Gee! No, GTL! Visualizing Data With The SAS® Graph Template Language

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Gee! No, GTL!

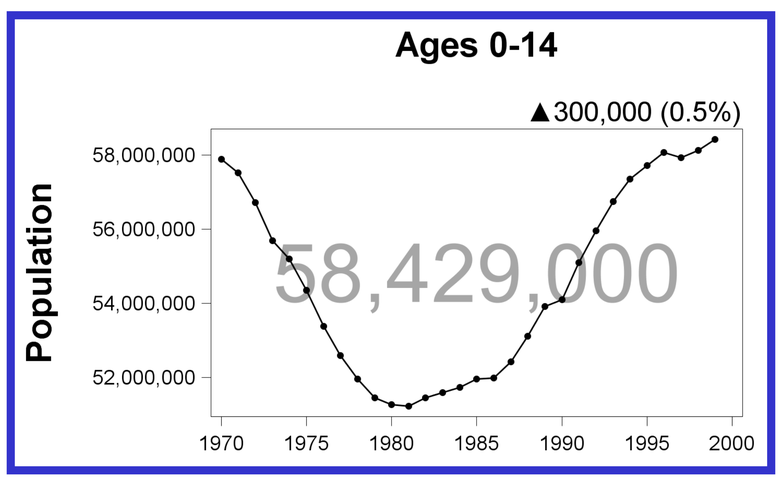
The example to the right shows how GTL can be used to present an information-rich, customized grid of time series plots from the segments and measures in the TOTARRESTS sample dataset.

Data Prep

To make coding life easier, several fields are renamed. Additional measures are derived to show the percentage each age segment contributed to the total population and overall number of arrests.

Define A Template For One Chart

A seriesplot statement is used to create each of the individual charts.

