**. glm MR `part\_count\_lag\_4\_vars' `covariates' ib(freq).state ib(freq).time, family(poisson) link(log) vce(cl mineid) exposure(hours) iter(50) eform**

Iteration 0: log pseudolikelihood = -9588.5647

Iteration 1: log pseudolikelihood = -8984.1559

Iteration 2: log pseudolikelihood = -8980.8745

Iteration 3: log pseudolikelihood = -8980.8723

Iteration 4: log pseudolikelihood = -8980.8723

Generalized linear models No. of obs = 6,253

Optimization : ML Residual df = 6,217

Scale parameter = 1

Deviance = 8386.878884 (1/df) Deviance = 1.349023

Pearson = 9312.143395 (1/df) Pearson = 1.497852

Variance function: V(u) = u [Poisson]

Link function : g(u) = ln(u) [Log]

AIC = 2.884015

Log pseudolikelihood = -8980.872289 BIC = -45954.78

(Std. Err. adjusted for 1,238 clusters in mineid)

-----------------------------------------------------------------------------------

| Robust

MR | IRR Std. Err. z P>|z| [95% Conf. Interval]

------------------+----------------------------------------------------------------

p47\_c\_4lag | .9975301 .0237937 -0.10 0.917 .9519687 1.045272

p48\_c\_4lag | 1.002354 .0026922 0.88 0.381 .9970909 1.007644

p71\_c\_4lag | .96499 .0168188 -2.04 0.041 .9325825 .9985237

p72\_c\_4lag | 1.004793 .0060601 0.79 0.428 .9929851 1.016741

p75\_c\_4lag | 1.000229 .0000759 3.02 0.003 1.00008 1.000378

p77\_c\_4lag | .9976861 .0015298 -1.51 0.131 .9946923 1.000689

mine\_time | .9926505 .0088927 -0.82 0.410 .9753732 1.010234

onsite\_insp\_hours | .9998818 .0000567 -2.09 0.037 .9997708 .9999929

|

state |

1 | 1.135179 .0889595 1.62 0.106 .9735514 1.323639

2 | 2.21704 .1428428 12.36 0.000 1.954029 2.515452

3 | .7522517 .1268633 -1.69 0.091 .5405208 1.046921

4 | 1.1999 .1160394 1.88 0.060 .9927217 1.450316

5 | .9577701 .1502036 -0.28 0.783 .7043207 1.302423

6 | 1.054182 .0617317 0.90 0.368 .9398752 1.182391

7 | 1.036647 .2308527 0.16 0.872 .6700007 1.603933

8 | .9487383 .0495049 -1.01 0.313 .8565071 1.050901

9 | .8396379 .0449016 -3.27 0.001 .7560876 .9324209

10 | 1.229632 .1737816 1.46 0.144 .9321299 1.622086

11 | .929482 .2431959 -0.28 0.780 .5565791 1.552227

12 | .981726 .1031404 -0.18 0.861 .7990296 1.206196

13 | 1.376741 .2024672 2.17 0.030 1.031983 1.836675

14 | .6504453 .0829427 -3.37 0.001 .5066036 .8351283

