Metrics

Andriy Koval

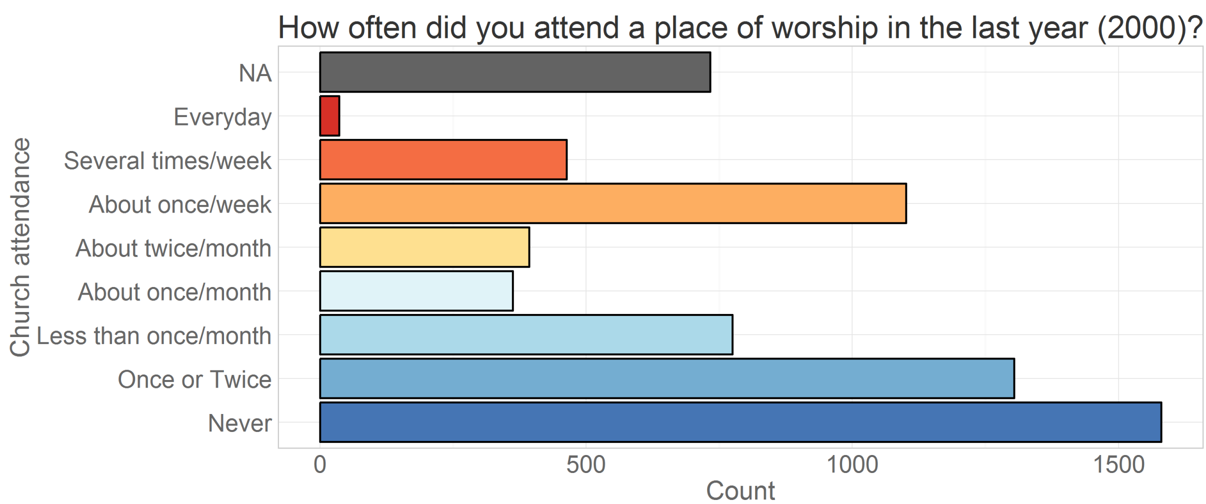
Tuesday, June 24, 2014

Contents

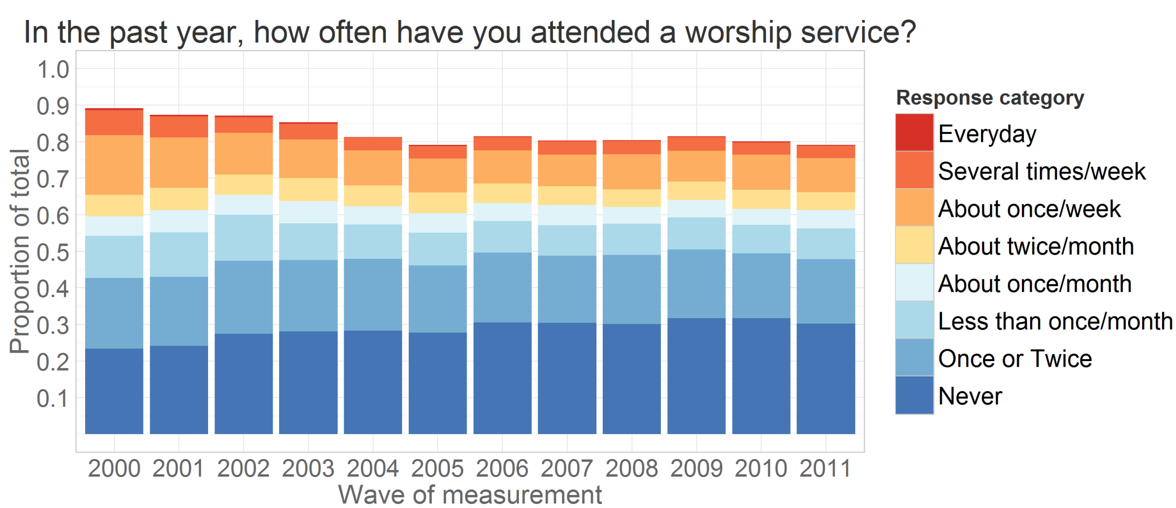
Mapping Church Attendance in Time

Cross-Sectional View

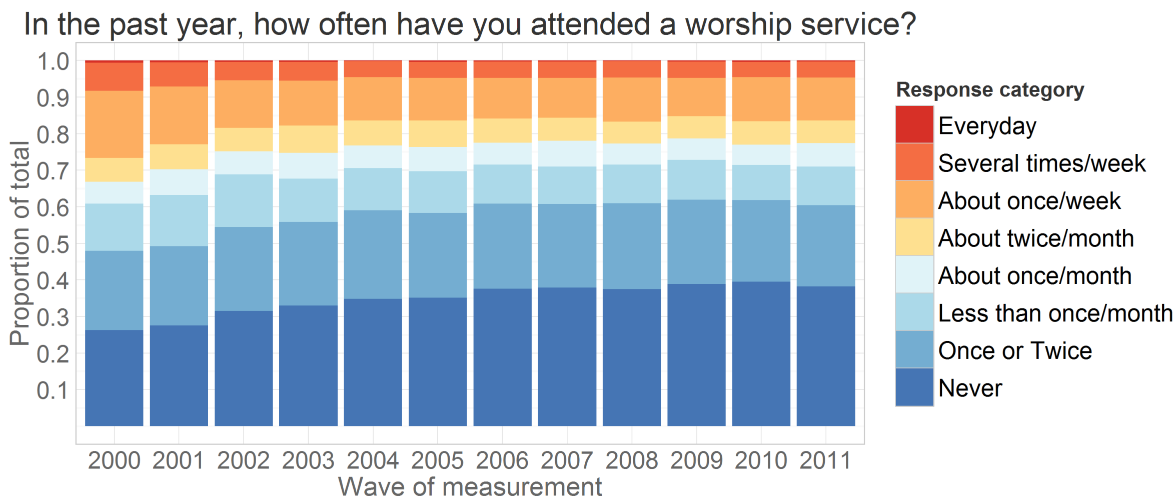
The focal variable of interest is **attend**, the item measuring church attendance for the year that preceded the interview date. The questionnaire recorded the responses on the ordinal scale.



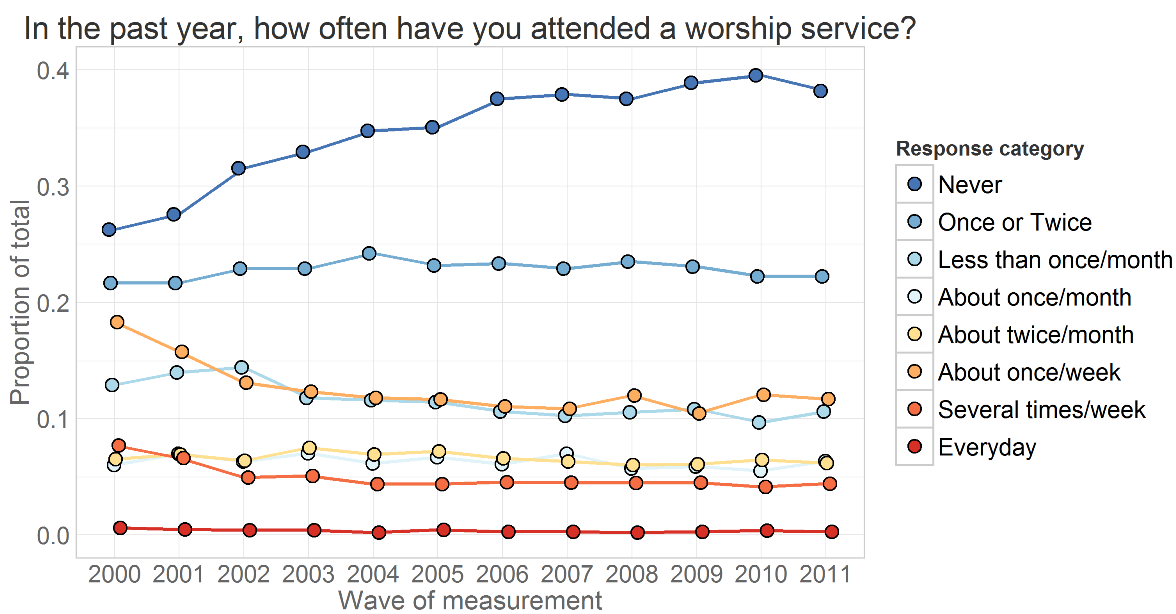
Creating frequency distributions for each of the measurement wave we have:



Missing values are used in the calculation of total responses to show the natural attrition in the study. Assumming that attrition is not significantly associated with the outcome measure, we can remove missing values from the calculation of the total and look at prevalence of endorsements over time.



Tracing the rate of change of prevalence in a line graph, we see more clearly which categores increase over time (e.g. "Never"), which decline (e.g. ""About once/week), and which stay relatively stable (e.g. "About twice/month")



Longitudinal View

Graphs above shows change in the cross-sectional distribution of responses over the years. Modeling the change in these response frequencies is handled well by Markov models. LCM, however, works with longitudinal data, modeling the trajectory of each individual and treating attendance as a continuous outcome.

