**. glm MR `part\_penalty\_point\_vars' `covariates' ib(freq).state ib(freq).time if sample\_pp, family(poisson) link(log) vce(cl mineid) exposure(hours) iter(50) eform**

Iteration 0: log pseudolikelihood = -5000.0519

Iteration 1: log pseudolikelihood = -4690.9911

Iteration 2: log pseudolikelihood = -4689.5219

Iteration 3: log pseudolikelihood = -4689.5213

Iteration 4: log pseudolikelihood = -4689.5213

Generalized linear models No. of obs = 3,333

Optimization : ML Residual df = 3,304

Scale parameter = 1

Deviance = 4308.596316 (1/df) Deviance = 1.304055

Pearson = 4665.766053 (1/df) Pearson = 1.412157

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

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

AIC = 2.831396

Log pseudolikelihood = -4689.521303 BIC = -22492.22

(Std. Err. adjusted for 727 clusters in mineid)

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

| Robust

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

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

p47\_pp | .9979223 .0011927 -1.74 0.082 .9955873 1.000263

p48\_pp | 1.0002 .0001353 1.48 0.139 .999935 1.000466

p71\_pp | 1.000247 .0006035 0.41 0.682 .999065 1.001431

p72\_pp | .9993632 .0005013 -1.27 0.204 .9983811 1.000346

p75\_pp | 1.000015 4.02e-06 3.75 0.000 1.000007 1.000023

p77\_pp | .9999489 .0001139 -0.45 0.654 .9997256 1.000172

mine\_time | .987247 .0095254 -1.33 0.183 .9687531 1.006094

onsite\_insp\_hours | .9998554 .0000641 -2.26 0.024 .9997298 .9999811

|

state |

1 | 1.401021 .191234 2.47 0.013 1.072158 1.830755

2 | 2.451335 .1948074 11.28 0.000 2.09777 2.864492

3 | .7698895 .1150868 -1.75 0.080 .5743632 1.031977

4 | 1.212036 .1163757 2.00 0.045 1.004121 1.463002

5 | .9923884 .2011483 -0.04 0.970 .6670381 1.476429

6 | 1.10571 .0780186 1.42 0.154 .962899 1.269702

7 | 1.214589 .2383309 0.99 0.322 .8268062 1.784248

8 | .8413151 .0553533 -2.63 0.009 .7395285 .9571114

9 | .8585564 .0616514 -2.12 0.034 .7458399 .9883074

10 | 1.094195 .1621297 0.61 0.544 .8184084 1.462916

11 | .8246881 .3797815 -0.42 0.676 .3344247 2.033673

12 | .9532691 .1218511 -0.37 0.708 .7420124 1.224672

13 | 1.249644 .2138625 1.30 0.193 .8935372 1.747671

14 | .6907871 .1416613 -1.80 0.071 .4621537 1.032528

15 | .6967318 .0731061 -3.44 0.001 .5672199 .8558149

17 | 1.112299 .0683326 1.73 0.083 .9861185 1.254625

|

time |

2007 | 1.113154 .0653398 1.83 0.068 .9921829 1.248876

2009 | .9039288 .049046 -1.86 0.063 .8127353 1.005355

2010 | .8992159 .055714 -1.71 0.086 .7963883 1.01532

2011 | .9484524 .0553615 -0.91 0.365 .8459225 1.063409

2012 | .9973471 .0638189 -0.04 0.967 .8797901 1.130612

2013 | .9370062 .0740407 -0.82 0.410 .8025681 1.093964

2014 | .9153151 .0742538 -1.09 0.275 .7807607 1.073058

2015 | .9373735 .0833095 -0.73 0.467 .7875203 1.115741

|

\_cons | .0000102 7.66e-07 -152.77 0.000 8.78e-06 .0000118

ln(hours) | 1 (exposure)

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

**. estat gof**

Deviance goodness-of-fit = 4461.917

Prob > chi2(3316) = 0.0000

Pearson goodness-of-fit = 4795.053

Prob > chi2(3316) = 0.0000

**. glm MR `part\_penalty\_point\_vars' `covariates' ib(freq).state ib(freq).time if sample\_pp, family(nbinomial) link(log) vce(cl mineid) exposure(hours) iter(50) eform**

