

# R documentation

of all in ‘man’

December 26, 2023

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Builtin.marginals

*Builtin Marginal Tables for Marginal Adjustment***Value**

Marginal table function (ends in .m) to be used in the marginal.tables component of a model.

**List of tables**

|                   |  |
|-------------------|--|
| AgeRaceSex.m      | Age by Race by Sex<br>Age given by Age.code Race by Race.code                  |
| AgeSex.m          | Age by Sex Age given by Age.code Race by Race.code                             |
| Race.m            | Number of categories given by PAT.race.code                                    |
| HispanicAgeSex.m  | Hispanic yes/no Age given by PAT.age.code                                      |
| Poverty2.m        | Poverty 2 categories: Below/Above/Undefined                                    |
| PovertyRaceSex.m  | Poverty 2 categories: Below/Above/Undefined<br>Race given by PAT.race.code()   |
| PovertyAgeSex.m   | Poverty 2 categories: Below/Above/Undefined<br>Age age code: "9b"              |
| Poverty4.m        | Poverty 4 categories<br>Under 100_200, 200_300, 300+, Undefined                |
| Employed.m        | Employed, Unemployed, Not_in Under_16  |
| HouseType.m       | Non_inst, Inst (Institutional), House (Household)                              |
| DisabilityRace.m  | Disability Yes, No, Other, Race give by Race.code                              |
| Education.m       | Under_18, Less_than_high_school, High_school<br>Some_College, College_degree   |
| Education4.m      | Less_than_high_school, High_school,<br>Some_college, College_degree            |
| Tenure.m          | Rent, Own, Group_quarters.   |
| MaritalStatus3.m  | Married, Single Mother, Single Father.   |
| MaritalStatus3a.m | Married, Single, Under_15_years  |
| MaritalStatus7.m  | Married, Widowed, Separated, Divorced<br>Never_married, Other, Under_15_years. |

|               |   |
|---------------|---|
| HealthIns3.m  | Insured, Uninsured, Military_inst<br>(Military or Institutional Group Quarters) |
| FamilyType3.m | Married_head, Female_head, Male_head, Other                                     |

**Author(s)**

David Dorer 21 Dec 2023 15:37

Builtin.models

*Builtin Models***Models**

## 1. BrooklineI.model

marginal tables: AgeRaceSex, MaritalStatus3, HispanicAgeSex, Education4, Employed, Tenure, DisabilityRace, Poverty2, HouseType, FamilyType3, HealthIns3

extra variables: SPM3 (Supplemental Poverty Measure)

parameters: geotype="tract", model.type="person", nages="7a", nraces="5"

## 2. BrooklineIII.model

marginal tables: AgeRaceSex, MaritalStatus7, DisabilityRace, Poverty2, Tenure, Employed, HouseType, FamilyType3

extra variables: SNAP, SPM3 (Supplemental Poverty Measure)

parameters: geotype="tract", nages="9", nraces="5", model.type="person"

## 3. BrooklineIIIb.model

marginal tables: AgeSex.m, Race.m, Poverty2.m, Hispanic.m, HouseType.m, Employed.m, Tenure.m, MaritalStatus7.m

extra variables: SNAP, SPM3 (Supplemental Poverty Measure)

parameters: geotype="blockgroup", nages="9", nraces="5", model.type="person"

## 4. PennsylvaniaI.model

marginal tables: AgeRaceSex, Poverty4, Employed, Education4, HispanicAgeSex, MaritalStatus3, Tenure.

extra variables: WIC, Age6a, EmployedHouse18.

parameters: nages="9", nraces="5", geotype="tract", model.type="person".

## 5. NewYorkCityI.model

marginal tables: AgeRaceSex, HispanicAgeSex, Education4, Poverty2, Employed.

extra variables: none.

parameters: nages="9", nraces="5", model.type="person", geotype="tract".

## 6. TestI.model

marginal tables: AgeRaceSex, HispanicAgeSex, Education4, Poverty2, Employed.

extra variables: SPM3

parameters: nages="9", nraces="5", geotype="person", model.type="person".

**Author(s)**

David Dorer 20 Dec 2023 11:33

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|                   |                                       |
|-------------------|---------------------------------------|
| Builtin.variables | <i>Builtin Derived PUMS variables</i> |
|-------------------|---------------------------------------|

---

**Value**

PUMS variable function (ends in .v) to be used in the variables component of a model.

