

# SAS MACRO: TABLE GENERATION

MSUG Meeting

10/31/2022

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# TOPICS

- ▶ Background
- ▶ Sample table
- ▶ Traditional way
- ▶ Macro way:
  - ▶ CSV input file
  - ▶ Parameters to feed
  - ▶ SAS macro program

# BACKGROUND

- ▶ Many tables to produce
- ▶ Many data points to get in (counts, %, mean, STDEV, p-value, etc)
- ▶ Copy from SAS output >>>paste to table: time consuming, error
- ▶ Cohort/condition changes

# SAMPLE TABLE (171 CELLS)

	Year 2011-2013 (N = 20364)	Year 2014-2017 (N = 29586)	P-Value
Demographics			
Gender (male)	14850 (73.1%)	20759 (70.2%)	<.0001
Race			
Not-White	13508 (66.3%)	20396 (68.9%)	<.0001
NH-Black	5704 (28.0%)	7625 (25.8%)	
Hispanic	481 (2.4%)	817 (2.8%)	
Other	671 (3.3%)	748 (2.5%)	
Payer (add new category)			
Medicare		3089 (10.4%)	<.0001
Medicaid		5657 (19.1%)	
Selfpay		2757 (9.3%)	
Private/BCBS		11117 (37.6%)	
Automobile		5009 (16.9%)	
Other gov		140 (0.5%)	
Workers Compensation		929 (3.1%)	
Other		888 (3.0%)	
Frailty (index<=0.4)	108 (0.5%)	312 (1.1%)	<.0001
Any CMS 60% indicator	10342 (50.8%)	11677 (39.5%)	<.0001
Injury traits			
Type (blunt)	17060 (83.8%)	25836 (87.3%)	<.0001
Mechanism			
Cut	643 (3.2%)	835 (2.8%)	<.0001
Firearm	2528 (12.4%)	2886 (9.8%)	
Fall	5582 (27.4%)	9371 (31.7%)	
MVC	4855 (23.8%)	7274 (24.6%)	
Motorcycle	1603 (7.9%)	2375 (8.0%)	
Pedal	1568 (7.7%)	2292 (7.7%)	
Struck	1600 (7.9%)	2077 (7.0%)	
Other	1985 (9.7%)	2476 (8.4%)	
Iss			
Moderate (9-15)		19067 (64.4%)	<.0001
Severe (16-25)		6755 (22.8%)	
Critical (>=26)		3764 (12.7%)	
MAX AIS >=3			
Max Head/Neck Injury AIS>=3		8825 (29.8%)	<.0001
Max Face Injury AIS>=3		282 (1.0%)	0.7333
Max Chest Injury AIS>=3		9163 (31.0%)	0.0615
Max Abd/Pelvic Injury AIS>=3		3152 (10.7%)	0.0022
Max Extremity/Pelvic Girdle AIS>=3		9192 (31.1%)	0.0003
Max External AIS>=3		193 (0.7%)	0.8332
ED GCS Motor Score			
1	2127 (10.8%)	2542 (9.0%)	<.0001
2-5	1338 (6.8%)	1818 (6.5%)	
6	16304 (82.5%)	23808 (84.5%)	
Shock index (0-1)			
<0.4	727 (3.8%)	1023 (3.6%)	0.4884
0.4~<0.5	2172 (11.2%)	3194 (11.4%)	
0.5~<0.8	11643 (60.2%)	17034 (60.7%)	
>=0.8	4797 (24.8%)	6811 (24.3%)	
e_arrive_from			
Home/scene	15703 (77.1%)	23154 (78.3%)	<.0001
Refer	3504 (17.2%)	5279 (17.8%)	
Institution	106 (0.5%)	30 (0.1%)	
Other	1051 (5.2%)	1123 (3.8%)	
Hospital traits			
Traum Level			
I	11619 (57.1%)	16034 (54.2%)	<.0001
II	8745 (42.9%)	13552 (45.8%)	
Region			
South Central (SC)	1384 (6.8%)	2757 (9.3%)	<.0001
South East North (SEN)	2153 (10.6%)	3457 (11.7%)	
South East South (SES)	8670 (42.6%)	11240 (38.0%)	
East Central (EC)	3055 (15.0%)	4548 (15.4%)	
South West (SW)	1378 (6.8%)	2079 (7.0%)	
West Central (WC)		3569 (12.1%)	
North Central (NC)		1247 (4.2%)	
Upper Peninsula (UP)		689 (2.3%)	
Teaching		6310 (36.4%)	<.0001
Bedsize			
<200	439 (2.2%)	818 (2.8%)	<.0001
200-349	6116 (30.0%)	4016 (13.6%)	
350-499	4437 (21.8%)	3409 (11.5%)	
>=500	9372 (46.0%)	6338 (21.6%)	
Urban		14581 (49.3%)	<.0001
Profit status			
For profit	3139 (15.4%)	2166 (7.3%)	<.0001
Non-profit	16007 (78.6%)	11719 (39.9%)	
Other	1218 (6.0%)	696 (2.3%)	
Medi/Surg ICU Hosp	20028 (100.0%)	14191 (47.9%)	<.0001
Medi/Surg ICU System	8580 (42.1%)	6516 (22.0%)	<.0001
Tot fac medicaid days/tot fac ip days ratio (mean)	2.13 ± 0.79	2.29 ± 0.84	<.0001
Tot fac medicaid days/tot fac ip days ratio (mean)	0.22 ± 0.09	0.24 ± 0.09	<.0001



