

Compare MIXED and GLIMMIX to Analyze Breast Cancer Longitudinal Study

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ABSTRACT

The importance of choosing the type of statistical program that we use to analyze data in a longitudinal study are growing as a specialty due to the fact that computerized data analyses have become the standard for scientific research. There are many procedures in SAS® that can be used to analyze longitudinal data. The purpose of this paper is to compare MIXED and GLIMMIX procedure in SAS to analyze data from a longitudinal study. A randomized trial design was used in which 185 participants were assigned to a therapeutic group by teleconference (n=92) in which participants interacted in real time with each other or the control group (n=93) who received usual psychosocial care (any support used by the patient in the course of cancer treatment). The randomization was stratified by treatment type. Data were collected at baseline, the end of the intervention, and 16 weeks from baseline. A mixed-effects repeated measures model was used to assess outcome variable of social well being (social connection) by group over time. The effect of group, time and interaction effect of group by time were examined after controlling for several confounding factors. SAS is the most powerful statistical program for data analyses in a longitudinal study.

Keywords: SAS, MIXED, GLIMMIX, longitudinal

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INTRODUCTION

The programming of longitudinal data sets as required for intervention research, poses a challenge to new investigators. Every Programmer's goals should include writing clear and efficient codes. There are many procedures in SAS that can be used to analyze a longitudinal study. The MIXED procedure performs a variety of mixed linear models to data. The GLIMMIX procedure fits estimation and statistical inferences for generalized linear mixed model. This procedure extends the SAS mixed models such as models data from non-normal distribution. SAS provides practical and efficient way to analyze longitudinal and complex design.

PURPOSE

The purpose of this paper is to compare MIXED and GLIMMIX procedures in SAS to analyze data from a longitudinal study.

BACKGROUND

This paper use the data from a research grant (R01). The effects of a therapeutic group using teleconference for African American women with breast cancer have not been reported. This group may experience social disconnection, a sense of being cut off from partners, family and friends due to side effects of treatment and fatalistic beliefs about cancer. A therapeutic group by teleconference may assist African American women with breast cancer to feel connected to women in a similar situation, to learn ways to talk about cancer and to decrease fatalistic beliefs. A randomized trial design was used in which 185 participants were assigned to the therapeutic group (n=92) and control group (n=93). The therapeutic group intervention was led by two social workers experienced in working with oncology patients and leading support groups. The intervention was delivered by teleconference with participants interacting in real time with each other. Control group was defined as any support used by the patient in the course of cancer treatment. The randomization was stratified by treatment type. Data were collected at baseline, the end of the intervention (8 weeks from baseline), and 16 weeks from baseline.

DATA ANALYSES

All data analyses were performed using **SAS/STAT**® statistical software, version 9.2 (SAS, 2008). Proc MEAN and FREQ used to describe the data. Proc MIXED and GLIMMIX were used to analyze this longitudinal study.

RESULTS

Table 1 showed descriptive statistics for social well being (SWB) and physical well being by group and time. The results showed the mean of SWB for therapeutic group slightly increase from time 1 to time2 and time 2 to time 3. However, the mean of SWB for control group slightly decrease from baseline to time 3. The mean for physical well being for both groups increase. Figure 1 showed the different distribution for SWB. It seems Gamma and Log normal are better fit for SWB. Table 2 indicated type III tests output for MIXED procedure. There were significant difference for physical activity ($P < .0001$) and interaction effect of time by group ($P = 0.0172$) on social well being. Table 3 showed type III tests output for GLIMMIX procedure with different distribution. There were significant difference for PWB and time by group interaction effect with different distribution for SWB.

CONCLUSION

Our data indicated both MIXED and GLIMMIX provide the same results. However, GLIMMIX procedure easily examined different distribution for our outcome (social well being). In our view this could be one important advantage of using GLIMMIX procedure. SAS is the most powerful statistical program in data analyses for longitudinal study.

