Evaluation of Fertility Data Collected from Population Censuses

United Nations Statistics Division

Outline

1. Fertility data collected in censuses
   1. Children ever born
   2. Recent births
   3. Brass P/F method
   4. Other methods
2. Evaluation of fertility data
   1. Data collection errors, coverage and completeness
   2. Patterns of average parities and parity distributions
   3. Age-specific fertility rates from data on births
   4. Methods for deriving fertility estimates
   5. Comparing estimates from multiple independent sources

1. Children ever born (summary birth histories)

- Measure of all live births a woman has had in her lifetime
- Asked to all women age 15 and older
- For every woman the following information is collected:
  - Total number of female children she has borne in her lifetime
  - Total number of male children she has borne in her lifetime
  - Number of female children who are surviving
  - Number of male children who are surviving

► CEB/CS

1. Children ever born

Recommended question sequence to improve completeness of data:

1. Total number of sons ever born alive during the lifetime of the woman
2. Total number of sons living (surviving) at the time of the census
3. Total number of sons born alive who died before the census data
4. Total number of daughters ever born alive during the lifetime of the woman
5. Total number of daughters living (surviving) at the time of the census
6. Total number of daughters born alive who died before the census date

Source: United Nations (2008), *Principles and Recommendations for Population and Housing Censuses*

1. Children ever born – When is it used?

- Widely used for over 50 years both for measures of fertility and for child mortality (next session)
- Very important for countries without or with incomplete birth registration
- Also important for countries with complete birth registration
  - > Allows for the study of fertility by detailed socio-economic characteristics

2. Recent births

- Measure of recent fertility
- Asked to all women age 15–49 at the time of the census who reported at least one live birth in their lifetime
- **Preferred question:** Date of birth of last child born alive (day, month and year)
- **Alternative question:** Births in the last twelve months to the woman or in the household
  - More error-prone than exact date of birth, although both are subject to under-reporting
  - Date of birth can be converted to births in last 12 months during data processing (will miss only small percentage of cases in which woman had multiple births in a year)

Fertility data – possible errors

Both methods: enumerator's error

1. **Enumerators' failure to reach individuals**
   a) The not-at-home error: information provided by neighbors
   b) Coverage error: omit an area or forgot to record the answer

2. **Recording error**
   a) Answer is recorded incorrectly by the enumerator
      e.g., childless women misclassified into parity not stated

Children ever born – possible errors

1. Errors because the respondent did not understand the question
   a) Mortality error: reported only children living rather than ever-born
   b) Non-resident error: did not report surviving children living elsewhere
   c) Marriage error: women not reporting her children born from previous marriage or children born out of wedlock

2. Errors because of respondents' lapse of memory or neglect
   a) Memory error: respondent forgot some children
      > Believed to be more common among older women

3. Age misreporting
   a) Teenage mothers may exaggerate their age
   b) Age misreporting if this results in a systematic over- or under-stating of age

Recent births – possible errors

1. Reference period errors
   a) Uncertain of the exact date of birth relative to the reference period
   b) Incorrectly moving birth into or out of the reference period
2. Births missed because mother not located
   a) Women had a birth recently but died or migrated before the census
   b) Household had a birth recently but the household dissolved before the census
   c) Not significant in most cases, however could become an issue when many deaths occurring in a short period (HIV/AIDS) or when there is significant migration

Standard fertility measures

Average Parity/Children Ever Born – average number of children had by women in an age group

Parity Distributions – distribution of women in each age group by number of children they have had

Age Specific Fertility Rates (ASFR) – indicates the age pattern of fertility in a society

$$ {}_nF_x = \frac{{}_nB_x}{{}_nW_x} $$

${}_nB_x$ =Births to women age x to x+n during period

${}_nW_x$ =Mid-period population of women age x to x+n

Total Fertility Rate (TFR) – number of children a woman would have in her lifetime if she lived her whole life under today's fertility conditions (ASFRs)

$$ TFR = n \cdot \sum {}_nF_x $$

Census fertility data – what can we get?

	Parity Distribution	Average Parity	ASFR	TFR
Children Ever Born	**Y**	**Y**	**Y***	**Y***
Recent Fertility	**N**	**N**	**Y**	**Y**

*With one census under constant fertility, otherwise with two censuses

Evaluating fertility data using standard fertility measures

United Nations Workshop on Census Evaluation
Hanoi, Viet Nam
2–6 December 2013

CEB – quality assessment (Step 1)

- Initial assessment of data quality and missing values
  - Any missing values in CEB data?
  - Missing value for any relevant variables? (age of mother, sex of child, survival status of the child)
  - Was imputation, hotdecking or any other method used to clean the data?
    - If so, should have a good understanding of the rules followed

Note: hot-deck imputation > a missing value imputed from a randomly selected similar record

CEB – quality assessment

Table 2.11 Proportion of women whose parity data was not subject to logical imputation or hotdecking, by age and population group, Census 2001

Age group	African	Coloured	Indian / Asian	White
12-14	65.2	53.5	61.4	46.2
15-19	73.5	63.7	68.8	55.9
20-24	82.5	78.5	79.1	73.9
25-29	88.2	87.6	88.0	85.4
30-34	90.9	91.2	92.2	90.2
35-39	91.9	92.6	93.5	91.3
40-44	91.4	92.5	93.3	91.5
45-49	89.9	91.3	91.9	90.4

Source: *Estimation of fertility from the 2001 South Africa census data,* Tom Moultrie & Rob Dorrington, Centre for Actuarial Research, University of Cape Town

CEB – quality assessment (Step 2)

Tabulation of children ever born

- Number of children should not be grouped, except for the last open category (usually no lower than 9+ or 10+ children)
- Children ever born *not stated* should be distinguished from *no children (parity "0")*
- Are parities reasonable?
  - Quick rule-of-thumb: maximum parity should be one child every 18 months from age of 12
  - E.g. by exact age 20 (end of 15 – 19 age group) maximum children should be 5

Source: *IUSSP Tools for Demographic Estimation* http://demographicestimation.iussp.org/

CEB – quality assessment

Mongolia, 1989 Census (Source: IPUMS)

Parity	15-19	20-24	25-29	30-34	35-39	40-44	45-49
0	105,548	43,676	9,824	2,711	987	865	726
1	4,827	30,834	15,350	5,432	2,185	1,302	1,488
2	896	17,309	23,960	10,659	4,479	2,217	2,053
3	834	5,382	19,279	11,159	4,923	2,663	1,950
4	199	1,828	11,831	11,922	6,974	3,525	2,658
5	68	477	5,730	11,189	7,426	4,933	3,379
6	0	53	2,161	7,568	6,348	4,442	3,619
7	0	25	707	3,737	4,551	3,638	2,977
8	15	22	263	2,355	3,879	3,986	3,706
9	61	0	119	746	2,190	2,747	3,059
10	0	0	0	419	1,300	2,433	3,253
11	0	0	0	147	743	1,183	1,667
12	22	38	11	53	262	845	1,299
13	0	0	0	19	161	403	898
14	0	0	0	20	82	242	392
15+	0	0	0	0	72	235	629
Unknown	0	0	65	58	35	35	20

Parities obviously wrong

Unknown separated from parity '0'

CEB – quality assessment

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United Nations Statistics Division

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14		0	0	20	82	242	392
15+		0	0	0	72	235	629
Unknow		38	65	58	35	35	20
Total women			**89,300**	**68,194**	**46,597**	**35,694**	**33,773**
Total children			**218,303**	**267,951**	**240,263**	**220,854**	**231,755**
Proportion unknown			**0.0007**	**0.0009**	**0.0008**	**0.0010**	**0.0006**
Proportion childless	**0.9366**	**0.4383**	**0.1100**	**0.0398**	**0.0212**	**0.0242**	**0.0215**
Average parity	**0.0910**	**0.9237**	**2.4446**	**3.9292**	**5.1562**	**6.1874**	**6.8621**

Total children by age group = Parity * women at that parity

Proportion with unknown parity should stay constant

Proportion childless should decrease with age

Average parity should increase with age

CEB – quality assessment

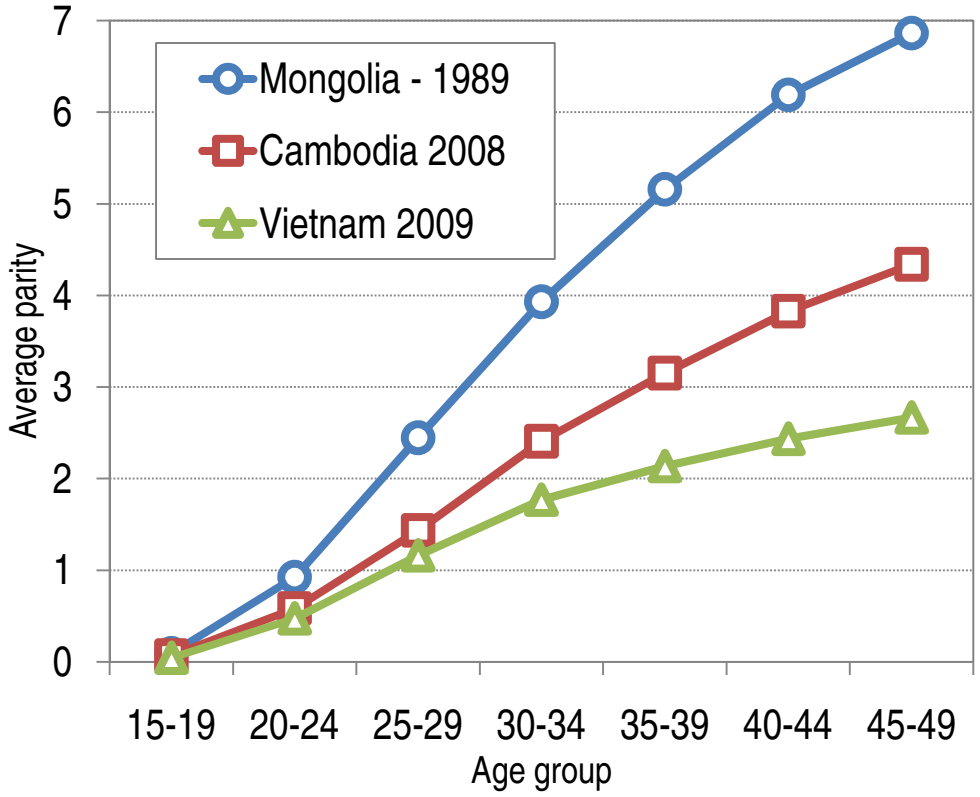
Average parity at age *x*:

