Final Models

George Rhodes

5/11/2018

```
## Installing package into '/Users/george/Documents/School/UW/Thesis/thesis_R/packrat/lib/x86_64-apple-
## (as 'lib' is unspecified)

##
## The downloaded binary packages are in
##   /var/folders/6s/cv2xpvws1978z4cyr4w1sl0h0000gn/T//RtmpoIQOrr/downloaded_packages

## Warning: package 'haven' was built under R version 3.4.3

## Installing package into '/Users/george/Documents/School/UW/Thesis/thesis_R/packrat/lib/x86_64-apple-
## (as 'lib' is unspecified)

##
## The downloaded binary packages are in
##   /var/folders/6s/cv2xpvws1978z4cyr4w1sl0h0000gn/T//RtmpoIQOrr/downloaded_packages

## Warning: package 'dplyr' was built under R version 3.4.2

##
## Attaching package: 'dplyr'

## The following objects are masked from 'package:stats':
##
##     filter, lag

## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union

## Installing package into '/Users/george/Documents/School/UW/Thesis/thesis_R/packrat/lib/x86_64-apple-
## (as 'lib' is unspecified)

##
## The downloaded binary packages are in
##   /var/folders/6s/cv2xpvws1978z4cyr4w1sl0h0000gn/T//RtmpoIQOrr/downloaded_packages

## Installing package into '/Users/george/Documents/School/UW/Thesis/thesis_R/packrat/lib/x86_64-apple-
## (as 'lib' is unspecified)

##
## The downloaded binary packages are in
##   /var/folders/6s/cv2xpvws1978z4cyr4w1sl0h0000gn/T//RtmpoIQOrr/downloaded_packages

## Installing package into '/Users/george/Documents/School/UW/Thesis/thesis_R/packrat/lib/x86_64-apple-
## (as 'lib' is unspecified)

##
##   There is a binary version available (and will be installed) but
##   the source version is later:
##      binary source
## MASS 7.3-49 7.3-50
##
##
## The downloaded binary packages are in
```

```
##   /var/folders/6s/cv2xpvws1978z4cyr4w1sl0h0000gn/T//RtmpoIQOrr/downloaded_packages

## Warning: package 'MASS' was built under R version 3.4.3

##
## Attaching package: 'MASS'

## The following object is masked from 'package:dplyr':
##
##     select

## Installing package into '/Users/george/Documents/School/UW/Thesis/thesis_R/packrat/lib/x86_64-apple-
## (as 'lib' is unspecified)

##
## The downloaded binary packages are in
##   /var/folders/6s/cv2xpvws1978z4cyr4w1sl0h0000gn/T//RtmpoIQOrr/downloaded_packages

## Warning: package 'pscl' was built under R version 3.4.2

## Classes and Methods for R developed in the
## Political Science Computational Laboratory
## Department of Political Science
## Stanford University
## Simon Jackman
## hurdle and zeroinfl functions by Achim Zeileis
```

Comparing regressions 5/8/18 ## Probability: Binge [0][1+] FAMILY Treatedyn

```
##
## Call:
## lm(formula = binge2cat ~ faminc_mid + treatedyn + alctry + evermj +
##       evercoc + edu4cat + age + sex + marital + dependents + era +
##       faminc_mid * treatedyn + edu4cat * treatedyn, data = data_clean,
##       na.action = na.omit)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.7924 -0.2904 -0.1556  0.4188  1.2264
##
## Coefficients:
##                               Estimate Std. Error t value Pr(>|t|)
## (Intercept)                  0.5235305  0.0086689  60.392  < 2e-16 ***
## faminc_mid                   0.0033358  0.0005190   6.427 1.31e-10 ***
## treatedynYes                -0.0096358  0.0127300  -0.757  0.44909
## alctry                      -0.0068766  0.0003350 -20.530  < 2e-16 ***
## evermjyes                    0.0884658  0.0031519  28.068  < 2e-16 ***
## evercocyes                   0.0976769  0.0039556  24.693  < 2e-16 ***
## edu4catHS                   -0.0132751  0.0047430  -2.799  0.00513 **
## edu4catSome C               -0.0527273  0.0049574 -10.636  < 2e-16 ***
## edu4catC Grad               -0.0869093  0.0051049 -17.025  < 2e-16 ***
## age 30-34                   -0.0432595  0.0046011  -9.402  < 2e-16 ***
## age 35-49                   -0.1150866  0.0041570 -27.685  < 2e-16 ***
## age 50-64                   -0.1941982  0.0051257 -37.887  < 2e-16 ***
## age 65+                     -0.2507978  0.0062739 -39.975  < 2e-16 ***
## sex f                       -0.1542752  0.0027262 -56.590  < 2e-16 ***
## marital widowed              0.0473904  0.0072387   6.547 5.90e-11 ***
## marital divorced             0.0584432  0.0040242  14.523  < 2e-16 ***
## marital never                0.0698975  0.0040589  17.221  < 2e-16 ***
## dependents1                 -0.0438257  0.0039925 -10.977  < 2e-16 ***
## dependents2                 -0.0410382  0.0041153  -9.972  < 2e-16 ***
## dependents3+                -0.0518834  0.0050459 -10.282  < 2e-16 ***
## era2                         0.0318405  0.0026831  11.867  < 2e-16 ***
## faminc_mid:treatedynYes     -0.0018225  0.0017399  -1.047  0.29489
## treatedynYes:edu4catHS      -0.0006431  0.0143954  -0.045  0.96437
## treatedynYes:edu4catSome C   0.0033541  0.0152211   0.220  0.82559
## treatedynYes:edu4catC Grad   0.0528759  0.0177640   2.977  0.00292 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4136 on 99776 degrees of freedom
##   (317 observations deleted due to missingness)
## Multiple R-squared:  0.1318, Adjusted R-squared:  0.1316
## F-statistic:   631 on 24 and 99776 DF,  p-value: < 2.2e-16
```

```
## Negative Binomial: Binge 0-30 w/era FAMILY INCOME Treatedyn

##
## Call:
## glm.nb(formula = dr5day ~ faminc_mid + treatedyn + alctry + evermj +
##     evercoc + edu4cat + age + sex + marital + dependents + era +
##     faminc_mid * treatedyn + edu4cat * treatedyn, data = data_clean,
##     na.action = na.omit, init.theta = 0.1968342402, link = log)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -1.3425  -0.8168  -0.6511  -0.3014   7.5309
