

Migration Discrete Time Event History Analysis Code for the ChitwanABM

Author: Alex Zvoleff

Email: azvoleff@mail.sdsu.edu

Date: July, 2012

Uses discrete time event history analysis to parameterize the ChitwanABM using data from the Chitwan Valley Family Study.

Note the following regarding this source dataset, created from the migration_1_preprocess.R script:

1. The data contains only respondents from the CVSF who were present in the dataset, in a "local" neighborhood in Chitwan in the first month of 1996.
2. Only local to distant migrations are coded. A local to distant migration is defined as a person leaving the Chitwan Valley for a location outside the valley (regardless of whether they make a move within Nepal or internationally).
3. Age, household ID, gender, and respondent ID are all coded from the CVFS data.
4. Only 126 months of data were available. Given that one month was used to define the minimum period away from a household to be considered a migrant, there were only 125 months of data to consider (as migrations cannot be conclusively determined within the last one month of data).

Follows analysis of Massey, Axinn, and Ghimire (2010):

Massey, D. S., W. G. Axinn, and D. J. Ghimire. 2010. Environmental change and out-migration: evidence from Nepal. *Population and Environment*. (last accessed 16 September 2010).

Load the data and setup R

Basic Statistics

Total number of person-month records: 197131.

First check how many migrations and censored entries. Then check a cross tab of migrations with the categorical predictors:

```
##
##           0           1      <NA>
## 195726    1405           0
```

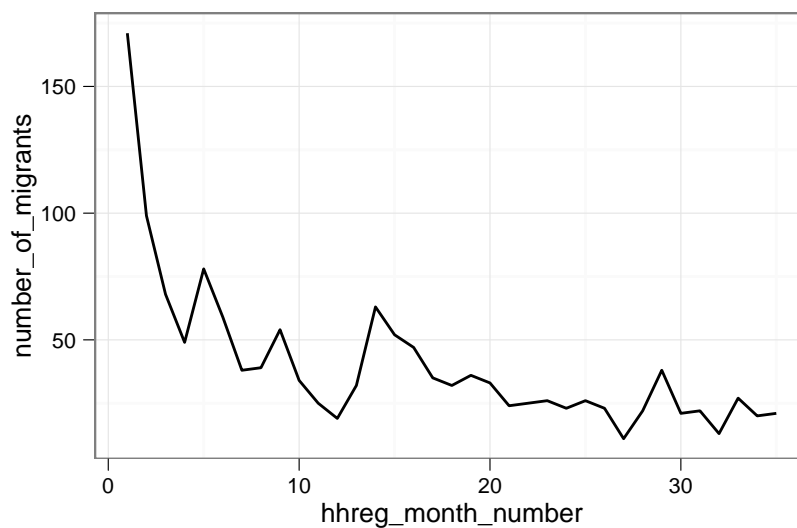
```
##
##           migr_long$agegrp
## migr_long$migr (55,99] (15,25] (25,35] (35,45] (45,55]
##           0    20565    32376    24599    22115    17052
##           1      123      496      215      106      84
```

```
##
##           migr_long$ethnic
## migr_long$migr UpHindu HillTibeto LowHindu Newar TeraiTibeto
##           0    89025      29672      21378 12200      43451
##           1      718       249       135   97      206
```

```
##          migr_long$gender
## migr_long$migr   male female
##          0  89970 105756
##          1    736    669
```

```
## , , gender = male
##
##          ethnic
## agegrp   UpHindu HillTibeto LowHindu Newar TeraiTibeto
## (55,99]   5475      2153      899    832      1616
## (15,25]   6594      1891     1133    856      2695
## (25,35]   3796      1069     1042    689      2479
## (35,45]   3887      1356     1032    588      2095
## (45,55]   3674      1186     1037    695      1450
##
## , , gender = female
##
##          ethnic
## agegrp   UpHindu HillTibeto LowHindu Newar TeraiTibeto
## (55,99]   4798      1925     1011    639      1340
## (15,25]   9332      2379     1660   1421      4911
## (25,35]   7227      2217     1806    873      3616
## (35,45]   6678      2134     1195    951      2305
## (45,55]   3797      1642     1217    600      1838
##
```

And look at the number of migrations per time (censoring after 1st migration).



Migrations per month (censored)

