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Subject: Lab 25: Repeated Measures Designs and Accuracy

Figure:

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Summary:

This lab we are running an ANOVA test on data having to do with glucose levels that was test on a time interval for 6 different groups. Each group having 6 participants. We wanted to see if means for the class is same across each time. There is a similar pattern in each of the groups. No matter what time the meal was eaten there was a clear sharp spike in the glucose level. This glucose level fluctuated throughout the day, but generally had a negative slope. By the end of the day the glucose levels were down to where they where before the meal. The means were sometimes different throughout the day, but they were the same at the last time interval. In any case eating will cause in spike in glucose levels.

Figure 1: Means by tm

The MEANS Procedure

tm=1

Variable	N	Mean	Std Dev	Minimum	Maximum
t0	6	5.2600000	0.5579606	4.6100000	6.2400000
t1	6	4.9450000	0.3270933	4.5000000	5.3500000
t2	6	7.5483333	1.0305031	5.6900000	8.7200000
t3	6	5.8733333	1.2370071	4.8500000	8.2100000
t4	6	4.5966667	0.9038510	2.9700000	5.5700000
t5	6	4.7483333	0.9512816	3.8800000	6.3300000
t6	6	4.3800000	0.5417010	3.6500000	4.9600000
t7	6	4.4200000	0.3203748	3.9900000	4.9300000
t8	5	4.4880000	0.3960682	4.1500000	5.1600000
t9	6	4.6866667	0.5377980	4.1300000	5.5400000

tm=2

Variable	N	Mean	Std Dev	Minimum	Maximum
t0	6	4.2883333	0.5223568	3.7600000	4.9500000
t1	6	4.1083333	0.4360925	3.4200000	4.7000000
t2	6	6.9900000	1.1331019	5.5300000	9.0000000
t3	6	7.4216667	1.6633991	4.9800000	9.7400000
t4	6	6.4383333	1.0197140	5.0200000	7.7800000
t5	6	6.4350000	1.0272634	5.3400000	7.7400000
t6	6	5.2533333	0.6791073	4.4500000	6.1300000
t7	6	4.2250000	0.6463977	3.4500000	5.1400000
t8	6	4.1816667	0.5974752	3.5900000	5.2500000
t9	6	4.3716667	0.6230704	3.5800000	5.4200000

tm=3

Variable	N	Mean	Std Dev	Minimum	Maximum
t0	6	4.4833333	0.2186931	4.2200000	4.8100000
t1	6	4.5783333	0.2837898	4.2200000	4.9200000
t2	6	7.2000000	1.0918608	6.0100000	8.4600000
t3	6	7.5983333	0.9199004	6.7400000	9.1200000
t4	6	5.9833333	1.0590310	4.3000000	7.5000000
t5	6	5.4283333	0.7245527	4.2800000	6.1600000
t6	6	4.6183333	0.1346724	4.4100000	4.8200000
t7	6	4.4133333	0.4559678	3.8200000	4.9600000
t8	6	4.4133333	0.6241367	3.4400000	5.2900000
t9	6	4.4100000	0.4035344	3.8100000	4.9500000

tm=4

Variable	N	Mean	Std Dev	Minimum	Maximum
t0	6	4.2066667	0.1868333	3.9400000	4.4500000
t1	6	4.2366667	0.3166491	3.7800000	4.7100000
t2	6	7.6500000	0.5644112	7.1400000	8.7100000
t3	6	7.2300000	1.0464798	5.6800000	8.6800000
t4	6	6.5250000	0.5703595	6.0700000	7.5500000
t5	6	5.8433333	0.9998733	4.2200000	6.8600000
t6	6	4.9516667	0.5261717	4.3100000	5.7500000
t7	6	4.1916667	0.5992467	3.1500000	4.8300000
t8	6	4.1816667	0.4835046	3.6000000	4.8300000
t9	6	4.3666667	0.4213154	3.8800000	4.9200000

