

Delivering South Carolina Health and Demographic Information via the Web Using SAS/IntrNetTM Software

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Abstract

This paper describes the use of SAS/IntrNetTM software to develop a health information query system available to the public via the web. The Office of Research and Statistics(ORS), collects various health and demographic data. These data include hospitalizations, census and numerous other data. ORS undertook the challenge to condense much of its data and make it available to the public via the web using SAS® and SAS/IntrNetTM software. The data were summarized by selected categories and a “query system” was designed using SAS/IntrNetTM software, SAS® web publishing tools and HTML forms. The use of SAS® and SAS/IntrNetTM software allowed ORS to condense its data and make it readily available via the web. ORS receives numerous requests from various sources. Using the query system, requestors may obtain needed information in minutes instead of days. The SAS® query system has helped numerous people receive information expediently and has also allowed our staff to pursue other pertinent projects. Overall, the development of a query system using SAS/IntrNetTM software has been an asset to ORS.

Introduction

The Office of Research and Statistics(ORS), of the South Carolina State Budget and Control Board, is charged with gathering, analyzing, and publishing data vital to the health, economic and social well being of South Carolina. ORS is often overwhelmed with requests from hospitals, government agencies, health insurance companies, the general public and many other sources. In order to provide faster service to requestors, ORS made the decision to make much of its frequently requested data available on the web at <http://www.ors.state.sc.us>.

The web site contains a wide variety of information from standard reports to a detailed query system. Most of the data maintained by ORS is created using SAS®; therefore it seemed logical to use SAS/IntrNetTM software to make data available on the web. SAS® web publishing tools along with HTML forms were used to create various “query systems”. The query systems were designed to maximize information delivery and minimize wait time.

Methods

One the biggest challenges faced in developing this web site was the massive size of ORS databases. Many of the data sets contain millions of records with several hundred variables. To maximize efficiency, the large databases were summarized using PROC SUMMARY by selected characteristics. The web user is then prompted to make selections from the summarized data set using an HTML form. The values from the HTML form are then passed to a SAS® program, which generates HTML output from the pre-summarized data, based on the selections chosen by the user. SAS® web publishing macros were also incorporated in order to format SAS® output as HTML. An example of a query is shown in Figure 1 and Figure 2. An example of a SAS® program is shown in figure 3.

The example shown in figures 1-3 is an example of one of the more simple queries. This example is taken from the ORS inpatient hospital discharge database that contains around 450,000 records per year. ORS receives many requests for simple information such as the top reasons for hospitalization for a particular age group, county, year etc. In the past, it may have taken a staff member a couple of days to fill the request; now the requestor can receive this information in a matter of seconds through the ORS web site. The steps required to achieve this task are described below.

First, the data were summarized by all of the categories the requestor may be allowed to choose using a PROC SUMMARY procedure. This reduced the size of the database considerably in order to make the query run quickly. Next, an HTML form was written using the same categories by which the data was summarized. Included in the form is the name of the SAS® program that will generate the requested data.

Upon selecting the submit button, the values chosen by the requestor will be sent to the appropriate SAS® program to generate the requested data. The SAS® program must contain many things. For example the location of the requested data must be properly referenced using a library name. Also, the values that will be received by the program from the HTML form must be specified in a global macro statement. In this particular case, the ds2htm SAS® web publishing macro was used to present the data. This macro automatically formats the SAS® output as HTML and allows some specifications for color, fonts, and other user specified parameters. This

macro is basically the equivalent of a PROC PRINT. Overall, the example shown in Figure 3 accepts the values from the HTML form and prints out the appropriate data set based on the parameters requested.

The example shown in Figure 4 is a more complex. This code shows how a hyperlink can be embedded into the generated SAS® output. This example is taken from the ORS emergency room hospital discharge database. This program generates the top 50 reasons for emergency room visits for specified age, race, gender and county groups. If one of the top reasons is for a type of injury, the user will be allowed to hyperlink to another SAS® program that will show information on the causes of the injury. The embedded hyperlink will only show for diagnosis codes related to injury and will also send the selected values into the next SAS® program to generate further information.

