# An Own-Children Maternal Orphanhood Method For Estimating Fertility Rates from Census Microdata

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**OWCHMOM**

Minnesota Population Center

University of Minnesota

IPUMS S PARIS

2005

# An Own-Children Maternal Orphanhood Method for Estimating Fertility Rates from Census Microdata

- Objectives and Motivation
  - Bob – promote need for and use of IPUMS census microdata
  - Michel - expand demographic tool kit using empirical data
- Empirical results, ZA:  Authorities, OWCHMOM, OWCH
- Methodology and Data:
  - Method:  Own Children, with mortality estimates from % maternal orphanhood, not model life tables
  - DATA:  IPUMS Microdata only; use:
    - MOMLOC to match children to moms
    - % maternal orphans to estimate mortality
- Other examples:  Burkina Faso → Zambia
- Conclusions, lessons learned
  - MOMLOC is great!
  - It’s the mortality, stupid!

# Bob's job: Get data
# The pitch: Power of census microdata and value added by IPUMS
# Publications: Topics

1. Microdata revolution
2. Confidentiality
3. Assortative mating
4. Coherence
5. Own children maternal mor
6. Sustainable development g

Carling, J., ed. (2002). *Nordic demography: Trends and differentials.* Scandinavian Population Studies, Volume 13, Oslo: Unipub/Nordic Demographic Society. 7–30.

The Census in global perspective and the coming microdata revolution

相同出生队列小学及以上人口比例统计的一致性*

——基于亚太十三国人口普查数据的分析

Robert McCaa Lara Cleveland Patricia Kelly Hall Steven Ruggles Matthew Sobek

【摘　要】文章根据国际微观数据系列整合共享数据库中的13个亚太国家各自多次人口普查微观数据，检测了不同出生队列的小学毕业及以上受教育程度人口所占比例在历次普查之间的一致性。研究发现，中国、越南、蒙古和印度尼西亚4个国家的一致性很高，平均差异不到0.5个百分点，回归系数为0.93～1.07，$R^2$ 高达0.99。然而，另外一些国家的一致性较差，有的国家与平均值的绝对差异高达16个百分点。这13个亚太国家的回归系数的变化范围为0.62～1.44，$R^2$ 为0.65～0.99。总体而言，这些国家小学及以上受教育程度人口

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**Abstract**
*The IPUMS-International project, now in its fifteenth year, integrates and disseminates population microdata for twenty-two African countries (82 countries world-wide) and the number continues to increase as more National Statistical Offices cooperate with the initiative. Statistical quality is a serious concern both for the producers of the microdata as well as the researchers who use them. This paper applies the intra-cohort*

United Nations Economic Commission for Africa
African Centre for Statistics

# AFRICA ADDENDUM TO THE UNITED NATIONS PRINCIPLES AND RECOMMENDATIONS FOR POPULATION AND HOUSING CENSUSES, REV 2

March 2008

**2.2. Topics that are not considered core at the Global level but are regarded as core by African countries**

…

(2) Orphanhood (paternal, maternal and dual)

Information on the survival status of biological parents can be used in indirectly estimating adult mortality indicators. This information is very critical in the African set up where no complete Civil Registration and Vital Statistics Systems are available to provide the same information.

Orphanhood information is also critical to Africa because of the need for these indicators in the national, sub regional, regional, and international programmes to assist orphans and vulnerable children (OVCs) in many African countries. Moreover

# Orphanhood questions: South Africa 2011 census

**SECTION D: PARENTAL SURVIVAL AND INCOME - ASK OF EVERYONE LISTED ON THE FLAP**

| **P-14** MOTHER ALIVE | **P-14a** MOTHER PERSON NUMBER | **P-15** FATHER ALIVE |
|---|---|---|
| **Is** *(name's)* **own biological mother still alive?**<br>1 = Yes<br>2 = No<br>3 = Do not know<br><br>*Mark the appropriate circle with an X.* | **Who in this household is** *(name's)* **biological mother?**<br><br>*If the person's mother does not reside in the household (not listed on the flap), write 98.*<br><br>***Note:*** *Refer to* | **Is** *(name's)* **own biological father still alive?**<br>1 = Yes<br>2 = No<br>3 = Do not know<br><br>*Mark the appropriate circle with an X.* |

# Almost all 2010 round African census samples have necessary variables. Exceptions: Egypt 2006, Ghana 2010, Nigeria 2010.