##
## Coefficients:
##                              Estimate Std. Error z value Pr(>|z|)
## (Intercept)                  1.463843   0.056186  26.054  < 2e-16 ***
## faminc_mid                  -0.001993   0.003257  -0.612 0.540700
## treatedynYes                 0.274860   0.073038   3.763 0.000168 ***
## alctry                      -0.062083   0.002340 -26.535  < 2e-16 ***
## evermjyes                    0.579775   0.019689  29.446  < 2e-16 ***
## evercocyes                   0.494458   0.023152  21.357  < 2e-16 ***
## edu4catHS                   -0.053604   0.029335  -1.827 0.067655 .
## edu4catSome C               -0.339220   0.030858 -10.993  < 2e-16 ***
## edu4catC Grad               -0.592248   0.031963 -18.529  < 2e-16 ***
## age 30-34                   -0.143790   0.027923  -5.149 2.61e-07 ***
## age 35-49                   -0.290641   0.025262 -11.505  < 2e-16 ***
## age 50-64                   -0.548763   0.031677 -17.324  < 2e-16 ***
## age 65+                     -0.983248   0.040997 -23.983  < 2e-16 ***
## sex f                       -0.995666   0.017013 -58.524  < 2e-16 ***
## marital widowed              0.171818   0.049237   3.490 0.000484 ***
## marital divorced             0.373053   0.024695  15.107  < 2e-16 ***
## marital never                0.264968   0.024731  10.714  < 2e-16 ***
## dependents1                 -0.266053   0.024758 -10.746  < 2e-16 ***
## dependents2                 -0.290362   0.025544 -11.367  < 2e-16 ***
## dependents3+                -0.351412   0.031520 -11.149  < 2e-16 ***
## era2                         0.200543   0.016803  11.935  < 2e-16 ***
## faminc_mid:treatedynYes     -0.016556   0.010019  -1.652 0.098448 .
## treatedynYes:edu4catHS      -0.048978   0.082461  -0.594 0.552542
## treatedynYes:edu4catSome C   0.084091   0.087470   0.961 0.336367
## treatedynYes:edu4catC Grad   0.405009   0.102117   3.966 7.30e-05 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for Negative Binomial(0.1968) family taken to be 1)
##
##     Null deviance: 74515  on 99800  degrees of freedom
## Residual deviance: 60664  on 99776  degrees of freedom
##   (317 observations deleted due to missingness)
## AIC: 226798
##
## Number of Fisher Scoring iterations: 1
##
##
##              Theta:  0.19683
```

```
##          Std. Err.:  0.00174
##
##  2 x log-likelihood:  -226746.15500
```

Comparing ERA 5/9/18 ## Probability: Binge [0][1+] FAMILY Treatedyn ERA_1

```
##
## Call:
## lm(formula = binge2cat ~ faminc_mid + treatedyn + alctry + evermj +
##     evercoc + edu4cat + age + sex + marital + dependents + faminc_mid *
##     treatedyn + edu4cat * treatedyn, data = era_1, na.action = na.omit)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.7663 -0.2715 -0.1482  0.2996  1.1470
##
## Coefficients:
##                              Estimate Std. Error t value Pr(>|t|)
## (Intercept)                 0.5220341  0.0117793  44.318  < 2e-16 ***
## faminc_mid                  0.0022652  0.0007475   3.030  0.00244 **
## treatedynYes                0.0007291  0.0195340   0.037  0.97023
## alctry                     -0.0065282  0.0004677 -13.958  < 2e-16 ***
## evermjyes                   0.0859768  0.0044388  19.369  < 2e-16 ***
## evercocyes                  0.1013466  0.0057778  17.541  < 2e-16 ***
## edu4catHS                  -0.0149956  0.0065035  -2.306  0.02113 *
## edu4catSome C              -0.0554940  0.0068880  -8.057 8.02e-16 ***
## edu4catC Grad              -0.1011999  0.0070934 -14.267  < 2e-16 ***
## age 30-34                  -0.0385639  0.0060655  -6.358 2.06e-10 ***
## age 35-49                  -0.1142209  0.0056705 -20.143  < 2e-16 ***
## age 50-64                  -0.1679356  0.0071890 -23.360  < 2e-16 ***
## age 65+                    -0.2424918  0.0086639 -27.989  < 2e-16 ***
## sex f                      -0.1535217  0.0038019 -40.380  < 2e-16 ***
## marital widowed             0.0459380  0.0099752   4.605 4.13e-06 ***
## marital divorced            0.0752718  0.0057594  13.069  < 2e-16 ***
## marital never               0.0785430  0.0058608  13.401  < 2e-16 ***
## dependents1                -0.0464939  0.0055951  -8.310  < 2e-16 ***
## dependents2                -0.0542216  0.0057031  -9.507  < 2e-16 ***
## dependents3+               -0.0580037  0.0071109  -8.157 3.52e-16 ***
## faminc_mid:treatedynYes    -0.0050103  0.0028261  -1.773  0.07626 .
