Advanced Methods in Health Services Research: Analysis - 309.716
Tuesday and Thursday 10:30-11:50
Instructors: Darrell J. Gaskin, Ph.D.
Roland J. Thorpe, Ph.D.
250 Hampton House

Computer Exercise #6: Estimating Multinomial Logit, Two Part Probit-OLS and GLM Models
Due: October 6, 2016

Use the analysis file built for computer exercise #1 and the subpop command to reduce the sample to **those persons 18 years to 64 years old**.

1. Estimate a multinomial logit model for the determinants of insurance status.

    a. Insurance status = f(health status, age, race, sex, poverty status, education, and location). *Use the following reference categories: excellent health, age category 25-44, male, white non-Hispanic, HS diploma/GED, high income, msa, East)*.

```
. svy, subpop(adult): mlogit insurance ib3.agecat ib1.sex ib1.race ib5.income msa ib3.education
ib1.region ib1.healthstatus
(running mlogit on estimation sample)

Survey: Multinomial logistic regression

Number of strata   =       165                Number of obs      =      30158
Number of PSUs     =       370                Population size    =  269717779
                                              Subpop. no. of obs =      15711
                                              Subpop. size       =  154522136
                                              Design df          =        205
                                              F(  69,    137)    =      61.17
                                              Prob > F           =     0.0000

------------------------------------------------------------------------------
                             |             Linearized
                   insurance |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-----------------------------+------------------------------------------------------------------
Private_Insurance            |  (base outcome)
-----------------------------+------------------------------------------------------------------
Public_Insurance             |
                      agecat |
                       18-24 |   .4052911   .1160632     3.49   0.001     .1764604    .6341217
                       45-64 |  -.4694487    .107731    -4.36   0.000    -.6818515   -.2570458
                             |
                       2.sex |   .6562593   .0809203     8.11   0.000     .4967165     .815802
                             |
                        race |
                       Black |   .7201112   .1205439     5.97   0.000     .4824463     .957776
                    Hispanic |   .4557957   .1434915     3.18   0.002     .1728875     .738704
                       Asian |   .1314794   .2329901     0.56   0.573    -.3278848    .5908436
                       Other |   .0533022   .2197475     0.24   0.809    -.3799527    .4865571
                             |
                      income |
                        Poor |   4.251985   .2223543    19.12   0.000      3.81359    4.690379
                  Near Poor  |    3.26231   .2316767    14.08   0.000     2.805536    3.719085
                 Low Income  |   2.659456    .206297    12.89   0.000     2.252721    3.066192
               Middle Income |   1.413408   .2123667     6.66   0.000     .9947056    1.832111
                             |
                         msa |  -.0823923   .1717735    -0.48   0.632    -.4210614    .2562769
                             |
                   education |
```

No High School	.917141	.161076	5.69	0.000	.5995629	1.234719
Some High	.8500778	.1059918	8.02	0.000	.641104	1.059052
Some College/Tech School/AA degree	-.429354	.1033791	-4.15	0.000	-.6331765	-.2255315
College	-1.298107	.1671272	-7.77	0.000	-1.627615	-.9685984
region						
South	-1.419974	.1544701	-9.19	0.000	-1.724527	-1.11542
Midwest	-.7757658	.1772446	-4.38	0.000	-1.125222	-.4263097
West	-.6163193	.1912307	-3.22	0.001	-.9933504	-.2392881
healthstatus						
Very Good	.1389469	.1332466	1.04	0.298	-.1237626	.4016564
Good	.4486975	.1205004	3.72	0.000	.2111185	.6862764
Fair	.9456693	.1326335	7.13	0.000	.6841687	1.20717
Poor	2.090825	.1989954	10.51	0.000	1.698485	2.483165
_cons	-4.147342	.2881529	-14.39	0.000	-4.715466	-3.579219
Uninsured						
agecat						
18-24	-.0220343	.0744044	-0.30	0.767	-.1687302	.1246617
45-64	-.2315221	.0726922	-3.18	0.002	-.3748424	-.0882019
2.sex	-.3338661	.0531033	-6.29	0.000	-.4385648	-.2291674
race						
Black	.2302198	.0863242	2.67	0.008	.0600227	.4004169
Hispanic	.9295126	.0975924	9.52	0.000	.7370992	1.121926
Asian	.3393797	.1786468	1.90	0.059	-.0128409	.6916003
Other	.0276913	.1678672	0.16	0.869	-.3032762	.3586588
income						
Poor	2.493157	.1099588	22.67	0.000	2.276362	2.709953
Near Poor	1.884362	.1537194	12.26	0.000	1.581288	2.187436
Low Income	1.41562	.0997428	14.19	0.000	1.218967	1.612273
Middle Income	.6831492	.101556	6.73	0.000	.4829209	.8833774
msa	-.0302029	.0951153	-0.32	0.751	-.2177325	.1573267
education						
No High School	.8875245	.1601948	5.54	0.000	.5716839	1.203365
Some High	.431207	.0872598	4.94	0.000	.2591654	.6032486
Some College/Tech School/AA degree	-.3344949	.0842183	-3.97	0.000	-.50054	-.1684497
College	-1.021857	.1000081	-10.22	0.000	-1.219034	-.8246812
region						
South	.3637485	.1008367	3.61	0.000	.1649385	.5625585
Midwest	.0157004	.1100296	0.14	0.887	-.2012344	.2326351
West	.1326453	.1123637	1.18	0.239	-.0888914	.3541821
healthstatus						
Very Good	.0573467	.0889328	0.64	0.520	-.1179935	.2326869
Good	-.0623519	.1001388	-0.62	0.534	-.259786	.1350821
Fair	.0841687	.1299178	0.65	0.518	-.1719778	.3403152
Poor	.3409962	.2021567	1.69	0.093	-.0575767	.7395692
_cons	-2.111545	.1499035	-14.09	0.000	-2.407095	-1.815994
Medicare						
agecat						
18-24	-1.14137	.3885654	-2.94	0.004	-1.907467	-.3752733
45-64	.9796771	.1532432	6.39	0.000	.6775424	1.281812
2.sex	-.228388	.1198402	-1.91	0.058	-.4646654	.0078893
race						
Black	.0345603	.1494899	0.23	0.817	-.2601746	.3292951
Hispanic	-.6233952	.2088881	-2.98	0.003	-1.03524	-.2115507
Asian	-.4915361	.6965881	-0.71	0.481	-1.864932	.8818594
Other	.3143378	.4559502	0.69	0.491	-.5846153	1.213291

```
                              income |
                                Poor |   3.384063   .2729184    12.40   0.000     2.845976     3.92215
                            Near Poor |   2.906522   .3461802     8.40   0.000     2.223992    3.589052
                          Low Income  |   2.181762   .2702795     8.07   0.000     1.648878    2.714646
                       Middle Income  |    1.15772   .2595938     4.46   0.000     .6459037    1.669536
                                      |
                                 msa  |  -.0191817   .1703239    -0.11   0.910    -.3549928    .3166295
                                      |
                           education  |
                        No High School |    .926049   .2247289     4.12   0.000     .4829727    1.369125
                            Some High  |   .6553029   .1915686     3.42   0.001     .2776057       1.033
Some College/Tech School/AA degree     |   .0593331   .2150832     0.28   0.783    -.3647258    .4833919
                              College  |  -.7124037    .331956    -2.15   0.033    -1.366889   -.0579181
                                      |
                              region  |
                                South  |  -.4468301   .2129654    -2.10   0.037    -.8667133   -.0269469
                              Midwest  |  -.6246119   .2266182    -2.76   0.006    -1.071413   -.1778106
                                 West  |  -.7360515    .293565    -2.51   0.013    -1.314845   -.1572578
                                      |
                         healthstatus |
                           Very Good  |   .4630448   .3415361     1.36   0.177    -.2103289    1.136419
                                Good  |   1.213139   .3052068     3.97   0.000     .6113925    1.814886
                                Fair  |   2.103954   .3042284     6.92   0.000     1.504136    2.703772
                                Poor  |   3.146354   .3464028     9.08   0.000     2.463385    3.829323
                                      |
                                _cons |  -5.761939   .4446996   -12.96   0.000     -6.63871   -4.885168
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b. Compute and interpret the relative rate ratios for poverty categories. Compute and interpret the marginal effects of being poor and near poor on being uninsured or publicly insured.