tm=5

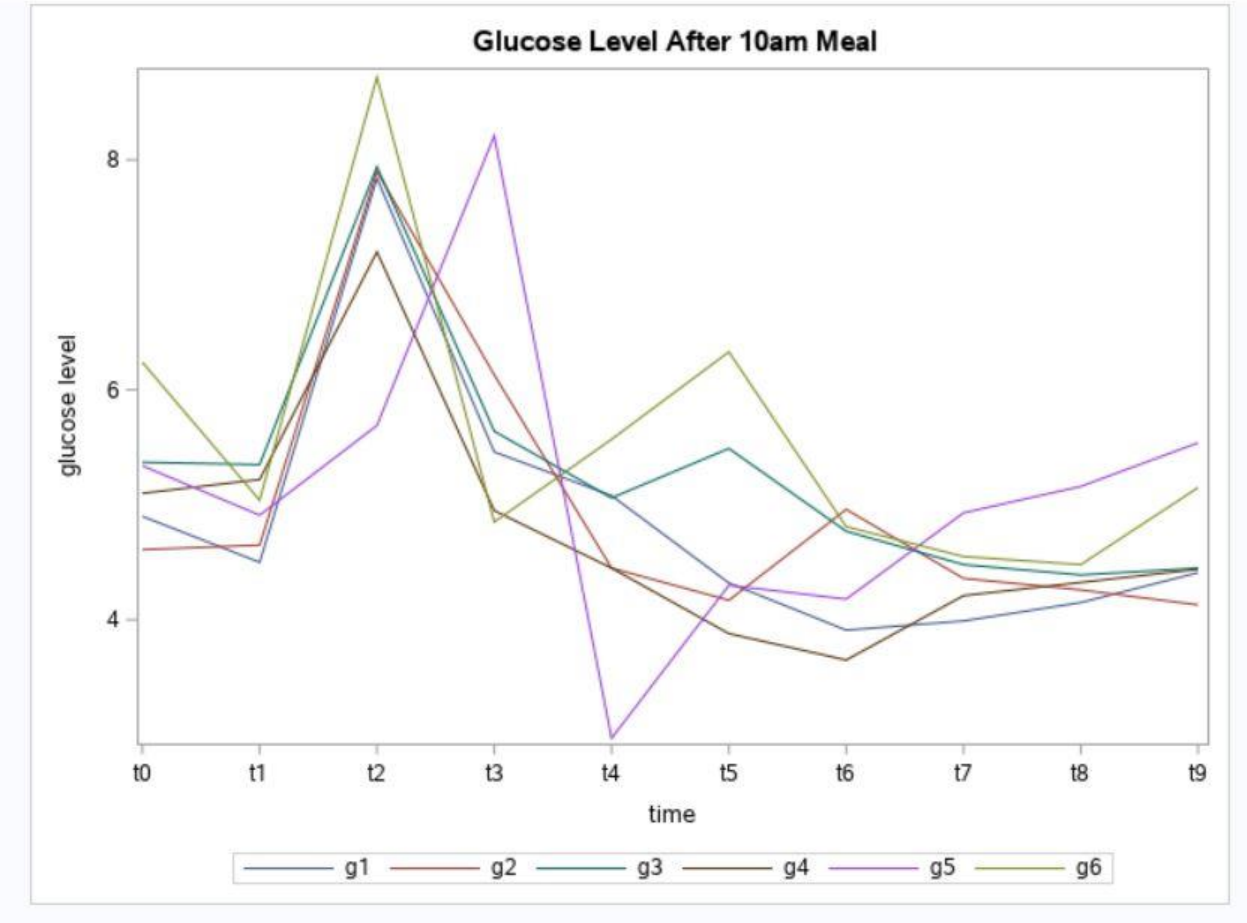
Variable	N	Mean	Std Dev	Minimum	Maximum
t0	6	4.6800000	0.2603843	4.3300000	5.0300000
t1	6	4.7250000	0.2922841	4.4400000	5.1200000
t2	6	7.8450000	1.5528780	5.5600000	9.2900000
t3	6	9.0300000	0.6258115	8.3900000	10.0300000
t4	6	7.7800000	1.8862131	4.5000000	9.8800000
t5	6	7.1750000	1.0331844	5.7100000	8.3100000
t6	6	6.3833333	1.0617093	5.2400000	7.9200000
t7	6	4.9533333	0.5294777	4.2700000	5.7900000
t8	6	4.6216667	0.3574027	4.1000000	5.0600000
t9	5	4.3820000	0.7046418	3.5200000	5.2400000

tm=6

Variable	N	Mean	Std Dev	Minimum	Maximum
t0	6	4.5366667	0.2720784	4.3300000	5.0600000
t1	6	4.5366667	0.3849502	4.0700000	5.0400000
t2	6	7.3400000	2.0932749	4.3600000	9.5300000
t3	6	8.7683333	1.5860570	6.6400000	10.0200000
t4	6	8.9983333	1.1479968	7.7200000	10.4700000
t5	6	8.0183333	1.3368383	6.5800000	9.9100000
t6	6	5.5400000	0.6557439	4.7400000	6.3800000
t7	6	4.9916667	0.6267828	4.2800000	5.9100000
t8	6	4.3700000	0.7644344	3.3800000	5.6500000
t9	6	4.3516667	0.5478108	3.5200000	5.1400000

