ARC CENTRE OF EXCELLENCE IN POPULATION AGEING RESEARCH

Projecting Births in Iran Using a Three-Parameter Model

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Background

- In a previous paper based on Australia, the argument was made that, for all births beyond the first birth, parity and interval since the last birth are much better predictors of the number and timing of future births than is age – particularly age on its own.

- McDonald, P. and Kippen , R. 2011. Forecasting births. Feature Article, ABS Catalogue Number 2051.0, Australian Bureau of Statistics, Canberra. http://www.abs.gov.au/ausstats/abs@.nsf/mf/2051.0

Rationale: Probabilities

- The patterning of births is such that parity is the principal determinant of whether or not a woman will have another birth and that time since the last birth is a good predictor of when she will have the next birth.
  - A 37-years-old women who had her first birth three years ago is much more likely to have the next birth than a 27 year-old woman who had her first birth 10 years ago.

Rationale: Population at risk

- McDonald and Kippen demonstrated in the Australian case that there was a high degree of stability across time in age-parity-time since last birth probabilities of birth for all births other than the first. The principal determinant of change then became the rate and timing of first births.
- Changes in the timing of first births produced changes in the relevant population at risk by age, parity and time since last birth and forecasting accuracy was greatly enhanced by taking the three-parameter population into consideration because it took into account previous changes in first births.

The centrality of the first birth

The Australian study concluded:

When fertility rates are low, the main factor that affects the **annual** incidence of births is changes in the rates of first birth by age across successive cohorts of women.

Data requirements: two large matrices

- 1. A matrix of probabilities of birth by single years of age (35), single parity (10) and single years since the time of the last birth (10) = 3500 cells (but a large number of the cells are zero or near zero).
- 2. An equivalent (3500 cell) matrix of the population at risk (but again a large number of the cells are zero or near zero).
- Deriving the database requires a very large survey or census, or accumulation from birth registration data.

Data inputs for Iran

1) 1986, 1996, 2006 Censuses

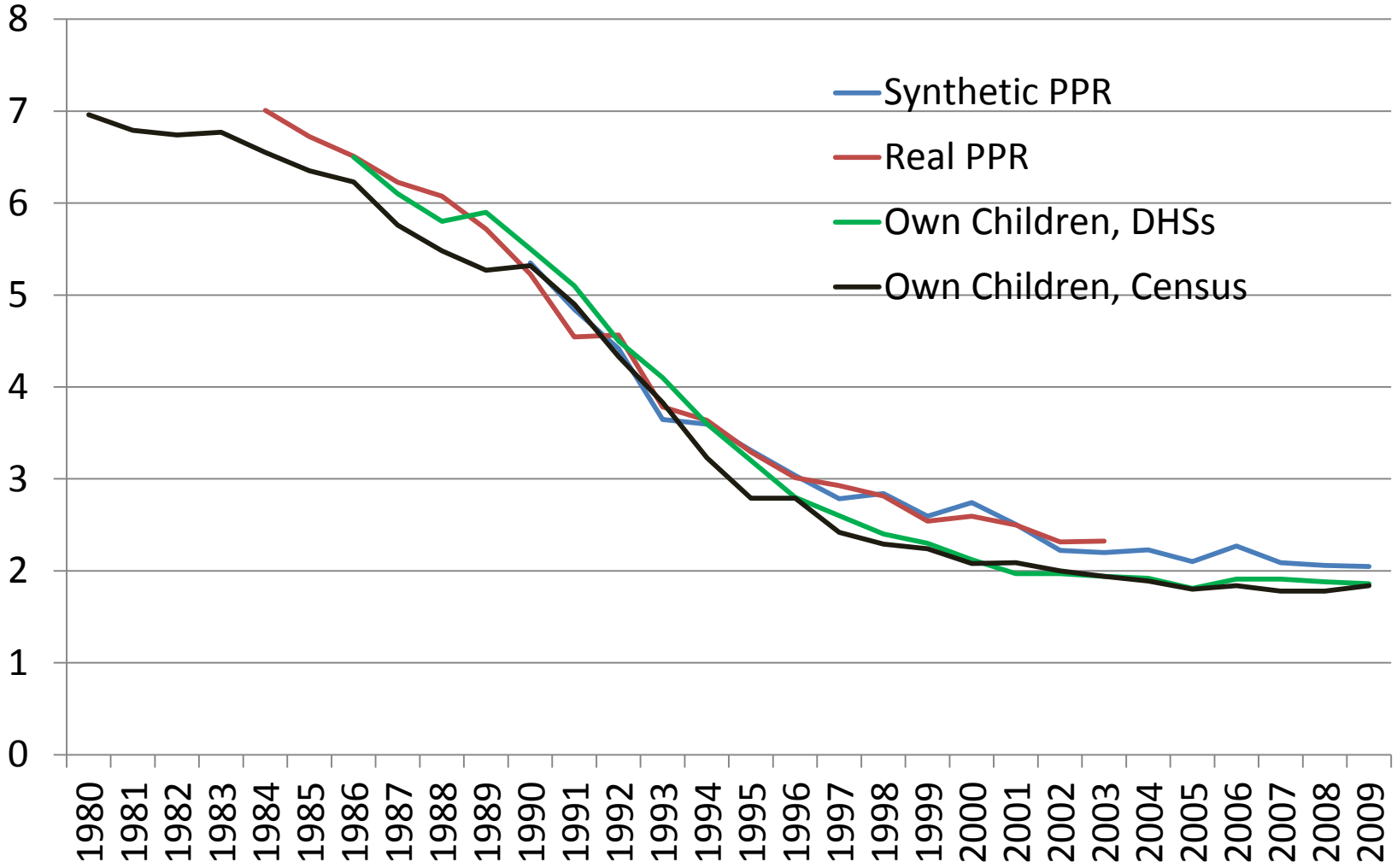
2) The 2000 Iran Demographic Health Survey (IDHS)