$$P_x = \frac{B_x}{W_x} = \frac{\sum_j jW_{j,x}}{\sum_j W_{j,x}}$$

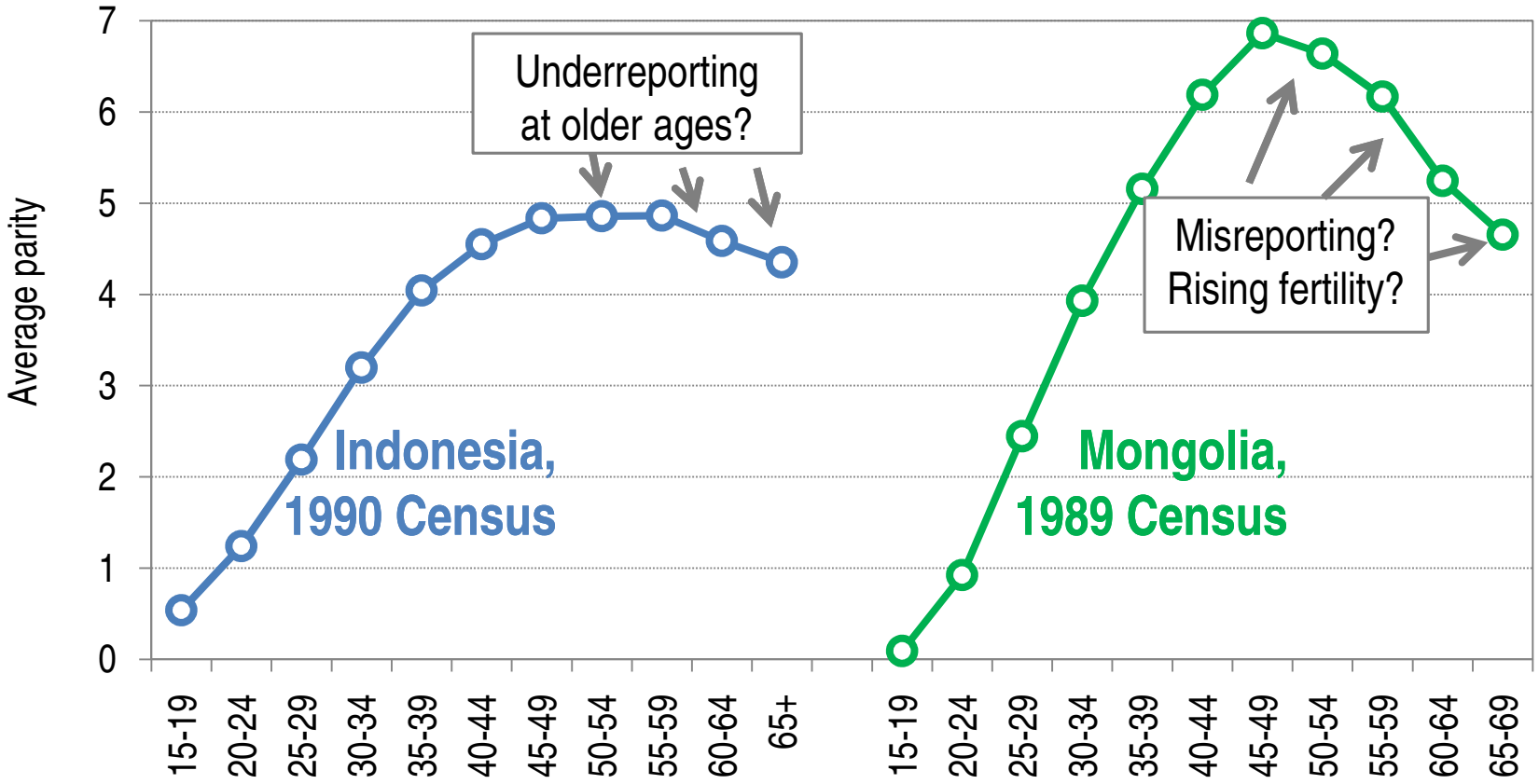
where

B_x = number of births by age x

$W_{j,x}$ = number of women of age x at parity j



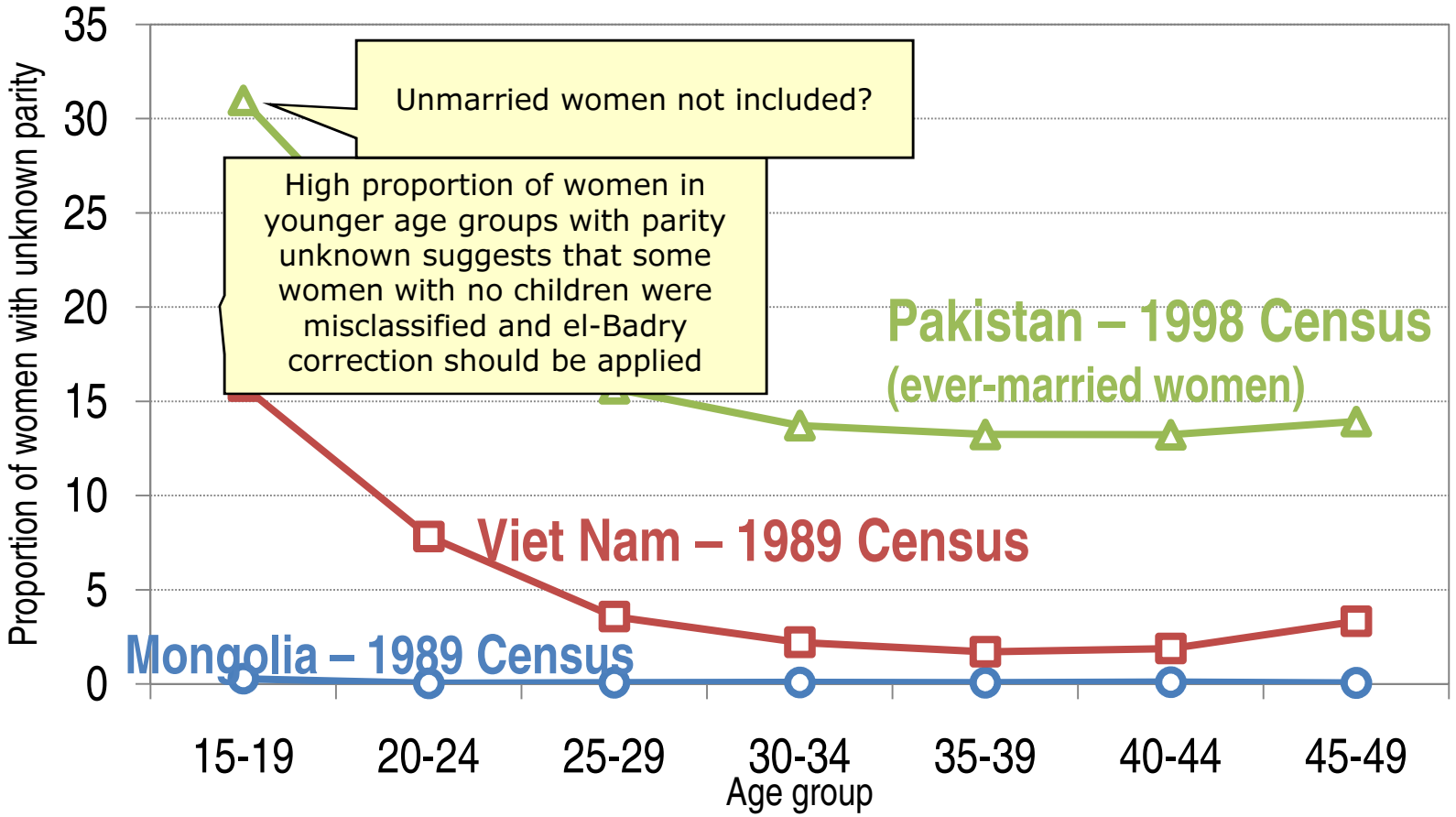
CEB – quality assessment



The el-Badry Correction

- to adjust reported data on children ever born
- A common problem with CEB data is that enumerators may incorrectly code women of zero parity as "parity unknown" or "parity not stated"
- The el-Badry method corrects for this by apportioning those women with parity 'reportedly' unknown between those whose parity is 'truly' unknown and those who have no children
- Method is based on assumption that proportion of women whose parity is 'truly' unknown does not depend on age
  - Check if proportion of women with parity unknown is high and going down with age
  - If parity unknown is less than 2% of each age group, it is safe to assume that data are consistent and no correction needed

Identifying when to use the el-Badry method



El-Badry: Step 1

Calculate proportion of women in each age group with a) parity missing and b) parity = 0

a) Parity unknown:

$$U_i = \frac{U_{i,u}}{N_i}$$

Where:

Ui = proportion unknown in age group

Ui,u = number unknown in age group

Ni = total women in age group

b) Parity 0:

$$Z_i = \frac{N_{i,0}}{N_i}$$

Where:

Zi = proportion parity 0 in age group

Ni,0 = number parity 0 in age group

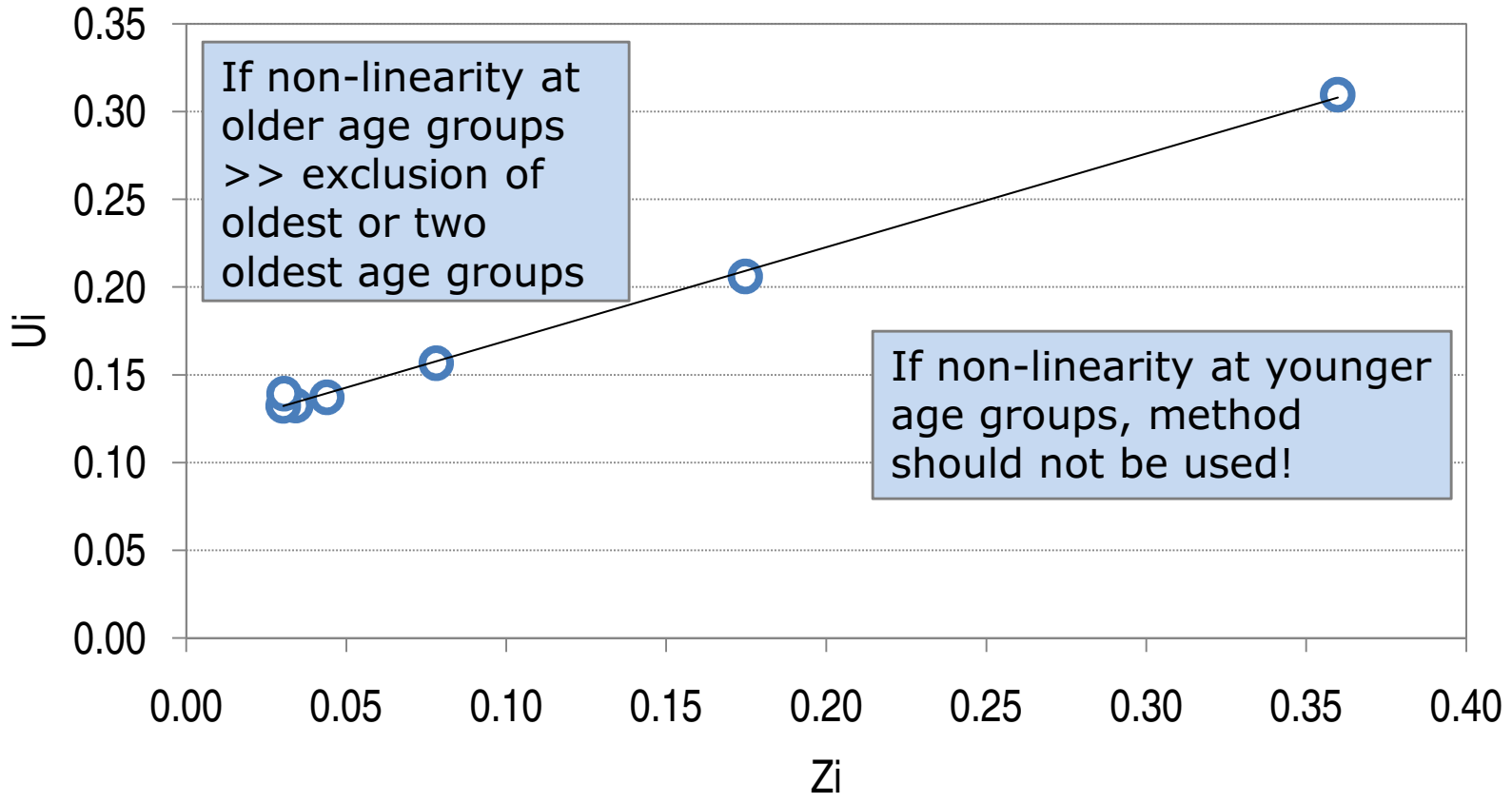
Ni = total women in age group

El-Badry: Step 1

Pakistan, 1998 Census (Source: Feeney & Alam, 1998: 93)