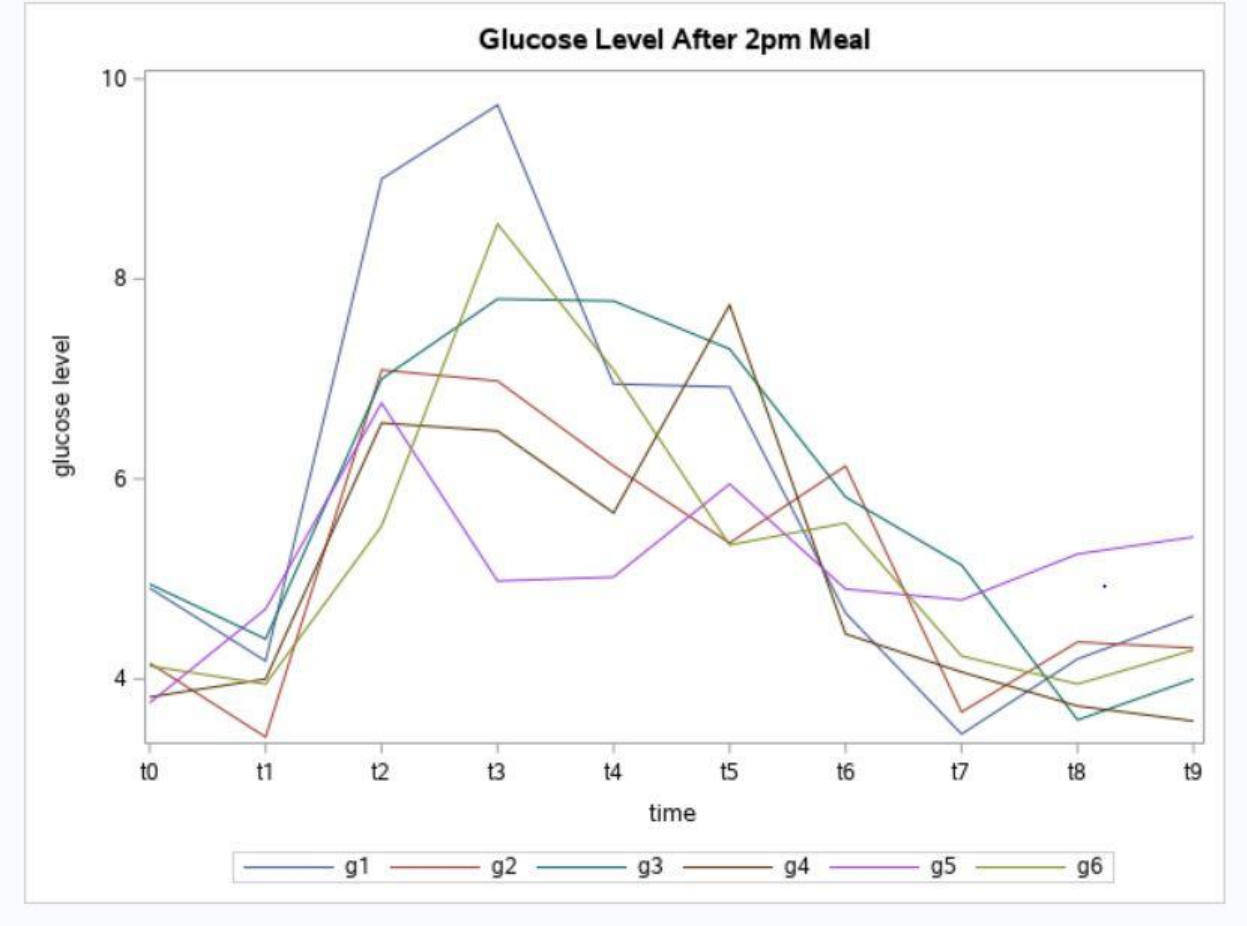
Here we can see the means by time.