One must also consider whether or not to allow multiple selections on the HTML forms. If a selection is multiple on the HTML form, then this must also be accounted for in the global macro statement in the SAS® program. SAS® will create several other macro variables for a multiple selection. These will be variable0 as well as variable1 to variable*n*, which are the actual selected values (SAS Institute Inc. 1997, p.287). Variable0 is the total number of selections made by the user and can be used in iterative macro processing such as the %do statement (SAS Institute Inc. 1997 p.288). An example of how to incorporate a multiple selection for a variable such as diagnosis follows:

```
Libname net '/internet';
%macro mult;
%global diag diag0 diag1;
%do i=1 %to %superq(diag0);
%ds2htm(data=net.diag,var=rank drg dname14
cnt pct,where=diag eq "%superq(diag&i)",
talign=center,bgtype=color,bg=violet,bwidth=5,c
pad=4,tbbgcolr=white,tsize=4,tcolor=white,csize
=3,ccolor=ltpurple,htmlfref=_webout,runmode=s
);
%end;
%mend mult;
%mult;
```

As shown above, the macro variable diag0 and diag1 as well as diag must be included in the global statement if there is a multiple selection. The %do loop

will iterate through the data until the total number of selections is reached(diag0).

Although the programming and designing of the ORS query system was somewhat complex, now that a process has been established updating and maintaining the system is not a large burden.

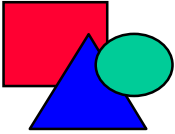
Conclusion

The development of the ORS web site has been a definite asset to the office. The development of the SAS® query system has allowed requestors to receive timely answers to pertinent questions. The system has also enabled staff members to spend less time filling requests and more time working on other important projects. Overall, the use of SAS/IntrNet™ software was a logical choice for ORS since almost all of the data sets are maintained in SAS®. The endeavor with SAS/Intrnet™ software has been successful for ORS and we intend to expand our site much more in the near future.

References

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- SAS Institute Inc. 1997. Running SAS® Applications on the Web Course Notes. Copyright 1997 by SAS Institute Inc., Cary, NC.
- SAS Institute Inc. 1997. Using Web Publishing Tools with SAS® Output. Copyright 1997 by SAS Institute Inc., Cary, NC.
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Figure 1-Example of HTML Form Used to Submit SAS® Query



South Carolina Budget & Control Board Office of Research and Statistics

Redistricting

Economics

Geodetic Survey

Technology Planning and Management

Health & Demographics

Census

Special Projects

Home Page

Email Us!

Top 25 Reasons for Inpatient Hospitalization by County, Age, Race and Gender Group

Select the Age Group:

Select the County:

Select the Race:

Select the Gender:

Select the year:

Figure 2-Example of Output Generated from SAS/IntrNet™ Query

Top 25 Reasons For Inpatient Hospitalization by Selected Groups

1997 Inpatient Hospital Discharge Database

Office of Research and Statistics

Race Total Gender Total County Total Age Group 0 to 18

DRG NAME	DISCHARGES	PERCENT OF TOTAL
TOTAL	36,977	100.0
BRONCHITIS & ASTHMA AGE 0-17	4,820	13.0
SIMPLE PNEUMONIA & PLEURISY AGE 0-17	3,044	8.2
ESOPHAGITIS, GASTROENT & MISC DIGEST DISORDERS AGE 0-17	2,886	7.8
VAGINAL DELIVERY W/O COMPLICATING DIAGNOSES	2,360	6.4
NUTRITIONAL & MISC METABOLIC DISORDERS AGE 0-17	1,722	4.7
VIRAL ILLNESS & FEVER OF UNKNOWN ORIGIN AGE 0-17	1,300	3.5
CHILDHOOD MENTAL DISORDERS	873	2.4
SEIZURE & HEADACHE AGE 0-17	860	2.3
OTITIS MEDIA & URI AGE 0-17	780	2.1
RED BLOOD CELL DISORDERS AGE 0-17	754	2.0
PSYCHOSES	745	2.0
KIDNEY & URINARY TRACT INFECTIONS AGE 0-17	552	1.5
FULL TERM NEONATE W MAJOR PROBLEMS	495	1.3
APPENDECTOMY W/O COMPLICATED PRINCIPAL DIAG W/O CC	493	1.3
LARYNGOTRACHEITIS	484	1.3
VAGINAL DELIVERY W COMPLICATING DIAGNOSES	461	1.2
DIABETES AGE 0-35	424	1.1
POISONING & TOXIC EFFECTS OF DRUGS AGE 0-17	374	1.0
SEPTICEMIA AGE 0-17	343	0.9
CRANIOTOMY AGE 0-17	304	0.8
LOWER EXTREM & HUMER PROC EXCEPT HIP, FOOT, FEMUR AGE 0-17	296	0.8
CELLULITIS AGE 0-17	294	0.8
CESAREAN SECTION W/O CC	286	0.8
OTHER ANTEPARTUM DIAGNOSES W MEDICAL COMPLICATIONS	286	0.8