```
. svy, subpop(adult): mlogit insurance ib3.agecat ib1.sex ib1.race ib5.income msa ib3.education
ib1.region ib1.healthstatus, rrr
(running mlogit on estimation sample)

Survey: Multinomial logistic regression

Number of strata   =       165                Number of obs      =      30158
Number of PSUs     =       370                Population size    =  269717779
                                              Subpop. no. of obs =      15711
                                              Subpop. size       =  154522136
                                              Design df          =        205
                                              F(  69,    137)    =      61.17
                                              Prob > F           =     0.0000

------------------------------------------------------------------------------------------------------
                                    |             Linearized
                          insurance |        RRR   Std. Err.      t    P>|t|     [95% Conf. Interval]
------------------------------------+-----------------------------------------------------------------
Private_Insurance                   |  (base outcome)
------------------------------------+-----------------------------------------------------------------
Public_Insurance                    |
                             agecat |
                              18-24 |   1.499739   .1740645     3.49   0.001     1.192987    1.885365
                              45-64 |   .6253469   .0673693    -4.36   0.000     .5056798    .7733328
                                    |
                              2.sex |   1.927568   .1559794     8.11   0.000     1.643317    2.260988
                                    |
                               race |
                              Black |   2.054662    .247677     5.97   0.000     1.620033    2.605895
                           Hispanic |   1.577428   .2263474     3.18   0.002     1.188732    2.093221
                              Asian |   1.140514   .2657286     0.56   0.573      .720446    1.805511
                              Other |   1.054748   .2317783     0.24   0.809     .6838938    1.626706
                                    |
                             income |
                              Poor  |    70.2447   15.61921    19.12   0.000     45.31284    108.8945
```

Near Poor	26.10979	6.04903	14.08	0.000	16.53593	41.22665
Low Income	14.28852	2.947678	12.89	0.000	9.513583	21.46003
Middle Income	4.10994	.8728143	6.66	0.000	2.703928	6.247062
msa	.9209107	.158188	-0.48	0.632	.6563498	1.29211
education						
No High School	2.502127	.4030326	5.69	0.000	1.821323	3.437413
Some High	2.339829	.2480027	8.02	0.000	1.898576	2.883635
Some College/Tech School/AA degree	.6509295	.0672925	-4.15	0.000	.5309027	.798092
College	.2730482	.0456338	-7.77	0.000	.1963974	.3796147
region						
South	.2417204	.0373386	-9.19	0.000	.1782573	.3277776
Midwest	.4603511	.0815948	-4.38	0.000	.3245804	.6529141
West	.5399281	.1032509	-3.22	0.001	.3703338	.7871881
healthstatus						
Very Good	1.149063	.1531088	1.04	0.298	.8835895	1.494298
Good	1.566271	.1887362	3.72	0.000	1.235059	1.986306
Fair	2.574536	.3414697	7.13	0.000	1.982123	3.344008
Poor	8.091586	1.610188	10.51	0.000	5.465659	11.97911
_cons	.0158064	.0045547	-14.39	0.000	.0089557	.0278975
Uninsured						
agecat						
18-24	.9782067	.0727829	-0.30	0.767	.8447368	1.132765
45-64	.7933251	.0576686	-3.18	0.002	.6873976	.915576
2.sex	.7161497	.0380299	-6.29	0.000	.6449614	.7951954
race						
Black	1.258877	.1086715	2.67	0.008	1.061861	1.492447
Hispanic	2.533274	.2472282	9.52	0.000	2.089864	3.070763
Asian	1.404076	.2508337	1.90	0.059	.9872412	1.996909
Other	1.028078	.1725806	0.16	0.869	.7383951	1.431408
income						
Poor	12.09942	1.330438	22.67	0.000	9.74118	15.02856
Near Poor	6.582153	1.011805	12.26	0.000	4.861214	8.912329
Low Income	4.119039	.4108444	14.19	0.000	3.38369	5.014196
Middle Income	1.980104	.2010915	6.73	0.000	1.620802	2.419056
msa	.9702487	.0922855	-0.32	0.751	.8043406	1.170378
education						
No High School	2.429109	.3891306	5.54	0.000	1.771247	3.331308
Some High	1.539114	.1343027	4.94	0.000	1.295848	1.828048
Some College/Tech School/AA degree	.7156995	.060275	-3.97	0.000	.6062032	.8449737
College	.3599258	.0359955	-10.22	0.000	.2955156	.4383747
region						
South	1.438712	.145075	3.61	0.000	1.179321	1.755157
Midwest	1.015824	.1117707	0.14	0.887	.8177208	1.261921
West	1.141845	.128302	1.18	0.239	.9149449	1.425015
healthstatus						
Very Good	1.059023	.0941819	0.64	0.520	.8887018	1.261986
Good	.9395522	.0940856	-0.62	0.534	.7712166	1.144631
Fair	1.087812	.1413262	0.65	0.518	.8419979	1.40539
Poor	1.406348	.2843027	1.69	0.093	.9440495	2.095033
_cons	.1210508	.0181459	-14.09	0.000	.0900766	.1626761
Medicare						
agecat						
18-24	.3193811	.1241004	-2.94	0.004	.1484559	.6871015
45-64	2.663596	.4081779	6.39	0.000	1.969033	3.603162
2.sex	.7958154	.0953707	-1.91	0.058	.6283453	1.00792

race						
Black	1.035164	.1547466	0.23	0.817	.770917	1.389988
Hispanic	.5361211	.1119893	-2.98	0.003	.3551413	.8093282
Asian	.611686	.4260932	-0.71	0.481	.1549068	2.415387
Other	1.369352	.6243565	0.69	0.491	.5573202	3.364539
income						
Poor	29.49035	8.048458	12.40	0.000	17.21836	50.50892
Near Poor	18.29306	6.332695	8.40	0.000	9.244157	36.19973
Low Income	8.861905	2.395191	8.07	0.000	5.20114	15.09926
Middle Income	3.182668	.826201	4.46	0.000	1.90771	5.309703
msa	.9810011	.1670879	-0.11	0.910	.7011785	1.372494
education						
No High School	2.524515	.5673316	4.12	0.000	1.620886	3.93191
Some High	1.925726	.3689085	3.42	0.001	1.319966	2.809482
Some College/Tech School/AA degree	1.061129	.228231	0.28	0.783	.694387	1.621565
College	.4904638	.1628124	-2.15	0.033	.2548986	.9437273
region						
South	.6396526	.1362238	-2.10	0.037	.4203308	.973413
Midwest	.5354692	.1213471	-2.76	0.006	.3425241	.8371009
West	.4790015	.1406181	-2.51	0.013	.2685159	.8544837
healthstatus						
Very Good	1.588905	.5426683	1.36	0.177	.8103177	3.11559
Good	3.364029	1.026724	3.97	0.000	1.842996	6.140377
Fair	8.198524	2.494223	6.92	0.000	4.500266	14.93596
Poor	23.25113	8.054257	9.08	0.000	11.7445	46.03135
_cons	.003145	.0013986	-12.96	0.000	.0013087	.0075579

The relative risk ratio describe the relative likelihood of belonging in the respective categories, i.e. public insurance, uninsured, Medicare, compared to having private insurance when you fall into one of the poverty categories. For example, being poor increase the relative risk that one would be uninsured to 12.10 compared to having private insurance. Similarly, being poor increases the relative risk that one would have Medicare to 29.49 compared to having private insurance. The other coefficients can have the same interpretation.

MARGINAL EFFECTS:

```
. margins, dydx(1.income 2.income) predict(outcome(2)) noestimcheck /*publicly insured not
medicare*/

Average marginal effects                        Number of obs   =      25152
Model VCE    : Linearized

Expression   : Pr(insurance==Public_Insurance), predict(outcome(2))
dy/dx w.r.t. : 1.income 2.income

------------------------------------------------------------------------------
             |            Delta-method
             |      dy/dx   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      income |
       Poor  |   .2455239   .0138132    17.77   0.000     .2184506    .2725973
  Near Poor  |   .1527979   .0154428     9.89   0.000     .1225305    .1830653
------------------------------------------------------------------------------
Note: dy/dx for factor levels is the discrete change from the base level.
```

```
. margins, dydx(1.income 2.income) predict(outcome(3)) noestimcheck /*uninsured*/

Average marginal effects                          Number of obs    =      25152
Model VCE    : Linearized

Expression   : Pr(insurance==Uninsured), predict(outcome(3))
dy/dx w.r.t. : 1.income 2.income

------------------------------------------------------------------------------
             |            Delta-method
             |      dy/dx   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      income |
       Poor  |   .2684913   .0179669    14.94   0.000     .2332769    .3037058
  Near Poor  |    .224161   .0255516     8.77   0.000     .1740808    .2742412
------------------------------------------------------------------------------
Note: dy/dx for factor levels is the discrete change from the base level.
```

The marginal effects measure the direct effect of being poor or near poor on the log odds of being publicly insured or uninsured. Specifically, being poor increases the log odds of being publicly insured by 0.246 while being near poor increases the log odds of being publicly insured by 0.153. Similarly, being poor increases the log odds of being uninsured by 0.268 while being near poor increases the log odds of being uninsured by 0.224.

2. For persons 18-64, estimate the following models of health expenditures. Use the following specification: Log (Total health expenditures) = f(health status, age, race, gender, education, insurance status, poverty status and location). *Use the following reference categories: excellent health, age category 25-44, male, white non-Hispanic, HS diploma/GED, privately insured, high income, msa, East)*

    a. Estimate the two part probit-OLS model. Create a table displaying the coefficients and marginal effects of income and education on health expenditures.

	First Stage (Probit)	2nd Stage (OLS)
income		
Poor	-0.285***	-0.150**
	(0.0526)	(0.0600)
Near Poor	-0.298***	-0.235***
	(0.0698)	(0.0859)
Low Income	-0.179***	-0.189***
	(0.0559)	(0.0604)
Middle Income	-0.201***	-0.0934**
	(0.0401)	(0.0389)
education		
Grade 8 and below	-0.0293	-0.177**
	(0.0642)	(0.0777)
Some High School	-0.0381	-0.133**
	(0.0491)	(0.0579)

Some College	0.205***	0.0924**
	(0.0404)	(0.0405)
College	0.323***	0.180***
	(0.0475)	(0.0465)
Advanced Degree	0.336***	0.282***
	(0.0683)	(0.0585)

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

b. Conduct a Park Test to determine what GLM analysis to estimate.