15 | .6998716 .0629333 -3.97 0.000 .5867827 .8347558

17 | 1.140072 .058759 2.54 0.011 1.030533 1.261256

|

time |

2000 | 1.160991 .0720874 2.40 0.016 1.027961 1.311237

2002 | 1.007015 .0561809 0.13 0.900 .9027095 1.123374

2003 | .8908843 .0535653 -1.92 0.055 .7918482 1.002307

2004 | .925186 .0597228 -1.20 0.228 .8152337 1.049968

2005 | .8072878 .0482309 -3.58 0.000 .7180817 .9075758

2006 | .7675368 .0562458 -3.61 0.000 .664848 .8860863

2007 | .7333797 .0537076 -4.23 0.000 .6353205 .8465741

2008 | .6743638 .052665 -5.04 0.000 .578654 .785904

2009 | .59913 .0476753 -6.44 0.000 .5126103 .7002527

2010 | .5910031 .0509977 -6.09 0.000 .4990447 .6999066

2011 | .6168825 .0530154 -5.62 0.000 .521254 .7300548

2012 | .6370102 .0550348 -5.22 0.000 .5377823 .754547

2013 | .5925965 .0616474 -5.03 0.000 .4832915 .7266228

2014 | .5819362 .0598913 -5.26 0.000 .475633 .7119979

2015 | .5972924 .0703952 -4.37 0.000 .4740966 .7525011

|

\_cons | .0000154 9.24e-07 -185.09 0.000 .0000137 .0000174

ln(hours) | 1 (exposure)

-----------------------------------------------------------------------------------

**. estat gof**

Deviance goodness-of-fit = 8386.879

Prob > chi2(6217) = 0.0000

Pearson goodness-of-fit = 9312.143

Prob > chi2(6217) = 0.0000

**. glm MR `part\_count\_lag\_4\_vars' `covariates' ib(freq).state ib(freq).time, family(nbinomial) link(log) vce(cl mineid) exposure(hours) iter(50) eform**

Iteration 0: log pseudolikelihood = -9219.8992

Iteration 1: log pseudolikelihood = -9092.1964

Iteration 2: log pseudolikelihood = -9091.0996

Iteration 3: log pseudolikelihood = -9091.0995

Generalized linear models No. of obs = 6,253

Optimization : ML Residual df = 6,217

Scale parameter = 1

Deviance = 3868.436565 (1/df) Deviance = .6222353

Pearson = 4155.39003 (1/df) Pearson = .6683915

Variance function: V(u) = u+(1)u^2 [Neg. Binomial]

Link function : g(u) = ln(u) [Log]

AIC = 2.919271

Log pseudolikelihood = -9091.099457 BIC = -50473.22

(Std. Err. adjusted for 1,238 clusters in mineid)

-----------------------------------------------------------------------------------

| Robust

MR | IRR Std. Err. z P>|z| [95% Conf. Interval]

------------------+----------------------------------------------------------------