**List of variables**

|                   |   |
|-------------------|---|
| Age.v             | Age arguments AGEP and nages  |
| WIC.v             | Does person live in a household that receives WIC benefits.                         |
| Race.v            | Race with arguments RAC1P and nraces  |
| SNAP.v            | Does person live in a household that receives SNAP benefits.                        |
| Hispanic.v        | Is the person of Hispanic Ethnicity ("Hispanic" or "No")                            |
| Employed.v        | Is the person employed ("Under_16", "Employed", "Unemployed", "Not_in")             |
| EmployedHouse18.v | Are all adults in household over 18 employed?                                       |
| Tenure.v          | "Group_quarters", "Own", "Rent".  |
| HousingCost.v     | "Low", "High", "Vacant".  |
| Poverty2.v        | Poverty Threshold "Below", "Above", "Undefined".                                    |
| Poverty4.v        | Poverty Threshold "Below", "100_to_199", "200_to_299", "Over_300", "Undefined".     |
| HealthIns3.v      | "Insured", "Uninsured", "Military_inst" (Military or Institutional Group Quarters). |
| Disability.v      | "Yes", "No", "Other" (See table B18101)   |
| HouseType.v       | Non_inst, Inst (Institutional), House (Household)                                   |
| Education4.v      | "Less_than_high_school", "High_school", "Some_college", "College_degree"            |
| FamilyType3.v     | "Married_head", "Female_head", "Male_head", "Other".                                |
| FamilyType.v      | "Married_head", "Female_head", "Male_head", "Child_group", "18_years_and_over".     |
| MaritalStatus3a.v | Married, Single, Under_15_years   |
| MaritalStatus7.v  | Married, Widowed, Separated, Divorced<br>Never_married, Other, Under_15_years.      |

**Author(s)**

David Dorer

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GettingStarted

*Getting Started - Installation and Setup*

---

**Description**

Downloading Installing and Initializing PAT

**Downloading**

- 1a. (Linux/Ubuntu) Download tar.gz file for current version of PAT e.g. PAT\_0.1.tar.gz
- 1b. (Windows) Download zip file for current version of PAT e.g. PAT\_0.1.zip

**Setup outside of R session.**

1. Decide on and create the folder where you want to store files.
2. Create sub-folders/directories:
  - 2a. logs
  - 2b. data
  - 2c. output

**Installation Within R**

In an R session run (one time)

Linux: `install.packages(pkgs="path_to_PAT_<vers>.tar.gz", repos=NULL);`

or

Windows: `install.packages(pkgs="path_to_PAT_<vers>.zip", repos=NULL);`

**Setup within R session**

1. every time you start R run

```
require(PAT)
```

2. Every time set your census key `PAT.census.key("your_key_here")`  
You can get your census key at

Census key request page [https://api.census.gov/data/key\\_signup.html](https://api.census.gov/data/key_signup.html)

3. Every time set your root folder/directory

```
PAT.root("path_to_base_folder");
```

The default for the root folder is your working directory: `getwd()`;

which is where you were when you started R (probably wrong choice)

4. Optionally set `nraces` (number of race categories) for PUMS derived variables and marginal Detail/Subject/DataProfile tables.

4a. To see current value use: `PAT.race.code()`

4b. To change: `PAT.race.code(<new_value>);`

4c. To see choices: `help(PAT.race.code);`

5. Optionally set `nages` (number of ages categories) for PUMS derived variables and Detail/Subject/DataProfile tables.

5a. To see current value use: `PAT.age.code();`

5b. To change: `PAT.age.code("new_value");`

5c. To see choices: `help(PAT.age.code);`

6a. Set/check PUMS vintage (every time)

To see current value: `PAT.pums.vintage();`

To set: `PAT.pums.vintage(<new_value>);`

6b. Set/check PUMS period (every time)

To see current value: `PAT.pums.period();`

To set: `PAT.pums.period("new_value");` (valid values 1 and 5)

7a. Set/check vintage for marginal tables, usually the same as PUMS vintage (every time).

To see current value: `PAT.vintage();`

To set: `PAT.vintage(<new_value>);`

7b. Set/check period for marginal tables, usually 5 (every time). To see current value: `PAT.period();`

To set: `PAT.period(<new_value>)`

NOTE: There are many fewer ACS tables for the 1 year period.

Many of your marginal tables may fail with a 1 year period.

8. Check/Set other options:

```
PAT.vintage()
```

```
PAT.period()
```

```
PAT.pums.vintage()
```

```
PAT.pums.period()
```

```
PAT.verbose()
```

```
9. help(package="PAT")
```

**Author(s)**

David Dorer 16 Dec 2023 10:09

---

loglinf3

*Loglinear Model fit with specified marginal tables*

---

**Description**

Wrapper R function for compiled C IPF subroutine.

**Usage**

```
loglin3f(seed.table, target.list, target.data, niter=5, maxdev=0.001, debug=0)
```

**Arguments**

|             |   |
|-------------|---|
| seed        | Starting seed table for fit.  |
| target.list | list with index specifying variable is seed table. Note the marginal.tables function computes this list from the model. |
| target.data | list containing the data for the marginal tables specified by target.list   |
| niter       | Maximum number of iterations. Same as iter in the PAT.synth.data function.  |
| maxdev      | Maximum relative change in difference between target marginals and current fit margin between successive iteration.     |
| debug       | Verbose/debug level for messages. Default PAT.verbose()   |

**Details**

The arguments are the same as the IpF function in mipfp package.

