Modular programming approach to create mean plot and adverse events frequency plot

Claus Stenberg

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Dermatology
beyond the skin

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Who are we

Claus Stenberg Statistical Programming



Parag Naithani Statistical Programming



Sasha Ann Solow Rahbek Medical Communication



Line Conradsen Hiort Biostatistics



Peter Dahl Biostatistics



Lillian Sandoe Medical Communication



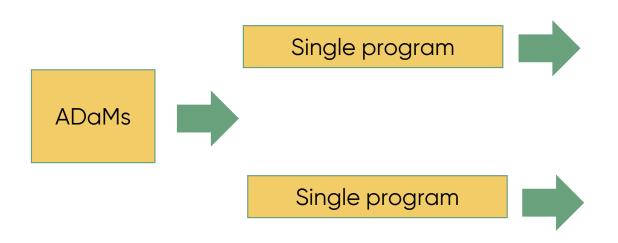


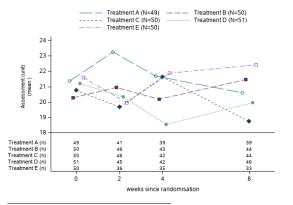
Abstract

- Clear data visualization can be achieved when the same clinical data are represented both as a table and a plot. This way, the viewer can get a quick overview from the plot and can examine the detailed data in the table if they are interested in specific values.
- To accomplish this, a modular programming approach can be applied to ensure that the same numbers are displayed both in the tabular and pictorial format.
- In this presentation, we explore two common types of plots in clinical trials
 - the mean plot
 - the most frequent adverse events plot
 - We will demonstrate the use of modular macros for creating these outputs.
 - The macros are built using the **SG** and the TEMPLATE/SGRENDER (**GTL**) procedures with the possibility for the user to adjust the layout.
- Furthermore, we discuss **the pros and cons** of the modular approach to output programming.

Same data -two outputs!

- Two programs two outputs?
- One program for two outputs?





Abbreviation: This is abbreviation1, This is abbreviation2, This is abbreviation3

Note: This is note1, This is note2. This is note3

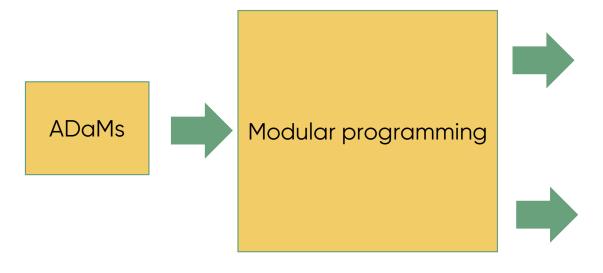
06MAY21:13:44:50-f_meanplot_bds.sas/example2.png

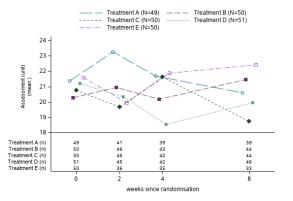
	Treat A 1 mg/g (N=49)	Treat B 3 mg/g (N=50)	Treat C 8 mg/g (N=50)	Treat D 20 mg/g (N=52)	Treat E Vehicle (N=50)
Total extent					
n	48	50	50	51	50
Mean (SD)	13.03 (8.30)	16.51 (14.29)	11.76 (7.82)	14.84 (12.68)	15.78 (11.76)
Median	10.00	11.00	10.50	9.00	10.90
Q1;Q3	(8.00;16.25)	(7.50;18.00)	(6.00;15.00)	(6.00;18.00)	(7.60;19.00)
Min;max	5.0;38.0	5.0;59.0	5.0;48.5	2.5;49.1	5.0;49.9
Total intens	ity sum				
n	49	50	50	51	50
Mean (SD)	8.8 (3.3)	8.4 (3.2)	8.0 (2.6)	9.3 (3.4)	8.3 (3.4)
Median	9.0	9.0	8.0	9.0	8.0
Q1;Q3	(7.0;10.0)	(6.0;10.0)	(6.0;10.0)	(7.0;12.0)	(6.0;11.0)
Min;max	3;18	3;16	4;16	3;16	3;18
Total VAS sur					
n	49	50	50	51	50
Mean (SD)	11.67 (4.79)	11.52 (4.45)	10.68 (5.10)	11.85 (5.17)	11.00 (4.81)
Median	12.30	11.45	10.85	12.90	11.05
Q1;Q3	(7.60;14.50)	(8.50;15.10)	(6.60;14.60)	(8.50;16.10)	(8.10;14.80)
Min;max	1.0;19.9	2.0;19.7	0.2;19.0	0.3;20.0	1.7;20.0
CORAD score					
n	48	50	50	51	50
Mean (SD)	45.363 (13.322)	44.293 (14.093)	41.036 (12.193)	47.213 (14.232)	42.761 (15.209)
Median	44.400	43.860	41.470	44.500	40.020
01:03	(35.900;56.350)	(32.400;52.400)	(32.040;49.000)	(38.000;58.940)	(31.300;50.900)



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- One program for two outputs?





