PharmaSUG 2020 - Paper QT-289

Highlight changes: An extension to PROC COMPARE

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ABSTRACT

Although version control on the files, datasets or any document can be challenging, COMPARE® Procedure provides an easy way to compare two files and indicate the differences between them. The paper utilizes the comparison results from PROC COMPARE® and builds it into a SAS® macro to highlight changes between files in terms of addition, deletion or an update to a record in a convenient excel format. Some common examples where this utility can be useful is comparing CDISC Controlled Terminology (CT) release versions, comparing Medical dictionary versions like MedDRA, WHODrug, or comparing certain Case Report Form (CRF) data like Adverse Events (AE) to review new events being reported at various timepoints for data monitoring purposes.

INTRODUCTION

COMPARE® Procedure is widely used to exhibit differences between two files. It has several useful options to control the results that are of interest to the user. The macro ***%diff_report*** discussed in the paper utilizes PROC COMPARE results along with some data manipulations to produce a very comprehensive excel report using the ODS EXCEL® system.

MACRO DESCRIPTION

The macro definition is as below:

```
%diff_report(newds     = , /* Name of the current or latest dataset        */
             oldsds    = , /* Name of the previous dataset to compare with */
             unqkey    = , /* Unique list of variables to identify records */
             vars2cmp  = , /* List of variables to compare, default is ALL */
             outdsn    =   /* Name of the output dataset or excel file     */
             );
```

Here the parameter “unqkey=” assumes a list of variables [separated by space (“ “) as delimiter] which are able to uniquely identify the records in the datasets. These variables support the comparison in the form of ID variables in COMPARE Procedure. If no unique key(s) is provided, the program will abort and request to re-assess this parameter again.

The other parameter “vars2cmp=” takes a list of variables [separated by space (“ “) as delimiter] on which the comparisons are to be made. If no value is provided, then it includes all the variables in the dataset for comparison.

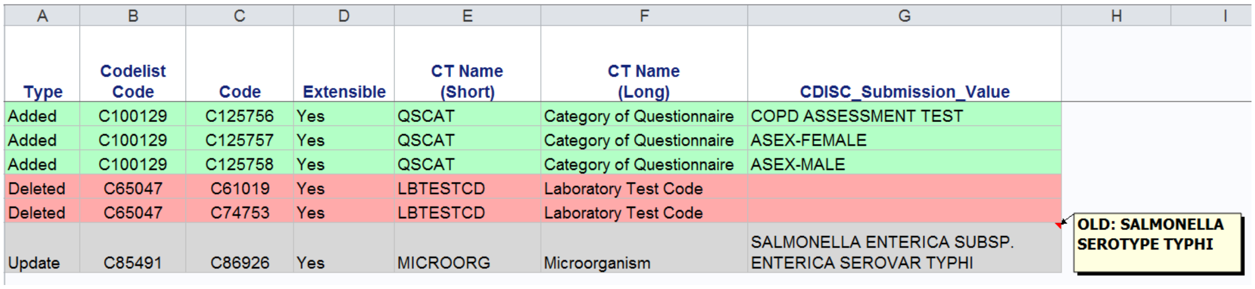
Sample call looks like:

```
      %diff_report(newds    = NEW,
                   oldsds   = OLD,
                   unqkey   = Var1 Var2 Var3,
                   vars2cmp = , /* default is ALL */
                   outdsn   = DIFF
                   );

      %diff_report(newds    = NEW,
                   oldsds   = OLD,
                   unqkey   = Var1 Var2 Var3,
                   vars2cmp = Var4 Var5 Var6 Var7,
                   outdsn   = DIFF
                   );
```

MACRO REPORTS

Sample report created from the macro is shown below (Display 1 & Display 2)

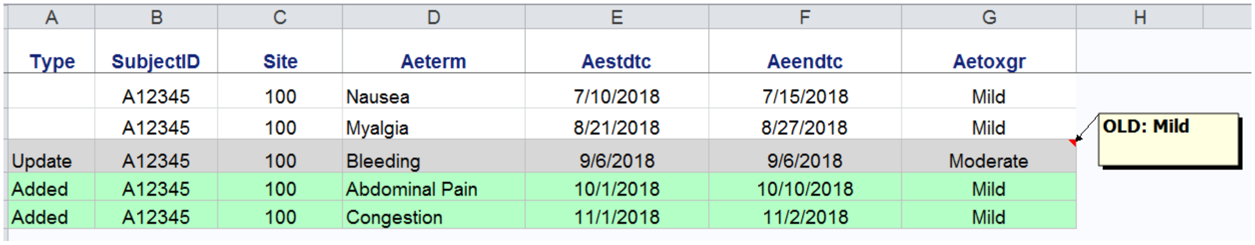


Type	Codelist Code	Code	Extensible	CT Name (Short)	CT Name (Long)	CDISC_Submission_Value
Added	C100129	C125756	Yes	QSCAT	Category of Questionnaire	COPD ASSESSMENT TEST
Added	C100129	C125757	Yes	QSCAT	Category of Questionnaire	ASEX-FEMALE
Added	C100129	C125758	Yes	QSCAT	Category of Questionnaire	ASEX-MALE
Deleted	C65047	C61019	Yes	LBTESTCD	Laboratory Test Code	
Deleted	C65047	C74753	Yes	LBTESTCD	Laboratory Test Code	
Update	C85491	C86926	Yes	MICROORG	Microorganism	SALMONELLA ENTERICA SUBSP. ENTERICA SEROVAR TYPHI

OLD: SALMONELLA SEROTYPE TYPHI

Display 1: Comparison between CDISC Controlled Terminology (CT) versions

Display 1 highlights records which were added, deleted and updated when comparing two versions of the CDSIC CT file.



