

Automatic Referencing SAS® Macro Variables Using Array Processing, CALL SYMPUT Routine and DO Loops

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ABSTRACT

This paper illustrates how one can use the combination of array processing, SAS® macro facility, CALL SYMPUT routine, and iterative DO loops to automatically assign titles and labels to address corresponding variables in the frequency tables.

In the Adult/Adolescent Spectrum of Diseases (ASD) project at Centers for Diseases Control and Prevention(CDC), there is a need to produce frequency tables for each of the 23 1987-definition AIDS Opportunistic Illnesses (OI). By using the technique described herein, one can set up an array with all 23 AIDS OI names, use SAS macro to set up macro variable for future reference, use CALL SYMPUT routine to assign value to macro variable which can be used later in the title statement and label statement for each AIDS OI name in the frequency table, and use DO Loops to perform this task repetitively for each of the 23 AIDS OI names.

This technique can be applied widely to any program which requires users to reference multiple variables repetitively in the title and label statement of the frequency procedure or tabulate procedure.

INTRODUCTION

In the Adult/Adolescent Spectrum of Diseases (ASD) project at Centers for Diseases Control and Prevention, there is a need to produce frequency tables for each of the 23 1987-definition AIDS Opportunistic Illnesses (OI) by

race, sex and mode of exposure.

In order to produce a summary table which contains counts of all 23 AIDS OIs by sex from the frequency tables, a SAS array is used to contain all 23 AIDS OI names, SAS macro is used to set up macro variables for future reference, then CALL SYMPUT routine is used to assign value to macro variable which can be referred later as a value of a variable for each AIDS OI in a DATA STEP, and DO Loop is used to perform this task repetitively for each of the 23 AIDS OI names, finally PROC TABULATE is used to produce one two-dimensional summary table which contains counts and total for all 23 AIDS OIs by sex .

THE MACRO

The complete macro is presented in Appendix A. Important codes are highlighted here for explanation.

```
ARRAY DXNAME{23} $ ('CANDLUNG',
'CANDESOP', 'COCCI', 'CRYPTOCO',
'CRYPTOSP', 'CMV', 'CMVRET',
'DEMENTIA', 'HERPES', 'HISTO',
'ISOSPORIASIS', 'KS', 'BURKL', 'BRAIN
LYMPHOMA', 'MAVIUM', 'TB', 'MYCO',
'PCP', 'PML', 'SALMONELLA', 'TOXOP',
'WASTING');
```

The above array statement put all 23 AIDS OI names in it for future reference.

```
%DO I=1 %TO 23;
  IF (DX(&I) NE ' ' AND DX(&I) NE '8'
  THEN OIDX&I=1;
%END;
```

APPLICATIONS DEVELOPMENT

The above DO loop is to set up a macro variable OIDX&I for each OI to be used later in the frequency table.

```
DATA _NULL_;  
  SET OI(KEEP=DXNAME&I);  
  CALL SYMPUT('OINAME',  
    PUT(DXNAME&I,$10.));  
RUN;
```

The above data step use CALL SYMPUT routine to assign value, which was defined in the array statement, to another macro variable OINAME.

```
PROC FREQ DATA=OI;  
  TABLES (OIDX&I) * SEX /  
    OUT=OIDX&I NOPRINT;  
RUN;
```

The above frequency table output counts of specific AIDS OI with sex variable to a dataset.

```
DATA OIDX&I(DROP= OIDX&I)  
  SET OIDX&I(KEEP= OIDX&I SEX  
    COUNT);  
  IF OIDX&I=1;  
  OINAME="&OINAME";  
RUN;
```

The above frequency table invokes macro variable &OINAME which contains a specific AIDS OI name and assign it to a variable which is used later in the summary table.

```
DATA OIALL;  
  SET OIDX1;
```

```
RUN;
```

```
%DO I=2 %TO 23;  
  DATA OIALL;  
    SET OIALL OIDX&I;  
  RUN;  
%END;
```

The above DATA STEP and DO loop is to combine all counts of 23 AIDS OI into one dataset for generating the summary table.

CONCLUSION

This technique can be applied widely to any program which requires users to reference multiple variables repetitively in the title and label statement of frequency procedure or table statement of tabulate procedure.

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QUESTIONS? COMMENTS?

Your questions and comments are valued and encouraged! Contact the author at :

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APPENDIX A.