Iteration 0: log pseudolikelihood = -4864.7283

Iteration 1: log pseudolikelihood = -4787.4352

Iteration 2: log pseudolikelihood = -4786.8698

Iteration 3: log pseudolikelihood = -4786.8697

Generalized linear models No. of obs = 3,333

Optimization : ML Residual df = 3,304

Scale parameter = 1

Deviance = 2000.962577 (1/df) Deviance = .6056182

Pearson = 2116.392196 (1/df) Pearson = .6405545

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

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

AIC = 2.889811

Log pseudolikelihood = -4786.869731 BIC = -24799.86

(Std. Err. adjusted for 727 clusters in mineid)

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

| Robust

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

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

p47\_pp | .9987852 .0010582 -1.15 0.251 .9967134 1.000861

p48\_pp | 1.000255 .0002093 1.22 0.222 .9998453 1.000666

p71\_pp | 1.00076 .0007871 0.97 0.334 .9992189 1.002304

p72\_pp | .9993039 .0005641 -1.23 0.217 .998199 1.00041

p75\_pp | 1.000019 4.80e-06 3.94 0.000 1.000009 1.000028

p77\_pp | 1.000015 .0001419 0.11 0.916 .9997369 1.000293

mine\_time | .9933669 .0075367 -0.88 0.380 .9787046 1.008249

onsite\_insp\_hours | .9998315 .0000555 -3.03 0.002 .9997226 .9999403

|

state |

1 | 1.3074 .1899434 1.84 0.065 .9834293 1.738097

2 | 1.996031 .1345395 10.25 0.000 1.749014 2.277934

3 | .7025391 .1212827 -2.05 0.041 .5008682 .9854114

4 | 1.162435 .1082427 1.62 0.106 .9685166 1.39518

5 | .9637749 .1951712 -0.18 0.855 .6480393 1.433342

6 | .9729846 .0616256 -0.43 0.665 .8593967 1.101586

7 | 1.114225 .2175983 0.55 0.580 .7598729 1.633823

8 | .7954249 .0550567 -3.31 0.001 .6945153 .9109961

9 | .7871087 .0550134 -3.43 0.001 .6863438 .9026673

10 | .7438938 .1417979 -1.55 0.121 .5119865 1.080845

11 | .9161536 .5169062 -0.16 0.877 .3031858 2.768393

12 | .9874169 .1316333 -0.09 0.924 .7603722 1.282257

13 | 1.228716 .2366877 1.07 0.285 .8423341 1.792332

14 | .6961923 .150942 -1.67 0.095 .4551762 1.064827

15 | .6640107 .0580829 -4.68 0.000 .5593944 .7881921

17 | 1.037159 .0613551 0.62 0.537 .9236145 1.164661

|

time |

2007 | 1.140774 .0766618 1.96 0.050 .9999947 1.301373

2009 | .8266036 .0548094 -2.87 0.004 .7258667 .9413209

2010 | .9055194 .0654597 -1.37 0.170 .7858952 1.043352

2011 | .9573807 .0629716 -0.66 0.508 .8415831 1.089112

2012 | .9758845 .0708778 -0.34 0.737 .8464012 1.125176

2013 | .8192378 .0643926 -2.54 0.011 .7022714 .9556854

2014 | .7819139 .0647499 -2.97 0.003 .6647699 .9197007

2015 | .8566254 .0720336 -1.84 0.066 .7264628 1.01011

|

\_cons | .0000107 7.84e-07 -155.70 0.000 9.23e-06 .0000123

ln(hours) | 1 (exposure)

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

**. nbreg MR `part\_penalty\_point\_vars' `covariates' ib(freq).state ib(freq).time if sample\_pp, vce(cl mineid) exposure(hours) iter(50) irr**

Fitting Poisson model:

Iteration 0: log pseudolikelihood = -4917.2929

Iteration 1: log pseudolikelihood = -4693.715

Iteration 2: log pseudolikelihood = -4689.5426

Iteration 3: log pseudolikelihood = -4689.5213

Iteration 4: log pseudolikelihood = -4689.5213

Fitting constant-only model:

Iteration 0: log pseudolikelihood = -4833.1956

Iteration 1: log pseudolikelihood = -4642.8135

Iteration 2: log pseudolikelihood = -4639.576

Iteration 3: log pseudolikelihood = -4639.57

Iteration 4: log pseudolikelihood = -4639.57

Fitting full model:

Iteration 0: log pseudolikelihood = -4561.3148

Iteration 1: log pseudolikelihood = -4549.565

Iteration 2: log pseudolikelihood = -4549.4556

Iteration 3: log pseudolikelihood = -4549.4556

Negative binomial regression Number of obs = 3,333

Wald chi2(28) = .