This request took 0.02 seconds of real time (v1.0 build 1036).

Figure 3-Example of SAS® Program Used for Internet Query

```
libname net '/ub';
title; footnote;
%macro ub;
%global agegr year countyn sexn racen;
%if %superq(year)=1996 %then %do;
title 'Top 25 Reasons For Inpatient Hospitalization By Selected
Groups';
title2 '1996 Inpatient Hospital Discharge Database';
title3 'Office Of Research and Statistics';
%ds2htm(data=net.newtop25,var=rank drg dname14 cnt pct,
where=agegr eq "%superq(agegr)" & countyn eq
"%superq(countyn)" & sexn eq "%superq(sexn)"
and racen eq "%superq(racen)",
caption=Race %superq(racen) Gender %superq(sexn) County
%superq(countyn) Age Group %superq(agegr&b),center=Y,
talign=center,bgtype=color,bg=violet,bwidth=5,cpad=4,tbbgcolr=
white,tsize=4,tcolor=white,csize=3,ccolor=ltpurple,
htmlfref=_webout,runmode=s,encode=n);
%end;
%mend ub;
%ub;
```

```
where=agegr eq "%superq(agegr)" & racen eq "%superq(racen)"
& sexn eq "%superq(sexn)"
& countyn eq "%superq(countyn)",
caption=Race %superq(racen) Gender %superq(sexn) County
%superq(countyn) Age Group %superq(agenam),center=Y,
talign=center,bgtype=color,bg=red,bwidth=5,cpad=4,tbbgcolr=
white,tsize=4,tcolor=white,csize=3,ccolor=ltpurple,
htmlfref=_webout,runmode=s,encode=n);
%end;
%mend loop;
%loop;
```

Figure4- Example of Source Code to Embed HTML Hyperlinks Into SAS® Output

```
libname ub '/internet';
title; footnote;
%macro loop;
%global agegr year countyn sexn racen;
%if %superq(year)=1996 %then %do;
data new; set ub.%superq(ages); if (('800' le pdthre le '904') or
('910' le pdthre le '995'))
and agegr eq symget("agegr") and racen eq symget("racen") and
countyn eq symget("countyn")
and sexn eq symget("sexn");
length label $ 200;
retain fmtname 'DIAGN' type 'C';
start=pdthre; end=pdthre;
label='<a href="" || "%superq(_url)?" ||
'_service=' || "%superq(_service)&"||
'_program=' || "%superq(_pgmlib).ecode.sas&"||
'agegr=' || "%superq(agegr)&"||
'countyn=' || "%superq(countyn)&"||
'sexn=' || "%superq(sexn)&"||
'racen=' || "%superq(racen)&"||
'pdthre=' || pdthre || "">
||trim(pdthre)||' </a>';
proc format cntlin=new; run;
data ertop; set ub.%superq(ages);
if (('800' le pdthre le '904') or ('910' le pdthre le '995')) then
do;
format pdthre $diagn.; end; run;
title 'Top 50 Reasons For Emergency Room Visits By Selected
Age Groups';
title2 '1996 Outpatient Hospital Discharge Database';
title3 'Office Of Research and Statistics';
title4 'NOTE: The codes underlined in blue are diagnosis codes
for injuries, ';
title5 ' you may click on these codes to receive information on
the causes of the injury.';
%ds2htm(data=ertop,var=pdthre dname14 cnt pct,
```