

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

LeRoy Bessler

Bessler Consulting & Research, bessler@execpc.com

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 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/limit information, how to handle the viewer's concerns when presenting partial information, and how to supplement the big picture with details. The ideas presented are technology-independent.

For a broader discussion of effective design, please see the author's paper "Visual Communication Art & Science: The Design Guide and Gallery for Clear, Convincing Graphs, Tables, Maps, and Text" in *Proceedings of the Twenty-Fourth Annual SAS Users Group Conference*, SAS Institute Inc. (Cary, N.C.), 1999.

Pulitzer's First Rule

"Put it before them briefly so they will read it."

Text Parts of Charts

Avoid redundant information. On a plot or bar chart, omit axis labels when that information is self-evident from tickmark labels (e.g., if they are dates) or mentioned in a title. (See Figures 8, 10, 11, 12.)

Make the chart title a headline. (See Figures 10, 11, 12.) State the message or meaning of the chart, rather than simply provide an uninspiring statement of chart 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 (Figure 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 (Figure 4).

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

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. (See Figures 5, 6, 7, 8, 9.)

However, 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 (Figures 5 & 6)

Focus attention on high-impact categories. Often the high-ranking categories that can be fit on one page account for 80-99% 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, etc.; and/or (b) values above a minimum cut-off.

When limiting the list, provide a subtitle that your program automatically loads with a statement of what percent of the total for all observations is accounted for by the Top N observations listed in the ranking report.

Nested Ranking Report (Figure 7)

A Nested Ranking Report includes all the observations, not just the Top N or those that are above a specified minimum. It is used when the observations belong to a class and a subclass.

The observations are presented grouped by class, and the classes are presented in the order of decreasing class total response. Within a class, the observations are keyed by subclass and presented in the order of decreasing response.

Ranking Shares of the Whole When Numerous: Annotated Ranked Horizontal Bar Chart (Figure 8)

When the shares of the whole are too numerous or too small, there may not be room to display pie slice description, value, and percent of whole.

An annotated ranked horizontal bar chart is a feasible solution. In any case, an ordered horizontal bar chart is always 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 (Figure 9)

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, N.C.), 1995.

Sparse Annotation (Figures 10, 11, & 12)

With Sparse Annotation/Tickmarking, you suppress almost all the tick mark values on both axes.

It is most likely to be applicable for a trend chart, i.e., a graph of a response variable on the vertical axis versus a temporal value (date or time) on the horizontal axis.

When trying to draw an inference from, or influence a decision with, a trend chart, you are interested in only: (a) portraying the trend; and (b) identifying the response level at critical points, not at every single temporal instance. (The complete list of precision data belongs in a table, not a graph.)

The critical points along a trend are: starting value; ending value; intermediate maximum value, if any; intermediate minimum value, if any; points of inflection, if any; and points along the trend where something of special significance occurs.

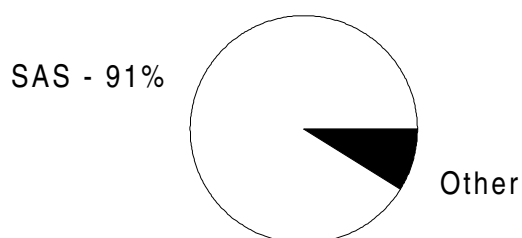
Also, you can use vertical reference lines, or other labeled eyecatchers, to indicate temporal instances where a significant environmental change occurred, with expected or obvious impact on response. You might even highlight an event to emphasize that it had *no* effect on response.

Power of the Pac-Man Pie Chart (Figures 1 & 2)

A two-part pie chart may seem trivial, if not silly. But when the share of interest to your message is tiny or huge, the image is very “impactful” and, therefore, memorable. If needed, you can 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.

Figure 1. Pac-Man Pie Chart

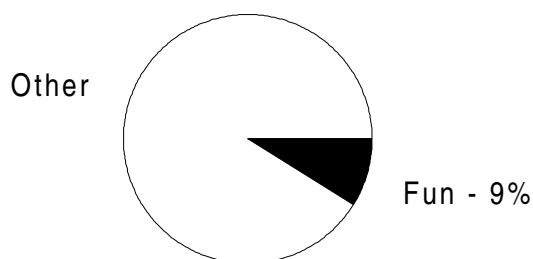
Mainframe Data Analysis Software Market Shares



Source: Computer Intelligence, 1993

Figure 2. The Other Pac-Man

Allocation of Personal Time ("Other" Probably Exaggerated)



Source: Ascetic Life, 1 April 2000

Best Choice: Graph versus Table

A chart can both depict relative size, and supply detail. Presentations or reports that deliver both image (impact) and numbers (precision) are memorable, quickly and easily comprehended, and both influencing and reliable for decisions.