Figure 2: 10am Means



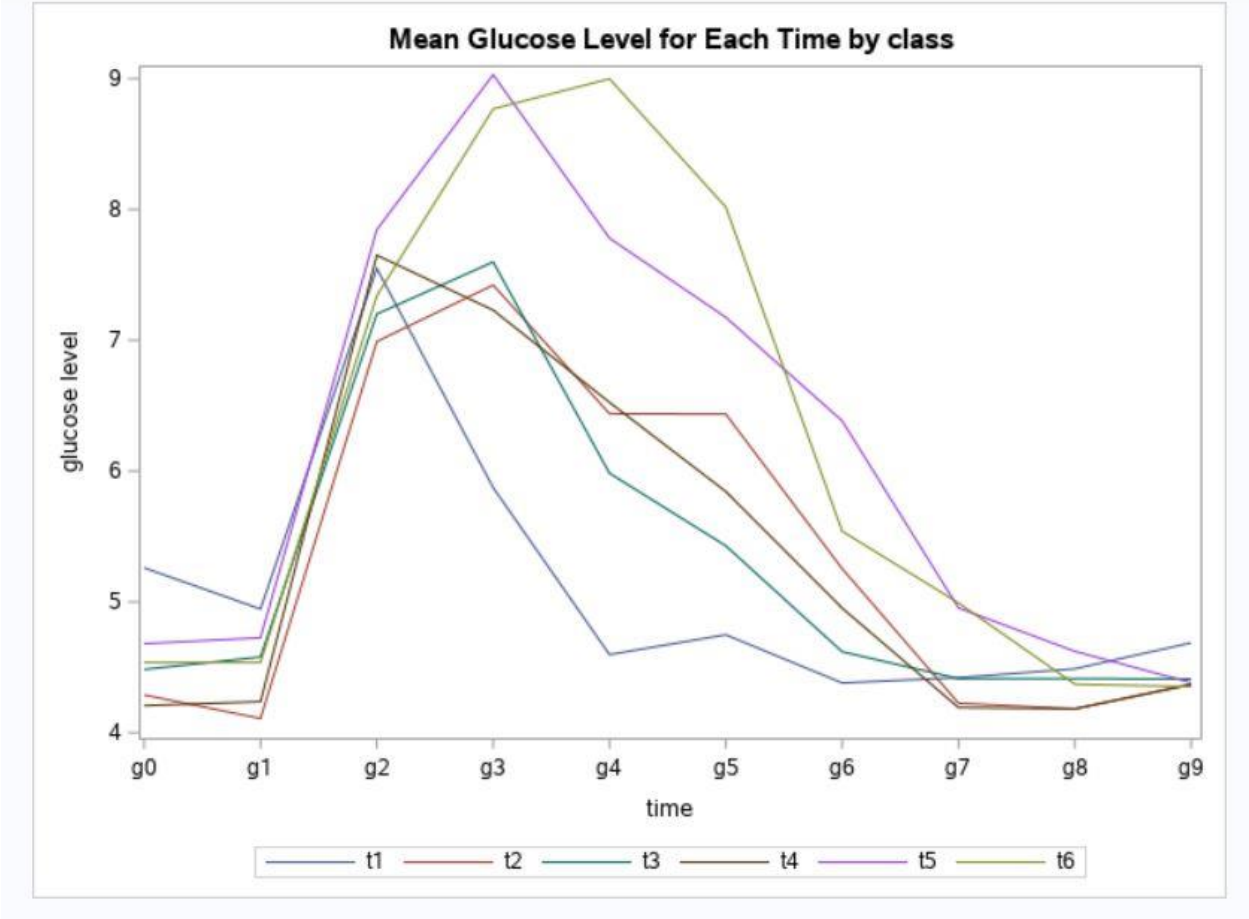
From the chart we can see that the glucose levels spiked 30 minutes after meal across all subjects and went down sharply and hour after the meal. Then they went down gradually throughout the day.

Figure 3: 2pm Means



We can see a similar trend for the 2pm meal. The glucose level went up 30 minutes after meal and went down gradually throughout the day.