Households interviewed:	**113,913**
Ever married women 15-49:	**90,240**
Births occurred to women:	**316,371**

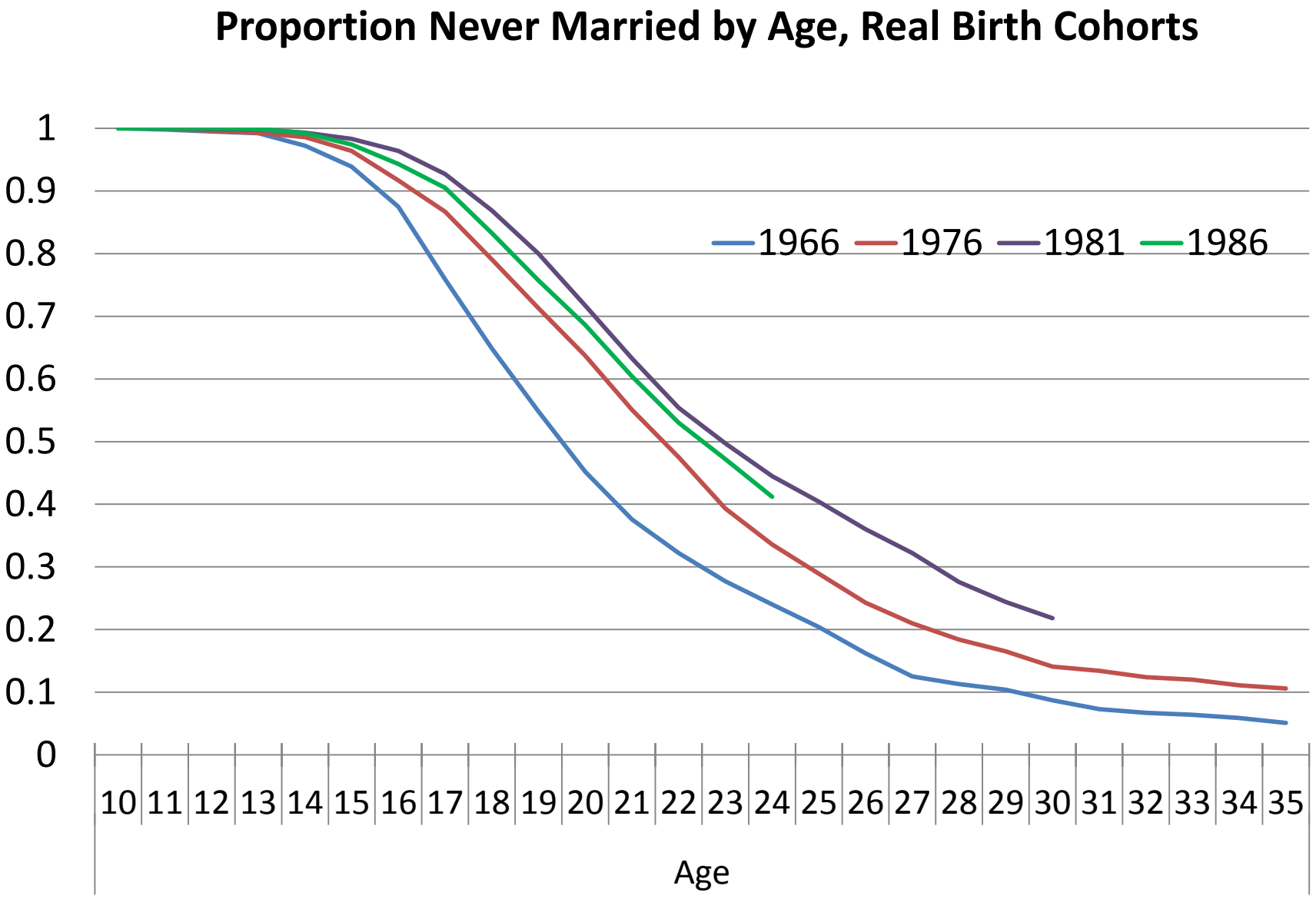
3) The 2010 Iran Multiple Indexes & Demographic Health Survey (IDHS)

Households interviewed:	**31,350**
Ever married women 15-54:	**34,435**
Births occurred to women:	**62,189**