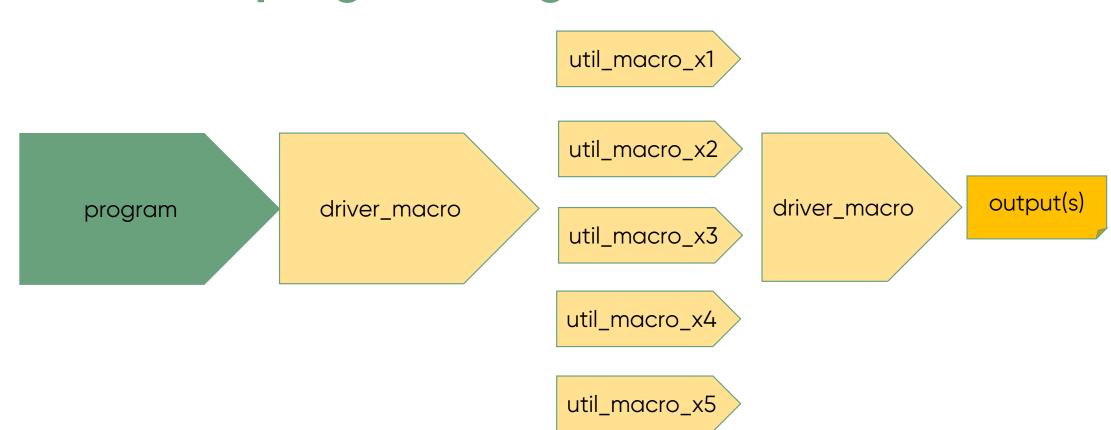
Abbreviation: This is abbreviation1, This is abbreviation2, This is abbreviation3
Note: This is note1. This is note2. This is note3

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Q1;Q3	(7.0;10.0)	(6.0;10.0)	(6.0;10.0)	(7.0;12.0)	(6.0;11.0)
Min;max	3;18	3;16	4;16	3;16	3;18
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Q1;Q3	(7.60; 14.50)	(8.50;15.10)	(6.60;14.60)	(8.50;16.10)	(8.10;14.80)
Min;max	1.0;19.9	2.0;19.7	0.2;19.0	0.3;20.0	1.7;20.0
SCORAD score					
n	48	50	50	51	50
Mean (SD)				47.213 (14.232)	
Median	44.400	43.860	41.470	44.500	40.020
Q1;Q3	(35.900;56.350)	(32.400;52.400)	(32.040;49.000)	(38.000;58.940)	(31.300;50.900)



Modular programming at LEO Pharma





Development of new standard TFL

programs and shells



Template for summary statistics for categorical and continuous variables - <Analysis population set> Sample 2 Mean plot +/- SD with . Total mber of contributing subjects Sample 6 Mean plot +/- SE with broken y-axis Treatment A (N=49)
 Treatment B (N=50)
 Treatment C (N=50) ~ (N=50) 29.5 -26.5 weeks since randomisation 02MAR 21:11:17:11 dcar-standard examples png 02MAR21:10:25:52 dcar.-standard examples png



Driver for the mean plot macro - the structure

Data input
- subject level and
basic structure
data (e.g. ADSL,
ADLB)

Count of population - on specified groups

Summary statistics
- arithmetic & geometric
mean, confidence
intervals

Axis ranges and ticks
- min, max, number of

ticks etc.

Mean plot -with specified options

Output -graphical file and dataset



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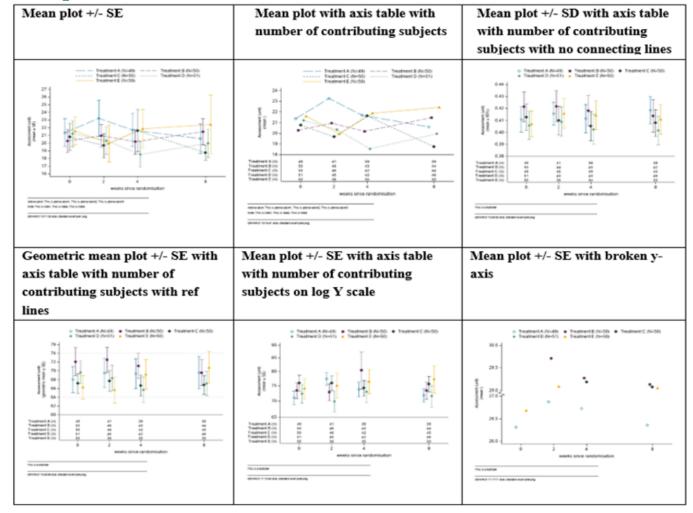