```
.  /*Part B*/
.
.    /*Park Test*/
. svy, subpop(age18to64): glm healthexp ib3.agecat ib1.sex ib1.race ib5.income notmsa ib3.education
ib1.region ib1.healthstatus ib
> 1.insurance, family(gamma) link(log)
(running glm on estimation sample)

Survey: Generalized linear models

Number of strata   =       165                Number of obs      =      31113
Number of PSUs     =       370                Population size    =  282464364
                                              Subpop. no. of obs =      16917
                                              Subpop. size       =  170277348
                                              Design df          =        205

------------------------------------------------------------------------------
             |             Linearized
  healthexp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      agecat |
       18-24 |  -.1525881   .0708288    -2.15   0.032    -.2922343   -.0129418
       45-64 |   .4421097   .0433598    10.20   0.000     .3566214     .527598
             |
         sex |
      female |   .4685999   .0384777    12.18   0.000      .392737    .5444627
             |
        race |
       Black |  -.4413024   .0592257    -7.45   0.000    -.5580719   -.3245329
    Hispanic |  -.5400887   .0616302    -8.76   0.000     -.661599   -.4185783
       Asian |  -.7675889   .0722038   -10.63   0.000    -.9099462   -.6252317
       Other |   .0192808   .1349877     0.14   0.887    -.2468613     .285423
             |
      income |
        Poor |  -.1192354    .088956    -1.34   0.182    -.2946214    .0561505
  Near Poor  |  -.1538654    .093684    -1.64   0.102    -.3385731    .0308423
  Low Income |  -.2147216   .0717328    -2.99   0.003    -.3561503    -.073293
Middle Income |  -.1369234   .0433445    -3.16   0.002    -.2223815   -.0514653
             |
      notmsa |  -.1861548   .0524585    -3.55   0.000    -.2895822   -.0827274
             |
   education |
Grade 8 and below |  -.0523859   .1500581    -0.35   0.727    -.3482409    .2434692
 Some High School |  -.0763148   .0736007    -1.04   0.301    -.2214262    .0687966
     Some College |   .1285256   .0481397     2.67   0.008     .0336131    .2234381
          College |   .2032447   .0560938     3.62   0.000     .0926499    .3138394
 Advanced Degree |   .2645275   .0751969     3.52   0.001     .1162689     .412786
             |
       region |
      Midwest |   .0598253   .0560905     1.07   0.287     -.050763    .1704136
        South |   .0173792   .0572827     0.30   0.762    -.0955596     .130318
         West |  -.0469751   .0534701    -0.88   0.381     -.152397    .0584468
             |
```

```
            healthstatus |
              Very Good  |   .3019975   .0573575     5.27   0.000     .1889112    .4150838
                   Good  |   .6460287   .0520156    12.42   0.000     .5434745    .7485829
                   Fair  |   1.192653   .0652875    18.27   0.000     1.063932    1.321374
                   Poor  |   1.740819   .0787071    22.12   0.000      1.58564    1.895998
                         |
               insurance |
Public Ins not Medicare  |   .3835083   .0833456     4.60   0.000     .2191839    .5478327
             Uninsured   |  -.9190729   .0725297   -12.67   0.000    -1.062073   -.7760731
    Public Ins Medicare  |   .7460566   .0923205     8.08   0.000     .5640372     .928076
                         |
                   _cons |   7.157574   .0815598    87.76   0.000     6.996771    7.318378
------------------------------------------------------------------------------------------

. predict healthhat2, xb
(6345 missing values generated)

. gen lnhealthhat2 = ln(healthhat2)
(6345 missing values generated)

. gen r2 = ((healthexp-healthhat2))^2
(6526 missing values generated)

. gen lnr2 = ln(r2)
(6526 missing values generated)

. svy, subpop(age18to64): glm lnr2 lnhealthhat2, family(gamma) link(log)  nolog
(running glm on estimation sample)

Survey: Generalized linear models

Number of strata   =       165                Number of obs      =      31113
Number of PSUs     =       370                Population size    =  282464364
                                              Subpop. no. of obs =      16917
                                              Subpop. size       =  170277348
                                              Design df          =        205

------------------------------------------------------------------------------
             |             Linearized
        lnr2 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
lnhealthhat2 |    2.230204   .0444583    50.16   0.000     2.142549    2.317858
       _cons |  -2.048806   .0920827   -22.25   0.000    -2.230357   -1.867256
------------------------------------------------------------------------------

. test lnhealthhat2 == 0

Adjusted Wald test

 ( 1)  [lnr2]lnhealthhat2 = 0

       F(  1,   205) = 2516.42
            Prob > F =    0.0000

. test lnhealthhat2 == 1

Adjusted Wald test

 ( 1)  [lnr2]lnhealthhat2 = 1

       F(  1,   205) =  765.68
            Prob > F =    0.0000

. test lnhealthhat2 == 2

Adjusted Wald test

 ( 1)  [lnr2]lnhealthhat2 = 2

       F(  1,   205) =   26.81
            Prob > F =    0.0000
```

```
. test lnhealthhat2 == 3

Adjusted Wald test

 ( 1)  [lnr2]lnhealthhat2 = 3

       F(  1,   205) =  299.81
            Prob > F =    0.0000
```

We see that the coefficient is 2.2. It is nearest to 2 and thus we use the Gamma distribution.

c. Estimate the GLM (one step). Create a table display the coefficients and marginal effects of poverty status

	GLM	Marginal Effects
income		
Poor	-0.119	-363.89
	(0.0890)	(263.60)
Near Poor	-0.154	-461.70*
	(0.0937)	(268.46)
Low Income	-0.215***	-625.58***
	(0.0717)	(202.75)
Middle Income	-0.137***	-414.27***
	(0.0433)	(132.38)

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

d. Compare the GLM result to the two part probit-OLS results.

	First Stage (Probit)	2nd Stage (OLS)	GLM
income			
Poor	-0.285***	-0.150**	-0.119
	(0.0526)	(0.0600)	(0.0890)
Near Poor	-0.298***	-0.235***	-0.154
	(0.0698)	(0.0859)	(0.0937)
Low Income	-0.179***	-0.189***	-0.215***
	(0.0559)	(0.0604)	(0.0717)
Middle Income	-0.201***	-0.0934**	-0.137***
	(0.0401)	(0.0389)	(0.0433)

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

In the two part probit-OLS model, we see that each poverty status category is statistically significant in decreasing the probability of having any expenditures. In addition, they also significantly decrease health expenditures by 15% (poor), 23.5% (near poor), 18.9% (low income), and 9.34% (high income), conditional on having any health expditures. On the other hand, relative to high-income individuals, only low-income and middle-income individuals significantly decreases expenditures by 21.5% and 13.7%, respectively.

e. Compare the predict mean, 25th and 75th percentile from the GLM and two part probit-OLS models. (Note use a smearing factor to compute the predicted value for the two part probit-OLS model)

```
. gen predictolsmodel = smear*healthexphat*probithealthexpnhat
(6345 missing values generated)

. summarize predictolsmodel, detail

                        predictolsmodel
-------------------------------------------------------------
      Percentiles      Smallest
 1%     440.6569       200.7225
 5%     1134.039       200.7225
10%     2200.526       221.8453       Obs                26721
25%     4875.182       225.2032       Sum of Wgt.        26721

50%     10272.64                      Mean            18453.2
                        Largest       Std. Dev.       27925.07
75%     21501.58       477914.6
90%     40542.86       479207.3       Variance        7.80e+08
95%     58902.71       482385.7       Skewness        5.665885
99%     134717.8       526405.1       Kurtosis        56.15866


. quietly svy, subpop(age18to64): glm healthexp ib3.agecat ib1.sex
ib1.race ib5.income notmsa ib3.education ib1.region ib1.healths
> tatus ib1.insurance, family(gamma) link(log)

. predict glmexppredict
(option mu assumed; predicted mean healthexp)
(6345 missing values generated)

. summarize glmexppredict, detail

                  Predicted mean healthexp
-------------------------------------------------------------
      Percentiles      Smallest
 1%     251.2586       155.1926
 5%     422.3792       157.2931
10%     607.9389       161.7436       Obs                26721
25%     1076.563       170.8991       Sum of Wgt.        26721

50%     1828.039                      Mean            2625.364
                        Largest       Std. Dev.       2796.034
75%     3158.811       39124.57
```

90%	5215.802	41121.04	Variance	7817808
95%	7386.246	41121.04	Skewness	4.001164
99%	14104.01	42803.04	Kurtosis	29.73515

.

We see that in the two part probit-OLS model, there is a wider spread of expenditures and we observe that the magnitudes of expenditures at the 25th and 75th percentiles are larger than those we see from the GLM model. The mean for the two part model is also much larger than that we see in the GLM model.

Log file

```
. do "C:\Users\bdela\AppData\Local\Temp\STD00000000.tmp"

. /*Variable Creation*/
.
.
. gen age18over = 0

. replace age18over = 1 if age08x >= 18
(23183 real changes made)

.
. gen agecat = 1 if age08x >=0 & age08x <=17
(23434 missing values generated)

. replace agecat = 2 if age08x >=18 & age08x <=24
(3372 real changes made)

. replace agecat = 3 if age08x >=25 & age08x <=44
(8813 real changes made)

. replace agecat = 4 if age08x >=45 & age08x <=64
(7614 real changes made)

. replace agecat = 5 if age08x >=65 & age08x <=74
(1867 real changes made)

. replace agecat = 6 if age08x >=75
(1517 real changes made)

.
. label define agecats 1  "0-18" 2 "18-24" 3  "25-44" 4 "45-64" 5 "65-74" 6 "75+"

. label values agecat agecats /*set label name sexn to the variable sex*/

. tabulate agecat

     agecat |      Freq.     Percent        Cum.
------------+-----------------------------------
       0-18 |      9,632       29.35       29.35
      18-24 |      3,372       10.28       39.63
      25-44 |      8,813       26.86       66.48
      45-64 |      7,614       23.20       89.69
      65-74 |      1,867        5.69       95.38
        75+ |      1,517        4.62      100.00
------------+-----------------------------------
      Total |     32,815      100.00

.
.
.
. gen race = 1 if racex == 1 & racethnx != 1
(18775 missing values generated)

