*STATA.OUTPUT -- Chapter 13

. *small example of rank sum test

. clear
. input x grp

```
       x grp
  1.  4 1
  2. 35 1
  3. 21 1
  4. 28 1
  5. 66 1
  6. 10 2
  7. 42 2
  8. 71 2
  9. 77 2
 10. 90 2
 11. end
```

. ranksum x, by(grp) porder

```
Two-sample Wilcoxon rank-sum (Mann-Whitney) test
         grp |      obs    rank sum    expected
-------------+---------------------------------
           1 |        5          20        27.5
           2 |        5          35        27.5
-------------+---------------------------------
    combined |       10          55          55


unadjusted variance       22.92
adjustment for ties        0.00
                     ----------
adjusted variance         22.92

Ho: x(grp==1) = x(grp==2)
             z =  -1.567
    Prob > |z| =   0.1172
P{x(grp==1) > x(grp==2)} = 0.200
```

. clear

. *comparison of cholesterol levels type-A versus type-B individuals

. ranksum chol, by(type) porder

```
Two-sample Wilcoxon rank-sum (Mann-Whitney) test

        type |      obs    rank sum    expected
-------------+---------------------------------
           0 |       20         503         410
           1 |       20         317         410
-------------+---------------------------------
    combined |       40         820         820

unadjusted variance     1366.67
adjustment for ties       -0.90
                     ----------
adjusted variance       1365.77

Ho: chol(type==0) = chol(type==1)
             z =   2.516
    Prob > |z| =   0.0119

P{chol(type==0) > chol(type==1)} = 0.733
```

. * t-test type-A versus type-B

. infile chol type using stata.mw.data

. ttest chol, by(type)

```
Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      20      245.05    8.192575    36.63831    227.9027    262.1973
       1 |      20       210.3    10.80913    48.33991    187.6762    232.9238
---------+--------------------------------------------------------------------
combined |      40     227.675    7.249172    45.84779    213.0122    242.3378
---------+--------------------------------------------------------------------
    diff |               34.75    13.56303                7.293091    62.20691
------------------------------------------------------------------------------

    diff = mean(0) - mean(1)                                      t =   2.5621
Ho: diff = 0                                     degrees of freedom =       38

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.9928         Pr(|T| > |t|) = 0.0145          Pr(T > t) = 0.0072
```

. *ORDINAL CORRELATION
. clear
. *small example
. input x y

```
       x   y
  1. 20  2
  2.  1 12
  3.  2  6
  4.  7  9
  5. 14 10
  6. end
```

. ktau x y

```
   Number of obs =       5
 Kendall's tau-a =      -0.4000
 Kendall's tau-b =      -0.4000
 Kendall's score =      -4
     SE of score =       4.082
 Test of Ho: x and y are independent
      Prob > |z| =       0.4624  (continuity corrected)
```

. *two-way table: vitamin use by dietary calories

. tabi 78 69 155 \ 56 43 112 \ 85 44 116, gamma taub

```
           |                col
       row |         1          2          3 |     Total
-----------+---------------------------------+----------
         1 |        78         69        155 |       302
         2 |        56         43        112 |       211
         3 |        85         44        116 |       245
-----------+---------------------------------+----------
     Total |       219        156        383 |       758

                 gamma =  -0.0760  ASE = 0.051
       Kendall's tau-b =  -0.0486  ASE = 0.033
```

. *two-way table: vitamin use by prepregnancy weight

. tabi 58 137 125 65 49 \ 17 43 34 16 13 \ 49 75 51 20 6, gamma taub

```
           |                          col
       row |         1          2          3          4          5 |     Total
-----------+-------------------------------------------------------+----------
         1 |        58        137        125         65         49 |       434
         2 |        17         43         34         16         13 |       123
         3 |        49         75         51         20          6 |       201
-----------+-------------------------------------------------------+----------
     Total |       124        255        210        101         68 |       758

                 gamma =  -0.2156  ASE = 0.046
       Kendall's tau-b =  -0.1423  ASE = 0.030
```

. *LOG-LINEAR MODEL APPROACH TO CATEGORICAL DATA

. clear
. *two-way table -- log-linear model (vitamin C and frequency of colds)

. input rr cc n

```
   rr cc n
  1. 1 1  7
  2. 2 1  3
  3. 3 1 10
  4. 1 2 12
  5. 2 2  1
  6. 3 2  1
  7. 1 3 22
  8. 2 3  7
  9. 3 3  8
 10. end
```

