

Show Them What's Important: Solutions for a Finite Workday in an Era of Information Overload

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Abstract & Introduction

The biggest obstacle to information delivery and assimilation is the volume of information available. Dilbert reported that when he computed the total time spent waiting for web pages to load, he found that it wiped out all the productivity gains of the Information Age. This is a tutorial about design and construction of data presentation for effective communication. It covers concepts, examples, and innovations for making best use of those precious resources: the time and attention of your information recipients/users, and your own time and effort to package and deliver information. The tutorial shows how to emphasize, order, rank, and subset information, and how to handle the viewer's concerns when presenting partial information. Though the presentation includes statistical maps, space does not permit their inclusion in this paper. Solutions use base SAS*, SAS/GRAPH*, and SAS macros, and are platform independent. See also my Invited Poster "Visual Communication Art & Science: The Design Guide and Gallery for Clear, Convincing Graphs, Tables, Maps, and Text".

Pulitzer's first rule for journalists was: "Put it before them briefly so they will read it."

Text Parts of Graphs

Avoid providing the same information in multiple places. Omit axis labels when that information is either self-evident from tickmark labels (e.g., when they are dates) or is mentioned in the title or subtitle. *Make the graph title a headline.* State the message or meaning of the graph, rather than simply provide an uninspiring statement of graph content or subject.

"First Things First"

The cover for a past issue of *Ora-dot-com* said, "The intelligence of a civilization can be measured by its ability to prioritize information."

Textual Reports

The design of a newspaper article, like that below for a data report, permits the reader to stop at any point, and get the most valuable information in the shortest time, in a progression of decreasing importance. If the reader reads only the headline, she/he gets the essence in the fewest words. The subheadline expands on the headline. The first paragraph is a one or few sentence summary. Subsequent paragraphs provide more information of progressively less importance.

Sequencing Information in a Report

The first page should be an Exception Report (Exhibit 3). To monitor actual measurements versus goals or thresholds, any exceptions must be on Page 1 if hardcopy, or selectable as Option 1 if online. All exceptions should be on the same page/screen, even if

the items are unrelated. The user may not bother to look further if everything is OK.

The second page should be a Summary Report (Exhibit 4).

If the report includes trend charts and/or historical tables, there should be a one-page summary to show all the current report-month (or report-week or report-day) critical values.

Then, everything else follows.

Sequencing Information in a Table, List, or Graph

To provide a tool for rapid identification and assessment of categories of significance, order table or graph entries by decreasing value of the measurement of interest. (Exhibits 5, 6, 7, 10, 11)

To provide an all-encompassing look-up tool for a large set of categories, order table or graph entries alphabetically by category name.

"Let Part Stand for the Whole"

Somewhere I read the above recommendation for effective communication. I cannot cite the published source. The point is that often, if not almost always, the essence or the *most significant* is enough. And, if more turns out to truly be desired, it can be supplied on demand, rather than as routine.

Subset Ranking Reports

Focus attention on high-impact categories. Often the high-ranking categories that can be fit on one page account for 50-99% of the total of the measurement of interest, even if the full list of categories would run to several pages.

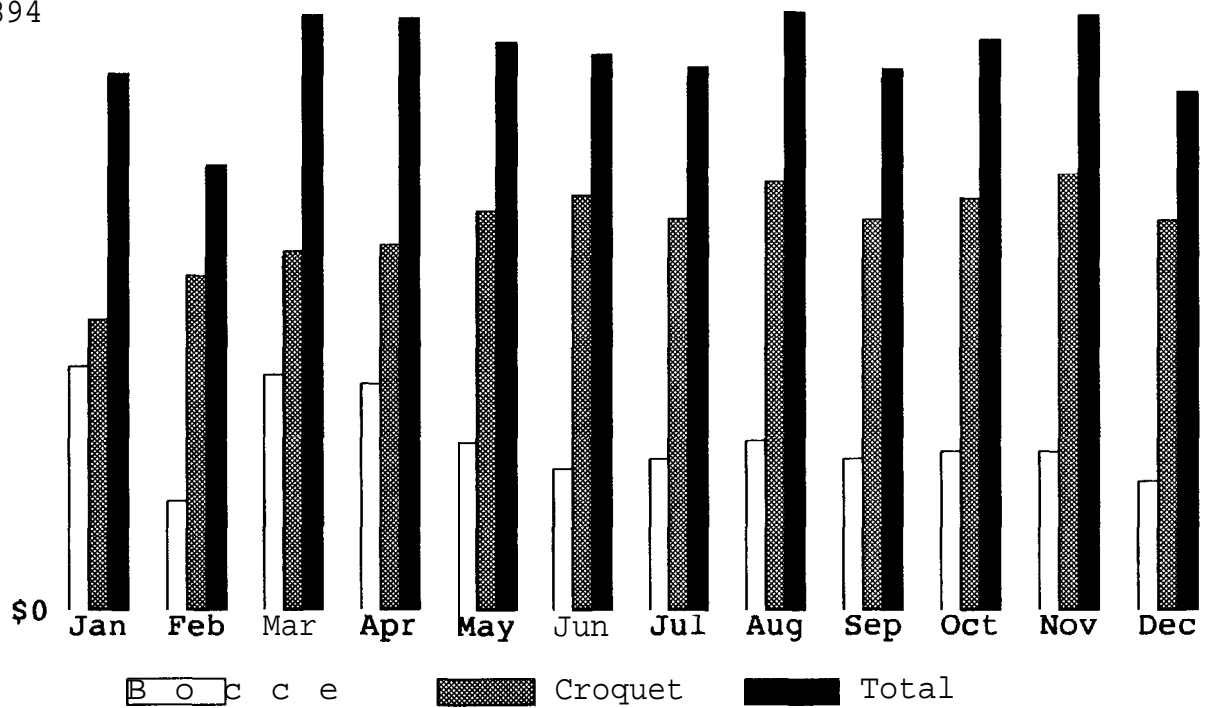
Limit the list. Show only: (a) Top 10, Top 40, Top NN, etc. (Exhibit 5); and/or (b) values above a minimum cut-off (Exhibit 6). See Exhibits 5A, 6A, and 8 for the programs and the TOPNN macro. When limiting the list, provide a subtitle that your program (in my case, the TOPNN macro) automatically loads with a statement of what percent of the total for all observations is accounted for by the Top NN observations listed in the ranking report.

