Appendix A

3rd Order Log-Logistic Regression Results for the Non Elderly – 1992 NMES

```
-> ipl=        1
  Source |       SS       df       MS              Number of obs =      95
---------+------------------------------           F(  3,    91) = 2405.38
   Model |  305.842493     3  101.947498           Prob > F      =  0.0000
Residual |   3.8568665    91  .042383148           R-squared     =  0.9875
---------+------------------------------           Adj R-squared =  0.9871
   Total |  309.699359    94  3.29467403           Root MSE      =  .20587

------------------------------------------------------------------------------
  lnodds |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
  lnmoop |   1.028337   .0302884     33.952   0.000       .9681726    1.088501
   lnmp2 |   .3279916   .0137416     23.868   0.000       .3006955    .3552877
   lnmp3 |   .1039791   .0059403     17.504   0.000       .0921795    .1157788
   _cons |   .2481396   .0278213      8.919   0.000        .192876    .3034032
------------------------------------------------------------------------------

-> ipl=        2
  Source |       SS       df       MS              Number of obs =      18
---------+------------------------------           F(  3,    14) =  125.96
   Model |  23.5796402     3  7.85988005           Prob > F      =  0.0000
Residual |    .8735684    14  .062397743           R-squared     =  0.9643
---------+------------------------------           Adj R-squared =  0.9566
   Total |  24.4532086    17  1.43842403           Root MSE      =   .2498

------------------------------------------------------------------------------
  lnodds |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
  lnmoop |   1.275706   .1246871     10.231   0.000       1.008279    1.543133
   lnmp2 |   .1921735   .1078129      1.782   0.096      -.0390621    .4234092
   lnmp3 |   .0123426     .02171      0.569   0.579      -.0342207    .0589059
   _cons |   .8920519   .0885659     10.072   0.000       .7020969    1.082007
------------------------------------------------------------------------------

-> ipl=        3
  Source |       SS       df       MS              Number of obs =     661
---------+------------------------------           F(  3,   657) =41417.33
   Model |  2115.81186     3  705.270619           Prob > F      =  0.0000
Residual |  11.1876545   657  .017028393           R-squared     =  0.9947
---------+------------------------------           Adj R-squared =  0.9947
   Total |  2126.99951   660  3.22272653           Root MSE      =  .13049

------------------------------------------------------------------------------
  lnodds |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
  lnmoop |   1.640223   .0067654    242.442   0.000       1.626939    1.653508
   lnmp2 |   .2358787   .0043474     54.257   0.000       .2273422    .2444152
   lnmp3 |   .0217826   .0006417     33.947   0.000       .0205227    .0230426
   _cons |   .8545995   .0066664    128.195   0.000       .8415096    .8676895
------------------------------------------------------------------------------
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```
-> ipl=        4
  Source |       SS       df       MS              Number of obs =     135
---------+------------------------------           F(  3,   131) = 5832.04
   Model |  421.075911     3  140.358637           Prob > F      =  0.0000
Residual |  3.15275169   131  .024066807           R-squared     =  0.9926
---------+------------------------------           Adj R-squared =  0.9924
   Total |  424.228663   134  3.16588554           Root MSE      =  .15513

------------------------------------------------------------------------------
  lnodds |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
  lnmoop |   2.067369   .0237845     86.921   0.000       2.020317     2.11442
   lnmp2 |   .5307119   .0178904     29.665   0.000       .4953205    .5661032
   lnmp3 |   .0668307   .0031987     20.893   0.000       .0605029    .0731584
   _cons |   .9250693   .0178594     51.797   0.000       .8897391    .9603995
------------------------------------------------------------------------------

-> ipl=        5
  Source |       SS       df       MS              Number of obs =      97
---------+------------------------------           F(  3,    93) = 1856.86
   Model |  225.398596     3  75.1328652           Prob > F      =  0.0000
Residual |  3.76299442    93  .040462306           R-squared     =  0.9836
---------+------------------------------           Adj R-squared =  0.9830
   Total |   229.16159    96   2.3870999           Root MSE      =  .20115

------------------------------------------------------------------------------
  lnodds |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
  lnmoop |    1.20965    .021538     56.164   0.000        1.16688     1.25242
   lnmp2 |   .0904161   .0133463      6.775   0.000       .0639129    .1169192
   lnmp3 |   .0052674   .0031591      1.667   0.099       -.001006    .0115407
   _cons |  -.2725821   .0274003     -9.948   0.000      -.3269936   -.2181706
------------------------------------------------------------------------------

-> ipl=        6
  Source |       SS       df       MS              Number of obs =      36
---------+------------------------------           F(  3,    32) =  637.87
   Model |  120.944988     3  40.3149961           Prob > F      =  0.0000
Residual |  2.02247349    32  .063202297           R-squared     =  0.9836
---------+------------------------------           Adj R-squared =  0.9820
   Total |  122.967462    35  3.51335605           Root MSE      =   .2514

------------------------------------------------------------------------------
  lnodds |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
  lnmoop |   1.216438   .0539722     22.538   0.000       1.106501    1.326376
   lnmp2 |   -.077237   .0439161     -1.759   0.088      -.1666911    .0122171
   lnmp3 |    .005772   .0140506      0.411   0.684      -.0228481    .0343921
   _cons |   .5502528    .063478      8.668   0.000       .4209524    .6795532
------------------------------------------------------------------------------
```

```
-> ipl=        7
  Source |       SS       df       MS              Number of obs =    1288
---------+------------------------------           F(  3,  1284) =94094.71
   Model |  4173.02539     3  1391.00846           Prob > F      =  0.0000
Residual |  18.9814588  1284  .014783068           R-squared     =  0.9955
---------+------------------------------           Adj R-squared =  0.9955
   Total |  4192.00685  1287  3.25719258           Root MSE      =  .12159

------------------------------------------------------------------------------
  lnodds |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
  lnmoop |   1.530963    .003594    425.980   0.000       1.523912    1.538014
   lnmp2 |   .2010627   .0020244     99.317   0.000       .1970911    .2050343
   lnmp3 |     .01849   .0004554     40.599   0.000       .0175965    .0193835
   _cons |  -.5283127   .0042469   -124.400   0.000      -.5366443   -.5199811
------------------------------------------------------------------------------

-> ipl=        8
  Source |       SS       df       MS              Number of obs =     246
---------+------------------------------           F(  3,   242) =12675.98
   Model |  725.871756     3  241.957252           Prob > F      =  0.0000
Residual |  4.61926039   242  .019087853           R-squared     =  0.9937
---------+------------------------------           Adj R-squared =  0.9936
   Total |  730.491017   245  2.98159599           Root MSE      =  .13816

------------------------------------------------------------------------------
  lnodds |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
  lnmoop |   1.710414   .0107335    159.353   0.000       1.689271    1.731557
   lnmp2 |   .2842935   .0080191     35.452   0.000       .2684974    .3000896
   lnmp3 |   .0336115   .0019594     17.154   0.000       .0297518    .0374713
   _cons |   .0543327   .0110507      4.917   0.000       .0325649    .0761005
------------------------------------------------------------------------------

-> ipl=        9
  Source |       SS       df       MS              Number of obs =     103
---------+------------------------------           F(  3,    99) = 2035.24
   Model |  286.768458     3  95.5894861           Prob > F      =  0.0000
Residual |  4.64975632    99  .046967236           R-squared     =  0.9840
---------+------------------------------           Adj R-squared =  0.9836
   Total |  291.418215   102  2.85704132           Root MSE      =  .21672

------------------------------------------------------------------------------
  lnodds |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
  lnmoop |   1.521131   .0363363     41.863   0.000       1.449032     1.59323
   lnmp2 |   .1103374   .0143106      7.710   0.000       .0819421    .1387327
   lnmp3 |    .019345   .0084659      2.285   0.024       .0025468    .0361432
   _cons |  -.4183104   .0261139    -16.019   0.000       -.470126   -.3664948
------------------------------------------------------------------------------
```

```
-> ipl=       10
  Source |       SS       df       MS              Number of obs =      36
---------+------------------------------           F(  3,    32) =  568.31
   Model |  116.655431     3  38.8851436           Prob > F      =  0.0000
Residual |   2.1895111    32  .068422222           R-squared     =  0.9816
---------+------------------------------           Adj R-squared =  0.9798
   Total |  118.844942    35  3.39556977           Root MSE      =  .26158

------------------------------------------------------------------------------
  lnodds |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
  lnmoop |   1.856376   .0688594     26.959   0.000       1.716114    1.996639
   lnmp2 |   .2636983   .0546097      4.829   0.000       .1524621    .3749346
   lnmp3 |   .0151784    .025188      0.603   0.551      -.0361279    .0664848
   _cons |   .4011379   .0612369      6.551   0.000       .2764025    .5258734
------------------------------------------------------------------------------

-> ipl=       11
  Source |       SS       df       MS              Number of obs =     785
---------+------------------------------           F(  3,   781) =83980.30
   Model |   2516.2491     3  838.749702           Prob > F      =  0.0000
Residual |  7.80020426   781  .009987457           R-squared     =  0.9969
---------+------------------------------           Adj R-squared =  0.9969
   Total |  2524.04931   784  3.21945065           Root MSE      =  .09994

------------------------------------------------------------------------------
  lnodds |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
  lnmoop |   1.592924    .004907    324.623   0.000       1.583292    1.602557
   lnmp2 |    .233218   .0024115     96.711   0.000       .2284843    .2379518
   lnmp3 |   .0303497   .0008133     37.316   0.000       .0287532    .0319463
   _cons |    -.87723    .004545   -193.008   0.000       -.886152   -.8683081
------------------------------------------------------------------------------

-> ipl=       12
  Source |       SS       df       MS              Number of obs =     139
---------+------------------------------           F(  3,   135) = 5072.28
   Model |  412.725524     3  137.575175           Prob > F      =  0.0000
Residual |  3.66159985   135  .027122962           R-squared     =  0.9912
---------+------------------------------           Adj R-squared =  0.9910
   Total |  416.387124   138    3.017298           Root MSE      =  .16469

------------------------------------------------------------------------------
  lnodds |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
  lnmoop |   1.635539   .0223557     73.160   0.000       1.591326    1.679752
   lnmp2 |   .3662254   .0134862     27.156   0.000       .3395539     .392897
   lnmp3 |   .0795462   .0058544     13.587   0.000        .067968    .0911244
   _cons |  -.6992638   .0183075    -38.196   0.000      -.7354703   -.6630572
------------------------------------------------------------------------------
```

```
-> ipl=       13
  Source |       SS       df       MS              Number of obs =      93
---------+------------------------------           F(  3,    89) = 4039.88
   Model |  244.456556     3  81.4855186           Prob > F      =  0.0000
Residual |   1.7951569    89  .020170302           R-squared     =  0.9927
---------+------------------------------           Adj R-squared =  0.9925
   Total |  246.251713    92  2.67664905           Root MSE      =  .14202

------------------------------------------------------------------------------
  lnodds |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
  lnmoop |   1.192253   .0225827     52.795   0.000       1.147381    1.237124
   lnmp2 |   .1081199   .0092478     11.691   0.000       .0897447    .1264951
   lnmp3 |    .006368    .000939      6.782   0.000       .0045022    .0082337
   _cons |    1.68074   .0222479     75.546   0.000       1.636533    1.724946
------------------------------------------------------------------------------

-> ipl=       14
  Source |       SS       df       MS              Number of obs =      41
---------+------------------------------           F(  3,    37) = 1246.93
   Model |  116.471256     3  38.8237522           Prob > F      =  0.0000
Residual |  1.15201124    37  .031135439           R-squared     =  0.9902
---------+------------------------------           Adj R-squared =  0.9894
   Total |  117.623268    40  2.94058169           Root MSE      =  .17645

------------------------------------------------------------------------------
  lnodds |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
  lnmoop |   .9352596   .0375598     24.901   0.000       .8591562    1.011363
   lnmp2 |   .0268821   .0228014      1.179   0.246       -.019318    .0730822
   lnmp3 |   .0052166   .0033453      1.559   0.127      -.0015617    .0119949
   _cons |   1.591682   .0468847     33.949   0.000       1.496684    1.686679
------------------------------------------------------------------------------

-> ipl=       15
  Source |       SS       df       MS              Number of obs =      25
---------+------------------------------           F(  3,    21) =  189.30
   Model |  56.9611825     3  18.9870608           Prob > F      =  0.0000
Residual |  2.10632801    21  .100301334           R-squared     =  0.9643
---------+------------------------------           Adj R-squared =  0.9592
   Total |  59.0675106    24  2.46114627           Root MSE      =   .3167

------------------------------------------------------------------------------
  lnodds |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
  lnmoop |   .8886003    .079478     11.180   0.000       .7233167    1.053884
   lnmp2 |   .2116832   .0432449      4.895   0.000       .1217506    .3016158
   lnmp3 |   .0591864   .0153827      3.848   0.001       .0271963    .0911766
   _cons |   .6600614   .0977487      6.753   0.000       .4567818     .863341
------------------------------------------------------------------------------
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```
-> ipl=       16
  Source |       SS       df       MS              Number of obs =       6
---------+------------------------------           F(  3,     2) =  230.00
   Model |  9.36582546     3  3.12194182           Prob > F      =  0.0043
Residual |  .027147655     2  .013573827           R-squared     =  0.9971
---------+------------------------------           Adj R-squared =  0.9928
   Total |  9.39297312     5  1.87859462           Root MSE      =  .11651

------------------------------------------------------------------------------
  lnodds |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
  lnmoop |   .7575798   .1381421      5.484   0.032       .1632025    1.351957
   lnmp2 |  -.1534394    .113387     -1.353   0.309      -.6413041    .3344252
   lnmp3 |  -.0359639   .0199313     -1.804   0.213      -.1217215    .0497938
   _cons |   .7252665   .0663259     10.935   0.008        .439889    1.010644
------------------------------------------------------------------------------

-> ipl=       17
  Source |       SS       df       MS              Number of obs =     123
---------+------------------------------           F(  3,   119) = 3053.57
   Model |  373.368485     3  124.456162           Prob > F      =  0.0000
Residual |  4.85014579   119  .040757528           R-squared     =  0.9872
---------+------------------------------           Adj R-squared =  0.9869
   Total |   378.21863   122  3.10015271           Root MSE      =  .20188

------------------------------------------------------------------------------
  lnodds |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
  lnmoop |   1.264254   .0232095     54.471   0.000       1.218297    1.310212
   lnmp2 |   .2554846    .015543     16.437   0.000        .224708    .2862612
   lnmp3 |   .0370303   .0025662     14.430   0.000       .0319491    .0421116
   _cons |   1.474751   .0299808     49.190   0.000       1.415386    1.534116
------------------------------------------------------------------------------

-> ipl=       18
  Source |       SS       df       MS              Number of obs =      95
---------+------------------------------           F(  3,    91) = 2324.83
   Model |  341.404109     3   113.80137           Prob > F      =  0.0000
Residual |  4.45448083    91  .048950339           R-squared     =  0.9871
---------+------------------------------           Adj R-squared =  0.9867
   Total |   345.85859    94   3.6793467           Root MSE      =  .22125

------------------------------------------------------------------------------
  lnodds |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
  lnmoop |   1.313108    .030892     42.506   0.000       1.251745    1.374471
   lnmp2 |   .1801353   .0149059     12.085   0.000       .1505266     .209744
   lnmp3 |   .0179951   .0018205      9.885   0.000        .014379    .0216113
   _cons |   2.001622   .0354134     56.522   0.000       1.931277    2.071966
------------------------------------------------------------------------------