**Value**

|        |                                      |
|--------|--------------------------------------|
| seed   | Argument passed to function.         |
| p.hat  | Model fit scaled to sum to 1.        |
| nlast  | Last iteration.                      |
| ifault | Did the fit converge 0: yes 1: no    |
| maxdev | Maximum deviation at last iteration. |

**Author(s)**

David Dorer

**References**

<https://cran.r-project.org/web/packages/mipfp/mipfp.pdf> <https://www.jstatsoft.org/article/view/v086c02>

---

|                |  |
|----------------|--|
| make.spm.state | Create State Supplemental Poverty Measure Datafile |
|----------------|--|

---

### Description

subset US SPM file for a state.

### Usage

```
make.spm.state(state="25",vintage="2021")
```

### Arguments

|         |   |
|---------|---|
| state   | State FIPS for ouput .RData file.                           |
| vintage | Vintage for SPM data file. Default PAT.pums.vintage().      |
| ddir    | Folder/directory for output .RData file. Default datadir(). |
| debug   | Level of diagnostic messages. Default PAT.verbose().        |

Input file: spm\_pu\_<vintage>.RData

### Details

Subset U.S. SPM .RData file for a state.

### Value

Object SPM.<vintage>.<state\_FIPS>.data  
Output data .RData data file. File name SPM.<vintage>.<state\_FIPS>.data.RData.

### Author(s)

David Dorer 10 Dec 2023 13:30

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|               |  |
|---------------|--|
| PAT.acs.table | Download an ACS Detail (B, S, or DP) Table |
|---------------|--|

---

### Description

Download and ACS table for a given geography.

### Usage

```
PAT.acs.table()
```



**Arguments**

|                |   |
|----------------|---|
| group          | ACS table name or "group" (API term). For example the table B01001 has title "Sex by Age." Check out tables at <a href="http://data.census.gov">data.census.gov</a> .   |
| state          | State FIPS code. Required.  |
| county         | County FIPS code. Character variable - optional defaults to "".   |
| tract          | County FIPS code. Character variable (6 characters) - optional defaults to ""   |
| blockgroup     | Blockgroup FIPS code. Character variable (1 character) defaults to "" (ignored)   |
| puma           | PUMA FIPS code. 5 characters - optional defaults to ""  |
| place          | Place FIPS code. Defaults to "" which will be ignored.  |
| csd            | County Subdivision FIPS code - defaults to "" which will be ignored   |
| vintage        | Defaults to PAT.vintage().  |
| period         | Defaults to PAT.period().   |
| ddir           | character variable indicating where to store downloaded tables - default datadir().   |
| debug          | Level of messages to print - default PAT.verbose().   |
| cache.metadata | Cache level for metadata 0: no caching, download from Census website for every table. 1: cache metadata in file 2: cache metadata in both a file and in the .GlobalEnv or computer memory. Default 2 speeds downloading and decoding many tables. If you seem to be having difficulties with stale cached data use 0. Default PAT.cache.metadata(). |
| cache.tables   | Cache level for ACS tables. 0: download table from census for each table. 1: cache tables in a file (best). 2: cache table in both a file and in computer memory. With a run of many tracts 2 will quickly exhaust memory. For testing where you are repeatedly downloading the same table you might temporarily use 2 to save time.                |

**Details**

Download B, S, DP (SF1) tables attaches names for rows using metadata, table has 2 columns: "Est" and "MoE". Various geographies can be specified. The function sorts out the geography if you use too many geography values.

**Value**

|      |   |
|------|---|
| list | list with 2 components "data" (matrix with table rownames and 2 columns "Est" and "MoE") and "par" various parameters such as the table "object" name, folder where the table was stored, name of the filename of where the table was stored, date time of download, etc. |
|------|---|

**Author(s)**

David Dorer

**References**

To find, examine and check data, see Census webpage [data.census.gov](http://data.census.gov)

---

|              |                                    |
|--------------|------------------------------------|
| PAT.age.race | <i>Set age and race categories</i> |
|--------------|------------------------------------|

---

### Description

PAT.age.code(code) Set the PAT.age.code option.  
 PAT.race.code(code) Set the PAT.race code option.

### Usage

```
PAT.age.code("7a")
PAT.race.code("5")
```

### Arguments

|      |           |
|------|-----------|
| code | Age code  |
| code | Race code |

With no argument return the Age or Race Code

### Details

Recode age categories for B01001 or B01001A etc

### Value

The race or age code.  
 or  
 Sets the corresponding Global race or age code option.