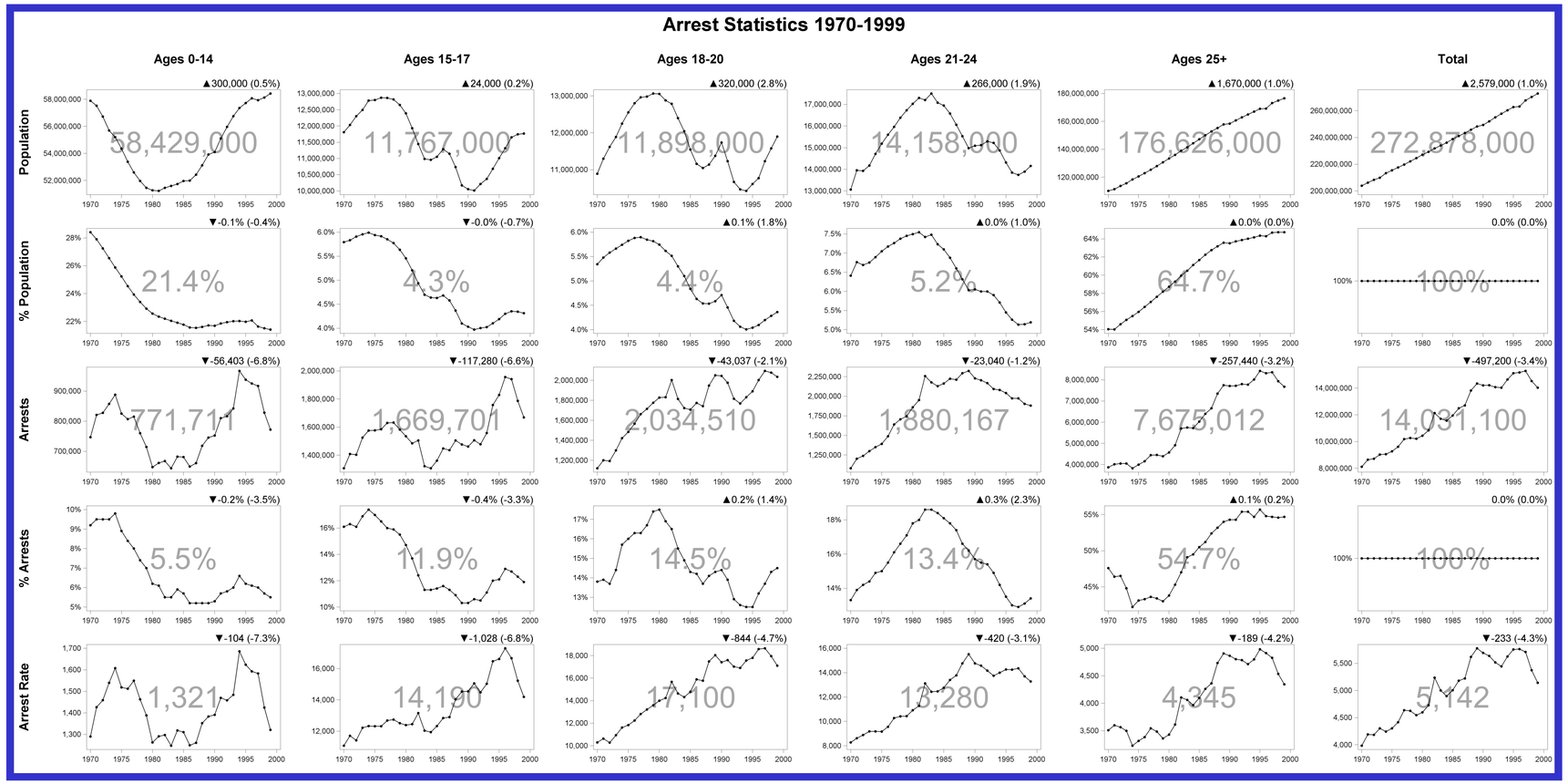


Let A Macro Do The Rest!

The SAS macro facility is used within the scope of PROC SGRENDER and a Layout Lattice statement to define and create a grid of 30 charts – 5 rows of measures X 6 columns of age ranges.

Add A Little Visual Interest

PROC FCMP is used to provide Yahoo! Finance stock quote-like summary info for each chart. The ending value is displayed on the chart wall, while YOY change (absolute & percent) and a directional arrow are shown above the chart.



