

```

%_mprintto;
options notes nosource;
proc datasets lib=work nolist memtype=data kill; quit;
/* Standard - leave this */
%let TFL_Part=%scan(&_SASPROGRAMFILE,-3,%str(/));

/* Standard - leave this */
data _null_;
    tmp="%TFL_Part";
    if tmp not in ("dev" "qc") then call symput("TFL_Part", "prod");
    call symput('TFLpath', compress("&_SASPROGRAMFILE",""));
run;
%put NOTE:
=====;
%put NOTE: Covance Study Number : 000000106326;
%put NOTE: Client Protocol ID   : ZRHM-PK-05-JP;
%put NOTE: Program Name        : tlf_anlco.sas;
%put NOTE: Purpose             : table and figure of exhaled co data;
%put NOTE: ;
%put NOTE: Input Data           : ADAM.ADBX;
%put NOTE: Output               : L_15_04_04_09(CO) T_15_2_4_09(CO)
F_15_01_02_09_1(CO) F_15_01_02_09_2(CO) ;
%put NOTE: Macros Called        : _MPRINTTO;
%put NOTE: ;
%put NOTE: Programmed by        : cvn_ahall;
%put NOTE: Creation Date        : 2014-05-30;
%put NOTE: SAS Version          : 9.3;
%put NOTE: ;
%put NOTE: == Latest Run
=====;
%put NOTE: Run by                : &sysuserid;
%put NOTE: Date/Time             :
%sysfunc(putn(%sysfunc(date()),e8601da.))T%sysfunc(putn(%sysfunc(time()),
e86011z.));
%put NOTE: ;
%put NOTE: == Modification History
=====;
%put NOTE: Date      Initials    No. Reason;
%put NOTE: 24Jun2014  AMH         3) Small n in statistics row;
%put NOTE: 24Jun2014  AMH         4) Conservative rounding of Ci and SD;
%put NOTE: 24Jun2014  AMH         5) Add CO listing to reference list;
%put NOTE: 24Jun2014  AMH         6) Ammend footnotes;
%put NOTE: 24Jun2014  AMH         7) Consistent Y axes;
%put NOTE: 24Jun2014  AMH         8) SD to SE in statistics column;
%put NOTE: 24Jun2014  AMH         9) Change symbol for overall point on
plots;
%put NOTE: 24Jun2014  AMH         10) Add dataset where clause to
listing;
%put NOTE: 24Jun2014  AMH         11) Amend Menthol to menthol;
%put NOTE: 24Jun2014  AMH         12) Amend NRT footnote;
%put NOTE: 08Aug2014  AMH         13) Center output;
%put NOTE: 08Aug2014  AMH         14) Correct figure footnotes;
%put NOTE: 23Sep2014  APH         15) Create xls spreadsheet of data;

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%put NOTE: 23Sep2014    APH           16) Move figures and footnotes outside
of plot;
%put NOTE: ;
%put NOTE:
=====;
options notes source source2 nofullstimer validvarname=upcase missing=' '
NOQUOTELENMAX/*turn off warnings about quoted strings to long*;;
ods _all_ close;
ods listing;

/*formats macro and appendix output macros*/
%include
"/cvn/projects/prj/development/000000106326/dev/adhoc/TMPLTMIX.sas";

*=====;
* START OF PROGRAM CODE                                     ;
*=====;
data adsl;
    set adam.adsl(where=(pprotfl='Y'));
    if analgrln=1 then do;
        if index(trt01a,'THS 2.2') or index(trt02a,'THS 2.2') then
colord=1;
        output;
        if index(trt01a,'CC') or index(trt02a,'CC') then colord=2;
        output;
    end;
    else if analgrln=2 then do;
        if index(trt01a,'THS 2.2') or index(trt02a,'THS 2.2') then
colord=1;
        output;
        if index(trt01a,'NRT') or index(trt02a,'NRT') then colord=2;
        output;
    end;
    else if missing(analgrln) then delete;
run;

proc sort data=adsl nodupkey out=adsl1;
    by analgrln analgrl colord subjid;
run;

proc freq data=adsl1(where=(not missing(colord))) noprint;
    table analgrln*analgrl*colord/ out =totals2(drop=percent
rename=(count=total));
run;

data _null_;
    set totals2;
    call
symput('tot'||strip(put(colord,best.))||strip(put(analgrln,best.)),strip(
put(total,best.)));
run;

*****;

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* read in data ;
*****;
proc sort data=adam.adbx(where=(anl02fl='Y' and pprotfl='Y' and
paramcd='CO' and atptn>0 and not missing(aval)
and aday in (1,3)
))
    out=adbx1;
    by analgrln;
run;

/*treatment and timpoint formats to display text rather than numbers for
listing*/
%fmt(datain=adbx1, start=trtan, label=trta, name=trt);
%fmt(datain=adbx1, start=atptn, label=atpt, name=tpt);
%fmt(datain=adbx1, start=analgrln, label=analgrl, name=grp);

data adbx;
    set adbx1;
    format trtan trt. atptn tpt.    analgrln grp.;
run;

title1 j=1 "PAGESPLIT"; /*do not change*/
title2 j=1 'PK #byvall';
title3 j=1 'Proc Mixed Procedure';
TITLE4 J=L "The where clause used on the dataset adam.adbx: anl02fl='Y'
and pprotfl='Y'"; /* 10) AMH 24Jun2014 */