### Values for age code

|      |   |
|------|---|
| "7a" | 7 age categories<br>14 and under, 15 to 19, 20 to 34, 35 to 44,<br>45 to 54, 55 to 64, 65 and over. |
| "7b" | 7 age categories<br>under 5, 5 to 9, 15 to 17, 18 to 24,<br>25 to 64, 65 and over                   |
| "9"  | xx  |
| "6"  | xx  |
| "6a" | xx  |
| ...  | use RecodeAges(doc=1) to see possible values.<br>then RecodeAges(nages="9",doc=1) to see recoding.  |

### Values for race code

- "3" 3 race categories:  
White, Black, Other
- "5" 5 race categories  
White, Black, Asian, Other, Two.
- "7" 7 race categories  
white, black, native, asian, Hawaiian, Other, Two.

Author(s)

David Dorer 26 Dec 2023 13:42

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|                    |                                     |
|--------------------|-------------------------------------|
| PAT.cache.metadata | Set Cache Level For Table Metadata. |
|--------------------|-------------------------------------|

---

Description

Set metadata cache level.

Usage

PAT.cache.metadata(2)

Arguments

value Value for metadata cache level. No value given return level. Values 0, 1, 2.

Details

Sets global PAT option "PAT.cache.metadata"

Value

- |       |  |
|-------|--|
| level | Current value of PAT.cache.metadata.   |
| 0     | Download metadata for every ACS table. Do not save in a file or in .GlobalEnv                        |
| 1     | Save metadata in file for later use. Better.   |
| 2     | Save metadata in file and in .GlobalEnv. Speeds up table rowname decoding. Best for many ACS tables. |

Author(s)

David Dorer 19 Dec 2023 11:38

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|                  |                              |
|------------------|------------------------------|
| PAT.cache.tables | <i>Set Table Cache Level</i> |
|------------------|------------------------------|

---

**Description**

Set PAT.cache.tables global PAT option.

**Description**

Set ACS table cache level.

**Usage**

PAT.cache.tables(1). Set option PAT.cache.tables to 1. With no argument return current value of option "PAT.cache.tables".

**Arguments**

value                      Value for table cache level. No argument return table cache level.

**Details**

Sets global PAT option "PAT.cache.tables"

**Value**

|       |  |
|-------|--|
| level | Current value table cache level.   |
| 0     | Download ACS table every time. Do not save in a file or in .GlobalEnv  |
| 1     | Save ACS table in file for later use. Best.  |
| 2     | Save ACS table in file and in .GlobalEnv. Quickly uses up memory if a large number of tables are downloaded. |

**Author(s)**

David Dorer 19 Dec 2023 11:38

---

|                 |  |
|-----------------|--|
| PAT.convert.spm | <i>Convert Supplemental Povert Measure sas7bdat file to .RData format.</i> |
|-----------------|--|

---

**Description**

Convert downloaded SAS data file to R .RData format.

**Usage**

PAT.convert.spm(vintage,ddir=datadir(),download=1)

**Arguments**

|          |  |
|----------|--|
| vintage  | SPM vintage.                                       |
| ddir     | Data directory to store output.                    |
| download | Should SAS file be downloaded from Census website. |

**Details**

PAT.convert.spm(vintage)

**Value**

An R .RData file named SPM.<vintage>.RData with R object SPM.<vintage>.data.

**Author(s)**

David Dorer 10 Dec 2023 14:05

---

PAT.merge.synth.blockgroups

*Merge Synthetic Blockgroup Files*

---

**Description**

Zip individual blockgroup files and merge into a single csv file.

**Usage**

```
PAT.merge.synth.blockgroups(state="25",ddir=datadir(),odir=outdir(),zip=TRUE,outtag="_test")
```

**Arguments**

|        |   |
|--------|---|
| state  | State FIPS code.  |
| ddir   | Data directory for output zip and output csv file.  |
| odir   | Directory with input csv tract files.   |
| zip    | 1: Zip tract files before merging. 0: Use existing zip file.  |
| minwt  | Only output records to the csv file with weights >= minwt. Total population of subset is scaled to agree with input data. Default 0.0 |
| outtag | Tag to append to zip file and output file names.  |

**Details**

xxx

**Value**

|          |   |
|----------|---|
| zip file | Output zip file synth_data_<state><outtag>.zip contains individual tract csv files.                             |
| csv file | Merged csv data file synth_data_blockgroup_all_<state><outtag>.csv contains stacked individual tract csv files. |

**Author(s)**

David Dorer 15 Dec 2023 14:54

---

PAT.merge.synth.tracts

*Merge Synthetic Tract Files*


---

### Description

Zip individual tract files and merge into a single csv file.

