Metrics

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Contents

Metrics:labeling factors and exploring scales

Report explains how the response categories from NLSY97 questionnaire are labeled and demonstrates application of labeled factors in data operations and graphing.

Data preliminaries

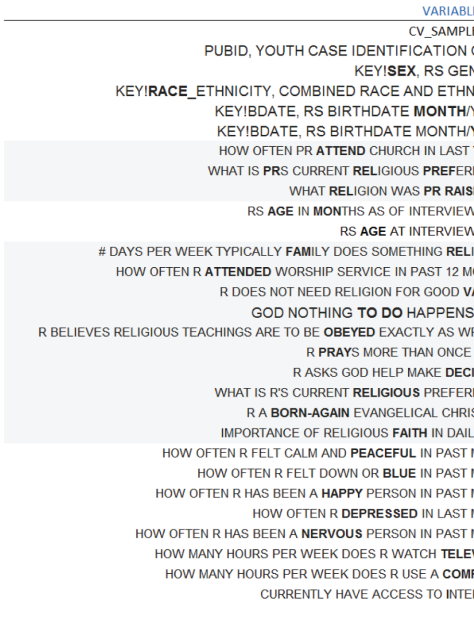


Figure 3.2 Databox slice of variables sel

Initial point of departure - the databox of the selected variables, described in the Methods chapter.
This databox corresponds to the dataset **dsL** produced by Derive_dsL_from_Extract report, given in the Appendix.

```
dsL<-readRDS("./Data/Derived/dsL.rds")
```

sample	id	sex	race	bmonth	byear	attendPR	relprefPR	relraisedPR	year	agemon	ageyear	famrel	attend	values	todo	obeyed	pray	decisions	relpref	bornagain	faith	calm	blue	happy	depressed	nervous	tv	computer	internet
1	1	2	4	9	1981	7	21	21	1997	190	15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1	1	2	4	9	1981	7	21	21	1998	206	17	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1	1	2	4	9	1981	7	21	21	1999	219	18	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1	1	2	4	9	1981	7	21	21	2000	231	19	NA	1	NA	NA	NA	NA	NA	NA	NA	NA	3	3	3	3	3	NA	NA	NA
1	1	2	4	9	1981	7	21	21	2001	243	20	NA	6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1	1	2	4	9	1981	7	21	21	2002	256	21	NA	2	1	1	1	0	1	NA	NA	NA	4	2	3	2	1	2	5	NA
1	1	2	4	9	1981	7	21	21	2003	266	22	NA	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1
1	1	2	4	9	1981	7	21	21	2004	279	23	NA	1	NA	NA	NA	NA	NA	NA	NA	NA	4	1	4	1	1	NA	NA	0
1	1	2	4	9	1981	7	21	21	2005	290	24	NA	1	0	1	0	0	1	21	NA	NA	NA	NA	NA	NA	NA	NA	NA	1
1	1	2	4	9	1981	7	21	21	2006	302	25	NA	1	NA	NA	NA	NA	NA	NA	NA	NA	4	1	4	1	1	NA	NA	1
1	1	2	4	9	1981	7	21	21	2007	313	26	NA	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	6	1
1	1	2	4	9	1981	7	21	21	2008	325	27	NA	1	0	1	0	0	1	21	NA	3	3	3	3	3	3	NA	NA	1
1	1	2	4	9	1981	7	21	21	2009	337	28	NA	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	6	1
1	1	2	4	9	1981	7	21	21	2010	350	29	NA	1	NA	NA	NA	NA	NA	NA	NA	NA	3	3	3	3	3	1	6	1
1	1	2	4	9	1981	7	21	21	2011	360	29	NA	1	0	1	0	0	1	21	NA	1	NA	NA	NA	NA	NA	NA	6	1
1	2	1	2	7	1982	NA	NA	NA	1997	178	14	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1	2	1	2	7	1982	NA	NA	NA	1998	196	16	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Figure 3.3 Generic dataset used in the current study, view for one respondent