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```
-> ipl=       19
  Source |       SS       df       MS              Number of obs =      80
---------+------------------------------           F(  3,    76) = 1706.45
   Model |  191.563878     3  63.8546261           Prob > F      =  0.0000
Residual |   2.8438812    76   .03741949           R-squared     =  0.9854
---------+------------------------------           Adj R-squared =  0.9848
   Total |  194.407759    79  2.46085771           Root MSE      =  .19344

------------------------------------------------------------------------------
  lnodds |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
  lnmoop |   1.342251   .0239307     56.089   0.000       1.294589    1.389913
   lnmp2 |   .2363857   .0169853     13.917   0.000       .2025567    .2702148
   lnmp3 |   .0221976   .0029257      7.587   0.000       .0163706    .0280246
   _cons |   .6526474   .0317504     20.556   0.000        .589411    .7158838
------------------------------------------------------------------------------

-> ipl=       20
  Source |       SS       df       MS              Number of obs =      25
---------+------------------------------           F(  3,    21) =  396.62
   Model |  67.7309759     3   22.576992           Prob > F      =  0.0000
Residual |  1.19538687    21  .056923184           R-squared     =  0.9827
---------+------------------------------           Adj R-squared =  0.9802
   Total |  68.9263628    24  2.87193178           Root MSE      =  .23859

------------------------------------------------------------------------------
  lnodds |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
  lnmoop |   .9711176   .0566334     17.147   0.000        .853342    1.088893
   lnmp2 |   .0686191   .0358318      1.915   0.069      -.0058971    .1431354
   lnmp3 |   .0117069   .0059579      1.965   0.063      -.0006831     .024097
   _cons |   1.274808   .0717247     17.774   0.000       1.125648    1.423968
------------------------------------------------------------------------------

-> ipl=       21
  Source |       SS       df       MS              Number of obs =      83
---------+------------------------------           F(  3,    79) = 1622.14
   Model |  224.942774     3  74.9809247           Prob > F      =  0.0000
Residual |  3.65165743    79  .046223512           R-squared     =  0.9840
---------+------------------------------           Adj R-squared =  0.9834
   Total |  228.594432    82  2.78773697           Root MSE      =    .215

------------------------------------------------------------------------------
  lnodds |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
  lnmoop |   1.158905   .0283697     40.850   0.000       1.102436    1.215373
   lnmp2 |   .1862828   .0217528      8.564   0.000       .1429851    .2295806
   lnmp3 |    .030229   .0043844      6.895   0.000       .0215021     .038956
   _cons |    .866542   .0354968     24.412   0.000       .7958874    .9371966
------------------------------------------------------------------------------
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```
-> ipl=       22
  Source |       SS       df       MS              Number of obs =      58
---------+------------------------------           F(  3,    54) = 1114.55
   Model |  173.539553     3  57.8465176           Prob > F      =  0.0000
Residual |  2.80267227    54  .051901338           R-squared     =  0.9841
---------+------------------------------           Adj R-squared =  0.9832
   Total |  176.342225    57  3.09372325           Root MSE      =  .22782

------------------------------------------------------------------------------
  lnodds |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
  lnmoop |   .8611484   .0454843     18.933   0.000       .7699578     .952339
   lnmp2 |  -.0174433   .0279733     -0.624   0.536      -.0735264    .0386398
   lnmp3 |    .000104   .0039589      0.026   0.979      -.0078331    .0080411
   _cons |   1.913165   .0522935     36.585   0.000       1.808323    2.018008
------------------------------------------------------------------------------

-> ipl=       23
  Source |       SS       df       MS              Number of obs =      61
---------+------------------------------           F(  3,    57) = 1584.69
   Model |  184.506921     3   61.502307           Prob > F      =  0.0000
Residual |  2.21218187    57  .038810208           R-squared     =  0.9882
---------+------------------------------           Adj R-squared =  0.9875
   Total |  186.719103    60  3.11198505           Root MSE      =    .197

------------------------------------------------------------------------------
  lnodds |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
  lnmoop |   1.267037   .0278727     45.458   0.000       1.211223    1.322851
   lnmp2 |   .1302579   .0179956      7.238   0.000       .0942223    .1662935
   lnmp3 |   .0134795   .0028976      4.652   0.000       .0076772    .0192817
   _cons |   .8463711    .035423     23.893   0.000       .7754377    .9173045
------------------------------------------------------------------------------

-> ipl=       24
  Source |       SS       df       MS              Number of obs =      33
---------+------------------------------           F(  3,    29) =  231.95
   Model |  78.0530688     3  26.0176896           Prob > F      =  0.0000
Residual |  3.25291544    29  .112169498           R-squared     =  0.9600
---------+------------------------------           Adj R-squared =  0.9559
   Total |  81.3059842    32  2.54081201           Root MSE      =  .33492

------------------------------------------------------------------------------
  lnodds |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
  lnmoop |   .7206272   .1347306      5.349   0.000       .4450722    .9961822
   lnmp2 |  -.1105214   .0740161     -1.493   0.146      -.2619013    .0408585
   lnmp3 |  -.0121664   .0096213     -1.265   0.216      -.0318442    .0075113
   _cons |   2.101374   .1117858     18.798   0.000       1.872747    2.330002
------------------------------------------------------------------------------
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```
-> ipl=       25
  Source |       SS       df       MS              Number of obs =     159
---------+------------------------------           F(  3,   155) = 5001.63
   Model |  492.381375     3  164.127125           Prob > F      =  0.0000
Residual |  5.08628555   155  .032814745           R-squared     =  0.9898
---------+------------------------------           Adj R-squared =  0.9896
   Total |   497.46766   158   3.1485295           Root MSE      =  .18115

------------------------------------------------------------------------------
  lnodds |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
  lnmoop |   1.410947   .0205055     68.808   0.000        1.37044    1.451453
   lnmp2 |   .0891125   .0113234      7.870   0.000       .0667443    .1114807
   lnmp3 |   .0030982   .0016678      1.858   0.065      -.0001963    .0063927
   _cons |   1.995875   .0224328     88.971   0.000       1.951562    2.040189
------------------------------------------------------------------------------

-> ipl=       26
  Source |       SS       df       MS              Number of obs =      48
---------+------------------------------           F(  3,    44) = 1057.84
   Model |  112.080781     3  37.3602602           Prob > F      =  0.0000
Residual |  1.55397074    44  .035317517           R-squared     =  0.9863
---------+------------------------------           Adj R-squared =  0.9854
   Total |  113.634751    47  2.41776067           Root MSE      =  .18793

------------------------------------------------------------------------------
  lnodds |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
  lnmoop |   .8881042   .0274997     32.295   0.000       .8326822    .9435262
   lnmp2 |  -.1773623    .014845    -11.948   0.000      -.2072804   -.1474441
   lnmp3 |  -.0239216   .0015952    -14.996   0.000      -.0271364   -.0207067
   _cons |   1.679487   .0439712     38.195   0.000       1.590869    1.768105
------------------------------------------------------------------------------

-> ipl=       27
  Source |       SS       df       MS              Number of obs =     165
---------+------------------------------           F(  3,   161) = 2794.02
   Model |  435.680349     3  145.226783           Prob > F      =  0.0000
Residual |  8.36841432   161  .051977729           R-squared     =  0.9812
---------+------------------------------           Adj R-squared =  0.9808
   Total |  444.048763   164  2.70761441           Root MSE      =  .22799

------------------------------------------------------------------------------
  lnodds |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
  lnmoop |   1.476446   .0294434     50.145   0.000       1.418301    1.534591
   lnmp2 |   .1750389   .0227349      7.699   0.000       .1301418    .2199361
   lnmp3 |   .0244074   .0043731      5.581   0.000       .0157713    .0330434
   _cons |   1.649103   .0301115     54.767   0.000       1.589639    1.708568
------------------------------------------------------------------------------
```

```
-> ipl=       28
  Source |       SS       df       MS              Number of obs =      31
---------+------------------------------           F(  3,    27) =  607.16
   Model |  80.0117646     3  26.6705882           Prob > F      =  0.0000
Residual |  1.18603266    27  .043927136           R-squared     =  0.9854
---------+------------------------------           Adj R-squared =  0.9838
   Total |  81.1977972    30  2.70659324           Root MSE      =  .20959

------------------------------------------------------------------------------
  lnodds |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
  lnmoop |   1.048392   .1043977     10.042   0.000       .8341852    1.262598
   lnmp2 |  -.1262209      .0835     -1.512   0.142      -.2975487    .0451068
   lnmp3 |  -.0106782   .0156954     -0.680   0.502      -.0428824     .021526
   _cons |   2.294564   .0723208     31.728   0.000       2.146174    2.442954
------------------------------------------------------------------------------

-> ipl=       29
  Source |       SS       df       MS              Number of obs =     117
---------+------------------------------           F(  3,   113) = 5568.06
   Model |  394.496958     3  131.498986           Prob > F      =  0.0000
Residual |   2.6686842   113  .023616674           R-squared     =  0.9933
---------+------------------------------           Adj R-squared =  0.9931
   Total |  397.165643   116  3.42384175           Root MSE      =  .15368

------------------------------------------------------------------------------
  lnodds |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
  lnmoop |   1.383701   .0180565     76.632   0.000       1.347928    1.419474
   lnmp2 |   .1510551    .014352     10.525   0.000       .1226212     .179489
   lnmp3 |   .0329309   .0034669      9.499   0.000       .0260624    .0397995
   _cons |   1.289012   .0221936     58.080   0.000       1.245043    1.332982
------------------------------------------------------------------------------

-> ipl=       30
  Source |       SS       df       MS              Number of obs =      39
---------+------------------------------           F(  3,    35) =  613.78
   Model |  124.329781     3  41.4432603           Prob > F      =  0.0000
Residual |     2.36323    35  .067520857           R-squared     =  0.9813
---------+------------------------------           Adj R-squared =  0.9797
   Total |  126.693011    38   3.3340266           Root MSE      =  .25985

------------------------------------------------------------------------------
  lnodds |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
  lnmoop |   1.763089   .0954174     18.478   0.000       1.569382    1.956797
   lnmp2 |   .2158413   .0449643      4.800   0.000       .1245589    .3071237
   lnmp3 |    .015256   .0053539      2.850   0.007        .004387     .026125
   _cons |   2.111643   .0713644     29.590   0.000       1.966765     2.25652
------------------------------------------------------------------------------
```

```
-> ipl=       31
  Source |       SS       df       MS              Number of obs =     147
---------+------------------------------           F(  3,   143) = 2957.62
   Model |  432.398629     3  144.132876           Prob > F      =  0.0000
Residual |   6.9687771   143  .048732707           R-squared     =  0.9841
---------+------------------------------           Adj R-squared =  0.9838
   Total |  439.367406   146  3.00936579           Root MSE      =  .22075

------------------------------------------------------------------------------
  lnodds |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
  lnmoop |   1.664321   .0250284     66.497   0.000       1.614848    1.713795
   lnmp2 |   .1682311   .0202813      8.295   0.000       .1281412     .208321
   lnmp3 |   .0173382   .0039553      4.384   0.000       .0095199    .0251566
   _cons |   .9179109    .024995     36.724   0.000       .8685034    .9673184
------------------------------------------------------------------------------

-> ipl=       32
  Source |       SS       df       MS              Number of obs =      29
---------+------------------------------           F(  3,    25) =  702.67
   Model |  45.0813839     3   15.027128           Prob > F      =  0.0000
Residual |  .534642548    25  .021385702           R-squared     =  0.9883
---------+------------------------------           Adj R-squared =  0.9869
   Total |  45.6160265    28   1.6291438           Root MSE      =  .14624

------------------------------------------------------------------------------
  lnodds |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
  lnmoop |   1.085683    .037348     29.069   0.000       1.008763    1.162602
   lnmp2 |   .4554284   .0377607     12.061   0.000       .3776588     .533198
   lnmp3 |   .0980967   .0100309      9.779   0.000       .0774378    .1187557
   _cons |   .6488838   .0481696     13.471   0.000       .5496767    .7480909
------------------------------------------------------------------------------

-> ipl=       33
  Source |       SS       df       MS              Number of obs =      94
---------+------------------------------           F(  3,    90) = 2764.60
   Model |  264.342029     3  88.1140095           Prob > F      =  0.0000
Residual |  2.86850687    90  .031872299           R-squared     =  0.9893
---------+------------------------------           Adj R-squared =  0.9889
   Total |  267.210536    93  2.87323156           Root MSE      =  .17853

------------------------------------------------------------------------------
  lnodds |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
  lnmoop |   1.377571   .0188401     73.119   0.000       1.340142    1.415001
   lnmp2 |   .1627608   .0157923     10.306   0.000       .1313867     .194135
   lnmp3 |   .0156125   .0034004      4.591   0.000        .008857     .022368
   _cons |   .4258514   .0268525     15.859   0.000       .3725042    .4791985
------------------------------------------------------------------------------
```

```
-> ipl=       34
  Source |       SS       df       MS              Number of obs =      25
---------+------------------------------           F(  3,    21) =  125.37
   Model |  61.8161143     3  20.6053714           Prob > F      =  0.0000
Residual |  3.45156253    21   .16436012           R-squared     =  0.9471
---------+------------------------------           Adj R-squared =  0.9396
   Total |  65.2676768    24  2.71948654           Root MSE      =  .40541

------------------------------------------------------------------------------
  lnodds |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
  lnmoop |   1.303318   .1274283     10.228   0.000       1.038316     1.56832
   lnmp2 |   .2476674   .1658784      1.493   0.150      -.0972957    .5926304
   lnmp3 |   .0569785   .0448092      1.272   0.217      -.0362074    .1501645
   _cons |     1.1964   .1490861      8.025   0.000       .8863583    1.506441
------------------------------------------------------------------------------

-> ipl=       35
  Source |       SS       df       MS              Number of obs =      95
---------+------------------------------           F(  3,    91) = 3712.32
   Model |  305.735567     3  101.911856           Prob > F      =  0.0000
Residual |  2.49816301    91  .027452341           R-squared     =  0.9919
---------+------------------------------           Adj R-squared =  0.9916
   Total |   308.23373    94  3.27908224           Root MSE      =  .16569

------------------------------------------------------------------------------
  lnodds |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
  lnmoop |   1.455078    .019807     73.463   0.000       1.415733    1.494422
   lnmp2 |    .400624   .0143618     27.895   0.000       .3720961    .4291519
   lnmp3 |   .0720243   .0037024     19.453   0.000       .0646699    .0793787
   _cons |   .0460845   .0224547      2.052   0.043       .0014809    .0906881
------------------------------------------------------------------------------

-> ipl=       36
  Source |       SS       df       MS              Number of obs =      17
---------+------------------------------           F(  3,    13) =  126.96
   Model |  30.1905849     3  10.0635283           Prob > F      =  0.0000
Residual |  1.03043208    13  .079264006           R-squared     =  0.9670
---------+------------------------------           Adj R-squared =  0.9594
   Total |   31.221017    16  1.95131356           Root MSE      =  .28154

------------------------------------------------------------------------------
  lnodds |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
  lnmoop |    1.02722   .1537007      6.683   0.000       .6951702    1.359271
   lnmp2 |  -.1764032   .0573916     -3.074   0.009      -.3003901   -.0524162
   lnmp3 |   .0762584   .0532075      1.433   0.175      -.0386894    .1912061
   _cons |   .5618133   .1106814      5.076   0.000       .3227008    .8009259
------------------------------------------------------------------------------
```