. list

```
     +--------------+
     | rr   cc    n |
     |--------------|
  1. |  1    1    7 |
  2. |  2    1    3 |
  3. |  3    1   10 |
  4. |  1    2   12 |
  5. |  2    2    1 |
  6. |  3    2    1 |
  7. |  1    3   22 |
  8. |  2    3    7 |
  9. |  3    3    8 |
     +--------------+
```

. table rr cc [weight = n]

```
----------------------------
          |        cc
       rr |    1     2     3
----------+-----------------
        1 |    7    12    22
        2 |    3     1     7
        3 |   10     1     8
----------------------------
```

. xi: poisson n i.rr i.cc

```
Poisson regression                                Number of obs   =          9
                                                  LR chi2(4)      =      31.49
                                                  Prob > chi2     =     0.0000
Log likelihood = -21.616711                       Pseudo R2       =     0.4214
------------------------------------------------------------------------------
           n |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      _Irr_2 |  -1.315677   .3395576    -3.87   0.000    -1.981197   -.6501562
      _Irr_3 |  -.7691331   .2775281    -2.77   0.006    -1.313078   -.2251881
      _Icc_2 |  -.3566749    .348466    -1.02   0.306    -1.039656    .3263059
      _Icc_3 |   .6151856   .2775374     2.22   0.027     .0712223    1.159149
       _cons |   2.446624   .2455723     9.96   0.000     1.965312    2.927937
------------------------------------------------------------------------------
```

. predict n0

. list n0 n

```
     +---------------+
     |       n0    n |
     |---------------|
  1. |  11.5493    7 |
  2. | 3.098592    3 |
  3. | 5.352113   10 |
  4. | 8.084507   12 |
  5. | 2.169014    1 |
  6. | 3.746479    1 |
  7. |  21.3662   22 |
  8. | 5.732394    7 |
  9. | 9.901408    8 |
     +---------------+
```

. gen lr = -2*n0*log(n/n0)
. egen x2 = total(lr)

. list x2 in 1

```
     +---------+
     |      x2 |
     |---------|
     | 12.6277 |
     +---------+
```

. display "pvalue = " 1-chi2(4,x2)
```
pvalue = .01324571
```

. gen xx = (n-n0)ˆ2/n0
. egen X2 = total(xx)

. list X2 in 1

```
     +----------+
     |       X2 |
     |----------|
     | 11.03548 |
     +----------+
```

. display "pvalue = " 1-chi2(4,X2)

```
pvalue = .02616811
```

.* saturated model = observed values

. xi: poisson n i.rr i.cc i.rr*i.cc

```
Poisson regression                                Number of obs   =          9
                                                  LR chi2(8)      =      42.75
                                                  Prob > chi2     =     0.0000
Log likelihood = -15.987718                       Pseudo R2       =     0.5721

------------------------------------------------------------------------------
           n |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      _Irr_2 |  -.8472979   .6900656    -1.23   0.220    -2.199802    .5052058
      _Irr_3 |   .3566749   .4928054     0.72   0.469    -.6092059    1.322556
      _Icc_2 |   .5389965   .4755949     1.13   0.257    -.3931523    1.471145
      _Icc_3 |   1.145132   .4339489     2.64   0.008      .294608    1.995657
 _IrrXcc_2_2 |  -1.637609   1.248809    -1.31   0.190    -4.085229    .8100118
 _IrrXcc_2_3 |  -.2978344     .81517    -0.37   0.715    -1.895538    1.299869
 _IrrXcc_3_2 |  -2.841581   1.151603    -2.47   0.014    -5.098683   -.5844803
 _IrrXcc_3_3 |  -1.368276   .6428932    -2.13   0.033    -2.628323   -.1082283
       _cons |    1.94591   .3779645     5.15   0.000     1.205113    2.686707
------------------------------------------------------------------------------
```

. *a typical chi-square analysis (vitamin C and frequency of colds)

. tabi 7 12 22 \ 3 1 7 \ 10 1 8, chi

```
           |               col
       row |         1          2          3 |     Total
-----------+---------------------------------+----------
         1 |         7         12         22 |        41 
         2 |         3          1          7 |        11 
         3 |        10          1          8 |        19 
-----------+---------------------------------+----------
     Total |        20         14         37 |        71 

          Pearson chi2(4) =  11.0355   Pr = 0.026
```