### Usage

```
PAT.merge.synth.tracts(state="25",ddir=datadir(),odir=outdir(),zip=TRUE,outtag="_test")
```

### Arguments

|        |   |
|--------|---|
| state  | State FIPS code.  |
| ddir   | Data directory for output zip and output csv file.  |
| odir   | Directory with input csv tract files.   |
| zip    | 1: create zip file with tract data. 0: Merge files in existing zip file.  |
| minwt  | Only output records to the csv file with weights $\geq$ minwt. Total population of subset is scaled to agree with input data. |
| outtag | Tag to append to zip file name and merged csv file name.  |

### Details

Merge tract synthetic data files in odir output: ddir/synth\_data\_tract\_all\_<state><outtag>.csv and zip them into synth\_tract\_<state><outtag>.zip

### Value

|          |  |
|----------|--|
| zip file | Output zip file synth_data_<state><outtag>.zip contains individual tract csv files.                        |
| csv file | Merged csv data file synth_data_tract_all_<state><outtag>.csv contains stacked individual tract csv files. |

### Author(s)

David Dorer 22 Dec 2023 09:57

---

PAT.model

*Statistical Models for Synthetic Data*


---

### Description

A model with PUMS variables and marginal tables.

### Usage

See BrooklineI.model and PennsylvaniaI.model for examples

**List Elements**

|                 |  |
|-----------------|--|
| name            | character variable with name for model, e.g. "BrooklineI"  |
| variables       | A named list with functions that define the variables.   |
| marginal.tables | A named list with functions that define the marginal tables. See PAT.acs.table for required arguments.       |
| parameters      | A named list with model parameters:  |
| model           | name of model. Same as name component.   |
| nages           | the number of age categories for model<br>(see PAT.nage.codes)   |
| nraces          | the number of race categories for model<br>(see PAT.nrace.codes)   |
| geotype         | type of geography "tract" or "blockgroup".   |
| comment         | comment (any text).  |
| ...             | optional user defined parameters that can be<br>passed to the model variables and marginal.tables functions. |

**Author(s)**

David Dorer

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|               |                           |
|---------------|---------------------------|
| PAT.pums.data | <i>Download PUMS Data</i> |
|---------------|---------------------------|

---

**Description**

Download PUMS data for a PUMA and create derived variables.

**Usage**

```
PAT.pums.data(state="25",puma="03301",model="BrooklineIII")
```

**Arguments**

|            |  |
|------------|--|
| state      | State FIPS code.   |
| puma       | PUMA FIPS code.  |
| model      | A model or the name of a model. Default NULL i.e. use variables to select variables  |
| variables  | Ignored in model is given. A character vector of variable names to download. May include defined derived variables. Ignored if model is given. |
| parameters | Named list of parameters for derived variables. Same as model component "parameters." Ignored if model is given.                               |
| vintage    | PUMS vintage. Default PAT.pums.vintage().  |
| period     | PUMS period. Default PAT.pums.period().  |
| key        | Census key. Default PAT.census.key().  |
| debug      | Level of messages to print. Default PAT.verbose().   |

Details

If SPM variables are used then period is set to 1.

Value

- A list with:
- person            Person level data.frame. Note person data.frame includes person levels for house variables.
  - house            House level data.frame. Note house data.frame is person data frame subset on SPORDER==1.
  - par              parameters from model (if model is used) or parameters argument.

Author(s)

David Dorer 11 Dec 2023 13:46

References

<https://www.census.gov/programs-surveys/acs/microdata/documentation.html> <https://www.census.gov/data/datasets/timer-series/demo/supplemental-poverty-measure/acs-research-files.html>

---

|                |  |
|----------------|--|
| PAT.repweights | Create Replicate Reights and Tabulations |
|----------------|--|

---

Description

Creates replicate weight design to be used in tabulations.

Usage

```
\code{PAT.repweights()} starts with a data.frame having a
\code{weights} variable and creates a \code{svy.repdesign} object.

\code{PAT.reptable()} creates a multiway table using a formula and
output from \code{PAT.repweights()}

\code{PAT.repweights(<data.frame>,seed=200,rep=100)} set random seed to
200 and create 100 replicate weights.

\code{PAT.reptable(<formula>,<svy.repdesign object>)} tabulate using a
formula and output from \code{PAT.repweights}
```

Arguments

- PAT.repweights:
- dat            data.frame with weights variable.
  - seed          random seed for bootstrap. <NA> don't set seed.
  - rep          number of replicate weights.



PAT.reptable:

|         |  |
|---------|--|
| formula | formula specifying tabulation variables. As in table or svytable functions |
| design  | svyrep.design, output of PAT.repweights() function.                        |

Details

Output of PAT.repweights() is used as input to PAT.reptable()

Value

svyrep.design object (PAT.repweights)  
multiway tabulation with dimension with "Est" and "MoE" (PAT.reptable).