An "X" indicates the variable is available in that dataset.

| Variable | Variable Label | BF 2006 | CM 2005 | EG 2006 | ET 2007 | GH 2010 | KE 2009 | LR 2008 | MW 2008 | ML 2009 | MZ 2007 | NG 2010 | ZA 2011 | SS 2008 | SD 2008 | ZM 2010 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AGE | Age (Single year) | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| CHBORN | Children ever born | X | X | . | X | X | X | X | X | X | X | . | X | X | X | X |
| MORTMOT | Mortality status of mother | X | X | . | X | . | X | X | X | X | X | X | X | X | X | X |
| MOMLOC | Mother's location in house | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| STEPMOM | Probable stepmother | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| | Compute OWCHMOM ?? | Yes | Yes | No | Yes | No | Yes | Yes | Yes | Yes | Yes | No | Yes | Yes | Yes | Yes |

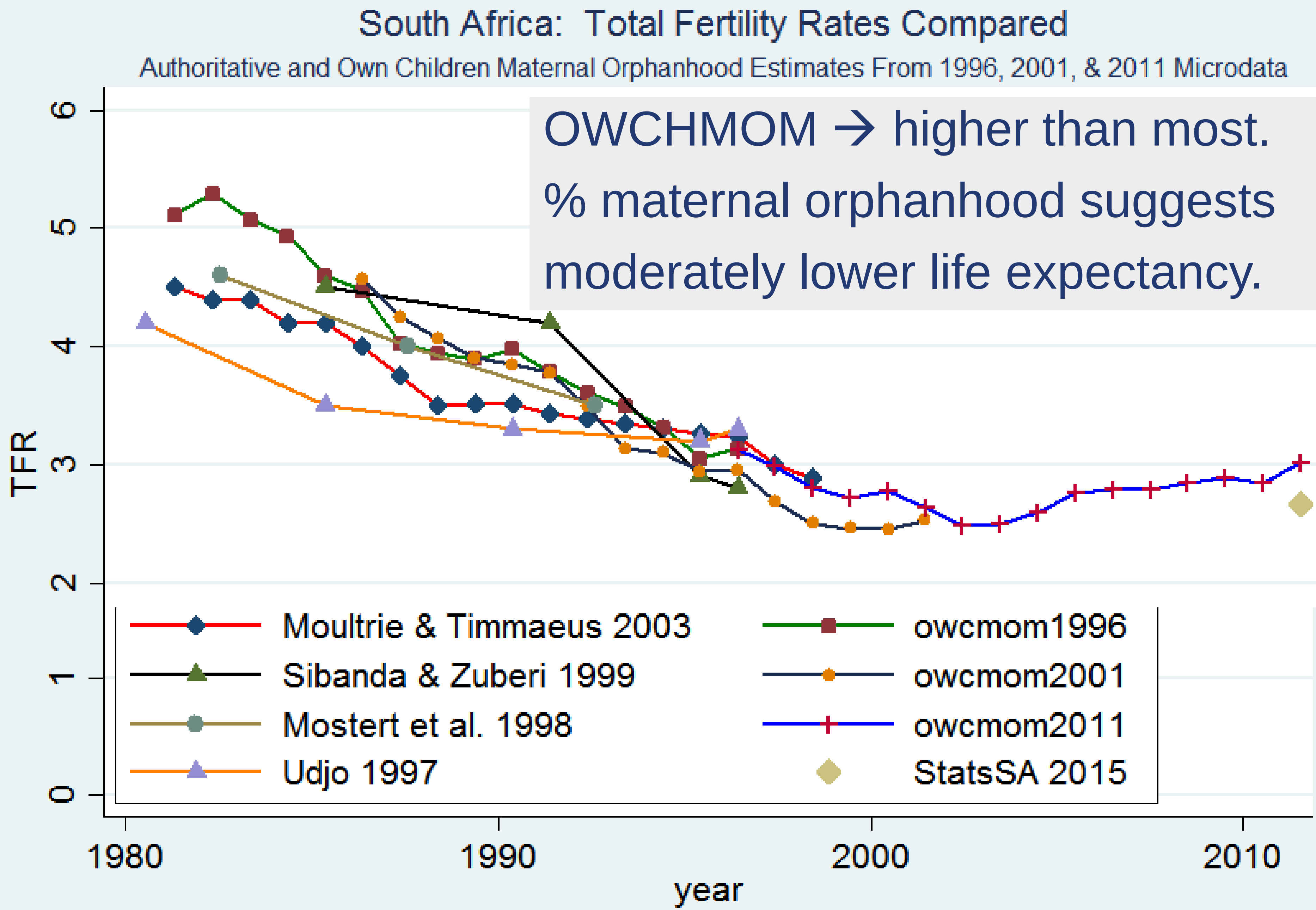
# Gold Standard: Moultrie & Timaeus, Pop Studies, 2003

Adjustments to ZA1996 census sample data:

1. Weighted to compensate for undercount
2. El Badry corrections for childlessness
3. Discount stillbirths (estimated from ‘98 DHS)

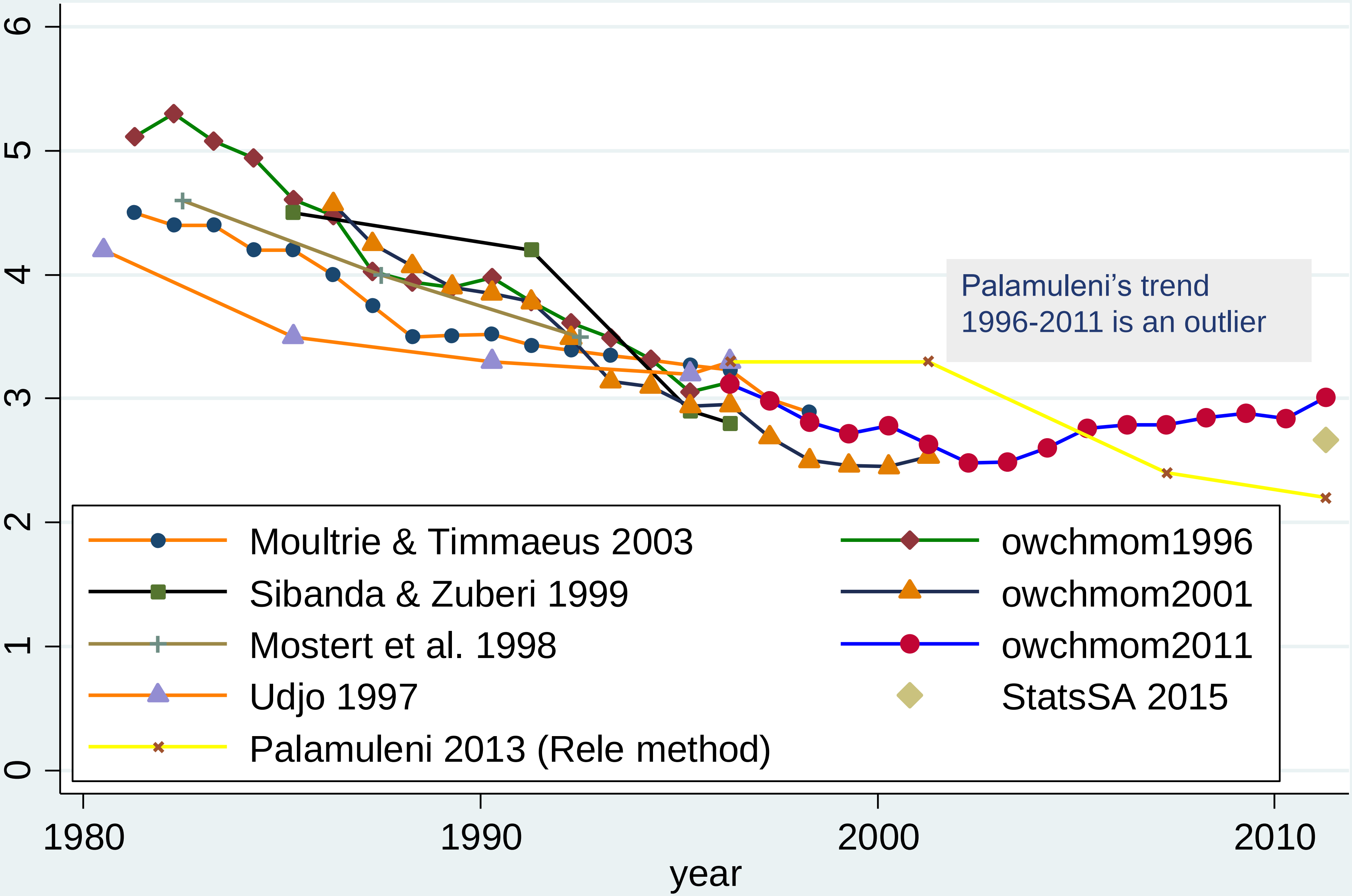
Methods (not OWCH):

a. Births last year (Census and DHS 1998)
b. Reverse Survival (age structure + life tables)


South Africa: Total Fertility Rates Compared
Authoritative and Own Children Maternal Orphanhood Estimates From 1996, 2001, & 2011 Microdata
OWCHMOM → higher than most.
% maternal orphanhood suggests
moderately lower life expectancy.
TFR
0
1
2
3
4
5
6
1980
1990
2000
2010
year
Moultrie & Timmaeus 2003
Sibanda & Zuberi 1999
Mostert et al. 1998
Udjo 1997
owcmom1996
owcmom2001
owcmom2011
StatsSA 2015