Perhaps as a surprise to nobody, research has indeed confirmed the intuition that graphs lead to quicker decisions, and tables lead to more reliable decisions.

There are several effective ways to supply detail for a graph, but sometimes a companion table is the best solution (Figure 12). So, **the best answer to the question of graph versus table is often “graph and table”**. And you can put them on the same page.

Other possible and effective composite solutions (e.g., for a multi-line trend chart) entail putting significant values (e.g., averages, peaks, or ending values for the trend period) in a set of footnotes or legend entries. In this way, the footnotes or legend combine descriptive text with data to create a simple, but useful, table of significant information.

Author Information and Related Work

LeRoy Bessler, Ph.D.
 Visual Communication Power
 Bessler Consulting & Research
 PO Box 96
 Milwaukee, WI 53201-0096, USA
 bessler@execpc.com
 414-351-6748

LeRoy Bessler is a SAS consultant, with interests in macro-based Software-Intelligent Application Development, visual communication, graphic design, information visualization, color, and InfoGeographics. An internationally recognized expert on SAS/GRAPH and graphic design, and an award winner for papers on graphic design and visual communication, Dr. Bessler is writing a book titled “Chart Smart: Design Guide and Solution Toolkit for SAS Graphs, Tables, and Maps That Inform and Influence”.

See his companion SUGI 25 paper: “Show Them Where It’s At: Data Mine the Earth’s Surface for Locational Significance of What’s Hidden in Your Data Warehouse”.

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Ralph's Grocery Store

Exceptions - March 2000

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.

Figure 3. Exception Report

Ralph's Grocery Store

Summary - March 2000

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.

Figure 4. Summary Report

Top 10 Test SAS PROCs Used
12-01-93 To 01-31-95

List accounts for 90% of 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	REG	15,047
8	PRINTTO	11,409
9	DATASETS	9,254
10	CONTENTS	7,545
		=====
		412,857

Figure 5. Top 10 Ranking Report

Ranked List of Test SAS PROCs Used
From 12-01-93 To 01-31-95

List accounts for 86% of total

Only values not less than 10,000

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	REG	15,047
8	PRINTTO	11,409
		=====
		396,058

Figure 6. Ranking Report With Cutoff

Ranking Report on Test SAS System Use
12-01-93 to 01-31-95

Rank: Product	PROC	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	2,380
	TRANSPOS	2,193
	APPEND	1,638
	SQL	1,136
	TABULATE	771
	CORR	517
	COPY	413
	PDS	133
	CATALOG	72