Parity	15-19	20-24	25-29	30-34	35-39	40-44	45-49
0	**38,359**	**48,695**	**24,995**	**12,595**	**7,785**	**6,704**	**5,132**
1	21,367	59,795	34,422	15,400	8,055	6,774	5,186
2	9,100	53,693	51,685	27,244	13,482	10,466	7,925
3	3,876	31,345	54,374	37,696	21,176	16,027	11,203
4	877	16,538	48,331	46,630	31,065	23,679	16,443
5	0	7,185	28,518	39,469	30,100	24,981	16,840
6	0	2,409	15,497	30,961	29,253	27,134	18,643
7	0	1,059	7,064	19,579	23,894	24,467	17,775
8	0	351	2,758	9,749	15,690	19,957	15,211
9	0	172	1,038	4,378	8,665	13,678	11,595
10	0	0	633	1,908	4,495	8,714	8,340
11	0	0	177	721	2,020	4,719	4,860
12	0	0	103	322	925	2,559	2,657
13	0	0	71	142	372	1,119	1,262
14	0	0	13	72	201	492	579
15+	0	0	0	115	154	331	455
Not Stated	**33,018**	**57,445**	**50,129**	**39,295**	**30,149**	**29,265**	**23,339**
Total women	106,597	278,687	319,808	286,276	227,481	221,066	167,445
Ui	**0.310**	**0.206**	**0.157**	**0.137**	**0.133**	**0.132**	**0.139**
Zi	**0.360**	**0.175**	**0.078**	**0.044**	**0.034**	**0.030**	**0.031**

El-Badry: Step 2



El-Badry: Step 3

Regress Ui on Zi

>>in Excel, use SLOPE and INTERCEPT functions

In our example,

intercept (β) =0.116

>> 11.6% of data of each age group is truly missing

To correct data:

Parity truly missing=

$$U_i' = N_i \cdot \beta$$

Parity 0 =

$$N_{i,0}' = N_i \cdot (Z_i + U_i - \beta)$$

El-Badry: Step 4

Revised figures for women with unknown and 0 parity, Pakistan 1998 census with el-Badry correction

	15-19	20-24	25-29	30-34	35-39	40-44	45-49
Ni,0	38,359	48,695	24,995	12,595	7,785	6,704	5,132
Ui	33,018	57,445	50,129	39,295	30,149	29,265	23,339
Total women	106,597	278,687	319,808	286,276	227,481	221,066	167,445
Ui	0.310	0.206	0.157	0.137	0.133	0.132	0.139
Zi	0.360	0.175	0.078	0.044	0.034	0.030	0.031
U`i = Ni * β	12,384	32,376	37,154	33,258	26,428	25,682	19,453
N`i,0 = Ni (Zi + Ui – β)	58,993	73,764	37,970	18,632	11,506	10,287	9,018

Recalculation of average parity after el-Badry

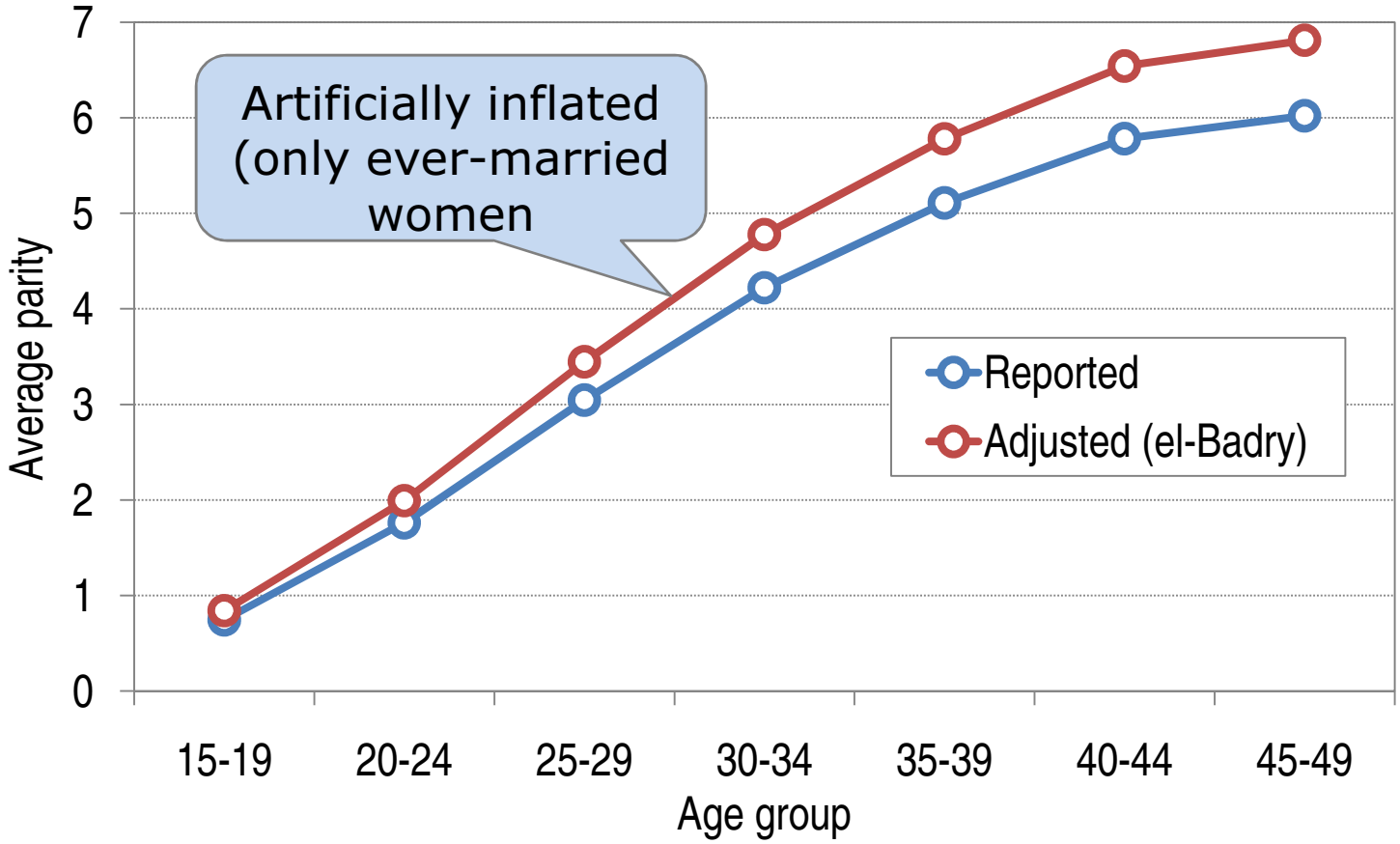
If the el-Badry method has been applied, average parities should be calculated *excluding* the remaining ("true") number of women with unknown parity from the denominator

- This will increase the average parities by $1/(1+\beta)$ because women formerly considered missing are now classified as parity 0

When missing data is more than 2% but the correction is not applied (e.g. due to violation of linearity), women of unknown parity should be included in the denominator

- This will lead to underestimation of average parity because the unknown parities are functionally treated as parity 0

Average parity, reported and adjusted by el-Badry method, Pakistan, 1998 census



CEB checks, Parity distribution of women age 45-49

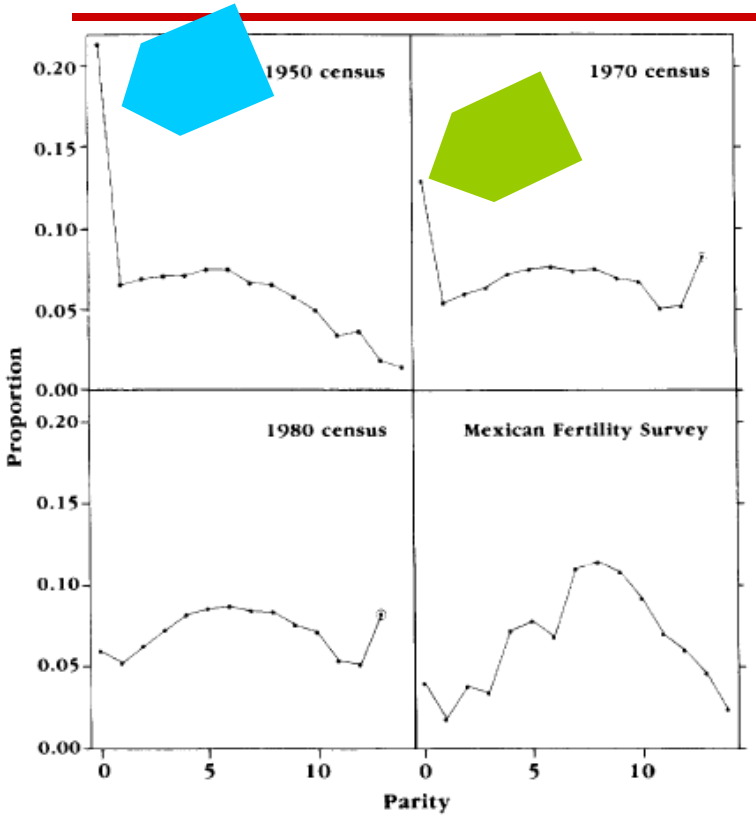
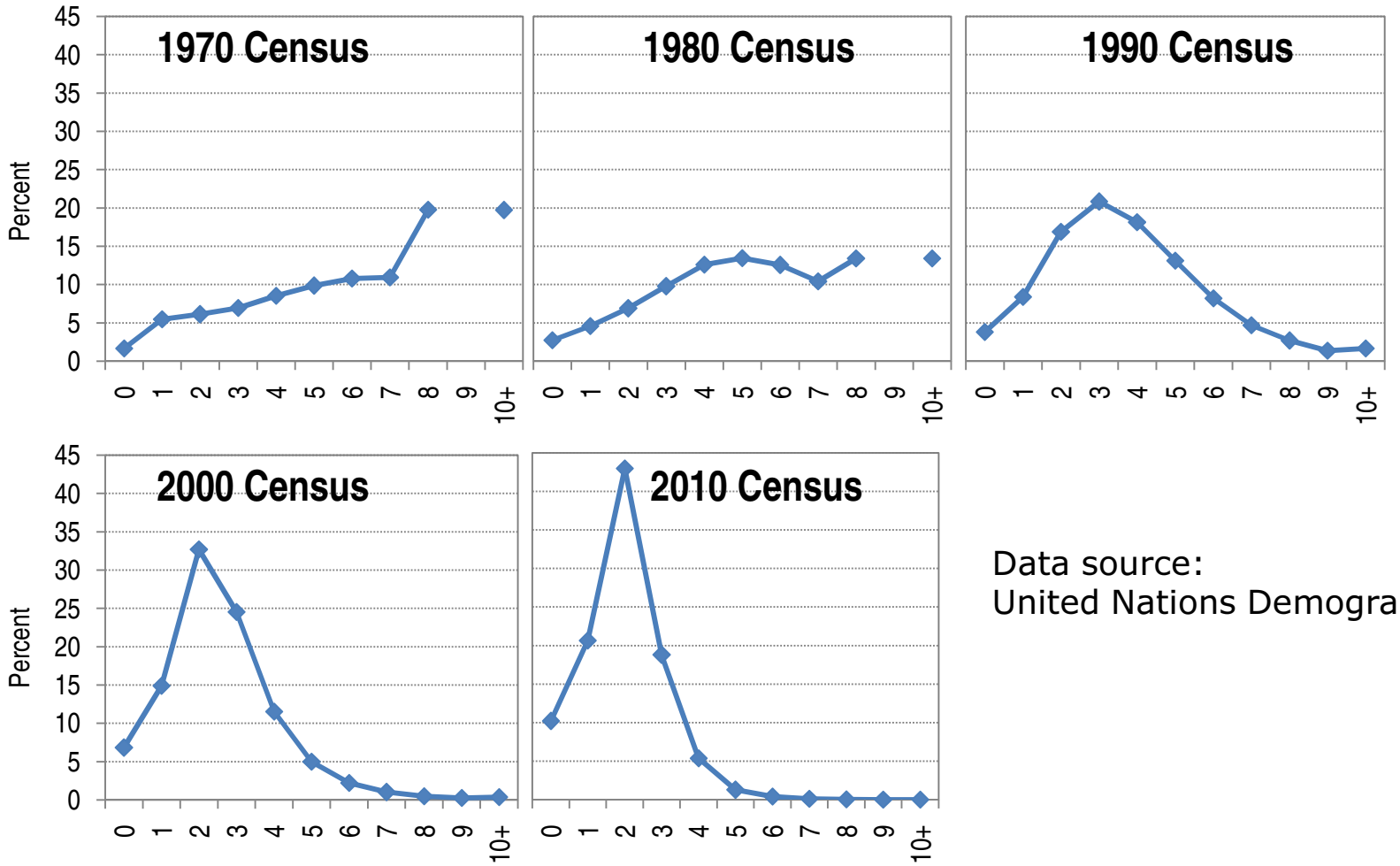


Figure 3. **Completed parity distributions for Mexico, from the censuses of 1950, 1970, and 1980 and from the Mexican Fertility Survey**

- High level of parity 0 in 1950 and 1970 censuses: possibly groups "not stated" and "0" parity combined. No separate groups unlike as in the 1980 census.
- Flat curve: probably some form of misreporting, seems to be improving over time
- Mexican fertility survey: shape of the curve more plausible (small sample size)

Source: Feeney (1991)

CEB Checks, Parity distribution of women age 45-49, Thailand, 1970-2010 censuses



Data source:
United Nations Demographic Yearbook

CEB Additional Checks
Cohort analysis of mean number of CEB

Figure 5. **Time plot of mean number of children ever born, based on censuses of Thailand, 1960, 1970, and 1980**

Source: Table 3 in this article.