%let tflno=L_15_04_04_09(CO);

%mixout1(fileout=/cvn/projects/prj/data/000000106326/TFL/&TFL_Part./&tfln
o);
options ps=28;

proc mixed data=adbx method=reml maxiter=200 order=internal;
    by analgrln;
    class subjidn trtseqan trtan aperiod atptn;
    model aval = trtseqan aperiod trtan atptn trtan*atptn / outp=pred;
    random subjidn(trtseqan);
    repeated atptn / subject=subjidn*trtan type=csh;
    lsmeans trtan / pdiff alpha=0.05 cl;
    lsmeans trtan*atptn / pdiff alpha=0.05 cl;
    ods output lsmeans=lsmeans;
    ods output diffs=diffs(where=(atptn=_atptn));
run;

/*Residual Plots*/
title3 j=1 'Residual Plots';
options ps=27; /*change this for proc plot*/

proc rank data=pred out=resid normal=vw ;
    by analgrln ;
    ranks nscore;

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var resid;
run;

proc plot data=resid hpercent=50;
by analgr1n ;
plot resid*pred / vref=0;
plot resid*nscore;
run;
quit;

%mixout2(blankn=72, halfblnk=N,title=Listing 15.4.4.9 Analysis of
Exhaled CO (ppm) During Single Use Day - PK Population);

/*data counts*/
/*timepoints*/
proc univariate data=adbx noprint;
by analgr1n;
class trtan atptn;
var aval;
output out=num1 n=n1;
run;

proc sql;
create table num2 as
select analgr1n, paramcd, trtan, count(distinct usubjid) as n1
from adbx
where not missing(aval)
group by analgr1n, paramcd, trtan;
quit;

/*Manipulate datasets for output all relevent stats on each row*/
/* _____ */

data tabout;
length out $100 stat $100;
set lsmeans(in=a) diffs(in=b) num1(in=c) num2(in=d);
/*ordering columns of treatmnts*/
if b then colord=3; /*comparision*/
else if trtan=4 then colord=1;
else if trtan in (5,7) then colord=2;
/* N row*/
if c or d then do;
ord=1;
stat=/'N';/'n'; /* 3) AMH 24Jun2014 */
out=compress(put(n1,best.));
output;
end;
/*mean (sd) row*/
if a or b then do;
ord=2;
stat='LS Mean (SE)'; /* 8) AMH 24Jun2014 */
out=compress(put(round(estimate,0.01),8.2));

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        if colord=3 then out=compress(out)||'
('||compress(put(/*round(stderr,0.001)*/CEIL(STDERR*1000)/1000,8.3))||')'
; /* 4) AMH 24Jun2014 */
        output;
        /*95% CI row*/
        ord=3;
        stat='95% CI';

out=compress(put(/*round(lower,0.01)*/FLOOR(LOWER*100)/100,8.2))||',
'||compress(put(/*round(upper,0.01)*/CEIL(UPPER*100)/100,8.2));
        output;
        end;
run;

/*Add labels for all number variables*/
/*_____*/
data tabout1;
    set tabout;
        /*subscript in tpoint labels*/
        atpt=tranwrd(put(atptn,tpt.),'T0','T`{sub 0}');
/*overall timepoint label*/
        if missing(atptn) then do;
            atptn=0;
            atpt='Overall';
        end;
/*Variable label*/
var='Exhaled CO (ppm)';
run;

/*transpose for output*/
proc sort data=tabout1;
    by analgrln atptn ord colord;
run;

proc transpose data=tabout1 out=ttabout(drop=_NAME_) prefix=col;
    by analgrln var atptn atpt ord stat;
    id colord;
    var out;
run;

/* Standard - macro for paging */
%macro outrtf(blankn=68, halfblnk=N, ref=);

/* treatment column headers and footnotes */
/*group 1*/
%let col11=THS 2.2 Menthol#(N=&tot11);
%let col21=mCC#(N=&tot21);
%let col31=THS 2.2 Menthol -#mCC;
%let foot1=%str(mCC = menthol conventional cigarettes);/* 11) AMH
22JUN2014 */
/*group 2*/

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%let col12=THS 2.2 Menthol#(N=&tot12);
%let col22=NRT gum#(N=&tot22);
%let col32=THS 2.2 Menthol -#NRT gum;
%let foot2=%str(NRT gum = Nicotine Replacement Therapy gum);/* 12) AMH
22JUN2014 */

%if &halfblnk=N %then %let halfblnk=;
%else %if &halfblnk=Y %then %let halfblnk=~;

/* Standard - just change the number to match the listing you're working
on. Also change the letters in the*/
/* bracket, eg ccb = current cigarette brands. Make sure to do this at
the top of the code too. */

%let tflno=T_15_02_04_09(CO);

/* Standard - leave this */
%let TFL_Part=%scan(&_SASPROGRAMFILE,-3,%str(/));

/* Standard - leave this */
data _null_;
    tmp="%TFL_Part";
    if tmp not in ("dev" "qc") then call symput("TFL_Part", "prod");
    call symput('TFLpath', compress("&_SASPROGRAMFILE",""));
run;

/*page numbers*/
data paging;
    set ttabout;
    by analgrln atptn;
    retain ln 0 page 0;
    if first.atptn then ln+1;
    if first.analgrln or ln>4 then do;
        page+1;
        ln=1;
    end;