REFERENCES

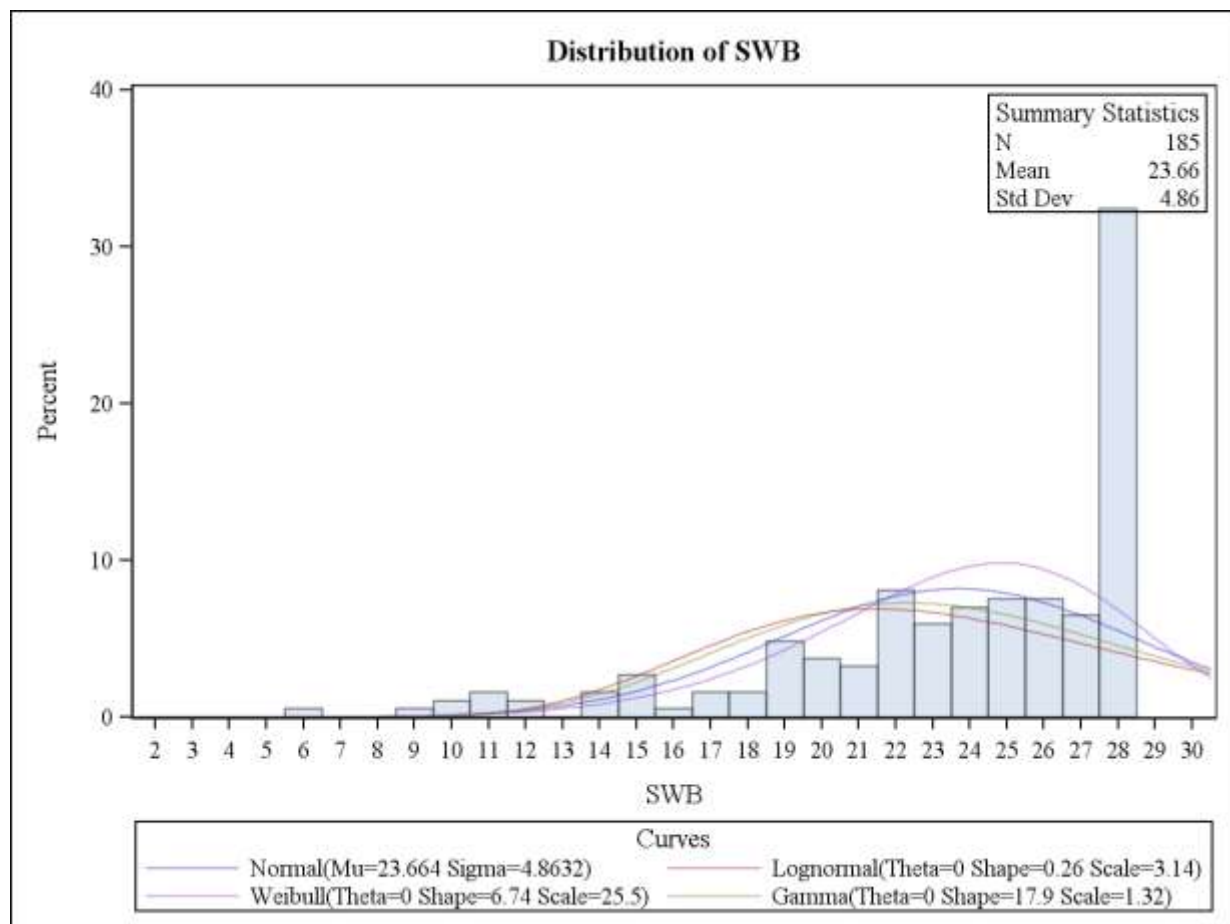
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group	time	N Obs	Variable	N	Mean	Std Dev	Minimum	Maximum
Therapeutic	1	92	SWB	92	23.52	5.15	5.83	28.00
			PWB	92	21.57	5.25	4.00	28.00
	2	82	SWB	82	23.79	4.93	2.00	28.00
			PWB	82	22.23	4.58	11.00	28.00
	3	83	SWB	83	24.94	3.26	14.00	28.00
			PWB	83	23.12	4.32	8.00	28.00
Usual	1	93	SWB	93	23.80	4.58	11.00	28.00
			PWB	93	19.84	6.06	4.00	28.00
	2	86	SWB	86	23.50	4.90	8.00	33.83
			PWB	86	21.42	5.38	5.00	28.00
	3	89	SWB	89	23.43	4.60	10.50	28.00
			PWB	89	22.01	5.53	3.00	28.00