Discrete-time Event History Models

Fixed effect model

```
##
## Call:
## glm(formula = migr ~ ethnic + gender + agegrp + timeyears + I(timeyears^2) +
##      years_schooling + in_school_1996 + I(log(MARFT_1996 + 1)) +
##      own_any_farmland, family = binomial, data = migr_long)
##
## Deviance Residuals:
##      Min       1Q   Median       3Q      Max
## -0.368   -0.143   -0.104   -0.082    3.633
##
## Coefficients:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept)    -4.8652     0.2132  -22.82 < 2e-16 ***
## ethnicHillTibeto    0.2578     0.1040    2.48 0.01320 *
## ethnicLowHindu     0.1405     0.1332    1.05 0.29165
## ethnicNewar    -0.1054     0.1540   -0.68 0.49377
## ethnicTeraiTibeto -0.4501     0.1173   -3.84 0.00013 ***
## genderfemale    -0.4554     0.0811   -5.61 2.0e-08 ***
## agegrp(15,25]     1.0220     0.1865    5.48 4.3e-08 ***
## agegrp(25,35]     0.4081     0.1853    2.20 0.02767 *
## agegrp(35,45]    -0.0754     0.1931   -0.39 0.69615
## agegrp(45,55]     0.0416     0.1952    0.21 0.83125
## timeyears        -0.5875     0.1665   -3.53 0.00042 ***
## I(timeyears^2)     0.1189     0.0588    2.02 0.04318 *
## years_schooling    0.0726     0.0112    6.49 8.3e-11 ***
## in_school_1996    -0.2230     0.1031   -2.16 0.03047 *
## I(log(MARFT_1996 + 1)) 0.0225     0.0313    0.72 0.47190
## own_any_farmlandTRUE -0.0672     0.1076   -0.62 0.53208
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##      Null deviance: 8922.7  on 96341  degrees of freedom
## Residual deviance: 8487.5  on 96326  degrees of freedom
## (100789 observations deleted due to missingness)
## AIC: 8520
##
## Number of Fisher Scoring iterations: 8
##
```

	coef	odds_ratio	se_coef
## (Intercept)	-4.8652	0.0077	0.2132
## ethnicHillTibeto	0.2578	1.2940	0.1040
## ethnicLowHindu	0.1405	1.1508	0.1332
## ethnicNewar	-0.1054	0.9000	0.1540
## ethnicTeraiTibeto	-0.4501	0.6376	0.1173
## genderfemale	-0.4554	0.6342	0.0811
## agegrp(15,25]	1.0220	2.7786	0.1865
## agegrp(25,35]	0.4081	1.5039	0.1853
## agegrp(35,45]	-0.0754	0.9274	0.1931
## agegrp(45,55]	0.0416	1.0425	0.1952

```
## timeyears          -0.5875      0.5557  0.1665
## I(timeyears^2)      0.1189      1.1263  0.0588
## years_schooling     0.0726      1.0753  0.0112
## in_school_1996     -0.2230      0.8001  0.1031
## I(log(MARFT_1996 + 1)) 0.0225      1.0228  0.0313
## own_any_farmlandTRUE -0.0672      0.9350  0.1076
```

Mixed-effects model - random intercept at neighborhood level (age groups)

```
## Length Class      Mode
##      1      mer      S4
```

```
##              coef se_coef odds_ratio
## (Intercept)  -4.9032  0.2245    0.0074
## ethnicHillTibeto    0.2005  0.1157    1.2220
## ethnicLowHindu     0.1035  0.1455    1.1091
## ethnicNewar       -0.1583  0.1654    0.8536
## ethnicTeraiTibeto  -0.4836  0.1367    0.6166
## genderfemale      -0.4722  0.0827    0.6236
## agegrp(15,25]      1.0286  0.1901    2.7970
## agegrp(25,35]      0.4343  0.1887    1.5440
## agegrp(35,45]     -0.0624  0.1966    0.9395
## agegrp(45,55]      0.0486  0.1985    1.0498
## timeyears        -0.5658  0.1682    0.5679
## I(timeyears^2)      0.1163  0.0594    1.1233
## years_schooling     0.0719  0.0116    1.0746
## in_school_1996     -0.1982  0.1060    0.8202
## I(log(MARFT_1996 + 1)) 0.0255  0.0392    1.0258
## own_any_farmlandTRUE -0.0726  0.1150    0.9299
```

Mixed-effects model - random intercepts at individual and neighborhood level (age groups)

```
## Warning: false convergence (8)
```

```
## Length Class      Mode
##      1      mer      S4
```

```
##              coef se_coef odds_ratio
## (Intercept)  -27.0704  2.7229  0.000e+00
## ethnicHillTibeto    -0.2797  1.6790  7.560e-01
## ethnicLowHindu     -0.2321  2.1333  7.929e-01
## ethnicNewar       -1.0573  2.5098  3.474e-01
## ethnicTeraiTibeto  -0.8437  1.8822  4.301e-01
## genderfemale      -0.7431  1.2783  4.757e-01
## agegrp(15,25]     -1.1417  2.1656  3.193e-01
## agegrp(25,35]      0.1703  2.0878  1.186e+00
## agegrp(35,45]     -0.4356  2.0406  6.469e-01
## agegrp(45,55]     -0.4038  1.9329  6.678e-01
```

## timeyears	10.4894	0.6624	3.593e+04
## I(timeyears^2)	-1.5993	0.1971	2.020e-01
## years_schooling	0.1272	0.1728	1.136e+00
## in_school_1996	1.5838	1.5522	4.874e+00
## I(log(MARFT_1996 + 1))	0.1423	0.4919	1.153e+00
## own_any_farmlandTRUE	-0.5020	1.6912	6.053e-01