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

Iteration 0: log pseudolikelihood = -9591.7502

Iteration 1: log pseudolikelihood = -8987.9042

Iteration 2: log pseudolikelihood = -8984.6578

Iteration 3: log pseudolikelihood = -8984.6556

Iteration 4: log pseudolikelihood = -8984.6556

Generalized linear models No. of obs = 6,253

Optimization : ML Residual df = 6,217

Scale parameter = 1

Deviance = 8394.445549 (1/df) Deviance = 1.350241

Pearson = 9338.116553 (1/df) Pearson = 1.502029

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

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

AIC = 2.885225

Log pseudolikelihood = -8984.655621 BIC = -45947.21

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

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| Robust

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

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

p47\_c\_lag\_all | 1.013906 .0102211 1.37 0.171 .99407 1.034139

p48\_c\_lag\_all | 1.001373 .0010821 1.27 0.204 .9992541 1.003496

p71\_c\_lag\_all | .9902925 .005039 -1.92 0.055 .9804654 1.000218

p72\_c\_lag\_all | 1.002477 .0030825 0.80 0.421 .9964533 1.008536

p75\_c\_lag\_all | 1.000028 .0000114 2.48 0.013 1.000006 1.000051

p77\_c\_lag\_all | .999218 .0004515 -1.73 0.083 .9983335 1.000103

mine\_time | .9860302 .0081751 -1.70 0.090 .9701368 1.002184

onsite\_insp\_hours | .9999445 .0000445 -1.25 0.212 .9998574 1.000032

|

state |

1 | 1.092719 .0752046 1.29 0.198 .9548295 1.250521

2 | 2.223511 .1292262 13.75 0.000 1.984125 2.491779

3 | .7655982 .1509274 -1.35 0.175 .5202332 1.126688

4 | 1.166653 .1000811 1.80 0.072 .9861016 1.380264

5 | .9232899 .1408993 -0.52 0.601 .6846047 1.245192

6 | 1.016241 .0588881 0.28 0.781 .9071353 1.138469

7 | 1.028792 .2286324 0.13 0.898 .6655212 1.590353

8 | .9228786 .0473432 -1.56 0.118 .8346 1.020495

9 | .7957371 .0481883 -3.77 0.000 .7066794 .8960181

10 | 1.189948 .1836358 1.13 0.260 .8793635 1.610229

11 | .9415213 .2439443 -0.23 0.816 .566614 1.564491

12 | .9370358 .0956813 -0.64 0.524 .7670779 1.144651

13 | 1.322548 .1972227 1.87 0.061 .9873639 1.771517

14 | .6372251 .0830586 -3.46 0.001 .4935642 .8227011

15 | .6847056 .0647751 -4.00 0.000 .5688239 .8241948

17 | 1.185581 .0888632 2.27 0.023 1.023601 1.373193

|

time |

2000 | 1.104739 .0661393 1.66 0.096 .9824246 1.242281

2002 | 1.004355 .0553149 0.08 0.937 .9015865 1.118838

2003 | .8880351 .0528215 -2.00 0.046 .7903138 .9978396

2004 | .9174275 .0583165 -1.36 0.175 .8099625 1.039151

2005 | .8082343 .0485093 -3.55 0.000 .7185371 .9091288

2006 | .7774342 .0557469 -3.51 0.000 .6755028 .8947467

2007 | .7431481 .0542653 -4.07 0.000 .6440505 .8574933

2008 | .6768775 .0523101 -5.05 0.000 .5817388 .7875755

2009 | .5943938 .0502347 -6.16 0.000 .5036578 .7014762

2010 | .5766736 .0525899 -6.04 0.000 .4822859 .6895338

2011 | .605984 .0528403 -5.74 0.000 .5107855 .7189253

2012 | .621596 .053032 -5.57 0.000 .5258806 .7347324

2013 | .577567 .0584082 -5.43 0.000 .4737204 .7041783

2014 | .5624987 .0599114 -5.40 0.000 .4565207 .6930787

2015 | .5683014 .0677831 -4.74 0.000 .4498349 .7179666

|

\_cons | .0000163 1.00e-06 -178.94 0.000 .0000144 .0000184

ln(hours) | 1 (exposure)