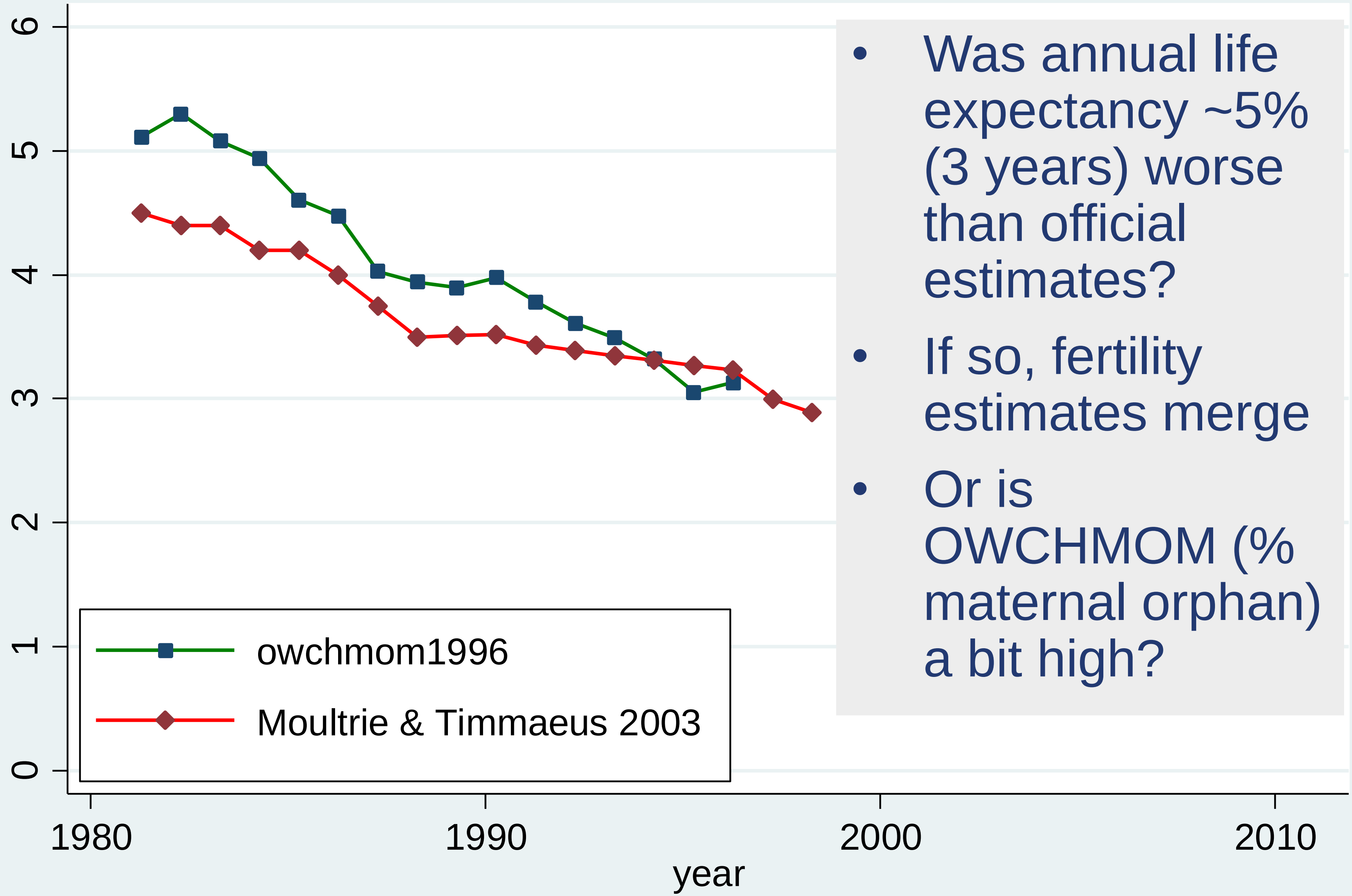
# South Africa: Published Total Fertility Estimates Compared with OWCHMOM