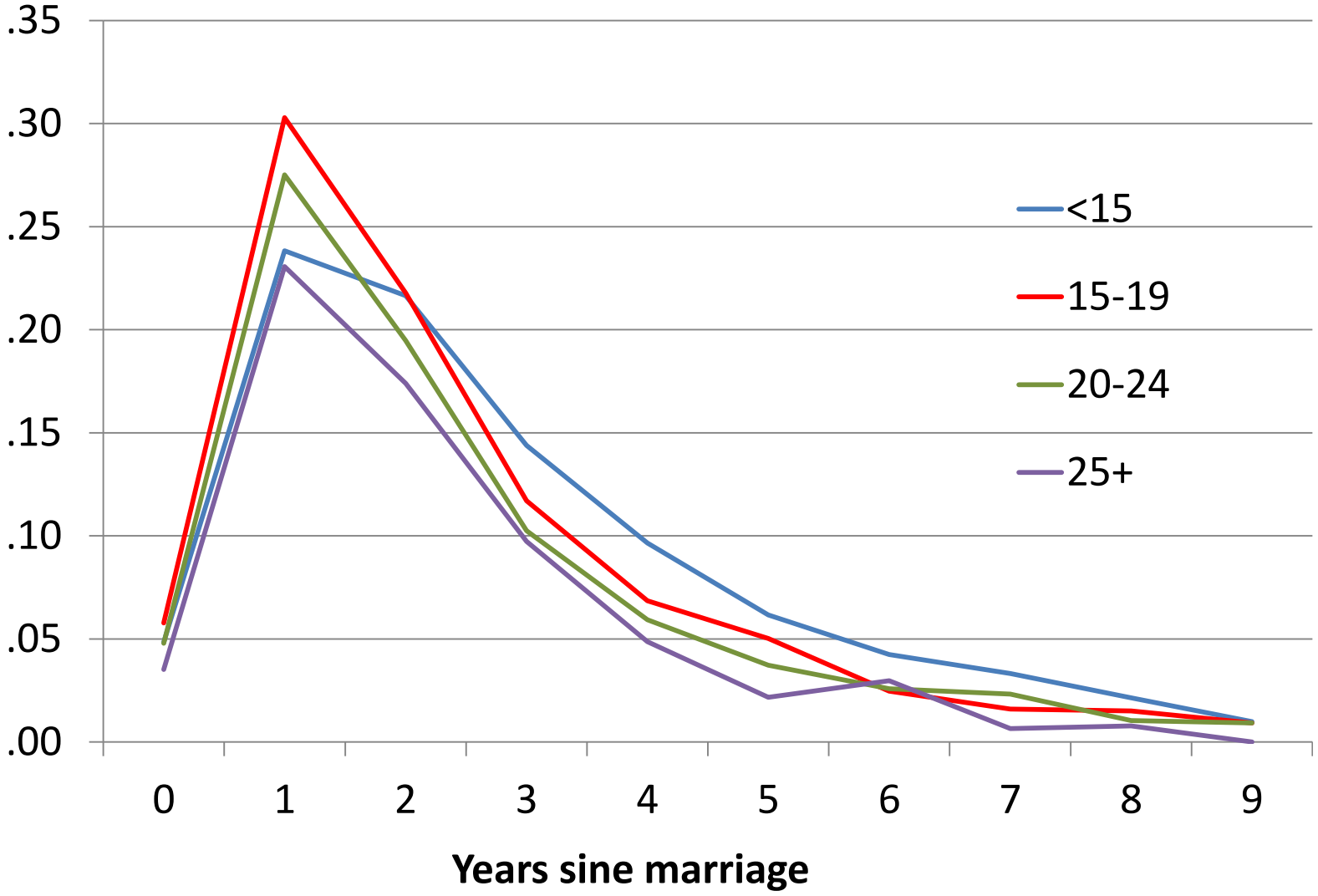
Figure 18. Total Fertility Rate, Iran, 1980-2009



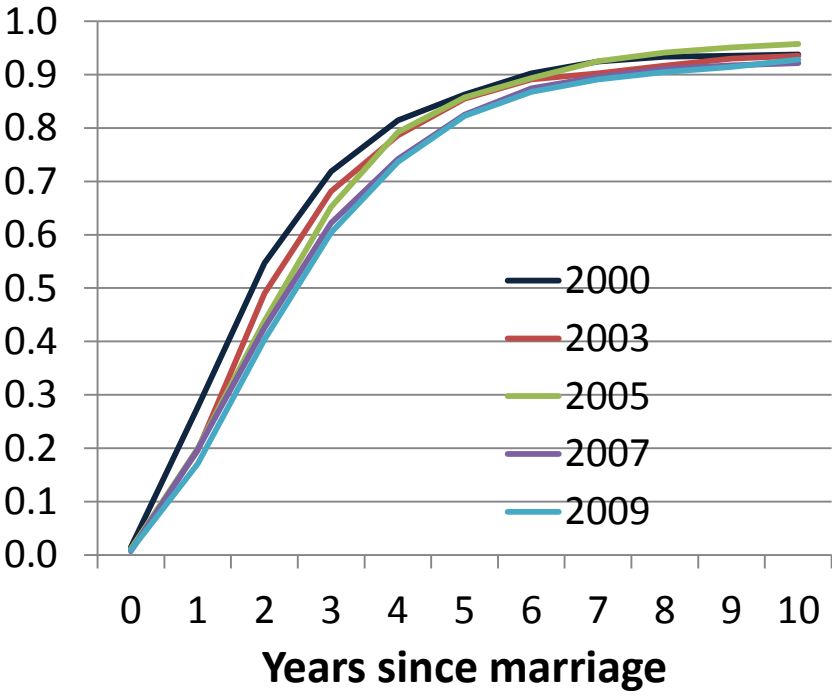
Data sources: The 2010 and 2000 Iran DHS and the 2006 and 2011 Censuses

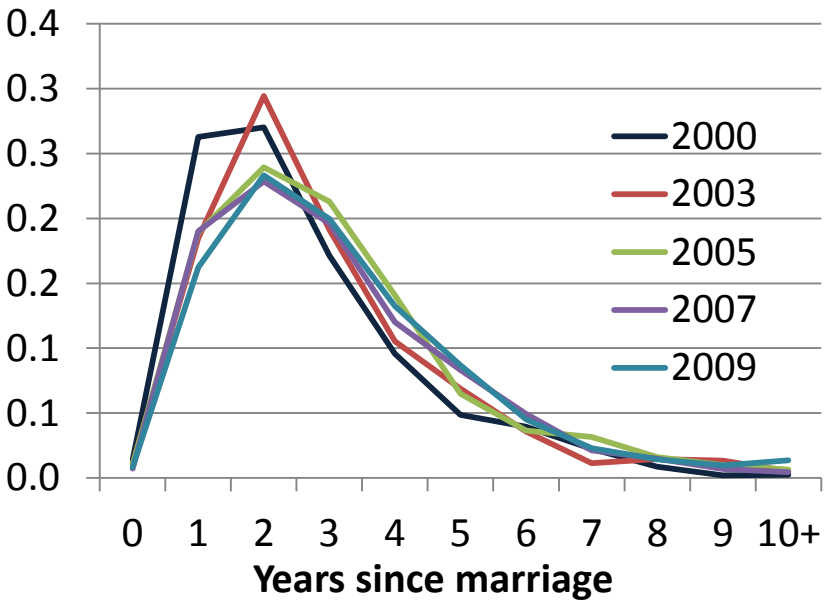

Proportion Never Married by Age, Real Birth Cohorts
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1966
1976
1981
1986
10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35
Age