Author(s)

David Dorer 26 Dec 2023 13:32

Examples

```
\code{PAT.repweights(dat=my.dataframe,seed=50,rep=80)}  
  
\code{PAT.reptable(~Age+Sex,design=design1)}
```

---

|          |                           |
|----------|---------------------------|
| PAT.root | <i>Set root directory</i> |
|----------|---------------------------|

---

Description

Set root folder/directory.

Usage

```
PAT.root("C:/Users/<my_user_name>/census/<project>/")  
or PAT.root() returns current value of PAT.root
```

Arguments

|         |  |
|---------|--|
| root    | Value to set root directory. NA (default) return root directory. |
| default | Default Value to set root directory. Default for default getwd() |

Details

Sets global PAT option "PAT.root"

Value

|      |   |
|------|---|
| root | Current value of root directory/folder. |
|------|---|

Author(s)

David Dorer 10 Dec 2023 14:18

PAT.synth.data

*Synthesize Data***Description**

Run a synthetic data model using a PUMA and set of marginal tables

**Usage**

```
PAT.synth.data(model="BrooklineIII", state="25", puma="03400", outtag="_test", iter=30)
```

**Arguments**

|              |   |
|--------------|---|
| model        | Model see vignette("CreatingModels")  |
| state        | State FIPS code   |
| puma         | PUMA FIPS code  |
| outtag       | A tag to include in some output file names  |
| iter         | Maximum number of IPF iterations  |
| vers         | Version of IPF program 1:Internal C code 2:mipfp package Ipfp function  |
| maxdev       | Termination criteria for relative change in marginal table deviation from one iteration to the next. Default 0.001  |
| add          | Add a small amount to every cell of seed/model table. This allows the data to take on non-zero weights even though the weight is zero in the PUMS data. Default 0.0 |
| minwt        | Records with weights < minwt will be dropped from the synthetic data. Default 0.001   |
| update       | Name of input checkpoint file. "" no input check point file Geographies in checkpoint file are skipped  |
| county       | Vector of county FIPS codes. Default character(0). For the default all the tracts in county will be run.  |
| tract        | Vector of tract FIPS codes Default character(0). For the default only tracts in tract will be run for county[1]   |
| bdir         | base directory for program run. Default PAT.root()  |
| odir         | Output directory. Tract synthetic files go here. Default PAT.root()/output/   |
| ddir         | Data directory. Cached ACS table go here. Various data files are stored here. For example the cross walk files. Default PAT.root()/data/                            |
| logfile      | File to log messages. Default synth_<state>_checkpoint<outtag>.txt.   |
| vintage      | ACS vintage for marginal tables default: PAT.vintage()  |
| period       | ACS period for marginal tables default: PAT.period()  |
| checkfile    | Output check point file. As tract output files are written a record with the geography is appended to this file.  |
| download     | Should marginal tables be downloaded? Default PAT.download()  |
| pums.vintage | PUMS/PUMA vintage default: PAT.pums.vintage()   |
| pums.period  | PUMS/PUMA period default: PAT.pums.period()   |
| key          | Census key. Default PAT.census.key().   |
| debug        | Verbose/debug level for printing messages. Default PAT.verbose()  |
| dump.seed    | Dump the PUMA seed table/dataset in a file. 0 no dump 1 dump. Default 0   |

Value

A log of the run. The other effects are the output files.

synthetic data    The output file go in odir with names synth\_data\_<state\_FIPS>\_<puma\_FIPS>\_<county\_FIPS>\_<tract\_FIPS>. The file has 3 initial comment lines with the output file name, last iteration, number of iterations (argument), convergence flag (1:yes 2:no) nages and nraces. The 4th row is a header record. Each data row has header variables:

|               |  |
|---------------|--|
| state         | State FIPS                                     |
| puma          | PUMA FIPS                                      |
| county        | County FIPS                                    |
| tract         | Tract FIPS                                     |
| blockgroup    | Blockgroup FIPS, set to "".                    |
| model         | Model name                                     |
| type          | person or house.                               |
| ages          | age parameter e.g. "9", "7", "7a".             |
| races         | race parameter, "3", "5", "7".                 |
| date          | date-time when record was written.             |
| variables ... | columns with the value of the model variables. |

Check point file

synth\_<state>\_checkpoint<outtag>.txt  
The file has the state, puma,count,tract and additional information. By using the check point file previously completed tracts will be skipped. Useful when you are doing an entire state and your computer updates and reboots. The file is appended to so if you want to start over but still use the update feature delete the check point file before you start a clean run.