Table 1. Measure of Center and Dispersion for Social Well Being (SWB) and Physical Well Being (PWB)**Figure1. Social Well Being (SWB) Distribution**

Type III Tests of Fixed Effects				
Normal				
Effect	Num DF	Den DF	F Value	Pr > F
Wave	14	502	1.10	0.3504
educg	2	502	0.10	0.9024
PWB	1	502	21.32	<.0001
group	1	502	0.24	0.6240
time	2	502	0.65	0.5203
time*group	2	502	4.10	0.0172

Table 2. Type III Tests Output for MIXED Procedure

Type III Tests of Fixed Effects										
Effect	Num DF	Den DF	Normal		Lognormal		Poisson		Gamma	
			F Value	P-Value	F Value	P-Value	F Value	P-Value	F Value	P-Value
Wave	14	502	1.10	0.3504	1.15	0.3153	1.04	0.4103	1.09	0.3644
educg	2	502	0.10	0.9024	0.10	0.9020	0.09	0.9130	0.08	0.9217
PWB	1	502	21.32	<.0001	15.92	<.0001	20.21	<.0001	19.97	<.0001
group	1	502	0.24	0.6240	0.04	0.8332	0.25	0.6169	0.26	0.6124
time	2	502	0.65	0.5203	1.35	0.2614	0.58	0.5582	0.58	0.5627
time*group	2	502	4.10	0.0172	3.65	0.0266	3.86	0.0217	3.76	0.0240

Table 3. Type III Tests Output for GLIMMIX Procedure With Different Distribution

Attachment A

SAS Syntax

SAS procedure for Table1 :

```
ods rtf;
ods listing close;
proc means maxdec=2 data=last;
  class group time ;
  var swb pwb;
  title ' means / group and time'; run;
```

```
ods rtf close;
ods listing; quit; run;
```

SAS Procedure for figure 1:

```
ods rtf;
ods listing close;
ods graphics on;

symbol;
goptions ftext= ctext= htext=;
proc univariate data=last;
  var swb;
  where time=1;
  histogram / midpoints= 2 to 30 by 1
    normal
    lognormal
    weibull
    gamma
    vaxis = axis1
    name = 'MyHist';
  inset n mean(5.2) std='Std Dev'(5.2) / pos = ne header = 'Summary Statistics';
  axis1 label=(a=90 r=0);
```

```
title 'univariate / '; Run;
ods graphics off;
ods rtf close; ods listing; quit; run;
```

SAS Procedure for table 2:

```
ods rtf;
ods listing close;
ods graphics on;
```

```
%macro mix (a,b,c,d,e,f);
proc mixed noclprint noitprint data=last ;
  class id time &a;
  model &b = &c / s ddfm=&e;
  lsmeans time group time*group / slice = time pdiff ;
  repeated time / type=&d sub=id(group) ;
  title 'mixed model ' &f ;
```

```
%mend mix; run;
```

```
%mix (group wave educg ,swb, wave educg pwb group time group*time ,cs,residual,SWB/cs/residual);
run;
```

```
ods graphics off;
ods rtf close; ods listing; quit; Run;
```

SAS Procedure for Table 3:

```
ods rtf;
ods listing close;
%macro gmix (a,b,c,d,e,f);
proc glimmix data=last;
  class id time &a;
  model &b = &c /dist=&d s ddfm=&e;
  random time / subject= id(group) type=cs rside;
  lsmeans group*time/slice=time slicediff=time adjust =bon;
  title 'Glimmix model ' &f ;
%mend gmix; run;
```

```
%gmix (group wave educg ,swb, wave educg pwb group time group*time ,normal, residual,
SWB/normal/residual);
%gmix (group wave educg ,swb, wave educg pwb group time group*time ,logn, residual,
SWB/lnormal/residual);
%gmix (group wave educg ,swb, wave educg pwb group time group*time ,p, residual,
SWB/posion/residual);
%gmix (group wave educg ,swb, wave educg pwb group time group*time ,gamma, residual,
SWB/gamma/residual);
run;
```

```
ods rtf close; ods listing; quit; run;
```