Probability of first birth by years since marriage for women's age at marriage

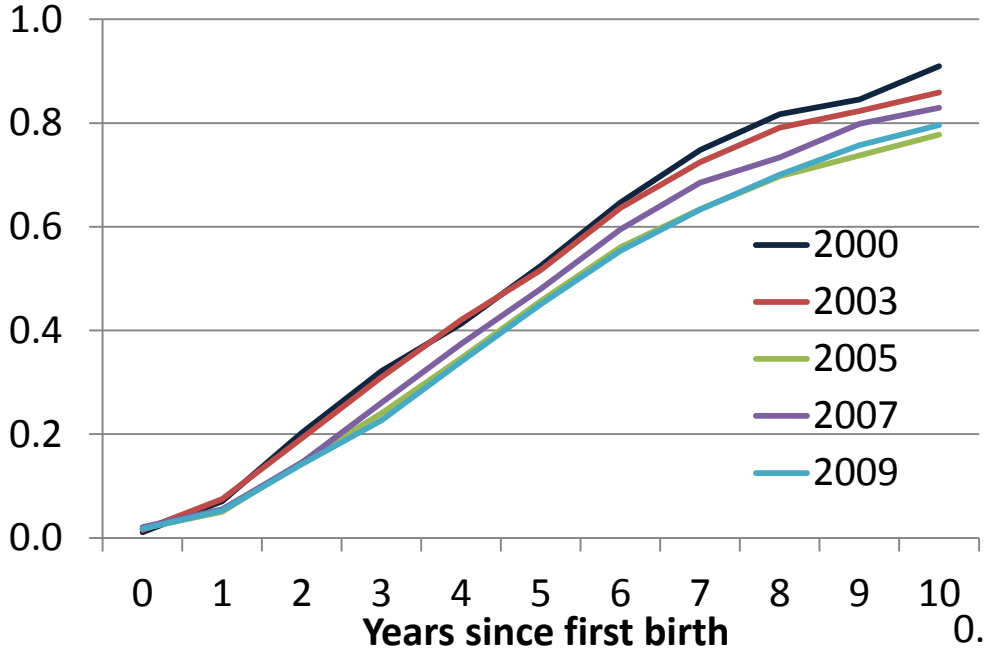


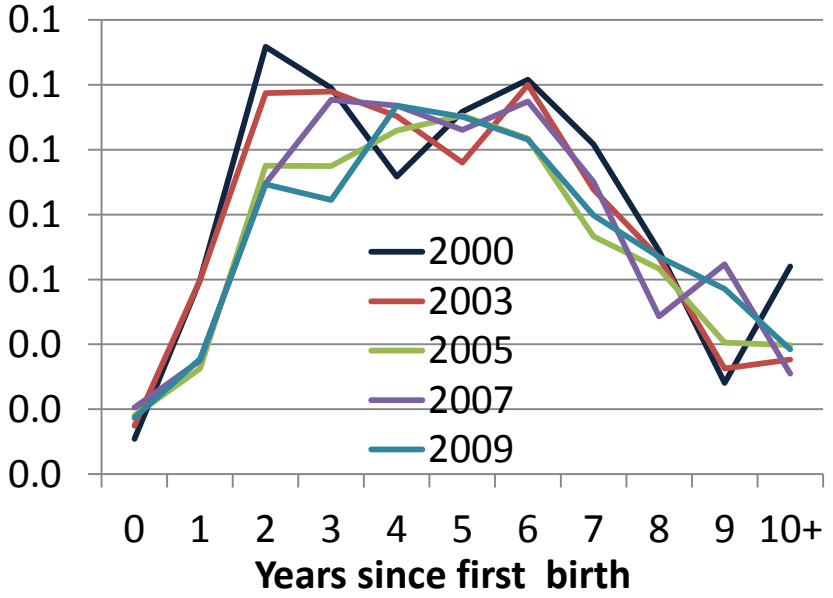
Probability of having first birth by years since marriage for selected years in which the first birth occurred



