

# Producing a Browseable Statistical Package Using SAS

John Iwaniszek , George DeMuth, and Mike DeSpirito  
– Stat-Tech Services, LLC. Chapel Hill, North Carolina

## Abstract

SAS was used to produce an entire statistical report with inter-linked HTML pages. The report included graphics, tables, profiles summaries, and listings. The report provides an example and ideas for producing HTML output via SAS ODS or using our HTML output macros. Cascading Style sheets are implemented but not necessary and may result in incompatibilities between the dominant browsers. The authors have found that tables and listings organized in HTML are easier to access and more convenient to use than paper, word-processing files, or other representations of data summaries.

## Introduction

Presentation of statistical results is a fundamental part of many SAS programmers' livelihood. One of the latest formats in which results may now be displayed is HTML. HTML (Hypertext Markup Language) is a set of instructions in which displays text in a browser like Netscape or Microsoft Internet Explorer. The current version of SAS (version 8) contains a complete system for generating output in HTML form. Optionally, Base SAS can be used to produce HTML pages using simple and common DATA \_NULL\_ programming techniques. The result can be a highly interlinked set of tables, listings, graphs, and supporting documentation that is more readily accessible than paper or other electronic forms these reports may take.

## Implementing HTML pages in statistical presentations

It is beyond the scope of this paper to describe the syntax and usage of HTML. Several good guides to HTML exist at different levels of difficulty and specificity. The reader is urged to browse the Web publishing aisles at his or her local library or bookstore for a ready supply of information regarding scripting HTML pages. This paper will briefly describe a system of macros the authors developed to convey SAS data sets and other data into interlinked systems of HTML pages, and then demonstrate a simple example that uses these macros. This paper will use as its example a simple and hypothetical browseable statistical package consisting of a demographic table and some supporting listings. A full sample browseable package may be found at the time this paper was printed at <http://www.stattechservices.com>.

Figure 1 and figure 2 are presented below. They are parent (figure 1) and child (figure 2). In a browseable environment, the reader will first see the demographics table displayed in figure 1. He or she may then jump to the supporting table by activating the hyperlink imbedded in the variable label "Gender". Many other displays may be linked together in this way. One may provide an index to tables and listings, tables linked directly to supporting listings, imbedded graphics, and any number of useful and informative arrangements of statistical and verbal content. This may be accomplished using the New ODS feature in SAS V8 or, as presented below with simple DATA \_NULL\_ programming. The following program employs a system of macros developed by the authors that function as HTML primitives to effect a series of data step programs that turn a summary data step into HTML table presented in Figure 1.

Figure 1. Sample View of an HTML Demographic Page

Table 1 Summary of Demographic Data			
<a href="#">[Main Index]</a> <a href="#">[Next Table]</a> <a href="#">[Last Table]</a>			
Characteristic	Treatment Group		Total
	Placebo	Active	
<u>Gender</u>			
Female	51 (68%)	60 (72%)	111 (70%)
Male	24 (32%)	23 (28%)	47 (30%)
Total	75	83	158
Missing	0	0	0
<u>Age (yrs)</u>			
N	75	83	158
Mean	35.3	35.6	35.4
Std. Dev.	6.55	6.19	6.34
Median	36.0	35.0	36.0
Min	20.0	24.0	20.0
Max	48.0	55.0	55.0
<u>Ethnicity</u>			
African American	52 (69%)	42 (51%)	94 (59%)
Caucasian	17 (23%)	28 (34%)	45 (28%)
Hispanic	6 (8%)	13 (16%)	19 (12%)
Other			
Total	75	83	158
Missing	0	0	0

Support Documents

[Summary Table in RTF Format](#)  
[Listing 1. Demographic and Disease History](#)

Output generated by demotab.htm on 04APR00

Figure 2. Table linked to Variable Label Gender in Demographic Table

Population Profile for Gender				
	<a href="#">[Main Index]</a>	<a href="#">[Population Profile Index]</a>	<a href="#">[Next Profile]</a>	
Measure	Female		Male	
	Placebo	Active	Placebo	Active
Total Patients	51 (100%)	68 (100%)	24 (100%)	23 (100%)
Male n, %			24 (100%)	23 (100%)
Age > 35 (yr) n, %	17 (33%)	13 (22%)	10 (75%)	22 (96%)
African American n, %	34 (67%)	38 (58%)	10 (75%)	12 (52%)
Duration of Disease (mo)	6.5 (1.8)	8.4 (1.8)	11.9 (1.8)	10.4 (1.8)
Previous Disease n, %	8 (16%)	12 (18%)	4 (17%)	6 (26%)
Enzyme Related n, %	18 (35%)	20 (31%)	5 (21%)	8 (35%)
Completed Study as Planned n, %	45 (88%)	48 (88%)	20 (83%)	19 (83%)
At Least 12 Weeks Followup n, %	45 (88%)	48 (88%)	20 (83%)	19 (83%)
Any Completion n, %	5 (10%)	4 (7%)	4 (17%)	3 (4%)
Treatment Responder n, %	6 (12%)	25 (52%)	2 (8%)	13 (68%)
Success at 4 Weeks n, %	1 (2%)	1 (2%)		
Success at 8 Weeks n, %	4 (8%)	19 (37%)	1 (5%)	4 (18%)
Success at 12 Weeks n, %	24 (50%)	36 (75%)	10 (50%)	15 (79%)
Success at 6 Months n, %	22 (50%)	35 (90%)	10 (70%)	16 (94%)
Success at 1 Year n, %	16 (50%)	20 (100%)	9 (90%)	7 (100%)
Baseline Pain Score	9.1 (1.3)	9.8 (1.8)	9.5 (0.9)	9.6 (0.5)
Percent Improvement at 4 Weeks	37.9 (28.8)	18.7 (17.2)	35.9 (37.9)	17.7 (16.7)
Percent Improvement at 8 Weeks	31.3 (16.1)	39.1 (18.2)	24.8 (16.4)	36.7 (18.2)
Percent Improvement at 12 Weeks	52.7 (14.6)	63.8 (19.0)	56.2 (18.1)	56.6 (15.4)
Percent Improvement at 6 Months	54.8 (15.8)	76.1 (17.3)	54.7 (14.8)	74.9 (17.0)
Percent Improvement at 1 Year	52.4 (20.8)	88.7 (18.4)	58.2 (8.2)	86.9 (19.4)