Nested Ranking Report (Exhibit 7)

The Nested Ranking Report includes all the observations, not just the Top NN or those that are above a specified minimum. It is used when the observations belong to a CLASS and a SUBCLASS. The RANKNEST macro assumes that the response (or RANKVAR) has already been summed to the SUBCLASS level. See Exhibits 7A and 9 for the program and macro. You can generalize the macro to sum the response at the SUBCLASS level.

1991 Club Sports Revenues, By Month

Peak in
August
\$151,894



	Bocce	Croquet	Total
Jan	\$62,188	\$73,962	\$136,150
Feb	\$27,920	\$85,079	\$112,999
Mar	\$59,741	\$91,144	\$150,885
Apr	\$57,467	\$92,639	\$150,106
May	\$42,691	\$101,361	\$144,052
Jun	\$35,896	\$105,319	\$141,215
Jul	\$38,538	\$99,411	\$137,949
Aug	\$43,038	\$108,856	\$151,894
Sep	\$38,444	\$99,006	\$137,450
Oct	\$40,296	\$104,507	\$144,803
Nov	\$40,201	\$110,826	\$151,027
Dec	\$32,776	\$98,928	\$131,704

Exhibit 14. Sparse Annotation: Chart for Peak, Trend, & Visual Comparison with Detail Supplied in Table Below

At the end of the report, the grand total response is listed. For PAGEBY = YES, the report starts a new page every time the CLASS changes.

Nested Banking provides a natural drill-down" from a simple CLASS level summary report.

Ranking Shares of the Whole When Numerous:
Annotated Banked Horizontal Bar Chart (Exhibit 10)

When the shares of the whole are too numerous or too small, there may not be room to display pie slice name, value, and percent of whole. The annotated ranked horizontal bar chart is a feasible solution. (See Exhibits 10A and 10B for the program and macro.) In any case, an ordered horizontal bar chart is a good way to compare response across categories, especially when you do not want to show percent of whole.

Ranking Shares of the Whole When Few:
New, Improved Pie Chart (Exhibit 11)

When the shares of the whole are few or moderate in number, the best alternative is my New, Improved Pie Chart. For how to create it, see my paper "Reinventing the Pie Chart: Improved and Reliable Communication for This Popular Business Chart" in *Proceedings of the Twentieth Annual SAS Users Group International Conference* (SAS Institute Inc., Cary, NC, 1995).

Summarizing Shares of the Whole into Two:
Power of the Pac-Man Pie Chart (Exhibits 1 & 2)

The idea of a two-part pie chart may seem trivial, if not silly. But when the share of interest to your message is either tiny or huge, the image is very "irnpactful" and, therefore, memorable.

In the case of Exhibit 2, you can easily satisfy any curiosity about "Other" with a table displayed below the pie chart. But it is essential to not blunt the visual message by splitting the big wedge into a lot of little ones that may be as small as or smaller than the wedge whose smallness you wish to emphasize.