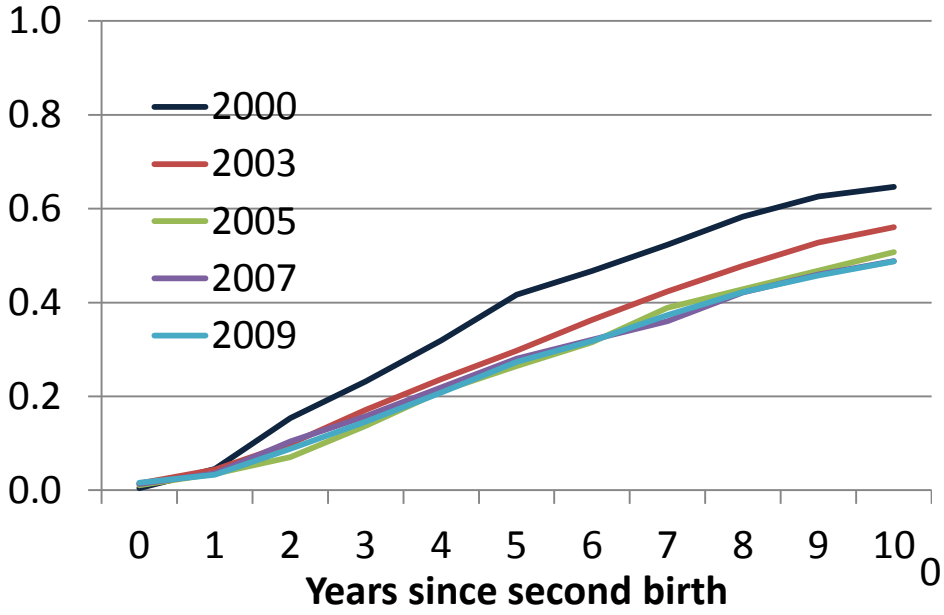


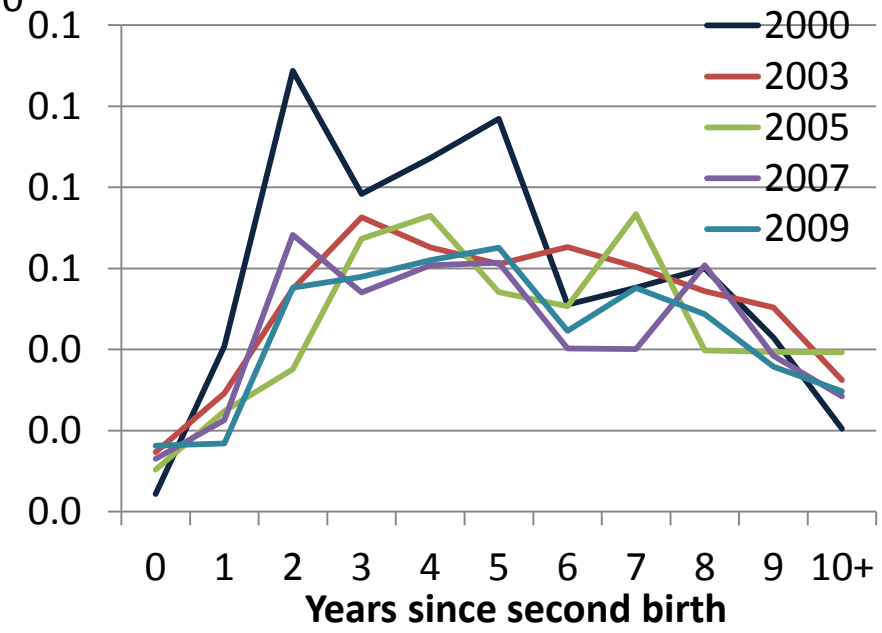
Probability of having second birth by years since first birth for selected years in which the second birth occurred