Tract files        The synthetic data for each tract is put in a separate file in folder odir.

log file           Folder logdir() file name. Default log<outtag>.txt

Author(s)

David Dorer 20 Dec 2023 11:52

References

vignette("CreateModels")  
vignette("SynthesizeData")

---

|                   |                                 |
|-------------------|---------------------------------|
| PAT.synth.example | Run Synthetic Data Example/Test |
|-------------------|---------------------------------|

---

Description

Example/Test run of PAT.synth.data()

Usage

PAT.synth.example()

Arguments

No arguments.

Details

Runs the synthetic data generation step on an example. Used for testing setup.

Value

Log file, checkpoint file and synthetic tract data files.

Author(s)

David Dorer 16 Dec 2023 19:17

---

|                |                 |
|----------------|-----------------|
| PAT.test.model | Test PUMS model |
|----------------|-----------------|

---

Description

Test/Run a PUMS model checking for errors.

Usage

PAT.test.model(model="BrooklineIII")

Arguments

|          |  |
|----------|--|
| model    | model or model name (with or without quotes). Default: "TestI"                                     |
| state    | state FIPS   |
| puma     | PUMA FIPS  |
| key      | census key (default PAT.census.key())  |
| vintage  | marginal tables vintage (default PAT.vintage())  |
| period   | marginal tables period (default PAT.period())  |
| download | download data 1:download 0:used cached data (default PAT.download())                               |
| debug    | debug/message level - higher more messages 0:no messages 1+: more messages (default PAT.verbose()) |

Details

Tests model to be used for synthetizing data.

**Value**

list with components:

|                 |  |
|-----------------|--|
| marginals       | marginal tables/targets ("B","S","DP" PUMA geography table)  |
| variables       | one-way PUMS/PUMA frequency (weighted) of PUMA model table for variables used in marginal tables       |
| model.vars      | one-way PUMS/PUMA frequency tables for variables not used in marginal tables ("carry along" variables) |
| total.pop       | total population for marginal tables.  |
| puma.population | total population for PUMA PUMA data (sum of PUMS weights)  |
| diag            | Fit diagnostics for marginal fit   |
| diag\$marginal  | Observed marginal.   |
| diag\$fit       | "Expected" fitted marginal based on the PUMS table/model.  |
| diag\$std.moe   | Standardized residual based on marginal table MoE.   |
| diag\$std.res   | Standardized residual based on $\sqrt{(\text{Observed}-\text{fit})^2/\text{fit}}$ with sign            |
| diag\$devres    | Deviance residual (with sign)  |
| par             | various parameters state FIPS, PUMA FIPS, detail tables vintage & period, PUMS vintage & period.       |

**Author(s)**

David Dorer 10 Dec 2023 14:34

**References**

help(PAT.models)  
 help(Builtin.variables)  
 help(Builtin.marginals)

**Examples**

```
PAT.test.model("TestI",state="25",puma="03400")
PAT.test.model("NewYorkCityI",state="36",puma="03701")
```

---

|             |                                 |
|-------------|---------------------------------|
| PAT.vintage | <i>Set Period &amp; Vintage</i> |
|-------------|---------------------------------|

---

**Description**

Set Marginal Tables Vintage/Period and PUMS Variable Vintage/Period

**Usage**

```
PAT.vintage(2021)
PAT.vintage()
PAT.period(5)
PAT.pums.vintage(2021)
PAT.pums.period(1)
With no argument return value.
```

**Arguments**

period                      Period PAT.acs.table or period for PUMS data (1 or 5).

**Details**

Without an argument return current value.

**Value**

Current vintage or period.

**Author(s)**

David Dorer

---

PUMA.Blockgroup.2020    *PUMA (2012 & 2022) to Blockgroup (2020) Relationship File*

---

**Description**

PUMA to Blockgroup Correlation/Relationship Correspondence Dataset

**Usage**

```
data(PUMA.2012.Blockgroup.2020)   data(PUMA.2022.Tract.2020)
```

**Format**

245590 observations (2012 PUMAs)  
or 240942 observations (2022 PUMAs)

**Value**

A data.frame PUMA.2012.Blockgroup.2020 or PUMA.2022.Blockgroup.2020

**Variable names**

|            |                                      |
|------------|--------------------------------------|
| State      | State FIPS code.                     |
| Puma       | PUMA FIPS code.                      |
| County     | County FIPS code.                    |
| Tract      | Tract FIPS code.                     |
| StateAb    | State Postal Abbreviation.           |
| PumaName   | County name.                         |
| PumaName   | PUMA name.                           |
| Allocation | Fraction of Tract intersecting PUMA. |

## References

Missouri Census Data Center Geocorr Engine.  
<https://mcdc.missouri.edu/applications/geocorr2022.html>  
 Census Public Use Microdata Areas (PUMAs) webpage. 2020\_Census\_Tract\_to\_2020\_PUMA.txt