p47\_c\_4lag | 1.018079 .0228273 0.80 0.424 .9743071 1.063817

p48\_c\_4lag | 1.002166 .0027954 0.78 0.438 .9967023 1.00766

p71\_c\_4lag | .9905516 .0185966 -0.51 0.613 .9547654 1.027679

p72\_c\_4lag | .9999739 .0092568 -0.00 0.998 .9819945 1.018282

p75\_c\_4lag | 1.000346 .0000859 4.03 0.000 1.000178 1.000515

p77\_c\_4lag | .9979883 .0017211 -1.17 0.243 .9946208 1.001367

mine\_time | .9941528 .0069601 -0.84 0.402 .9806043 1.007888

onsite\_insp\_hours | .9998607 .0000525 -2.65 0.008 .9997579 .9999636

|

state |

1 | 1.045317 .1117257 0.41 0.678 .8477543 1.288921

2 | 1.739031 .0913114 10.54 0.000 1.568965 1.927532

3 | .7223821 .1204881 -1.95 0.051 .520946 1.001708

4 | 1.060115 .0831376 0.74 0.457 .9090735 1.236252

5 | .877083 .1487592 -0.77 0.439 .6290297 1.222954

6 | .8888873 .0439216 -2.38 0.017 .8068396 .9792785

7 | .9163611 .2090112 -0.38 0.702 .5860269 1.4329

8 | 1.126552 .0501552 2.68 0.007 1.032416 1.229271

9 | .7489721 .0390986 -5.54 0.000 .6761302 .8296615

10 | .8379723 .1418356 -1.04 0.296 .6013882 1.167628

11 | .8943203 .2390512 -0.42 0.676 .5296238 1.510145

12 | .9911515 .0879699 -0.10 0.920 .8328973 1.179475

13 | 1.350767 .2154368 1.89 0.059 .9881446 1.846463

14 | .6285762 .0896596 -3.26 0.001 .475273 .8313285

15 | .6626407 .0438941 -6.21 0.000 .5819605 .7545061

17 | 1.070572 .0558823 1.31 0.191 .9664606 1.185898

|

time |

2000 | 1.099082 .0750286 1.38 0.166 .9614414 1.256427

2002 | .935403 .0631349 -0.99 0.322 .8194963 1.067703

2003 | .8743631 .0668471 -1.76 0.079 .7526889 1.015706

2004 | .8446285 .0609298 -2.34 0.019 .7332663 .9729033

2005 | .7425332 .0529669 -4.17 0.000 .6456502 .8539539

2006 | .756016 .058298 -3.63 0.000 .6499695 .8793645

2007 | .7001812 .0543337 -4.59 0.000 .601392 .8151982

2008 | .6262861 .0475827 -6.16 0.000 .5396373 .726848

2009 | .5061333 .042322 -8.14 0.000 .4296244 .5962671

2010 | .5516931 .047285 -6.94 0.000 .4663822 .6526092

2011 | .5827864 .0493236 -6.38 0.000 .4937063 .6879392

2012 | .5952168 .0525699 -5.87 0.000 .5006066 .7077075

2013 | .4922323 .0471447 -7.40 0.000 .407985 .5938763

2014 | .4761413 .0473488 -7.46 0.000 .3918231 .5786042

2015 | .5127567 .0528804 -6.48 0.000 .4189163 .6276181

|

\_cons | .0000178 1.15e-06 -168.57 0.000 .0000156 .0000202

ln(hours) | 1 (exposure)

-----------------------------------------------------------------------------------

**. nbreg MR `part\_count\_lag\_4\_vars' `covariates' ib(freq).state ib(freq).time, vce(cl mineid) exposure(hours) iter(50) irr**

Fitting Poisson model:

Iteration 0: log pseudolikelihood = -10020.12

Iteration 1: log pseudolikelihood = -8995.4197

Iteration 2: log pseudolikelihood = -8980.9195

Iteration 3: log pseudolikelihood = -8980.8723

Iteration 4: log pseudolikelihood = -8980.8723

Fitting constant-only model:

Iteration 0: log pseudolikelihood = -9249.9658

Iteration 1: log pseudolikelihood = -8971.6355

Iteration 2: log pseudolikelihood = -8961.958

Iteration 3: log pseudolikelihood = -8961.9317

Iteration 4: log pseudolikelihood = -8961.9317

Fitting full model:

Iteration 0: log pseudolikelihood = -8712.7325

Iteration 1: log pseudolikelihood = -8675.5147

Iteration 2: log pseudolikelihood = -8674.703

Iteration 3: log pseudolikelihood = -8674.7027

Negative binomial regression Number of obs = 6,253

Wald chi2(35) = .

Dispersion = mean Prob > chi2 = .

Log pseudolikelihood = -8674.7027 Pseudo R2 = 0.0320

(Std. Err. adjusted for 1,238 clusters in mineid)

-----------------------------------------------------------------------------------

| Robust

MR | IRR Std. Err. z P>|z| [95% Conf. Interval]

------------------+----------------------------------------------------------------