. clear
. *two-way table (structural zeros) -- two cancer therapy drugs

. input rr cc n
 rr cc n

```
  1. 1 1 36
  2. 2 1 18
  3. 1 2  5
  4. 2 2  4
  5. 3 2  3
  6. 2 3  8
  7. 3 3  4
  8. end
```

. list

```
     +--------------+
     | rr   cc    n |
     |--------------|
  1. |  1    1   36 |
  2. |  2    1   18 |
  3. |  1    2    5 |
  4. |  2    2    4 |
  5. |  3    2    3 |
  6. |  2    3    8 |
  7. |  3    3    4 |
     +--------------+
```

```
. table rr cc  [weight = n]
----------------------------
          |        cc
       rr |    1     2     3
----------+-----------------
        1 |   36     5
        2 |   18     4     8
        3 |          3     4
----------------------------
```

. xi: poisson n i.rr i.cc

```
Poisson regression                                Number of obs   =          7
                                                  LR chi2(4)      =      63.23
                                                  Prob > chi2     =     0.0000
Log likelihood = -13.997633                       Pseudo R2       =     0.6931

------------------------------------------------------------------------------
           n |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      _Irr_2 |  -.5896301    .257438    -2.29   0.022    -1.094199   -.0850609
      _Irr_3 |  -1.017428   .4997527    -2.04   0.042    -1.996925    -.037931
      _Icc_2 |  -1.713171   .3313352    -5.17   0.000    -2.362576   -1.063766
      _Icc_3 |  -.9752247   .3931746    -2.48   0.013    -1.745833   -.2046166
       _cons |   3.547809   .1641702    21.61   0.000     3.226042    3.869577
------------------------------------------------------------------------------
```

```
. predict n0

. list n0 n

     +---------------+
     |       n0    n |
     |---------------|
  1. | 34.73713   36 |
  2. | 19.26287   18 |
  3. | 6.262866    5 |
  4. | 3.472962    4 |
  5. | 2.264173    3 |
  6. | 7.264173    8 |
  7. | 4.735827    4 |
     +---------------+

. gen lr = -2*n0*log(n/n0)
. egen x2 = total(lr)

. list x2 in 1

     +----------+
     |       x2 |
     |----------|
     | .8941672 |
     +----------+

. display "pvalue = " 1-chi2(2,x2)
pvalue = .63949043


. gen xx = (n-n0)^2/n0
. egen X2 = total(xx)

. list X2 in 1

     +----------+
     |       X2 |
     |----------|
     | .8913323 |
     +----------+

. display "pvalue = " 1-chi2(2,X2)
pvalue = .64039752
```

```
. clear
. input rr cc n
   rr cc  n
  1. 1 1   5
  2. 1 0  20
  3. 0 1  35
  4. end

. *Population size for the capture/recapture sampling strategy

. table rr cc  [weight = n]
----------------------
          |     cc
       rr |    0     1
----------+-----------
        0 |    5    20
        1 |   35
----------------------
. xi: poisson n i.rr i.cc

Poisson regression                                Number of obs   =          3
                                                  LR chi2(2)      =      25.31
                                                  Prob > chi2     =     0.0000
Log likelihood = -6.8602666                       Pseudo R2       =     0.6485
------------------------------------------------------------------------------
           n |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      _Irr_1 |  -1.945910   .4780914    -4.07   0.000    -2.882952   -1.008868
      _Icc_1 |  -1.386294         .5    -2.77   0.006    -2.366276   -.4063124
       _cons |   4.941642   .5277987     9.36   0.000     3.907176    5.976109
------------------------------------------------------------------------------

. predict n0
. *values are identical because the model is saturated

. list n0 n

     +---------+
     | n0    n |
     |---------|
  1. |  5    5 |
  2. | 20   20 |
  3. | 35   35 |
     +---------+

. gen n22 = exp(4.941642)
. gen N = sum(n)+n22

. list n22 N in 3

     +---------------------+
     |      n22          N |
     |---------------------|
     | 140.0         200.0 |
     +---------------------+
```

. clear
. *Estimation of population size
. *New York state spina bifida data

. input S1 S2 S3 n

```
     S1 S2 S3 n
  1. 2 2 2 1
  2. 1 2 2 8
  3. 2 1 2 3
  4. 1 1 2 13
  5. 2 2 1 1
  6. 1 2 1 3
  7. 2 1 1 8
  8. end
```