To demonstrate mapping of individual trajectories to time, let's select a dataset that would include personal identifyer (**id**), cohort indicator (**byear**), wave of measurement (**year**) and the focal variable of interest - worship attendance (**attend**).

```r
ds<- dsL %>%  dplyr::filter(year %in% c(2000:2011), id==47) %>%
              dplyr:: select(id, byear, year, attend, attendF)
print(ds)
```

```
   id byear year attend             attendF
1  47  1982 2000      5   About twice/month
2  47  1982 2001      2       Once or Twice
3  47  1982 2002      4    About once/month
4  47  1982 2003      2       Once or Twice
5  47  1982 2004      3 Less than once/month
6  47  1982 2005      2       Once or Twice
7  47  1982 2006      2       Once or Twice
8  47  1982 2007      3 Less than once/month
9  47  1982 2008      2       Once or Twice
10 47  1982 2009      1               Never
11 47  1982 2010      1               Never
12 47  1982 2011      1               Never
```

The view above lists attendance data for subjust with id = 47. Mapping his attendance to time we have

where vertical dimension maps the outcome value and the horizontal maps the time. There will be a trajecory for each of the

```r
length(unique(dsL$id))
```

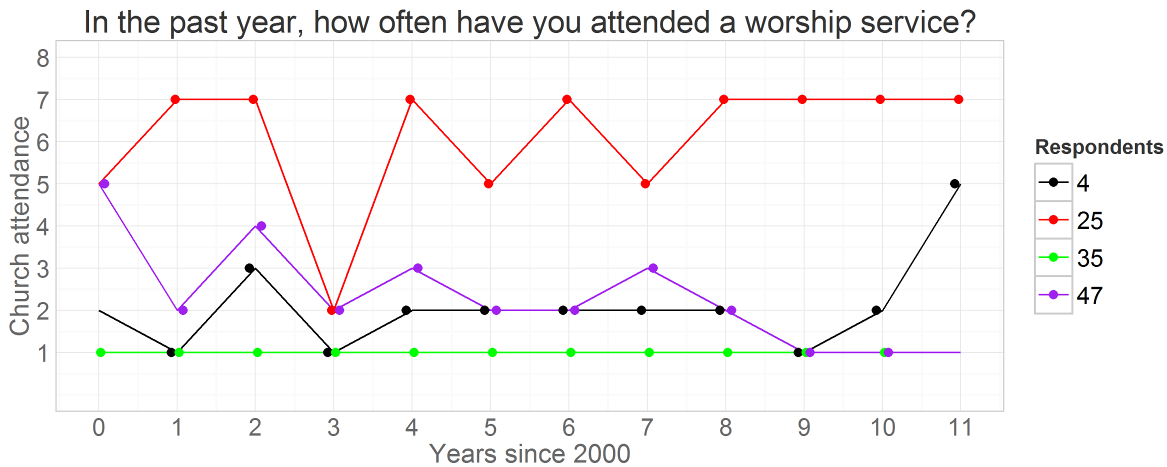
```
[1] 8983
```

subjects in total. Unless specified otherwise, only individuals from the cross-sample will be used in the model to increase external validity.

```r
ds<- dsL %>% dplyr::filter(sample==1)
```

Each of such trajectories imply a story, a life scenario. Why one person grows in his religious involvement, while other declines, or never develops an interest in the first place? To demostrate how interpretations of trajectories can vary among individuals consider the following scenario.

Attendance trajectories of subjects with **id**s 4, 25, 35, and 47 are plotted in the next graph



The respondent **id**=35 reported attending no worship services in any of the years, while respodent **id**=25 seemed to frequent it, indicating weekly attendance in 8 out of the 12 years. Individual **id**=47 started as a fairly regular attendee of religious services in 2000 (5= "about twice a month"), then gradually declined his involvement to nill in 2009 and on. Respondent **id**=4, on the other hand started off with a rather passive involvement, reporting attended church only "Once or twice" in 2000, maintained a low level of participation throughout the years, only to surge his attendance in 2011. Latent curve models will describe intraindividual trajectories of change, while summarizinig the interindividual similarities and trends.