Appendix B

3rd Order Log-Logistic Regression Results for the Elderly – 1992 NMES

```
-> ipl=        1
  Source |       SS       df       MS              Number of obs =     271
---------+------------------------------           F(  3,   267) = 6312.62
   Model |  969.687286     3  323.229095           Prob > F      =  0.0000
Residual |  13.6713752   267  .051203652           R-squared     =  0.9861
---------+------------------------------           Adj R-squared =  0.9859
   Total |  983.358661   270  3.64206911           Root MSE      =  .22628

------------------------------------------------------------------------------
  lnodds |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
  lnmoop |   1.492615   .0138132    108.057   0.000       1.465418    1.519811
   lnmp2 |   .2132053   .0081531     26.150   0.000       .1971528    .2292577
   lnmp3 |   .0216962   .0014721     14.739   0.000       .0187979    .0245945
   _cons |   .0970413   .0172941      5.611   0.000       .0629911    .1310916
------------------------------------------------------------------------------

-> ipl=        2
  Source |       SS       df       MS              Number of obs =     286
---------+------------------------------           F(  3,   282) = 6476.79
   Model |  896.414127     3  298.804709           Prob > F      =  0.0000
Residual |  13.0099841   282  .046134695           R-squared     =  0.9857
---------+------------------------------           Adj R-squared =  0.9855
   Total |  909.424111   285  3.19096179           Root MSE      =  .21479

------------------------------------------------------------------------------
  lnodds |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
  lnmoop |   1.870395    .014838    126.054   0.000       1.841187    1.899602
   lnmp2 |   .2991561   .0099501     30.066   0.000       .2795703    .3187419
   lnmp3 |   .0202544   .0018981     10.671   0.000       .0165181    .0239906
   _cons |  -.2493622   .0153731    -16.221   0.000      -.2796228   -.2191017
------------------------------------------------------------------------------

-> ipl=        3
  Source |       SS       df       MS              Number of obs =     129
---------+------------------------------           F(  3,   125) = 8213.81
   Model |  383.006522     3  127.668841           Prob > F      =  0.0000
Residual |   1.9428987   125   .01554319           R-squared     =  0.9950
---------+------------------------------           Adj R-squared =  0.9948
   Total |  384.949421   128  3.00741735           Root MSE      =  .12467

------------------------------------------------------------------------------
  lnodds |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
  lnmoop |   1.052572   .0108431     97.073   0.000       1.031112    1.074032
   lnmp2 |   .2052475   .0067467     30.422   0.000        .191895    .2185999
   lnmp3 |   .0425626   .0017337     24.550   0.000       .0391314    .0459939
   _cons |   .0244914   .0158575      1.544   0.125      -.0068926    .0558753
------------------------------------------------------------------------------
```

```
-> ipl=        4
  Source |       SS       df       MS              Number of obs =     540
---------+------------------------------           F(  3,   536) =77806.15
   Model |  1776.08577     3  592.028591           Prob > F      =  0.0000
Residual |   4.0784351   536  .007609021           R-squared     =  0.9977
---------+------------------------------           Adj R-squared =  0.9977
   Total |  1780.16421   539  3.30271653           Root MSE      =  .08723

------------------------------------------------------------------------------
  lnodds |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
  lnmoop |   1.456565   .0047581    306.125   0.000       1.447218    1.465912
   lnmp2 |   .0989779   .0017526     56.473   0.000        .095535    .1024208
   lnmp3 |   .0180522   .0006072     29.730   0.000       .0168593     .019245
   _cons |  -.8261255   .0046334   -178.298   0.000      -.8352274   -.8170236
------------------------------------------------------------------------------

-> ipl=        5
  Source |       SS       df       MS              Number of obs =     329
---------+------------------------------           F(  3,   325) = 3772.72
   Model |  1164.88921     3  388.296405           Prob > F      =  0.0000
Residual |  33.4497098   325  .102922184           R-squared     =  0.9721
---------+------------------------------           Adj R-squared =  0.9718
   Total |  1198.33892   328  3.65347233           Root MSE      =  .32081

------------------------------------------------------------------------------
  lnodds |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
  lnmoop |   1.353372   .0170589     79.335   0.000       1.319812    1.386932
   lnmp2 |   .1354451   .0069065     19.611   0.000        .121858    .1490322
   lnmp3 |   .0077417   .0015246      5.078   0.000       .0047423     .010741
   _cons |  -.0288342   .0211457     -1.364   0.174      -.0704339    .0127655
------------------------------------------------------------------------------

-> ipl=        6
  Source |       SS       df       MS              Number of obs =     272
---------+------------------------------           F(  3,   268) = 4425.14
   Model |  983.959069     3  327.986356           Prob > F      =  0.0000
Residual |  19.8638414   268  .074118811           R-squared     =  0.9802
---------+------------------------------           Adj R-squared =  0.9800
   Total |  1003.82291   271  3.70414358           Root MSE      =  .27225

------------------------------------------------------------------------------
  lnodds |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
  lnmoop |   1.716371   .0276049     62.176   0.000       1.662021    1.770722
   lnmp2 |   .1079747   .0080613     13.394   0.000       .0921032    .1238463
   lnmp3 |  -.0074709   .0050011     -1.494   0.136      -.0173173    .0023754
   _cons |   -.563099   .0209306    -26.903   0.000      -.6043084   -.5218897
------------------------------------------------------------------------------
```

```
-> ipl=        7
  Source |       SS       df       MS              Number of obs =     107
---------+------------------------------           F(  3,   103) = 2555.51
   Model |  303.895845     3  101.298615           Prob > F      =  0.0000
Residual |  4.08284255   103  .039639248           R-squared     =  0.9867
---------+------------------------------           Adj R-squared =  0.9864
   Total |  307.978688   106  2.90545932           Root MSE      =   .1991

------------------------------------------------------------------------------
  lnodds |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
  lnmoop |   .9622642   .0214949     44.767   0.000       .9196342    1.004894
   lnmp2 |   .1523191   .0084182     18.094   0.000       .1356236    .1690145
   lnmp3 |   .0343741   .0028561     12.035   0.000       .0287097    .0400385
   _cons |  -.3060569   .0246775    -12.402   0.000      -.3549988    -.257115
------------------------------------------------------------------------------

-> ipl=        8
  Source |       SS       df       MS              Number of obs =     239
---------+------------------------------           F(  3,   235) = 9930.15
   Model |  660.545375     3  220.181792           Prob > F      =  0.0000
Residual |  5.21066722   235  .022173052           R-squared     =  0.9922
---------+------------------------------           Adj R-squared =  0.9921
   Total |  665.756042   238  2.79729429           Root MSE      =  .14891

------------------------------------------------------------------------------
  lnodds |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
  lnmoop |   1.343431   .0131444    102.206   0.000       1.317536    1.369327
   lnmp2 |   .0209974    .004437      4.732   0.000       .0122561    .0297387
   lnmp3 |   .0058502   .0019436      3.010   0.003       .0020211    .0096792
   _cons |  -.9076475   .0131758    -68.888   0.000      -.9336052   -.8816898
------------------------------------------------------------------------------
```

Appendix C

Fortran Source Code for Imputation of MOOP

```
The following variables are needed prior to calling either yngoop3 or
oldoop3:

For units headed by a person less than 65 years old:

   Let:

               1 if has private insurance
      icov =   2 if Medicaid or Medicare only
               3 if uninsured

               1 if single individual
      isize =  2 if family size 2 or 3
               3 if family size is 4 or more

      npoor =  1 if census money income is less than 150% of poverty
               2 otherwise

      irace =  2 if Black
               1 otherwise

      v        a random draw from a uniform distribution
      u        a random draw from a uniform distribution

   ipl = (icov-1)*12 + (isize-1)*4 + (npoor-1)*2 + irace

   then

             oop = yngoop3(ipl,v,u) ! returns with value of MOOP in $1

For Units headed by a person 65 years old or older:

   iage=       1 if head is less than 75 years old
               2 if head is 75 years old or older

   isize =     1 if single individual
               2 if family size is 2 or more

      npoor =  1 if census money income is less than 150% of poverty
               2 otherwise

   ipl = (iage-1)*4 + (isize-1)*2 + npoor

   then

              oop = oldoop3(ipl,v,u) ! returns with value of MOOP in $1
```

Then add Medicare Part B premiums:

```
partB =  0              if income less than 120% of poverty
         PREM*NOLD      otherwise
```

Where PREM is the yearly premium and NOLD is the number of Elderly.
Source Code for yngoop3, oldoop3 and other need functions:

```
      function yngoop3(ipl,v,u)
      real ypzero(36),cof(4,36)

      data ypzero/
     & .065,.041,.075,.143,.061,.083,.012,.012,.031,.024,.003,.006,
     & .397,.606,.219,.628,.371,.408,.212,.279,.237,.507,.256,.345,
     & .378,.482,.248,.420,.151,.194,.103,.128,.043,.126,.036,.213/

      data (cof(n,1),n=1,4)/1.028337,.32799,.10397,.24814/
      data (cof(n,2),n=1,4)/1.2757,.19217,.01234,.89205/
      data (cof(n,3),n=1,4)/1.64022,.23587,.021783,.85459/
      data (cof(n,4),n=1,4)/2.067369,.5307119,.06683,.92506/
      data (cof(n,5),n=1,4)/1.20965,.090416,.005267,-.27258/
      data (cof(n,6),n=1,4)/1.216438,-.077237,.00577,.550253/
      data (cof(n,7),n=1,4)/1.530963,.20106,.01849,-.528312/
      data (cof(n,8),n=1,4)/1.710414,.28429,.0336115,.054332/
      data (cof(n,9),n=1,4)/1.52113,.11033,.019345,-.41831/
      data (cof(n,10),n=1,4)/1.85638,.26369,.01517,.40114/
      data (cof(n,11),n=1,4)/1.59292,.2332,.03035,-.87723/
      data (cof(n,12),n=1,4)/1.635539,.36623,.079546,-.69926/
      data (cof(n,13),n=1,4)/1.19225,.108119,.006368,1.68074/
      data (cof(n,14),n=1,4)/.93525,.02688,.0052166,1.59168/
      data (cof(n,15),n=1,4)/.8886,.21168,.059186,.66006/
      data (cof(n,16),n=1,4)/.75758,-.15343,-.03596,.725266/
      data (cof(n,17),n=1,4)/1.26425,.25548,.03703,1.47475/
      data (cof(n,18),n=1,4)/1.3131,.180135,.017995,2.001622/
      data (cof(n,19),n=1,4)/1.34225,.2363857,.0221976,.652647/
      data (cof(n,20),n=1,4)/.971117,.0686191,.011707,1.2748/
      data (cof(n,21),n=1,4)/1.1589,.186283,.030229,.86654/
      data (cof(n,22),n=1,4)/.861148,-.017444,.000104,1.913165/
      data (cof(n,23),n=1,4)/1.26704,.13025,.01348,.84627/
      data (cof(n,24),n=1,4)/.720627,-.1105214,-.012166,2.101374/
      data (cof(n,25),n=1,4)/1.410947,.089113,.003098,1.995875/
      data (cof(n,26),n=1,4)/.8881,-.17736,-.02393,1.67948/
      data (cof(n,27),n=1,4)/1.476446,.17504,.024407,1.6491/
      data (cof(n,28),n=1,4)/1.048392,-.1262209,-.010678,2.294564/
      data (cof(n,29),n=1,4)/1.383701,.151055,.03293,1.28901/
      data (cof(n,30),n=1,4)/1.76309,.21584,.01526,2.11164/
      data (cof(n,31),n=1,4)/1.664321,.1682311,.017338,.917911/
      data (cof(n,32),n=1,4)/1.08568,.45543,.098097,.648884/
      data (cof(n,33),n=1,4)/1.377571,.1627608,.0156125,.4258514/
      data (cof(n,34),n=1,4)/1.303318,.24766,.05697,1.1964/
      data (cof(n,35),n=1,4)/1.455078,.400624,.0720243,.04608/
      data (cof(n,36),n=1,4)/1.02722,-.1764032,.076258,.561813/


      yngoop3=0.0
      havemp=1.-ypzero(ipl)
      if(v.gt.havemp) return
```

```
 d=cof(4,ipl)
 f1=cof(1,ipl)
 f2=cof(2,ipl)
 f3=cof(3,ipl)
 z=amin1(.99,u)
 odds=alog(z/(1.-z))

 yngoop3=root3(odds,d,f1,f2,f3)

 return
 end
 function oldoop3(ipl,v,u)

 real opzero(8),cof(4,8)

 data (cof(n,1),n=1,4)/1.4926,.2132,.02169,.09704/
 data (cof(n,2),n=1,4)/1.8704,.2992,.2025,-.2494/
 data (cof(n,3),n=1,4)/1.05257,.20525,.04256,.02449/
 data (cof(n,4),n=1,4)/1.45657,.098978,.01805,-.82613/
 data (cof(n,5),n=1,4)/1.3534,.13545,.00774,-.02883/
 data (cof(n,6),n=1,4)/1.71637,.10798,-.00747,-.563099/
 data (cof(n,7),n=1,4)/.9226,.15232,.034374,-.30606/
 data (cof(n,8),n=1,4)/1.34343,.020997,.00585,-.90765/

data opzero/.1666,.0233,.1010,.016,.0872,.0220,.0536,.0165/

 oldoop3=0.0
 havemp=1.-opzero(ipl)
 if(v.gt.havemp) return

 d=cof(4,ipl)
 f1=cof(1,ipl)
 f2=cof(2,ipl)
 f3=cof(3,ipl)
 z=amin1(.99,u)
 odds=alog(z/(1.-z))

 oldoop3=root3(odds,d,f1,f2,f3)

 return
 end
```

```
      function root3(odds,d,f1,f2,f3)

      data tol/.001/
      con=d-odds

      y0=-con/f1
      zero0=cube(y0,con,f1,f2,f3)

      do inter=1,20

       slope=dcube(y0,f1,f2,f3)
       step=zero0/slope
       istep=1

1      y1=y0-step/float(istep)
       zero1=cube(y1,con,f1,f2,f3)
       if(abs(zero1).lt.abs(zero0)) go to 5
       istep=istep+1
       if(istep.gt.3) go to 4
       go to 1

4      y1=y0-zero0/f1
       zero1=cube(y1,con,f1,f2,f3)

5      if(abs(zero1).lt.tol) go to 10

        y0=y1
        zero0=zero1

      repeat

10    root3=1000.*exp(y1)


      return
      end


      function cube(y,con,f1,f2,f3)

      cube=con+f1*y+f2*y*y+f3*y*y*y

      return
      end


      function dcube(y,f1,f2,f3)

      dcube=f1+2.0*y*f2+3.0*f3*y*y

      return
      end
```

Appendix D

Replication of NMES Imputation Model on 1996-7 CEX

In this appendix, the results of replicating the imputation model on the 1996-7 CEX data using the groupings based upon insurance status, family size, income and race are presented. These are the same groupings as was utilized in the NMES analysis except that on the CEX data, small sample sizes did not allow the groupings to be differentiated by race with the exception for the groups that had only private insurance. Also the sample size was too small to differentiate groups by race and income for those who had only public insurance (INSTAT=2).

The following results are for the non-elderly population only. The replication of the imputation model for the elderly population appears in Appendix E.