. list

```
     +-------------------+
     | S1   S2   S3    n |
     |-------------------|
  1. |  2    2    2    1 |
  2. |  1    2    2    8 |
  3. |  2    1    2    3 |
  4. |  1    1    2   13 |
  5. |  2    2    1    1 |
  6. |  1    2    1    3 |
  7. |  2    1    1    8 |
     +-------------------+
```

. table S1 S2 S3 [weight = n]

```
------------------------------------
          |        S3 and S2
          | ---- 1 ---    ---- 2 ---
       S1 |    1     2       1     2
----------+-------------------------
        1 |          3      13     8
        2 |    8     1       3     1
------------------------------------
```

.ix poisson n i.S1 i.S2 i.S3

```
Poisson regression                                Number of obs   =          7
                                                  LR chi2(3)      =      17.51
                                                  Prob > chi2     =     0.0006
Log likelihood = -13.984239                       Pseudo R2       =     0.3850
------------------------------------------------------------------------------
           n |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      _IS1_2 |  -1.118477   .3797685    -2.95   0.003    -1.862809   -.3741442
      _IS2_2 |  -1.118477   .3797685    -2.95   0.003    -1.862809   -.3741442
      _IS3_2 |  -.1055291   .4030488    -0.26   0.793    -.8954903     .684432
       _cons |   2.758899   .4522637     6.10   0.000     1.872479     3.64532
------------------------------------------------------------------------------
```

```
. predict n0

. list n0 n

     +---------------+
     |       n0    n |
     |---------------|
  1. | 1.516518    1 |
  2. | 4.640831    8 |
  3. | 4.640831    3 |
  4. | 14.20182   13 |
  5. | 1.685304    1 |
  6. | 5.157348    3 |
  7. | 5.157348    8 |
     +---------------+

. gen N = exp(2.758899)+sum(n)

. list N in 7

     +----------+
     |        N |
     |----------|
     | 52.78246 |
     +----------+

. gen lr = -2*n0*log(n/n0)
. egen x2 = total(lr)

. list x2 in 1

     +----------+
     |       x2 |
     |----------|
     | 5.589116 |
     +----------+

. display "pvalue = " 1-chi2(3,x2)
pvalue = .13340459

. gen xx = (n-n0)^2/n0
. egen X2 = total(xx)

. list X2 in 1

     +----------+
     |       X2 |
     |----------|
     | 6.037157 |
     +----------+

. display "pvalue = " 1-chi2(3,X2)
pvalue = .1098164
```

. clear
. *matched pair categorical data (EMF exposure)

. input rr cc N e

```
     rr cc N e
  1. 2 1  5  5
  2. 3 1 13 15
  3. 1 2  5  5
  4. 3 2  9 10
  5. 1 3 17 15
  6. 2 3 11 10
  7. end
```

. table rr cc [weight = N]

```
----------------------------
          |        cc
       rr |    1     2     3
----------+-----------------
        1 |          5    17
        2 |    5          11
        3 |   13     9
----------------------------
```

. *symmetry (case/control data)
. gen lrs = -2*N*log(e/N)
. egen Gs = total(lrs)

. list Gs in 1

```
     +----------+
     |       Gs |
     |----------|
     | .7352599 |
     +----------+
```

. display "pvalue = " 1-chi2(3,Gs)

```
pvalue = .86488078
```

. *quasi independence (case/control data)

. xi: poisson N i.rr i.cc

```
Poisson regression                                Number of obs   =          6
                                                  LR chi2(4)      =      11.19
                                                  Prob > chi2     =     0.0245
Log likelihood = -12.184235                       Pseudo R2       =     0.3148
------------------------------------------------------------------------------
           N |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      _Irr_2 |   -.421622   .3451078    -1.22   0.222    -1.098021    .2547768
      _Irr_3 |   .5594016   .4237671     1.32   0.187    -.2711667     1.38997
      _Icc_2 |  -.3849767   .3747343    -1.03   0.304    -1.119443    .3494891
      _Icc_3 |   .8152409   .4205561     1.94   0.053    -.0090339    1.639516
       _cons |   2.012569   .4291519     4.69   0.000     1.171447    2.853692
------------------------------------------------------------------------------
```