Year	TotalArrests	AGE1	AGE2	AGE3	AGE4	AGE5	ArrestRate	AGE1rate	AGE2rate	AGE3rate	AGE4rate	AGE5rate	Population	AGE1pop	AGE2pop	AGE3pop	AGE4pop	AGE5pop
1970	8,117,700	746,828	1,306,950	1,120,243	1,079,654	3,864,025	3,983.0	1,290.1	11,066.5	10,285.0	8,263.1	3,507.9	203,809,000	57,890,000	11,810,000	10,892,000	13,066,000	110,151,000
1971	8,639,700	820,772	1,408,271	1,200,918	1,200,918	4,008,821	4,189.7	1,426.7	11,705.4	10,627.6	8,608.7	3,598.5	206,212,000	57,528,000	12,031,000	11,300,000	13,950,000	111,403,000
1972	8,712,400	827,678	1,402,696	1,193,599	1,237,161	4,051,266	4,184.0	1,459.2	11,404.0	10,271.9	8,885.1	3,564.1	208,233,000	56,720,000	12,300,000	11,620,000	13,924,000	113,669,000
1973	9,027,700	857,632	1,525,681	1,299,989	1,299,989	4,044,410	4,302.0	1,539.8	12,207.4	10,937.1	9,171.0	3,498.9	209,847,000	55,696,000	12,498,000	11,886,000	14,175,000	115,592,000
1974	9,055,800	887,468	1,575,709	1,421,761	1,349,314	3,821,548	4,244.7	1,607.6	12,327.6	11,609.1	9,174.0	3,227.6	213,343,000	55,204,000	12,782,000	12,247,000	14,708,000	118,402,000
1975	9,273,600	825,350	1,576,512	1,483,776	1,391,040	3,996,922	4,304.0	1,518.2	12,313.6	11,822.0	9,161.2	3,315.2	215,464,000	54,363,000	12,803,000	12,551,000	15,184,000	120,563,000
1976	9,608,500	807,114	1,585,403	1,566,186	1,489,318	4,160,481	4,416.4	1,512.1	12,315.7	12,236.8	9,546.9	3,384.8	217,565,000	53,377,000	12,873,000	12,799,000	15,600,000	122,916,000
1977	10,189,900	815,192	1,630,384	1,660,954	1,640,574	4,442,796	4,636.9	1,549.9	12,675.0	12,813.0	10,278.6	3,543.7	219,758,000	52,598,000	12,863,000	12,963,000	15,961,000	125,373,000
1978	10,271,000	760,054	1,633,089	1,715,257	1,704,986	4,457,614	4,624.6	1,462.9	12,739.6	13,211.6	10,407.7	3,483.7	222,095,000	51,954,000	12,819,000	12,983,000	16,382,000	127,957,000
1979	10,205,800	714,406	1,581,899	1,775,809	1,745,192	4,388,494	4,544.6	1,388.4	12,505.1	13,593.2	10,431.5	3,358.4	224,571,000	51,455,000	12,650,000	13,064,000	16,730,000	130,672,000
1980	10,441,000	647,342	1,534,827	1,827,175	1,858,498	4,573,158	4,596.3	1,262.6	12,386.6	13,996.0	10,915.0	3,427.7	227,162,000	51,271,000	12,391,000	13,055,000	17,027,000	133,418,000
1981	10,840,000	661,240	1,485,080	1,831,960	1,951,200	4,910,520	4,727.3	1,290.9	12,444.1	14,226.6	11,278.6	3,611.4	229,308,000	51,225,000	11,934,000	12,877,000	17,300,000	135,972,000
1982	12,136,400	667,502	1,504,914	2,002,506	2,257,370	5,704,108	5,235.2	1,297.4	13,152.5	15,660.5	13,123.5	4,105.4	231,823,000	51,450,000	11,442,000	12,787,000	17,201,000	138,943,000
1983	11,700,500	643,528	1,322,157	1,813,578	2,176,293	5,744,946	5,000.6	1,247.4	12,032.7	14,630.3	12,435.2	4,059.8	233,981,000	51,589,000	10,988,000	12,396,000	17,501,000	141,507,000
1984	11,564,000	682,276	1,306,732	1,723,036	2,127,776	5,724,180	4,896.7	1,318.8	11,928.2	14,308.6	12,457.7	3,965.6	236,158,000	51,735,000	10,955,000	12,042,000	17,080,000	144,346,000
1985	11,945,200	680,876	1,361,753	1,708,164	2,162,081	6,032,326	5,003.3	1,310.3	12,321.3	14,790.6	12,759.4	4,097.0	238,746,000	51,962,000	11,052,000	11,549,000	16,945,000	147,238,000
1986	12,487,500	649,350	1,448,550	1,773,225	2,222,775	6,393,600	5,179.9	1,249.1	12,831.5	15,889.1	13,408.8	4,260.5	241,078,000	51,984,000	11,289,000	11,160,000	16,577,000	150,068,000
1987	12,711,600	661,003	1,436,411	1,741,489	2,211,818	6,660,878	5,222.1	1,260.9	12,889.5	15,765.8	13,774.8	4,360.7	243,419,000	52,423,000	11,144,000	11,046,000	16,057,000	152,749,000
1988	13,812,300	718,240	1,505,541	1,947,534	2,292,842	7,348,144	5,619.1	1,352.3	14,025.9	17,480.8	14,767.8	4,731.7	245,810,000	53,112,000	10,734,000	11,141,000	15,526,000	155,297,000
1989	14,340,900	745,727	1,477,113	2,050,749	2,323,226	7,744,086	5,777.0	1,383.1	14,525.6	18,027.0	15,519.2	4,907.2	248,241,000	53,916,000	10,169,000	11,376,000	14,970,000	157,810,000
1990	14,195,100	752,340	1,462,095	2,044,094	2,228,631	7,707,939	5,691.6	1,390.6	14,539.5	17,411.4	14,769.9	4,865.6	249,404,000	54,102,000	10,056,000	11,740,000	15,089,000	158,417,000
1991	14,211,900	810,078	1,506,461	1,975,454	2,202,845	7,717,062	5,636.8	1,470.2	15,048.1	17,590.9	14,571.0	4,803.0	252,129,000	55,099,000	10,011,000	11,230,000	15,118,000	160,671,000
1992	14,075,100	816,356	1,477,886	1,815,688	2,167,565	7,797,605	5,518.8	1,458.7	14,474.9	17,021.5	14,175.4	4,786.5	255,041,000	55,964,000	10,210,000	10,667,000	15,291,000	162,909,000
1993	14,036,300	842,178	1,558,029	1,768,574	2,091,409	7,776,110	5,444.5	1,484.1	15,025.8	16,898.3	13,740.3	4,712.7	257,806,000	56,747,000	10,369,000	10,466,000	15,221,000	165,003,000
1994	14,648,700	966,814	1,757,844	1,831,088	2,080,115	8,012,839	5,626.4	1,685.6	16,460.8	17,562.7	13,994.3	4,797.3	260,355,000	57,357,000	10,679,000	10,426,000	14,864,000	167,029,000
1995	15,119,800	937,428	1,829,496	1,889,975	2,041,173	8,421,729	5,754.4	1,623.9	16,612.1	17,804.8	14,257.0	4,980.9	262,751,000	57,726,000	11,013,000	10,615,000	14,317,000	169,080,000
1996	15,168,100	925,254	1,956,685	2,002,189	1,971,853	8,312,119	5,763.4	1,593.1	17,291.3	18,583.5	14,243.4	4,913.6	263,179,000	58,079,000	11,316,000	10,774,000	13,844,000	169,166,000
1997	15,284,300	917,058	1,941,106	2,093,949	1,971,675	8,360,512	5,708.5	1,582.9	16,661.9	18,644.4	14,348.8	4,827.5	267,744,000	57,937,000	11,650,000	11,231,000	13,741,000	173,185,000
1998	14,528,300	828,113	1,786,981	2,077,547	1,903,207	7,932,452	5,374.9	1,424.6	15,217.4	17,943.9	13,700.0	4,534.0	270,299,000	58,129,000	11,743,000	11,578,000	13,892,000	174,956,000
1999	14,031,100	771,711	1,669,701	2,034,510	1,880,167	7,675,012	5,141.9	1,320.8	14,189.7	17,099.6	13,279.9	4,345.3	272,878,000	58,429,000	11,767,000	11,898,000	14,158,000	176,626,000