## treatedynYes:edu4catHS      0.0099566  0.0216346   0.460  0.64536
## treatedynYes:edu4catSome C  0.0029332  0.0231404   0.127  0.89913
## treatedynYes:edu4catC Grad  0.0456540  0.0269615   1.693  0.09040 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4038 on 49130 degrees of freedom
##   (8889 observations deleted due to missingness)
## Multiple R-squared:  0.1324, Adjusted R-squared:  0.132
## F-statistic: 326.1 on 23 and 49130 DF,  p-value: < 2.2e-16
```

Comparing ERA 5/9/18 ## Probability: Binge [0][1+] FAMILY Treatedyn ERA_2

```
##
## Call:
## lm(formula = binge2cat ~ faminc_mid + treatedyn + alctry + evermj +
##     evercoc + edu4cat + age + sex + marital + dependents + faminc_mid *
##     treatedyn + edu4cat * treatedyn, data = era_2, na.action = na.omit)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.7903 -0.3059 -0.1631  0.4465  1.2722
##
## Coefficients:
##                              Estimate Std. Error t value Pr(>|t|)
## (Intercept)                 0.5574228  0.0128958  43.225  < 2e-16 ***
## faminc_mid                  0.0038708  0.0007233   5.352 8.76e-08 ***
## treatedynYes               -0.0130145  0.0169246  -0.769   0.4419
## alctry                     -0.0072458  0.0004798 -15.101  < 2e-16 ***
## evermjyes                   0.0943273  0.0044984  20.969  < 2e-16 ***
## evercocyes                  0.0973347  0.0054458  17.873  < 2e-16 ***
## edu4catHS                  -0.0101627  0.0069156  -1.470   0.1417
## edu4catSome C              -0.0473101  0.0071288  -6.636 3.24e-11 ***
## edu4catC Grad              -0.0711350  0.0073445  -9.685  < 2e-16 ***
## age 30-34                  -0.0471449  0.0070068  -6.728 1.73e-11 ***
## age 35-49                  -0.1184088  0.0061160 -19.360  < 2e-16 ***
## age 50-64                  -0.2171175  0.0073604 -29.498  < 2e-16 ***
## age 65+                    -0.2604034  0.0091132 -28.574  < 2e-16 ***
## sex f                      -0.1553264  0.0039025 -39.802  < 2e-16 ***
## marital widowed             0.0458765  0.0104985   4.370 1.25e-05 ***
## marital divorced            0.0440683  0.0056305   7.827 5.11e-15 ***
## marital never               0.0609796  0.0056551  10.783  < 2e-16 ***
## dependents1                -0.0415594  0.0056919  -7.301 2.89e-13 ***
## dependents2                -0.0277817  0.0059322  -4.683 2.83e-06 ***
## dependents3+               -0.0468631  0.0071551  -6.550 5.83e-11 ***
## faminc_mid:treatedynYes    -0.0004364  0.0022341  -0.195   0.8451
## treatedynYes:edu4catHS     -0.0101454  0.0194169  -0.523   0.6013
## treatedynYes:edu4catSome C  0.0013484  0.0203376   0.066   0.9471
## treatedynYes:edu4catC Grad  0.0539254  0.0237614   2.269   0.0232 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4223 on 50623 degrees of freedom
##   (7107 observations deleted due to missingness)
## Multiple R-squared:  0.1307, Adjusted R-squared:  0.1303
## F-statistic:   331 on 23 and 50623 DF,  p-value: < 2.2e-16
```

Era interaction probability

```
##
## Call:
## lm(formula = binge2cat ~ faminc_mid + treatedyn + alctry + evermj +
##     evercoc + edu4cat + age + sex + marital + dependents + era +
##     faminc_mid * treatedyn * era + edu4cat * treatedyn * era,
##     data = data_clean, na.action = na.omit)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.7799 -0.2898 -0.1557  0.4175  1.2395