. replace race = 2 if racex == 2 & racethnx != 1
(6476 real changes made)

. replace race = 3 if racethnx == 1
(9392 real changes made)

. replace race = 4 if racex == 4 & racethnx != 1
(1997 real changes made)
```

```
. replace race = 5 if (racex == 3 | racex == 5 | racex == 6) & racethnx != 1
(910 real changes made)

.
. label define racexn2 1 "White" 2 "Black" 3 "Hispanic" 4 "Asian" 5 "Other"

. label values race racexn2

.
. label define sexn 1 "male" 2 "female"

. label values sex sexn

. tabulate sex

        sex |      Freq.     Percent        Cum.
------------+-----------------------------------
       male |     15,885       48.04       48.04
     female |     17,181       51.96      100.00
------------+-----------------------------------
      Total |     33,066      100.00

.
. gen female = 0 if sex == 1
(17181 missing values generated)

. replace female = 1 if sex == 2
(17181 real changes made)

.
.
.
. gen racesexcat = 1 if race == 1 & female == 0
(26095 missing values generated)

. replace racesexcat = 2 if race == 1 & female == 1
(7320 real changes made)

. replace racesexcat = 3 if race == 2 & female == 0
(2894 real changes made)

. replace racesexcat = 4 if race == 2 & female == 1
(3582 real changes made)

. replace racesexcat = 5 if race == 3 & female == 0
(4612 real changes made)

. replace racesexcat = 6 if race == 3 & female == 1
(4780 real changes made)

. replace racesexcat = 7 if race == 4 & female == 0
(965 real changes made)

. replace racesexcat = 8 if race == 4 & female == 1
(1032 real changes made)

. replace racesexcat = 9 if race == 5 & female == 0
(443 real changes made)

. replace racesexcat = 10 if race == 5 & female == 1
(467 real changes made)
```

```
.
.
. gen whitemale = 0 /*okay since no missings for race and sex*/

. replace whitemale = 1 if race == 1 & female == 0
(6971 real changes made)

. gen whitefemale = 0

. replace whitefemale = 1 if race == 1 & female == 1
(7320 real changes made)

. gen blackmale = 0

. replace blackmale = 1 if race == 2 & female == 0
(2894 real changes made)

. gen blackfemale = 0

. replace blackfemale = 1 if race == 2 & female == 1
(3582 real changes made)

. gen hispanicmale = 0

. replace hispanicmale = 1 if race == 3 & female == 0
(4612 real changes made)

. gen hispanicfemale = 0

. replace hispanicfemale = 1 if race == 3 & female == 1
(4780 real changes made)

. gen asianmale = 0

. replace asianmale = 1 if race == 4 & female == 0
(965 real changes made)

. gen asianfemale = 0

. replace asianfemale = 1 if race ==4 & female == 1
(1032 real changes made)

. gen othermale = 0

. replace othermale = 1 if race == 5 & female == 0
(443 real changes made)

. gen otherfemale = 0

. replace otherfemale = 1 if race == 5 & female == 1
(467 real changes made)

.
. label define racesex 1 "White Male" 2 "White Female" 3 "Black Male" 4 "Black Female" 5
"Hispanic Male" 6 "Hispanic Female" 7 "As
> ian Male" 8 "Asian Female" 9 "Other Male" 10 "Other Female"

. label values racesexcat racesex

.
.
. gen healthstatus = 1 if rthlth42 == 1
(23215 missing values generated)
```

```
. replace healthstatus = 2 if rthlth42 == 2
(10188 real changes made)

. replace healthstatus = 3 if rthlth42 == 3
(8628 real changes made)

. replace healthstatus = 4 if rthlth42 == 4
(2777 real changes made)

. replace healthstatus = 5 if rthlth42 == 5
(815 real changes made)

.
. label define health 1 "Excellent" 2 "Very Good" 3 "Good" 4 "Fair" 5 "Poor"

. label values healthstatus health

.
.
.
. gen education = 1 if educyr >=0 & educyr <=8
(25465 missing values generated)

. replace education = 2 if educyr >=9 & (educyr <=12 & educyr >=0) & hideg == 1
(3732 real changes made)

. replace education = 3 if hideg == 2 | hideg == 3
(11173 real changes made)

. replace education = 4 if educyr >=13 & educyr <=17 & hideg == 3
(3629 real changes made)

. replace education = 5 if hideg == 4
(3245 real changes made)

. replace education = 6 if hideg == 5 | hideg ==6
(1590 real changes made)

.
. label define educ 1 "Grade 8 and below" 2 "Some High School" 3 "HighSchool" 4 "Some College"
5 "College" 6 "Advanced Degree"

. label values education educ

.
.
.
. gen insurance = 1 if inscov08 == 1
(14773 missing values generated)

. replace insurance = 2 if inscov08 == 2 & mcrev08 == 2
(6642 real changes made)

. replace insurance = 3 if inscov08 == 3
(5662 real changes made)

. replace insurance = 4 if inscov08 == 2 & mcrev08 == 1
(2469 real changes made)

.
. label define insure 1 "Private Ins" 2 "Public Ins not Medicare" 3 "Uninsured" 4 "Public Ins
Medicare"
```

```
. label values insurance insure

.
.
.
. gen region = 1 if region08 == 1
(28080 missing values generated)

. replace region = 2 if region08 == 2
(6499 real changes made)

. replace region = 3 if region08 == 3
(12424 real changes made)

. replace region = 4 if region08 == 4
(8906 real changes made)


.
. label define region2 1 "Northeast" 2 "Midwest" 3 "South" 4 "West"

. label values region region2

.
.
.
. gen income = 1 if povcat08 == 1
(26099 missing values generated)

. replace income = 2 if povcat08 == 2
(2171 real changes made)

. replace income = 3 if povcat08 == 3
(5667 real changes made)

. replace income = 4 if povcat08 == 4
(9595 real changes made)

. replace income = 5 if povcat08 == 5
(8666 real changes made)


.
. label define pov 1 "Poor" 2 "Near Poor" 3 "Low Income" 4 "Middle Income" 5 "High Income"

. label values income pov

.
. gen notmsa = 1 if msa08 == 0
(28406 missing values generated)

. replace notmsa = 0 if msa08 == 1
(28155 real changes made)


.
. gen obtotv08n = 0 if obtotv08 == 0
(22054 missing values generated)

. replace obtotv08n = 1 if obtotv08 >=1
(22054 real changes made)

.
.
.
```

```
.
. gen healthexp = totexp08

. replace healthexp = . if totexp08 >50000
(223 real changes made, 223 to missing)

. summarize healthexp

    Variable |       Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
   healthexp |     32843     2580.49    5570.572          0      49887

. summarize healthexp, detail

                          healthexp
-------------------------------------------------------------
      Percentiles      Smallest
 1%            0              0
 5%            0              0
10%            0              0       Obs                32843
25%           65              0       Sum of Wgt.        32843

50%          516                      Mean            2580.49
                        Largest       Std. Dev.       5570.572
75%         2353          49559
90%         6998          49573       Variance        3.10e+07
95%        12321          49828       Skewness        4.165092
99%        30437          49887       Kurtosis        24.36206

.
. gen age18to64 = 0 if age08x !=-1
(251 missing values generated)

. replace age18to64 = 1 if age08x >= 18 & age08x <=64
(19799 real changes made)

. gen logincome = ln(income + 1)

. gen loghealthexp = ln(healthexp + 1)
(223 missing values generated)

. gen healthexpn = 0

. replace healthexpn =1 if healthexp >= 1
(26205 real changes made)

. gen healthexppop = 0

. replace healthexppop = 1 if age18to64 == 1 & healthexpn == 1
(15035 real changes made)

.
. /*Number 1*/
.
.  svy, subpop(age18to64): mlogit insurance ib3.agecat ib1.sex ib1.race ib5.income notmsa
ib3.education ib1.region ib1.healthstatus
(running mlogit on estimation sample)

Survey: Multinomial logistic regression

Number of strata   =       165                 Number of obs      =      31216
Number of PSUs     =       370                 Population size    =  283647757
                                               Subpop. no. of obs =      17020
```

```
                                    Subpop. size       =  171460741
                                    Design df          =        205
                                    F(  72,    134)    =      57.75
                                    Prob > F           =     0.0000