SAS CODE

```
*==> Rename totarrests SAS dataset variables & compute percentages of totals;

%macro renameVars;
libname l 'C:\Program Files\SAS\9.3\SASEnterpriseGuide\5.1\Sample\Data';
proc sql;
create table totarrests as
select Year, Population as Population0, TotalArrests as Arrests0, ArrestRate as ArrestRate0
%do i=1 %to 5;
  , age&i.pop as Population&i, age&i as Arrests&i, age&i.rate as ArrestRate&i
%end;
%do i=0 %to 5;
  , Population&i/Population0 as PctPopulation&i, Arrests&i/Arrests0 as PctArrests&i
%end;
from l.totarrests;
%mend;
%renameVars;
```

Read, prep TOTARRESTS SAS dataset, Derive new % of total fields

```
*==> Find ending value for specified var and YOY change (Absolute & % Differences);

%let lastvar=?; %let pctchg=?; %let delta=?; %let updown=?;
%macro getdelta;
%let yvar = %sysfunc(dequote(&yvar));
data _null_;
set totarrests nobs=n point=n;
format Population: Arrests: ArrestRate: comma11. Pct: percentn7.1;
call symput("lastvar",compress(vvalue(&yvar)));
saveval=&yvar;
prev=n-1;
set totarrests point=prev;
pctchg=(saveval-&yvar)/&yvar;
call symput("pctchg",compress(put(pctchg,percentn7.1)));
&yvar=saveval-&yvar;
call symput("delta",compress(vvalue(&yvar)));
if &yvar=0 | &yvar=. then call symput("updown","0020");  * Space (no change);
else if &yvar<0      then call symput("updown","25BC");  * Down arrow;
else                      call symput("updown","25B2");  * Up arrow;
stop;
run;
%mend;
```