Author and Belated Work in Progress

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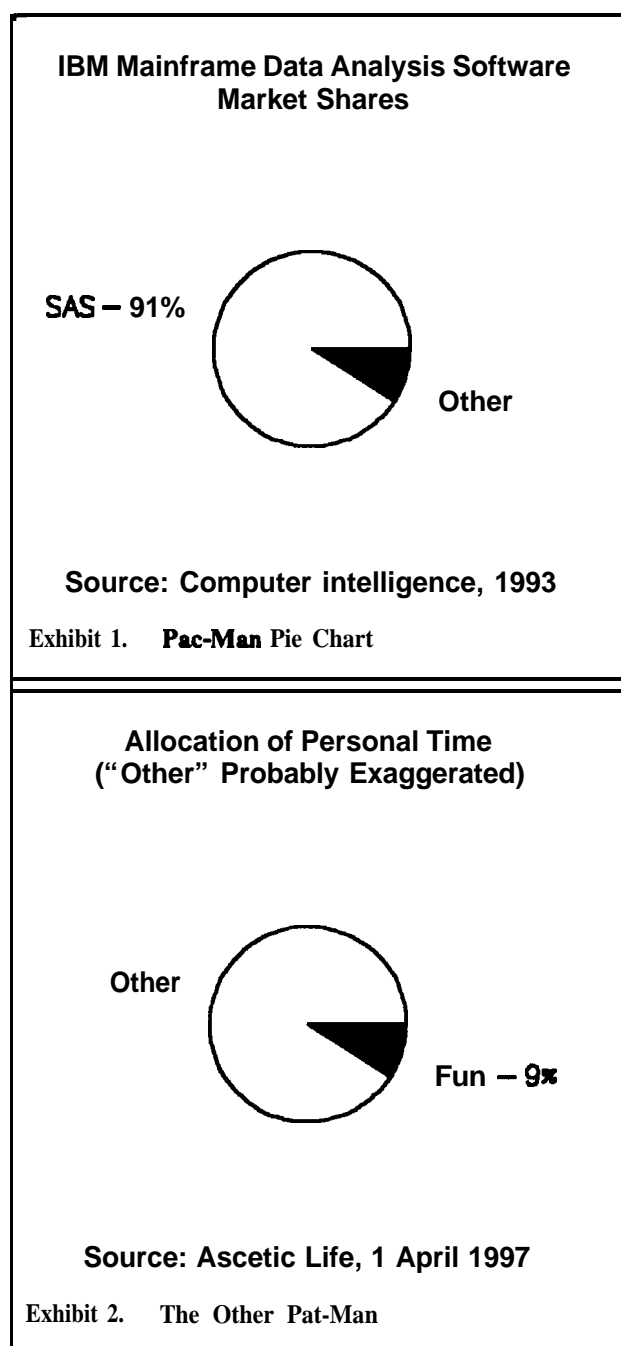
Born to See, Meant to Look
- Faust

Dr. LeRoy Bessler is a SAS consultant, and frequent speaker, with interests in visual communication, graphic design, information visualization, color, InfoGeographics, and Software-Intelligent Application Development.

An award winner for papers on graphic design and visual communication, Dr. Bessler is writing a book to be published by SAS Institute, titled "Chart Smart: Design Guide and Solution Toolkit for SAS Graphs, Tables, and Maps That Inform and Influence".

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Ralph's Grocery Store
 Exceptions - March 1992

Exception	Actual Value	Goal or Threshold
Grocery Returns (% of sales)	2.30	1
Employee Hours Late or Absent (% of scheduled)	3.03	1

If no exceptions listed, then no goals missed, no thresholds reached.

Exhibit 3. Exception Report

Ralph's Grocery Store
 Summary - March 1992

Sales	\$14,153
Operating Costs (Rent, Utilities, Etc.)	\$1,139
Returns	\$326
Store Open Hours	264
Employee Hours Scheduled	528
Employee Hours Worked	512
Employee Hours Late or Absent	16

For history, see appropriate graphs elsewhere in this report.

Exhibit 4. Summary Report (Headings suppressed with LABEL var='00'X)

TOP 10 SAS PROCs Used From 12-01-93 To 01-31-95

This list accounts for 89.9% of the total

Rank	PROC	Count
1	DATASTEP	212,421
2	SORT	70,216
3	PRINT	26,836
4	GPLOT	23,504
5	MEANS	19,103
6	FORMAT	17,522
7	REO	15,247
5	PRINTTO	11,409
9	DATASETS	9,254
10	CONTENTS	7,545

		412,557

Exhibit 5. Top 10 Ranking Report

```

XTOPNN(DATA=INDATA,
CLASSVAR=SASPROC,
CVARLABL='PROC',
RANKVAR=COUNT,
RVARFMT=COMMA7.,
RVARLABL='Count',
NN=10,
TTLTEXT=SAS PROCs Used From 12-01-93 To 01-31-95)
RUN;
    
```

Exhibit 5A. Program for Exhibit 5

Ranked List Of BAB PROCs Used From 12-01-93 To 01-31-95

This list Recounts for 86.3% of the total

Only values not less than 10,000 are listed

Rank	PRDC	count
1	DATASTEP	212,421
2	SORT	70,216
3	PRINT	26,836
4	OPLDT	23,504
5	MEANS	19,103
6	FORMAT	17,522
7	REO	15,047
5	PRINTTO	11,409

		396,058

Exhibit 6. Ranking Report With Cutoff

```

XTOPNN(DATA=INDATA,
CLASSVAR=SASPROC,
CVARLABL='PROC',
RANKVAR=COUNT,
RVARFMT=COMMA7.,
RVARLABL='Count',
NN=10,
MINRVAR=10000,
TTLTEXT=SAS PROCs Used From 12-01-93 To 01-31-95)
RUN;
    
```