/* EXAMPLE OF SAS PROGRAM LISTING*/

```
*****
* CREATED BY: PEI-CHUN WAN (404)639-2044 *
* *
* THIS PROGRAM IS WRITTEN FOR ASD *
* FREQUENCY OF EACH 1987-DEF. AIDS OI *
* - TOTAL AND BY SEX RACE AND MODE IN ASD *
* - AMONG PERSONS WHO ARE DEAD AND AMONG PERSONS WITH AIDS *
*****;
```

```
OPTIONS LS=80 PS=66 MLOGIC MPRINT SYMBOLGEN PAGENO=1;
```

```
LIBNAME XYZ 'path';
```

```
%LET MONTH=JUNE;
```

```
%LET YEAR=1996;
```

```
%MACRO DATA;
```

```
DATA OI(KEEP= OIDX1-OIDX23 DXNAME1-DXNAME23 REP_ST _SEX );
```

```
SET XYZ.JUNE96( KEEP=OK REP_ST PATNO FORM FRSTDATE STAT SEX
CANDLUNG CANDESOP COCCI CRYPTO CO CRYPTOSP CMV CMVRET
DEMENTIA HS HISTO ISO KS BURKL IBL PLB MAVIUM TB MYCO PC PML
SALS TP WASTING);
```

```
BY REP_ST PATNO;
```

```
WHERE OK = '1' AND FORM NE '0' ;
```

```
ARRAY DX{23} $ CANDLUNG CANDESOP COCCI CRYPTO CO CRYPTOSP CMV
CMVRET DEMENTIA HS HISTO ISO KS BURKL IBL PLB MAVIUM TB MYCO PC
PML SALS TP WASTING;
```

```
ARRAY DXNAME{23} $
('CANDLUNG','CANDESOP','COCCI','CRYPTO CO','CRYPTOSP',
'CMV','CMVRET','DEMENTIA','HERPES','HISTO','ISO','KS',
'BURKL','IBL','PLB','MAVIUM','TB','MYCO','PCP','PML','SAL','TP','WASTING');
```

```
RETAIN AIDS OIDX1-OIDX23 0 _SEX;
```

```
IF FIRST.PATNO THEN DO;
```

```
AIDS=0;
```

```
%DO I=1 %TO 23;
```

```
OIDX&I=0;
```

APPLICATIONS DEVELOPMENT

```
%END;
  _SEX=SEX;
END;

DO I=1 TO 23 ;
  IF DX(I) NE ' ' AND DX(I) NE '8' THEN DO;
    AIDS = 1;
    I=23;
  END;
END;

%DO I = 1 %TO 23;
  IF DX(&I) NE ' ' AND DX(&I) NE '8' THEN OIDX&I=1;
%END;

IF LAST.PATNO AND (AIDS=1) AND STAT=2 THEN OUTPUT;
/* SELECT 1987 DEF. AIDS */
RUN;
%MEND DATA;

%MACRO FTABLES;
  %DO I=1 %TO 23;
    DATA _NULL_;
      SET OI(KEEP=DXNAME&I);
      CALL SYMPUT('OINAME',PUT(DXNAME&I,$10.));
    RUN;

    PROC FREQ DATA=OI;
      TABLES (OIDX&I) * _SEX / OUT= OIDX&I NOPRINT;
    RUN;

    DATA OIDX&I(DROP=OIDX&I);
      SET OIDX&I(KEEP=OIDX&I _SEX COUNT);
      IF OIDX&I=1;
      OINAME="&OINAME";
    RUN;
  %END;

DATA OIALL;
  SET OIDX1;
RUN;

%DO I=2 %TO 23;
  DATA OIALL;
    SET OIALL OIDX&I;
```

```
RUN;  
%END;  
  
PROC TABULATE DATA=OIALL;  
  CLASS OINAME _SEX;  
  VAR COUNT;  
  TABLE OINAME, _SEX * COUNT * SUM ALL * COUNT * SUM /RTS=12;  
  FORMAT COUNT 8.;  
  KEYLABEL ALL='*TOTAL*' SUM=' '  
  TITLE1 " ASD- 1997-DEF. AIDS OI BY SEX";  
RUN;  
  
%MEND FTABLES;  
  
%DATA;  
%FTABLES;  
  
/* END OF SAS PROGRAM LISTING */
```