Find ending value and YOY change (% and absolute) for specified field

```
*==> Define function to permit %getdelta macro calls from PROC SGRENDER;

proc fcmp outlib = sasuser.ds.functions;
function GetDeltas(yvar $);
rc = run_macro('getdelta', yvar);
return(rc);
endsub;
run;

option cmplib = (sasuser.ds);
```

User function allows macros, DATA steps to be run from SGRENDER

```
*==> Define/generate one chart (SeriesPlot - y-axis Metric X x-axis Year);

%macro CreateOneChart(YVAR);
cell;
cellheader;
%let rc=%sysfunc(getdeltas("&yvar"));
entry textattrs=(size=19pt) halign=left " " halign=right {unicode "&UPDOWN"x} "&delta. (&pctchg.)";
endcellheader;
layout overlay /
yaxisopts=(label=" " labelattrs=(color=black) tickvalueattrs=(size=14pt color=black))
xaxisopts=(label=" " labelattrs=(color=black) tickvalueattrs=(size=14pt color=black));
drawtext textattrs=(size=56pt color=black) "&lastvar" / width=100 drawspace=WALLPERCENT widthunit=percent
         xspace=wallpercent yspace=wallpercent x=50 y=50 justify=center transparency=.80;
seriesplot x=Year y=&YVAR / lineattrs=(color=black thickness=1.5px) display=(markers)
           MARKERATTRS=(SYMBOL=circlefilled color=black size=10px);
endlayout;
endcell;
%mend;
```

Define a series plot chart

```
*==> Define/generate grid of charts (Lattice - 5 Rows of Metrics X 6 Columns of Age Ranges);

%macro CreateAllCharts;
proc template;
%let Segments=1|2|3|4|5|0|;
%let Metrics=Population|PctPopulation|Arrests|PctArrests|ArrestRate|;
define statgraph mygraphs.example;
begingraph / designwidth=4050px designheight=2000px border=false;
layout lattice / backgroundcolor=white opaque=true columns=6 border=false;
entrytitle textattrs=(size=36pt weight=bold) "Arrest Statistics 1970-1999";
entrytitle textattrs=(size=24pt weight=bold) " ";
column2headers;
entry textattrs=(size=24pt weight=bold) "Ages 0-14";
entry textattrs=(size=24pt weight=bold) "Ages 15-17";
entry textattrs=(size=24pt weight=bold) "Ages 18-20";
entry textattrs=(size=24pt weight=bold) "Ages 21-24";
entry textattrs=(size=24pt weight=bold) "Ages 25+";
entry textattrs=(size=24pt weight=bold) "Total";
endcolumn2headers;
rowheaders;
entry textattrs=(size=24pt weight=bold) "Population" / rotate=90;
entry textattrs=(size=24pt weight=bold) "% Population" / rotate=90;
entry textattrs=(size=24pt weight=bold) "Arrests" / rotate=90;
entry textattrs=(size=24pt weight=bold) "% Arrests" / rotate=90;
entry textattrs=(size=24pt weight=bold) "Arrest Rate" / rotate=90;
endrowheaders;
sidebar / align=top; entry textattrs=(size=18pt) " " / valign=center; endsidebar;
%do r=1 %to 5;
  %do c=1 %to 6;
      %CreateOneChart(%scan(&Metrics,&r,'|')%scan(&Segments,&c,'|'));
  %end;
%end;
endlayout;
endgraph;
end;
run;
```

Generate 5x6 charts (1 row per measure, 1 column per age segment)

```
proc sgrender data=totarrests template="mygraphs.example";
format Population: Arrests: ArrestRate: comma11. Pct: percentn7.4;
run;
%mend;
```

Invoke PROC SGRENDER

```
*==> Create file containing grid of charts (Arrests.png);

ods graphics on / antialias antialiasmax=10000 reset imagename="sampleGTLchart";
ods listing gpath="c:\temp";

%CreateAllCharts;
```

Create charts