Dispersion = mean Prob > chi2 = .

Log pseudolikelihood = -4549.4556 Pseudo R2 = 0.0194

(Std. Err. adjusted for 727 clusters in mineid)

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

| Robust

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

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

p47\_pp | .9985404 .0011159 -1.31 0.191 .9963557 1.00073

p48\_pp | 1.000196 .0001571 1.25 0.213 .9998878 1.000504

p71\_pp | 1.000379 .0006105 0.62 0.534 .9991834 1.001577

p72\_pp | .999299 .0005076 -1.38 0.167 .9983045 1.000294

p75\_pp | 1.000017 4.45e-06 3.78 0.000 1.000008 1.000026

p77\_pp | .9999598 .0001292 -0.31 0.756 .9997066 1.000213

mine\_time | .9899022 .0079721 -1.26 0.208 .9743999 1.005651

onsite\_insp\_hours | .9998458 .0000577 -2.67 0.008 .9997328 .9999588

|

state |

1 | 1.346 .1862381 2.15 0.032 1.026289 1.76531

2 | 2.237871 .1541551 11.69 0.000 1.955241 2.561355

3 | .7325556 .1149781 -1.98 0.047 .5385679 .9964161

4 | 1.17666 .1060181 1.81 0.071 .9861819 1.403929

5 | .9759797 .1977537 -0.12 0.904 .6560996 1.451817

6 | 1.023364 .0646418 0.37 0.715 .9041972 1.158236

7 | 1.163674 .2294016 0.77 0.442 .7907319 1.712512

8 | .8250202 .0536798 -2.96 0.003 .7262419 .9372335

9 | .8240142 .0535404 -2.98 0.003 .7254838 .9359262

10 | .8943656 .1521163 -0.66 0.512 .6408262 1.248217

11 | .836291 .4025297 -0.37 0.710 .3255749 2.148147

12 | .9711941 .1212882 -0.23 0.815 .7603318 1.240535

13 | 1.226659 .2075984 1.21 0.227 .8803743 1.70915

14 | .6788991 .1427235 -1.84 0.065 .4496338 1.025065

15 | .6853875 .0611909 -4.23 0.000 .5753625 .8164523

17 | 1.070921 .0623056 1.18 0.239 .9555099 1.200273

|

time |

2007 | 1.128741 .0701756 1.95 0.051 .9992495 1.275014

2009 | .866179 .0521554 -2.39 0.017 .7697578 .9746782

2010 | .8902918 .0579495 -1.79 0.074 .7836592 1.011434

2011 | .9477864 .0568672 -0.89 0.371 .8426328 1.066062

2012 | .970532 .0625438 -0.46 0.643 .855374 1.101194

2013 | .860848 .064147 -2.01 0.044 .7438721 .9962187

2014 | .8321386 .0644944 -2.37 0.018 .7148647 .9686513

2015 | .8807645 .0703132 -1.59 0.112 .7531937 1.029942

|

\_cons | .0000106 7.53e-07 -161.75 0.000 9.25e-06 .0000122

ln(hours) | 1 (exposure)

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

/lnalpha | -1.609554 .1203868 -1.845508 -1.373601

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

alpha | .1999767 .0240745 .1579451 .2531937

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**. lrtest pois nbin, stats force**

Likelihood-ratio test LR chi2(13) = 433.45

(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 | 3,333 -4869.058 -4766.182 17 9566.363 9670.261

nbin | 3,333 -4639.57 -4549.456 30 9158.911 9342.26

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

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

**. summ MR pcpp1\_yhat**

Variable | Obs Mean Std. Dev. Min Max

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

MR | 6,253 1.881017 3.268911 0 37

pcpp1\_yhat | 6,253 1.60724 2.404007 .0006514 29.79523