Let:

INSTAT = 1 if has private insurance
2 if Medicaid or Medicare only
3 if uninsured

ISIZE = 1 if single individual
2 if family size 2 or 3
3 if family size is 4 or more

NONPOOR = 1 if census money income is less than 150% of poverty
2 otherwise

IRACE = 2 if Black, INSTAT=1 and ISIZE=3
1 otherwise

If INSTAT = 2 (public insurance only) then if ISIZE = 1 or 2 then
NONPOOR=1 and IRACE=1

The groupings are identified by the following formula:

IPL = (INSTAT-1)*12 + (ISIZE-1)*4 + (NONPOOR-1)*2 + IRACE

Probability of Having MOOP – Non-Elderly Population

IPL	Probability of MOOP
1	.842
3	.908
5	.949
7	.968
9	.951
10	.873
11	.979
12	.986
13	.703
17	.665
21	.634
23	.787
25	.558
27	.643
29	.728
31	.718
33	.784
35	.796

Non-Elderly Imputation Model for Non-Zero MOOP

```
-> ipl0 = 1

      Source |       SS       df       MS              Number of obs =     110
-------------+------------------------------           F(  3,   106) = 5054.28
       Model |  313.666183     3  104.555394           Prob > F      =  0.0000
    Residual |   2.1927717   106  .020686525           R-squared     =  0.9931
-------------+------------------------------           Adj R-squared =  0.9929
       Total |  315.858954   109  2.89778857           Root MSE      =  .14383

------------------------------------------------------------------------------
     lnodds0 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnmp |   1.270823   .0162808    78.06   0.000     1.238545    1.303101
       lnmp2 |   .3314816   .0130191    25.46   0.000     .3056699    .3572933
       lnmp3 |   .0629001   .0032124    19.58   0.000     .0565311     .069269
       _cons |   .4990751   .0194402    25.67   0.000      .460533    .5376171
------------------------------------------------------------------------------
```

```
-> ipl0 = 3

      Source |       SS       df       MS              Number of obs =     796
-------------+------------------------------           F(  3,   792) =       .
       Model |  2563.74701     3  854.582338           Prob > F      =  0.0000
    Residual |  5.40361419   792  .006822745           R-squared     =  0.9979
-------------+------------------------------           Adj R-squared =  0.9979
       Total |  2569.15063   795  3.23163601           Root MSE      =   .0826

------------------------------------------------------------------------------
     lnodds0 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnmp |   1.760454   .0036304   484.92   0.000     1.753328     1.76758
       lnmp2 |   .1899753   .0025243    75.26   0.000     .1850201    .1949304
       lnmp3 |   .0186888   .0006408    29.17   0.000      .017431    .0199466
       _cons |   .4756625   .0037021   128.49   0.000     .4683955    .4829296
------------------------------------------------------------------------------
```

```
-> ipl0 = 5

      Source |       SS       df       MS              Number of obs =     229
-------------+------------------------------           F(  3,   225) =12106.47
       Model |  720.740062     3  240.246687           Prob > F      =  0.0000
    Residual |  4.46500935   225  .019844486           R-squared     =  0.9938
-------------+------------------------------           Adj R-squared =  0.9938
       Total |  725.205071   228    3.180724           Root MSE      =  .14087

------------------------------------------------------------------------------
     lnodds0 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnmp |   1.475147   .0100905   146.19   0.000     1.455263    1.495031
       lnmp2 |   .2272457   .0071674    31.71   0.000     .2131219    .2413695
       lnmp3 |    .023161    .001601    14.47   0.000     .0200063    .0263158
       _cons |  -.0026705   .0121682    -0.22   0.826    -.0266487    .0213077
------------------------------------------------------------------------------
```

```
-> ipl0 = 7

      Source |       SS       df       MS              Number of obs =    2057
-------------+------------------------------           F(  3,  2053) =       .
       Model |  6698.27732     3  2232.75911           Prob > F      =  0.0000
    Residual |  37.1833876  2053  .018111733           R-squared     =  0.9945
-------------+------------------------------           Adj R-squared =  0.9945
       Total |  6735.46071  2056  3.27600229           Root MSE      =  .13458

------------------------------------------------------------------------------
     lnodds0 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnmp |   1.555788   .0037595   413.83   0.000     1.548415    1.563161
       lnmp2 |   .2738869   .0020143   135.97   0.000     .2699366    .2778373
       lnmp3 |   .0354377   .0005649    62.73   0.000     .0343298    .0365456
       _cons |  -.6591008   .0037144  -177.44   0.000    -.6663853   -.6518163
------------------------------------------------------------------------------


-> ipl0 = 9

      Source |       SS       df       MS              Number of obs =     205
-------------+------------------------------           F(  3,   201) = 9061.35
       Model |  636.166433     3  212.055478           Prob > F      =  0.0000
    Residual |   4.7038417   201  .023402198           R-squared     =  0.9927
-------------+------------------------------           Adj R-squared =  0.9926
       Total |  640.870275   204  3.14152096           Root MSE      =  .15298

------------------------------------------------------------------------------
     lnodds0 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnmp |   1.519885   .0134181   113.27   0.000     1.493426    1.546343
       lnmp2 |   .2694567   .0083575    32.24   0.000     .2529771    .2859364
       lnmp3 |   .0397127   .0025392    15.64   0.000     .0347058    .0447197
       _cons |  -.2443986   .0135966   -17.97   0.000    -.2712089   -.2175883
------------------------------------------------------------------------------


-> ipl0 = 10

      Source |       SS       df       MS              Number of obs =      43
-------------+------------------------------           F(  3,    39) =  548.36
       Model |  102.228558     3  34.0761859           Prob > F      =  0.0000
    Residual |  2.42351615    39   .06214144           R-squared     =  0.9768
-------------+------------------------------           Adj R-squared =  0.9751
       Total |  104.652074    42  2.49171604           Root MSE      =  .24928

------------------------------------------------------------------------------
     lnodds0 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnmp |   2.268354   .0750149    30.24   0.000     2.116622    2.420086
       lnmp2 |   .9294971   .0764459    12.16   0.000     .7748708    1.084123
       lnmp3 |   .1486186   .0166335     8.93   0.000     .1149741     .182263
       _cons |   .1682033    .051008     3.30   0.002       .06503    .2713767
------------------------------------------------------------------------------
```

```
-> ipl0 = 11

      Source |       SS       df       MS              Number of obs =    1267
-------------+------------------------------           F(  3,  1263) =66580.57
       Model |  4096.66838     3  1365.55613           Prob > F      =  0.0000
    Residual |  25.9039132  1263  .020509828           R-squared     =  0.9937
-------------+------------------------------           Adj R-squared =  0.9937
       Total |  4122.57229  1266  3.25637622           Root MSE      =  .14321

------------------------------------------------------------------------------
     lnodds0 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnmp |   1.546965   .0060943   253.84   0.000     1.535009    1.558921
       lnmp2 |    .317996   .0028232   112.64   0.000     .3124573    .3235348
       lnmp3 |   .0624999   .0011404    54.81   0.000     .0602627    .0647371
       _cons |   -1.04679   .0053111  -197.09   0.000     -1.05721   -1.036371
------------------------------------------------------------------------------


-> ipl0 = 12

      Source |       SS       df       MS              Number of obs =     109
-------------+------------------------------           F(  3,   105) = 5171.79
       Model |  348.298536     3  116.099512           Prob > F      =  0.0000
    Residual |  2.35710525   105  .022448621           R-squared     =  0.9933
-------------+------------------------------           Adj R-squared =  0.9931
       Total |  350.655641   108  3.24681149           Root MSE      =  .14983

------------------------------------------------------------------------------
     lnodds0 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnmp |   1.427354   .0207109    68.92   0.000     1.386288     1.46842
       lnmp2 |   .3195822   .0114892    27.82   0.000     .2968013    .3423632
       lnmp3 |   .0812965   .0052383    15.52   0.000       .07091     .091683
       _cons |   -.464437     .01933   -24.03   0.000    -.5027648   -.4261093
------------------------------------------------------------------------------


-> ipl0 = 13

      Source |       SS       df       MS              Number of obs =      98
-------------+------------------------------           F(  3,    94) = 1603.29
       Model |  283.075756     3  94.3585853           Prob > F      =  0.0000
    Residual |  5.53218641    94  .058853047           R-squared     =  0.9808
-------------+------------------------------           Adj R-squared =  0.9802
       Total |  288.607942    97  2.97533961           Root MSE      =   .2426

------------------------------------------------------------------------------
     lnodds0 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnmp |   1.634853   .0387734    42.16   0.000     1.557868    1.711839
       lnmp2 |   .0747695   .0233731     3.20   0.002     .0283616    .1211775
       lnmp3 |  -.0081499   .0035738    -2.28   0.025    -.0152457   -.0010541
       _cons |   1.651279   .0368749    44.78   0.000     1.578062    1.724495
------------------------------------------------------------------------------
```

```
-> ipl0 = 17

      Source |       SS       df       MS              Number of obs =     159
-------------+------------------------------           F(  3,   155) = 9067.74
       Model |  422.169203     3  140.723068           Prob > F      =  0.0000
    Residual |  2.40545913   155  .015519091           R-squared     =  0.9943
-------------+------------------------------           Adj R-squared =  0.9942
       Total |  424.574662   158  2.68718141           Root MSE      =  .12458

------------------------------------------------------------------------------
     lnodds0 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnmp |   1.406477   .0147449    95.39   0.000      1.37735    1.435604
       lnmp2 |   .1112553   .0082043    13.56   0.000     .0950485     .127462
       lnmp3 |   .0050012   .0011762     4.25   0.000     .0026777    .0073248
       _cons |   1.685182   .0153879   109.51   0.000     1.654785    1.715579
------------------------------------------------------------------------------


-> ipl0 = 21

      Source |       SS       df       MS              Number of obs =     157
-------------+------------------------------           F(  3,   153) = 6806.47
       Model |  437.864224     3  145.954741           Prob > F      =  0.0000
    Residual |  3.28085766   153  .021443514           R-squared     =  0.9926
-------------+------------------------------           Adj R-squared =  0.9924
       Total |  441.145082   156  2.82785309           Root MSE      =  .14644

------------------------------------------------------------------------------
     lnodds0 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnmp |   1.606122   .0241057    66.63   0.000     1.558499    1.653745
       lnmp2 |   .2328089   .0136431    17.06   0.000     .2058558     .259762
       lnmp3 |   .0239905   .0020119    11.92   0.000     .0200157    .0279652
       _cons |   1.801535   .0189411    95.11   0.000     1.764115    1.838954
------------------------------------------------------------------------------


-> ipl0 = 23

      Source |       SS       df       MS              Number of obs =      34
-------------+------------------------------           F(  3,    30) =  826.94
       Model |  96.6098117     3  32.2032706           Prob > F      =  0.0000
    Residual |  1.16827395    30  .038942465           R-squared     =  0.9881
-------------+------------------------------           Adj R-squared =  0.9869
       Total |  97.7780856    33  2.96297229           Root MSE      =  .19734

------------------------------------------------------------------------------
     lnodds0 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnmp |   2.274316   .0666782    34.11   0.000     2.138141    2.410491
       lnmp2 |   .5451357   .0621607     8.77   0.000     .4181865    .6720848
       lnmp3 |   .0597377    .012886     4.64   0.000     .0334209    .0860545
       _cons |   1.250818   .0489752    25.54   0.000     1.150798    1.350839
------------------------------------------------------------------------------
```

```
-> ipl0 = 25

      Source |       SS       df       MS              Number of obs =      65
-------------+------------------------------           F(  3,    61) = 3147.43
       Model |  180.236844     3  60.0789479           Prob > F      =  0.0000
    Residual |  1.16438395    61  .019088261           R-squared     =  0.9936
-------------+------------------------------           Adj R-squared =  0.9933
       Total |  181.401228    64  2.83439418           Root MSE      =  .13816

------------------------------------------------------------------------------
     lnodds0 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnmp |   2.172226   .0671027    32.37   0.000     2.038045    2.306406
       lnmp2 |   .4828395   .0308537    15.65   0.000     .4211436    .5445354
       lnmp3 |   .0554706   .0039029    14.21   0.000     .0476662     .063275
       _cons |   2.776844   .0422846    65.67   0.000      2.69229    2.861397
------------------------------------------------------------------------------


-> ipl0 = 27

      Source |       SS       df       MS              Number of obs =      75
-------------+------------------------------           F(  3,    71) = 1419.60
       Model |  238.830971     3  79.6103238           Prob > F      =  0.0000
    Residual |  3.98164499    71  .056079507           R-squared     =  0.9836
-------------+------------------------------           Adj R-squared =  0.9829
       Total |  242.812616    74  3.28125157           Root MSE      =  .23681

------------------------------------------------------------------------------
     lnodds0 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnmp |   1.639134    .072721    22.54   0.000     1.494132    1.784135
       lnmp2 |   -.044923   .0464196    -0.97   0.336     -.137481     .047635
       lnmp3 |  -.0211202   .0073036    -2.89   0.005    -.0356833   -.0065572
       _cons |   2.241372   .0475961    47.09   0.000     2.146468    2.336276
------------------------------------------------------------------------------


-> ipl0 = 29

      Source |       SS       df       MS              Number of obs =      37
-------------+------------------------------           F(  3,    33) =  503.46
       Model |   87.724984     3  29.2416613           Prob > F      =  0.0000
    Residual |  1.91667577    33  .058081084           R-squared     =  0.9786
-------------+------------------------------           Adj R-squared =  0.9767
       Total |  89.6416598    36   2.4900461           Root MSE      =    .241

------------------------------------------------------------------------------
     lnodds0 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnmp |   2.850055   .1568527    18.17   0.000     2.530936    3.169174
       lnmp2 |    .863806   .0846488    10.20   0.000     .6915868    1.036025
       lnmp3 |   .0998697   .0119731     8.34   0.000     .0755103    .1242291
       _cons |   1.897999   .0745764    25.45   0.000     1.746272    2.049726
------------------------------------------------------------------------------
```

```
-> ipl0 = 31

      Source |       SS       df       MS              Number of obs =      86
-------------+------------------------------           F(  3,    82) = 2092.53
       Model |  255.489676     3  85.1632252           Prob > F      =  0.0000
    Residual |  3.33729774    82  .040698753           R-squared     =  0.9871
-------------+------------------------------           Adj R-squared =  0.9866
       Total |  258.826973    85  3.04502322           Root MSE      =  .20174

------------------------------------------------------------------------------
     lnodds0 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnmp |   1.530674   .0303045    50.51   0.000     1.470389    1.590959
       lnmp2 |   .2877134   .0312452     9.21   0.000     .2255567    .3498701
       lnmp3 |   .0579084   .0079339     7.30   0.000     .0421253    .0736916
       _cons |   1.072714   .0346481    30.96   0.000     1.003788     1.14164
------------------------------------------------------------------------------


-> ipl0 = 33

      Source |       SS       df       MS              Number of obs =      54
-------------+------------------------------           F(  3,    50) = 1696.97
       Model |  145.832873     3  48.6109578           Prob > F      =  0.0000
    Residual |  1.43228579    50  .028645716           R-squared     =  0.9903
-------------+------------------------------           Adj R-squared =  0.9897
       Total |  147.265159    53  2.77858791           Root MSE      =  .16925

------------------------------------------------------------------------------
     lnodds0 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnmp |   1.780869   .0517555    34.41   0.000     1.676915    1.884823
       lnmp2 |   .5609236   .0427114    13.13   0.000     .4751353    .6467119
       lnmp3 |   .1003726    .008277    12.13   0.000     .0837479    .1169974
       _cons |   1.312455   .0356775    36.79   0.000     1.240795    1.384115
------------------------------------------------------------------------------


-> ipl0 = 35

      Source |       SS       df       MS              Number of obs =      65
-------------+------------------------------           F(  3,    61) = 1450.22
       Model |  182.047952     3  60.6826505           Prob > F      =  0.0000
    Residual |  2.55246037    61  .041843613           R-squared     =  0.9862
-------------+------------------------------           Adj R-squared =  0.9855
       Total |  184.600412    64  2.88438144           Root MSE      =  .20456

------------------------------------------------------------------------------
     lnodds0 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnmp |   1.532605   .0356367    43.01   0.000     1.461345    1.603865
       lnmp2 |   .2644441   .0304412     8.69   0.000     .2035731     .325315
       lnmp3 |   .0330439    .005472     6.04   0.000     .0221019    .0439859
       _cons |   .8283945   .0360977    22.95   0.000     .7562126    .9005764
------------------------------------------------------------------------------
```

Appendix E

Replication of Imputation Model – Elderly Population

The groupings of the elderly population were made on the same basis as in the earlier analysis. Groups were differentiated by age, family size and income. Specifically, let

IAGE = 1 if head is less than 75 years old
2 if head is 75 years old or older

ISIZE = 1 if single individual
2 if family size is 2 or more

NONPOOR = 1 if census money income is less than 150% of poverty
2 otherwise

Then the group can be identified as

IPL = (IAGE-1)*4 + (ISIZE-1)*2 + NONPOOR.