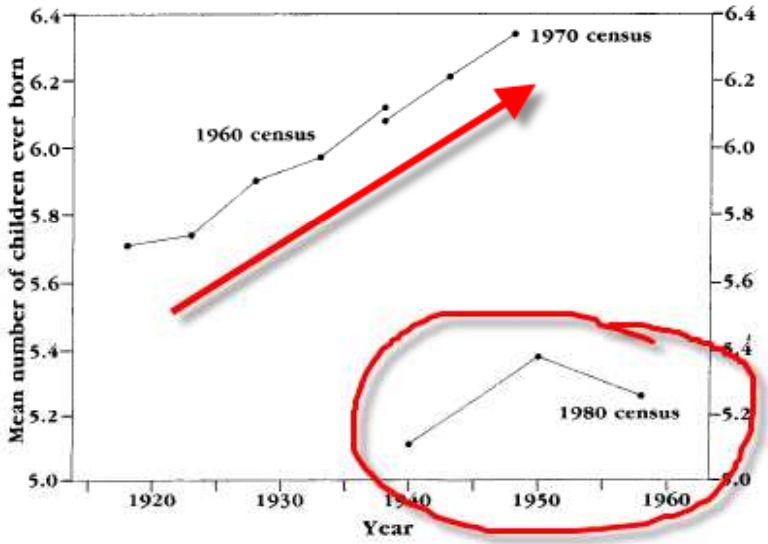


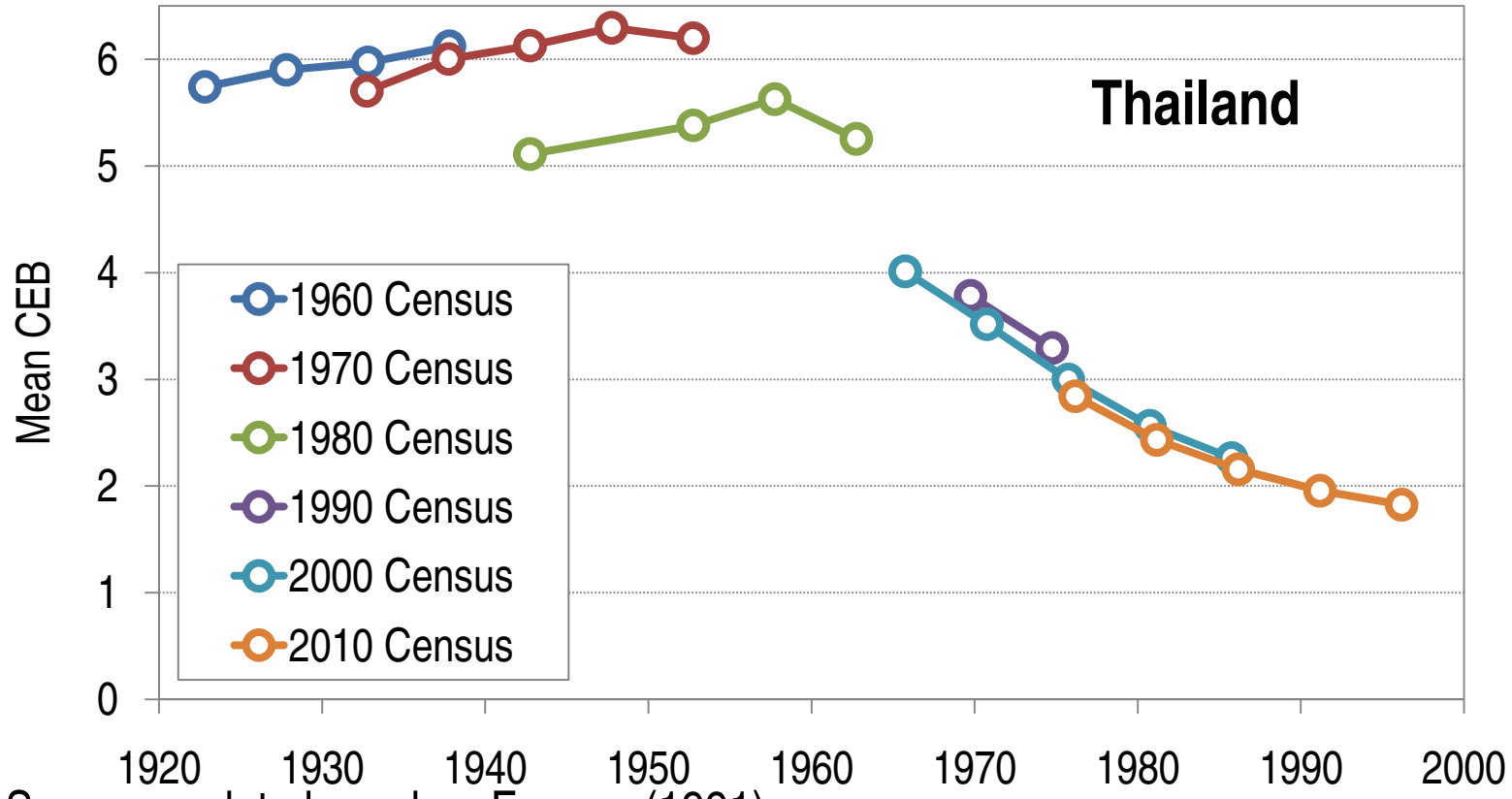
Table 3. **Mean number of children ever born to women of ages 45 and over, by age group: Thailand, Whole Kingdom, censuses of 25 April 1960, 1 April 1970, and 1 April 1980**

Age group	Mean CEB	Year
1960 census		
45–49	6.12	1938
50–54	5.97	1933
55–59	5.90	1928
60–64	5.74	1923
65–69	5.71	1918
1970 census		
45–49	6.34	1948
50–54	6.21	1943
55–59	6.08	1938
1980 census		
45–49	5.26	1958
50–59	5.38	1950
60–69	5.11	1940

- Simple test for quality of reporting among older women
- Assumes all childbearing at age 25
- Year in time = census year – (age – 25)
- Thailand example: 1960 and 1970 censuses - an increase in fertility
- Erroneous data from 1980 census (conclusion was reached after comparing with other census data)

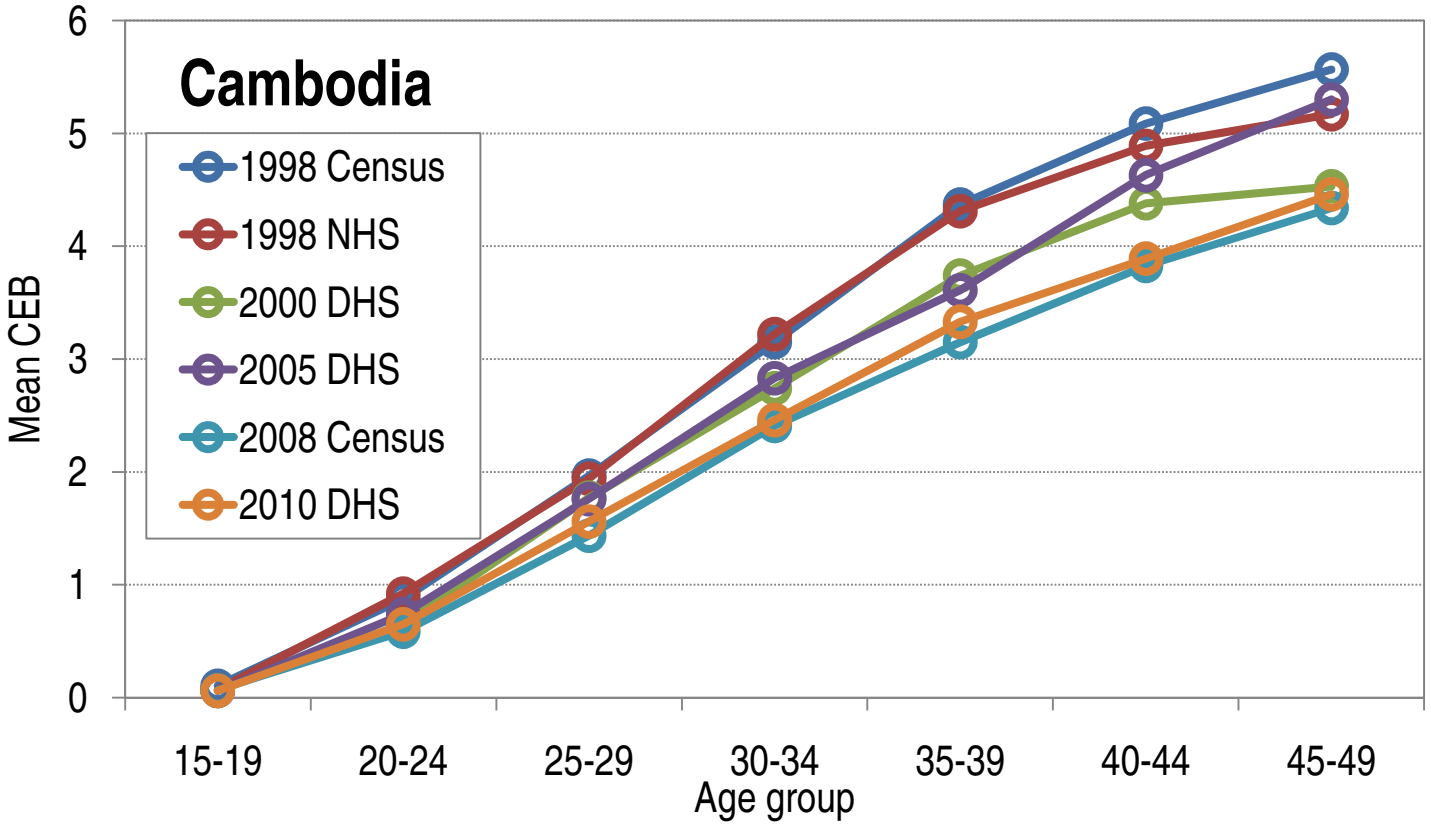
Source: Feeney (1991)

CEB - Additional Checks
Cohort analysis of mean CEB



Source: update based on Feeney (1991)

CEB – Additional checks
Multiple sources of data



Data source: United Nations *Demographic Yearbook* and DHS STATcompiler http://www.statcompiler.com/