Labeling Factor Levels

Review of the item reference cards shows that initially, all items were recorded on some discrete scale, either counting occasions or assigning an intiger to a category of response. However, data were saved as numerical values or intigers

```
ds<- dsL[,1:(ncol(dsL)/2)]# selects the first half of variables
str(ds)
```

```
'data.frame':   134745 obs. of  30 variables:
 $ sample     : int  1 1 1 1 1 1 1 1 1 1 ...
 $ id         : int  1 1 1 1 1 1 1 1 1 1 ...
 $ sex        : int  2 2 2 2 2 2 2 2 2 2 ...
 $ race       : int  4 4 4 4 4 4 4 4 4 4 ...
 $ bmonth     : int  9 9 9 9 9 9 9 9 9 9 ...
 $ byear      : int  1981 1981 1981 1981 1981 1981 1981 1981 1981 1981 ...
 $ attendPR   : int  7 7 7 7 7 7 7 7 7 7 ...
 $ relprefPR  : int  21 21 21 21 21 21 21 21 21 21 ...
 $ relraisedPR: int  21 21 21 21 21 21 21 21 21 21 ...
 $ year       : int  1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 ...
 $ agemon     : num  190 206 219 231 243 256 266 279 290 302 ...
 $ ageyear    : num  15 17 18 19 20 21 22 23 24 25 ...
 $ famrel     : num  NA NA NA NA NA NA NA NA NA NA ...
 $ attend     : num  NA NA NA 1 6 2 1 1 1 1 ...
 $ values     : num  NA NA NA NA NA 1 NA NA 0 NA ...
 $ todo       : num  NA NA NA NA NA 1 NA NA 1 NA ...
 $ obeyed     : num  NA NA NA NA NA 1 NA NA 0 NA ...
 $ pray       : num  NA NA NA NA NA 0 NA NA 0 NA ...
 $ decisions  : num  NA NA NA NA NA 1 NA NA 1 NA ...
 $ relpref    : num  NA NA NA NA NA NA NA NA 21 NA ...
 $ bornagain  : num  NA NA NA NA NA NA NA NA NA NA ...
 $ faith      : num  NA NA NA NA NA NA NA NA NA NA ...
 $ calm       : num  NA NA NA 3 NA 4 NA 4 NA 4 ...
 $ blue       : num  NA NA NA 3 NA 2 NA 1 NA 1 ...
 $ happy      : num  NA NA NA 3 NA 3 NA 4 NA 4 ...
 $ depressed  : num  NA NA NA 3 NA 2 NA 1 NA 1 ...
 $ nervous    : num  NA NA NA 3 NA 1 NA 1 NA 1 ...
 $ tv         : num  NA NA NA NA NA 2 NA NA NA NA ...
 $ computer   : num  NA NA NA NA NA 5 NA NA NA NA ...
 $ internet   : num  NA NA NA NA NA NA 1 0 1 1 ...
```

LabelingFactorLevels.R sourced at the end of Derive_dsL_from_Extract matches numeric values with response labels from the questionnaire and adds to **dsL** copies of the variables, saved as labeled factors. For estimations routines such as lme4 or

graphing functions such as ggplot, the data type (string,numeric, factor) is a meaningful input, so a quick access to both formats frequently proves useful. It is convenient to think that **dsL** contains only

```
ncol(dsL)/2
```

```
[1] 30
```