Probability of Having MOOP – Elderly Population

IPL	Probability of MOOP
1	1.000
2	.986
3	.999
4	.996
5	.996
6	.995
7	.976
8	.997

Elderly Imputation Model for Non-Zero MOOP

```
-> ipl = 1

      Source |       SS       df       MS              Number of obs =     188
-------------+------------------------------           F(  3,   184) = 3040.15
       Model |  570.365877     3  190.121959           Prob > F      =  0.0000
    Residual |  11.5068149   184  .062537037           R-squared     =  0.9802
-------------+------------------------------           Adj R-squared =  0.9799
       Total |  581.872692   187  3.11161867           Root MSE      =  .25007

------------------------------------------------------------------------------
      lnodds |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnmp |   2.101525   .0400035    52.53   0.000       2.0226    2.180449
       lnmp2 |   .1727591   .0255197     6.77   0.000     .1224102    .2231081
       lnmp3 |   .1089421   .0197995     5.50   0.000     .0698789    .1480053
       _cons |  -.1673944   .0231582    -7.23   0.000    -.2130843   -.1217046
------------------------------------------------------------------------------
```

```
-> ipl = 2

      Source |       SS       df       MS              Number of obs =     165
-------------+------------------------------           F(  3,   161) = 6133.49
       Model |  448.936087     3  149.645362           Prob > F      =  0.0000
    Residual |  3.92809342   161  .024398096           R-squared     =  0.9913
-------------+------------------------------           Adj R-squared =  0.9912
       Total |   452.86418   164  2.76136695           Root MSE      =   .1562

------------------------------------------------------------------------------
      lnodds |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnmp |   1.961973   .0210569    93.17   0.000      1.92039    2.003557
       lnmp2 |   .2546825   .0141478    18.00   0.000     .2267433    .2826217
       lnmp3 |    .004392    .004425     0.99   0.322    -.0043466    .0131305
       _cons |  -.8216088   .0156114   -52.63   0.000    -.8524383   -.7907794
------------------------------------------------------------------------------
```

```
-> ipl = 3

      Source |       SS       df       MS              Number of obs =     169
-------------+------------------------------           F(  3,   165) = 9921.25
       Model |   491.09388     3   163.69796           Prob > F      =  0.0000
    Residual |  2.72245588   165  .016499733           R-squared     =  0.9945
-------------+------------------------------           Adj R-squared =  0.9944
       Total |  493.816335   168  2.93938295           Root MSE      =  .12845

------------------------------------------------------------------------------
      lnodds |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnmp |   1.846542   .0233022    79.24   0.000     1.800533     1.89255
       lnmp2 |  -.4010439   .0310036   -12.94   0.000    -.4622588    -.339829
       lnmp3 |   .4341095   .0183691    23.63   0.000     .3978406    .4703783
       _cons |  -1.177701   .0161101   -73.10   0.000    -1.209509   -1.145892
------------------------------------------------------------------------------
```

```
-> ipl = 4

      Source |       SS       df       MS              Number of obs =     475
-------------+------------------------------           F(  3,   471) =26014.65
       Model |  1513.18687     3  504.395622           Prob > F      =  0.0000
    Residual |  9.13217354   471  .019388903           R-squared     =  0.9940
-------------+------------------------------           Adj R-squared =  0.9940
       Total |  1522.31904   474  3.21164355           Root MSE      =  .13924

------------------------------------------------------------------------------
      lnodds |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnmp |   1.979389   .0172136   114.99   0.000     1.945564    2.013214
       lnmp2 |   .2290744   .0106835    21.44   0.000     .2080812    .2500677
       lnmp3 |   .0672247    .005711    11.77   0.000     .0560024     .078447
       _cons |  -2.395021   .0130408  -183.66   0.000    -2.420646   -2.369396
------------------------------------------------------------------------------


-> ipl = 5

      Source |       SS       df       MS              Number of obs =     302
-------------+------------------------------           F(  3,   298) = 3436.29
       Model |   1016.1833     3  338.727767           Prob > F      =  0.0000
    Residual |   29.374944   298  .098573638           R-squared     =  0.9719
-------------+------------------------------           Adj R-squared =  0.9716
       Total |  1045.55824   301  3.47361543           Root MSE      =  .31396

------------------------------------------------------------------------------
      lnodds |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnmp |   2.541231   .0308295    82.43   0.000      2.48056    2.601902
       lnmp2 |   .0633489   .0156158     4.06   0.000     .0326177    .0940802
       lnmp3 |  -.0531291   .0059835    -8.88   0.000    -.0649043   -.0413539
       _cons |  -.8010746   .0209389   -38.26   0.000    -.8422815   -.7598677
------------------------------------------------------------------------------


-> ipl = 6

      Source |       SS       df       MS              Number of obs =     196
-------------+------------------------------           F(  3,   192) = 2998.97
       Model |  588.964149     3  196.321383           Prob > F      =  0.0000
    Residual |  12.5689003   192  .065463022           R-squared     =  0.9791
-------------+------------------------------           Adj R-squared =  0.9788
       Total |  601.533049   195  3.08478487           Root MSE      =  .25586

------------------------------------------------------------------------------
      lnodds |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnmp |   2.560052   .0429927    59.55   0.000     2.475253     2.64485
       lnmp2 |  -.6190044   .0740219    -8.36   0.000    -.7650049   -.4730039
       lnmp3 |   .2318814   .0309174     7.50   0.000     .1709001    .2928628
       _cons |  -1.158787   .0303005   -38.24   0.000    -1.218551   -1.099022
------------------------------------------------------------------------------
```

```
-> ipl = 7

      Source |       SS       df       MS              Number of obs =     137
-------------+------------------------------           F(  3,   133) = 5903.80
       Model |  383.310372     3  127.770124           Prob > F      =  0.0000
    Residual |   2.8783902   133  .021642032           R-squared     =  0.9925
-------------+------------------------------           Adj R-squared =  0.9924
       Total |  386.188762   136  2.83962325           Root MSE      =  .14711

------------------------------------------------------------------------------
      lnodds |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnmp |   2.575988    .041496    62.08   0.000     2.493911    2.658065
       lnmp2 |  -.5825523    .056553   -10.30   0.000    -.6944119   -.4706927
       lnmp3 |   .2024832   .0197975    10.23   0.000     .1633245    .2416419
       _cons |  -1.706958    .020833   -81.94   0.000    -1.748165   -1.665751
------------------------------------------------------------------------------


-> ipl = 8

      Source |       SS       df       MS              Number of obs =     290
-------------+------------------------------           F(  3,   286) =26061.01
       Model |  876.737503     3  292.245834           Prob > F      =  0.0000
    Residual |   3.2071789   286  .011213912           R-squared     =  0.9964
-------------+------------------------------           Adj R-squared =  0.9963
       Total |  879.944682   289  3.04479129           Root MSE      =   .1059

------------------------------------------------------------------------------
      lnodds |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnmp |   2.841958   .0314979    90.23   0.000     2.779961    2.903955
       lnmp2 |  -.8559645    .036577   -23.40   0.000    -.9279588   -.7839702
       lnmp3 |   .3537896   .0119303    29.65   0.000     .3303072     .377272
       _cons |  -2.678313   .0139782  -191.61   0.000    -2.705826     -2.6508
------------------------------------------------------------------------------
```

Appendix F

New MOOP Imputation Model – Non-Elderly Population

The non-elderly population of the CEX data was divided into mutually exclusive groups based upon the insurance status, the age of the head of the unit, family size and income. The variables that defined the various groups are the following

INSTAT = 1	if the unit has private insurance;
INSTAT = 2	if the unit has public insurance (Medicare or Medicaid) only; and
INSTAT = 3	if the unit does not have health care insurance

ISIZE = 1	if the unit is composed of a single individual only
ISIZE = 2	if the unit has two or three family members
ISIZE = 3	if the unit has four or more members

NONPOOR = 1	if the family's income is less than 150% of poverty
NONPOOR = 2	if the family income is greater than or equal to 150% of poverty;

While these variables are the same as in the previous versions of the imputation model, the age of the oldest adult in the unit was included as a dimension that defined the various groups. In general, I defined five different age groups:

IAGE = 1	if age is less than or equal to 25 year old;
IAGE = 2	if age is greater than 25 and less than or equal to 35 years old;
IAGE = 3	if age is greater than 35 and less than or equal to 45 years old;
IAGE = 4	if age is greater than 45 and less than or equal to 55 years old;
IAGE = 5	if age is greater than 55 and less than 65 years old;

Ideally, I would have wished to use all five age groups to define the various analysis groupings but the sample size of the CEX limited my ability to pursue this strategy. Only for those units with private insurance was I able to create a significant number of age groups. If the unit had private insurance (INSTAT=1) could the groupings be done by a wide range of age groups. For those units with public insurance, many of the age classifications had to be redefined. Age could not be used for those units without health care insurance. Specifically, the age classifications were redefined as

If INSTAT = 1 and ISIZE = 3	then	IAGE = MIN(IAGE,4)
If INSTAT = 2 and ISIZE = 1	then	IAGE = 1
If INSTAT = 2 and ISIZE = 2	then	IAGE = MAX(IAGE,2)
If INSTAT = 2 and ISIZE = 3	then	IAGE = MIN(IA,4) where IA=MAX(IAGE,3)

Also because of sample size, it was not possible to differentiate groups who have only public insurance by income. The various groups can be identified by the variable IPL which is defined as

If INSTAT = 1	then	IPL = (NONPOOR-1)*15 + (ISIZE-1)*5 + IAGE
If INSTAT = 2	then	IPL = 30 + (ISIZE-1)*5 + IAGE
If INSTAT = 3	then	IPL = 46 + (NONPOOR-1)*2 + (ISIZE-1)*4

Probability of Having MOOP – Non-Elderly Population

IPL	Probability of MOOP
1	.649
2	.943
6	.963
7	.894
8	.964
11	.936
16	.842
17	.886
18	.910
19	.932
20	.933
21	.891
22	.964
23	.955
24	.979
25	.987
27	.981
28	.983
29	.974
31	.703
37	.487
38	.705
39	.735
40	.877
43	.602
44	.823
46	.558
48	.642
50	.728
52	.718
54	.784
56	.796