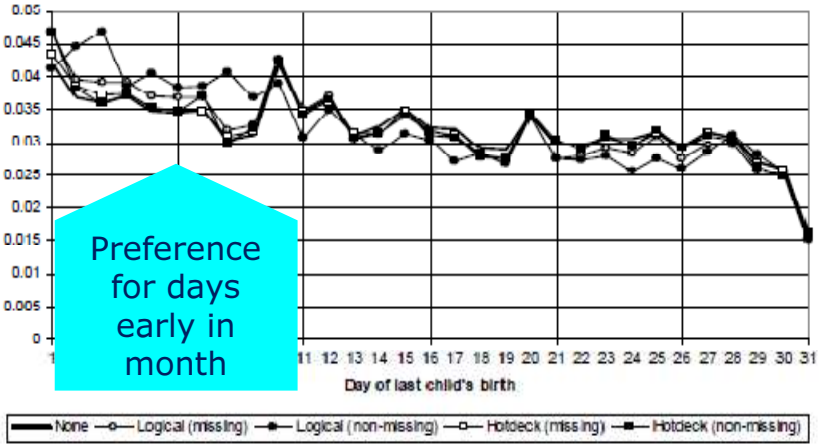
Recent births – quality assessment

Initial assessment

- Any missing values in data? (month/date/year of birth)
  - Missing data for any relevant variables? (age of mother, sex of child, survival status of the child)
- Is distribution of reported birth dates reasonable?
- If possible, compare with civil registration data on live births

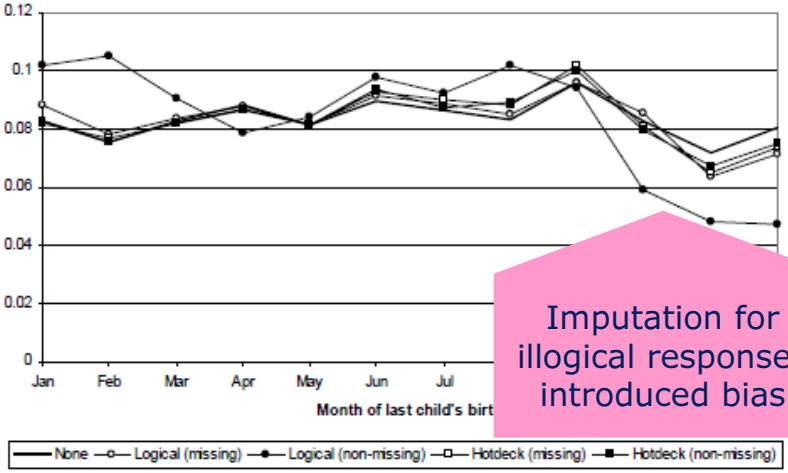
Recent births – quality assessment – missing and inconsistent data

Figure 2.3 Distribution of last child born's day of birth by imputation and cleaning method, Census 2001



Preference for days early in month

Figure 2.4 Distribution of last child born's month of birth by imputation and cleaning method, Census 2001



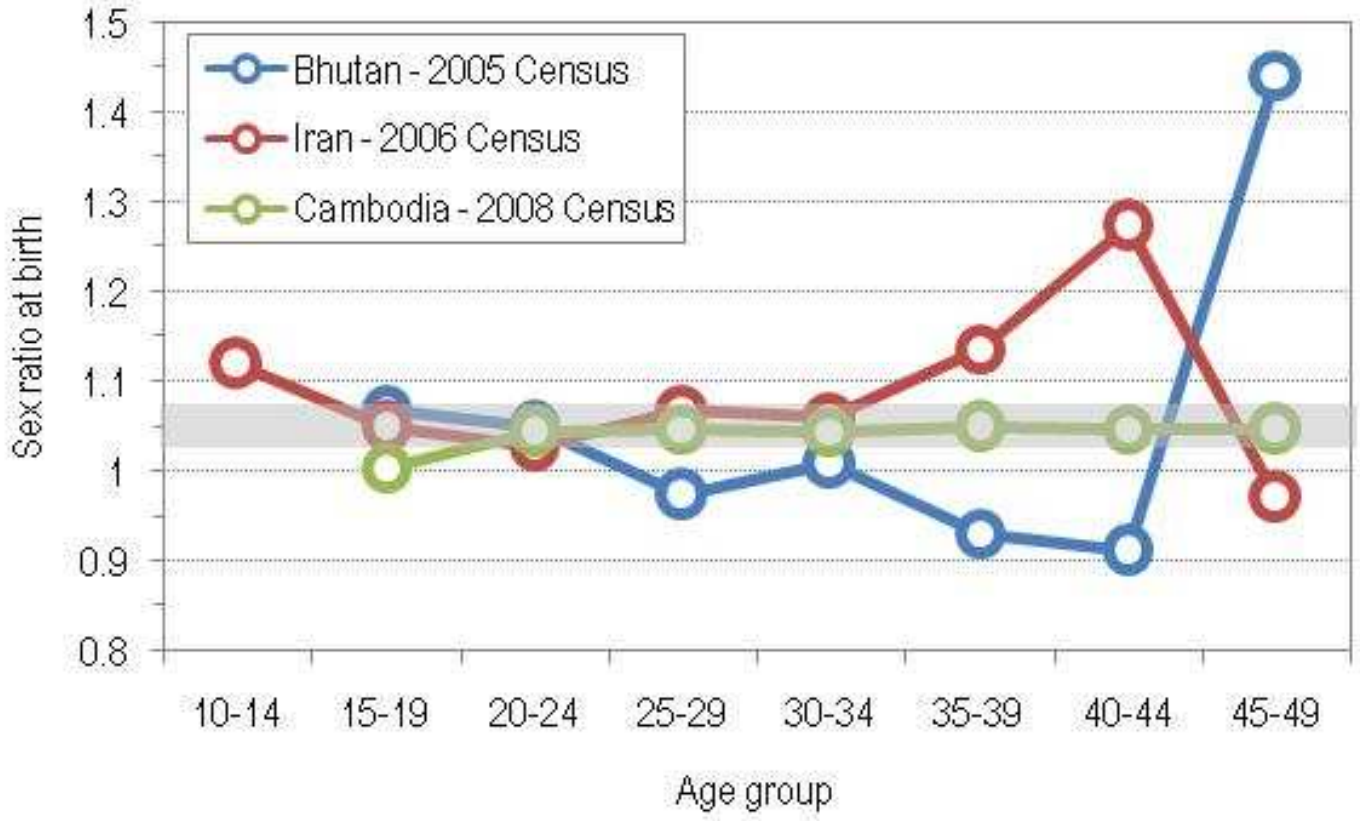
Imputation for illogical responses introduced bias

Table 2.9 Distribution of women aged 12 to 49 by imputation flag for response to question on year of last child's birth

	No imputation	*Logical imputation from missing response*	*Logical imputation from non-missing response*	*Hotdeck applied to missing response*	*Hotdeck applied to non-missing response*	*TOTAL*
Women	6560661	604260	391548	734257	165002	8455720
(per cent)	77.6	7.1	4.6	8.7	2.0	77.6

Source: Moutrie & Dorrington (2004)

Recent births, quality assessment – sex ratio



Data source: United Nations Demographic Yearbook

Recent births quality assessment age specific fertility rates (ASFR)

Age Specific Fertility Rate (ASFR)

$$nFx = \frac{nBx}{nWx}$$

nBx =Births to women age x to x+n during period

nWx =Mid-period population of women age x to x+n

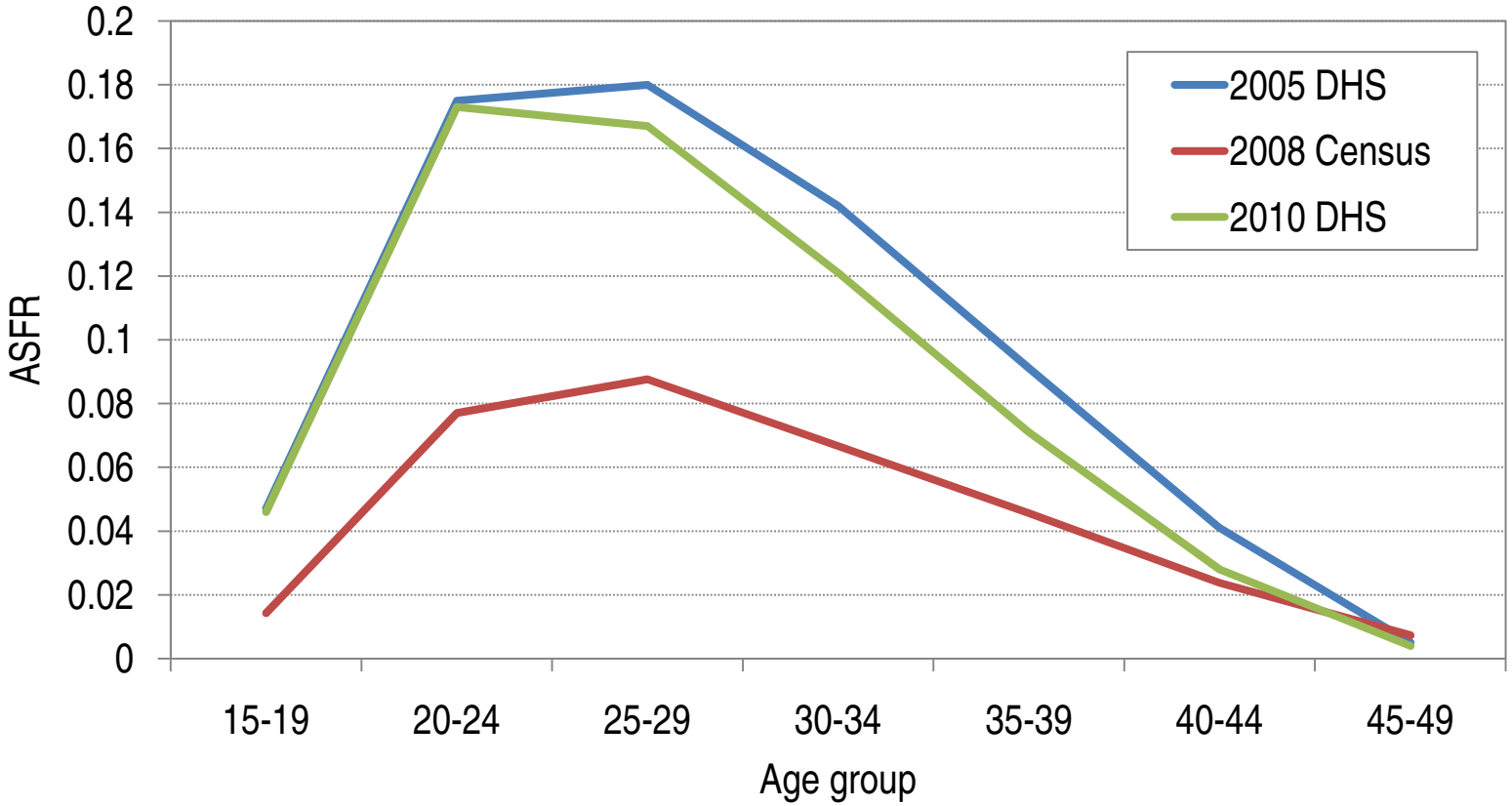
Are births classified by age of mother at birth of her child or by age of mother at the survey/census date?

If not known, assume the latter, almost universally, in censuses, data are classified by age of mother at time of census. In this case, ASFRs are shifted by ½ year as mothers were ½ year younger at the time of birth.