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

**. estat gof**

Deviance goodness-of-fit = 8394.446

Prob > chi2(6217) = 0.0000

Pearson goodness-of-fit = 9338.117

Prob > chi2(6217) = 0.0000

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

Iteration 0: log pseudolikelihood = -9231.9321

Iteration 1: log pseudolikelihood = -9097.2938

Iteration 2: log pseudolikelihood = -9096.0509

Iteration 3: log pseudolikelihood = -9096.0506

Generalized linear models No. of obs = 6,253

Optimization : ML Residual df = 6,217

Scale parameter = 1

Deviance = 3878.338892 (1/df) Deviance = .623828

Pearson = 4161.45878 (1/df) Pearson = .6693677

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

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

AIC = 2.920854

Log pseudolikelihood = -9096.050621 BIC = -50463.32

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

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| Robust

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

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

p47\_c\_lag\_all | 1.014443 .0082653 1.76 0.078 .9983724 1.030773

p48\_c\_lag\_all | 1.001195 .0013017 0.92 0.358 .9986469 1.003749

p71\_c\_lag\_all | 1.002004 .0071488 0.28 0.779 .9880903 1.016114

p72\_c\_lag\_all | 1.003033 .003427 0.89 0.375 .9963384 1.009772

p75\_c\_lag\_all | 1.00002 .0000126 1.56 0.119 .999995 1.000044

p77\_c\_lag\_all | .999222 .0004924 -1.58 0.114 .9982574 1.000188

mine\_time | .9922664 .0077272 -1.00 0.319 .9772363 1.007528

onsite\_insp\_hours | .9999673 .0000412 -0.79 0.428 .9998866 1.000048

|

state |

1 | 1.030044 .1071597 0.28 0.776 .8400432 1.263018

2 | 1.725164 .0898925 10.47 0.000 1.557676 1.91066

3 | .7282724 .13655 -1.69 0.091 .5043068 1.051702

4 | 1.050884 .0811788 0.64 0.521 .9032353 1.222668

5 | .8530774 .1398556 -0.97 0.332 .6186434 1.17635

6 | .8658795 .0431773 -2.89 0.004 .7852574 .9547789

7 | .9215475 .2118889 -0.36 0.722 .5872233 1.446213

8 | 1.051777 .0419007 1.27 0.205 .9727779 1.137193

9 | .6800875 .0418186 -6.27 0.000 .602871 .7671941

10 | .8129557 .1386579 -1.21 0.225 .5819502 1.135659

11 | .9160718 .2411074 -0.33 0.739 .5468847 1.534487

12 | .9390638 .0846646 -0.70 0.486 .7869588 1.120568

13 | 1.313246 .2137738 1.67 0.094 .9545205 1.806787

14 | .6048516 .0907366 -3.35 0.001 .4507711 .8115992

15 | .6536411 .0437486 -6.35 0.000 .5732814 .7452652

17 | 1.038718 .0811107 0.49 0.627 .8913112 1.210502

|

time |

2000 | 1.05374 .0698859 0.79 0.430 .9252951 1.200015

2002 | .937535 .0626794 -0.96 0.335 .8223941 1.068796

2003 | .8736818 .0659359 -1.79 0.074 .7535533 1.012961

2004 | .8402626 .0602569 -2.43 0.015 .7300854 .9670667

2005 | .7354239 .0518528 -4.36 0.000 .6405038 .8444107

2006 | .7584406 .0576722 -3.64 0.000 .6534251 .8803337

2007 | .7015865 .0543172 -4.58 0.000 .6028104 .8165479

2008 | .6261574 .047445 -6.18 0.000 .5397425 .7264078

2009 | .5122363 .0431022 -7.95 0.000 .434356 .6040805

2010 | .5481428 .0471115 -7.00 0.000 .4631642 .6487126

2011 | .5767159 .0485192 -6.54 0.000 .4890465 .6801014

2012 | .5776797 .0508631 -6.23 0.000 .4861174 .686488

2013 | .475415 .0452876 -7.81 0.000 .3944466 .5730039

2014 | .4565836 .0462983 -7.73 0.000 .3742891 .5569722

2015 | .4860963 .0506711 -6.92 0.000 .3962711 .5962828

|

\_cons | .0000184 1.23e-06 -163.76 0.000 .0000162 .000021

ln(hours) | 1 (exposure)

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

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

Fitting Poisson model:

Iteration 0: log pseudolikelihood = -10034.278

Iteration 1: log pseudolikelihood = -8998.7615

Iteration 2: log pseudolikelihood = -8984.6662

Iteration 3: log pseudolikelihood = -8984.6556

Iteration 4: log pseudolikelihood = -8984.6556

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 = -8716.7583

Iteration 1: log pseudolikelihood = -8682.5533

Iteration 2: log pseudolikelihood = -8681.8409

Iteration 3: log pseudolikelihood = -8681.8407

Negative binomial regression Number of obs = 6,253

Wald chi2(35) = .