Exhibit 6A. Program for Exhibit 6

Ranking Report on BAB System Use, 12-01-93 to 01-31-95

Rank: Product P R O C count

1: Base SAS	DATASTEP	212,421
	SORT	70,216
	PRINT	26,836
	MEANS	19,103
	FORMAT	17,522
	PRINTTO	11,409
	DATASETS	9,254
	CONTENTS	7,545
	SUMMARY	5,849
	FREQ	4,287
	UNIVARIA	2,350
	TRANSPOS	2,193
	APPEND	1,636
	SQL	1,136
	TABULATE	771
	CORR	517
	CHART	496
	COPY	413
	PDS	133
	PLOT	53
	CATALDB	72
	DELETE	46
	SOURCE	20
	COMPARE	5
	CIMPORT	2

1: Base SAS 394,350

2: SAS/GRAPH	GPLOT	23,504
	GREPLAY	6,041
	GSLIDE	5,417
	GPRINT	5,223
	GCHART	1,254
	GMAP	836
	GPROJECT	92
	GCONTOUR	54
	GSD	11
	GREDUCE	5
	GREMOVE	4
	GGRID	2

2: SAS/GRAPH 42,473

3: SAS/STAT	REG	15,047
	GLM	1,758
	ANOVA	1,186
	TTEST	337
	NLIN	160
	STEPWISE	137
	DISCRIM	7
	STEPDISC	4
	TREE	2

3: SAS/STAT 15,555

4: SAS/ETS	FORECAST	1,502
	EXPAND	408
	ARIMA	139
	AUTOREG	11
	MODEL	4
	X11	2

4: SAS/ETS 2,066

5: SAS/FSP	FSVIEW	745
	FSBROWSE	53
	FSEDIT	10
	FSPRINT	2

5: SAS/FSP 540

6: SAS/ASSIST N . A . 58

7: SAS/DB2 ACCESS *****
458,383

Exhibit 7. Nested Ranking Report

TITLE1 Ranking Report on SAS System Use, 12-01-93 to 01-31-95;

```

XRANKNEST(DATA=INDATA,
CLASS=PRODUCT,
SUBCLASS=SASPROC,
RANKVAR=COUNT,
RVARFMT=COMMA7.,
CLASSLBL=Product,
SUBCLLBL=PROC,
RANKVLBL=Count,
PAGEBY=NO)
RUN;
    
```

Exhibit 7A. Program for Exhibit 7

```

XMACRO TOPNN(DATA=,
              CLASSVAR=,
              CVARLABL=,
              RANKVAR=,
              RVARFMT=,
              RVARLABL=,
              N=,
              MINRVAR=,
              TTLTEXT=);

DATA;
SET &DATA;
XOLDBAL BELOWMIN;
IF _N = 1
  THEN CALL SYMPUT('BELOWMIN','N');
IF &MINRVAR ^= . THEN DO;
  IF &RANKVAR < &MINRVAR
    THEN RETURN;
  ELSE DO;
    CALL SYMPUT('BELOWMIN','Y');
    DELETE;
  END;
END;
KEEP &CLASSVAR &RANKVAR;
RUN;

PROC SORT OUT=FORTOPNN; 5V DESCENDING &RANKVAR;
RUN;

DATA TOREPORT;
SET FORTOPNN;
IF _N < &N + 1;
RANK = _N_;
RUN;

PRDC MEANS DATA=&DATA NOPRINT SUM N;
VAR &RANKVAR;
OUTPUT OUT=ALL SUM=SUMTOT N=NTOT;
RUN;

PRDC MEANS DATA=TOREPORT NOPRINT SUM N;
VAR &RANKVAR;
OUTPUT OUT=TOPNN SUM=SUMTOP N=NTOP;
RUN;

DATA _NULL_;
MERGE ALL TOPNN;
FORMAT PCTTDT 5.11;
PCTTDT = ROUND((100*(SUMTOT / SUMTOT)),.1);
XOLDBAL RANKLEN;
CALL SYMPUT('RANKLEN',LENGTH(LEFT(&N)));
XOLDBAL MIN;
IF &MINRVAR ^= .
  THEN CALL SYMPUT('MIN',TRIM(LEFT(PUT(&MINRVAR,&RVARFMT))));
XOLDBAL PCTTOT;
CALL SYMPUT('PCTTOT',TRIM(LEFT(PCTTDT)));
XGLOBAL HTTLMIN;
FORMAT TTLTOPNN $14.;
IF NTOP < NTOT
  AND
  NTDP = 5NN
  THEN DO;
    TTLTOPNN = "Top &N";
    CALL SYMPUT('HTTLMIN','0');
  END;
ELSE DO;
  TTLDPW = 'Ranked List of';
  IF &MINRVAR = . OR "&BELOWMIN" = 'N'
    THEN CALL SYMPUT('HTTLMIN','0');
  ELSE
    CALL SYMPUT('HTTLMIN','1');
END;
XGLOBAL TTLTOPM;
CALL SYMPUT('TTLTOPM',TRIM(TTLTOPNN));
RUN;

OPTIONS MISSING= ' ' NODATE NONUMBER;

PROC PRINT DATA=TOREPORT NOOBS LABEL SPLIT='';
FORMAT RANK &RANKLEN.;
FORMAT &RANKVAR &RVARFMT;
LABEL RANK = 'Rank'
      &CLASSVAR = &CVARLABL
      &RANKVAR = &RVARLABL;
VAR RANK &CLASSVAR &RANKVAR;
SUM &RANKVAR;
TITLE1 "&TTLTOPM&TTLTEXT";
TITLES "This list accounts for BPCCTOTX of the total";
XMACRO TTLMIN(TTLNO=);
XIF &HTTLMIN = 1 XTHEN XDO;
TITLE5 "Only values not less than &MIN are listed";
XEND;
XMEMD TTLMIN;
XTTLNIN;
RUN;

XMEMD TOPNN;