Cambodia, 2008 Census

Age group	Births in 12 months preceding census	Total women in age group	ASFR
14.5 – 19.5	11,160	780,320	0.0143
19.5 – 24.5	53,740	697,160	0.0771
24.5 – 29.5	54,910	626,430	0.0877
29.5 – 34.5	24,130	361,650	0.0667
34.5 – 39.5	19,880	435,880	0.0456
39.5 – 44.5	9,380	393,760	0.0238
44.5 – 49.5	2,580	352,520	0.0073

Recent births, quality assessment
Comparing ASFRs, Cambodia

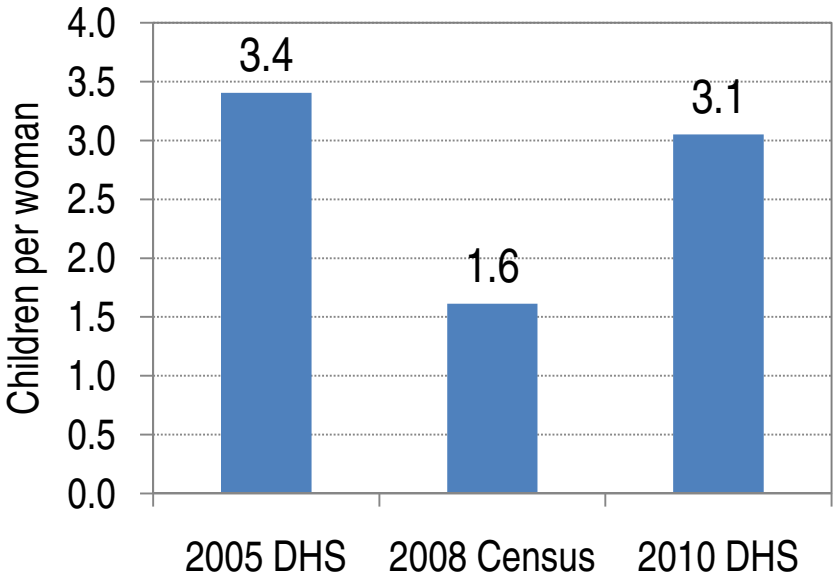


Data sources: IPUMS-International and DHS STATcompiler

Recent births, quality assessment
Comparing Total fertility rates (TFR)

Cambodia, TFRs comparison

Age group	2005 DHS	2008 Census	2010 DHS
15 - 19	0.047	0.014	0.046
20 - 24	0.175	0.077	0.173
25 - 29	0.180	0.088	0.167
30 - 34	0.142	0.067	0.121
35 - 39	0.091	0.046	0.071
40 - 44	0.041	0.024	0.028
45 - 49	0.005	0.007	0.004
TFR	**3.4**	**1.6**	**3.1**



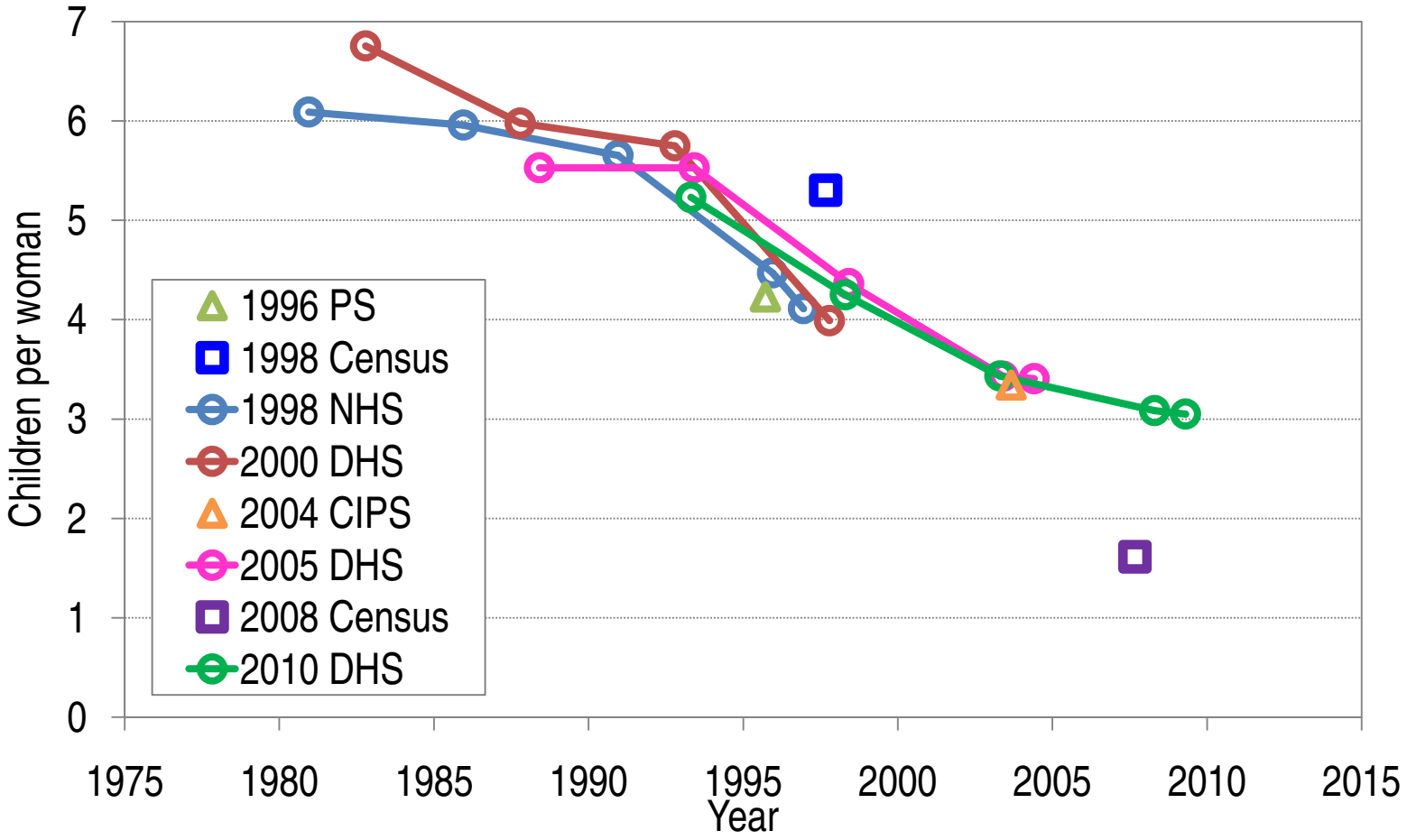
$$TFR = 5 \cdot \sum_{x=15-19}^{45-49} {}_5F_x$$

Estimating fertility from data collected in censuses

To obtain new estimates of fertility

To compare estimates from the current census with estimates available from other sources e.g. surveys

Cambodia, TF estimates from different sources



Methods for estimating fertility

- Interpolation of average parities (Mortara, 1949)
- Brass P/F method and its variations and extensions, e.g. Arriaga (1983), Relational Gompertz model
- Methods based on population structure: Reverse Survival and Own Children Method
- Methods based on data from two or several censuses: Arriaga (1983), synthetic relational Gompertz model, parity increments

Interpolation and backdating average parities

Average parity at ages x, x+n by definition:

$$ {}_nP_x = \int_x^{x+n} F(a)da $$

where *F* is cohort cumulative fertility function.

- By using interpolation one can compute age-specific fertility rates from average parities, P, assuming that fertility was more or less constant before the census
- For ages with completed fertility, e.g. age > 45, we can assume that P ≈ TFR, total fertility for a given cohort
- By plotting P ≈ TFR at years defined by the census date and mean age at childbearing, one can produce estimates of historical TFR trends (Feeney, 1991, see slide presented before)
- Software: FERTCB application, Mortpak, UN

The P/F ratio method: Rationale

- The P/F method aims to balance out the strengths and weaknesses of CEB and recent fertility data by comparing:
  1. Cumulative fertility equivalent derived from recent fertility data "F" (trusting the age pattern of fertility but not level)
  2. Life-time average parities "P" (trusting the overall level but not the age distribution)
- The method is typically used to adjust estimates of current fertility level (computed from data on recent births or from incomplete civil registration)
- The method is also used to assess the quality of CEB data and, sometimes, the age reporting of the mother
- Works well if fertility was constant before the census (improbable now); no severe problems with the data

Source: United Nations (1983)

P/F Method: Data requirements

1. Total number of children ever born by 5-year age group of mother
2. Recent fertility by 5-year age group of mother, measured either by:
   - Births in past year question on census
   - Births registered in year of census from vital registration
3. Total number of women in each 5-year age group

P/F Method: Assumptions

- Assumptions:
  - Mis-reporting of current fertility is constant across all age groups
  - Increasing under-reporting of parity (children ever born) by age of women
  - Constant fertility (most important for youngest age groups – up to 35 or so)
    - > Can be relaxed through a modification of the original P/F ratio method that uses two consecutive censuses or fertility rates derived from vital registration or another data source

P/F Method: Computational procedure

Procedure described here follows Arriaga (1983) which is implemented in MortPak

0	1	2	3	4	5		6
Age Group	p(i)	f(i)	p*(i)	f*(i)	P(i)	F(i)	P/F
	Average CEB as shown	ASFRs as shown	CEB transformed into age-specific rates	ASFR adjusted for time of census	Cumulated P(i) and F(i)		Adjustment factor for fertility rates, usually ages groups 20-24, 25-29 or 30-34 as the most reliable

P/F method: Interpretation

Typical "look" of P/F ratios:

- With perfect data, ratio should be the same for all age groups and close to 1
- In practice, ok if ratios for 20-24, 25-29 and (less important) 30-34 are close

- Typically, P/F ratio will decrease with women's age
- Deviation from the above typical pattern: indicates either violations of the assumptions or different patterns of under-reporting

Example in MortPak: Timor-Leste 2004 Census

Estimation of age-specific fertility rates from data on children ever born

TITLE: Timor-Leste, 2004 Census

Arraiga's approach for estimation of ASFR for one point in time and the age pattern of fertility (Brass)

	First Enumeration
Month	July
Year	2004
Fertility pattern is tabulated by age of woman at:	enumeration

p*(i) f*(i) P(i) F(i)

In the present case the adjustment factors are declining over the age groups:
Increasing fertility or increasing mis-reporting with women's age?

Age Group of Woman	Children Ever Born	Age Specific Fertility Pattern (A.S.F.P.)	Fertility Consistent with C.E.B. (A.S.F.R.)	Fertility Pattern by Age at Survey Date	Fertility Pattern by Age at Birth of Child	Cumulation of A.S.F.R.	Cumulation of Fertility Pattern by Age at Birth	Adjustment Factors	Age Specific Fertility Rates Based on Adjustment Factor for the Age Group 20 - 25	25 - 30	30 - 35
July 2004				Recorded	Calculated						
15 - 20	0.113	0.0427	0.0828	0.0427	0.0552	0.0828	0.0552	1.5007	0.0621	0.0550	0.0586
20 - 25	1.049	0.2485	0.2795	0.2485	0.2667	0.3624	0.3219	1.1257	0.3002	0.2659	0.2831
25 - 30	2.564	0.3263	0.2866	0.3263	0.3290	0.6490	0.6509	0.9971	0.3703	0.3280	0.3492
30 - 35	3.859	0.3066	0.2353	0.3066	0.3005	0.8843	0.9513	0.9295	0.3382	0.2996	0.3189
35 - 40	4.912	0.2269	0.1692	0.2269	0.2184	1.0535	1.1698	0.9006	0.2459	0.2178	0.2319
40 - 45	5.426	0.1204	0.0867	0.1204	0.1100	1.1402	1.2798	0.8909	0.1238	0.1097	0.1168
45 - 50	5.327	0.0453	0.0316	0.0453	0.0369	1.1718	1.3167	0.8900	0.0416	0.0368	0.0392
Mean Age of Childbearing:			27.9248		28.9905						
Total Fertility Rate:			5.8592		6.5836				7.4113	6.5647	6.9880

P/F Method: Interpretation

- Example 1: a **declining trend in the P/F ratios** by age of women could indicate that a) fertility has been increasing or b) that reported data on children ever born suffer from progressively increasing omissions of children as age of women increases
- Example 2: **large fluctuations in the P/F ratios** may reflect either differential coverage by age or selective age misreporting by women
- Example 3: a **rising trend in the P/F ratios** by age of women indicates that fertility could have been decreasing in the past