1: Base SAS		393,695
2: SAS/GRAPH	GPLOT	23,504
	GREPLAY	6,041
	GSLIDE	5,417
	GPRINT	5,223
	GCHART	1,284
	GMAP	836

2: SAS/GRAPH		42,305
3: SAS/STAT	REG	15,047
	GLM	1,758
	ANOVA	1,106
	TTEST	337
	NLIN	160
	STEPWISE	137

3: SAS/STAT		18,545
4: SAS/ETS	FORECAST	1,502
	EXPAND	408
	ARIMA	139

4: SAS/ETS		2,049
5: SAS/FSP	FSVIEW	745
	FSBROWSE	83
	FSEDIT	10

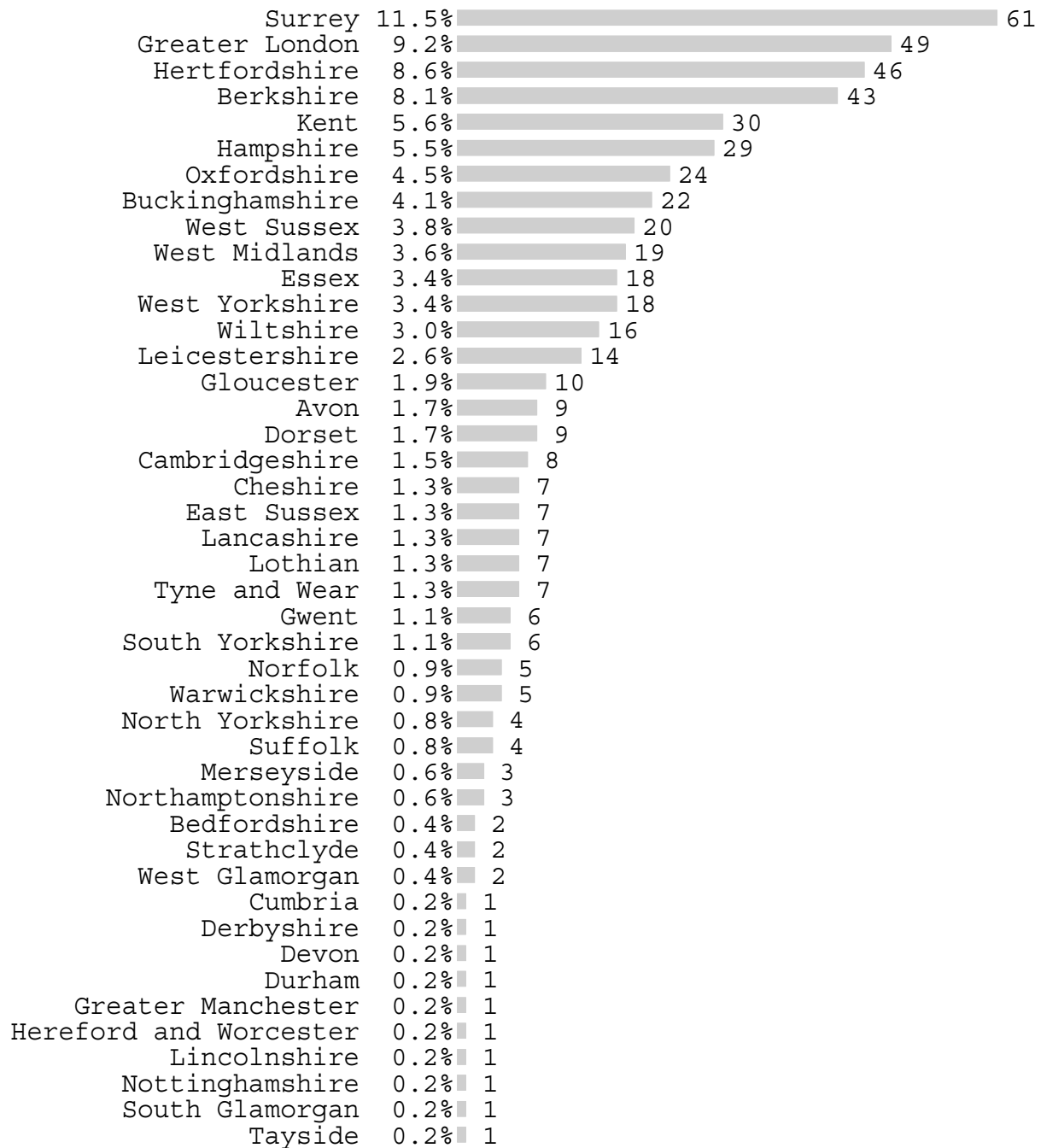
5: SAS/FSP		838
		=====
		000,000

Figure 7. Nested Ranking Report

**Figure 8. Annotated Ranked Horizontal Bar Chart:
For When No Pie Chart Will Work**

Where Are the Members of the United Kingdom SAS Users Group?

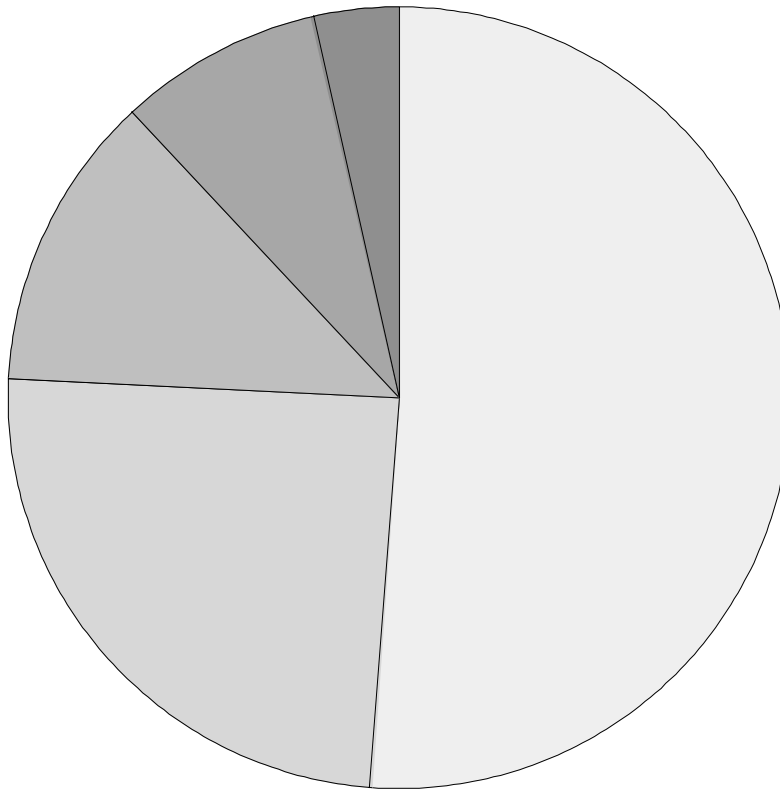
County, Percent of Total Membership, and Number of Members