    if last.analgrln then call symput("tpage",compress(put(page,best.)));
run;

/* Standard - leave this */
options number nodate orientation=landscape papersize=&p_pgsize missing='
' NOQUOTELNMAX/*turn off warnings about quoted strings too long*/;
ods escapechar='`';
%let linetop = \brdrt\brdrs\brdrw30; * needs to be 1.5pt so calculated
in twips (1/20 pt) ;
%let linebot = \brdrb\brdrs\brdrw30;
%let linebot2 = \brdrb\brdrs\brdrw15;

ods path stdlib.tl106326 (read) ;
ods results off;

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```

ods rtf toc_data/* contents*/
file="/cvn/projects/prj/data/000000106326/TFL/&TFL_Part./&tflno..rtf"
style=t106326 startpage=yes headery=1440 footery=1440 ;
ods noproctitle;

%do i=1 %to &tpage;

ODS PROCLABEL = ' ';
title ;
footnote;
%let wd=0;

data comp;
    set paging end=eof;
    by atptn ord;
    where page=&i;
    flag=1;
    call symput('grp',compress(put(analgrln,best.)));
    /* Amend title as needed */
    _firtitl="Table 15.2.4.9    Analysis of Exhaled CO (ppm) During
Single Use Day - PK Population";
    _upcas=(length(_firtitl)-
length(compress(_firtitl,'ABCDEFGHIJKLMNOPQRSTUVWXYZ')))/2;
    len=&blankn.-length("(Page &i of &tpage)");
    if eof then do;
        call symput('_FSRTITL', trim(left(_firtitl)));
        call symput('_blankn', compress(put(len,best.)));
    end;
    drop _firtitl _upcas len;
run;

ods listing close;

* most set up in template others below;
* title arial 12pt bold with 12pt paragraph space below;
* all headers to be arial 11pt bold;
* data arial 10pt;
* headers to be central, text values left aligned and numeric centered
around decimal point;
/* Update with your variables as needed */
proc report data = comp headline headskip missing nowd spanrows split =
'#'
%IF &I=1 %THEN %DO; CONTENTS=' ' %END; %ELSE %DO; CONTENTS='' %END;;
    column flag page var atptn atpt ord stat ("Group-&grp PK &linebot."
coll col2 col3) ;

define flag / order noprint;
    define page          / order order = internal noprint;
define var              / group style={just=left cellwidth=2.5cm} "Variable";
define atptn           / order order=internal noprint;

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        define atpt      / group style={just=left cellwidth=2.1cm} "Time
point";
        define ord      / order order=internal noprint;
        define stat     / display style={just=left cellwidth=3cm}
"Statistic";
        define col1     / display style={just=C/*d*/ cellwidth=3cm}
style(header)={just=center} "&&col1&grp";
        define col2     / display style={just=C/*d*/ cellwidth=3cm}
style(header)={just=center} "&&col2&grp";
        define col3     / display style={just=C/*d*/ cellwidth=3cm}
style(header)={just=center} "&&col3&grp"; /* 13) AMH 08Aug2014 */

        break after page / page;

        break before flag / page %IF &I=1 %THEN %DO;
                CONTENTS="&_FSRTITL" %END; %ELSE %DO; CONTENTS='' %END;;

        compute before page / style={protectspecialchars=off};
                line "&linetop";
        endcomp;

        compute before _page_ / style={just=left protectspecialchars=off};
                line "\b\fs24\sa24&_FSRTITL." ; * \b = bold, \fs24 is font
size 12pt, \sa24 is space after 12pt;
                line "&linebot";
        endcomp;

        compute after atptn;
                line " ";
        endcomp;

        compute after _page_ / style={just=left protectspecialchars=off
pretext="&linetop."};
                LINE "Note:  &&foot&grp; THS = Tobacco Heating System.";
/*                line "Note: Means and 95% confidence interval (CI) are the
adjusted least squares means and CIs from an ANOVA model with sequence,
period, product, time point and product *timepoint as fixed effect
factors and subject within sequence as a random effect. Time point is
fitted as a repeated effect.";*/
                LINE 'Note: Means and 95% CI are the adjusted least squares means
and confidence intervals from an ANOVA model.';
                line "Note: Comparison overall time points is the main
comparison.";
/*                line "Note:  &&foot&grp; THS = Tobacco Heating System.";*/
                line "";
                line "Appendix &ref.";
                line "Path: &TFLpath." &_blankn.*"\~\~" "(Page &i of
&tpage)";
                line "Program Run: &sysdate  &sysuserid  Program Status:
&status";
        endcomp;

run;
%end;