Variants on the P/F method

- P/F method for first births – not affected by fertility decline through higher-parity control
- Two-census methods, deriving age schedule of fertility from the two censuses or an additional source (such as vital registration)
  - Can be implemented in MortPak FERTPF by adding optional data for second census
- The Relational Gompertz model uses the same data as the P/F model, but
  - Does not require an assumption of constant fertility
  - Compares/replaces recent fertility data with model fertility schedules to check accuracy
  - Relies on parity data for all age groups (not just younger ones)

Relational Gompertz model

- An improved and more versatile version of the Brass P/F method with the same input data
- Shape of fertility distribution adheres to Gompertz relational model
- Level is estimated from average parities
- Robust
- Can be used for smoothing and extrapolation of fertility schedule
- Can be used with different standard patterns

Software: *IUSSP Tools for Demographic Estimation* http://demographicestimation.iussp.org/

Reverse Survival method of fertility estimation

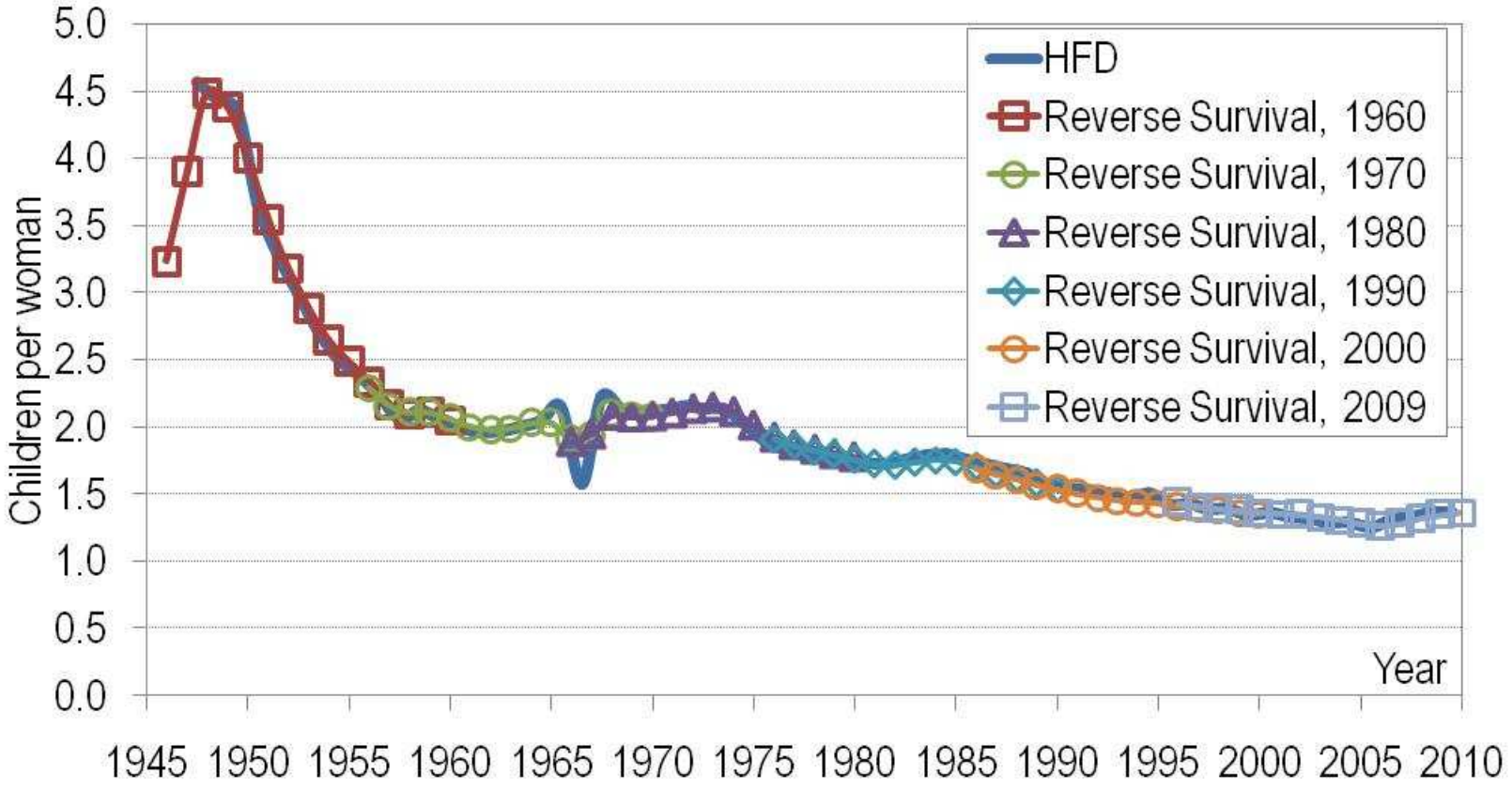
- Population by single age and sex is 15-year back projected (reverse survived)
- TFR for years y0, y-1, y-2, … y-14 computed to match births obtained by reverse survival

Assumptions

- Population by single age and sex is free of errors
- Estimates of mortality are available for the period before census
- Reasonably good assumptions can be made about age pattern of fertility

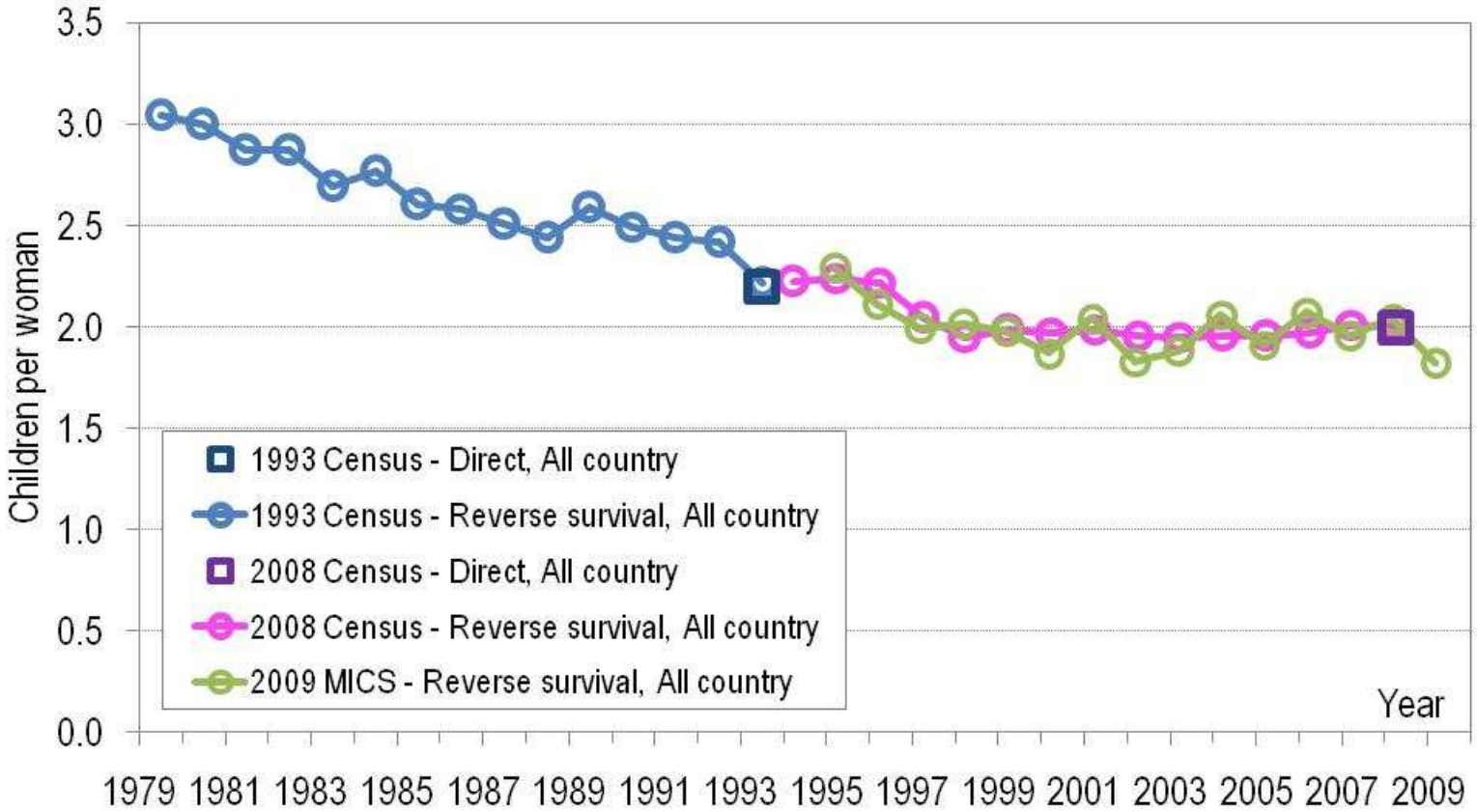
Software *: IUSSP Tools for Demographic Estimation* http://demographicestimation.iussp.org/

Reverse survival fertility estimates, Japan



Sources: Human Fertility Database (HFD) and computed from Human Mortality Database

Reverse survival fertility estimates, DPR Korea



Sources: computed from 1993 and 2008 census and 2009 MICS

Own-children method of fertility estimation

- Based on the same idea as the reverse survival method
- Produces estimates of both TFR and age pattern of fertility

Data requirements

- Distribution of own children by age and by age of mother
- Estimates of mortality for the period before census

Software

East-West CENTER
http://www.eastwestcenter.org/research/research-program-overview/population-and-health/demographic-software-available-from-the-east-west-center

Reference

United Nations (1983)

Step 1

Obtain distribution of own children by age and by age of mother:

TABLE 161. OWN-CHILDREN DATA, WITH CHILDREN CLASSIFIED BY SINGLE YEAR OF AGE AND SINGLE YEAR AGE OF MOTHER, COLOMBIA, 1978