Total All 44 Counties = 532

Figure 9. New, Improved Pie Chart: Legend Always Works (even when pie labels disappear)

1991 Per Capita United States Beverage Consumption
 Beverage Category, Percent of Total Consumption, Gallons
 Total Gallons All Categories = 94.5



Soft Drinks	51.2%		48.4
Beer	24.6%		23.2
Fruit Juices & Drinks	12.3%		11.6
Bottled Water	8.5%		08.0
Wine & Spirits	3.5%		03.3

Note: Awkward position of area-fill blocks in the legend due to limits of SAS/GRAPH CGM driver

Figure 10. Sparse Annotation: End-points and Maximum Only

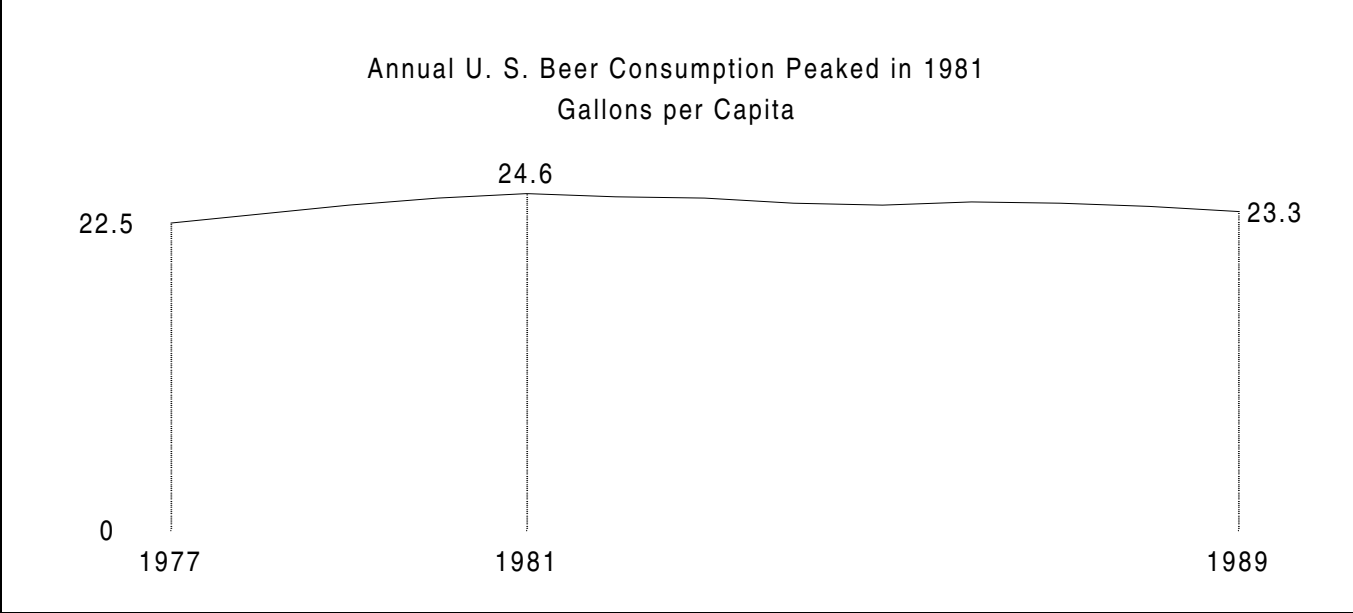


Figure 11. Sparse Annotation: End-points and Trend-Change Point Only

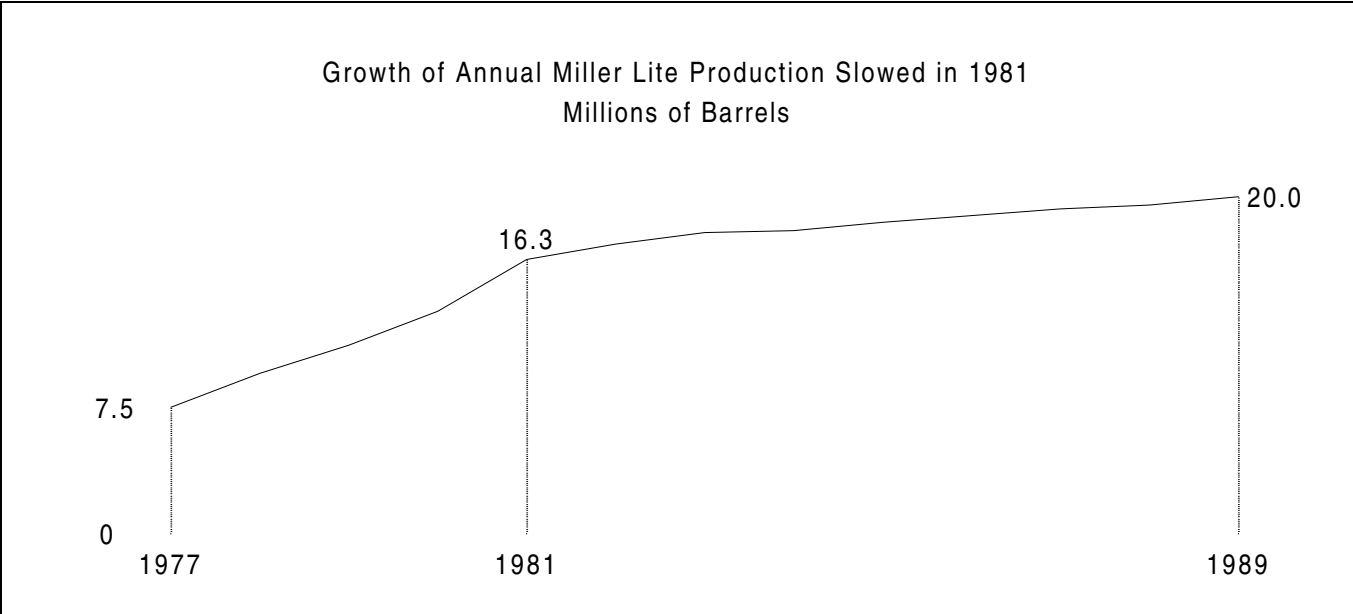
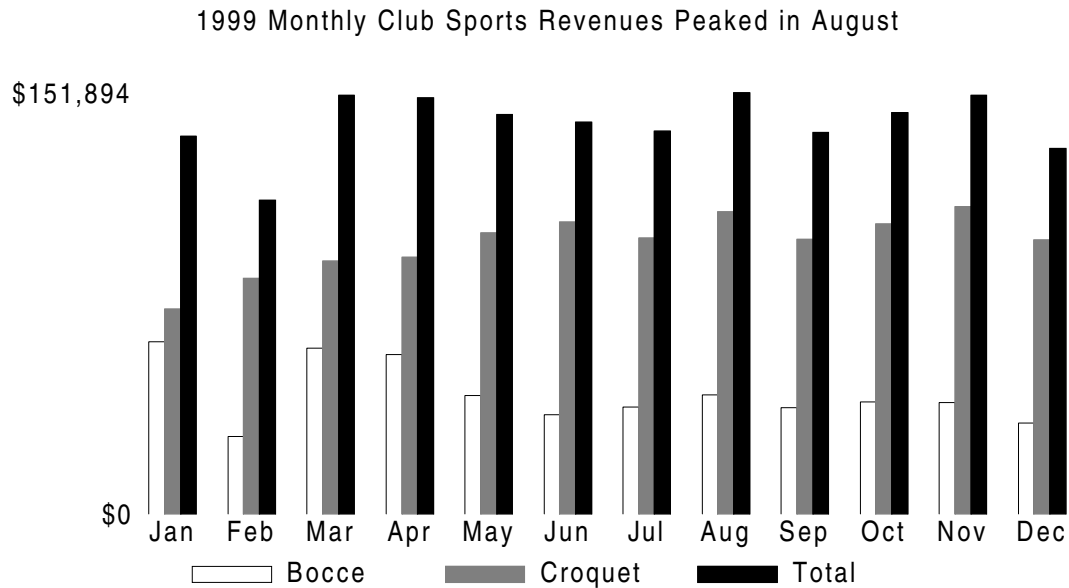


Figure 12. Composite: Sparsely Annotated Chart for Peak, Trend, & Visual Comparison With Detail Supplied in Table Below



	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