Full code and examples available at Github

https://github.com/clausstenberg/phuse_2021_DV02







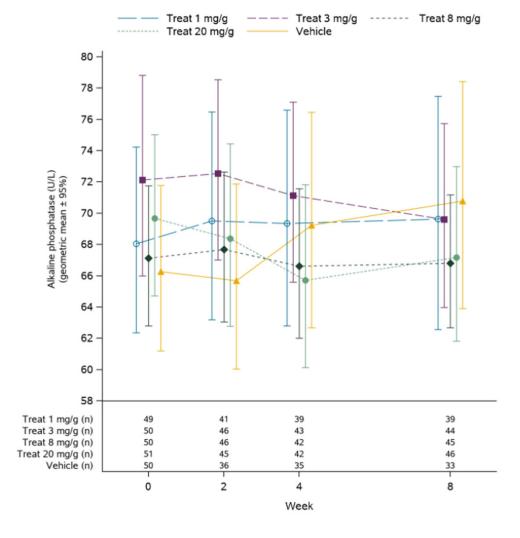


• Want:

 Geometric mean plot for Alkaline phosphatase by week with 95% confidence intervals and x-axis table with contributing subjects by treatment group.

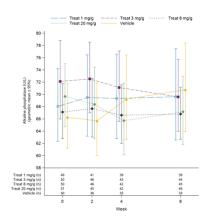
• How:

- Make SAS programs that
 - Select data
 - Call driver macro for mean plot
 - Count population number
 - Do summary statistics
 - Set Axis ranges and ticks
 - Do mean plot





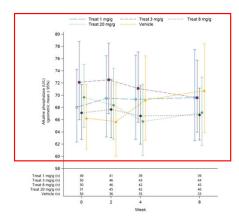
• Input data to mean plot macro:



#	mean	⊕ up_ci	⊕ low_ci	(#) nsubj	⊕ npop		treatgrpn	weekn			
1	65.720961	71.8263554	60.1345379	42	51	Treat 20 mg/g	20	4	ALP	Alkaline phosphatase (U/L)	4-20
2	70.792907	78.4281471	63.9009827	33	50	Vehicle	90	8	ALP	Alkaline phosphatase (U/L)	8-90
3	69.519222	76.4692674	63.2008441	41	49	Treat 1 mg/g	1	2	ALP	Alkaline phosphatase (U/L)	2-1
4	66.628917	71.5791949	62.0209900	42	50	Treat 8 mg/g	8	4	ALP	Alkaline phosphatase (U/L)	4-8
5	69.605673	75.7286115	63.9777972	44	50	Treat 3 mg/g	3	8	ALP	Alkaline phosphatase (U/L)	8-3
6	65.685085	71.8641006	60.0373530	36	50	Vehicle	90	2	ALP	Alkaline phosphatase (U/L)	2-90
7	69.359423	76.6028356	62.8009340	39	49	Treat 1 mg/g	1	4	ALP	Alkaline phosphatase (U/L)	4-1
0	70 100061	70 01/2010	CE 0047244	EU	En	Troot 2 mala	2	0	ALD.	Alkalina phaanhataaa /LI/L\	0.2



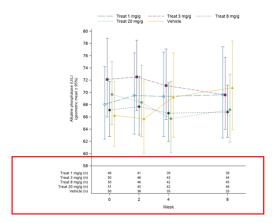
- proc SGPLOT
 - Code for the plot



```
/* plot statement */
   proc sgplot data = _data4plot noborder noautolegend dattrmap=_attributemap;
     styleattrs axisbreak=spark;
/* plot only with symbols */
   %if %upcase(&only_symbols_meanplot.) = Y %then %do;
        scatter x=&x var meanplot y=&y meanVar meanplot./ group = _group name groupdisplay=cluster clusterwidth=&clusterWidth. attrid=&attrid meanplot. name="symbol"
/* adding confidence intervals if wanted*/
       %if %length(&up_ciVar_meanplot. &low_ciVar_meanplot.) > 0 %then %do;
           verrorlower=&low civar meanplot. yerrorupper=&up civar meanplot.;
       %end:
    %end;
/* plot with connecting lines and symbols */
    %else %do:
/* line */
        series x=&x_var_meanplot y=&y_meanVar_meanplot. / group = _group_name groupdisplay=cluster clusterwidth=&clusterWidth. attrid=&attrid_meanplot. name="mean";
   scatter */
        scatter x=&x_var_meanplot y=&y_meanVar_meanplot./ group = _group_name_groupdisplay=cluster clusterwidth=&clusterWidth. attrid=&attrid_meanplot. name="symbol"
/* adding confidence intervals if wanted*/
       %if %length(&up_ciVar_meanplot. &low_ciVar_meanplot.) > 0 %then %do;
           yerrorlower=&low_ciVar_meanplot.yerrorupper=&up_ciVar_meanplot.;
       %end:
```



- proc SGPLOT
 - Code for the x-axis table





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• Want:

Frequency on AEs on AEBODSYS
with number of subjects (n) and
percent (%) as table, rate (R) and
events (E) as dotplot by treatment
group.