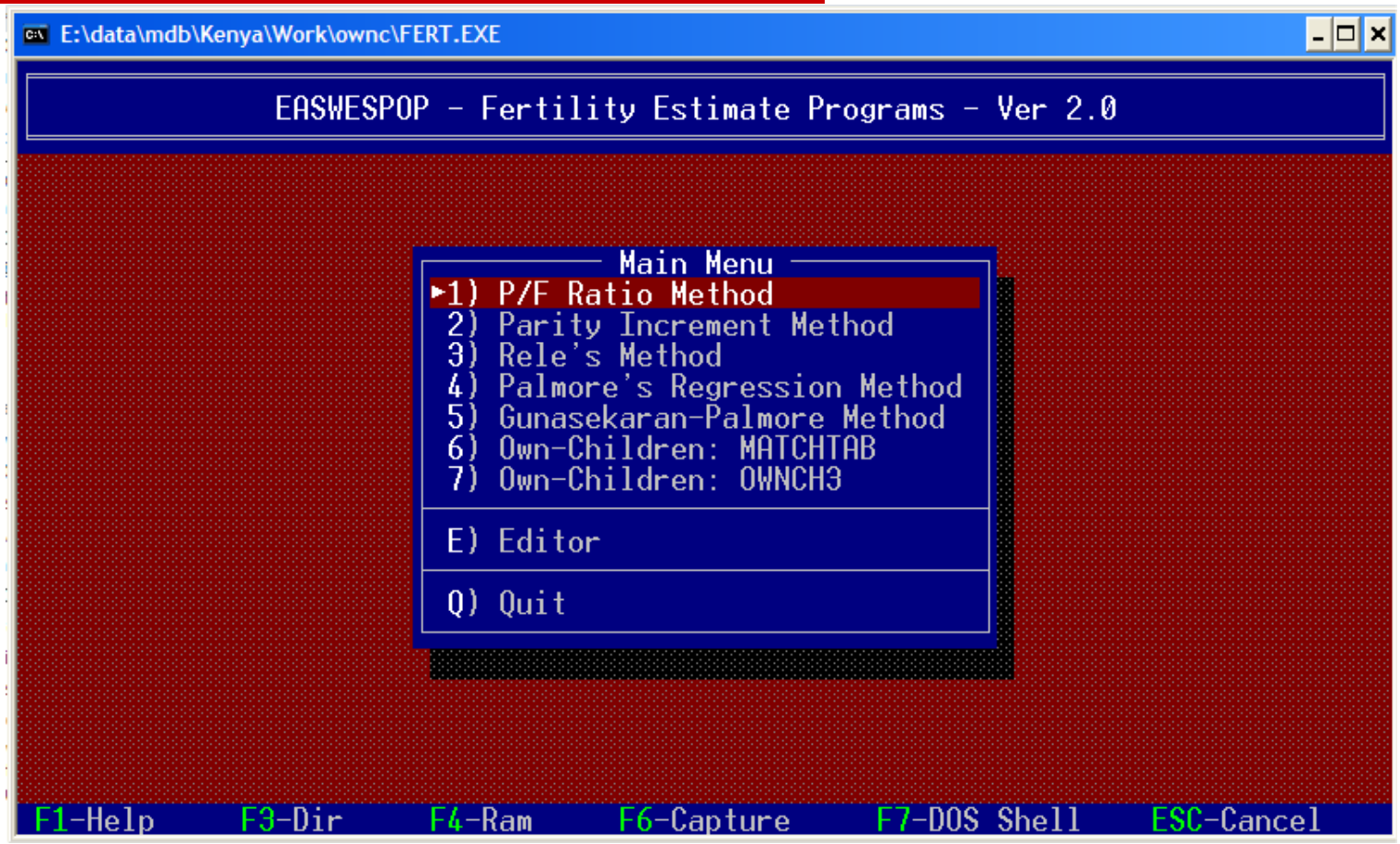
Age of mother	Number of children, by age of child																Number women
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
15	13	7	0	2	2	2	1	4	3	4	2	1	3	1	3	3	755
16	12	3	0	2	0	2	1	1	1	0	0	0	2	0	0	1	696
17	23	16	6	1	0	0	0	0	0	0	1	0	0	0	0	0	686
18	58	36	17	3	0	3	1	2	0	0	0	0	0	0	0	0	706
19	66	46	24	13	11	1	3	1	0	0	0	0	1	0	0	1	538
20	77	55	45	33	19	12	2	1	0	2	2	1	1	1	0	0	602
21	78	71	56	47	48	17	7	5	3	0	1	2	1	1	0	0	488
22	84	80	76	73	46	26	18	15	3	0	0	0	0	0	1	0	534
23	84	85	80	84	61	53	29	24	7	9	1	2	0	2	1	0	488
24	93	63	78	72	56	48	45	34	17	9	8	3	0	1	1	1	411
25	91	84	87	83	69	71	55	52	31	21	5	5	2	1	0	0	464
26	73	67	65	70	66	70	61	55	41	24	17	11	1	1	2	0	393
27	58	61	70	58	63	79	64	64	47	28	27	16	11	5	2	1	339
28	83	71	77	81	94	80	87	91	80	60	42	34	16	8	3	2	442
29	48	58	52	59	68	64	77	75	61	66	48	50	23	23	6	4	330
30	46	60	70	62	82	86	86	86	82	74	69	50	45	31	20	8	403
31	42	39	42	36	44	44	55	66	63	56	57	46	43	24	12	8	243
32	45	50	67	54	66	65	73	82	79	91	78	64	63	66	38	30	343

Usually requires tabulations of **microdata**. Algorithms for matching mothers and own children can be fairly complicated.

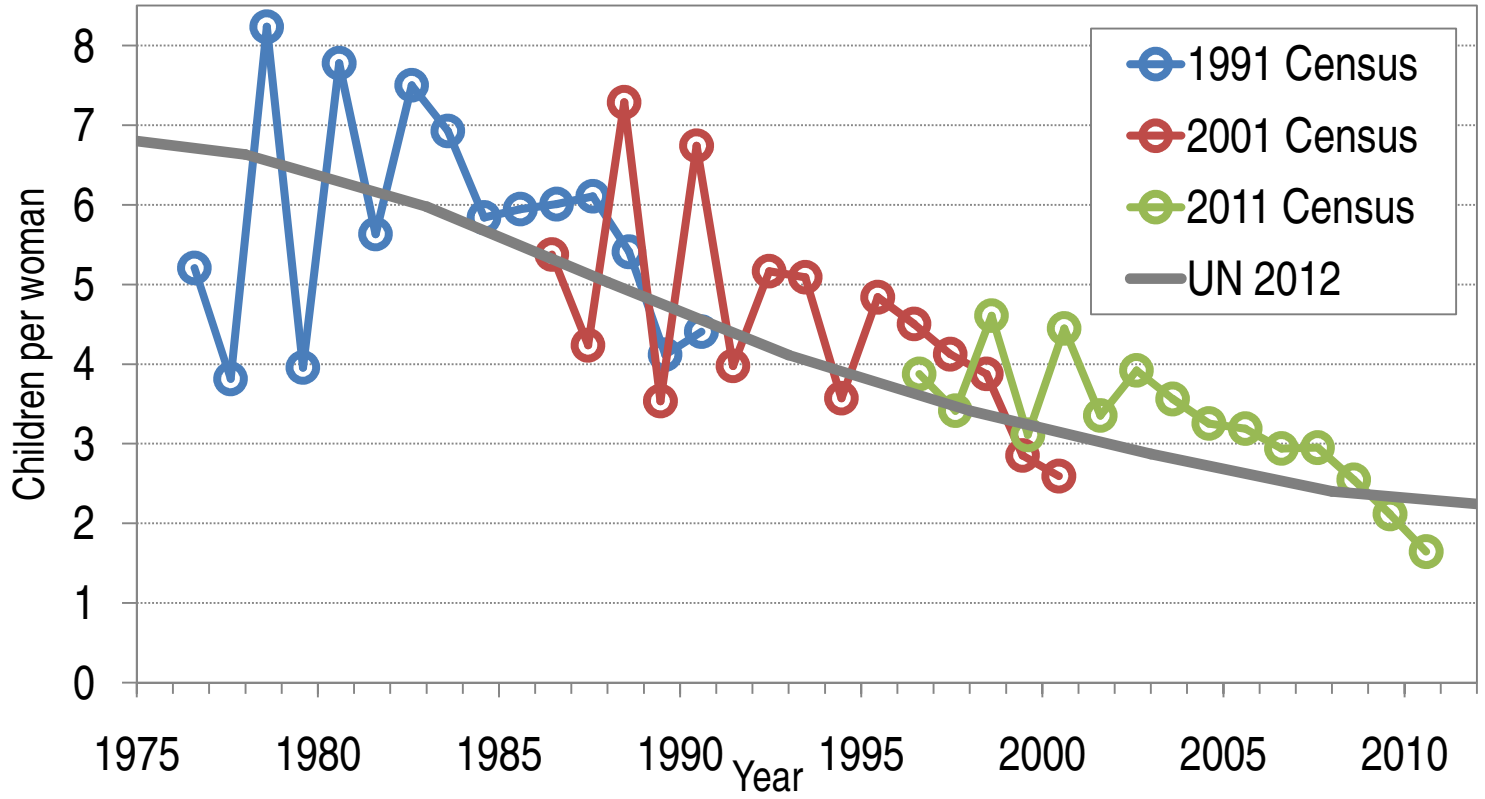
Step 2

Apply reverse survival techniques to the distribution obtained at the previous step to estimate shape and level of fertility in the last 15 year

Own-children method: FERT software

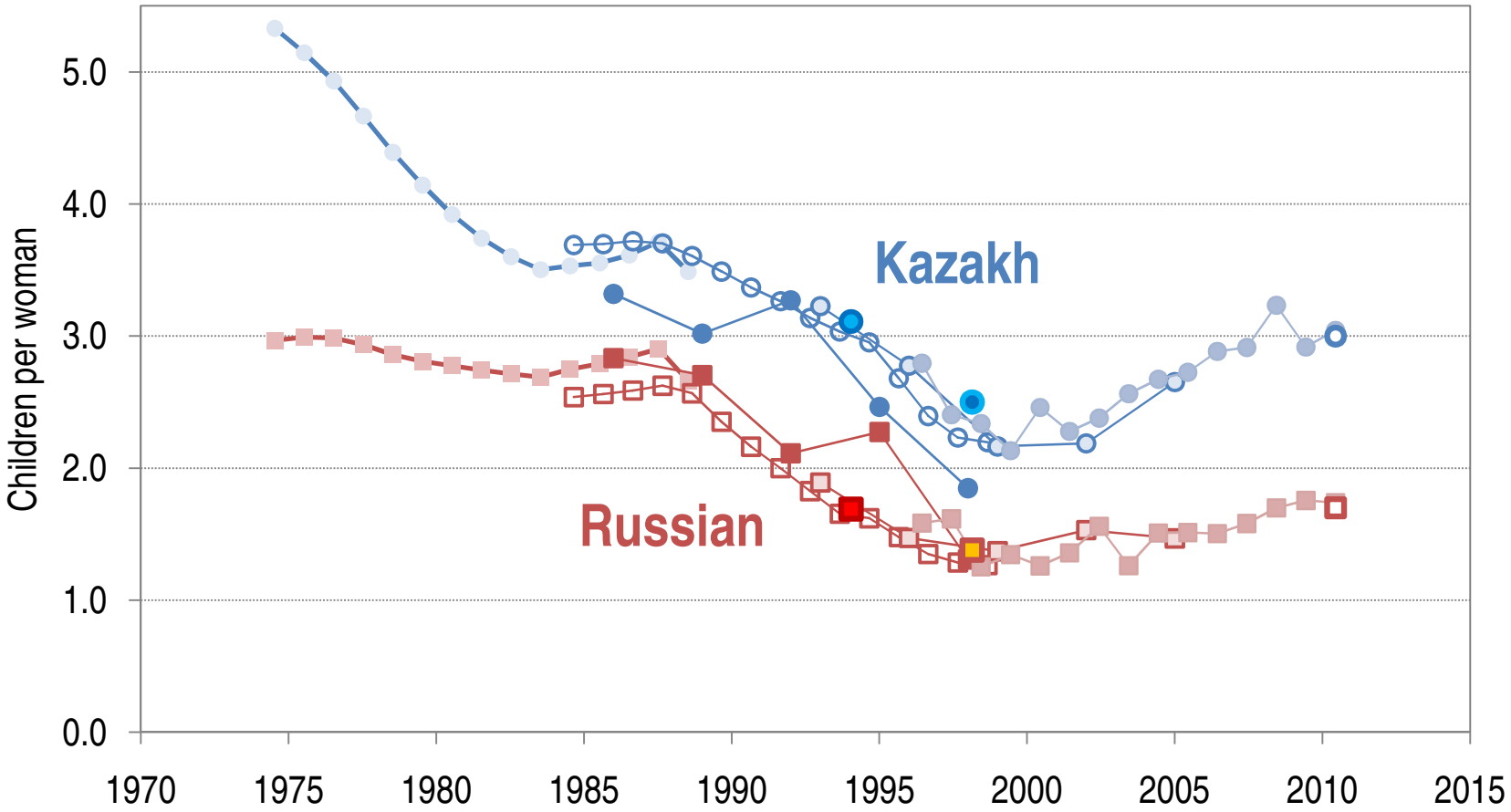


Fertility Estimates by Own-Children Method, Bangladesh



Source: Using IPUMS microdata, computed using Fert.exe (East-West Center).

Fertility Estimates by ethnic groups, Kazakhstan



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United Nations (1983), *Manual X: Indirect Techniques for Demographic Estimation*, (see Chapter 2) http://www.un.org/esa/population/publications/Manual_X/Manual_X.htm

MortPak manual (accompanies software)

East-West Center (www.eastwestcenter.org) (software)

धन्यवाद

terima kasih

Ташаккур

Рахмат!

THANK YOU …

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Kaadinchhey La

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