. predict nn

. list nn N

```
     +---------------+
     |       nn    N |
     |---------------|
  1. | 4.908397    5 |
  2. |  13.0916   13 |
  3. | 5.091603    5 |
  4. | 8.908397    9 |
  5. |  16.9084   17 |
  6. |  11.0916   11 |
     +---------------+
```

. gen lri = -2*nn*log(N/nn)
. egen Gi = total(lri)

. list Gi in 1

```
     +----------+
     |       Gi |
     |----------|
     | .0061932 |
     +----------+
```

. display "pvalue = " 1-chi2(1,Gi)
```
pvalue = .93727362
```

. *marginal homogeneity (case/control data)

. gen Gh = Gs-Gi

. list Gh in 1

```
     +----------+
     |       Gh |
     |----------|
     | .7290667 |
     +----------+
```

. display "pvalue = " 1-chi2(2,Gh)
```
pvalue = .69452068
```

. clear
. *playtime pattern -- quasi-independence

. input n rr cc

```
        n rr cc
  1.  2 2 1
  2.  0 3 1
  3.  2 4 1
  4.  2 5 1
  5.  1 6 1
  6.  2 1 2
  7.  1 3 2
  8.  3 4 2
  9.  2 5 2
 10.  3 6 2
 11.  2 1 3
 12.  1 2 3
 13.  1 4 3
 14.  5 5 3
 15.  2 6 3
 16.  3 1 4
 17.  2 2 4
 18.  1 3 4
 19.  1 5 4
 20.  2 6 4
 21.  3 1 5
 22.  1 2 5
 23.  2 3 5
 24.  1 4 5
 25.  0 6 5
 26.  2 1 6
 27.  3 2 6
 28.  4 3 6
 29.  3 4 6
 30.  3 5 6
 31. end
```

. table rr cc [weight = n]

	cc					
rr	1	2	3	4	5	6
1		2	2	3	3	2
2	2		1	2	1	3
3		1		1	2	4
4	2	3	1		1	3
5	2	2	5	1		3
6	1	3	2	2		

. xi: poisson n i.rr i.cc

```
Poisson regression                                Number of obs   =         30
                                                  LR chi2(10)     =       5.74
                                                  Prob > chi2     =     0.8365
Log likelihood = -43.673201                       Pseudo R2       =     0.0617
------------------------------------------------------------------------------
           n |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      _Irr_2 |  -.2161068   .4492066    -0.48   0.630    -1.096536     .664322
      _Irr_3 |  -.3384196   .4641617    -0.73   0.466     -1.24816    .5713205
      _Irr_4 |  -.1480231   .4355583    -0.34   0.734    -1.001702    .7056555
      _Irr_5 |   .0829034   .4074053     0.20   0.839    -.7155963    .8814031
      _Irr_6 |  -.2518707   .4669565    -0.54   0.590    -1.167089    .6633471
      _Icc_2 |   .4072161   .4922761     0.83   0.408    -.5576274     1.37206
      _Icc_3 |   .3865368    .491608     0.79   0.432    -.5769973    1.350071
      _Icc_4 |   .2194147   .5125869     0.43   0.669    -.7852372    1.224067
      _Icc_5 |   .0205735   .5439977     0.04   0.970    -1.045642    1.086789
      _Icc_6 |   .7110152   .4672306     1.52   0.128    -.2047399     1.62677
       _cons |   .5002299   .5006687     1.00   0.318    -.4810628    1.481523
------------------------------------------------------------------------------
```

. predict n0

. list n0 n

```
     +--------------+
     |       n0   n |
     |--------------|
  1. | 1.328596   2 |
  2. | 1.175637   0 |
  3. | 1.422203   2 |
  4. | 1.791643   2 |
  5. | 1.281920   1 |
  6. | 2.477986   2 |
  7. | 1.766546   1 |
  8. | 2.137043   3 |
  9. | 2.692175   2 |
 10. | 1.926250   3 |
     |--------------|
     |--------------|
     |--------------|
 20. | 1.596436   2 |
 21. | 1.683380   3 |
 22. | 1.356213   1 |
 23. | 1.200075   2 |
 24. | 1.451765   1 |
 25. | 1.308567   0 |
 26. | 3.357663   2 |
 27. | 2.705098   3 |
 28. | 2.393665   4 |
 29. | 2.895686   3 |
 30. | 3.647888   3 |
     +--------------+
```