Non-Elderly Imputation Model for Non-Zero MOOP

```
-> ipl1 = 1

      Source |       SS       df       MS              Number of obs =      30
-------------+------------------------------           F(  3,    26) =  717.87
       Model |  94.8576509     3   31.619217           Prob > F      =  0.0000
    Residual |  1.14519369    26  .044045911           R-squared     =  0.9881
-------------+------------------------------           Adj R-squared =  0.9867
       Total |  96.0028446    29  3.31044292           Root MSE      =  .20987

------------------------------------------------------------------------------
     lnodds1 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnmp |   3.380802   .2613304    12.94   0.000      2.84363    3.917974
       lnmp2 |   1.089769   .1311942     8.31   0.000     .8200957    1.359443
       lnmp3 |   .1570075   .0188927     8.31   0.000     .1181731     .195842
       _cons |   4.333561     .15029    28.83   0.000     4.024635    4.642486
------------------------------------------------------------------------------
```

```
-> ipl1 = 2

      Source |       SS       df       MS              Number of obs =      79
-------------+------------------------------           F(  3,    75) = 2530.18
       Model |  216.436061     3  72.1453537           Prob > F      =  0.0000
    Residual |  2.13854571    75  .028513943           R-squared     =  0.9902
-------------+------------------------------           Adj R-squared =  0.9898
       Total |  218.574607    78  2.80223855           Root MSE      =  .16886

------------------------------------------------------------------------------
     lnodds1 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnmp |   1.618113   .0296844    54.51   0.000     1.558978    1.677247
       lnmp2 |   .1982901   .0200768     9.88   0.000     .1582949    .2382852
       lnmp3 |   .0333083   .0085108     3.91   0.000     .0163539    .0502627
       _cons |   .0081001   .0249838     0.32   0.747    -.0416702    .0578705
------------------------------------------------------------------------------
```

```
-> ipl1 = 6

      Source |       SS       df       MS              Number of obs =      26
-------------+------------------------------           F(  3,    22) =  300.68
       Model |  61.4395456     3  20.4798485           Prob > F      =  0.0000
    Residual |  1.49844307    22  .068111048           R-squared     =  0.9762
-------------+------------------------------           Adj R-squared =  0.9729
       Total |  62.9379887    25  2.51751955           Root MSE      =  .26098

------------------------------------------------------------------------------
     lnodds1 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnmp |    1.75527   .1276162    13.75   0.000     1.490611     2.01993
       lnmp2 |   .5244303   .0842018     6.23   0.000     .3498065     .699054
       lnmp3 |   .0657601   .0127474     5.16   0.000     .0393236    .0921966
       _cons |   1.411803    .075072    18.81   0.000     1.256113    1.567493
------------------------------------------------------------------------------
```

```
-> ipl1 = 7

      Source |       SS       df       MS              Number of obs =      49
-------------+------------------------------           F(  3,    45) = 1345.27
       Model |  153.643226     3  51.2144087           Prob > F      =  0.0000
    Residual |  1.71314781    45  .038069951           R-squared     =  0.9890
-------------+------------------------------           Adj R-squared =  0.9882
       Total |  155.356374    48  3.23659112           Root MSE      =  .19512

------------------------------------------------------------------------------
     lnodds1 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnmp |   1.568187   .0369415    42.45   0.000     1.493783    1.642591
       lnmp2 |   .2874485   .0293632     9.79   0.000     .2283081     .346589
       lnmp3 |     .03204   .0056286     5.69   0.000     .0207034    .0433767
       _cons |   .5636717   .0380578    14.81   0.000     .4870193    .6403241
------------------------------------------------------------------------------


-> ipl1 = 8

      Source |       SS       df       MS              Number of obs =     152
-------------+------------------------------           F(  3,   148) = 5629.08
       Model |  455.771792     3  151.923931           Prob > F      =  0.0000
    Residual |  3.99438745   148  .026989104           R-squared     =  0.9913
-------------+------------------------------           Adj R-squared =  0.9911
       Total |  459.766179   151  3.04480913           Root MSE      =  .16428

------------------------------------------------------------------------------
     lnodds1 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnmp |    1.50419   .0251298    59.86   0.000     1.454531     1.55385
       lnmp2 |    .128676   .0105806    12.16   0.000     .1077674    .1495846
       lnmp3 |   .0644176   .0074306     8.67   0.000     .0497339    .0791014
       _cons |  -.3035066    .017026   -17.83   0.000     -.337152   -.2698612
------------------------------------------------------------------------------


-> ipl1 = 11

      Source |       SS       df       MS              Number of obs =     249
-------------+------------------------------           F(  3,   245) =12335.43
       Model |  774.586879     3  258.195626           Prob > F      =  0.0000
    Residual |  5.12815139   245   .02093123           R-squared     =  0.9934
-------------+------------------------------           Adj R-squared =  0.9933
       Total |  779.715031   248  3.14401222           Root MSE      =  .14468

------------------------------------------------------------------------------
     lnodds1 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnmp |   1.552922   .0115023   135.01   0.000     1.530266    1.575578
       lnmp2 |   .2973864   .0074936    39.69   0.000     .2826264    .3121464
       lnmp3 |   .0449263   .0022199    20.24   0.000     .0405538    .0492989
       _cons |  -.1611459    .011624   -13.86   0.000    -.1840416   -.1382502
------------------------------------------------------------------------------
```

```
-> ipl1 = 16

      Source |       SS       df       MS              Number of obs =      54
-------------+------------------------------           F(  3,    50) =  801.44
       Model |  151.922489     3  50.6408296           Prob > F      =  0.0000
    Residual |  3.15938312    50  .063187662           R-squared     =  0.9796
-------------+------------------------------           Adj R-squared =  0.9784
       Total |  155.081872    53  2.92607306           Root MSE      =  .25137

------------------------------------------------------------------------------
     lnodds1 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnmp |   1.963238   .0720205    27.26   0.000      1.81858    2.107895
       lnmp2 |   .3443781   .0660286     5.22   0.000     .2117557    .4770005
       lnmp3 |   .0553817   .0141797     3.91   0.000      .026901    .0838624
       _cons |   1.366921   .0504673    27.09   0.000     1.265554    1.468287
------------------------------------------------------------------------------


-> ipl1 = 17

      Source |       SS       df       MS              Number of obs =     196
-------------+------------------------------           F(  3,   192) =31047.51
       Model |  570.779961     3  190.259987           Prob > F      =  0.0000
    Residual |  1.17658116   192  .006128027           R-squared     =  0.9979
-------------+------------------------------           Adj R-squared =  0.9979
       Total |  571.956542   195  2.93311047           Root MSE      =  .07828

------------------------------------------------------------------------------
     lnodds1 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnmp |   2.165107   .0100126   216.24   0.000     2.145358    2.184856
       lnmp2 |   .3327327   .0087288    38.12   0.000     .3155161    .3499493
       lnmp3 |   .0282678   .0018427    15.34   0.000     .0246333    .0319024
       _cons |   1.027711   .0074443   138.05   0.000     1.013028    1.042394
------------------------------------------------------------------------------


-> ipl1 = 18

      Source |       SS       df       MS              Number of obs =     220
-------------+------------------------------           F(  3,   216) = 9178.32
       Model |  666.805555     3  222.268518           Prob > F      =  0.0000
    Residual |  5.23080448   216  .024216687           R-squared     =  0.9922
-------------+------------------------------           Adj R-squared =  0.9921
       Total |  672.036359   219  3.06865918           Root MSE      =  .15562

------------------------------------------------------------------------------
     lnodds1 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnmp |   1.767181   .0130663   135.25   0.000     1.741427    1.792934
       lnmp2 |   .1886579   .0092302    20.44   0.000     .1704652    .2068506
       lnmp3 |   .0105524   .0020142     5.24   0.000     .0065825    .0145223
       _cons |   .5314355   .0130668    40.67   0.000     .5056807    .5571903
------------------------------------------------------------------------------
```

```
-> ipl1 = 19

      Source |       SS       df       MS              Number of obs =     215
-------------+------------------------------           F(  3,   211) =19855.82
       Model |  700.220868     3  233.406956           Prob > F      =  0.0000
    Residual |  2.48032452   211  .011755093           R-squared     =  0.9965
-------------+------------------------------           Adj R-squared =  0.9964
       Total |  702.701192   214  3.28365043           Root MSE      =  .10842

------------------------------------------------------------------------------
     lnodds1 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnmp |   1.812815   .0104432   173.59   0.000     1.792229    1.833401
       lnmp2 |   .2396805   .0080486    29.78   0.000     .2238145    .2555465
       lnmp3 |   .0409031   .0028128    14.54   0.000     .0353584    .0464479
       _cons |   .1734063   .0096758    17.92   0.000     .1543326    .1924799
------------------------------------------------------------------------------


-> ipl1 = 20

      Source |       SS       df       MS              Number of obs =     107
-------------+------------------------------           F(  3,   103) = 7261.60
       Model |  328.818462     3  109.606154           Prob > F      =  0.0000
    Residual |  1.55467645   103  .015093946           R-squared     =  0.9953
-------------+------------------------------           Adj R-squared =  0.9952
       Total |  330.373138   106  3.11672772           Root MSE      =  .12286

------------------------------------------------------------------------------
     lnodds1 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnmp |   1.557268   .0200395    77.71   0.000     1.517524    1.597011
       lnmp2 |   .2930063   .0109866    26.67   0.000     .2712169    .3147957
       lnmp3 |   .0650828    .005606    11.61   0.000     .0539646    .0762011
       _cons |  -.2350858   .0153826   -15.28   0.000    -.2655936   -.2045779
------------------------------------------------------------------------------


-> ipl1 = 21

      Source |       SS       df       MS              Number of obs =      60
-------------+------------------------------           F(  3,    56) = 1430.29
       Model |   156.60119     3  52.2003968           Prob > F      =  0.0000
    Residual |  2.04379268    56  .036496298           R-squared     =  0.9871
-------------+------------------------------           Adj R-squared =  0.9864
       Total |  158.644983    59  2.68889802           Root MSE      =  .19104

------------------------------------------------------------------------------
     lnodds1 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnmp |    1.93819   .0358366    54.08   0.000       1.8664    2.009979
       lnmp2 |   .5361325   .0286849    18.69   0.000     .4786697    .5935954
       lnmp3 |    .058243   .0050111    11.62   0.000     .0482046    .0682814
       _cons |   .2480439   .0309887     8.00   0.000     .1859661    .3101217
------------------------------------------------------------------------------
```

```
-> ipl1 = 22

      Source |       SS       df       MS              Number of obs =     447
-------------+------------------------------           F(  3,   443) =79073.85
       Model |  1370.54711     3  456.849036           Prob > F      =  0.0000
    Residual |  2.55943177   443  .005777498           R-squared     =  0.9981
-------------+------------------------------           Adj R-squared =  0.9981
       Total |  1373.10654   446  3.07871421           Root MSE      =  .07601

------------------------------------------------------------------------------
     lnodds1 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnmp |   1.703292   .0043144   394.79   0.000     1.694813    1.711772
       lnmp2 |   .3336177   .0031382   106.31   0.000     .3274501    .3397852
       lnmp3 |   .0372242   .0006997    53.20   0.000     .0358491    .0385994
       _cons |  -.0485922   .0044889   -10.82   0.000    -.0574144     -.03977
------------------------------------------------------------------------------
```

```
-> ipl1 = 23

      Source |       SS       df       MS              Number of obs =     474
-------------+------------------------------           F(  3,   470) =37476.08
       Model |  1458.64181     3  486.213936           Prob > F      =  0.0000
    Residual |  6.09777034   470  .012973979           R-squared     =  0.9958
-------------+------------------------------           Adj R-squared =  0.9958
       Total |  1464.73958   473  3.09670101           Root MSE      =   .1139

------------------------------------------------------------------------------
     lnodds1 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnmp |   1.680711   .0068087   246.85   0.000     1.667331     1.69409
       lnmp2 |   .2378291   .0041564    57.22   0.000     .2296617    .2459965
       lnmp3 |   .0220017   .0011444    19.23   0.000      .019753    .0242504
       _cons |  -.6113615   .0065794   -92.92   0.000    -.6242902   -.5984329
------------------------------------------------------------------------------
```

```
-> ipl1 = 24

      Source |       SS       df       MS              Number of obs =     630
-------------+------------------------------           F(  3,   626) =60857.24
       Model |  2052.27161     3  684.090535           Prob > F      =  0.0000
    Residual |  7.03680741   626  .011240906           R-squared     =  0.9966
-------------+------------------------------           Adj R-squared =  0.9966
       Total |  2059.30841   629  3.27394024           Root MSE      =  .10602

------------------------------------------------------------------------------
     lnodds1 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnmp |   1.652191   .0061435   268.93   0.000     1.640126    1.664255
       lnmp2 |   .2971006    .003288    90.36   0.000     .2906438    .3035574
       lnmp3 |   .0425554   .0011679    36.44   0.000     .0402619    .0448488
       _cons |  -.8570955   .0054666  -156.79   0.000    -.8678306   -.8463604
------------------------------------------------------------------------------
```

```
-> ipl1 = 25

      Source |       SS       df       MS              Number of obs =     441
-------------+------------------------------           F(  3,   437) =21411.50
       Model |  1330.19265     3  443.397548           Prob > F      =  0.0000
    Residual |  9.04956248   437  .020708381           R-squared     =  0.9932
-------------+------------------------------           Adj R-squared =  0.9932
       Total |  1339.24221   440  3.04373229           Root MSE      =   .1439

------------------------------------------------------------------------------
     lnodds1 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnmp |   1.450697    .010328   140.46   0.000     1.430398    1.470996
       lnmp2 |   .2341676   .0044344    52.81   0.000     .2254521    .2428831
       lnmp3 |   .0338855    .001541    21.99   0.000     .0308568    .0369142
       _cons |  -1.181211   .0091289  -129.39   0.000    -1.199153   -1.163269
------------------------------------------------------------------------------
```

```
-> ipl1 = 27

      Source |       SS       df       MS              Number of obs =     315
-------------+------------------------------           F(  3,   311) = 3851.28
       Model |  1092.34992     3  364.116641           Prob > F      =  0.0000
    Residual |  29.4032999   311  .094544373           R-squared     =  0.9738
-------------+------------------------------           Adj R-squared =  0.9735
       Total |  1121.75322   314  3.57246249           Root MSE      =  .30748

------------------------------------------------------------------------------
     lnodds1 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnmp |   1.583961   .0251982    62.86   0.000      1.53438    1.633541
       lnmp2 |   .4846474   .0141509    34.25   0.000     .4568039    .5124909
       lnmp3 |   .1079689   .0054242    19.91   0.000     .0972962    .1186416
       _cons |  -.7927049   .0220837   -35.90   0.000    -.8361571   -.7492526
------------------------------------------------------------------------------
```

```
-> ipl1 = 28

      Source |       SS       df       MS              Number of obs =     675
-------------+------------------------------           F(  3,   671) =       .
       Model |  2104.75983     3  701.586609           Prob > F      =  0.0000
    Residual |  2.46911671   671  .003679757           R-squared     =  0.9988
-------------+------------------------------           Adj R-squared =  0.9988
       Total |  2107.22895   674  3.12645244           Root MSE      =  .06066

------------------------------------------------------------------------------
     lnodds1 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnmp |   1.555189   .0036395   427.31   0.000     1.548043    1.562335
       lnmp2 |   .3348093    .001768   189.37   0.000     .3313378    .3382809
       lnmp3 |   .0641008   .0007558    84.81   0.000     .0626167    .0655849
       _cons |   -.970979   .0031239  -310.82   0.000    -.9771129   -.9648452
------------------------------------------------------------------------------
```

```
-> ipl1 = 29

      Source |       SS       df       MS              Number of obs =     385
-------------+------------------------------           F(  3,   381) =30083.44
       Model |  1188.57519     3  396.191732           Prob > F      =  0.0000
    Residual |  5.01767919   381  .013169762           R-squared     =  0.9958
-------------+------------------------------           Adj R-squared =  0.9958
       Total |  1193.59287   384  3.10831478           Root MSE      =  .11476

------------------------------------------------------------------------------
     lnodds1 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnmp |   1.524288     .00882   172.82   0.000     1.506946     1.54163
       lnmp2 |   .2660472    .003984    66.78   0.000     .2582139    .2738805
       lnmp3 |   .0419135   .0015258    27.47   0.000     .0389134    .0449135
       _cons |  -1.231859   .0080446  -153.13   0.000    -1.247676   -1.216042
------------------------------------------------------------------------------


-> ipl1 = 31

      Source |       SS       df       MS              Number of obs =      98
-------------+------------------------------           F(  3,    94) = 1571.66
       Model |  283.198054     3  94.3993514           Prob > F      =  0.0000
    Residual |  5.64596125    94  .060063418           R-squared     =  0.9805
-------------+------------------------------           Adj R-squared =  0.9798
       Total |  288.844015    97  2.97777335           Root MSE      =  .24508

------------------------------------------------------------------------------
     lnodds1 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnmp |   1.635143     .03917    41.74   0.000      1.55737    1.712916
       lnmp2 |   .0745447   .0236123     3.16   0.002      .027662    .1214274
       lnmp3 |  -.0081997   .0036103    -2.27   0.025    -.0153681   -.0010313
       _cons |    1.65141   .0372522    44.33   0.000     1.577445    1.725375
------------------------------------------------------------------------------


-> ipl1 = 37

      Source |       SS       df       MS              Number of obs =      46
-------------+------------------------------           F(  3,    42) = 1226.29
       Model |  107.484004     3  35.8280014           Prob > F      =  0.0000
    Residual |  1.22709574    42  .029216565           R-squared     =  0.9887
-------------+------------------------------           Adj R-squared =  0.9879
       Total |    108.7111    45  2.41580222           Root MSE      =  .17093

------------------------------------------------------------------------------
     lnodds1 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnmp |   3.805655   .2000528    19.02   0.000     3.401932    4.209378
       lnmp2 |   .7267538   .0669524    10.85   0.000     .5916383    .8618694
       lnmp3 |   .0528099   .0065147     8.11   0.000     .0396627     .065957
       _cons |   5.147042   .1718608    29.95   0.000     4.800213    5.493871
------------------------------------------------------------------------------
```

```
-> ipl1 = 38

      Source |       SS       df       MS              Number of obs =      42
-------------+------------------------------           F(  3,    38) =  867.95
       Model |  85.7601441     3  28.5867147           Prob > F      =  0.0000
    Residual |  1.25155764    38  .032935727           R-squared     =  0.9856
-------------+------------------------------           Adj R-squared =  0.9845
       Total |  87.0117017    41  2.12223663           Root MSE      =  .18148

------------------------------------------------------------------------------
     lnodds1 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnmp |   1.121695   .0351967    31.87   0.000     1.050443    1.192947
       lnmp2 |   .0982069   .0197586     4.97   0.000     .0582077     .138206
       lnmp3 |   .0044751   .0029386     1.52   0.136    -.0014738     .010424
       _cons |   1.420082   .0422055    33.65   0.000     1.334641    1.505522
------------------------------------------------------------------------------


-> ipl1 = 39

      Source |       SS       df       MS              Number of obs =      33
-------------+------------------------------           F(  3,    29) =  441.00
       Model |  79.1982514     3  26.3994171           Prob > F      =  0.0000
    Residual |  1.73599769    29  .059861989           R-squared     =  0.9786
-------------+------------------------------           Adj R-squared =  0.9763
       Total |  80.9342491    32  2.52919528           Root MSE      =  .24467

------------------------------------------------------------------------------
     lnodds1 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnmp |   1.544476   .0927271    16.66   0.000     1.354828    1.734125
       lnmp2 |  -.0229351   .0877745    -0.26   0.796     -.202454    .1565838
       lnmp3 |  -.0228356   .0189589    -1.20   0.238     -.061611    .0159397
       _cons |   1.788168   .0733365    24.38   0.000     1.638177    1.938158
------------------------------------------------------------------------------


-> ipl1 = 40

      Source |       SS       df       MS              Number of obs =      35
-------------+------------------------------           F(  3,    31) =  819.62
       Model |  78.2010029     3   26.067001           Prob > F      =  0.0000
    Residual |  .985913605    31  .031803665           R-squared     =  0.9875
-------------+------------------------------           Adj R-squared =  0.9863
       Total |  79.1869165    34  2.32902696           Root MSE      =  .17834

------------------------------------------------------------------------------
     lnodds1 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnmp |   1.908364    .062105    30.73   0.000       1.7817    2.035028
       lnmp2 |   .4435909   .0646618     6.86   0.000     .3117123    .5754694
       lnmp3 |   .0705073   .0161085     4.38   0.000     .0376539    .1033607
       _cons |   1.010555   .0432926    23.34   0.000     .9222588    1.098851
------------------------------------------------------------------------------
```

```
-> ipl1 = 43

      Source |       SS       df       MS              Number of obs =     135
-------------+------------------------------           F(  3,   131) = 4795.36
       Model |  407.706476     3  135.902159           Prob > F      =  0.0000
    Residual |  3.71258714   131   .02834036           R-squared     =  0.9910
-------------+------------------------------           Adj R-squared =  0.9908
       Total |  411.419064   134  3.07029152           Root MSE      =  .16835

------------------------------------------------------------------------------
     lnodds1 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnmp |   1.949365   .0338096    57.66   0.000     1.882482    2.016249
       lnmp2 |   .3499296   .0180863    19.35   0.000     .3141506    .3857086
       lnmp3 |   .0355299   .0025548    13.91   0.000     .0304758     .040584
       _cons |   2.150156   .0248835    86.41   0.000      2.10093    2.199381
------------------------------------------------------------------------------


-> ipl1 = 44

      Source |       SS       df       MS              Number of obs =      56
-------------+------------------------------           F(  3,    52) =  878.09
       Model |  143.259898     3  47.7532992           Prob > F      =  0.0000
    Residual |  2.82791069    52  .054382898           R-squared     =  0.9806
-------------+------------------------------           Adj R-squared =  0.9795
       Total |  146.087808    55  2.65614197           Root MSE      =   .2332

------------------------------------------------------------------------------
     lnodds1 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnmp |    1.65879   .0456399    36.35   0.000     1.567207    1.750373
       lnmp2 |   .2325325   .0380845     6.11   0.000     .1561104    .3089547
       lnmp3 |   .0146117   .0078362     1.86   0.068    -.0011127    .0303362
       _cons |   1.063485   .0453828    23.43   0.000     .9724177    1.154552
------------------------------------------------------------------------------


-> ipl1 = 46

      Source |       SS       df       MS              Number of obs =      65
-------------+------------------------------           F(  3,    61) = 3146.01
       Model |  180.243037     3  60.0810124           Prob > F      =  0.0000
    Residual |  1.16494754    61  .019097501           R-squared     =  0.9936
-------------+------------------------------           Adj R-squared =  0.9933
       Total |  181.407985    64  2.83449976           Root MSE      =  .13819

------------------------------------------------------------------------------
     lnodds1 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnmp |    2.17228   .0671189    32.36   0.000     2.038067    2.306493
       lnmp2 |     .48282   .0308612    15.64   0.000     .4211092    .5445308
       lnmp3 |   .0554649   .0039039    14.21   0.000     .0476586    .0632712
       _cons |    2.77688   .0422948    65.66   0.000     2.692306    2.861454
------------------------------------------------------------------------------
```

```
-> ipl1 = 48

      Source |       SS       df       MS              Number of obs =      75
-------------+------------------------------           F(  3,    71) = 1421.99
       Model |  238.997297     3  79.6657656           Prob > F      =  0.0000
    Residual |  3.97771847    71  .056024204           R-squared     =  0.9836
-------------+------------------------------           Adj R-squared =  0.9829
       Total |  242.975015    74  3.28344615           Root MSE      =  .23669

------------------------------------------------------------------------------
     lnodds1 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnmp |   1.637898   .0726851    22.53   0.000     1.492968    1.782828
       lnmp2 |  -.0463199   .0463967    -1.00   0.322    -.1388323    .0461925
       lnmp3 |  -.0213438      .0073    -2.92   0.005    -.0358996   -.0067879
       _cons |   2.242124   .0475726    47.13   0.000     2.147267    2.336981
------------------------------------------------------------------------------


-> ipl1 = 50

      Source |       SS       df       MS              Number of obs =      37
-------------+------------------------------           F(  3,    33) =  503.46
       Model |   87.724984     3  29.2416613           Prob > F      =  0.0000
    Residual |  1.91667577    33  .058081084           R-squared     =  0.9786
-------------+------------------------------           Adj R-squared =  0.9767
       Total |  89.6416598    36   2.4900461           Root MSE      =    .241

------------------------------------------------------------------------------
     lnodds1 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnmp |   2.850055   .1568527    18.17   0.000     2.530936    3.169174
       lnmp2 |    .863806   .0846488    10.20   0.000     .6915868    1.036025
       lnmp3 |   .0998697   .0119731     8.34   0.000     .0755103    .1242291
       _cons |   1.897999   .0745764    25.45   0.000     1.746272    2.049726
------------------------------------------------------------------------------


-> ipl1 = 52

      Source |       SS       df       MS              Number of obs =      86
-------------+------------------------------           F(  3,    82) = 2092.53
       Model |  255.815647     3  85.2718822           Prob > F      =  0.0000
    Residual |  3.34155443    82  .040750664           R-squared     =  0.9871
-------------+------------------------------           Adj R-squared =  0.9866
       Total |  259.157201    85  3.04890825           Root MSE      =  .20187

------------------------------------------------------------------------------
     lnodds1 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnmp |   1.531126   .0303238    50.49   0.000     1.470802     1.59145
       lnmp2 |   .2859285   .0312651     9.15   0.000     .2237322    .3481248
       lnmp3 |   .0574634    .007939     7.24   0.000     .0416702    .0732566
       _cons |   1.073971   .0346702    30.98   0.000     1.005001    1.142941
------------------------------------------------------------------------------
```

```
-> ipl1 = 54

      Source |       SS       df       MS              Number of obs =      54
-------------+------------------------------           F(  3,    50) = 1621.84
       Model |  146.216098     3  48.7386993           Prob > F      =  0.0000
    Residual |  1.50257197    50  .030051439           R-squared     =  0.9898
-------------+------------------------------           Adj R-squared =  0.9892
       Total |   147.71867    53  2.78714472           Root MSE      =  .17335

------------------------------------------------------------------------------
     lnodds1 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnmp |   1.781647   .0530102    33.61   0.000     1.675173    1.888121
       lnmp2 |   .5550114   .0437468    12.69   0.000     .4671433    .6428794
       lnmp3 |   .0988205   .0084776    11.66   0.000     .0817927    .1158483
       _cons |   1.314594   .0365425    35.97   0.000     1.241196    1.387991
------------------------------------------------------------------------------
```

```
-> ipl1 = 56

      Source |       SS       df       MS              Number of obs =      65
-------------+------------------------------           F(  3,    61) = 1442.45
       Model |  181.964486     3  60.6548287           Prob > F      =  0.0000
    Residual |  2.56504025    61   .04204984           R-squared     =  0.9861
-------------+------------------------------           Adj R-squared =  0.9854
       Total |  184.529526    64  2.88327385           Root MSE      =  .20506

------------------------------------------------------------------------------
     lnodds1 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lnmp |   1.531775   .0357244    42.88   0.000     1.460339     1.60321
       lnmp2 |   .2642883   .0305161     8.66   0.000     .2032675     .325309
       lnmp3 |   .0330595   .0054855     6.03   0.000     .0220905    .0440284
       _cons |   .8288672   .0361866    22.91   0.000     .7565077    .9012268
------------------------------------------------------------------------------
```