variables, but each of them has a double, a labeled factor.

```
str(dsL)
```

```
'data.frame':   134745 obs. of  60 variables:
 $ sample      : int  1 1 1 1 1 1 1 1 1 1 ...
 $ id          : int  1 1 1 1 1 1 1 1 1 1 ...
 $ sex         : int  2 2 2 2 2 2 2 2 2 2 ...
 $ race        : int  4 4 4 4 4 4 4 4 4 4 ...
 $ bmonth      : int  9 9 9 9 9 9 9 9 9 9 ...
 $ byear       : int  1981 1981 1981 1981 1981 1981 1981 1981 1981 1981 ...
 $ attendPR    : int  7 7 7 7 7 7 7 7 7 7 ...
 $ relprefPR   : int  21 21 21 21 21 21 21 21 21 21 ...
 $ relraisedPR : int  21 21 21 21 21 21 21 21 21 21 ...
 $ year        : int  1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 ...
 $ agemon      : num  190 206 219 231 243 256 266 279 290 302 ...
 $ ageyear     : num  15 17 18 19 20 21 22 23 24 25 ...
 $ famrel      : num  NA NA NA NA NA NA NA NA NA NA ...
 $ attend      : num  NA NA NA 1 6 2 1 1 1 1 ...
 $ values      : num  NA NA NA NA NA 1 NA NA 0 NA ...
 $ todo        : num  NA NA NA NA NA 1 NA NA 1 NA ...
 $ obeyed      : num  NA NA NA NA NA 1 NA NA 0 NA ...
 $ pray        : num  NA NA NA NA NA 0 NA NA 0 NA ...
 $ decisions   : num  NA NA NA NA NA 1 NA NA 1 NA ...
 $ relpref     : num  NA NA NA NA NA NA NA NA 21 NA ...
 $ bornagain   : num  NA NA NA NA NA NA NA NA NA NA ...
 $ faith       : num  NA NA NA NA NA NA NA NA NA NA ...
 $ calm        : num  NA NA NA 3 NA 4 NA 4 NA 4 ...
 $ blue        : num  NA NA NA 3 NA 2 NA 1 NA 1 ...
 $ happy       : num  NA NA NA 3 NA 3 NA 4 NA 4 ...
 $ depressed   : num  NA NA NA 3 NA 2 NA 1 NA 1 ...
 $ nervous     : num  NA NA NA 3 NA 1 NA 1 NA 1 ...
 $ tv          : num  NA NA NA NA NA 2 NA NA NA NA ...
 $ computer    : num  NA NA NA NA NA 5 NA NA NA NA ...
 $ internet    : num  NA NA NA NA NA NA 1 0 1 1 ...
 $ sampleF     : Ord.factor w/ 2 levels "Cross-Sectional"<..: 1 1 1 1 1 1 1 1 1 1 ...
 $ idF         : Factor w/ 8983 levels "1","2","3","4",..: 1 1 1 1 1 1 1 1 1 1 ...
 $ sexF        : Ord.factor w/ 3 levels "Male"<"Female"<..: 2 2 2 2 2 2 2 2 2 2 ...
 $ raceF       : Ord.factor w/ 4 levels "Black"<"Hispanic"<..: 4 4 4 4 4 4 4 4 4 4 ...
 $ bmonthF     : Ord.factor w/ 12 levels "Jan"<"Feb"<"Mar"<..: 9 9 9 9 9 9 9 9 9 9 ...
 $ byearF      : Factor w/ 5 levels "1980","1981",..: 2 2 2 2 2 2 2 2 2 2 ...