. gen xx = (n-n0)ˆ2/n0
. egen X2 = total(xx)

. list X2 in 1

```
     +----------+
     |       X2 |
     |----------|
     | 12.94316 |
     +----------+
```

. display "pvalue = " 1-chi2(19,X2)

```
pvalue = .84146807
```

. clear
. *weight retained by prepregnancy weight by parity (701 mothers)

. input w r p n

```
          w r p   n
     1. 1 1 1  20
     2. 1 1 2  40
     3. 1 1 3  14
     4. 1 1 4  62
     5. 1 2 1   5
     6. 1 2 2  10
     7. 1 2 3   3
     8. 1 2 4  17
     9. 2 1 1  29
    10. 2 1 2 138
    11. 2 1 3  17
    12. 2 1 4  42
    13. 2 2 1   7
    14. 2 2 2  32
    15. 2 2 3   4
    16. 2 2 4  11
    17. 3 1 1  23
    18. 3 1 2 117
    19. 3 1 3  22
    20. 3 1 4   9
    21. 3 2 1  11
    22. 3 2 2  54
    23. 3 2 3  11
    24. 3 2 4   3
    25. end
```

. table r w p [weight = n]

```
------------------------------------------------------------------------------
        |                                p and w
        | ------- 1 ------  ------- 2 ------  ------- 3 ------  ------- 4 ------
      r |    1      2      3      1      2      3      1      2      3      1      2      3
--------+---------------------------------------------------------------------
      1 |   20     29     23     40    138    117     14     17     22     62     42      9
      2 |    5      7     11     10     32     54      3      4     11     17     11      3
------------------------------------------------------------------------------
```

. xi: poisson n i.r i.w i.p i.r*i.w i.p*i.w

```
Poisson regression                                Number of obs   =         24
                                                  LR chi2(14)     =     689.59
                                                  Prob > chi2     =     0.0000
Log likelihood = -56.729686                       Pseudo R2       =     0.8587

------------------------------------------------------------------------------
           n |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       _Ir_2 |  -1.357307   .1895373    -7.16   0.000    -1.728793   -.9858206
       _Iw_2 |   .3793972   .2648322     1.43   0.152    -.1396645    .8984588
       _Iw_3 |    .156696   .2697493     0.58   0.561     -.372003     .685395
       _Ip_2 |   .6931472    .244949     2.83   0.005      .213056    1.173238
       _Ip_3 |  -.3856625   .3143621    -1.23   0.220    -1.001801    .2304759
       _Ip_4 |   1.150572   .2294738     5.01   0.000     .7008116    1.600332
   _IrXw_2_2 |  -.0742441   .2426266    -0.31   0.760    -.5497835    .4012953
   _IrXw_2_3 |   .5850911   .2333036     2.51   0.012     .1278245    1.042358
   _IpXw_2_2 |   .8591323   .3060394     2.81   0.005     .2593061    1.458959
   _IpXw_2_3 |   .9221559   .3086417     2.99   0.003     .3172292    1.527083
   _IpXw_3_2 |   -.153334   .4173971    -0.37   0.713    -.9714173    .6647493
   _IpXw_3_3 |   .3558095   .3981687     0.89   0.372    -.4245868    1.136206
   _IpXw_4_2 |  -.7637991   .3151253    -2.42   0.015    -1.381433   -.1461649
   _IpXw_4_3 |  -2.192026   .4066981    -5.39   0.000    -2.989139   -1.394912
       _cons |   2.989867   .2037277    14.68   0.000     2.590568    3.389166
------------------------------------------------------------------------------
```