Appendix G

Fortran Source Code for Imputation of MOOP – NEW MODEL

```
The following variables are needed prior to calling either yngoop or oldoop:

For units headed by a person less than 65 years old:

   Let:

             1 if has private insurance
      icov =   2 if Medicaid or Medicare only
             3 if uninsured

             1 if single individual
      isize =  2 if family size 2 or 3
             3 if family size is 4 or more

      npoor =  1 if census money income is less than 150% of poverty
             2 otherwise

      age  =   max(age of reference individual, age of spouse)

      iage =   1 if age ≤ 25
             2 if 25 < age ≤ 35
             3 if 35 < age ≤ 45
             4 if 45 < age ≤ 55
             5 if 55 < age < 65

      if(icov=1 and isize=3) then iage = min(iage,4)
      if(icov=2 and isize=1) then iage = 1
      if(icov=2 and isize=2) then iage = max(iage,2)
      if(icov=2 and isize=3) then iage=min(max(iage,3),4)


      v        a random draw from a uniform distribution
      u        a random draw from a uniform distribution


      if icov = 1 then ipl = (npoor-1)*15 + (isize-1)*5 + iage
      if icov = 2 then ipl = 30 + (isize-1)*5+iage
      if icov = 3 then ipl = 46 + (isize-1)*4 + (npoor-1)*2

   then

      oop = yngoop(ipl,v,u) ! returns with value of MOOP in $1997

For Units headed by a person 65 years old or older:

   iage=       1 if head is less than 75 years old
             2 if head is 75 years old or older
```

```
isize =     1 if single individual
            2 if family size is 2 or more


npoor =     1 if census money income is less than 150% of poverty
            2 otherwise

   v        a random draw from a uniform distribution
   u        a random draw from a uniform distribution


   ipl = (iage-1)*4 + (isize-1)*2 + npoor

then

   oop = oldoop(ipl,v,u) ! returns with value of MOOP in $1997
```

Source Code for yngoop3, oldoop3 and other needed functions:

```
      function yngoop(ipl,v,u)
      real ypzero(56),cof(4,56)

      data ypzero/
     & .649,.943,3*0.0,.963,.894,.964,2*0.,.963,4*0.,.842,.886,.910,
     & .932,.933,.891,.964,.955,.979,.987,0.0,.981,.983,.974,0.,.703,
     & 5*0.,.487,.705,.735,.877,2*0.,.602,.823,0.,.558,0.,.642,
     & 0.,.728,0.,.718,0.,.784,0.,.796/

      data (cof(n,1),n=1,4)/3.380802,1.0897,.157,4.33356/
      data (cof(n,2),n=1,4)/1.61811,.19829,.0333,.008101/
      data (cof(n,6),n=1,4)/1.75527,.52443,.0656,1.4118/
      data (cof(n,7),n=1,4)/1.568187,.2874485,.03204,.56367/
      data (cof(n,8),n=1,4)/1.50419,.128676,.0644176,-.303506/
      data (cof(n,11),n=1,4)/1.55292,.29738,.044926,-.1611459/
      data (cof(n,16),n=1,4)/1.963238,.344378,.055382,1.36692/
      data (cof(n,17),n=1,4)/2.165107,.3327327,.0282678,1.02771/
      data (cof(n,18),n=1,4)/1.767181,.1886579,.0105524,.5314355/
      data (cof(n,19),n=1,4)/1.812815,.23968,.040903,.1734063/
      data (cof(n,20),n=1,4)/1.557268,.2930063,.0650828,-.2350858/
      data (cof(n,21),n=1,4)/1.93819,.5361325,.058243,.2480439/
      data (cof(n,22),n=1,4)/1.703292,.3336177,.0372242,-.0485922/
      data (cof(n,23),n=1,4)/1.680711,.2378291,.0220017,-.6113615/
      data (cof(n,24),n=1,4)/1.652191,.2971006,.0425554,-.8570955/
      data (cof(n,25),n=1,4)/1.450697,.2341678,.0338855,-1.18122/
      data (cof(n,27),n=1,4)/1.583961,.4846474,.1079689,-.7927049/
      data (cof(n,28),n=1,4)/1.555189,.3348093,.0641008,-.970979 /
      data (cof(n,29),n=1,4)/1.524288,.2660472,.0419135,-1.231859 /
      data (cof(n,31),n=1,4)/1.635143,.074544,-.0081997,1.65141 /
      data (cof(n,37),n=1,4)/3.80565,.7267538,.0528099,5.147042 /
      data (cof(n,38),n=1,4)/1.121695,.0982069,.0044751,1.42008 /
      data (cof(n,39),n=1,4)/1.544476,-.0229351,-.022356,1.788168 /
      data (cof(n,40),n=1,4)/1.908364,.443591,.0705073,1.01055 /
      data (cof(n,43),n=1,4)/1.949365,.3499296,.0355299,2.150156/
      data (cof(n,44),n=1,4)/1.65879,.2325325,.014617,1.063485 /
      data (cof(n,46),n=1,4)/2.17228,.48282,.0554649,2.77688/
      data (cof(n,48),n=1,4)/1.637898,-.0463199,-.0213438,2.242124 /
      data (cof(n,50),n=1,4)/2.850055,.86380,.0998697,1.89799/
      data (cof(n,52),n=1,4)/1.531126,.2859285,.0574634,1.073971 /
      data (cof(n,54),n=1,4)/1.781647,.5550114,.0988205,1.314594/
      data (cof(n,56),n=1,4)/1.531775,.2642883,.0330595,.8288672/


      yngoop=0.0
      havemp=ypzero(ipl)
      if(v.gt.havemp) return


      d=cof(4,ipl)
      f1=cof(1,ipl)
      f2=cof(2,ipl)
      f3=cof(3,ipl)
      z=amin1(.99,u)
      odds=alog(z/(1.-z))
```

```
 yngoop=root3(odds,d,f1,f2,f3)

 return
 end
 function oldoop(ipl,v,u)

 real opzero(8),cof(4,8)

 data (cof(n,1),n=1,4)/2.101525,.17275,.10894,-.167394/
 data (cof(n,2),n=1,4)/1.96197,.25468,.004392,-.821608/
 data (cof(n,3),n=1,4)/1.846542,-.401044,.434109,-1.1777/
 data (cof(n,4),n=1,4)/1.97939,.22907,.067225,-2.39502/
 data (cof(n,5),n=1,4)/2.541231,.063349,-.053129,-.80107/
 data (cof(n,6),n=1,4)/2.56005,-.619,.23188,-1.158788 /
 data (cof(n,7),n=1,4)/2.575988,-.58255523,.20248,-1.70695/
 data (cof(n,8),n=1,4)/2.841958,-.8559645,.353786,-2.678313/

data opzero/1.000,.986,.999,.996,.996,.995,.976,.997/

 oldoop3=0.0
 havemp=opzero(ipl)
 if(v.gt.havemp) return

 d=cof(4,ipl)
 f1=cof(1,ipl)
 f2=cof(2,ipl)
 f3=cof(3,ipl)
 z=amin1(.99,u)
 odds=alog(z/(1.-z))

 oldoop=root3(odds,d,f1,f2,f3)

 return
 end
```

```
      function root3(odds,d,f1,f2,f3)

      data tol/.001/
      con=d-odds

      y0=-con/f1
      zero0=cube(y0,con,f1,f2,f3)

      do inter=1,20

       slope=dcube(y0,f1,f2,f3)
       step=zero0/slope
       istep=1

1      y1=y0-step/float(istep)
       zero1=cube(y1,con,f1,f2,f3)
       if(abs(zero1).lt.abs(zero0)) go to 5
       istep=istep+1
       if(istep.gt.3) go to 4
       go to 1

4      y1=y0-zero0/f1
       zero1=cube(y1,con,f1,f2,f3)

5      if(abs(zero1).lt.tol) go to 10

        y0=y1
        zero0=zero1

      repeat

10    root3=1000.*exp(y1)


      return
      end


      function cube(y,con,f1,f2,f3)

      cube=con+f1*y+f2*y*y+f3*y*y*y

      return
      end


      function dcube(y,f1,f2,f3)

      dcube=f1+2.0*y*f2+3.0*f3*y*y

      return
      end
```

Imputation of Medical Out-of-Pocket (MOOP) Expenditures to CPS Analysis Files

David M. Betson
University of Notre Dame
February 1998

The purpose of this memo is to describe the methods that were employed to impute medical out-of-pocket (MOOP) expenditures to the various years of CPS data which were utilized to analyze the NRC Panel's poverty measure recommendations. The imputation procedure consisted of two parts: estimating the total amount of MOOP which would be used for a control total for the imputation, and a procedure of allocating the totals to individual records.

Constructing Control Totals for MOOP

After much searching and questioning of researchers both inside and outside of government, I concluded there did not exist a consistent series for how much the non-institutionalized population spends directly out of their own pockets for medical services and supplies. In the absence of an official series, I decided to construct one for the research project of back casting the NRC Panel's recommendation to years prior to 1992 -- the year that was reported in the Panel's report.

I began with a simple accounting relationship that states that the aggregate amount of MOOP in current dollars is equal to the real per capita MOOP (RPCMOOP) at time t times the current price of health care (PHC) times the size of the population (POP), i.e.,

$$MOOP_t \equiv POP_t \text{ x } PHC_t \text{ x } RPCMOOP_t .$$

Using this identity, a rather simple estimate of MOOP at t could be based upon the assumption that RPCMOOP remains constant over time? Utilizing this assumption, we could estimate MOOPt using only a single years estimate of MOOP and a historical series of population estimates and the price of health care. If B is the base year in which we have an estimate of MOOP then the specific estimate in any year t would be

$$MOOP_t = POP_t \text{ x } PHC_t \text{ x } RPCMOOP_B$$

$$= MOOP_B \text{ x } \frac{POP_t}{POP_B} \text{ x } \frac{PHC_t}{PHC_B} .$$

.

To evaluate how well this simple estimate performs, I used a historical series published by DHHS (Table 124 in *Health, United States 1992*) which reports on the aggregate amount of MOOP (direct out-of-pocket payments for services and supplies plus the total amount of health care insurance premiums paid by households) in the total population (including the institutionalized population). Given I would be back casting data, I chose the last year of

the series, 1991, as my base year. Using a historical series for the total population and medical price index, I employed the above equation to predict MOOP in each of the previous ten years in the published DHHS series. The results of this evaluation is presented in the following table.

YEAR	MOOP (in billions) DHHS	Estimate	Percentage Difference
1965	23.6	21.5	-8.8%
1967	23.8	24.6	3.5%
1970	31.6	30.6	-3.1%
1975	48.4	45.1	-6.9%
1980	76.1	75.0	-1.5%
1985	124.4	118.9	-4.4%
1987	146.3	138.8	-5.1%
1988	156.2	149.2	-4.5%
1989	168.9	162.3	-3.9%
1990	183.1	178.8	-2.4%
1991	196.5	196.5	0.0%

I feel that this comparison suggests two conclusions. While the naive model consistently underestimates the published data, it does a fairly good job of predicting previous years MOOP especially during the period which we will be imputing, 1979 to the present. Second, the consistent underestimation of the model suggests that real per capita MOOP has over time been declining not constant as assumed by the model. While it is true that over this period, the percentage of all health care directly financed out households' pockets has been significantly declining, what has not been documented has been real per capita spending.

While this exercise built some confidence in what I was going to do, I felt that some other information could also be used. The Annual Statistical Supplement to the Social Security Bulletin provides annual data on the amount of premiums paid by households to Medicare Part B. My strategy was to begin where there was some consensus, MOOP in 1992. As part of the NRC Panel's work, we received from AHCPR their estimate of MOOP for the non-institutionalized population in 1992. Their estimate was $219.4 billion dollars which included premium payments to Medicare Part B. In 1992, there was $11.0 billion of Medicare Part B payments. What I decided to do was to forecast and backcast the difference between these two numbers in 1992 ($208.4) by changes in population (using the CPS counts of total population) and prices (Medical Care Component of the CPI) employing the above naive accounting model. To arrive at the aggregate MOOP figure, I would add the published Medicare Part B payments to this estimate. The following table presents the results of the calculations for the years of the CPS to which I will be imputing MOOP values. The numbers in **bold** type face represent figures from published sources or figures which I believe there is some consensus.