3 Own Children Maternal Orphanhood Series 1996, 2001 and 2011



# South Africa: 2 Fertility Methods Compared

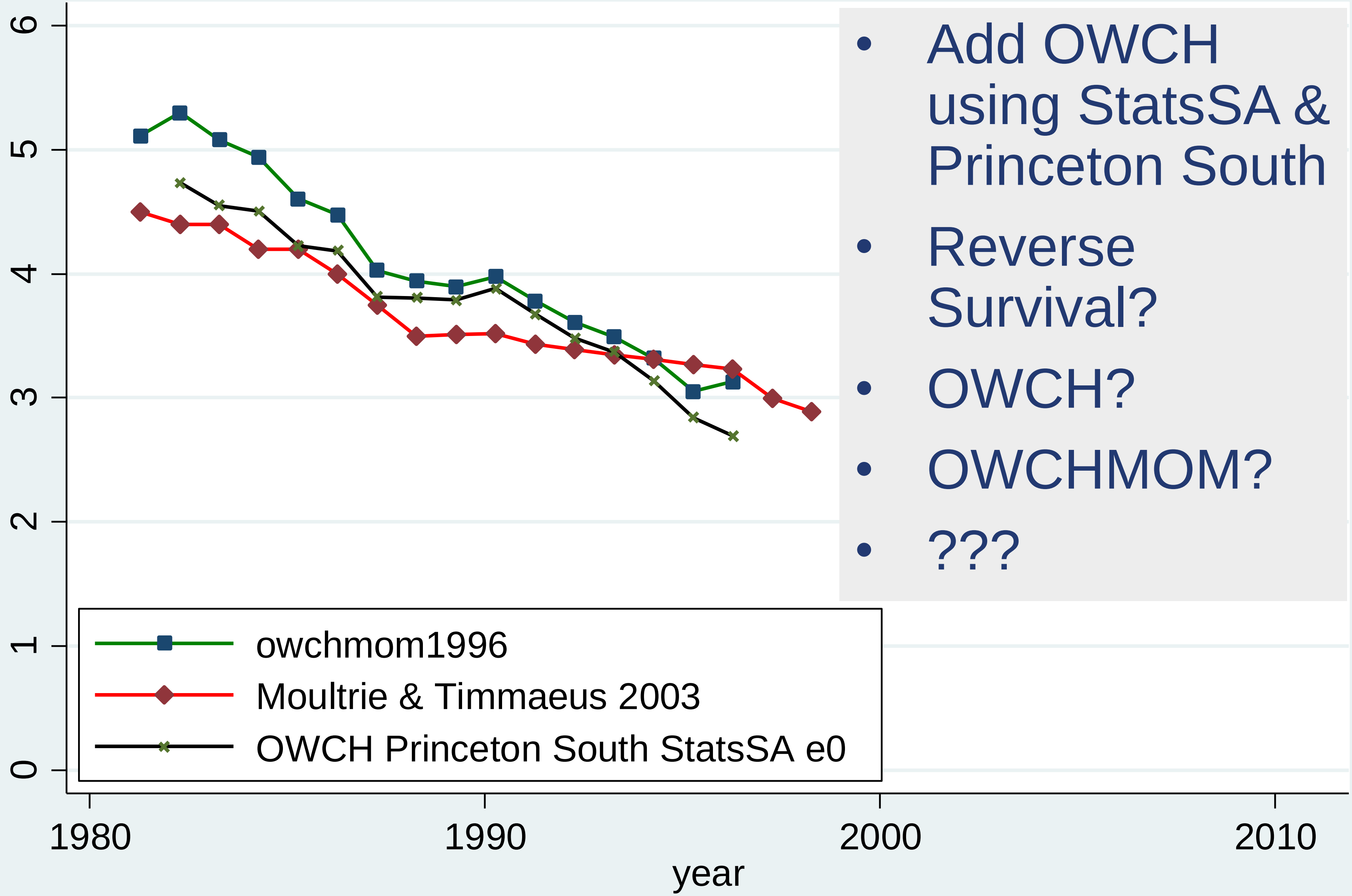
Reverse Survival (official StatsSA annual mortality estimates) vs. OWCHMOM




- Was annual life expectancy ~5% (3 years) worse than official estimates?
- If so, fertility estimates merge
- Or is OWCHMOM (% maternal orphan) a bit high?

# South Africa: 3 Fertility Methods Compared

Reverse Survival vs. OWCHMOM vs. OWCH South Princeton Models StatsSA e0 1981-1996




- Add OWCH using StatsSA & Princeton South
- Reverse Survival?
- OWCH?
- OWCHMOM?
- ???

# Rationale of Own Children Methods

Reconstruct age specific fertility rates from a census inflating numbers of children using mortality rates derived from model life tables

- Age Specific Fertility Rates = Births / Women by age and period
- Backward project person-years lived by women
- Backward project births from survivors
- Calculate ASFR and TFR for the 10 to 15 years before the census

# Framework

| | | | | |
|---|---|---|---|---|
| No birth | ← | **Women** | → | Died |
| | | ↓ | | |
| Living elsewhere | ← | **Births** | → | Died |
| | | ↓ | | |
| | | Living at home | | |

# Own Children Maternal Orphanhood Method - OWCHMOM

1. Use only information available in census microdata
2. Match mothers to co-resident children using MOMLOC (EASWESPOP is very good, MOMLOC is more accurate!)
3. Backward project children ever-born directly (use spreadsheet, not EASWESPOP)
4. Backward project women from orphanhood question (use spreadsheet, not EASWESPOP model life tables)

NEW!