Figure 4: Mean Glucose by Time



This chart shows the mean glucose level by time with the y values being the mean value for the time group at each time. We can see that it follows the same pattern, increasing at g2 and g3, but decreases throughout the day.

Figure 5: GLM t0

The GLM Procedure

Dependent Variable: t0

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	4.24779167	0.84955833	6.30	0.0004
Error	30	4.04368333	0.13478944		
Corrected Total	35	8.29147500			

R-Square	Coeff Var	Root MSE	t0 Mean
0.512308	8.023387	0.367137	4.575833

Source	DF	Type I SS	Mean Square	F Value	Pr > F
tm	5	4.24779167	0.84955833	6.30	0.0004

Source	DF	Type III SS	Mean Square	F Value	Pr > F
tm	5	4.24779167	0.84955833	6.30	0.0004

We can see the means are statistically different 15 minutes before the meal.

Figure 6: GLM t9

The GLM Procedure

Dependent Variable: t9

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	0.49047524	0.09809505	0.33	0.8896
Error	29	8.57551333	0.29570736		
Corrected Total	34	9.06598857			

R-Square	Coeff Var	Root MSE	t9 Mean
0.054101	12.27675	0.543790	4.429429

Source	DF	Type I SS	Mean Square	F Value	Pr > F
tm	5	0.49047524	0.09809505	0.33	0.8896

Source	DF	Type III SS	Mean Square	F Value	Pr > F
tm	5	0.49047524	0.09809505	0.33	0.8896

In this last recorded time the means glucose levels are the same.

Figure 7: GLM t0 contrast

The GLM Procedure

Dependent Variable: t0

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	4.24779167	0.84955833	6.30	0.0004
Error	30	4.04368333	0.13478944		
Corrected Total	35	8.29147500			

R-Square	Coeff Var	Root MSE	t0 Mean
0.512308	8.023387	0.367137	4.575833

Source	DF	Type I SS	Mean Square	F Value	Pr > F
tm	5	4.24779167	0.84955833	6.30	0.0004

Source	DF	Type III SS	Mean Square	F Value	Pr > F
tm	5	4.24779167	0.84955833	6.30	0.0004

Contrast	DF	Contrast SS	Mean Square	F Value	Pr > F
gr1 vs gr3	1	1.80963333	1.80963333	13.43	0.0010

Parameter	Estimate	Standard Error	t Value	Pr > |t|
gr1 and gr3	243.583333	5.29916354	45.97	<.0001

We can see for the contrast the means are different between group1 and group 3.

Figure 8: GLM t5 contrast

The GLM Procedure

Dependent Variable: t5

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	42.65221389	8.53044278	8.07	<.0001
Error	30	31.69768333	1.05658944		
Corrected Total	35	74.34989722			

R-Square	Coeff Var	Root MSE	t5 Mean
0.573669	16.38169	1.027905	6.274722

Source	DF	Type I SS	Mean Square	F Value	Pr > F
tm	5	42.65221389	8.53044278	8.07	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
tm	5	42.65221389	8.53044278	8.07	<.0001

Contrast	DF	Contrast SS	Mean Square	F Value	Pr > F
gr1 vs gr3	1	1.38720000	1.38720000	1.31	0.2609

Parameter	Estimate	Standard Error	t Value	Pr > |t|
gr1 and gr3	254.416667	14.8365360	17.15	<.0001

At t5 the means between the group1 and group3 are the same.

Figure 9: GLM t9 contrast

The GLM Procedure

Dependent Variable: t9

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	0.49047524	0.09809505	0.33	0.8896
Error	29	8.57551333	0.29570736		
Corrected Total	34	9.06598857			

R-Square	Coeff Var	Root MSE	t9 Mean
0.054101	12.27675	0.543790	4.429429

Source	DF	Type I SS	Mean Square	F Value	Pr > F
tm	5	0.49047524	0.09809505	0.33	0.8896

Source	DF	Type III SS	Mean Square	F Value	Pr > F
tm	5	0.49047524	0.09809505	0.33	0.8896

Contrast	DF	Contrast SS	Mean Square	F Value	Pr > F
gr1 vs gr3	1	0.22963333	0.22963333	0.78	0.3854

Parameter	Estimate	Standard Error	t Value	Pr > |t|
gr1 and gr3	227.416667	7.84892981	28.97	<.0001

The means between group1 and group3 are the same at t9.