```



```

ods rtf close;
ods results on;
ods path reset;

%mend ;

%outtrtf(blankn=71, halfblnk=N, ref=15.4.4.9 and 15.3.3.5); /* 5) AMH
24Jun2014 */

/*Figure Output*/
/*
_____*/

data figpag;
  set tabout1;
  where colord=3 and ord=2;
  by analgrln atptn;
  atpt=tranwrd(atpt,'T`{sub 0}','T0');
  /*overall timepoint no series plot*/
  est=estimate;
  low=lower;
  up=upper;
  TYPE=2; /* 9) AMH 24Jun2014 */
  if atptn ne 0 then DO; series=est; TYPE=1; END; /* 9) AMH
24Jun2014 */
  if atptn ne 0 then series=est;
  select(atptn);
  when (0) figpt=0.5;
  when (102) figpt=2;
  when (103) figpt=3;
  when (104) figpt=4;
  otherwise figpt=999;
end;
retain page 0;
if first.analgrln then page=1;
if last.analgrln then call
symput("tpage"||compress(put(analgrln,best.)),compress(put(page,best.)));
keep analgrln var atptn est low up page atpt series figpt TYPE /* 9)
AMH 24Jun2014 */;
run;

/*Create format for timpoint labels*/
%fmt(datain=figpag, start=figpt, label=atpt, name=tpoint);

/* Ensure ODS listing, html etc is turned off to prevent */
/* temporary or junk image files being produced */
title; footnote;
options notes source source2 nofullstimer validvarname=upcase
nonumber nodate orientation=portrait papersize=&p_pgsz missing=' ';
ods graphics on; /* As we are effectively using ODS graphics we need to
ensure that it is turned on */