 $ attendPRF   : Ord.factor w/ 8 levels "Never"<"Once or Twice"<..: 7 7 7 7 7 7 7 7 7 7 ...
 $ relprefPRF  : Ord.factor w/ 33 levels "Catholic"<"Baptist"<..: 21 21 21 21 21 21 21 21 21 21 ...
 $ relraisedPRF: Ord.factor w/ 33 levels "Catholic"<"Baptist"<..: 21 21 21 21 21 21 21 21 21 21 ...
 $ yearF       : Factor w/ 15 levels "1997","1998",..: 1 2 3 4 5 6 7 8 9 10 ...
 $ agemonF     : Factor w/ 244 levels "146","147","148",..: 45 61 74 86 98 111 121 134 145 157 ...
```

```
 $ ageyearF    : Factor w/ 21 levels "12","13","14",..: 4 6 7 8 9 10 11 12 13 14 ...
 $ famrelF     : Factor w/ 8 levels "0","1","2","3",..: NA NA NA NA NA NA NA NA NA NA ...
 $ attendF     : Ord.factor w/ 8 levels "Never"<"Once or Twice"<..: NA NA NA 1 6 2 1 1 1 1 ...
 $ valuesF     : Ord.factor w/ 2 levels "FALSE/less Religious"<..: NA NA NA NA NA 2 NA NA 1 NA ...
 $ todoF       : Ord.factor w/ 2 levels "FALSE/less Religious"<..: NA NA NA NA NA 2 NA NA 2 NA ...
 $ obeyedF     : Ord.factor w/ 2 levels "FALSE/less Religious"<..: NA NA NA NA NA 2 NA NA 1 NA ...
 $ prayF       : Ord.factor w/ 2 levels "FALSE/less Religious"<..: NA NA NA NA NA 1 NA NA 1 NA ...
 $ decisionsF  : Ord.factor w/ 2 levels "FALSE/less Religious"<..: NA NA NA NA NA 2 NA NA 2 NA ...
 $ relprefF    : Ord.factor w/ 33 levels "Catholic"<"Baptist"<..: NA NA NA NA NA NA NA NA 21 NA ...
 $ bornagainF  : Ord.factor w/ 2 levels "NO"<"YES": NA NA NA NA NA NA NA NA NA NA ...
 $ faithF      : Ord.factor w/ 5 levels "Exrtemely"<"Very"<..: NA NA NA NA NA NA NA NA NA NA ...
 $ calmF       : Ord.factor w/ 4 levels "All of the time"<..: NA NA NA NA NA NA NA NA NA NA ...
 $ blueF       : Ord.factor w/ 4 levels "All of the time"<..: NA NA NA NA NA NA NA NA NA NA ...
 $ happyF      : Ord.factor w/ 4 levels "All of the time"<..: NA NA NA NA NA NA NA NA NA NA ...
 $ depressedF  : Ord.factor w/ 4 levels "All of the time"<..: NA NA NA NA NA NA NA NA NA NA ...
 $ nervousF    : Ord.factor w/ 4 levels "All of the time"<..: NA NA NA NA NA NA NA NA NA NA ...
 $ tvF         : Ord.factor w/ 6 levels "less than 2"<..: NA NA NA NA NA 2 NA NA NA NA ...
 $ computerF   : Ord.factor w/ 6 levels "None"<"less than 1"<..: NA NA NA NA NA 5 NA NA NA NA ...
 $ internetF   : Ord.factor w/ 2 levels "No"<"Yes": NA NA NA NA NA NA 2 1 2 2 ...
```