Previous research in religiousity indicated that age might be one of the primary factors explaining interindividual differences in church attendance. To examine the role of age, we change the metric of time from waves of measurement, as in the previous graph, to biological age. There are, however, a number of ways information about age was recorded.

```
ds<- dsL %>% dplyr::filter(id %in% c(4,25,35,47),year %in% c(2000:2011)) %>%
  dplyr::select(idF,attend, year, byear, ageyear, agemon, ageyear) %>%
  mutate(time=year-2000, age=(year-byear+1), ageCurrent = agemon/12)
print(ds[ds$idF==25,])
```

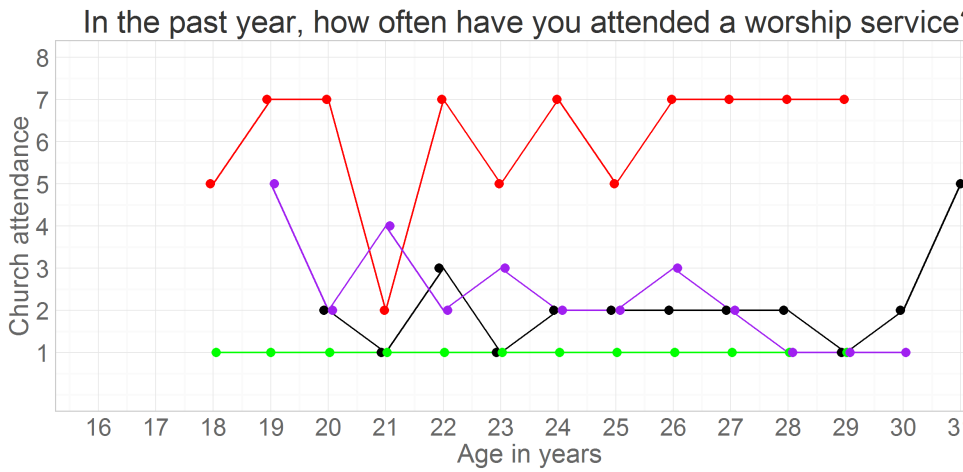
```
   idF attend year byear ageyear agemon time age ageCurrent
13  25      5 2000  1983      17    214    0  18      17.83
14  25      7 2001  1983      18    226    1  19      18.83
15  25      7 2002  1983      19    236    2  20      19.67
16  25      2 2003  1983      21    254    3  21      21.17
17  25      7 2004  1983      21    261    4  22      21.75
18  25      5 2005  1983      22    272    5  23      22.67
19  25      7 2006  1983      23    284    6  24      23.67
20  25      5 2007  1983      24    295    7  25      24.58
21  25      7 2008  1983      25    307    8  26      25.58
22  25      7 2009  1983      26    319    9  27      26.58
23  25      7 2010  1983      27    332   10  28      27.67
24  25      7 2011  1983      28    342   11  29      28.50
```

```
ds
```

```
   idF attend year byear ageyear agemon time age ageCurrent
1    4      2 2000  1981      19    238    0  20      19.83
2    4      1 2001  1981      20    251    1  21      20.92
3    4      3 2002  1981      21    262    2  22      21.83
4    4      1 2003  1981      22    276    3  23      23.00
```

5	4	2	2004	1981	23	287	4	24	23.92
6	4	2	2005	1981	24	297	5	25	24.75
7	4	2	2006	1981	25	309	6	26	25.75
8	4	2	2007	1981	26	320	7	27	26.67
9	4	2	2008	1981	27	336	8	28	28.00
10	4	1	2009	1981	28	344	9	29	28.67
11	4	2	2010	1981	29	357	10	30	29.75
12	4	5	2011	1981	30	368	11	31	30.67
13	25	5	2000	1983	17	214	0	18	17.83
14	25	7	2001	1983	18	226	1	19	18.83
15	25	7	2002	1983	19	236	2	20	19.67
16	25	2	2003	1983	21	254	3	21	21.17
17	25	7	2004	1983	21	261	4	22	21.75
18	25	5	2005	1983	22	272	5	23	22.67
19	25	7	2006	1983	23	284	6	24	23.67
20	25	5	2007	1983	24	295	7	25	24.58
21	25	7	2008	1983	25	307	8	26	25.58
22	25	7	2009	1983	26	319	9	27	26.58
23	25	7	2010	1983	27	332	10	28	27.67
24	25	7	2011	1983	28	342	11	29	28.50
25	35	1	2000	1983	17	216	0	18	18.00
26	35	1	2001	1983	18	227	1	19	18.92
27	35	1	2002	1983	19	239	2	20	19.92
28	35	1	2003	1983	20	250	3	21	20.83
29	35	1	2004	1983	21	264	4	22	22.00
30	35	1	2005	1983	22	274	5	23	22.83
31	35	1	2006	1983	23	286	6	24	23.83
32	35	1	2007	1983	24	297	7	25	24.75
33	35	1	2008	1983	25	310	8	26	25.83
34	35	1	2009	1983	26	320	9	27	26.67
35	35	1	2010	1983	27	334	10	28	27.83
36	35	1	2011	1983	28	345	11	29	28.75
37	47	5	2000	1982	18	220	0	19	18.33
38	47	2	2001	1982	19	233	1	20	19.42
39	47	4	2002	1982	20	243	2	21	20.25
40	47	2	2003	1982	21	257	3	22	21.42
41	47	3	2004	1982	22	266	4	23	22.17
42	47	2	2005	1982	23	280	5	24	23.33
43	47	2	2006	1982	24	292	6	25	24.33
44	47	3	2007	1982	25	302	7	26	25.17
45	47	2	2008	1982	26	315	8	27	26.25
46	47	1	2009	1982	27	326	9	28	27.17
47	47	1	2010	1982	28	339	10	29	28.25
48	47	1	2011	1982	29	351	11	30	29.25