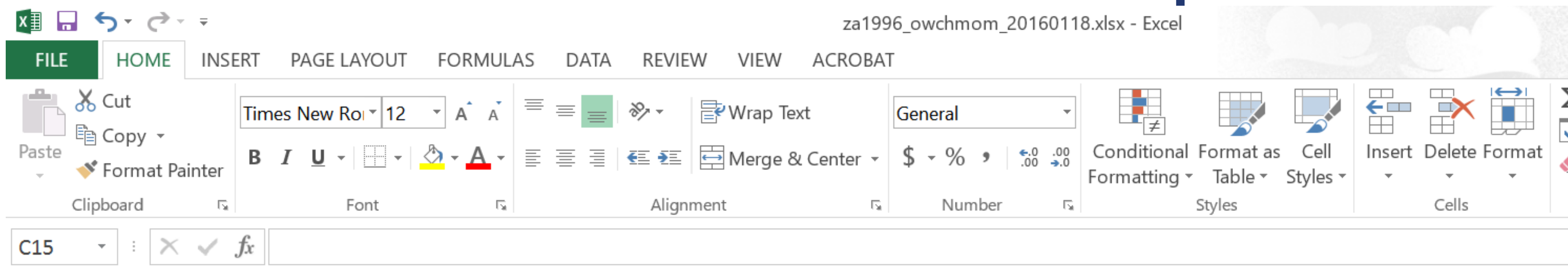
# Data needed—3 computed by IPUMS Tabulator. The 4th (age by age_mom) would be cool

1. AGE by SEX, age structure: number of women by single year of age: 12-64
2. CEB, fertility: Mean number of children ever-born by AGE (single year), for women 12-64
3. AGE by AGE_MOTHER: Age of children (0-49) by AGE of mother (12-64). Careful: MOMLOC where STEPMOM=0!

NEW!

4. MORTMOT, mortality (orphanhood): proportion of persons age 0-49 whose mother is alive (by single year of age)

# Garenne OWCHMOM spreadshe




| | A | B | C |
|---|---|---|---|
| 1 | **Own Children Maternal Orphanhood Method** | | |
| 2 | **Reconstructing Fertility Trends and Age Patterns** | | |
| 3 | **From Household Census Microdata: Children Ever-Born, Maternal Orphanhood, and Pointers to Childrens' Co-resident Mothers** | | |
| 4 | **Updated** | 1/16/2016 | |
| 5 | **Contact** | Michel.Garenne@pasteur.fr | |
| 6 | | | |
| 7 | **Input data** | *Data needed* | Enter data marked in yellow cells |
| 8 | a | Country name | South Africa |
| 9 | b | Date of census | 10/10/1996 |
| 10 | *1* | Population | Number of women age 12-64, by single year of age |
| 11 | *2* | Fertility | Mean number of children ever born to women 12-64, by single year of age |
| 12 | *3* | Mortality | Proportion of children whose mother had died, age 0-49 |
| 13 | *4* | Age pattern | Crosstabulation of own children by age of mother and age of child |
| 14 | | | |
| 15 | **Intermediate calculations** | | |
| 16 | *AgeDistribution* | | Mean age of children, by age of mother |
| 17 | *Orphanhood* | | Proportion of women who died, by age of women |
| 18 | *PersonYears* | | Person-years lived by women, by age and period |
| 19 | *Births* | | Number of births, by age of mother and period |
| 20 | **Output data** | | |
| 21 | *ASFR* | | Age-specific fertility rates, by period |
| 22 | *Figures* | | Age pattern of fertility |
| 23 | | | Fertility trends |

# Calculations: 1) Women

Principle: start from cohorts of surviving women, and take into account their mortality since delivery

Calculate mean age of children by age of mother = duration of exposure to mortality since birth of children

Calculate the proportion of women who have died since delivery = proportion of children who are orphans (from orphanhood question, MORTMOT)

Backward project person-years lived by women, by age and period

# Calculations: 2) Children

Principle: start from children ever-born (and not from survivors)

Calculate the distribution of surviving (own) children by age (year) and age of mother (year)

Distribute children ever-born according to the same distribution

Provides live births by period (year) and age of mother (single year)

# Calculations: 3) ASFR

Principle: ASFR(a,t) = Births(a,t)/Women(a,t)

Calculate ASFR, by age and period (single year)

Merge age groups and periods as desired (age groups and periods add up in both numerator and denominator)

Classic age group: 15-19, 20-24, …, 45-49

Periods: recommend 3 years: t-1 to t-3; t-4 to t-6 etc.