This give a certain flexibity to assemble needed dataset quickly and have access to factor labels. One can alternate between the raw metric and labeled factor by adding "F" suffix to the end of the variable name:

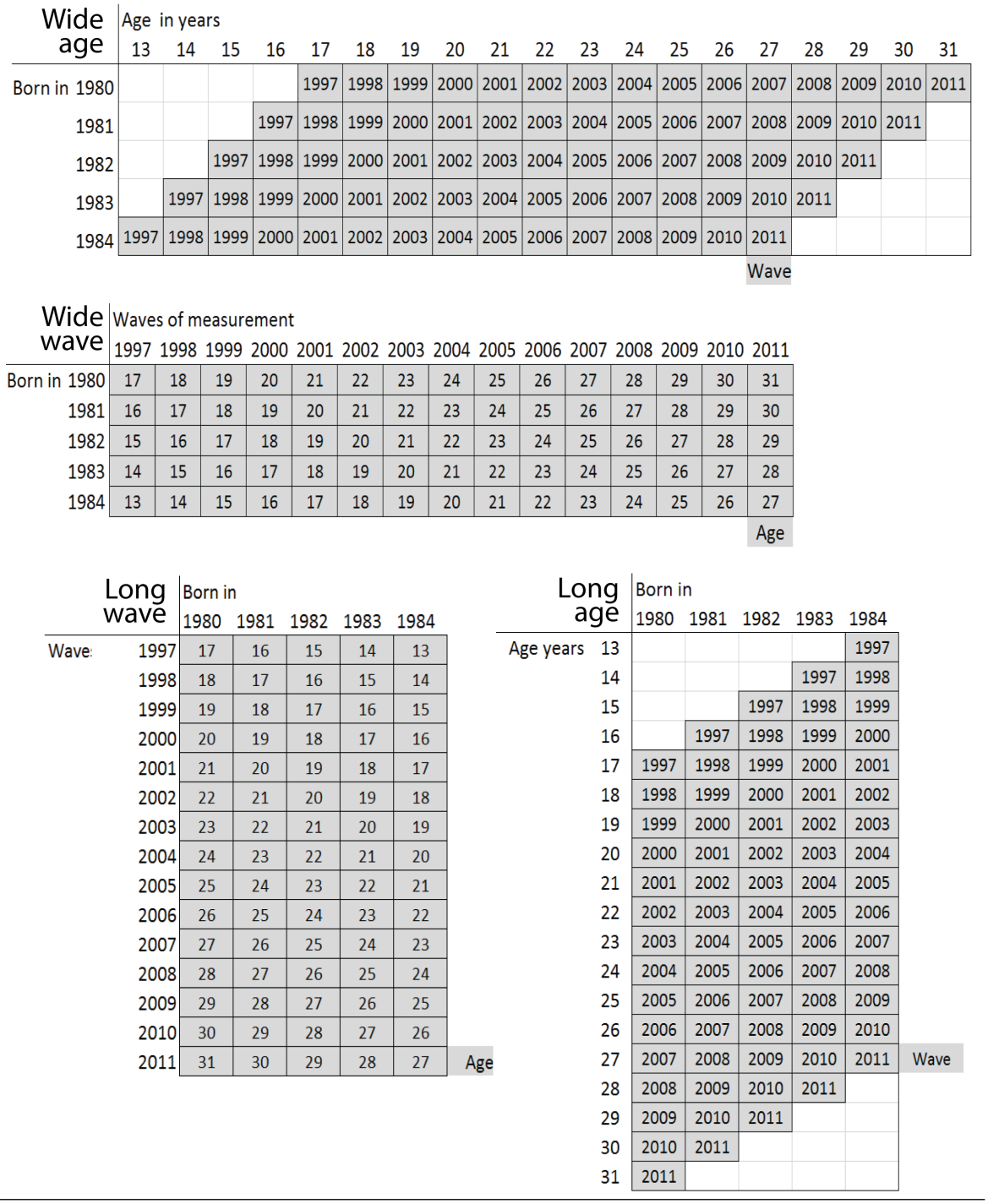
```
selectCols<-c("year","id","byear","attend","attendF") # select the columns with these names
ds<-dsL[,selectCols] # select all rows for the columns listed  selectCols
print(ds[ds$id==1,]) # print all availible data for respondent with ID 1
```

```
   year id byear attend         attendF
1  1997  1  1981     NA            <NA>
2  1998  1  1981     NA            <NA>
3  1999  1  1981     NA            <NA>
4  2000  1  1981      1           Never
5  2001  1  1981      6 About once/week
6  2002  1  1981      2   Once or Twice
7  2003  1  1981      1           Never
8  2004  1  1981      1           Never
9  2005  1  1981      1           Never
10 2006  1  1981      1           Never
11 2007  1  1981      1           Never
12 2008  1  1981      1           Never
13 2009  1  1981      1           Never
14 2010  1  1981      1           Never
15 2011  1  1981      1           Never
```

Having quick access to factor labels will be especially useful during graph production. For the grammer rules of operations with relevant data see Data Manipulation Guide.

Time metrics : Age, Period, Cohort

NLSY97 sample includes individuals from five cohorts, born between 1980 and 1984.The following graphics shows how birth cohort, age of respondents, and round of observation are related in NSLY97.