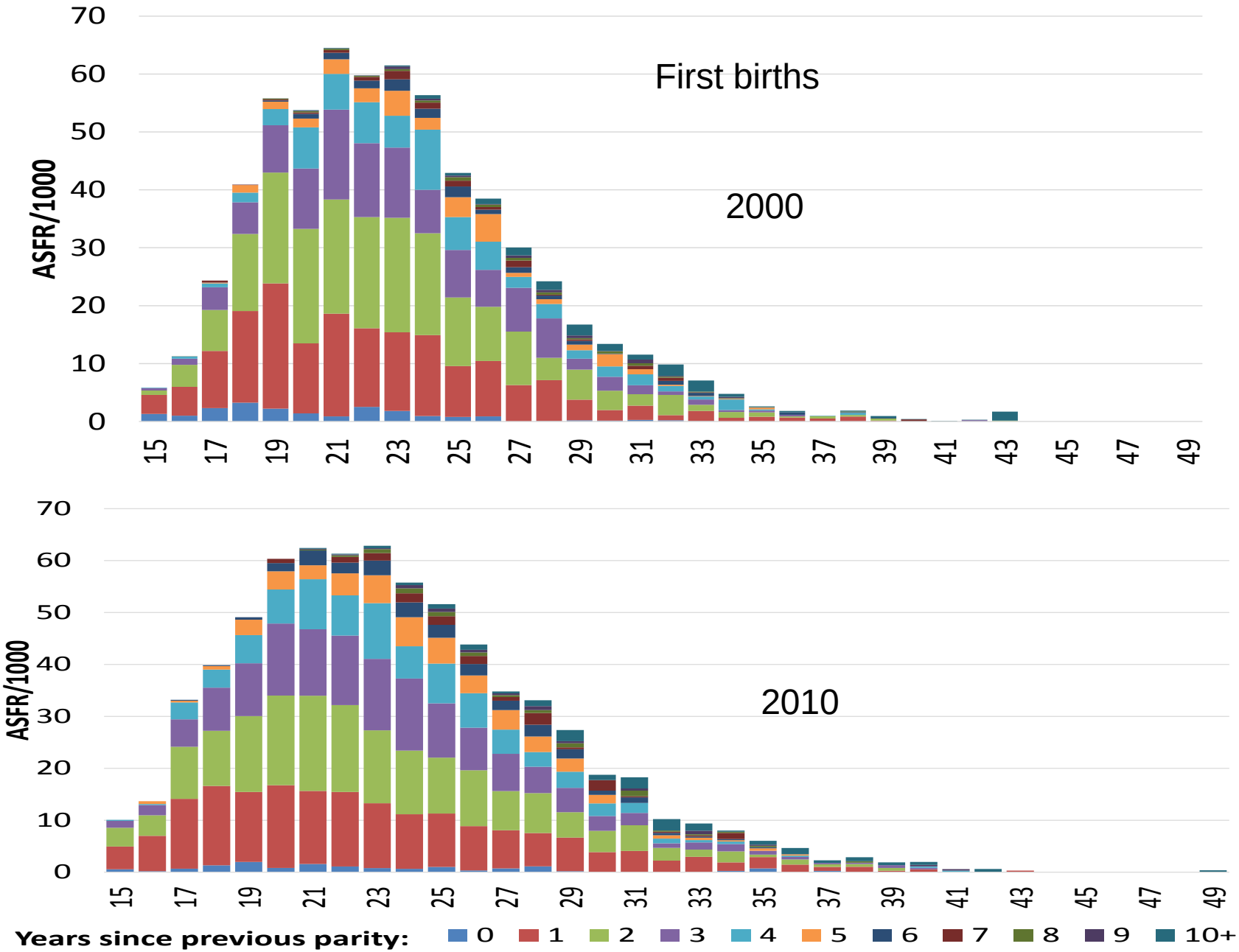


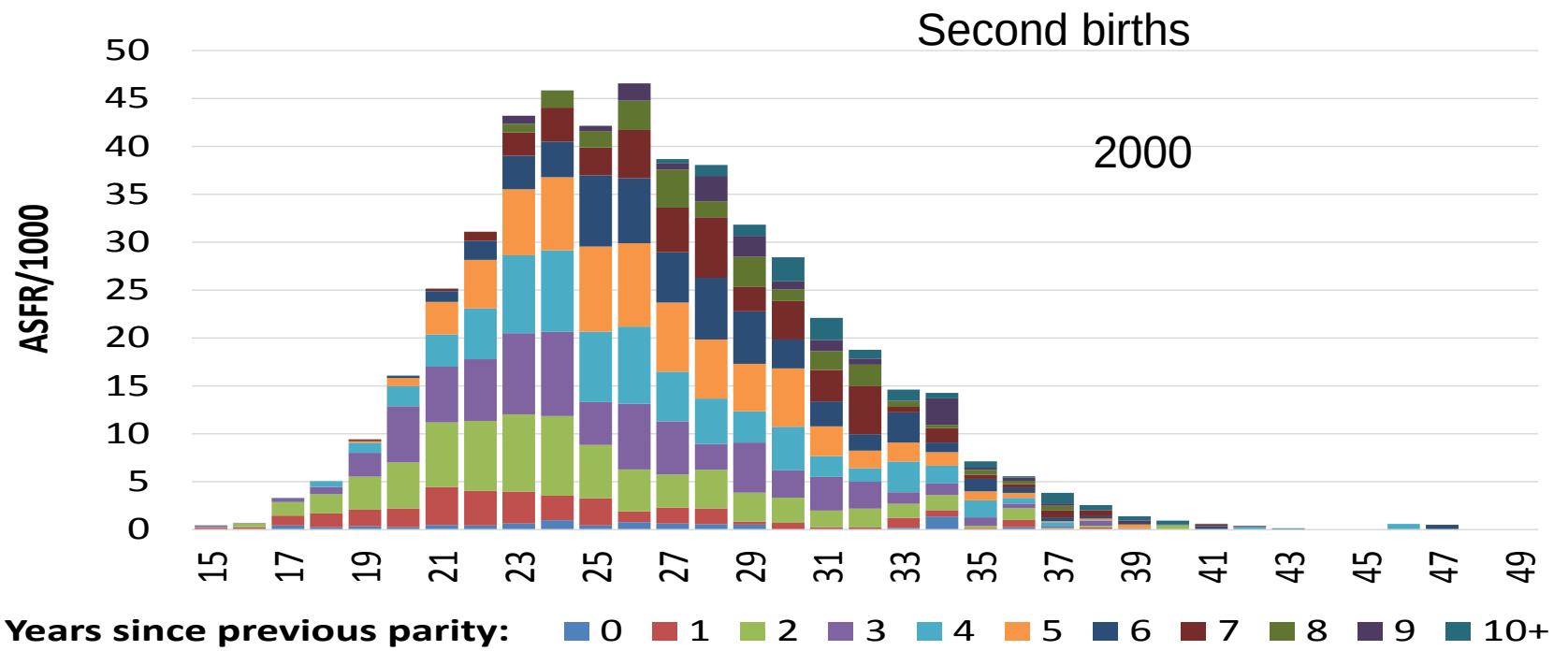


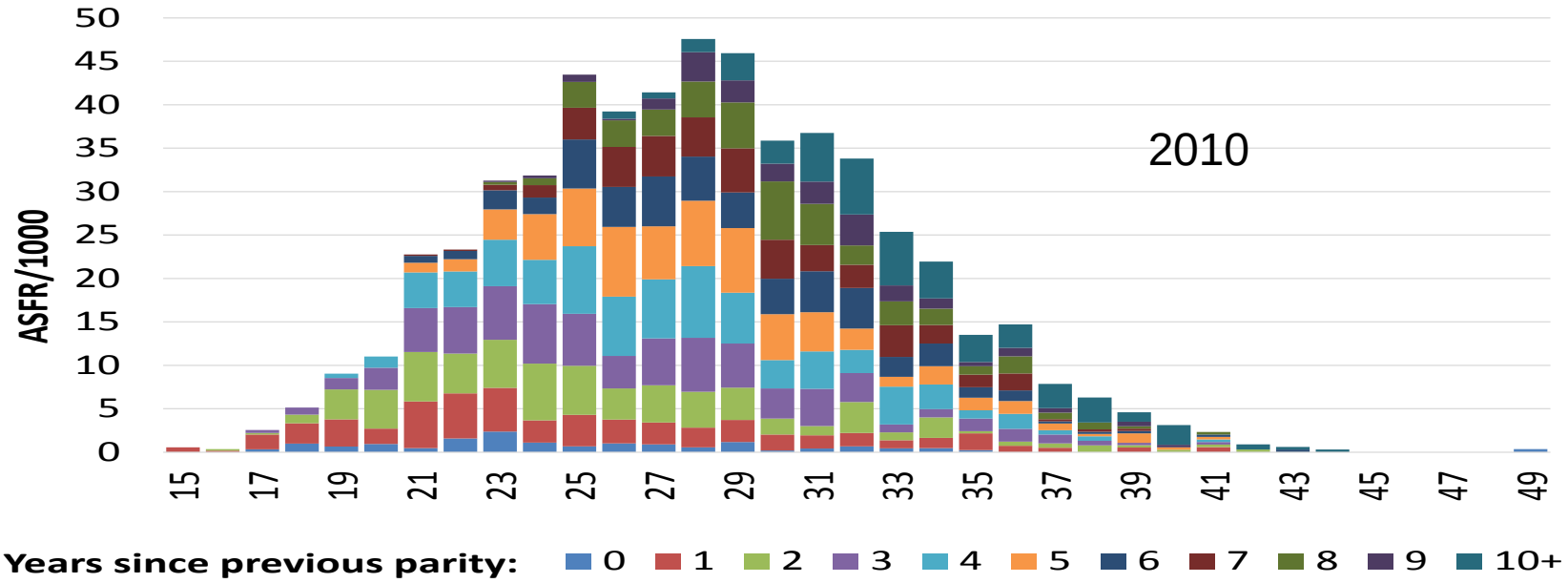
Probability of having third birth by years since second birth for selected years in which the third birth occurred