```

Exhibit 8. TOPNN Macro

```

XMACRO RANKNEST(DATA=,
                CLASS=,
                SUBCLASS=,
                RANKVAR=,
                RVARFMT=,
                CLASSLBL=,
                SUBCLLBL=,
                RANKVLBL=,
                PAGEBY=YES);

DATA _NULL_;
SET &DATA END=LAST;
XGLOBAL CLASSLEN;
RETAIN CLASSLL 0;
CLASSLL = MAX(CLASSLL,LENGTH(&CLASS));
IF LAST THEN CALL SYMPUT('CLASSLEN',CLASSLL);
RUN;

PRDC SORT DATA=&DATA OUT=SORT1;
BY &CLASS;
RUN;

PRDC MEANS DATA=SORT1 NOPRINT SUM N;
BY &CLASS;
VAR &RANKVAR;
OUTPUT OUT=SUMMED SUM=&RANKVAR N=&CLASSIZE;
RUN;

PROC MEANS DATA=SUMMED NOPRINT N;
VAR &RANKVAR;
OUTPUT OUT=COUNTED N=&CLASSIZE;
RUN;

DATA _NULL_;
SET COUNTED;
XGLOBAL RANKLEN;
CALL SYMPUT('RANKLEN',LENGTH(LEFT(&CLASSIZE)));
RUN;

PROC SORT DATA=SUMMED OUT=SORT2;
5V DESCENDING &RANKVAR;
RUN;

DATA RANKDATA;
SET SORT2;
LENGTH RANK $ &RANKLEN;
RAM = _N_;
RANK=TRANSLATE(RANK,'0',' ');
XLET RANKLEN = XEVAL(&RANKLEN + &CLASSLEN + 2);
LENGTH RANKCLAS $ &RANKLEN;
RANKCLAS = TRIM(LEFT(RANK)) || '|' || &CLASS;
KEEP &CLASS RANKCLAS;
RUN;

PRDC SORT DATA=RANKDATA OUT=SORT3;
5V &CLASS;
RUN;

DATA MERGED;
MERGE SORT3 SORT1;
5V &CLASS;
KEEP RANKCLAS &SUBCLASS &RANKVAR;
RUN;

PROC SORT DATA=MERGED OUT=TOPPRINT;
5V RANKCLAS DESCENDING &RANKVAR;
RUN;

DPTICNB MISSING=0 NODATE NONUMBER;

PROC PRINT DATA=TOPPRINT LABEL;
XIF &PAGEBY = YES XTHEN XDO;
PAGEBY RANKCLAS;
XEND;

BY RANKCLAS;
ID RANKCLAS;
VAR &SUBCLASS &RANKVAR;
SUM &RANKVAR;
FORMAT &RANKVAR &RVARFMT;
LABEL RANKCLAS=Rank &CLASSLBL;
LABEL &SUBCLASS=&SUBCLLBL;
LABEL &RANKVAR=&RANKVLBL;
RUN;

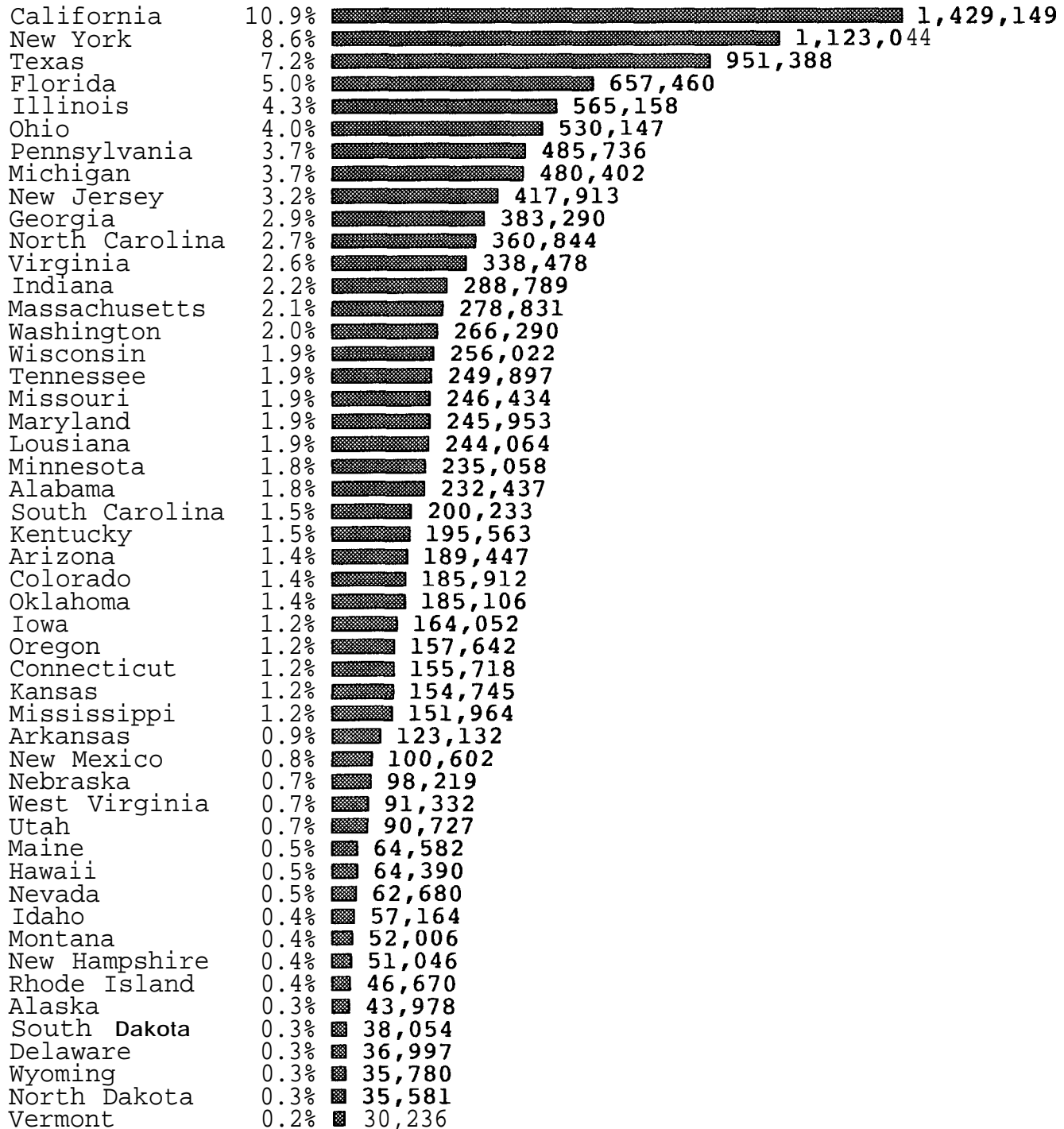
XMEMD RANKNEST;