Patient List

Female Subjects

Placebo Subjects

## Sample program

The following is a sample program that produced the table in figure 1. It takes a summary data set and outputs an HTML file using a series of macros that are essentially data step programs and program fragments. The portion of the program that produces the HTML output is shown below. The part of the program that generates the test data, and summary data set is omitted for brevity. An explanation of the function of each macro used in the program follows in table 1.

```
%starthtm(file=demotab.htm,title=Demographic Table) ;

%text(%bquote(Table 1),big=1,bold=Y) ;
%text(%bquote(Summary of Demographic Data),big=1,bold=Y) ;

%hr ;

%table(border=0,width=%bquote(60%)) ;
  %tbody ;
    %tr ;
      %tc ;
        %link(url=index.htm,text=%bquote([Main Index])) ;
      %tc ;
      %tc ;
        %link(url=basetab.htm,text=%bquote([Next Table])) ;
      %tc ;
    %tr ;
  %tbody ;
%table ;
```

```

        %tcelle ;
    %tcell ;
        %link(url=efftab2.htm,text=%bquote([Last Table])) ;
        %tcelle ;
    %trowe ;
%tbodye ;
%endtable ;

%hr ;

%text(<PAR> </PAR>) ;

%tmakei(data=_pset,border=1,rules=all,
        width=%bquote(60%),line=_morder) ;

%tmcol(var=_char,fmt=$70.,just=1,label=Characteristic) ;
%tmspan(text=Treatment Group) ;
    %tmcol(var=_col1,fmt=$18.,label=Placebo) ;
    %tmcol(var=_col2,fmt=$18.,label=Active) ;
    %tmspend ;
%tmcol(var=_totcol,label=Total,fmt=$18.) ;

%tmake ;

%text(%str( )) ;
%text(par=N) ;
    %link(url=demotab.rtf,text=Summary Table in RTF Format) ;
    %text(%bquote(</P>),par=N) ;

%text(%str(Support Listings:)) ;
%text(par=N) ;
    %link(url=demolist.htm,text=%bquote(Listing 1, Demographic and Disease History)) ;
    %text(%bquote(</P>),par=N) ;

%text(%str( )) ;
%text(%bquote(output generated by demotab.sas on) &sysdate) ;

%endhtml ;

```

Table 1. Directory of HTML Macros

BLANK	Adds blank lines in the output file
ENDFRAM	Terminate frame HTML output
ENDHTML	Terminate HTML output
ENDTABLE	Terminate a custom TABLE
FRAME	Initialize frame structure for an HTML file
GRABTITL	Format and print SAS TITLE and FOOTNOTES
HR	Horizontal Rule
IMG	Image
INSFILE	Insert text file
LINK	Link
PRTLST	Print data set to list
PRTVAR	Print variable
STARTHTM	Start an HTML table
TABLE	Start a custom table
TBODY	Start the table BODY in a custom table

TBODYE	Terminate the table BODY in a custom table
TCELL	Start a table CELL in a custom table
TCELLE	Terminate a table CELL in a custom table
TEXT	Add custom text in a HTML table
TFOOT	Start the footnote(TFOOT region for a in a custom table)
TFOOTE	Terminate the footnote(TFOOT region for a in a custom table)
THEAD	Start the header(THEAD region for a in a custom table)
THEADE	Terminate the header(THEAD region for a in a custom table)
TMAKE	Print a Table created with the HTML table generation system
TMAKEI	Initialize the HTML table generation system
TMCOL	Add a column to a table in the HTML table generation system
TMSPAN	Add a spanning header to a table in the HTML table generation system
TMSPEND	Terminate a spanning header region for a table in the HTML table generation system
TROW	Start a ROW in a custom table.
TROWE	Terminate a ROW in a custom table.

## Conclusion

The preceding discussion has been a very brief and sketchy outline of an argument in favor of producing statistical packages as interlinked HTML pages. Included was an example of how to use SAS to produce hypertextual tables, listings and supporting documentation. The macros are a convenient means to produce these types of displays, but the SAS programmer has other options, notably ODS and more direct DATA \_NULL\_ programming. It is our opinion that programmers probably need a working knowledge of HTML to accomplish this task, regardless of the route he or she takes. The various programming provide the bulk of the HTML scripting, but (inevitably) the programmer will find that a little HTML is a very useful and easily acquired tool.