------------------------------------------------------------------------------
             |             Linearized
   insurance |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
Private_Ins  |  (base outcome)
-------------+----------------------------------------------------------------
Public_Ins_not_Medicare |
      agecat |
       18-24 |   .4250573   .1156715     3.67   0.000     .1969989    .6531156
       45-64 |  -.4344212   .1056984    -4.11   0.000    -.6428166   -.2260258
             |
         sex |
      female |   .6405807   .0793574     8.07   0.000     .4841195    .7970419
             |
        race |
       Black |   .7405813    .120224     6.16   0.000     .5035473    .9776153
    Hispanic |   .4819201   .1432748     3.36   0.001     .1994391    .7644012
       Asian |   .2161596   .2330734     0.93   0.355    -.2433687    .6756879
       Other |   .0723553   .2197977     0.33   0.742    -.3609986    .5057092
             |
      income |
        Poor |    4.27075   .2204577    19.37   0.000     3.836095    4.705405
  Near Poor  |   3.295032   .2303908    14.30   0.000     2.840793    3.749272
  Low Income |   2.671577   .2020799    13.22   0.000     2.273155    3.069998
Middle Income |   1.427483   .2092371     6.82   0.000      1.01495    1.840016
             |
      notmsa |   .0737096   .1714215     0.43   0.668    -.2642657    .4116849
             |
   education |
Grade 8 and below |   .8997485   .1610539     5.59   0.000      .582214    1.217283
 Some High School |   .8452103    .106203     7.96   0.000       .63582      1.0546
     Some College |  -.4271726   .1035657    -4.12   0.000    -.6313631    -.222982
          College |  -1.297537    .167468    -7.75   0.000    -1.627718   -.9673567
  Advanced Degree |  -1.919394   .3961337    -4.85   0.000    -2.700413   -1.138376
             |
      region |
     Midwest |  -.7732221   .1778333    -4.35   0.000    -1.123839   -.4226054
       South |  -1.419507   .1557189    -9.12   0.000    -1.726523   -1.112491
        West |  -.6141853    .191275    -3.21   0.002    -.9913038   -.2370668
             |
  healthstatus |
    Very Good |   .1366326   .1321508     1.03   0.302    -.1239164    .3971816
         Good |    .470287   .1180262     3.98   0.000     .2375862    .7029879
         Fair |    .965964   .1309581     7.38   0.000     .7077664    1.224162
         Poor |   2.120388   .2010133    10.55   0.000     1.724069    2.516706
             |
        _cons |  -4.269223   .2475735   -17.24   0.000     -4.75734   -3.781106
-------------+----------------------------------------------------------------
Uninsured    |
      agecat |
       18-24 |   .0122333   .0742184     0.16   0.869    -.1340958    .1585625
       45-64 |  -.1799719   .0718844    -2.50   0.013    -.3216994   -.0382444
             |
         sex |
      female |  -.3404412   .0521949    -6.52   0.000    -.4433488   -.2375335
             |
        race |
       Black |    .255403    .083602     3.05   0.003     .0905731     .420233
```

Hispanic	.9495525	.0974765	9.74	0.000	.7573676	1.141737
Asian	.3285284	.1705771	1.93	0.055	-.007782	.6648388
Other	.026392	.1686852	0.16	0.876	-.3061883	.3589723
income						
Poor	2.50168	.1096096	22.82	0.000	2.285574	2.717787
Near Poor	1.899079	.1528869	12.42	0.000	1.597647	2.200511
Low Income	1.414986	.0986358	14.35	0.000	1.220515	1.609457
Middle Income	.6795717	.0985951	6.89	0.000	.4851812	.8739622
notmsa	.0132486	.0936087	0.14	0.888	-.1713106	.1978079
education						
Grade 8 and below	.8695881	.16205	5.37	0.000	.5500897	1.189086
Some High School	.4251489	.0875071	4.86	0.000	.2526196	.5976782
Some College	-.3317883	.08423	-3.94	0.000	-.4978565	-.1657202
College	-1.010168	.1000383	-10.10	0.000	-1.207404	-.8129322
Advanced Degree	-1.421426	.1689722	-8.41	0.000	-1.754572	-1.08828
region						
Midwest	.029095	.1138157	0.26	0.798	-.1953045	.2534945
South	.3648931	.1038454	3.51	0.001	.1601511	.5696351
West	.1544587	.1163394	1.33	0.186	-.0749165	.3838339
healthstatus						
Very Good	.0727436	.0876178	0.83	0.407	-.100004	.2454912
Good	-.0214427	.0995895	-0.22	0.830	-.2177937	.1749083
Fair	.1119966	.1289173	0.87	0.386	-.1421772	.3661703
Poor	.4366891	.2046015	2.13	0.034	.0332962	.8400821
_cons	-2.198516	.1454991	-15.11	0.000	-2.485383	-1.91165
Public_Ins_Medicare						
agecat						
18-24	-1.116939	.3889281	-2.87	0.005	-1.883751	-.3501265
45-64	1.025898	.1537105	6.67	0.000	.7228421	1.328954
sex						
female	-.2527068	.1179321	-2.14	0.033	-.4852222	-.0201915
race						
Black	.0605307	.1492601	0.41	0.686	-.233751	.3548123
Hispanic	-.6190991	.2081962	-2.97	0.003	-1.02958	-.2086186
Asian	-.5409819	.6919991	-0.78	0.435	-1.90533	.823366
Other	.4182817	.4388933	0.95	0.342	-.4470419	1.283605
income						
Poor	3.461414	.2788149	12.41	0.000	2.911702	4.011127
Near Poor	2.968715	.3501395	8.48	0.000	2.278379	3.659051
Low Income	2.242257	.2774753	8.08	0.000	1.695186	2.789328
Middle Income	1.209711	.2622096	4.61	0.000	.6927379	1.726685
notmsa	.0065116	.1693585	0.04	0.969	-.3273962	.3404193
education						
Grade 8 and below	.916701	.2253527	4.07	0.000	.4723949	1.361007
Some High School	.6524403	.1912873	3.41	0.001	.2752976	1.029583
Some College	.0598757	.2154081	0.28	0.781	-.3648237	.484575
College	-.705655	.3328669	-2.12	0.035	-1.361937	-.0493735
Advanced Degree	-1.536587	.5786653	-2.66	0.009	-2.677486	-.3956884
region						
Midwest	-.6156773	.2295321	-2.68	0.008	-1.068224	-.163131

```
                South  |  -.4450503   .2151248    -2.07   0.040    -.8691911   -.0209095
                 West  |  -.6730808   .2904714    -2.32   0.021    -1.245775   -.1003864
                       |
          healthstatus |
            Very Good  |   .5196919   .3406673     1.53   0.129     -.151969    1.191353
                 Good  |   1.255214   .3065598     4.09   0.000        .6508    1.859629
                 Fair  |   2.150626   .3048072     7.06   0.000     1.549667    2.751585
                 Poor  |   3.185727   .3496673     9.11   0.000     2.496322    3.875132
                       |
                _cons  |   -5.90819   .4575703   -12.91   0.000    -6.810337   -5.006043
------------------------------------------------------------------------------

. svy, subpop(age18to64): mlogit insurance ib3.agecat ib1.sex ib1.race ib5.income notmsa
ib3.education ib1.region ib1.healthstatus
> , rrr
(running mlogit on estimation sample)

Survey: Multinomial logistic regression

Number of strata   =       165                Number of obs      =      31216
Number of PSUs     =       370                Population size    =  283647757
                                              Subpop. no. of obs =      17020
                                              Subpop. size       =  171460741
                                              Design df          =        205
                                              F(  72,    134)    =      57.75
                                              Prob > F           =     0.0000

------------------------------------------------------------------------------
                       |             Linearized
             insurance |        RRR   Std. Err.      t    P>|t|     [95% Conf. Interval]
-----------------------+------------------------------------------------------------------
Private_Ins            |  (base outcome)
-----------------------+------------------------------------------------------------------
Public_Ins_not_Medicare |
                agecat |
                 18-24 |   1.529678   .1769402     3.67   0.000     1.217743    1.921518
                 45-64 |   .6476394   .0684545    -4.11   0.000     .5258094    .7976975
                       |
                   sex |
                female |   1.897582   .1505871     8.07   0.000     1.622745    2.218967
                       |
                  race |
                 Black |   2.097154   .2521282     6.16   0.000      1.65458     2.65811
              Hispanic |    1.61918   .2319877     3.36   0.001     1.220718    2.147708
                 Asian |   1.241301   .2893141     0.93   0.355     .7839824    1.965385
                 Other |   1.075037   .2362907     0.33   0.742       .69698    1.658161
                       |
                income |
                 Poor |   71.57527   15.77932    19.37   0.000     46.34412     110.543
            Near Poor |   26.97828    6.21555    14.30   0.000     17.12934    42.49012
           Low Income |   14.46276   2.922633    13.22   0.000     9.709992    21.54187
         Middle Income |   4.168195   .8721409     6.82   0.000     2.759227    6.296636
                       |
                notmsa |   1.076494   .1845343     0.43   0.668     .7677695    1.509359
                       |
             education |
     Grade 8 and below |   2.458985    .396029     5.59   0.000     1.789997    3.377997
      Some High School |   2.328467   .2472903     7.96   0.000      1.88857    2.870828
          Some College |    .652351   .0675612    -4.12   0.000     .5318663    .8001292
               College |   .2732038   .0457529    -7.75   0.000     .1963772    .3800864
      Advanced Degree  |   .1466958   .0581111    -4.85   0.000     .0671778    .3203389
                       |
                region |
```

Midwest	.4615236	.0820743	-4.35	0.000	.3250296	.6553372
South	.2418332	.037658	-9.12	0.000	.1779019	.328739
West	.5410815	.1034954	-3.21	0.002	.3710925	.7889385
healthstatus						
Very Good	1.146407	.1514986	1.03	0.302	.8834537	1.487626
Good	1.600454	.1888955	3.98	0.000	1.268184	2.019779
Fair	2.627319	.3440688	7.38	0.000	2.029453	3.401313
Poor	8.334367	1.675319	10.55	0.000	5.607299	12.38773
_cons	.0139927	.0034642	-17.24	0.000	.0085884	.0227975
Uninsured						
agecat						
18-24	1.012308	.0751319	0.16	0.869	.8745062	1.171825
45-64	.8352937	.0600446	-2.50	0.013	.724916	.9624777
sex						
female	.7114564	.0371344	-6.52	0.000	.6418833	.7885705
race						
Black	1.290982	.1079286	3.05	0.003	1.094801	1.522316
Hispanic	2.584553	.251933	9.74	0.000	2.132655	3.132205
Asian	1.388923	.2369184	1.93	0.055	.9922482	1.944177
Other	1.026743	.1731964	0.16	0.876	.736248	1.431857
income						
Poor	12.20298	1.337564	22.82	0.000	9.831327	15.14677
Near Poor	6.679739	1.021245	12.42	0.000	4.941389	9.029629
Low Income	4.116429	.4060274	14.35	0.000	3.388933	5.000094
Middle Income	1.973032	.1945314	6.89	0.000	1.624469	2.396387
notmsa	1.013337	.0948572	0.14	0.888	.8425598	1.218728
education						
Grade 8 and below	2.385928	.3866396	5.37	0.000	1.733409	3.28408
Some High School	1.529818	.13387	4.86	0.000	1.287393	1.817893
Some College	.7176392	.0604468	-3.94	0.000	.6078321	.8472833
College	.3641578	.0364297	-10.10	0.000	.2989725	.4435556
Advanced Degree	.2413696	.0407848	-8.41	0.000	.1729812	.3367954
region						
Midwest	1.029522	.1171758	0.26	0.798	.8225842	1.28852
South	1.44036	.1495748	3.51	0.001	1.173688	1.767622
West	1.167026	.1357711	1.33	0.186	.927821	1.467902
healthstatus						
Very Good	1.075455	.094229	0.83	0.407	.9048338	1.278249
Good	.9787856	.0974768	-0.22	0.830	.8042914	1.191137
Fair	1.118509	.1441952	0.87	0.386	.8674675	1.442201
Poor	1.547575	.3166361	2.13	0.034	1.033857	2.316557
_cons	.1109677	.0161457	-15.11	0.000	.0832937	.1478363
Public_Ins_Medicare						
agecat						
18-24	.3272802	.1272885	-2.87	0.005	.1520189	.7045989
45-64	2.7896	.4287907	6.67	0.000	2.06028	3.777092
sex						
female	.7766956	.0915973	-2.14	0.033	.6155604	.980011
race						