```

Exhibit 9. RANKNEST Macro

State and Local Government Employment By State In October 1991

State Name, Percent of USA Total, and Employee Count



USA Total = 13,130,342

**Exhibit 10. Annotated Ranked Horizontal Bar Chart:
For When No Pie Chart Will Work**

```

/* options statements */
%HBARANNO(DATA=INDATA,
  BARFILL=X2,
  BARSFACE=0.35,
  BARNWIDTH=0.55,
  MIDPOINT=STNAME,
  MIDPTLBL=State Name,
  MLBSHIF=-3000,
  RESPONSE=COUNT,
  RESPLBL=Employee Count,
  RESPFMT=COMMA9.,
  RMINSHIF=21,
  RMAXSHIF=12,
  TOTALLBL=USA Total,
  TTLTEXT=State and Local . . . In October 1991)
RUN;

```

Exhibit 10A. Program for Exhibit 10

```

%MACRO HBARANNO(DATA=,
  MIDPOINT=,
  MIDPTLBL=,
  MLBSHIF=-0,
  RESPONSE=,
  RESPLBL=,
  RESPFMT=,
  RMINSHIF=0,
  RMAXSHIF=0,
  BARFILL=X2,
  BARSFACE=1.00,
  BARNWIDTH=1.00,
  ANNOFONTSIZE=1.00,
  ANNOFONT=NONE,
  TOTALLBL=,
  TTLTEXT=);

DATA _NULL_;
SET BDATA END=LAST;
%GLOBAL MPLBLEN;
RETAIN MIDPTLEN 0;
MIDPTLEN =MAX(MIDPTLEN,LENGTH(&MIDPOINT));
IF LAST THEN CALL SYMPUT('MPLBLEN',MIDPTLEN * 0);
RUN;

PROC SDRT DATA=&DATA OUT=SORTED;
BY &MIDPOINT;
RUN;

PROC FREQ DATA=DATA;
TABLE SMIDPOINT /OUT=PERCENTS NOPRINT;
WEIGHT &RESPONSE;
RUN;

DATA TOGCHART(KEEP=&MIDPOINT &RESPONSE)
  TOANNO2(KEEP=&MIDPOINT MPLABEL);
MERGE SORTED PERCENTS;
DOUTPUT TOGCHART;
FDRNAT PCTCHARS 94.;
PCTCHARS =LEFT(ROUND(PERCENT,0.1));
IF PCTCHARS = INT(PCTCHARS)
  THEN PCTCHARS = TRIM(PCTCHARS) || '.0';
LENTH MPLABEL 21;
IF PCTCHARS < 10 THEN
  MPLABEL = STNAME || ' ' || SUBSTR(PCTCHARS,1,3) || 'X';
ELSE
  MPLABEL = STNAME || ' ' || PCTCHARS || 'X';
OUTPUT TOANNO2;
RUN;

DATA ANNOTEX1;
SET TOGCHART;