Type	SubjectID	Site	Aeterm	Aestdtc	Aeendtc	Aetoxgr
	A12345	100	Nausea	7/10/2018	7/15/2018	Mild
	A12345	100	Myalgia	8/21/2018	8/27/2018	Mild
Update	A12345	100	Bleeding	9/6/2018	9/6/2018	Moderate
Added	A12345	100	Abdominal Pain	10/1/2018	10/10/2018	Mild
Added	A12345	100	Congestion	11/1/2018	11/2/2018	Mild

OLD: Mild

Display 2: Comparison between Adverse events data versions

Display 2 highlights records which got modified when comparing two Adverse Events (AE) datasets at different timepoints.

A new column "Type" is added as the 1st column to indicate the type of change noted while comparing the two files. Some visual enhancements are made with the background color corresponding to the type of change and a comment box (SAS style- "flyover") is added to display the old value in comparison with the current value for a given cell when the type of change is "Update".

Please refer to APPENDIX for the program flow to create these reports.

CONCLUSION

The paper discussed a SAS macro which can compare two files and highlight changes between them in an easy to read excel file. Users are encouraged to enhance this macro to compare multiple datasets at the same time when stored at different sub-directories.

REFERENCES

SAS support, Add style with FLYOVER, http://support.sas.com/kb/24/275.html

CONTACT INFORMATION

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APPENDIX

```
%macro diff_report(newds    = ,    /* Name of the NEW dataset      */
                   oldds    = ,    /* Name of the OLD dataset      */
                   unqkey   = ,    /* List of key variables        */
                   vars2cmp = ALL, /* List of variables to compare */
                   outdsn   =      /* Name of the output dataset   */
                   );

/*=== Step 1: Add Checks ===*/
%* 1) Check all required Input parameters are provided;
<.. SAS code ..>;

%* 2) Check if &unqkey identifies records uniquely, otherwise ABORT;
<.. SAS code ..>;

%* 3) Check if &var2cmp parameter is provided or defaulted to ALL ;
*      - If defaulted to ALL, &vars2cmp stores all variables for comparison
         EXCEPT those listed in &unqkey
<.. SAS code ..>;

/*= Step 2: Run Compare (Restrict variables to &unqkey and &vars2cmp only)=*/
   proc compare data=&newds  comp=&oldds
                out=outcomp outnoequal outbase outcomp outdif noprint;
     id &unqkey;
     var &vars2cmp;
   run;

/*=== Step 3: Check for Added/Deleted Records ===*/
%* 1) Create a macro variable "lastkey" which holds the last variable from
      &unqkey. Example: If unqkey=var1 var2 var3 then lastkey is 'var3' ;

%* 2) Sort the dataset by &unqkey and _type_ ;
*    _TYPE_ is created by COMPARE Procedure with values-BASE, COMPARE and DIF

%* 3) Flag Added/Deleted records ;
   data add_del;
    set outcomp;
     by &unqkey _type_;
     length change $10;
       if first.&lastkey and last.&lastkey then
        do;
         if _type_="BASE" then
          do;  change='ADDED'; end;
         else if _type_="COMPARE" then
          do; change='DELETED'; end;
        end;
   run;

/*=== Step 4: Check for Updated Records ===*/
%* 1) Transpose dataset to easily identify current and previous values;
    proc transpose data= add_del out= t_add_del;
     by &idvar change;
     id _type_;
     var &vars2cmp;
    quit;
```

```
%* 2) Flag Change;
    data chg (where=(change ^= ' '));
     set t_add_del;
      by &unqkey;
      length chgtxt chgval $1000;
      diff_num = indexc(dif,"0123456789");*- Identifies numeric mismatches;
      diff_char= index(dif,"X");          *- Identifies character mismatches;
        if diff_char>0 or diff_num>0 then
        do;
          change='UPDATED'; chgtxt = strip(_name_)||">OLD:"||strip(compare);
          chgval=strip(chgval)||'#'||strip(chgtxt);
        end;
       <.. more lines of code ..>
    run;

/*=== Step 5: Combine and create Final dataset ===*/
    data &outdsn;
       <.. merge datasets- chg, &newds and &oldds by &unqkey >
       <.. more lines ..>
    run;

/*=== Step 6: Prepare EXCEL report ===*/
ods excel file = "./&outdsn";
<... ods excel options ...>

proc report data= &outdsn;
<... column and define statements ...>
/* Loop through all variables to style Added/Deleted/Updated records*/
%let dsid = %sysfunc(open(&outdsn.,i));
%do i=1 %to %sysfunc(attrn(&dsid,nvars));
 %let varn=%sysfunc(varname(&dsid,&i));
 compute &varn./char length=20; *- compute block start;
 * <... if record was Added ..> ;
 call define(_col_,"style","style=[font_weight=bold background=lightgreen]");
 * <... if record was Deleted ..> ;
 call define(_col_,"style","style=[font_weight=bold background=lightred]");
 * <... if record was Updated ..> ;
 call define(_col_,"style","style=[font_weight=bold background=lightgray
             flyover=' "||strip(chgtxt)||" ']");
 endcomp ; *- compute block end;
%end;
run;

%mend diff_report;
```