• How:

- Make SAS programs that
 - Select data
 - Call driver macro for dot plot
 - Count population number
 - Calc exposure year
 - Do summary statistics
 - Do AE dotplot

MedDRA system organ class	1	l mg/g	3	3 mg/g	8	3 mg/g	2	0 mg/g	R	E
	n	(%)	n	(%)	n	(%)	n	(%)	0 100 200	0 5 10 15 20
Infections and infestations	13	(26.5)	9	(18.0)	14	(28.0)	15	(29.4)	0 🕊	0 • 0
Skin and subcutaneous tissue disorders	5	(10.2)	8	(16.0)	3	(6.0)	4	(7.8)	♦ 0 ○ ■	♦ 00 ■
Nervous system disorders	5	(10.2)	1	(2.0)	2	(4.0)	6	(11.8)	m + m	* 00
Vascular disorders	2	(4.1)					1	(2.0)	•0	•••
Respiratory, thoracic and mediastinal disorders	2	(4.1)	1	(2.0)	3	(6.0)	2	(3.9)	H0+	mo+
Musculoskeletal and connective tissue disorders	2	(4.1)	3	(6.0)						
Gastrointestinal disorders	2	(4.1)	3	(6.0)	2	(4.0)	1	(2.0)	0 40	048
Reproductive system and breast disorders	1	(2.0)							0	0
Psychiatric disorders	1	(2.0)	1	(2.0)						
Metabolism and nutrition disorders	1	(2.0)							0	0
Injury, poisoning and procedural complications	1	(2.0)	4	(8.0)	6	(12.0)	2	(3.9)	OD # •	○ ■ ◆
General disorders and administration site conditions	1	(2.0)	1	(2.0)	2	(4.0)	2	(3.9)	B0 +	=+
Cardiac disorders	1	(2.0)							0	0
Renal and urinary disorders			1	(2.0)	1	(2.0)			•	•
Investigations			4	(8.0)	3	(6.0)	4	(7.8)	+ m	♦ ■
Blood and lymphatic system disorders			1	(2.0)			1	(2.0)		

O Treat A(N=49, PYE=6.75) ■ Treat B(N=50, PYE=7.36) ◆ Treat C(N=50, PYE=7.47) ● Treat D(N=51, PYE=7.53)

this is line 1 this is line 2

06SEP2021-/leo/development/dcar/standard_tfl/tfl/safety/programs/phuse_driver_dotplot_ods.sas*-test_aedotplot_ex_4_phuse.png

MedDRA system organ class		mg/g		3 mg/g		B mg/g	2	:0 mg/g		R				Ε		
	n	(%)	n	(%)	n	(%)	n	(%)	0	100	200	0	5	10	15	20
Infections and infestations	13	(26.5)	9	(18.0)	14	(28.0)	15	(29.4)			04 0				0 .	
Skin and subcutaneous tissue disorders	5	(10.2)	8	(16.0)	3	(6.0)	4	(7.8)					4 00			
Nervous system disorders	5	(10.2)	1	(2.0)	2	(4.0)	6	(11.8)	-				00			
Vascular disorders	2	(4.1)					1	(2.0)				80				
Respiratory, thoracic and mediastinal disorders	2	(4.1)	1	(2.0)	3	(6.0)	2	(3.9)	-			80	•			
Musculoskeletal and connective tissue disorders	2	(4.1)	3	(6.0)						•						
Gastrointestinal disorders	2	(4.1)	3	(6.0)	2	(4.0)	1	(2.0)	040			-				
Reproductive system and breast disorders	1	(2.0)							0			0				
Psychiatric disorders	1	(2.0)	1	(2.0)												
Metabolism and nutrition disorders	1	(20)							0			0				
Injury, poisoning and procedural complications	1	(2.0)	4	(8.0)	6	(12.0)	2	(3.9)	09			00				
General disorders and administration site conditions	1	(2.0)	1	(2.0)	2	(4.0)	2	(3.9)	814				•			
Cardiac disorders	1	(2.0)							0			0				
Renal and urinary disorders			1	(2.0)	1	(2.0)										
Investigations			4	(8.0)	3	(6.0)	4	(7.8)	-				• =			
Blood and lymphatic system disorders			1	(2.0)			1	(2.0)								