```

```

  xsvs = '2';
  vsvs = '2';
  WHEN = 'A';
  FUNCTION = 'LABEL';
  SIZE = 0 AWOSIZE;
  STYLE = "8ANNOFONT";
  VC = &MIDPOINT;
  X = &RESPONSE;
  POSITION = '6';
  LENGTH TEXT 9 &MPLBLEN;
  TEXT = ' ' || LEFT(PUT(&RESPONSE,&RESPFMT.));
  RUN;

  DATA ANNOTEX2;
  SET TOANNO2;
  xsvs = '2';
  vsvs = '2';
  WHEN = 'A';
  FUNCTION = 'LABEL';
  SIZE = &ANNOFONTSIZE;
  STYLE = "8ANNOFONT";
  VC = &MIDPOINT;
  X = &MLBSHIF; /* X=0 leaves n o space between label B bar */
  POSITION = '6';
  LENGTH TEXT 9 &MPLBLEN;
  TEXT = MPLABEL;
  RUN;

  DATA ANNOTEX1;
  SET ANNOTEX1 ANNOTEX2;
  RUN;

  PROC MEANS DATA=&DATA NOPRINT SUM MAX;
  VAR &RESPONSE;
  DOUTPUT OUT=RESPSTAT SUM=RESPTOT MAX=RESPMAX;
  RUN;

  DATA _NULL_;
  SET RESPSTAT;
  %GLOBAL RESPTOT;
  CALL SYMPUT('RESPTOT',LEFT(RIGHT(PUT(RESPTOT,COMMA10.))));
  %GLOBAL RESPMAX;
  CALL SYMPUT('RESPMAX',RESPMAX);
  RUN;

  PATTERN1 V=&BARFILL;

  TITLE1 H=1 F=NONE '';
  TITLE2 H=1 F=NONE "&TTLTEXT";
  TITLE3 H=1.0 F=NONE '';
  TITLE4 H=1 F=NONE
    "&MIDPTLBL, Percent O f &TOTALLBL, and &RESPLBL";
  TITLE5 H=0.5 F=NONE '';

  FOOTNOTE1 J=R "&TOTALLBL = BRESPTOT ";

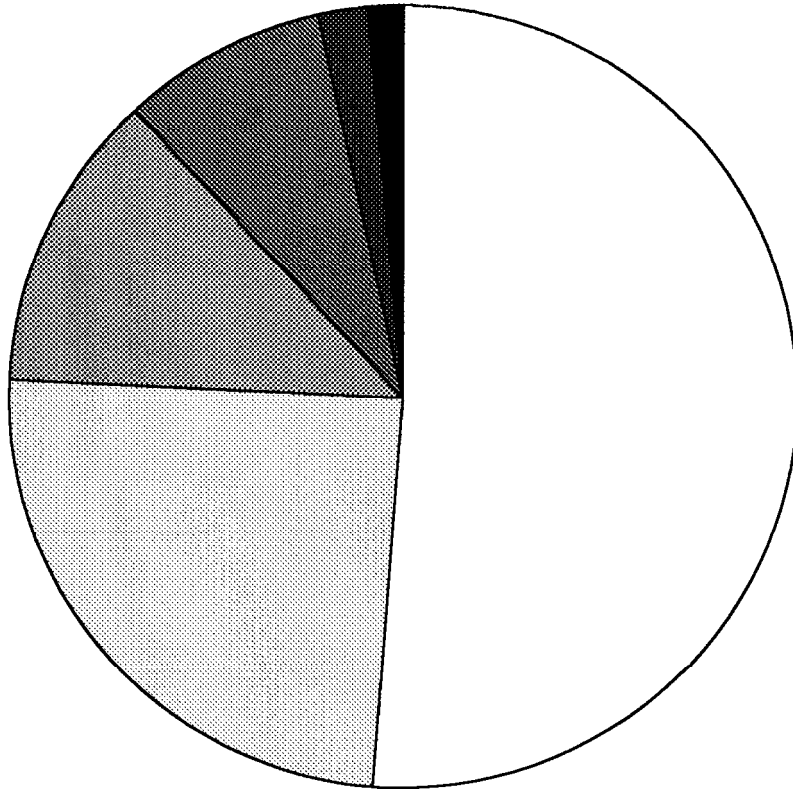
  PROC GCHART DATA=TOGCHART ANNO=ANNOTEX1;
  HBAR &MIDPOINT /
  SUMVAR = &RESPONSE
  DESCENDING
  DISCRETE
  MAXIS = AXIS1
  RAXIS = AXIS2
  SPACE = &BARSFACE
  NDSTATS
  WIDTH = &BARNWIDTH;
  AXIS1 LABEL=NONE MAJOR=NONE MINOR=NONE STYLE=0 VALUE=NONE;
  AXIS2 LABEL=NONE MAJOR=NONE MINOR=NONE STYLE=0 VALUE=NONE
  OFFSET=(&RMINSHIF,&RMAXSHIF) /* squash bar to fit labels */
  ORDER = (0 TO &RESPMAX BY &RESPMAX);

  %MEND HBARANNO;