```
                Black  |     1.0624   .1585739     0.41   0.686     .7915589    1.425913
             Hispanic  |   .5384293    .112099    -2.97   0.003     .3571571    .8117048
                Asian  |   .5821763   .4028655    -0.78   0.435     .1487736    2.278155
                Other  |   1.519349    .666832     0.95   0.342     .6395171     3.60963
                       |
               income  |
                 Poor  |     31.862   8.883601    12.41   0.000     18.38806    55.20903
           Near Poor  |   19.46689   6.816125     8.48   0.000     9.760842    38.82448
          Low Income  |   9.414555   2.612306     8.08   0.000     5.447658    16.27008
       Middle Income  |   3.352517   .8790622     4.61   0.000     1.999182    5.621985
                       |
               notmsa  |   1.006533   .1704649     0.04   0.969     .7207981    1.405537
                       |
            education  |
  Grade 8 and below  |   2.501026   .5636129     4.07   0.000     1.603831    3.900119
   Some High School  |   1.920221   .3673139     3.41   0.001     1.316923    2.799898
       Some College  |   1.061705   .2286997     0.28   0.781     .6943191    1.623485
            College  |    .493785   .1643647    -2.12   0.035     .2561642    .9518256
    Advanced Degree  |    .215114    .124479    -2.66   0.009     .0687358    .6732164
                       |
              region  |
            Midwest  |   .5402748   .1240104    -2.68   0.008     .3436184    .8494799
              South  |   .6407921   .1378503    -2.07   0.040     .4192906    .9793076
               West  |   .5101346   .1481795    -2.32   0.021     .2877178    .9044879
                       |
        healthstatus  |
          Very Good  |    1.68151   .5728354     1.53   0.129     .8590149    3.291531
               Good  |   3.508591   1.075593     4.09   0.000     1.917074    6.421353
               Fair  |   8.590233   2.618365     7.06   0.000     4.709901    15.66744
               Poor  |   24.18487   8.456658     9.11   0.000     12.13777    48.18908
                       |
              _cons  |   .0027171   .0012433   -12.91   0.000     .0011023    .0066974
------------------------------------------------------------------------------------------

.
. tabulate education

        education |      Freq.     Percent        Cum.
------------------+-----------------------------------
Grade 8 and below |      7,504       27.54       27.54
 Some High School |      3,732       13.70       41.24
       HighSchool |      7,544       27.69       68.93
     Some College |      3,629       13.32       82.25
          College |      3,245       11.91       94.16
  Advanced Degree |      1,590        5.84      100.00
------------------+-----------------------------------
            Total |     27,244      100.00

. margins, dydx(1.income 2.income) predict(outcome(3)) noestimcheck/*uninsured*/

Average marginal effects                        Number of obs   =      26721
Model VCE    : Linearized

Expression   : Pr(insurance==Uninsured), predict(outcome(3))
dy/dx w.r.t. : 1.income 2.income

------------------------------------------------------------------------------
             |            Delta-method
             |      dy/dx   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      income |
       Poor  |   .2638672   .0177408    14.87   0.000     .2290959    .2986385
  Near Poor  |   .2173327   .0245804     8.84   0.000      .169156    .2655094
```

```
------------------------------------------------------------------------------
Note: dy/dx for factor levels is the discrete change from the base level.

. margins, dydx(1.income 2.income) predict(outcome(2)) noestimcheck/*publicly insured not
medicare*/

Average marginal effects                        Number of obs   =      26721
Model VCE    : Linearized

Expression   : Pr(insurance==Public_Ins_not_Medicare), predict(outcome(2))
dy/dx w.r.t. : 1.income 2.income

------------------------------------------------------------------------------
             |            Delta-method
             |      dy/dx   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      income |
       Poor  |   .2331412   .0133663    17.44   0.000     .2069438    .2593386
  Near Poor  |   .1453332   .0146937     9.89   0.000      .116534    .1741324
------------------------------------------------------------------------------
Note: dy/dx for factor levels is the discrete change from the base level.

.  margins,  dydx(1.income  2.income)  predict(outcome(4))  noestimcheck/*publicly  insured
medicare*/

Average marginal effects                        Number of obs   =      26721
Model VCE    : Linearized

Expression   : Pr(insurance==Public_Ins_Medicare), predict(outcome(4))
dy/dx w.r.t. : 1.income 2.income

------------------------------------------------------------------------------
             |            Delta-method
             |      dy/dx   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      income |
       Poor  |   .0445678   .0064361     6.92   0.000     .0319532    .0571825
  Near Poor  |   .0430797    .009875     4.36   0.000     .0237251    .0624343
------------------------------------------------------------------------------
Note: dy/dx for factor levels is the discrete change from the base level.

.
. /*Number 2*/
.
. *two part probit-OLS model
. svy, subpop(age18to64): probit healthexpn ib3.agecat ib1.sex ib1.race ib5.income notmsa
ib3.education ib1.region ib1.healthstatu
> s ib1.insurance
(running probit on estimation sample)

Survey: Probit regression

Number of strata   =       165                  Number of obs      =      31216
Number of PSUs     =       370                  Population size    =  283647757
                                                Subpop. no. of obs =      17020
                                                Subpop. size       =  171460741
                                                Design df          =        205
                                                F(  27,    179)    =      75.30
                                                Prob > F           =     0.0000

------------------------------------------------------------------------------
             |             Linearized
  healthexpn |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
```

```
-------------------------+----------------------------------------------------------------
                 agecat |
                  18-24 |  -.0399506   .0417979    -0.96   0.340    -.1223594    .0424582
                  45-64 |   .3219381   .0328259     9.81   0.000     .2572184    .3866578
                        |
                    sex |
                 female |   .5060721   .0291953    17.33   0.000     .4485106    .5636336
                        |
                   race |
                  Black |  -.4122867   .0428795    -9.62   0.000     -.496828   -.3277453
               Hispanic |  -.4398107   .0423192   -10.39   0.000    -.5232472   -.3563741
                  Asian |  -.4599805   .0655998    -7.01   0.000    -.5893174   -.3306436
                  Other |   -.185569   .1248124    -1.49   0.139    -.4316496    .0605115
                        |
                 income |
                   Poor |  -.2847111   .0525734    -5.42   0.000    -.3883651   -.1810571
              Near Poor |   -.297532   .0697982    -4.26   0.000    -.4351465   -.1599176
             Low Income |  -.1792278   .0558786    -3.21   0.002    -.2893982   -.0690574
          Middle Income |  -.2011422   .0400596    -5.02   0.000    -.2801238   -.1221605
                        |
                 notmsa |  -.0567939    .038795    -1.46   0.145    -.1332823    .0196944
                        |
              education |
      Grade 8 and below |  -.0293005   .0641882    -0.46   0.649    -.1558542    .0972532
       Some High School |  -.0381313   .0491379    -0.78   0.439    -.1350118    .0587491
           Some College |   .2053192   .0403966     5.08   0.000     .1256732    .2849652
                College |   .3229223    .047472     6.80   0.000     .2293263    .4165183
         Advanced Degree |   .3360283   .0682553     4.92   0.000      .201456    .4706007
                        |
                 region |
                Midwest |   .0307644   .0585583     0.53   0.600    -.0846894    .1462182
                  South |  -.0436228   .0507469    -0.86   0.391    -.1436757      .05643
                   West |  -.0942803   .0541906    -1.74   0.083    -.2011226     .012562
                        |
            healthstatus |
              Very Good |    .201293   .0387591     5.19   0.000     .1248755    .2777106
                   Good |   .2759373   .0454517     6.07   0.000     .1863245    .3655501
                   Fair |   .8354909   .0585048    14.28   0.000     .7201426    .9508392
                   Poor |   1.386249   .1307244    10.60   0.000     1.128512    1.643986
                        |
              insurance |
Public Ins not Medicare |   .1483934   .0581607     2.55   0.011     .0337236    .2630633
             Uninsured |  -.7853768   .0409731   -19.17   0.000    -.8661594   -.7045941
    Public Ins Medicare |   .2045003   .1407427     1.45   0.148    -.0729885    .4819891
                        |
                  _cons |   .7679485   .0644321    11.92   0.000     .6409139    .8949831
-------------------------------------------------------------------------------------------

. outreg2 using "hw6twopartmodel.xls", replace
hw6twopartmodel.xls
dir : seeout

. margins, dydx(1.income 2.income 3.income 4.income 5.income) noestimcheck

Average marginal effects                        Number of obs   =      26721
Model VCE    : Linearized

Expression   : Pr(healthexpn), predict()
dy/dx w.r.t. : 1.income 2.income 3.income 4.income

------------------------------------------------------------------------------
             |            Delta-method
             |      dy/dx   Std. Err.      z    P>|z|     [95% Conf. Interval]
```

```
--------------+----------------------------------------------------------------
        income |
         Poor  |  -.0637865   .0121337    -5.26   0.000    -.0875682   -.0400049
    Near Poor  |  -.0669817   .0167173    -4.01   0.000     -.099747   -.0342164
   Low Income  |  -.0385407   .0122193    -3.15   0.002    -.0624901   -.0145913
Middle Income  |  -.0436311   .0086933    -5.02   0.000    -.0606697   -.0265925
------------------------------------------------------------------------------
Note: dy/dx for factor levels is the discrete change from the base level.