O Treat A(N=49, PYE=6.75) ■ Treat B(N=50, PYE=7.36) ◆ Treat C(N=50, PYE=7.47) ● Treat D(N=51, PYE=7.53)

this is li this is li

06SEP2021-/leo/development/dcar/standard_tll/tll/safety/programs/phuse_driver_dotplot_ods.sas*-test_aedotplot_ex_4_phuse.png

⊕ group	⊕ POPCOUNT	⊕ PY		⊕ VALN	⊕ VALE _↑			⊕ VALP	(#) VALR	
3	50	7.3620807666	Respiratory, thoracic and mediastinal disor	1	1	Treat B	Treat B (N=50, PYE=7.36)	2	13.58	3 mg/g
3	50	7.3620807666	Renal and urinary disorders	1	1	Treat B	Treat BI(N=50, PYE=7.36)	2	13.58	3 mg/g
1	49	6.7460643395	General disorders and administration site c	1	1	Treat A	Treat AI(N=49, PYE=6.75)	2.0408163265	14.82	1 mg/g
3	50	7.3620807666	Blood and lymphatic system disorders	1	1	Treat B	Treat BI(N=50, PYE=7.36)	2	13.58	3 mg/g
20	51	7.5290896646	Gastrointestinal disorders	1	1	Treat D	Treat DI(N=51, PYE=7.53)	1.9607843137	13.28	20 mg/g
20	51	7.5290896646	Blood and lymphatic system disorders	1	1	Treat D	Treat DI(N=51, PYE=7.53)	1.9607843137	13.28	20 mg/g
3	50	7.3620807666	Nervous system disorders	1	1	Treat B	Treat B (N=50, PYE=7.36)	2	13.58	3 mg/g
3	50	7.3620807666	General disorders and administration site c	1	1	Treat B	Treat B (N=50, PYE=7.36)	2	13.58	3 mg/g
1	49	6.7460643395	Cardiac disorders	1	1	Treat A	Treat AI(N=49, PYE=6.75)	2.0408163265	14.82	1 mg/g
1	49	6.7460643395	Psychiatric disorders	1	1	Treat A	Treat AI(N=49, PYE=6.75)	2.0408163265	14.82	1 mg/g
20	51	7.5290896646	Vascular disorders	1	1	Treat D	Treat DI(N=51, PYE=7.53)	1.9607843137	13.28	20 mg/g
1	49	6.7460643395	Injury, poisoning and procedural complicati	1	1	Treat A	Treat AI(N=49, PYE=6.75)	2.0408163265	14.82	1 mg/g
1	49	6.7460643395	Reproductive system and breast disorders	1	1	Treat A	Treat AI(N=49, PYE=6.75)	2.0408163265	14.82	1 mg/g
3	50	7.3620807666	Psychiatric disorders	1	1	Treat B	Treat BI(N=50, PYE=7.36)	2	13.58	3 mg/g
1	49	6.7460643395	Metabolism and nutrition disorders	1	1	Treat A	Treat AI(N=49, PYE=6.75)	2.0408163265	14.82	1 mg/g
8	50	7 4688569473	Renal and urinary disorders	1	1	Treat C	Treat CI(N=50_PYF=7.47)	2	13 39	8 ma/a



• proc TEMPLATE and SGRENDER (GTL)

ledDRA system organ class	j	1 mg/g		3 mg/g	8	3 mg/g	2	0 mg/g	R				Е	
	n	(%)	n	(%)	n	(%)	n	(%)	0 100	200	0	5 I	10	15 20
Infections and infestations	13	(26.5)	9	(18.0)	14	(28.0)	15	(29.4)		0 4 0			c	
Skin and subcutaneous tissue disorders	5	(10.2)	8	(16.0)	3	(6.0)	4	(7.8)	♦ ◎ ○ ■		89	\$80		
Nervous system disorders	5	(10.2)	1	(2.0)	2	(4.0)	6	(11.8)	**		=+	00		
Vascular disorders	2	(4.1)					1	(2.0)	•0		80			
Respiratory, thoracic and mediastinal disorders	2	(4.1)	1	(2.0)	3	(6.0)	2	(3.9)	H0+		100	•		
Musculoskeletal and connective tissue disorders	2	(4.1)	3	(6.0)							3			
Gastrointestinal disorders	2	(4.1)	3	(6.0)	2	(4.0)	1	(2.0)	0 410		04			
Reproductive system and breast disorders	1	(2.0)							0		0			
Psychiatric disorders	1	(2.0)	1	(2.0)										
Metabolism and nutrition disorders	1	(2.0)							0		0			
Injury, poisoning and procedural complications	1	(2.0)	4	(8.0)	6	(12.0)	2	(3.9)	○ ■ ◆		00	= +		
General disorders and administration site conditions	1	(2.0)	1	(2.0)	2	(4.0)	2	(3.9)	***		80	•		
Cardiac disorders	1	(2.0)							0		0			
Renal and urinary disorders			1	(2.0)	1	(2.0)			•					
Investigations			4	(8.0)	3	(6.0)	4	(7.8)	+ =			+ =		
Blood and lymphatic system disorders			1	(2.0)			1	(2.0)						

this is line 1 this is line 2

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• proc TEMPLATE and SGRENDER (GTL)