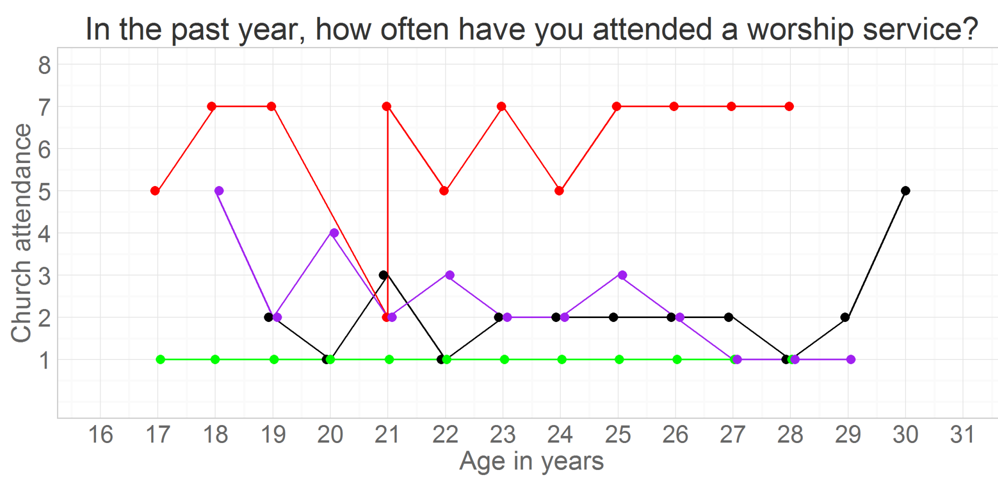
Note that for person **id** = 25 the age was recorded as 21 years for both 2003 and 2004. However, when you examine age in months (**agemon**) you can see this is rounding issue that disappears once a more precise scale is used. To avoid this potentially confusing peculiarity, age in years will be either calculated as (**age** = **year** - **byear** + 1)



Plotting age, caclulated as age = year - byear + 1

```
ds<- dsL %>% dplyr::filter(id %in% c(4,25,35,47),year %in% c(2000:2011)) %>%
  dplyr::select(idF,year,attend,agemon,ageyear) %>%
  mutate(time=year-2000, age=ageyear)
head(ds,12)
```

```
   idF year attend agemon ageyear time age
1    4 2000      2    238      19    0  19
2    4 2001      1    251      20    1  20
3    4 2002      3    262      21    2  21
4    4 2003      1    276      22    3  22
5    4 2004      2    287      23    4  23
6    4 2005      2    297      24    5  24
7    4 2006      2    309      25    6  25
8    4 2007      2    320      26    7  26
9    4 2008      2    336      27    8  27
10   4 2009      1    344      28    9  28
11   4 2010      2    357      29   10  29
12   4 2011      5    368      30   11  30
```



Plotting age, caclulated as age = ageyear

Plotting age, caclulated as age = agemon/12

```r
ds<- dsL %>% dplyr::filter(id %in% c(4,25,35,47),year %in% c(2000:2011)) %>%
  dplyr::select(idF,year,attend,agemon,ageyear,byear) %>%
  mutate(time=year-2000, age=agemon/12)
head(ds,12)
```

```
   idF year attend agemon ageyear byear time   age
1    4 2000      2    238      19  1981    0 19.83
2    4 2001      1    251      20  1981    1 20.92
3    4 2002      3    262      21  1981    2 21.83
4    4 2003      1    276      22  1981    3 23.00
5    4 2004      2    287      23  1981    4 23.92
6    4 2005      2    297      24  1981    5 24.75
7    4 2006      2    309      25  1981    6 25.75
8    4 2007      2    320      26  1981    7 26.67
9    4 2008      2    336      27  1981    8 28.00
10   4 2009      1    344      28  1981    9 28.67
11   4 2010      2    357      29  1981   10 29.75
12   4 2011      5    368      30  1981   11 30.67
```