```

Exhibit 10B. HBARANNO Macro

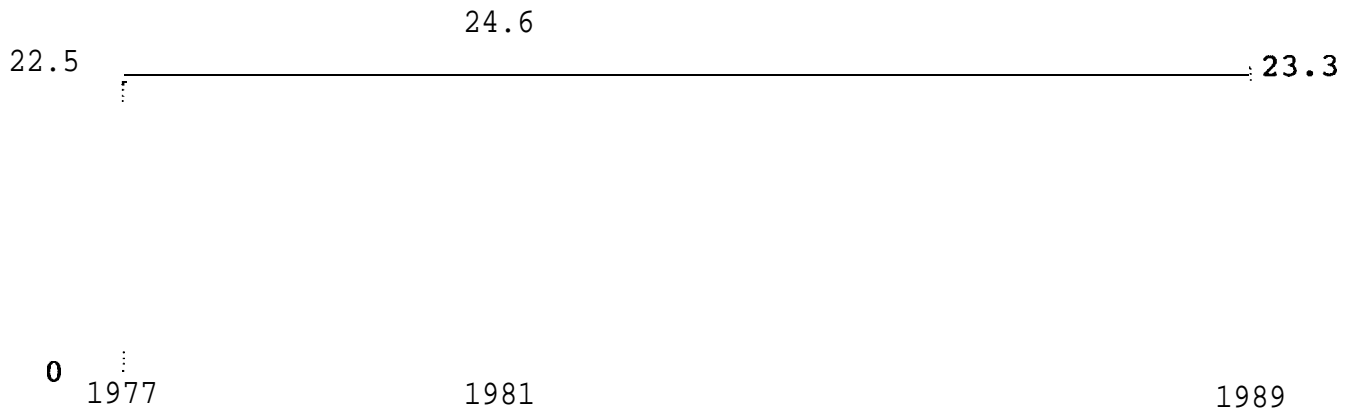
1991 Per Capita Consumption of Beverages in Six Categories
Estimates from "Beverage World 1992-m Data Bank"



	Share	Gallons	Beverage Category
□	51.2%	48.4	Soft Drinks
	24.5%	23.2	Beer
▒	12.3%	11.6	Fruit Juices and Drinks
▓	8.5%	8.0	Bottled Water
■	2.0%	1.9	Wine
■	1.5%	1.4	spirits

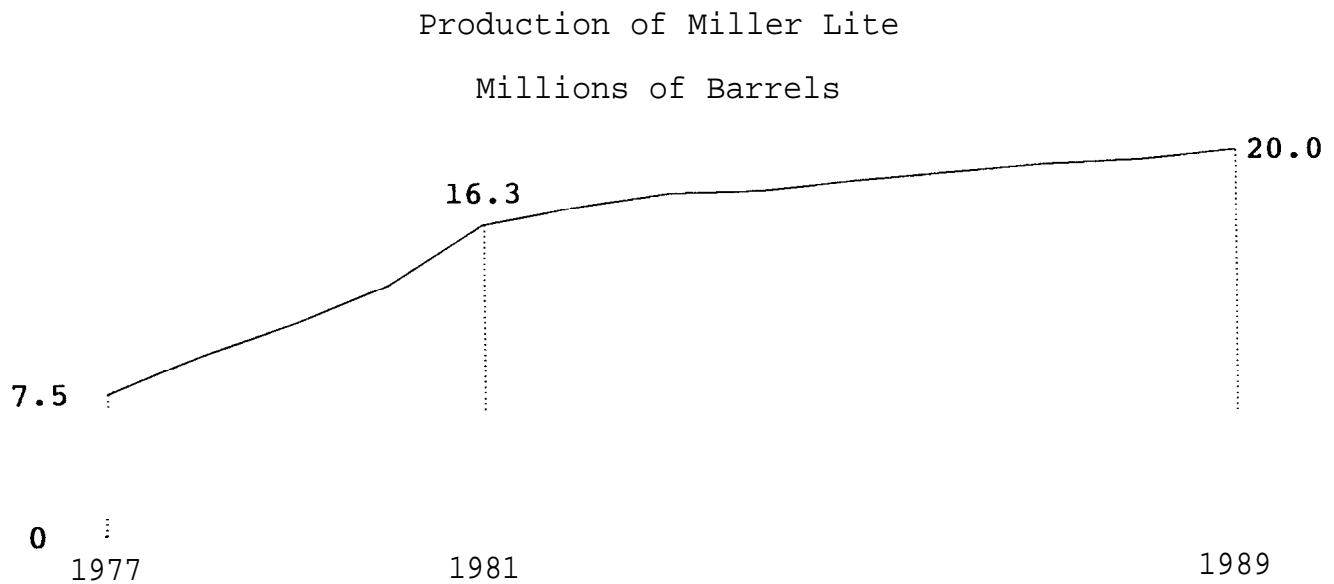
Exhibit 11. New, Improved Pie Chart

Annual U. S. Beer Consumption
Gallons per Capita



Gallonage: John C. Maxwell, Jr., Wheat First Securities
Reported in: "Beverage Industry", February 1990

Exhibit 12. Sparse Annotation: End-points and Maximum Only



Data Source: "Beverage Industry"

Exhibit 13. Sparse Annotation: End-points and Trend-Change Point Only