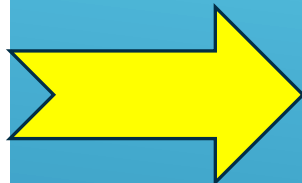
	Year 2011-2013 (N = 20364)	Year 2014-2017 (N = 29586)	P-Value
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Other	1985 (9.7%)	2476 (8.4%)	
Iss			
Moderate (9-15)	12564 (61.7%)	19067 (64.4%)	<.0001
Severe (16-25)	5095 (25.0%)	6755 (22.8%)	
Critical (>=26)	2705 (13.3%)	3764 (12.7%)	
MAX AIS >=3			
Max Head/Neck Injury AIS>=3	6457 (31.7%)	8825 (29.8%)	<.0001
Max Face Injury AIS>=3	188 (0.9%)	282 (1.0%)	0.7333
Max Chest Injury AIS>=3	6147 (30.2%)	9163 (31.0%)	0.0615
Max Abd/Pelvic Injury AIS>=3	2347 (11.5%)	3152 (10.7%)	0.0022
Max Extremity/Pelvic Girdle AIS>=3	6015 (29.5%)	9192 (31.1%)	0.0003
Max External AIS>=3	136 (0.7%)	193 (0.7%)	0.8332
ED GCS Motor Score			
1	2127 (10.8%)	2542 (9.0%)	<.0001
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Home/scene	15703 (77.1%)	23154 (78.3%)	<.0001
Refer	3504 (17.2%)	5279 (17.8%)	
Institution	106 (0.5%)	30 (0.1%)	
Other	1051 (5.2%)	1123 (3.8%)	

# TRADITIONAL WAY

```
/* Table-1a: Categorical variables */
proc freq data=out.analytic_rehab;
tables flg_hospdisp_rehab (flg_male
    e_wbho
    e_insur_8grp
    flg_frailty
    flg_cms60pct_any
    flg_injury_type
    e_injury_mechanism
    e_iss_3grp
    flg_max_hn_ais_ge3
    flg_max_fac_ais_ge3
    flg_max_chs_ais_ge3
    flg_max_abd_ais_ge3
    flg_max_ext_ais_ge3
    flg_max_ex_ais_ge3
    e_gcs_mtr_score
    e_shock_index
    e_arrive_from_4grp
    e_traumactr_level
    e_region
    flg_prov_teach
    e_prov_bedsizes_cat
    flg_prov_urban
    e_prov_profit
    flg_prov_hospicu
    flg_prov_hlthsysicu
    )*flg_hospdisp_rehab/chisq norow nopercent;

run;
```

```
/* Continuous variables */
proc ttest data=out.analytic_rehab;
class flg_hospdisp_rehab;
var val_prov_rn2bed_ratio val_prov_medd2inptd_ratio;
where flg_hospdisp_rehab in (1,0) and flg_ageyoung=1;
run;
```