MedDRA system organ class	Ī	1 mg/g	:	3 mg/g	8	3 mg/g	2	0 mg/g		F	₹				Ε		
	n	(%)	n	(%)	n	(%)	n	(%)	0	100	200		0	5 I	10	15 I	20 I
Infections and infestations	13	(26.5)	9	(18.0)	14	(28.0)	15	(29.4)			0 🐗	•				0 .	
Skin and subcutaneous tissue disorders	5	(10.2)	8	(16.0)	3	(6.0)	4	(7.8)		♦ 0 0 ■			•	80			
Nervous system disorders	5	(10.2)	1	(2.0)	2	(4.0)	6	(11.8)	=+	•			-	00			
Vascular disorders	2	(4.1)					1	(2.0)					80				
Respiratory, thoracic and mediastinal disorders	2	(4.1)	1	(2.0)	3	(6.0)	2	(3.9)	-	*			80				
Musculoskeletal and connective tissue disorders	2	(4.1)	3	(6.0)													
Gastrointestinal disorders	2	(4.1)	3	(6.0)	2	(4.0)	1	(2.0)	•	•			048				
Reproductive system and breast disorders	1	(2.0)							0				0				
Psychiatric disorders	1	(2.0)	1	(2.0)													
Metabolism and nutrition disorders	1	(2.0)							0				0				
Injury, poisoning and procedural complications	1	(2.0)	4	(8.0)	6	(12.0)	2	(3.9)	00	-			00 1	•			
General disorders and administration site conditions	1	(2.0)	1	(2.0)	2	(4.0)	2	(3.9)	100	•			80				
Cardiac disorders	1	(2.0)							0				0				
Renal and urinary disorders			1	(2.0)	1	(2.0)											
Investigations			4	(8.0)	3	(6.0)	4	(7.8)		• •			•				
Blood and lymphatic system disorders			1	(2.0)			1	(2.0)									



 $06 SEP 2021 - l/eo/development/dcar/standard_tfl/tfl/safety/programs/phuse_driver_dotplot_ods.sas*-test_aedotplot_ex_4_phuse.png$

• proc TEMPLATE and SGRENDER (GTL)

MedDRA system organ class	Ţ	1 mg/g	3	3 mg/g	8	3 mg/g	2	0 mg/g		R				Е	
	n	(%)	n	(%)	n	(%)	n	(%)	0	100	200	0	5 I	10	15 20
Infections and infestations	13	(26.5)	9	(18.0)	14	(28.0)	15	(29.4)			0 🛊			-	0 • •
Skin and subcutaneous tissue disorders	5	(10.2)	8	(16.0)	3	(6.0)	4	(7.8)		♦ 0 0 ■			\$80		
Nervous system disorders	5	(10.2)	1	(2.0)	2	(4.0)	6	(11.8)	=4	•		=4	00		
Vascular disorders	2	(4.1)					1	(2.0))		00			
Respiratory, thoracic and mediastinal disorders	2	(4.1)	1	(2.0)	3	(6.0)	2	(3.9)	-	•		100	•		
Musculoskeletal and connective tissue disorders	2	(4.1)	3	(6.0)									•		
Gastrointestinal disorders	2	(4.1)	3	(6.0)	2	(4.0)	1	(2.0)	-			04			
Reproductive system and breast disorders	1	(2.0)							0			0			
Psychiatric disorders	1	(2.0)	1	(2.0)											
Metabolism and nutrition disorders	1	(2.0)							0			0			
Injury, poisoning and procedural complications	1	(2.0)	4	(8.0)	6	(12.0)	2	(3.9)	08			00			
General disorders and administration site conditions	1	(2.0)	1	(2.0)	2	(4.0)	2	(3.9)		•			•		
Cardiac disorders	1	(2.0)							0			0			
Renal and urinary disorders			1	(2.0)	1	(2.0)									
Investigations			4	(8.0)	3	(6.0)	4	(7.8)		+ =			+ =		
Blood and lymphatic system disorders			1	(2.0)			1	(2.0)							



 $06 SEP 2021 - l/eo/development/dcar/standard_tfl/tfl/safety/programs/phuse_driver_dotplot_ods.sas*-test_aedotplot_ex_4_phuse.png$

proc TEMPLATE and SGRENDER (GTL)



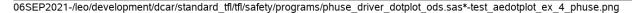


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proc TEMPLATE and SGRENDER (GTL)