##
## Coefficients:
##                                 Estimate Std. Error t value Pr(>|t|)
## (Intercept)                    0.5385495  0.0095707  56.271  < 2e-16 ***
## faminc_mid                     0.0015944  0.0007349   2.170  0.03003 *
## treatedynYes                   0.0005458  0.0198745   0.027  0.97809
## alctry                        -0.0068679  0.0003349 -20.508  < 2e-16 ***
## evermjyes                      0.0887267  0.0031515  28.154  < 2e-16 ***
## evercocyes                     0.0980218  0.0039556  24.780  < 2e-16 ***
## edu4catHS                     -0.0158333  0.0066336  -2.387  0.01700 *
## edu4catSome C                 -0.0570940  0.0070033  -8.152 3.61e-16 ***
## edu4catC Grad                 -0.1020864  0.0071999 -14.179  < 2e-16 ***
## age 30-34                     -0.0429752  0.0046005  -9.341  < 2e-16 ***
## age 35-49                     -0.1148055  0.0041571 -27.617  < 2e-16 ***
## age 50-64                     -0.1941176  0.0051261 -37.868  < 2e-16 ***
## age 65+                       -0.2519034  0.0062771 -40.131  < 2e-16 ***
## sex f                         -0.1545443  0.0027263 -56.686  < 2e-16 ***
## marital widowed                0.0469711  0.0072380   6.489 8.65e-11 ***
## marital divorced               0.0586130  0.0040238  14.567  < 2e-16 ***
## marital never                  0.0704090  0.0040593  17.345  < 2e-16 ***
## dependents1                   -0.0441334  0.0039919 -11.056  < 2e-16 ***
## dependents2                   -0.0414220  0.0041148 -10.066  < 2e-16 ***
## dependents3+                  -0.0521984  0.0050451 -10.346  < 2e-16 ***
## era2                           0.0024371  0.0084671   0.288  0.77348
## faminc_mid:treatedynYes       -0.0052993  0.0028925  -1.832  0.06694 .
## faminc_mid:era2                0.0030323  0.0009577   3.166  0.00154 **
## treatedynYes:era2             -0.0120783  0.0256479  -0.471  0.63769
## treatedynYes:edu4catHS         0.0107525  0.0221485   0.485  0.62734
## treatedynYes:edu4catSome C     0.0050429  0.0236888   0.213  0.83142
## treatedynYes:edu4catC Grad     0.0491449  0.0275992   1.781  0.07497 .
## edu4catHS:era2                 0.0048664  0.0094558   0.515  0.60680
## edu4catSome C:era2             0.0093289  0.0098232   0.950  0.34228
## edu4catC Grad:era2             0.0301901  0.0100968   2.990  0.00279 **
## faminc_mid:treatedynYes:era2   0.0050685  0.0036233   1.399  0.16186
## treatedynYes:edu4catHS:era2   -0.0210150  0.0291823  -0.720  0.47145
## treatedynYes:edu4catSome C:era2 -0.0050446 0.0309341  -0.163  0.87046
## treatedynYes:edu4catC Grad:era2  0.0031833 0.0360836   0.088  0.92970
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4135 on 99767 degrees of freedom
##   (317 observations deleted due to missingness)
```

```
## Multiple R-squared:  0.1322, Adjusted R-squared:  0.132
## F-statistic: 460.7 on 33 and 99767 DF,  p-value: < 2.2e-16
```

#Era interaction negative binomial

```
