Models In Epidemiology And Biostatistics
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Crohn's Disease Example
[adapted by S. Coward]

Patients with Crohn's Disease
Treatment : [treat] 0 - mesalamine, 1 - budesonide
Outcome : [remis] 0 - flare, 1- remission
[flare] 0 - remission, 1- flare
Strata : [strata] 0 - ileal, 1- colonic

data in cde.dta

Let $p_{ij} = P(\text{remission} \mid \text{treat=i and strata=j})$ and $p_i = P(\text{remission} \mid \text{treat=i})$

```
. table flare treat strata,row

----------------------------------------
          |       strata and treat
          | --- ileal --    --- colon --
    flare |  mesa   buda     mesa   buda
----------+-----------------------------
       no |    50     10       90    400
      yes |   450    190       15    600
          |
    Total |   500    200      105  1,000
----------------------------------------

. table treat strata,c(mean remis) col

----------------------------------------
          |            strata
    treat |    ileal     colon     Total
----------+-----------------------------
     mesa |       .1  .8571429   .231405
     buda |      .05        .4  .3416667
----------------------------------------
```

So the two crude estimates are $\hat{p}_0 = 0.231405$ and $\hat{p}_1 = 0.3416667$ suggesting that budasonide has a higher remission rate estimate than mesalamine.
But when one stratifies on disease location, we see stratum specific estimates of :
$\hat{p}_{00} = 0.1$ and $\hat{p}_{10} = 0.05$ for ileal and $\hat{p}_{01} = 0.8571429$ and $\hat{p}_{11} = 0.4$ for colonic.
For both disease locations, mesalamine has a higher remission rate estimate than budasonide.
It is instructive to identify all of these numbers in the counterplot below. Consider some comparisons based on the counterfactual approach.

Stata can be used to carry out a stratified analysis based on the odds ratio. The stratum specific odds ratio estimates can be computed 'by hand' as can the 'crude' odds ratio estimate. Sometimes, we might elect to reverse code 'treat'. Try it out.
You can create the corresponding counterplot here and then identify 'real' and counterfactual again.

```
. cc remis treat,by(strata)

          strata |       OR       [95% Conf. Interval]   M-H Weight
-----------------+-------------------------------------------------
           ileal |   .4736842      .2098533   .9711358     13.57143 (exact)
           colon |   .1111111      .0589522   .1969478     48.86878 (exact)
```

```
-----------------+------------------------------------------------------
           Crude |   1.723779      1.371666   2.172145              (exact)
    M-H combined |   .1899167      .1230803   .2930471
-----------------+------------------------------------------------------
Test of homogeneity (M-H)       chi2(1) =    10.06  Pr>chi2 = 0.0015

                    Test that combined OR = 1:
                                Mantel-Haenszel chi2(1) =     73.77
                                                Pr>chi2 =    0.0000
```

Similar 'hand' calculations can be done for the remission rate ratio [aka HR] and then identifications with the counterplot.

```
. cs remis treat,by(strata)

          strata |       RR       [95% Conf. Interval]   M-H Weight
-----------------+------------------------------------------------
           ileal |          .5     .2587227   .9662854     14.28571
           colon |    .4666667      .418515   .5203583     81.44796
-----------------+------------------------------------------------
           Crude |    1.476488     1.251781   1.741532
    M-H combined |    .4716408     .4112987   .5408357
-----------------+------------------------------------------------
Test of homogeneity (M-H)       chi2(1) =    0.067  Pr>chi2 = 0.7964
```

...and for the flare rate ratio [aka RR]

```
. cs flare treat,by(strata)

          strata |       RR       [95% Conf. Interval]   M-H Weight
-----------------+------------------------------------------------
           ileal |    1.055556     1.010946   1.102134     128.5714
           colon |          4.2      2.62174   6.728355     13.57466
-----------------+------------------------------------------------
           Crude |    .8565412     .8068415   .9093023
    M-H combined |    1.355844     1.243643   1.478167
-----------------+------------------------------------------------
Test of homogeneity (M-H)       chi2(1) =  151.247  Pr>chi2 = 0.0000

. counterplot flare treat strata,outcome(success)
```