. predict n0

. list n0 n

```
     +----------------+
     |       n0     n |
     |----------------|
  1. | 19.88304    20 |
  2. | 39.76608    40 |
  3. | 13.52047    14 |
  4. | 62.83041    62 |
  5. | 5.116959     5 |
  6. | 10.23392    10 |
  7. | 3.479532     3 |
  8. | 16.16959    17 |
  9. | 29.05714    29 |
 10. | 137.2143   138 |
     |----------------|
     |----------------|
     |----------------|
 20. |    8.208     9 |
 21. |   10.744    11 |
 22. |   54.036    54 |
 23. |   10.428    11 |
 24. |    3.792     3 |
     +----------------+
```

```
. gen lr = -2*n0*log(n/n0)
. egen x2 = total(lr)

. list x2 in 1

     +----------+
     |       x2 |
     |----------|
     | .5662699 |
     +----------+

. display "pvalue = " 1-chi2(9,x2)
pvalue = .99994813

. gen xx = (n-n0)^2/n0
. egen X2 = total(xx)

. list X2 in 1

     +----------+
     |       X2 |
     |----------|
     | .5416133 |
     +----------+

. display "pvalue = " 1-chi2(9,X2)
pvalue = .99995712

. tabi 136 226 171 \ 35 54 79, chi

           |                col
       row |         1          2          3 |     Total
-----------+---------------------------------+----------
         1 |       136        226        171 |       533
         2 |        35         54         79 |       168
-----------+---------------------------------+----------
     Total |       171        280        250 |       701

          Pearson chi2(2) =  12.5097   Pr = 0.002

. quietly xi: poisson n i.r i.w i.p i.r*i.p i.p*i.w i.r*i.w
. est store full

. quietly xi: poisson n i.r i.w i.p i.r*i.p i.p*i.w
. est store m0
. lrtest full m0

Likelihood-ratio test                                 LR chi2(2)  =     11.65
(Assumption: m0 nested in full)                       Prob > chi2 =    0.0029
```

. clear

. input ll rr cc n

```
     ll rr cc   n
  1. 1 1 1  35
  2. 1 1 2  70
  3. 1 1 3 115
  4. 1 2 1   9
  5. 1 2 2   7
  6. 1 2 3  32
  7. 1 3 1  54
  8. 1 3 2   5
  9. 1 3 3  48
 10. 2 1 1  44
 11. 2 1 2  58
 12. 2 1 3 112
 13. 2 2 1  23
 14. 2 2 2  11
 15. 2 2 3  41
 16. 2 3 1  54
 17. 2 3 2   5
 18. 2 3 3  35
 19. end
```

. table rr cc ll [weight = n]

```
------------------------------------------------
          |               ll and cc
          | ------- 1 ------    ------- 2 ------
       rr |    1      2      3       1      2      3
----------+-------------------------------------
        1 |   35     70    115      44     58    112
        2 |    9      7     32      23     11     41
        3 |   54      5     48      54      5     35
------------------------------------------------
```

. quietly xi: poisson n i.rr i.cc i.ll i.rr*i.cc i.rr*i.ll i.cc*i.ll
. est store full

. quietly xi: poisson n i.rr i.cc i.ll i.rr*i.ll i.cc*i.ll
. est store m1
. lrtest full m1

```
Likelihood-ratio test                                 LR chi2(4)  =    112.93
(Assumption: m1 nested in full)                       Prob > chi2 =    0.0000
```

. quietly xi: poisson n i.rr i.cc i.ll i.rr*i.cc i.cc*i.ll
. est store m2
. lrtest full m2

```
Likelihood-ratio test                                 LR chi2(2)  =      8.31
(Assumption: m2 nested in full)                       Prob > chi2 =    0.0157
```

. quietly xi: poisson n i.rr i.cc i.ll i.rr*i.ll i.rr*i.cc
. est store m3
. lrtest full m3

```
Likelihood-ratio test                                 LR chi2(2)  =      4.37
(Assumption: m3 nested in full)                       Prob > chi2 =    0.1123
```

. quietly xi: poisson n i.rr i.cc i.ll i.rr*i.cc
. est store m4
. lrtest full m4

```
Likelihood-ratio test                                 LR chi2(4)  =     11.19
(Assumption: m4 nested in full)                       Prob > chi2 =    0.0245
```

. quietly xi: poisson n i.rr i.cc i.ll i.rr*i.ll
. est store m5
. lrtest full m5

```
Likelihood-ratio test                                 LR chi2(6)  =    115.80
(Assumption: m5 nested in full)                       Prob > chi2 =    0.0000
```

. quietly xi: poisson n i.rr i.cc i.ll i.cc*i.ll
. est store m6
. lrtest full m6

```
Likelihood-ratio test                                 LR chi2(6)  =    119.75
(Assumption: m6 nested in full)                       Prob > chi2 =    0.0000
```

. quietly xi: poisson n i.rr i.cc i.ll
. est store m7
. lrtest full m7

```
Likelihood-ratio test                                 LR chi2(8)  =    122.62
(Assumption: m7 nested in full)                       Prob > chi2 =    0.0000
```