p47\_c\_4lag | 1.011057 .023665 0.47 0.638 .9657227 1.05852

p48\_c\_4lag | 1.001406 .0023755 0.59 0.554 .9967605 1.006072

p71\_c\_4lag | .9752552 .0160621 -1.52 0.128 .9442767 1.00725

p72\_c\_4lag | 1.000955 .0075244 0.13 0.899 .9863157 1.015812

p75\_c\_4lag | 1.000292 .0000808 3.62 0.000 1.000134 1.000451

p77\_c\_4lag | .9977596 .0017193 -1.30 0.193 .9943956 1.001135

mine\_time | .9930116 .0073105 -0.95 0.341 .9787863 1.007444

onsite\_insp\_hours | .9998671 .000054 -2.46 0.014 .9997613 .999973

|

state |

1 | 1.079937 .1004235 0.83 0.408 .9000049 1.295841

2 | 1.975611 .109372 12.30 0.000 1.772467 2.202039

3 | .7295125 .1250171 -1.84 0.066 .5213888 1.020713

4 | 1.092564 .087622 1.10 0.270 .9336449 1.278533

5 | .9105406 .1494434 -0.57 0.568 .6600777 1.25604

6 | .9458331 .0484679 -1.09 0.277 .8554524 1.045763

7 | .9669857 .2187221 -0.15 0.882 .6207077 1.506444

8 | 1.004267 .0497963 0.09 0.932 .9112604 1.106766

9 | .7873117 .0396238 -4.75 0.000 .7133579 .8689323

10 | .987199 .1532632 -0.08 0.934 .7282075 1.338302

11 | .8879692 .2230981 -0.47 0.636 .5426721 1.452976

12 | .9872951 .0890552 -0.14 0.887 .8273088 1.17822

13 | 1.330341 .1995319 1.90 0.057 .9915053 1.78497

14 | .6251524 .0838827 -3.50 0.000 .4805871 .8132045

15 | .6774316 .0487935 -5.41 0.000 .5882417 .7801445

17 | 1.096435 .0558922 1.81 0.071 .9921829 1.211641

|

time |

2000 | 1.13578 .0717298 2.02 0.044 1.003545 1.285439

2002 | .9817047 .059071 -0.31 0.759 .872494 1.104585

2003 | .8793514 .0572516 -1.97 0.048 .7740047 .9990364

2004 | .8957793 .0591892 -1.67 0.096 .7869684 1.019635

2005 | .7820036 .0498343 -3.86 0.000 .6901837 .8860389

2006 | .7775286 .0555112 -3.52 0.000 .6759978 .8943087

2007 | .7256109 .0528743 -4.40 0.000 .6290394 .8370081

2008 | .6577289 .0473479 -5.82 0.000 .5711782 .7573947

2009 | .55629 .0433975 -7.52 0.000 .477416 .6481948

2010 | .5707912 .0459383 -6.97 0.000 .487496 .6683185

2011 | .6037063 .0487404 -6.25 0.000 .5153517 .7072089

2012 | .6167293 .0508723 -5.86 0.000 .5246641 .7249497

2013 | .5380172 .0504422 -6.61 0.000 .4477041 .6465486

2014 | .5244742 .0501741 -6.75 0.000 .434804 .6326372

2015 | .5510918 .0565326 -5.81 0.000 .4507184 .6738181

|

\_cons | .0000168 1.02e-06 -182.02 0.000 .0000149 .0000189

ln(hours) | 1 (exposure)

------------------+----------------------------------------------------------------

/lnalpha | -1.52313 .0970024 -1.713251 -1.333008

------------------+----------------------------------------------------------------

alpha | .2180285 .0211493 .1802788 .2636828

-----------------------------------------------------------------------------------

**. lrtest pois nbin, stats force**

Likelihood-ratio test LR chi2(1) = 612.34

(Assumption: pois nested in nbin) Prob > chi2 = 0.0000

Akaike's information criterion and Bayesian information criterion

-----------------------------------------------------------------------------

Model | Obs ll(null) ll(model) df AIC BIC

-------------+---------------------------------------------------------------

pois | 6,253 -9569.622 -8980.872 36 18033.74 18276.41

nbin | 6,253 -8961.932 -8674.703 37 17423.41 17672.82

-----------------------------------------------------------------------------

Note: N=Obs used in calculating BIC; see [R] BIC note.

**. summ MR pcv3\_yhat**

Variable | Obs Mean Std. Dev. Min Max

-------------+---------------------------------------------------------

MR | 6,253 1.881017 3.268911 0 37

pcv3\_yhat | 6,253 1.922302 2.890726 .0006387 27.8425