MedDRA system organ class	1	1 mg/g		3 mg/g		8 mg/g	2	0 mg/g		R	₹			Ε		
	n	(%)	n	(%)	n	(%)	n	(%)	0	100	200		0 5	10	15	20
Infections and infestations	13	(26.5)	9	(18.0)	14	(28.0)	15	(29.4)			0 🖷	•			0 .	
Skin and subcutaneous tissue disorders	5	(10.2)	8	(16.0)	3	(6.0)	4	(7.8)		♦ 0 0 ■			♦ 80			
Nervous system disorders	5	(10.2)	1	(2.0)	2	(4.0)	6	(11.8)	=	• •			■ ♦ 0			
Vascular disorders	2	(4.1)					1	(2.0)		D			80			
Respiratory, thoracic and mediastinal disorders	2	(4.1)	1	(2.0)	3	(6.0)	2	(3.9)	-	D +			mo +			
Musculoskeletal and connective tissue disorders	2	(4.1)	3	(6.0)												
Gastrointestinal disorders	2	(4.1)	3	(6.0)	2	(4.0)	1	(2.0)	- 04	NO.			048			
Reproductive system and breast disorders	1	(2.0)							0				0			
Psychiatric disorders	1	(2.0)	1	(2.0)												
Metabolism and nutrition disorders	1	(2.0)							0				0			
Injury, poisoning and procedural complications	1	(2.0)	4	(8.0)	6	(12.0)	2	(3.9)	OI				O0 II	•		
General disorders and administration site conditions	1	(2.0)	1	(2.0)	2	(4.0)	2	(3.9)		•			mo +			
Cardiac disorders	1	(2.0)							0				0			
Renal and urinary disorders			1	(2.0)	1	(2.0)										
Investigations			4	(8.0)	3	(6.0)	4	(7.8)		• •			+ =			
Blood and lymphatic system disorders			1	(2.0)			1	(2.0)								







proc TEMPLATE Code for overall col N and first col

```
proc template:
  define statgraph aedotplot;
      begingraph;
        layout lattice /columns=&totcol.
                         columnweights = (&totwidth.)
                        rowdatarange=unionall
/* column for AE's display */
           layout overlay / walldisplay=none
                             border=false
                             x2axisopts=(display=(label line)
                                         displaysecondary=(line)
                                         labelposition=datacenter
                                         label="&display_txt_label_dotplot."
                                         labelattrs=(size=&fontsize axislabel.))
                             yaxisopts=(linearopts = (tickvaluesequence=(start=1 end=&count increment=1))
                                       display = none
                                       displaysecondary = none)
            /*--Draw alternating bands using referenceline--*/
              referenceline y = display_txt2nd/ lineattrs=(thickness=&band_thickness_dotplot.PCT) datatransparency=0.9;
           /* left colum with text box */
              scatterplot y=display_txt x=display_col / markercharacter=display_txt
                                                         markercharacterattrs=(size=&fontsize content.)
                                                         markercharacterposition=right
                                                         yaxis=Y
                                                         xaxis=X2
                                                         markerattrs=(size=0)
                                                         includemissinggroup=true
           endlayout;
```



2 (4.1) 1 (2.0) 3 (6.0) 2 (3.9) 2 (4.1) 3 (6.0) 2 (4.1) 3 (6.0) 2 (4.1) 3 (6.0)

1 (2.0) 1 (2.0)

1 (2.0)

Skin and subcutaneous tissue disorder Nervous system disorders Vascular disorders

Reproductive system and b Psychiatric disorders

Renal and urinary disorders

Cardiac disorders

Respiratory, thoracic and mediastinal disorders Musculoskeletal and connective tissue disorders Gastrointestinal disorders

proc TEMPLATE

Code for col with stats

endlayout;