Frequency  
Percent  
Col Pct

Table of e\_insur\_8grp by flg\_hospdisp\_rehab

e_insur_8grp	flg_hospdisp_rehab		
	0	1	Total
1	3895	625	4520
	8.08	1.30	9.37
	9.27	10.09	
2	6807	911	7718
	14.12	1.89	16.01
	16.20	14.71	
3	5124	300	5424
	10.63	0.62	11.25
	12.19	4.84	
4	15960	2228	18188
	33.10	4.62	37.72
	37.98	35.96	
5	6368	1738	8106
	13.21	3.60	16.81
	15.15	28.05	
6	275	23	298
	0.57	0.05	0.62
	0.65	0.37	
7	1316	240	1556
	2.73	0.50	3.23
	3.13	3.87	
8	2282	130	2412
	4.73	0.27	5.00
	5.43	2.10	
Total	42027	6195	48222
	87.15	12.85	100.00
Frequency Missing = 1728			

Statistics for Table of e\_insur\_8grp by flg\_hospdisp\_rehab

Statistic	DF	Value	Prob
Chi-Square	7	947.2020	<.0001
Likelihood Ratio Chi-Square	7	961.5970	<.0001
Mantel-Haenszel Chi-Square	1	15.8631	<.0001
Phi Coefficient		0.1402	
Contingency Coefficient		0.1388	
Cramer's V		0.1402	

flg_hospdisp_rehab	Method	N	Mean	Std Dev	Std Err	Minimum	Maximum
0		42027	0.2341	0.0940	0.000459	0.0700	0.4600
1		6195	0.2294	0.0871	0.00111	0.0700	0.4600
Diff (1-2)	Pooled		0.00461	0.0932	0.00127		
Diff (1-2)	Satterthwaite		0.00461		0.00120		

flg_hospdisp_rehab	Method	Mean	95% CL Mean	Std Dev	95% CL Std Dev
0		0.2341	0.2332 0.2350	0.0940	0.0934 0.0947
1		0.2294	0.2273 0.2316	0.0871	0.0856 0.0886
Diff (1-2)	Pooled	0.00461	0.00213 0.00710	0.0932	0.0926 0.0937
Diff (1-2)	Satterthwaite	0.00461	0.00227 0.00696		

Method	Variances	DF	t Value	Pr >  t
Pooled	Equal	48220	3.64	0.0003
Satterthwaite	Unequal	8469.3	3.85	0.0001

Equality of Variances				
Method	Num DF	Den DF	F Value	Pr > F
Folded F	42026	6194	1.17	<.0001



# MACRO WAY (1): CSV- INDEPENDENT VARIABLE LIST

var_order	var_name	var_type
1	flg_male	cat
2	e_wbho	cat
3	e_insur_8grp	cat
4	flg_frailty	cat
5	flg_cms60pct_any	cat
6	flg_injury_type	cat
7	e_injury_mechanism	cat
8	e_iss_3grp	cat
9	flg_max_hn_ais_ge3	cat
10	flg_max_fac_ais_ge3	cat
11	flg_max_chs_ais_ge3	cat
12	flg_max_abd_ais_ge3	cat
13	flg_max_ext_ais_ge3	cat
14	flg_max_ex_ais_ge3	cat
15	e_gcs_mtr_score	cat
16	e_shock_index	cat
17	e_arrive_from_4grp	cat
18	e_traumactr_level	cat
19	e_region	cat
20	flg_prov_teach	cat
21	e_prov_bedsizes_cat	cat
22	flg_prov_urban	cat
23	e_prov_profit	cat
24	flg_prov_hospicu	cat
25	flg_prov_hlthsysicu	cat
26	val_prov_rn2bed_ratio	con
27	val_prov_meddd2inptd_ratio	con

**flg\_:** binary (1/0)

**e\_:** multiple levels (1, 2, 3, ...)

**val\_:** continuous measure



# MACRO WAY (2): PARAMETERS TO FEED

```
%include "D:\...\macro_demo_tb_auto_gen.sas";
%demotb( input_dir =          /* Input file directory */
, output_dir =          /* Output file directory */
, input_file =          /* Independent variable list input file with only three columns */
, output_file =          /* Output CSV file name */
, grpvar =          /* Group variable */
, srcdata =          /* Source analytic file */
, varlevel_ge =          /* To control the export file whether we need the baseline row for dummy variable */
, cohort =          /* Control the data cohort to do the analysis */
);
```