Dispersion = mean Prob > chi2 = .

Log pseudolikelihood = -8681.8407 Pseudo R2 = 0.0313

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

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| Robust

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

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

p47\_c\_lag\_all | 1.014839 .0085679 1.74 0.081 .9981847 1.031772

p48\_c\_lag\_all | 1.001126 .0011794 0.96 0.339 .998817 1.00344

p71\_c\_lag\_all | .9962772 .0058274 -0.64 0.524 .984921 1.007764

p72\_c\_lag\_all | 1.002938 .0031295 0.94 0.347 .9968229 1.00909

p75\_c\_lag\_all | 1.000026 .0000122 2.10 0.036 1.000002 1.000049

p77\_c\_lag\_all | .9992225 .0004963 -1.57 0.117 .9982502 1.000196

mine\_time | .9888504 .007706 -1.44 0.150 .9738617 1.00407

onsite\_insp\_hours | .9999454 .0000412 -1.33 0.185 .9998647 1.000026

|

state |

1 | 1.045005 .0881891 0.52 0.602 .8856962 1.232969

2 | 1.959895 .1047199 12.59 0.000 1.765029 2.176274

3 | .7361687 .1454996 -1.55 0.121 .4997377 1.084458

4 | 1.075437 .0811745 0.96 0.335 .9275466 1.246907

5 | .8842244 .1406832 -0.77 0.439 .6473414 1.207791

6 | .9171434 .0470941 -1.68 0.092 .8293334 1.014251

7 | .9638975 .2185778 -0.16 0.871 .6180285 1.503326

8 | .9494723 .0438114 -1.12 0.261 .8673719 1.039344

9 | .7252692 .041551 -5.61 0.000 .6482366 .8114559

10 | .956329 .15115 -0.28 0.778 .7015732 1.303592

11 | .9031047 .2241457 -0.41 0.681 .555232 1.468932

12 | .9370258 .0854722 -0.71 0.476 .7836244 1.120457

13 | 1.28295 .1956595 1.63 0.102 .9514702 1.729914

14 | .6036803 .0837041 -3.64 0.000 .4600261 .7921938

15 | .6652199 .0489882 -5.54 0.000 .5758122 .7685101

17 | 1.09191 .0809154 1.19 0.235 .9442973 1.262596

|

time |

2000 | 1.086214 .065214 1.38 0.168 .9656309 1.221856

2002 | .9828714 .0585958 -0.29 0.772 .8744815 1.104696

2003 | .8797438 .056389 -2.00 0.046 .7758839 .9975064

2004 | .8890566 .0580679 -1.80 0.072 .7822291 1.010473

2005 | .7781722 .0491327 -3.97 0.000 .6875939 .8806826

2006 | .7815893 .0549298 -3.51 0.000 .6810146 .8970172

2007 | .729016 .0529067 -4.36 0.000 .6323579 .8404485

2008 | .6597485 .0471929 -5.81 0.000 .5734433 .7590429

2009 | .5605515 .0443303 -7.32 0.000 .4800646 .6545328

2010 | .564455 .0459257 -7.03 0.000 .4812526 .6620419

2011 | .5960632 .0478477 -6.45 0.000 .5092886 .6976228

2012 | .5989302 .0489278 -6.27 0.000 .5103168 .7029309

2013 | .5210201 .0484065 -7.02 0.000 .4342819 .6250823

2014 | .5056112 .0496397 -6.95 0.000 .4171072 .6128944

2015 | .5236631 .0542906 -6.24 0.000 .4273699 .6416528

|

\_cons | .0000176 1.09e-06 -177.50 0.000 .0000156 .0000199

ln(hours) | 1 (exposure)

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

/lnalpha | -1.522555 .0956701 -1.710065 -1.335045

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

alpha | .2181537 .0208708 .180854 .2631463

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**. lrtest pois nbin, stats force**

Likelihood-ratio test LR chi2(1) = 605.63

(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 -8984.656 36 18041.31 18283.98

nbin | 6,253 -8961.932 -8681.841 37 17437.68 17687.09

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

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

**. summ MR pcv4\_yhat**

Variable | Obs Mean Std. Dev. Min Max

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

MR | 6,253 1.881017 3.268911 0 37

pcv4\_yhat | 6,253 1.911876 2.798293 .000633 23.60368