.
.
.
. predict probithealthexpnhat
(option pr assumed; Pr(healthexpn))
(6345 missing values generated)

. summarize  probithealthexpnhat, detail

                      Pr(healthexpn)
-------------------------------------------------------------
      Percentiles      Smallest
 1%     .2413384       .1679557
 5%     .3767758       .1679557
10%     .4997447       .1769287       Obs               26721
25%     .6762185       .1769287       Sum of Wgt.       26721

50%     .8179805                      Mean           .7707458
                       Largest       Std. Dev.      .1821505
75%     .9115369       .9993678
90%     .9598115       .9994083       Variance       .0331788
95%     .9759533       .9994459       Skewness      -1.105731
99%     .9931905       .9995749       Kurtosis       3.635765

.
. gen age18to64health = 0 if age08x !=-1
(251 missing values generated)

. replace age18to64health = 1 if age08x >= 18 & age08x <=64 & healthexp > 0
(15035 real changes made)

.
. svy, subpop(age18to64health): reg loghealthexp ib3.agecat ib1.sex ib1.race ib5.income notmsa
ib3.education ib1.region ib1.health
> status ib1.insurance
(running regress on estimation sample)

Survey: Linear regression

Number of strata   =       165                 Number of obs      =      31391
Number of PSUs     =       370                 Population size    =  285006026
                                               Subpop. no. of obs =      13000
                                               Subpop. size       =  138614555
                                               Design df          =        205
                                               F(  27,    179)    =     117.96
                                               Prob > F           =     0.0000
                                               R-squared          =     0.1995

------------------------------------------------------------------------------
                        |             Linearized
           loghealthexp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
------------------------+-----------------------------------------------------------------
                agecat |
                18-24  |  -.0968416   .0533238    -1.82   0.071     -.201975    .0082918
```

```
                45-64  |   .5160689   .0322822    15.99   0.000     .4524212    .5797166
                       |
                   sex |
              female  |   .4284671   .0324599    13.20   0.000      .364469    .4924653
                       |
                  race |
                 Black  |  -.4071942   .0475736    -8.56   0.000    -.5009905    -.313398
              Hispanic  |  -.4345545    .042628   -10.19   0.000    -.5186001   -.3505089
                 Asian  |  -.6676905   .0684702    -9.75   0.000    -.8026867   -.5326943
                 Other  |   .0075954   .1025165     0.07   0.941    -.1945266    .2097173
                       |
                income |
                  Poor  |  -.1502753   .0599618    -2.51   0.013    -.2684962   -.0320545
             Near Poor  |  -.2352077     .08588    -2.74   0.007    -.4045289   -.0658864
            Low Income  |  -.1893176   .0603854    -3.14   0.002    -.3083737   -.0702614
          Middle Income  |  -.0933554   .0388537    -2.40   0.017    -.1699594   -.0167513
                       |
                notmsa |   -.126314   .0532493    -2.37   0.019    -.2313004   -.0213276
                       |
             education |
      Grade 8 and below  |  -.1765067   .0776802    -2.27   0.024    -.3296612   -.0233522
       Some High School  |  -.1327232   .0579384    -2.29   0.023    -.2469547   -.0184917
           Some College  |   .0924306    .040515     2.28   0.024     .0125512    .1723101
                College  |   .1799965   .0465127     3.87   0.000     .0882918    .2717012
         Advanced Degree  |   .2815982   .0585458     4.81   0.000     .1661692    .3970272
                       |
                region |
              Midwest  |   .0490861   .0475085     1.03   0.303    -.0445818    .1427541
                South  |   .0121505   .0468241     0.26   0.796    -.0801681    .1044691
                 West  |  -.0073031   .0476285    -0.15   0.878    -.1012077    .0866016
                       |
           healthstatus |
             Very Good  |   .2757654   .0406343     6.79   0.000     .1956506    .3558802
                  Good  |   .5885754   .0405297    14.52   0.000     .5086668     .668484
                  Fair  |   1.122856   .0584263    19.22   0.000     1.007663     1.23805
                  Poor  |   1.850241   .0847337    21.84   0.000     1.683179    2.017302
                       |
              insurance |
Public Ins not Medicare  |   .1275193   .0748825     1.70   0.090    -.0201194     .275158
             Uninsured  |  -.7144227   .0494021   -14.46   0.000     -.811824   -.6170213
    Public Ins Medicare  |   .7523009   .0985848     7.63   0.000     .5579307     .946671
                       |
                  _cons |   6.427621   .0652088    98.57   0.000     6.299055    6.556187
------------------------------------------------------------------------------------------

. outreg2 using "hw6twopartmodel.xls", replace append
replaced when both replace and append chosen
hw6twopartmodel.xls
dir : seeout

. margins, dydx(1.income 2.income 3.income 4.income 5.income education) noestimcheck

Average marginal effects                        Number of obs   =      26618
Model VCE    : Linearized

Expression   : Linear prediction, predict()
dy/dx  w.r.t.  :  1.income  2.income  3.income  4.income  1.education  2.education  4.education
5.education 6.education

------------------------------------------------------------------------------
                  |            Delta-method
                  |      dy/dx   Std. Err.      t    P>|t|     [95% Conf. Interval]
------------------+-----------------------------------------------------------
```

```
            income |
              Poor |  -.1502753   .0599618    -2.51   0.013    -.2684962   -.0320545
        Near Poor  |  -.2352077     .08588    -2.74   0.007    -.4045289   -.0658864
       Low Income  |  -.1893176   .0603854    -3.14   0.002    -.3083737   -.0702614
    Middle Income  |  -.0933554   .0388537    -2.40   0.017    -.1699594   -.0167513
                   |
         education |
Grade 8 and below  |  -.1765067   .0776802    -2.27   0.024    -.3296612   -.0233522
 Some High School  |  -.1327232   .0579384    -2.29   0.023    -.2469547   -.0184917
     Some College  |   .0924306    .040515     2.28   0.024     .0125512    .1723101
          College  |   .1799965   .0465127     3.87   0.000     .0882918    .2717012
  Advanced Degree  |   .2815982   .0585458     4.81   0.000     .1661692    .3970272
------------------------------------------------------------------------------
Note: dy/dx for factor levels is the discrete change from the base level.

.
. predict healthexphat
(option xb assumed; fitted values)
(6345 missing values generated)

. summarize healthexphat, detail

                        Fitted values
-------------------------------------------------------------
      Percentiles      Smallest
 1%     5.067243       4.638776
 5%     5.531896       4.679684
10%     5.782122       4.691834       Obs               26721
25%     6.214987       4.711423       Sum of Wgt.       26721

50%     6.715537                      Mean           6.764035
                        Largest       Std. Dev.      .7934478
75%     7.278801       9.966471
90%     7.792741       9.968574       Variance       .6295595
95%     8.114679       9.974698       Skewness       .3315561
99%     8.827353       10.05404       Kurtosis        3.18395

. predict resid, residuals
(6526 missing values generated)

. gen exphealthexphat = exp(healthexphat)
(6345 missing values generated)

. gen residsmear = exp(resid)
(6526 missing values generated)

. egen avgresidsmear = mean(residsmear)

. gen smear = avgresidsmear*exphealthexphat
(6345 missing values generated)

. summarize smear

    Variable |       Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
       smear |     26721    2756.259    3067.961   233.0482   52391.85

.
.
.
.  /*Part B*/
.
.    /*Park Test*/
```

```
. svy, subpop(age18to64): glm healthexp ib3.agecat ib1.sex ib1.race ib5.income notmsa
ib3.education ib1.region ib1.healthstatus ib
> 1.insurance, family(gamma) link(log)
(running glm on estimation sample)

