coeff Var	Root MSE	FD806 Mean
0.026872	91.15922	297.9673	326.8646

Source	DF	Type I SS	Mean Square	F Value	Pr > F
HHType6	5	19929588843	3985917769	44894.3	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
HHType6	5	19929588843	3985917769	44894.3	<.0001

## The GLM Procedure

Levene's Test for Homogeneity of FD806 Variance ANOVA of Absolute Deviations from Group Means					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
HHType6	5	5.0149E9	1.003E9	25667.0	<.0001
Error	8.13E6	3.177E11	39076.8		

Welch's ANOVA for FD806			
Source	DF	F Value	Pr > F
HHType6	5.0000	44119.9	<.0001
Error	1933052		

## The GLM Procedure

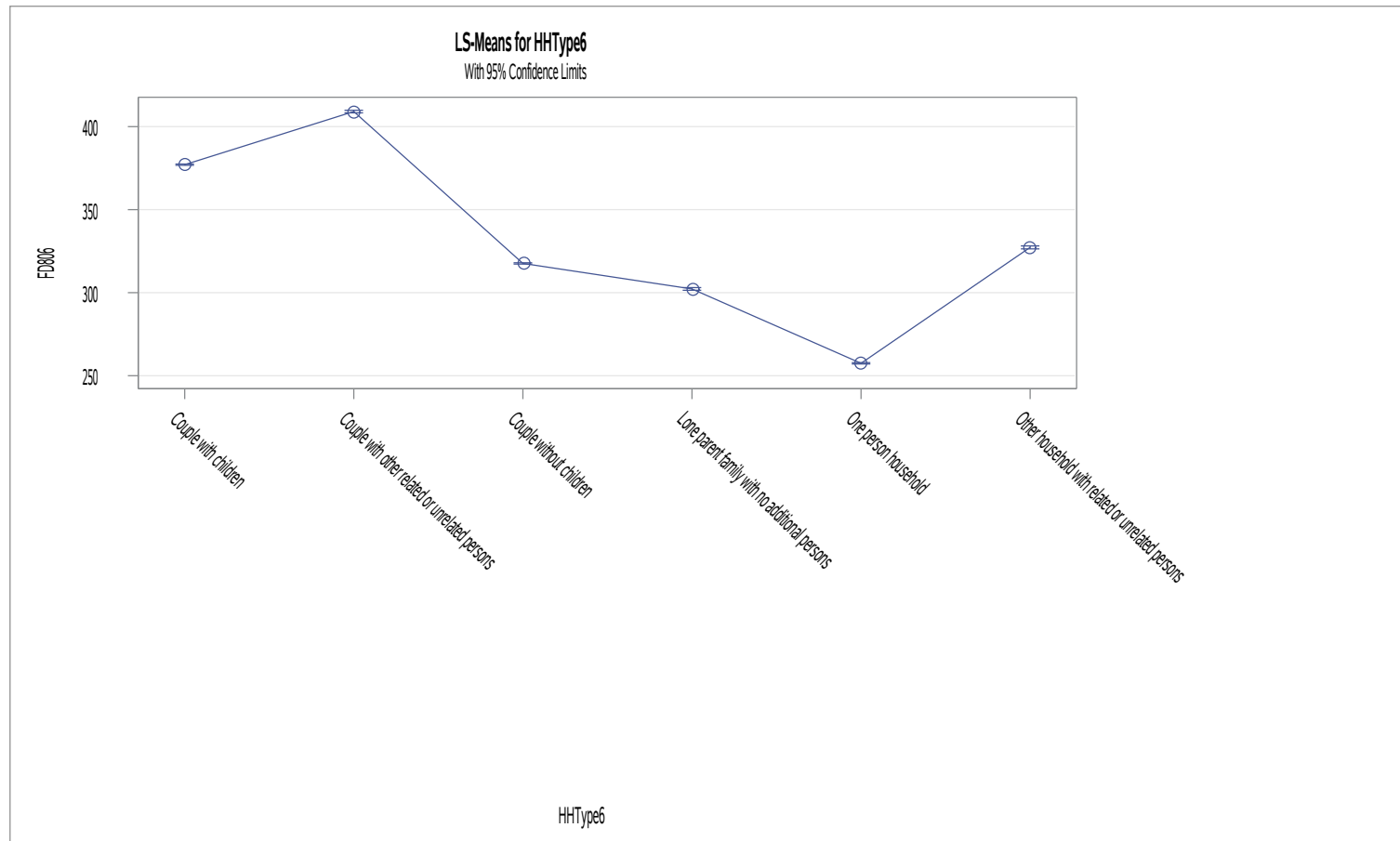
Level of HHType6	N	FD806	
		Mean	Std Dev
Couple with children	2457237	377.092158	323.959134
Couple with other related or unrelated persons	557180	409.085512	333.639240
Couple without children	2206478	317.617514	290.741589
Lone parent family with no additional persons	513225	302.248729	268.197191
One person household	1964999	257.465002	274.692386
Other household with related or unrelated persons	429757	327.270551	264.683575

**The GLM Procedure**  
**Least Squares Means**  
**Adjustment for Multiple Comparisons: Tukey-Kramer**

HHType6	FD806 LSMEAN	LSMEAN Number
Couple with children	377.092158	1
Couple with other related or unrelated persons	409.085512	2
Couple without children	317.617514	3
Lone parent family with no additional persons	302.248729	4
One person household	257.465002	5
Other household with related or unrelated persons	327.270551	6

Least Squares Means for effect HHType6 Pr >  t  for H0: LSMean(i)=LSMean(j) Dependent Variable: FD806						
i/j	1	2	3	4	5	6
1		<.0001	<.0001	<.0001	<.0001	<.0001
2	<.0001		<.0001	<.0001	<.0001	<.0001
3	<.0001	<.0001		<.0001	<.0001	<.0001
4	<.0001	<.0001	<.0001		<.0001	<.0001
5	<.0001	<.0001	<.0001	<.0001		<.0001
6	<.0001	<.0001	<.0001	<.0001	<.0001	

The GLM Procedure  
Least Squares Means  
Adjustment for Multiple Comparisons: Tukey-Kramer



**The GLM Procedure**  
**Least Squares Means**  
**Adjustment for Multiple Comparisons: Tukey-Kramer**

**FD806 Tukey-Kramer Grouping for LS-Means of HHType6 (Alpha = 0.05)**

LS-means covered by the same bar are not significantly different.