## Example

```
%include "D:\pro_John_mtqip_variation_rehab\pgm\macro_demo_tb_auto_gen.sas";
%demotb( input_dir = D:\pro_John_mtqip_variation_rehab\data\input\
, output_dir = D:\pro_John_mtqip_variation_rehab\data\output\
, input_file = indepvar_list.csv
, output_file = tb_demo_old.csv
, grpvar = flg_pre_policy
, srcdata = analytic_rehab_to2017
, varlevel_ge = 0
, cohort = where flg_ageyoung=0
);
```

# MACRO WAY (4): OUTPUT TABLE

var_order	var_name	var_level	y_stats	n_stats	p_value
1	flg_male	1	14890 (73.1%)	20769 (70.2%)	<.0001
		1	13508 (66.3%)	20396 (68.9%)	
		2	5704 (28.0%)	7625 (25.8%)	
		3	481 (2.4%)	817 (2.8%)	
2	e_wbho	4	671 (3.3%)	748 (2.5%)	<.0001
		1	1581 (7.8%)	3089 (10.4%)	
		2	2364 (11.6%)	5657 (19.1%)	
		3	2996 (14.7%)	2757 (9.3%)	
		4	7600 (37.3%)	11117 (37.6%)	
		5	3410 (16.7%)	5009 (16.9%)	
		6	163 (0.8%)	140 (0.5%)	
		7	662 (3.3%)	929 (3.1%)	
3	e_insur_8grp	8	1588 (7.8%)	888 (3.0%)	<.0001
4	flg_frailty	1	108 (0.5%)	312 (1.1%)	<.0001
5	flg_cms60pct_any	1	10342 (50.8%)	11677 (39.5%)	<.0001
6	flg_injury_type	1	17060 (83.8%)	25836 (87.3%)	<.0001
		1	643 (3.2%)	835 (2.8%)	
		2	2528 (12.4%)	2886 (9.8%)	
		3	5582 (27.4%)	9371 (31.7%)	
		4	4855 (23.8%)	7274 (24.6%)	
		5	1603 (7.9%)	2375 (8.0%)	
		6	1568 (7.7%)	2292 (7.7%)	
7	e_injury_mechanism	7	1600 (7.9%)	2077 (7.0%)	<.0001
		1	12564 (61.7%)	19067 (64.4%)	
		2	5095 (25.0%)	6755 (22.8%)	
8	e_iss_3grp	3	2705 (13.3%)	3764 (12.7%)	<.0001
9	flg_max_hn_ais_ge3	1	6457 (31.7%)	8825 (29.8%)	<.0001
10	flg_max_fac_ais_ge3	1	188 (0.9%)	282 (1.0%)	0.7333
11	flg_max_chs_ais_ge3	1	6147 (30.2%)	9163 (31.0%)	0.0615
12	flg_max_abd_ais_ge3	1	2347 (11.5%)	3152 (10.7%)	0.0022
13	flg_max_ext_ais_ge3	1	6015 (29.5%)	9192 (31.1%)	0.0003
14	flg_max_ex_ais_ge3	1	136 (0.7%)	193 (0.7%)	0.8332
		1	2127 (10.8%)	2542 (9.0%)	
		2	1338 (6.8%)	1818 (6.5%)	
15	e_gcs_mtr_score	3	16304 (82.5%)	23808 (84.5%)	<.0001
		1	727 (3.8%)	1023 (3.6%)	