Wide age	Age in years																		
	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Born in 1980					1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1981				1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	
1982			1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011		
1983		1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011			
1984	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011				
															Wave				

Wide wave	Waves of measurement														
	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Born in 1980	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
1981	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1982	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
1983	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
1984	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
															Age

Long wave	Born in					
	1980	1981	1982	1983	1984	
Wave: 1997	17	16	15	14	13	
1998	18	17	16	15	14	
1999	19	18	17	16	15	
2000	20	19	18	17	16	
2001	21	20	19	18	17	
2002	22	21	20	19	18	
2003	23	22	21	20	19	
2004	24	23	22	21	20	
2005	25	24	23	22	21	
2006	26	25	24	23	22	
2007	27	26	25	24	23	
2008	28	27	26	25	24	
2009	29	28	27	26	25	
2010	30	29	28	27	26	
2011	31	30	29	28	27	Age

Long age	Born in					
	1980	1981	1982	1983	1984	
Age years 13					1997	
14				1997	1998	
15			1997	1998	1999	
16		1997	1998	1999	2000	
17	1997	1998	1999	2000	2001	
18	1998	1999	2000	2001	2002	
19	1999	2000	2001	2002	2003	
20	2000	2001	2002	2003	2004	
21	2001	2002	2003	2004	2005	
22	2002	2003	2004	2005	2006	
23	2003	2004	2005	2006	2007	
24	2004	2005	2006	2007	2008	
25	2005	2006	2007	2008	2009	
26	2006	2007	2008	2009	2010	
27	2007	2008	2009	2010	2011	Wave
28	2008	2009	2010	2011		
29	2009	2010	2011			
30	2010	2011				
31	2011					

Figure 3.1 Overview of the age-period-cohort structure of NLSY97

NSLY97 contains static and dynamic indicators of age. Variables byear and bmonth were recorded once in 1997 (static) and contain respondentsâ€™ birth year and birth month respectively. Two age variables were recorded continuously at each interview (dynamic): age at the time of the interview in months (agemon) and in years (ageyear).

```
ds<- dsL %>% dplyr::filter(id==25, year %in% c(1997:2011)) %>% dplyr::select(id,bmonthF,byear,year, agem
  mutate (age = (year-byear+1), ageD = agemon/12)
print(ds)
```

```
   id bmonthF byear year agemon ageyear age  ageD
1  25     Mar  1983 1997    167      13  15 13.92
2  25     Mar  1983 1998    188      15  16 15.67
3  25     Mar  1983 1999    201      16  17 16.75
4  25     Mar  1983 2000    214      17  18 17.83
5  25     Mar  1983 2001    226      18  19 18.83
6  25     Mar  1983 2002    236      19  20 19.67
7  25     Mar  1983 2003    254      21  21 21.17
8  25     Mar  1983 2004    261      21  22 21.75
9  25     Mar  1983 2005    272      22  23 22.67
10 25     Mar  1983 2006    284      23  24 23.67
11 25     Mar  1983 2007    295      24  25 24.58
12 25     Mar  1983 2008    307      25  26 25.58
13 25     Mar  1983 2009    319      26  27 26.58
14 25     Mar  1983 2010    332      27  28 27.67
15 25     Mar  1983 2011    342      28  29 28.50
```

The variable ageyear records the full number of years a respondent reached at the time of the interview. Due to difficulties of administering the survey, time intervals between the waves could differ. For example, for one person id = 25 the age was recorded as 21 years for both 2003 and 2004 (see ageyear). However, when you examine age in months (agemon) you can see this rounding issue disappears, once a more precise scale is used. To avoid this potentially confusing peculiarity, age in years will be calculated as age = year â€“ byear +1 or as (ageD = agemon/12). The suffix D in ageD refers to the fact that it was calculated from a dynamic age indicator.

=== Read more in ./Models/Descriptives:
+ Metrics - how values of items are labeled + Descriptives - basic stats of various items
+ Attendance - focus on church attendence over time
+ Databox