Survey: Generalized linear models

Number of strata   =       165                Number of obs      =      31113
Number of PSUs     =       370                Population size    =  282464364
                                              Subpop. no. of obs =      16917
                                              Subpop. size       =  170277348
                                              Design df          =        205
```

healthexp	Coef.	Linearized Std. Err.	t	P>|t|	[95% Conf.	Interval]
agecat						
18-24	-.1525881	.0708288	-2.15	0.032	-.2922343	-.0129418
45-64	.4421097	.0433598	10.20	0.000	.3566214	.527598
sex						
female	.4685999	.0384777	12.18	0.000	.392737	.5444627
race						
Black	-.4413024	.0592257	-7.45	0.000	-.5580719	-.3245329
Hispanic	-.5400887	.0616302	-8.76	0.000	-.661599	-.4185783
Asian	-.7675889	.0722038	-10.63	0.000	-.9099462	-.6252317
Other	.0192808	.1349877	0.14	0.887	-.2468613	.285423
income						
Poor	-.1192354	.088956	-1.34	0.182	-.2946214	.0561505
Near Poor	-.1538654	.093684	-1.64	0.102	-.3385731	.0308423
Low Income	-.2147216	.0717328	-2.99	0.003	-.3561503	-.073293
Middle Income	-.1369234	.0433445	-3.16	0.002	-.2223815	-.0514653
notmsa	-.1861548	.0524585	-3.55	0.000	-.2895822	-.0827274
education						
Grade 8 and below	-.0523859	.1500581	-0.35	0.727	-.3482409	.2434692
Some High School	-.0763148	.0736007	-1.04	0.301	-.2214262	.0687966
Some College	.1285256	.0481397	2.67	0.008	.0336131	.2234381
College	.2032447	.0560938	3.62	0.000	.0926499	.3138394
Advanced Degree	.2645275	.0751969	3.52	0.001	.1162689	.412786
region						
Midwest	.0598253	.0560905	1.07	0.287	-.050763	.1704136
South	.0173792	.0572827	0.30	0.762	-.0955596	.130318
West	-.0469751	.0534701	-0.88	0.381	-.152397	.0584468
healthstatus						
Very Good	.3019975	.0573575	5.27	0.000	.1889112	.4150838
Good	.6460287	.0520156	12.42	0.000	.5434745	.7485829
Fair	1.192653	.0652875	18.27	0.000	1.063932	1.321374
Poor	1.740819	.0787071	22.12	0.000	1.58564	1.895998
insurance						
Public Ins not Medicare	.3835083	.0833456	4.60	0.000	.2191839	.5478327
Uninsured	-.9190729	.0725297	-12.67	0.000	-1.062073	-.7760731
Public Ins Medicare	.7460566	.0923205	8.08	0.000	.5640372	.928076
_cons	7.157574	.0815598	87.76	0.000	6.996771	7.318378

```
. predict healthhat2, xb
(6345 missing values generated)

. gen lnhealthhat2 = ln(healthhat2)
(6345 missing values generated)

. gen r2 = ((healthexp-healthhat2))^2
(6526 missing values generated)

. gen lnr2 = ln(r2)
(6526 missing values generated)

.
.
. svy, subpop(age18to64): glm lnr2 lnhealthhat2, family(gamma) link(log)  nolog
(running glm on estimation sample)

Survey: Generalized linear models

Number of strata   =       165                 Number of obs      =      31113
Number of PSUs     =       370                 Population size    =  282464364
                                               Subpop. no. of obs =      16917
                                               Subpop. size       =  170277348
                                               Design df          =        205

------------------------------------------------------------------------------
             |             Linearized
        lnr2 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
lnhealthhat2 |   2.230204   .0444583    50.16   0.000     2.142549    2.317858
       _cons |  -2.048806   .0920827   -22.25   0.000    -2.230357   -1.867256
------------------------------------------------------------------------------

. test lnhealthhat2 == 0

Adjusted Wald test

 ( 1)  [lnr2]lnhealthhat2 = 0

       F(  1,   205) = 2516.42
            Prob > F =    0.0000

. test lnhealthhat2 == 1

Adjusted Wald test

 ( 1)  [lnr2]lnhealthhat2 = 1

       F(  1,   205) =  765.68
            Prob > F =    0.0000

. test lnhealthhat2 == 2

Adjusted Wald test

 ( 1)  [lnr2]lnhealthhat2 = 2

       F(  1,   205) =   26.81
            Prob > F =    0.0000

. test lnhealthhat2 == 3
```

```
Adjusted Wald test

 ( 1)  [lnr2]lnhealthhat2 = 3

       F(  1,   205) =  299.81
            Prob > F =    0.0000


.
.
. /*Ceofficient=2.2 Gamma*/
.
.   /*Part C*/
.
. svy, subpop(age18to64): glm healthexp ib3.agecat ib1.sex ib1.race ib5.income notmsa
ib3.education ib1.region ib1.healthstatus ib
> 1.insurance, family(gamma) link(log)
(running glm on estimation sample)

Survey: Generalized linear models

Number of strata   =       165                Number of obs      =      31113
Number of PSUs     =       370                Population size    =  282464364
                                              Subpop. no. of obs =      16917
                                              Subpop. size       =  170277348
                                              Design df          =        205

------------------------------------------------------------------------------
             |             Linearized
  healthexp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      agecat |
       18-24 |  -.1525881   .0708288    -2.15   0.032    -.2922343   -.0129418
       45-64 |   .4421097   .0433598    10.20   0.000     .3566214     .527598
             |
         sex |
      female |   .4685999   .0384777    12.18   0.000      .392737    .5444627
             |
        race |
       Black |  -.4413024   .0592257    -7.45   0.000    -.5580719   -.3245329
    Hispanic |  -.5400887   .0616302    -8.76   0.000     -.661599   -.4185783
       Asian |  -.7675889   .0722038   -10.63   0.000    -.9099462   -.6252317
       Other |   .0192808   .1349877     0.14   0.887    -.2468613     .285423
             |
      income |
        Poor |  -.1192354    .088956    -1.34   0.182    -.2946214    .0561505
  Near Poor  |  -.1538654    .093684    -1.64   0.102    -.3385731    .0308423
  Low Income |  -.2147216   .0717328    -2.99   0.003    -.3561503    -.073293
Middle Income |  -.1369234   .0433445    -3.16   0.002    -.2223815   -.0514653
             |
      notmsa |  -.1861548   .0524585    -3.55   0.000    -.2895822   -.0827274
             |
   education |
Grade 8 and below |  -.0523859   .1500581    -0.35   0.727    -.3482409    .2434692
 Some High School |  -.0763148   .0736007    -1.04   0.301    -.2214262    .0687966
     Some College |   .1285256   .0481397     2.67   0.008     .0336131    .2234381
          College |   .2032447   .0560938     3.62   0.000     .0926499    .3138394
 Advanced Degree |   .2645275   .0751969     3.52   0.001     .1162689     .412786
             |
      region |
     Midwest |   .0598253   .0560905     1.07   0.287     -.050763    .1704136
       South |   .0173792   .0572827     0.30   0.762    -.0955596     .130318
        West |  -.0469751   .0534701    -0.88   0.381     -.152397    .0584468
             |
```

```
            healthstatus |
              Very Good  |   .3019975   .0573575     5.27   0.000     .1889112    .4150838
                   Good  |   .6460287   .0520156    12.42   0.000     .5434745    .7485829
                   Fair  |   1.192653   .0652875    18.27   0.000     1.063932    1.321374
                   Poor  |   1.740819   .0787071    22.12   0.000      1.58564    1.895998
                         |
               insurance |
Public Ins not Medicare  |   .3835083   .0833456     4.60   0.000     .2191839    .5478327
             Uninsured   |  -.9190729   .0725297   -12.67   0.000    -1.062073   -.7760731
    Public Ins Medicare  |   .7460566   .0923205     8.08   0.000     .5640372     .928076
                         |
                   _cons |   7.157574   .0815598    87.76   0.000     6.996771    7.318378
------------------------------------------------------------------------------

. outreg2 using "hw6glm.xls"
hw6glm.xls
dir : seeout

. margins, dydx(1.income 2.income 3.income 4.income 5.income) noestimcheck

Average marginal effects                        Number of obs   =      26618
Model VCE    : Linearized

Expression   : Predicted mean healthexp, predict()
dy/dx w.r.t. : 1.income 2.income 3.income 4.income

------------------------------------------------------------------------------
             |            Delta-method
             |      dy/dx   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      income |
        Poor |  -363.8902   263.5997    -1.38   0.167    -880.5362    152.7558
  Near Poor  |  -461.6971   268.4587    -1.72   0.085    -987.8665    64.47223
 Low Income  |  -625.5801   202.7473    -3.09   0.002    -1022.958   -228.2027
Middle Income|  -414.2702   132.3813    -3.13   0.002    -673.7328   -154.8077
------------------------------------------------------------------------------
Note: dy/dx for factor levels is the discrete change from the base level.

.
.
.   /*Part E*/
.
. quietly svy, subpop(age18to64): glm healthexp ib3.agecat ib1.sex ib1.race ib5.income notmsa
ib3.education ib1.region ib1.healths
> tatus ib1.insurance, family(gamma) link(log)

. predict glmexppredict
(option mu assumed; predicted mean healthexp)
(6345 missing values generated)

. summarize glmexppredict, detail

                  Predicted mean healthexp
-------------------------------------------------------------
      Percentiles      Smallest
 1%     251.2586       155.1926
 5%     422.3792       157.2931
10%     607.9389       161.7436       Obs               26721
25%     1076.563       170.8991       Sum of Wgt.       26721

50%     1828.039                      Mean           2625.364
                        Largest       Std. Dev.      2796.034
75%     3158.811       39124.57
```

```
90%     5215.802       41121.04       Variance        7817808
95%     7386.246       41121.04       Skewness       4.001164
99%     14104.01       42803.04       Kurtosis       29.73515

.
. gen predictolsmodel = smear*healthexphat*probithealthexpnhat
(6345 missing values generated)

. summarize predictolsmodel, detail

                      predictolsmodel
-------------------------------------------------------------
      Percentiles      Smallest
 1%     440.6569       200.7225
 5%     1134.039       200.7225
10%     2200.526       221.8453       Obs               26721
25%     4875.182       225.2032       Sum of Wgt.       26721

50%     10272.64                      Mean            18453.2
                        Largest       Std. Dev.      27925.07
75%     21501.58       477914.6
90%     40542.86       479207.3       Variance       7.80e+08
95%     58902.71       482385.7       Skewness       5.665885
99%     134717.8       526405.1       Kurtosis       56.15866

.
end of do-file
```