```

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ods graphics / noborder height=14 cm width=16 cm; /* Removes border
around the image */
ods path reset;
ods exclude all;
/* please include styles template */
%let temp=/cvn/projects/prj/development/000000106326/dev/macro/;
%include "&temp.figtmpl.sas";

%let blankn=71;
%macro graph();

%do grp=1 %to 2;
/*%let ref=15.4.4.9;*/
%let ref=15.4.4.9 and 15.2.4.9; /* 14) AMH 08Aug2014 */
%let tflno=F_15_01_02_09_0&grp.(CO);

/*group 1*/
%let tit1=THS 2.2 Menthol - mCC;
/*group 2*/
%let tit2=THS 2.2 Menthol - NRT gum;

ods rtf toc_data
file="/cvn/projects/prj/data/000000106326/TFL/&TFL_Part/&tflno..rtf"
style=t106326_g startpage=yes headery=1440 footery=1440 ;
ods exclude all;

%do i=1 %to &&tpage&grp; /* paging can either be done through a do loop
or multiple macro calls */

    data plot;
        set figpag end=eof;
        where page = &i and analgrln=&grp;
        /* macro variables work fine with templates */
        call symput("var", trim(left(var)));
        /* Amend title as needed */
/*
        _firtitl="Figure 15.1.2.9.&grp. Exhaled CO (ppm) Profiles
During Single Use Day Arithmetic Least Squares Mean Differences
(&&tit&grp) and 95% CI - Group-&grp. PK Population"; */
        _firtitl="Figure 15.1.2.9.&grp. Exhaled CO (ppm)
Profiles During Single Use Day Arithmetic Least Squares Mean Differences
(&&tit&grp) ( $\pm$  95% CI) - Group-&grp. PK Population";/* 2) AOB 30May2014
*/
        if eof then do;
            call symput('_FSRTITL', trim(left(_firtitl)));
            end;
        drop _firtitl ;
    run;

/* 15) APH 23SEP2014 */
PROC SQL;
CREATE TABLE PLOT2 AS

```

```

SELECT ANALGR1N, ATPT, VAR, EST, LOW, UP, FIGPT
FROM PLOT;
QUIT;

PROC EXPORT
DATA=PLOT2
DBMS=XLSX
OUTFILE="/cvn/projects/prj/data/000000106326/TFL/&TFL_Part./&tflno..xlsx"
REPLACE;
SHEET=Sheet1;
RUN;