Aggregate Control Totals for MOOP

YEAR	Medicare Part B	OTHER MOOP	TOTAL MOOP
1979	**2.3**	65.2	67.5
1983	**3.5**	101.2	104.7
1989	**10.5**	158.6	169.1
1992	**11.0**	**208.4**	**219.4**
1994	**16.2**	236.1	252.3

Allocating Aggregate MOOP to Elderly and Non Elderly Households

The next step is to allocate these aggregates to individual households. I first disaggregated the aggregate totals into what households (families) headed by non-elderly and headed by elderly adults would spend on MOOP. In conversations with Urban Institute and researchers in ASPE (Health), there seemed to be consensus that roughly 27% of all MOOP was made by elderly units. This percentage was based upon examination of NMES data from 1987 which was aged to 1992. However, in article by Acs and Sablehouse (Monthly Labor Review, 1995) the authors report that in 1992, 34% of MOOP expenditures were made by elderly families reported in the CEX survey (my own calculations on the CEX suggest that 33% of MOOP expenditures were made by the elderly). To be honest, I am not sure which estimate is to believe so I decided to average the two estimates and use the figure of 30.3% for split between the elderly and non-elderly populations in 1992.

The Acs and Sablehouse article show that over the period of 1980 to 1992, the share of MOOP paid by the elderly has grown. The share of MOOP of the elderly in 1992 was 9.2% higher than in 1980. To replicate the general pattern of changes in the elderly share, I assumed the following splits of the aggregate amount of MOOP :

Year :	1979	1983	1989	1992	1994
Elderly Share	27.4%	28.9%	30.3%	30.3%	30.0%

These shares were based upon the change in the relative number of families units headed by an elderly individual. In particular, I used the following adjustment process :

$$\text{Elderly Share of MOOP in Year t} = \frac{\text{\% of Families Headed by Elderly in Year t}}{\text{\% of Families Headed by Elderly in 1992}} \times 30.3$$

The following controls were derived for the Elderly and NonElderly subpopulations. Again the numbers in **bold** type face, represent figures from published sources or figures which I believe there is some consensus.

Subaggregate Control Totals for MOOP (in Billions)

YEAR	Aggregate	Medicare Part B	Other Elderly MOOP	NonElderly
1979	67.5	**2.3**	16.1	49.1
1983	104.7	**3.5**	26.7	74.5
1989	169.1	**10.5**	40.7	117.9
1992	**219.4**	**11.0**	55.4	153.0
1994	252.3	**16.2**	59.4	176.7

Allocating the Subaggregate Control Totals to Individual Records

The next step is allocate these subaggregates to individual family records. One procedure could be to compute the average family MOOP expenditure for each subgroup and then assign this average value to each record. However, given the rather skewed distribution of MOOP spending, this procedure would greatly overstate the amount of MOOP for the majority of families and hence potentially lead to an overstatement of poverty in the population.

For the NRC Panel, AHCPR produced tables from the 1987 NMES file which had been aged to 1992. These tables provided information on the cumulative distribution of MOOP for households which had MOOP expenditures as well as the percentage of households whom had MOOP expenditures. These detail tables were produced for various subgroups of the population defined by type of insurance coverage, age of the head of the family, race, income, and family size. Using the information, I was able to estimate the probability that a household with a given set of characteristics (X_h) would have MOOP. Let us denote this probability by

$$P(X_h)$$

I was also able to estimate for Elderly and NonElderly populations of the following form describing the cumulative distribution of MOOP :

$$Ln(C/(1-C)) = \alpha + \beta X_h + \gamma LNMOOP \qquad (1)$$

where

C = the percentile in the MOOP distribution

X_h = a vector of family characteristics (age, race, income, and insurance coverage)

LNMOOP = Log of Moop Spending.

The estimated relationship (α,β,γ) was utilized in the following manner. For each household, a uniform random number was drawn from a random number generator, RN_1. If RN_1 was less than $P(X_h)$ then the household would be assigned a level of MOOP otherwise the household would be assigned a zero value. If the household was to be assigned a non zero value of MOOP, a second random was drawn, RN_2, which was to represent the percentile in the MOOP distribution to which the family was to be assigned. The level of MOOP that corresponds to this percentile was then estimated as

$$\mu \ x \ EXP \left[\frac{Ln(RN_2/(1-RN_2)) - \alpha - \beta X_h}{\gamma} \right]$$

where μ is a proportional factor computed so that weighted sum of MOOP adds up to the control totals for the two subgroups of the population: the elderly and nonelderly.

This past summer (1997), I was able to acquire the micro (family) data from which the original AHCPR tables were constructed. Using this data I was able to reestimate the above equation (1) using the micro data instead of the aggregated tabular data. Given the larger sample size, I was able to estimate a more comprehensive model that included interaction terms of the family characteristics and level of MOOP. The description of variables used and regression results are provided below. Other than using the newly estimated regression results, the procedures to impute MOOP to the individual records remains the same as utilized for the NRC Panel report.

Description of Independent Variables

LNMOOP	Log of Medical Out of Pocket Expenses
PUBLIC	1 if Insured by Medicare or Medicaid only; 0 otherwise
UNINS	1 if Uninsured; 0 otherwise
FS23	1 if Family Size is 2 or 3; 0 otherwise
FS4M	1 if Family Size is 4 or more; 0 otherwise
FS2M	1 if Family Size is 2 or more; 0 otherwise
AGE75	1 if Head is 75 years or older; 0 otherwise
NONPOOR	1 if the ratio of the Family's Census Money Income to Poverty Line exceeds 1.50; 0 otherwise
BLACK	1 if Black; 0 otherwise
PUBLMP	= LNMOOP * PUBLIC
UNLMP	= LNMOOP * UNINS
NPLMP	= LNMOOP * NONPOOR
F23LMP	= LNMOOP * FS23
F4MLMP	= LNMOOP * FS4M
F2MLMP	= LNMOOP * FS2M
A75LMP	= LNMOOP * AGE75

Regression Model for NonElderly Population :

```
Ordinary    least squares regression.     Dep. Variable     =  LNODDS
Observations       =           5328       Weights           =  ONE
Mean of LHS        = -0.3648372D-01       Std.Dev of LHS    =  0.1757924D+01
StdDev of residuals=  0.4893229D+00       Sum of squares    =  0.1272368D+04
R-squared          =  0.9227089D+00       Adjusted R-squared=  0.9225198D+00
F[ 13,  5314]      =  0.4879926D+04       Prob value  0.3217295D-13
Log-likelihood     = -0.3744999D+04       Restr.(ß=0) Log-l = -0.1056531D+05
ANOVA  Source         Variation     Degrees ofFreedom,       Mean Square
       Regression     0.1518964D+05           13.              0.1168434D+04
       Residual       0.1272368D+04         5314.              0.2394369D+00
       Total          0.1646201D+05         5327.              0.3090297D+01

Variable  Coefficient  Std. Error   t-ratio Prob|t|>x   Mean of X  Std.Dev.of X
-------------------------------------------------------------------------------
Constant   .90283       0.2401E-01   37.595  0.00000
LNMOOP     1.2549       0.1397E-01   89.848  0.00000  -.47910        1.5211
PUBLMP    -.40385       0.1442E-01  -28.007  0.00000  -.21546        .86030
UNLMP     -.13039       0.1377E-01   -9.467  0.00000  -.19744        .74545
NPLMP     0.64415E-01   0.1184E-01    5.441  0.00000  -.19158        1.1969
F23LMP    0.92141E-01   0.1105E-01    8.338  0.00000  -.13601        .98365
F4MLMP     .14905       0.1251E-01   11.912  0.00000 -0.35087E-01    .75400
BLKLMP   -0.69204E-01   0.1100E-01   -6.290  0.00000  -.18269        .81236
PUBLIC     1.2560       0.2782E-01   45.142  0.00000   .13570        .34250
UNINS      1.0070       0.2266E-01   44.449  0.00000   .18131        .38531
FS23      -.87023       0.1916E-01  -45.427  0.00000   .43581        .49591
FS4M      -1.1897       0.2036E-01  -58.434  0.00000   .28697        .45239
NONPOOR   -.19126       0.2006E-01   -9.533  0.00000   .74474        .43605
BLACK      .38658       0.1912E-01   20.215  0.00000   .19839        .39882
```

Regression Model for Elderly Population :

```
Ordinary    least squares regression.     Dep. Variable     =  LNODDS
Observations       =           2173       Weights           =  ONE
Mean of LHS        = -0.1392984D+00       Std.Dev of LHS    =  0.1831889D+01
StdDev of residuals=  0.4271742D+00       Sum of squares    =  0.3950644D+03
R-squared          =  0.9457987D+00       Adjusted R-squared=  0.9456234D+00
F[  7,  2165]      =  0.5396953D+04       Prob value  0.3217295D-13
Log-likelihood     = -0.1231072D+04       Restr.(ß=0) Log-l = -0.4398273D+04
ANOVA  Source         Variation     Degrees ofFreedom,       Mean Square
       Regression     0.6893768D+04            7.              0.9848240D+03
       Residual       0.3950644D+03         2165.              0.1824778D+00
       Total          0.7288833D+04         2172.              0.3355816D+01

Variable  Coefficient  Std. Error   t-ratio Prob|t|>x   Mean of X  Std.Dev.of X
-------------------------------------------------------------------------------
Constant   .50786       0.1970E-01   25.777  0.00000
LNMOOP     1.2170       0.1288E-01   94.459  0.00000  0.10989E-01    1.3975
NPLMP      .44104       0.1451E-01   30.387  0.00000   .19703        .92900
A75LMP   -0.51473E-01   0.1341E-01   -3.837   .00012  0.28515E-01    .95821
F2MLMP    -.18101       0.1420E-01  -12.750  0.00000   .11100        .93611
AGE75     -.26820       0.1895E-01  -14.151  0.00000   .43580        .49598
FS2M      -.46551       0.1959E-01  -23.768  0.00000   .46710        .49903
NONPOOR   -.63639       0.2052E-01  -31.019  0.00000   .61528        .48664
```

Code Segments for Imputation of MOOP
(FORTRAN)

here is the call from the main routine :

```
where
   hage=reference person's age
   sage=spouse's age
   insstat = insurance status of reference person
   premimum = yearly medicare part b premimum


    iold=0
    if(hage.gt.64) then
      out(21)=oldoop(iseed)
      iold=1
      if(sage.gt.64)iold=2
      iage=2
     else
      out(21)=yngoop(iseed)
      if(sage.gt.64) iold=1
      iage=1
    end if
    medicare=0
    if(insstat.gt.0.and.insstat.ne.4) then
     medicare=float(iold)*premimum
     if(ew.eq.0.0) medicare=0
    end if
    out(21)=out(21)+medicare


   function yngoop(iseed)
   real cof(7),dum(7),ycof0(7)
   real ypzero(37)
   data ypzero/
     & .065,.041,.075,.143,.061,.083,.012,.012,.031,.024,.003,.006,
     & .397,.606,.219,.628,.371,.408,.212,.279,.237,.507,.256,.345,
     & .378,.482,.248,.420,.151,.194,.103,.128,.043,.126,.036,.213,
     & 0./
   data cof/.90283,1.256,1.007,-.87023,-1.1897,-.19126,.38658/
   data ycof0/1.2549,-.40385,-.13039,.092141,.14905,.064415,-.0692/

   yngoop=0.0

   do k=2,7
    dum(k)=0.0
   repeat

   if(insstat.eq.0) then   ! insurance status of reference person
    insure=3                     ! uninsured
    dum(3)=1.0
   else if(insstat.eq.2.or.insstat.eq.4) then
    insure=2                     ! public insurance only
    dum(2)=1.0
   else
    insure=1                     ! private
   end if
```

```
    ifam=xin(13)

    if(ifam.eq.1) then
     isize=1                ! family size = 1
    else if(ifam.eq.2.or.ifam.eq.3) then
     isize=2                ! family size 2 or 3
     dum(4)=1.0
    else
     isize=3                ! family size is four or more
     dum(5)=1.0
    end if

    rneeds=0.0        ! census money income to needs (poverty line) ratio
    pline=xin(14)

    if(pline.ne.0.0) rneeds=cminc/pline
    if(rneeds.lt.1.5) then
     ipoor=1
    else
     ipoor=2
     dum(6)=1.0
    end if

    if(xin(29).ne.2) then                       !  race
     irace=1                                    ! non black
    else
     irace=2                                    ! black
     dum(7)=1.0
    end if
    ipl=(insure-1)*12+(isize-1)*4+(ipoor-1)*2+irace
    if(ran1(iseed).lt.ypzero(ipl)) return
    cons=cof(1)
    do k=2,7
     cons=cons+dum(k)*cof(k)
    repeat
    ycof=ycof0(1)
    do k=2,7
     ycof=ycof+dum(k)*ycof0(k)
    repeat

c ran1 is an uniform random number generator RN[0,1]

c
c If imax99 equals 1 then the distribution of MOOP is bounded at the
c pmax percentile -- this is an alternative way to bound "high values"
c of MOOP compared to the Pat Doyle's way (imax99 equal 2) which limits
c the elderly to $8200 of MOOP which she estimated to be 99th percentile
c of the elderly MOOP Distribution -- see below
c


    p=ran1(iseed)
    if(imax99.eq.1) p=p*pmax
    odds=alog(p/(1.-p))
    yngoop=1000.*exp((odds-cons)/ycof)
    if(imax99.eq.2) then
```

```
 yngoop=amin1(amax1(1.,yngoop),8200.)
end if
yngoop=yngoop*yfac      ! yfac multiplicative factor to hit aggregrate
return
end



function oldoop(iseed)
real dum(4),cof(4),ycof0(4)
real opzero(9)
   data opzero/.1666,.0233,.1010,.016,.0872,.0220,.0536,.0165,0./
data cof/.50786,-.2682,-.46551,-.63639/
data ycof0/1.2170,-.05147,-.18101,.44104/

oldoop=0.0

do k=2,4
 dum(k)=0.0
repeat


if(hage.lt.75) then     ! age of reference person
 iage=1
else
 iage=2
 dum(2)=1.0
end if

if(xin(13).eq.1) then  ! family size
 isize=1
else
 isize=2
 dum(3)=1.0
end if

rneeds=0.0              ! census money income to needs (Poverty line) ratio
pline=xin(14)
if(pline.ne.0) rneeds=cminc/pline
if(rneeds.lt.1.5) then
 ipoor=1
else
 ipoor=2
 dum(4)=1.0
end if

ipl=(iage-1)*4+(isize-1)*2+ipoor

if(ran1(iseed).lt.opzero(ipl)) return  ! pzero is the probability of not having
MOOP

ycof=ycof0(1)
do j=2,4
 ycof=ycof+dum(j)*ycof0(j)
repeat

cons=cof(1)
do k=2,4
```

```
     cons=cons+dum(k)*cof(k)
    repeat

    p=ran1(iseed)    ! p is the random percentile in the MOOP distribution

c ran1 is an uniform random number generator RN[0,1]


c
c If imax99 equals 1 then the distribution of MOOP is bounded at the
c pmax percentile -- this is an alternative way to bound "high values"
c of MOOP compared to the Pat Doyle's way (imax99 equal 2) which limits
c the elderly to $18000 of MOOP which she estimated to be 99th percentile
c of the elderly MOOP Distribution -- see below
c


    if(imax99.eq.1) p=p*pmax


    odds=alog(p/(1.-p))


    oldoop=1000.*exp((odds-cons)/ycof)

    if(imax99.eq.2) then
     oldoop=amin1(amax1(1.,oldoop),18000.)
    end if

    oldoop=oldoop*ofac  ! ofac = a multiplicative factor to hit aggregate total

    return
    end
```