%end;

```
/* columnns for stats - one for each treatment group*/
        %if %length(&show_stat_dotplot.)>0 %then %do;
               %do i=1 %to &n treatgrp.;
                  layout overlay / walldisplay=none
                               border=false
                               x2axisopts=(offsetmin=0.2
                                           display=(label line tickvalues)
                                           displaysecondary=(line)
                                           LABELPOSITION=center
                                           label="&&treatshort&i."
                                           tickvalueattrs=(size=&fontsize_axisticks.)
                                           labelattrs=(size=&fontsize axislabel.))
                               yaxisopts=(linearopts=(tickvaluesequence=(start=1 end=&count increment=1))
                                         display=none
                                         displaysecondary=none)
                    /*--Draw alternating bands using referenceline--*/
                       referenceline y = display_txt2nd/ lineattrs=(thickness=&band_thickness_dotplot.PCT) datatransparency=0.9;
                  /*--Draw standard statistics columns--*/
                 %if %index(%upcase(&show stat dotplot.), N) %then %do:
                      scatterplot y=display txt x=n / markercharacter =nsubjc trt &i. MARKERCHARACTERPOSITION=left markercharacterattrs=(size=&fontsize content.)
                                                                                                                                                                        xaxis=x2;
                 %if %index(%upcase(&show_stat_dotplot.), P) %then %do;
                      scatterplot y=display txt x=p / markercharacter =percentc trt &i. MARKERCHARACTERPOSITION=left markercharacterattrs=(size=&fontsize content.) xaxis=x2;
                 %if %index(%upcase(&show_stat_dotplot.), E) %then %do;
                      scatterplot y=display txt x=e / markercharacter =eventc trt &i. MARKERCHARACTERPOSITION=left markercharacterattrs=(size=&fontsize content.) xaxis=x2;
                 %if %index(%upcase(&show_stat_dotplot.), R) %then %do;
                      scatterplot y=display_txt x=r / markercharacter =ratec_trt_&i.
                                                                                        MARKERCHARACTERPOSITION=left markercharacterattrs=(size=&fontsize_content.) xaxis=x2;
```



MedDRA system organ class	10	1 mg/g		B mg/g	- 8	3 mg/g	2	:0 mg/g		R				Ε		
	n	(%)	n	(%)	n	(%)	n	(%)	0	100	200	0	5	10	15	20
Infections and infestations	13	(26.5)	9	(18.0)	14	(28.0)	15	(29.4)			0.0				0 0	
Skin and subcutaneous tissue disorders	5	(10.2)	8	(16.0)	3	(6.0)	4	(7.B)				4	но			
Nervous system disorders	5	(10.2)	1	(2.0)	2	(4.0)	6	(11.8)	-	CD CD		-	00			
Vascular disorders	2	(4.1)					1	(2.0)				60				
Respiratory, thoracic and mediastinal disorders	2	(4.1)	1	(2.0)	3	(6.0)	2	(3.9)	80 80			804	•			
Musculoskeletal and connective tissue disorders	2	(4.1)	3	(6.0)												
Gastrointestinal disorders	2	(4.1)	3	(6.0)	2	(4.0)	1	(2.0)				141				
Reproductive system and breast disorders	1	(2.0)							0			0				
Psychiatric disorders	1	(2.0)	1	(2.0)												
Metabolism and nutrition disorders	1	(20)							0			0				
Injury, poisoning and procedural complications	1	(2.0)	4	(8.0)	6	(12.0)	2	(39)	00			00				
General disorders and administration site conditions	1	(2.0)	1	(2.0)	2	(4.0)	2	(39)		•			٠			
Cardiac disorders	1	(2.0)							0			0				
Renal and urinary disorders			1	(2.0)	1	(2.0)										
Investigations			4	(8.0)	3	(6.0)	4	(78)		• =						
Blood and lymphatic system disorders			1	(2.0)			1	(20)								

this is line 1

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proc TEMPLATE

Code for col with plots

```
/* columnns for dot plots */
/* first dotplot */
  %if &mk_dotplot.= Y %then %do;
     %if &mk_dotplot_1.= Y %then %do;
           layout overlay / walldisplay=none
                                   x2axisopts=(display=(label line ticks tickvalues)
                                               displaysecondary=(line)
                                               tickvalueattrs=(size=&fontsize axisticks.)
                                               labelattrs=(size=&fontsize_axislabel.))
                                   yaxisopts=(linearopts=(tickvaluesequence=(start=1 end=&count. increment=1))
                                             display=none
                                             displaysecondary=none)
                   /*--Draw alternating bands using referenceline--*/
                   referenceline y = display_txt2nd/ lineattrs=(thickness=&band_thickness_dotplot.PCT) datatransparency=0.9;
                  /*--Dot plots 1 - one overlay for each treatment group--*/
                   %do i=1 %to &n_treatgrp.;
                     scatterplot x = &&dotplot1._trt_&i. y=display_txt /xaxis=x2 markerattrs= (symbol=&&symbol&i. color=&&fillcolor&i.)
                                                                       legendlabel="&&treat&i.(N=&&popcount&i., PYE=&&pye&i.)" name="treat&i." ;
                   %end:
            endlayout;
   /* second dotplot */
      %if &mk_dotplot_2.= Y %then %do;
```



Treat A(N=49, PYE=6.75) ■ Treat B(N=50, PYE=7.36) ◆ Treat C(N=50, PYE=7.47) ● Treat D(N=51, PYE

this is line this is line

 $06 SEP 2021 - lleo/development/dcar/standard_tfl/tfl/safety/programs/phuse_driver_dotplot_ods.sas*-test_aedotplot_ex_4_phuse.png$

Pros and cons of the modular approach to output programming.