/* 15) APH 23SEP2014 */

ods path reset;
proc template;
  define statgraph temp;
    begingraph /;
      /* we can change the alignment of text using halign=, text
attributes can also be set */
/*      entrytitle halign=left "&_FSRTITL." /* */
/*      */
/*      entrytitle " " /* 16) APH 23SEP2014 */
/* textattrs options include size, color, font, weight and
style */
/* the default text attributes are picked up from the default
rtf styles template */
/* this can be changed using style= in the ods rtf statement
*/
      entrytitle halign=left "Variable: &var" /;
      layout overlay / XAXISOPTS=(label="Time point"
LINEAROPTS=(TICKVALUEFITPOLICY=rotate viewmin=0 viewmax=4.5
tickvaluelist=(0.5 2 3 4)) )
      YAXISOPTS=(label="LS Mean Difference"
linearopts=(tickvaluesequence=(start=-3.0 end=1 increment=0.5) viewmin=-
3.1 viewmax=1.2)); /* 7) AMH 24Jun2014 */
      scatterplot x=figpt y=est / INDEX=TYPE GROUP=TYPE
yerrorlower=low yerrorupper=up MARKERATTRS=(COLOR=BLACK) /* 9) AMH
24Jun2014 */
      seriesplot x=figpt y=series / INDEX=TYPE
primary=true display=(markers) MARKERATTRS=(COLOR=BLACK)
LINEATTRS=(COLOR=BLACK) /* 9) AMH 24Jun2014 */
      referenceline y=0 / lineattrs=(pattern=2);
      endlayout;
/* footnotes work using the same option as the entrytitle
statement */

/*      ENTRYFOOTNOTE HALIGN=LEFT 'Note: Means and 95% CI are the
adjusted least squares means and confidence intervals from an ANOVA
model.';
6) AMH 24Jun2014 */
/*      entryfootnote halign=left "Note: Means and 95% confidence
interval (CI) are the adjusted least squares means and CIs from an ANOVA
model with sequence, period, product, time point and product *timepoint

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as fixed effect factors and subject within sequence as a random effect.
Time point is fitted as a repeated effect."*/

```
/*      entryfootnote ""*/
/*      entryfootnote halign=left "Appendix &ref." / ;*/
/*      entryfootnote halign=left "Path: &TFLpath." halign=right
"(Page &i of &&tpage&grp)" / ;*/
/*      entryfootnote halign=left "Program Run: &sysdate  &sysuserid
Program Status: &status" / ;*/ /* 16) APH 23SEP2014 */
```

```
        endgraph;
```

```
    end;
```

```
run;
```

```
ods select all;
```

```
/*%if &i=1 %then ods proclabel "&_FSRTITL."; */
```

```
/*%else ods rtf notoc_data;;*/
```

```
ods rtf notoc_data;
```

```
ods escapechar='^';
```

```
ODS RTF PREPAGE="^S={outputwidth=100% just=l font_size=12pt
```

```
font_weight=bold background=white foreground=black
```

```
font_face=arial}^R/RTF'\QL' Figure 15.1.2.9.&grp. Exhaled CO (ppm)
```

```
Profiles During Single Use Day Arithmetic Least Squares Mean Differences
```

```
(&&tit&grp) ( $\pm$  95% CI) - Group-&grp. PK Population";
```

```
proc sgrender data=plot template=temp objectlabel=''; /* applies the
above template to the specified data */
```

```
    format figpt tpoint.;
```

```
run;
```

```
ODS RTF TEXT="^S={outputwidth=100% just=l font_size=9pt background=white
foreground=black font_face=arial}^R/RTF'\QL' Note: LS Mean and 95% CI are
the adjusted least squares means and confidence intervals based on an
ANOVA model.";
```

```
ODS RTF TEXT="^S={outputwidth=100% just=l font_size=9pt background=white
foreground=black font_face=arial}^R/RTF'\QL' Appendix &ref.";
```

```
ODS RTF TEXT="^S={outputwidth=100% just=l font_size=9pt background=white
foreground=black font_face=arial}^R/RTF'\QL' Path: &TFLpath.
```

```
(Page &i of &&tpage&grp)";
```

```
ODS RTF TEXT="^S={outputwidth=100% just=l font_size=9pt background=white
foreground=black font_face=arial}^R/RTF'\QL' Program Run: &sysdate
```

```
&sysuserid  Program Status: &status";
```

```
%end; %end;
```

```
%mend graph;
```

```
%graph;
```

```
ods exclude all;
```

```
ods path reset;
```

```
ods _all_ close;
```

```
ods graphics / reset;
```

```
proc printto ; run;  
*=====;  
* END OF PROGRAM CODE ;  
*=====;
```