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*Example of RII means tests (code developed by Samuel Chen, 2007);
*for 4 groups --- in this example, the mean of being willing to take some risk is compared
for four racial/ethnic groups;
imp=implic;
awgt=nwgt/5;
place=some;
cat=race;
if cat=1 then x1=place;
if cat=2 then x2=place;
if cat=3 then x3=place;
if cat=4 then x4=place;
proc freq;weight nwgt;
tables some*race/chisq;
title '   p1=white etc ';
PROC SORT DATA=final;
BY IMP;
PROC UNIVARIATE DATA=FINAL VARDEF=WDF;
  VAR X1 X2 X3 X4;
  WEIGHT awgt;
  BY IMP;
  OUTPUT OUT=RII MEAN=QX1 QX2 QX3 QX4
               STD=UX1 UX2 UX3 UX4
               N=NX1 NX2 NX3 NX4 ;

PROC PRINT DATA=RII;

*RII TECHNIQUE FOR A SCALAR;
PROC IML;
  RESET AUTONAME;
  USE RII VAR{QX1 QX2 QX3 QX4 }; READ ALL INTO QI;
  USE RII VAR{UX1 UX2 UX3 UX4 }; READ ALL INTO UI;
  USE RII VAR{NX1 NX2 NX3 NX4 }; READ ALL INTO NI;
  MM= NROW(QI); JMAT = J(MM,1);
  NN= NCOL(QI); NAMES={X1 X2 X3 X4 };
*AVERAGE OF THE FIVE POINT ESTIMATES OF THE MEAN (Eq. 1);
  QMBAR=QI(|+,|)/MM;
  QMBAR12=(QI[+,1]-QI[+,2])/MM;
  QMBAR13=(QI[+,1]-QI[+,3])/MM;
  QMBAR14=(QI[+,1]-QI[+,4])/MM;
  QMBAR23=(QI[+,2]-QI[+,3])/MM;
   QMBAR24=(QI[+,2]-QI[+,4])/MM;
  QMBAR34=(QI[+,3]-QI[+,4])/MM;
*VARIANCE OF THE MEAN (SQUARE OF THE STANDARD ERROR);
  UI=UI#UI;
*AVERAGE WITHIN IMPUTATION VARIANCE (Eq. 2);
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  UMBAR1=UI[+,1]/MM;
  UMBAR2=UI[+,2]/MM;
  UMBAR3=UI[+,3]/MM;
  UMBAR4=UI[+,4]/MM;
  UMBAR5=UI[+,5]/MM;

*INTERMEDIATE STEPS FOR CALCULATING BETWEEN IMPUTATION
VARIANCE;
  QMBARX=QMBAR@JMAT;
  QDIF = QI-QMBARX;
  QDIFSQ = QDIF#QDIF;
*BETWEEN IMPUTATION VARIANCE (Eq. 3);
  BM1 = QDIFSQ[+,1]/(MM-1);
  BM2 = QDIFSQ[+,2]/(MM-1);
  BM3 = QDIFSQ[+,3]/(MM-1);
  BM4 = QDIFSQ[+,4]/(MM-1);

*RII TOTAL VARIANCE OF THE MEAN (Eq. 4);
TM1 = UMBAR1+(1+1/MM)*BM1;
TM2 = UMBAR2+(1+1/MM)*BM2;
TM3 = UMBAR3+(1+1/MM)*BM3;
TM4 = UMBAR4+(1+1/MM)*BM4;

*Pooled standard deviation;
SP12=SQRT(((NI[+,1]-1)*TM1+(NI[+,2]-1)*TM2)/(NI[+,1]+NI[+,2]-2));
SP13=SQRT(((NI[+,1]-1)*TM1+(NI[+,3]-1)*TM3)/(NI[+,1]+NI[+,3]-2));
SP14=SQRT(((NI[+,1]-1)*TM1+(NI[+,4]-1)*TM4)/(NI[+,1]+NI[+,4]-2));
SP23=SQRT(((NI[+,2]-1)*TM2+(NI[+,3]-1)*TM3)/(NI[+,2]+NI[+,3]-2));
SP24=SQRT(((NI[+,2]-1)*TM2+(NI[+,4]-1)*TM4)/(NI[+,2]+NI[+,4]-2));
SP34=SQRT(((NI[+,3]-1)*TM3+(NI[+,4]-1)*TM4)/(NI[+,3]+NI[+,4]-2));
*Pooled standard error;
SE12=SP12*SQRT(1/NI[+,1]+1/NI[+,2]);
SE13=SP13*SQRT(1/NI[+,1]+1/NI[+,3]);
SE14=SP14*SQRT(1/NI[+,1]+1/NI[+,4]);
SE23=SP23*SQRT(1/NI[+,2]+1/NI[+,3]);
SE24=SP24*SQRT(1/NI[+,2]+1/NI[+,4]);
SE34=SP34*SQRT(1/NI[+,3]+1/NI[+,4]);
*T statistic;
T12=QMBAR12/SE12;
T13=QMBAR13/SE13;
T14=QMBAR14/SE14;
T23=QMBAR23/SE23;
T24=QMBAR24/SE24;
T34=QMBAR34/SE34;
DF12=NI[+,1]+NI[+,2]-2;
```

```
DF13=NI[+,1]+NI[+,3]-2;
DF14=NI[+,1]+NI[+,4]-2;
DF23=NI[+,2]+NI[+,3]-2;
DF24=NI[+,2]+NI[+,4]-2;
DF34=NI[+,3]+NI[+,4]-2;
*P-value;
P12=PROBT(T12,DF12)*2;
P13=PROBT(T13,DF13)*2;
P14=PROBT(T14,DF14)*2;
P23=PROBT(T23,DF23)*2;
P24=PROBT(T24,DF24)*2;
P34=PROBT(T34,DF34)*2;
if P12>1 then P12=(1-PROBT(T12,DF12))*2;
if P13>1 then P13=(1-PROBT(T13,DF13))*2;
if P14>1 then P14=(1-PROBT(T14,DF14))*2;
if P23>1 then P23=(1-PROBT(T23,DF23))*2;
if P24>1 then P24=(1-PROBT(T24,DF24))*2;
if P34>1 then P34=(1-PROBT(T34,DF34))*2;
*RII STANDARD ERROR OF THE MEAN (Eq. 5);
  SDTM = SQRT(TM);
*RELATIVE INCREASE IN VARIANCE DUE TO NONRESPONSE (Eq. 8);
  RM = (1+1/MM)*BM/UMBAR;
*DEGREES OF FREEDOM (Eq. 7);
  VUI = (MM-1)*(1+1/RM)##2;
*FRACTION OF INFORMATION ABOUT PARAMETER Q WHICH IS MISSING
(Eq. 9);
  GAMMA =(RM+2/(VUI+3))/(RM+1);
*COMMANDS TO PRINT RESULTS;
PRINT SE12 SE13 SE14  SE23 SE24  SE34 ;
PRINT T12 T13 T14  T23 T24  T34 ;
PRINT DF12 DF13 DF14   DF23  DF24  DF34 ;
PRINT P12 P13 P14  P23 p24  P34 ;
run;
```