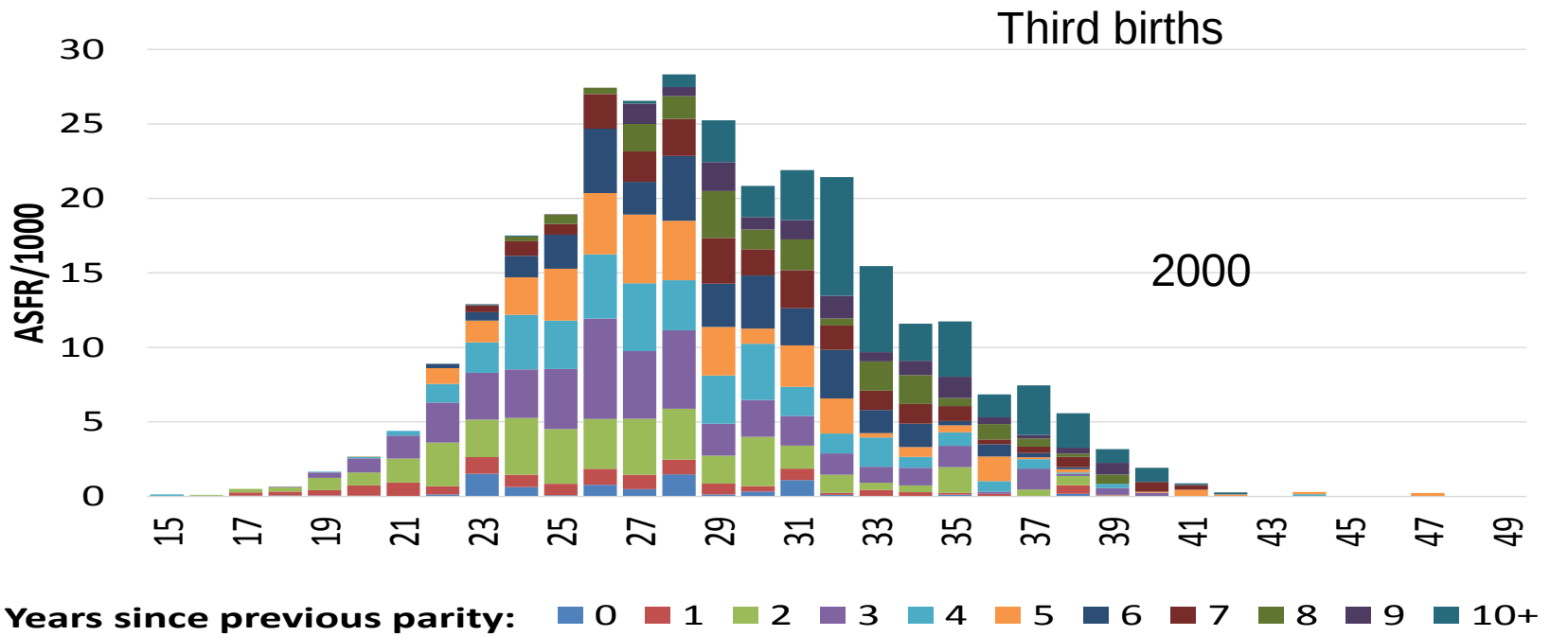


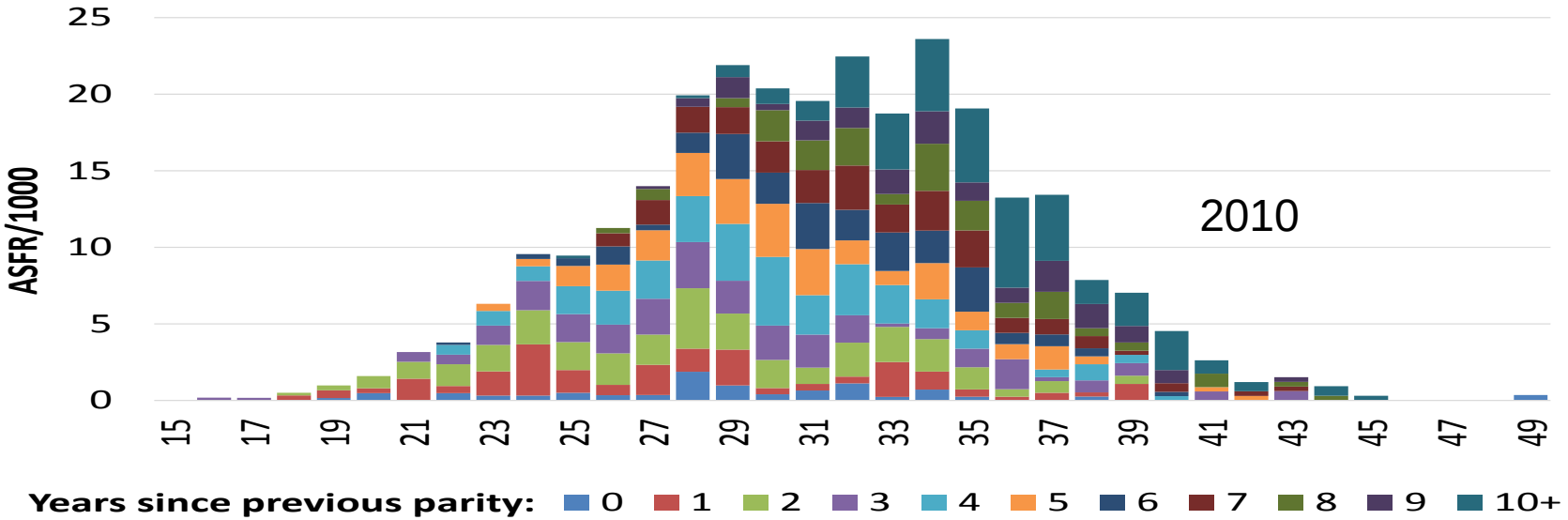



First births
2000
2010
ASFR/1000
70
60
50
40
30
20
10
0
15
17
19
21
23
25
27
29
31
33
35
37
39
41
43
45
47
49
Years since previous parity:
0
1
2
3
4
5
6
7
8
9
10+

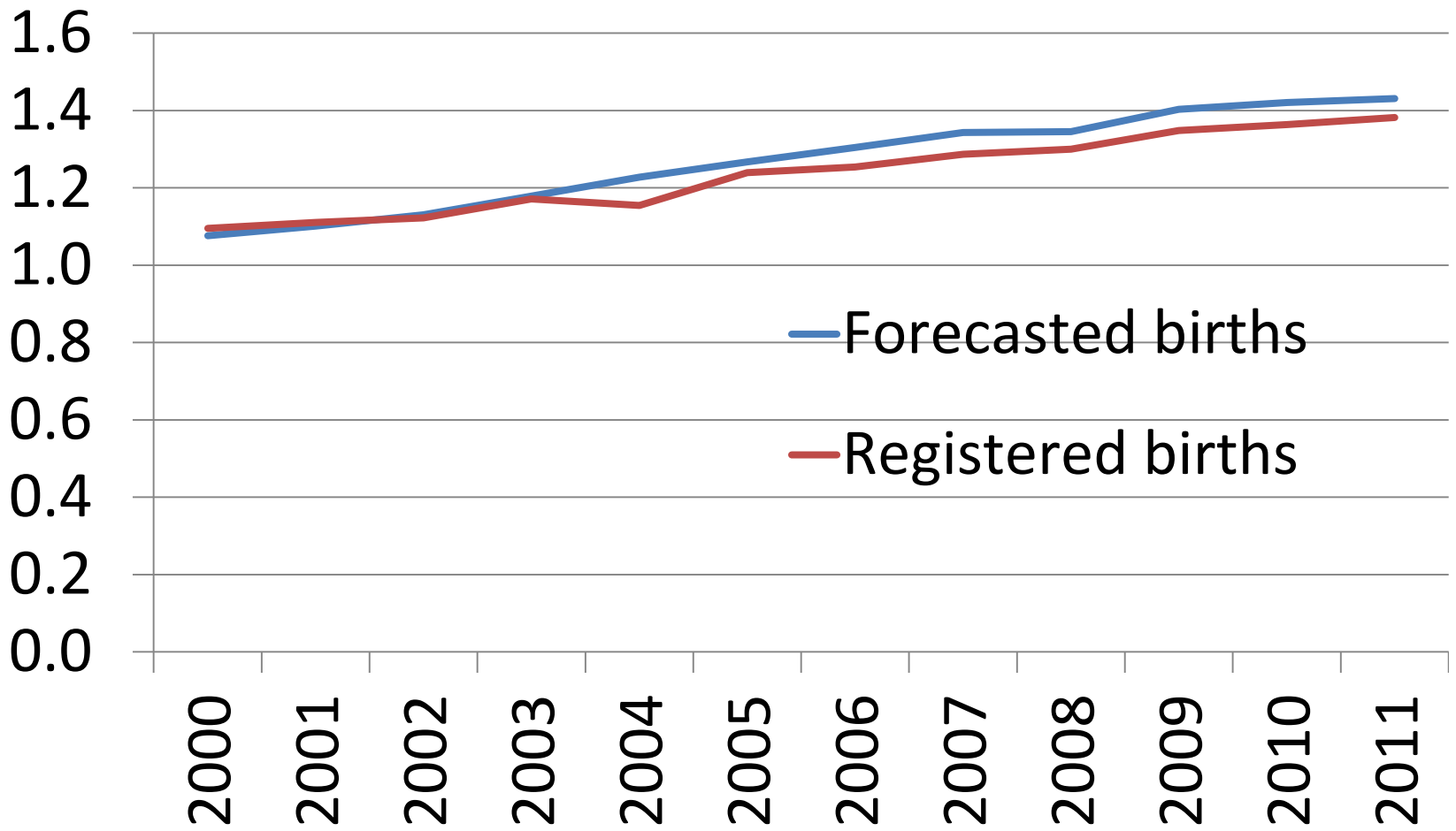

Second births
2000
ASFR/1000
50
45
40
35
30
25
20
15
10
5
0
15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49
Years since previous parity:
0 1 2 3 4 5 6 7 8 9 10+


2010
ASFR/1000
50
45
40
35
30
25
20
15
10
5
0
15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49
Years since previous parity:
0 1 2 3 4 5 6 7 8 9 10+


Third births
ASFR/1000
30
25
20
15
10
5
0
15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49
2000
Years since previous parity:
0 1 2 3 4 5 6 7 8 9 10+


ASFR/1000
25
20
15
10
5
0
15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49
2010
Years since previous parity:
0 1 2 3 4 5 6 7 8 9 10+

Number of registered births and forecasted births in the equivalent years between 2000 and 2010



Limitations

- Getting the data, especially the population at risk.
- Smoothing the data surface for random fluctuations where small numbers are involved.
- Handling the data. Difficult with Excel because of the size. Need to use matrix algebra and a computer program.
- Method for projecting probabilities of first birth.