		1	2127 (10.8%)	2542 (9.0%)	
		2	1338 (6.8%)	1818 (6.5%)	
15	e_gcs_mtr_score	3	16304 (82.5%)	23808 (84.5%)	<.0001
		1	727 (3.8%)	1023 (3.6%)	
		2	2172 (11.2%)	3194 (11.4%)	
		3	11643 (60.2%)	17034 (60.7%)	
16	e_shock_index	4	4797 (24.8%)	6811 (24.3%)	0.4884
		1	15703 (77.1%)	23154 (78.3%)	
		2	3504 (17.2%)	5279 (17.8%)	
		3	106 (0.5%)	30 (0.1%)	
17	e_arrive_from_4grp	4	1051 (5.2%)	1123 (3.8%)	<.0001
		1	11619 (57.1%)	16034 (54.2%)	
18	e_traumactr_level	2	8745 (42.9%)	13552 (45.8%)	<.0001
		1	1384 (6.8%)	2757 (9.3%)	
		2	2153 (10.6%)	3457 (11.7%)	
		3	8670 (42.6%)	11240 (38.0%)	
		4	3055 (15.0%)	4548 (15.4%)	
		5	1378 (6.8%)	2079 (7.0%)	
		6	2476 (12.2%)	3569 (12.1%)	
		7	794 (3.9%)	1247 (4.2%)	
19	e_region	8	454 (2.2%)	689 (2.3%)	<.0001
20	flg_prov_teach	1	8917 (43.8%)	11218 (37.9%)	<.0001
		1	439 (2.2%)	2017 (6.8%)	
		2	6116 (30.0%)	7308 (24.7%)	
		3	4437 (21.8%)	7647 (25.8%)	
21	e_prov_bedsizes_cat	4	9372 (46.0%)	12614 (42.6%)	<.0001
22	flg_prov_urban	1	19831 (97.4%)	29586 (100.0%)	<.0001
		1	3139 (15.4%)	4208 (14.2%)	
		2	16007 (78.6%)	23890 (80.7%)	
23	e_prov_profit	3	1218 (6.0%)	1488 (5.0%)	<.0001
24	flg_prov_hospicu	1	20028 (100.0%)	29196 (99.2%)	<.0001
25	flg_prov_hlthsysicu	1	8580 (42.8%)	13006 (44.2%)	0.0031
26	val_prov_rn2bed_ratio	1	2.13 ± 0.79	2.33 ± 0.88	<.0001
27	val_prov_meddd2inptd_ratio	1	0.22 ± 0.09	0.24 ± 0.10	<.0001

1. Very close to final table
2. Reformat to finalize
3. Copy big chunk to predesigned table



# SAS MACRO

**Step 1: Reads in independent variable list & source data**

**Step 2: Categorical independent variables**

- 1) Reads in the categorical independent variables into macro variables
- 2) Loops through each independent categorical variable with group variable for Chisq test
- 3) Extracts the needed numbers from outputs: count, proportion and p-value
- 4) Vertically stacks the results together

**Step 3: Continuous independent variables**

- 1) Reads in the continuous independent variables into macro variables
- 2) Loops through each independent continuous variable with group variable for t-test
- 3) Extracts the needed numbers from outputs: mean, stdev and p-value
- 4) Vertically stacks the results together

**Step 4: Vertically stacks the step-2 & 3 results together, sort by variable order**

**Step-5: Exports to a csv file**

# TAKEAWAYS

## 1. CSV file: how to configure



## 2. What to feed the macro program

```
%include "D:\...\macro_demo_tb_auto_gen.sas";
%demotb( input_dir =      /* Input file directory */
, output_dir =          /* Output file directory */
, input_file =          /* Independent variable list input file with only three columns */
, output_file =         /* Output CSV file name */
, grpvar =              /* Group variable */
, srcdata =             /* Source analytic file */
, varlevel_ge =         /* To control the export file whether we need the baseline row for dummy variable */
, cohort =              /* Control the data cohort to do the analysis */
);
```

## 3. SAS Macro can be powerful to improve your efficiency and accuracy

## 4. Macro program will be shared. It can be improved and tailored to your specific needs.

var_order	var_name	var_type
1	flg_male	cat
2	e_wbho	cat
3	e_insur_8grp	cat
4	flg_frailty	cat
5	flg_cms60pct_any	cat
6	flg_injury_type	cat
7	e_injury_mechanism	cat
8	e_iss_3grp	cat
9	flg_max_hn_ais_ge3	cat
10	flg_max_fac_ais_ge3	cat
11	flg_max_chs_ais_ge3	cat
12	flg_max_abd_ais_ge3	cat
13	flg_max_ext_ais_ge3	cat
14	flg_max_ex_ais_ge3	cat
15	e_gcs_mtr_score	cat
16	e_shock_index	cat
17	e_arrive_from_4grp	cat
18	e_traumactr_level	cat
19	e_region	cat
20	flg_prov_teach	cat
21	e_prov_bedsizes_cat	cat
22	flg_prov_urban	cat
23	e_prov_profit	cat
24	flg_prov_hospicu	cat
25	flg_prov_hlthsysicu	cat
26	val_prov_rn2bed_ratio	con
27	val_prov_meddd2inptd_ratio	con