##
## Call:
## glm.nb(formula = dr5day ~ faminc_mid + treatedyn + alctry + evermj +
##     evercoc + edu4cat + age + sex + marital + dependents + era +
##     faminc_mid * treatedyn * era + edu4cat * treatedyn * era,
##     data = data_clean, na.action = na.omit, init.theta = 0.197152126,
##     link = log)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -1.3577  -0.8173  -0.6515  -0.3029   7.5640
##
## Coefficients:
##                                 Estimate Std. Error z value Pr(>|z|)
## (Intercept)                     1.520749   0.061767  24.621  < 2e-16 ***
## faminc_mid                     -0.005729   0.004690  -1.222 0.221870
## treatedynYes                    0.532949   0.113928   4.678 2.90e-06 ***
## alctry                         -0.062389   0.002340 -26.665  < 2e-16 ***
## evermjyes                       0.581703   0.019685  29.551  < 2e-16 ***
## evercocyes                      0.493693   0.023146  21.330  < 2e-16 ***
## edu4catHS                      -0.076674   0.041569  -1.845 0.065107 .
## edu4catSome C                  -0.352215   0.044157  -7.976 1.51e-15 ***
## edu4catC Grad                  -0.690119   0.045757 -15.082  < 2e-16 ***
## age 30-34                      -0.144059   0.027916  -5.160 2.46e-07 ***
## age 35-49                      -0.291866   0.025258 -11.556  < 2e-16 ***
## age 50-64                      -0.549515   0.031673 -17.350  < 2e-16 ***
## age 65+                        -0.987505   0.041006 -24.082  < 2e-16 ***
## sex f                          -0.995918   0.017012 -58.542  < 2e-16 ***
## marital widowed                 0.171653   0.049199   3.489 0.000485 ***
## marital divorced                0.370339   0.024685  15.002  < 2e-16 ***
## marital never                   0.265503   0.024728  10.737  < 2e-16 ***
## dependents1                    -0.269388   0.024754 -10.883  < 2e-16 ***
## dependents2                    -0.292932   0.025539 -11.470  < 2e-16 ***
## dependents3+                   -0.353437   0.031510 -11.217  < 2e-16 ***
## era2                            0.107379   0.052534   2.044 0.040954 *
## faminc_mid:treatedynYes        -0.037695   0.016774  -2.247 0.024625 *
## faminc_mid:era2                 0.005472   0.006045   0.905 0.365377
## treatedynYes:era2              -0.459573   0.147088  -3.124 0.001781 **
## treatedynYes:edu4catHS         -0.092050   0.126556  -0.727 0.467015
## treatedynYes:edu4catSome C     -0.143276   0.136184  -1.052 0.292761
## treatedynYes:edu4catC Grad      0.285316   0.159128   1.793 0.072974 .
## edu4catHS:era2                  0.046966   0.058438   0.804 0.421581
## edu4catSome C:era2              0.029867   0.061136   0.489 0.625175
## edu4catC Grad:era2              0.186827   0.063208   2.956 0.003119 **
## faminc_mid:treatedynYes:era2    0.035272   0.020931   1.685 0.091963 .
## treatedynYes:edu4catHS:era2     0.071867   0.166985   0.430 0.666919
## treatedynYes:edu4catSome C:era2 0.394828   0.177746   2.221 0.026330 *
## treatedynYes:edu4catC Grad:era2 0.222151   0.207534   1.070 0.284424
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for Negative Binomial(0.1972) family taken to be 1)
```

```
## 
##      Null deviance: 74593  on 99800  degrees of freedom
## Residual deviance: 60675  on 99767  degrees of freedom
##   (317 observations deleted due to missingness)
## AIC: 226768
## 
## Number of Fisher Scoring iterations: 1
## 
## 
##                 Theta:  0.19715
##           Std. Err.:  0.00175
## 
##  2 x log-likelihood:  -226697.75100
```