---

PUMA.Tract.2020

*PUMA (2012 & 2022) to Tract (2020) Relationship File*

---

## Description

PUMA to Tract Correlation/Relationship Correspondence Dataset

## Usage

`data(PUMA.2022.Tract.2020)`   `data(PUMA.2012.Tract.2020)`

## Format

88865 observations (2012 PUMAs)  
 or 85395 observations (2020 PUMAs)

## Value

A data.frame PUMA.2012.Tract.2020 or PUMA.2022.Tract.2020

## Variable names

|            |                                      |
|------------|--------------------------------------|
| State      | State FIPS code.                     |
| Puma       | PUMA FIPS code.                      |
| County     | County FIPS code.                    |
| Tract      | Tract FIPS code.                     |
| StateAb    | State Postal Abbreviation.           |
| PumaName   | County name.                         |
| PumaName   | PUMA name.                           |
| Allocation | Fraction of Tract intersecting PUMA. |

## References

Missouri Census Data Center Geocorr Engine.  
<https://mcdc.missouri.edu/applications/geocorr2022.html>  
 Census Public Use Microdata Areas (PUMAs) webpage. 2020\_Census\_Tract\_to\_2020\_PUMA.txt

---

|            |                              |
|------------|------------------------------|
| RecodeAges | <i>Recode Age Categories</i> |
|------------|------------------------------|

---

**Description**

Recode age categories of tables derived from B01001 and B01001A-I.

**Usage**

```
RecodeAges(tab,nages="9")
```

**Arguments**

- |       |  |
|-------|--|
| tab   | table with 14 or 23 rows, age rownames, and colnames c("Est","MoE")          |
| nages | "number" of age categories, e.g. 9, "7a" etc.                                |
| doc   | Flag TRUE/1 print documentation/return age recode list for nages. Default 0. |
| debug | debug/message level. Default 0. Higher values of debug print more messages.  |

**Details**

B01001 has 2 levels Sex (Male/Female) and age categories. For example the "Male" rows need to be pulled out before the recode.

**Value**

- |       |  |
|-------|--|
| table | Table with Est and MoE columns and recode age rownames/values. |
|-------|--|

**Author(s)**

David Dorer 13 Dec 2023 11:08

---

|             |                             |
|-------------|-----------------------------|
| SplitString | <i>Split Table Rownames</i> |
|-------------|-----------------------------|

---

**Description**

Split the rownames of a table into components.

**Usage**

```
SplitString("Male : Under 5 years",s=" : ")
```

**Arguments**

- |   |  |
|---|--|
| x | character vector.  |
| s | String to use to split x into components. Default " : ". |



**Details**

Separates the "levels" of a table rowname by splitting it at a ":" string. Used to separate components of an ACS table rownames/labels.

**Value**

Character matrix with as many rows as the length of x and as many columns as the element of x with the largest number of substrings. The rows of the matrix are "padded out" by "" character string as needed.

**Author(s)**

David Dorer 12 Dec 2023 19:56

---

|                  |  |
|------------------|--|
| SPM.2021.25.data | <i>Supplemental Poverty Measure dataset for Massachusetts (FIPS 25).</i> |
|------------------|--|

---

**Description**

Supplemental Poverty Measure dataset subset for Massachusetts (FIPS 25).

**Usage**

```
data(SPM.2021.25.data)
```

**Value**

A data.frame with 67951 observations and 46 variables.

**References**

SPM datasets <https://www.census.gov/topics/income-poverty/supplemental-poverty-measure/data/datasets.html>  
 Data Dictionary <https://www2.census.gov/programs-surveys/supplemental-poverty-measure/datasets/spm/spm-asc-2020.pdf>

---

|             |                                   |
|-------------|-----------------------------------|
| WeightedSum | <i>Weighted Sum of Table Rows</i> |
|-------------|-----------------------------------|

---

**Description**

Compute the weighted sum of rows of a table

**Usage**

```
WeightedSum(table, weights=c(1, -1))
```

**Arguments**

|         |   |
|---------|---|
| x       | Table with rows and columns. The colnames are c("Est", "MoE")   |
| weights | Numeric vector of weights with length 1 or nrows(x). If weights has length 1 it is repeated down the rows. Default 1. |

**Details**

Computes the weighted sum of the "Est" column and the associated MoE. With the default weights (1) the Est result is the sum of the table rows and MoE is the associated MoE. The MoE is computed using the approximate formulas for standard error and variance. To take the difference of 2 rows use c(1,-1) as the weights.

**Value**

|       |  |
|-------|--|
| table | A table with 1 row and 2 columns "Est" and "MoE" |
|-------|--|

**Author(s)**

David Dorer 12 Dec 2023 19:50

**References**

Understanding and Using the American Community Survey. **Chapter 8** <https://www.census.gov/content/dam/Census/libr>

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