# Examples: IPUMS Samples

Kenya 2009 census

Available from IPUMS-international web site

Data on children ever-born

Data on maternal orphanhood

Cross-tabulation of age of children by age of mother

- Use MOMLOC and STEPMOM variables
- If STEPMOM>0, then MOMLOC = 0 (and thus this child is not biological)
- If STEPMOM=0 and MOMLOC >0 then biological child

## Lessons learned

1. MOMLOC is great
2. OWCHMOM is worth considering
3. It’s the mortality, stupid!

Reconstructing fertility levels and trends from census data is a challenge, but microdata are better than aggregated tables

- Level of fertility in past 5 to 6 years
- Age pattern in past 5 to 6 years
- May lead to misleading fertility trends

Attempt worthwhile where census data are reliable

- Data quality: age reporting, mother location
- Potential biases: low mortality & migration

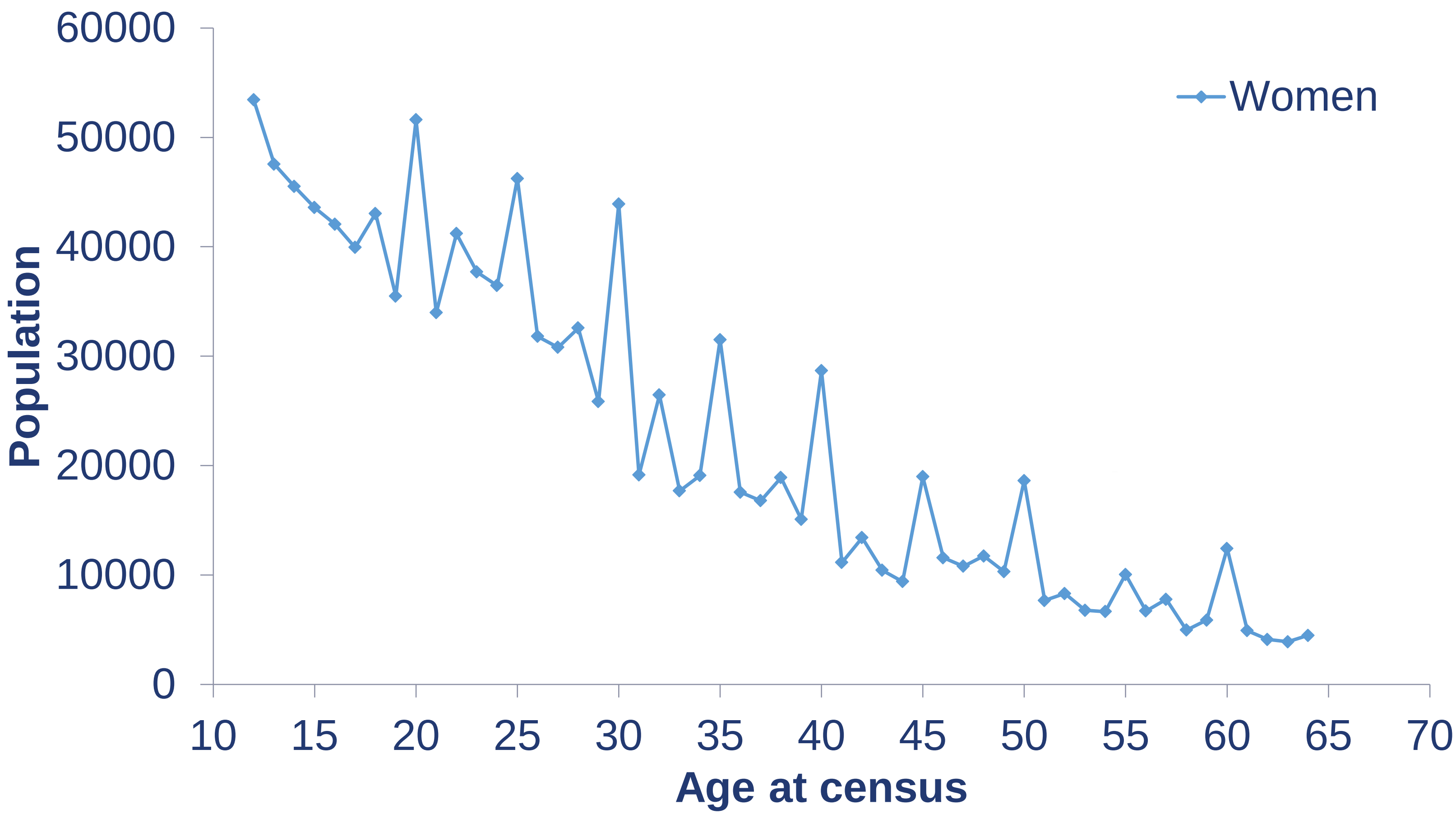
IPUMS MOMLOC is better than EASWESPOP

Both OWCH & OWCHMOM are sensitive to:

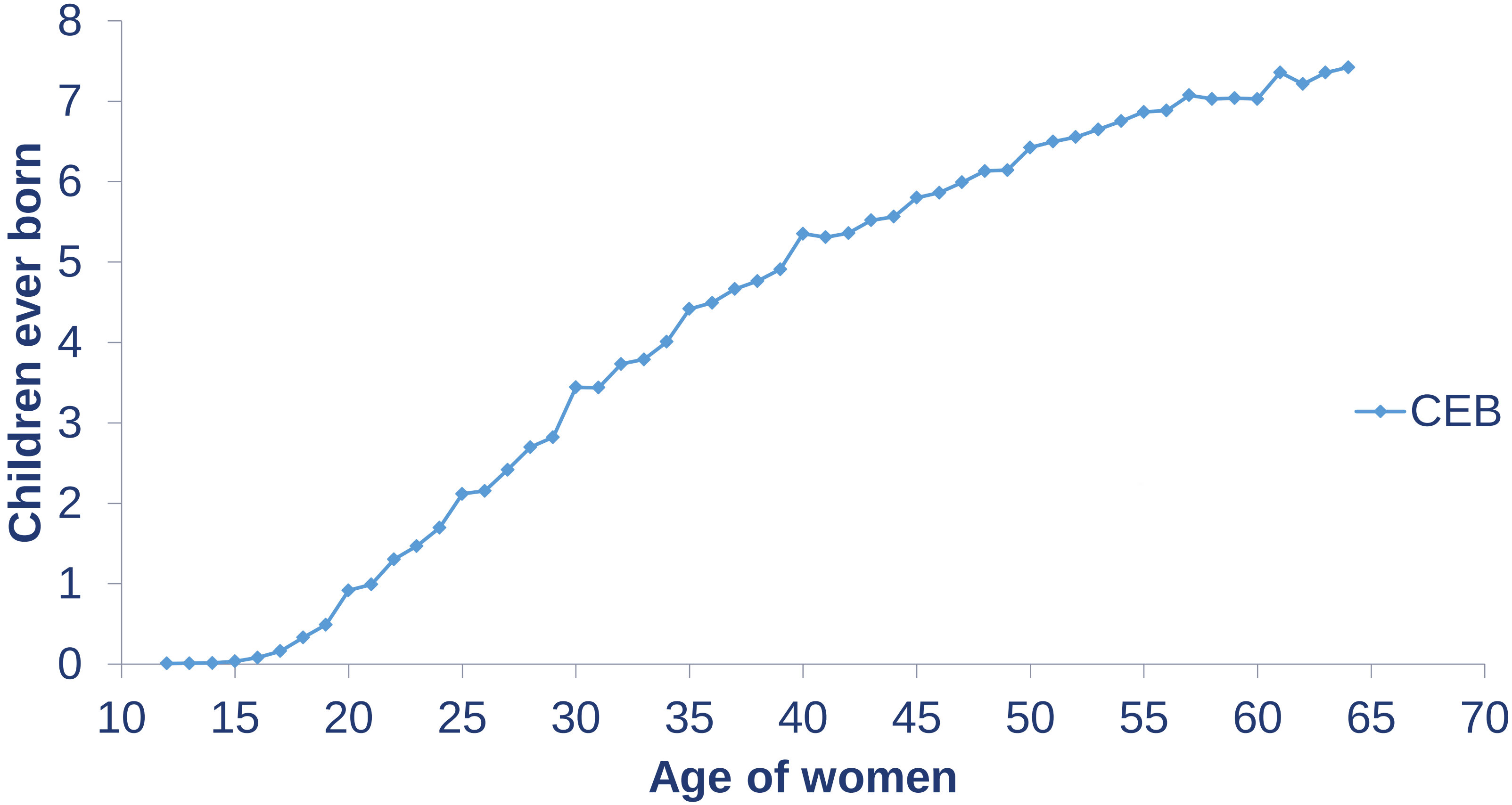
- data quality
- mortality inputs

But so is Reverse Survival

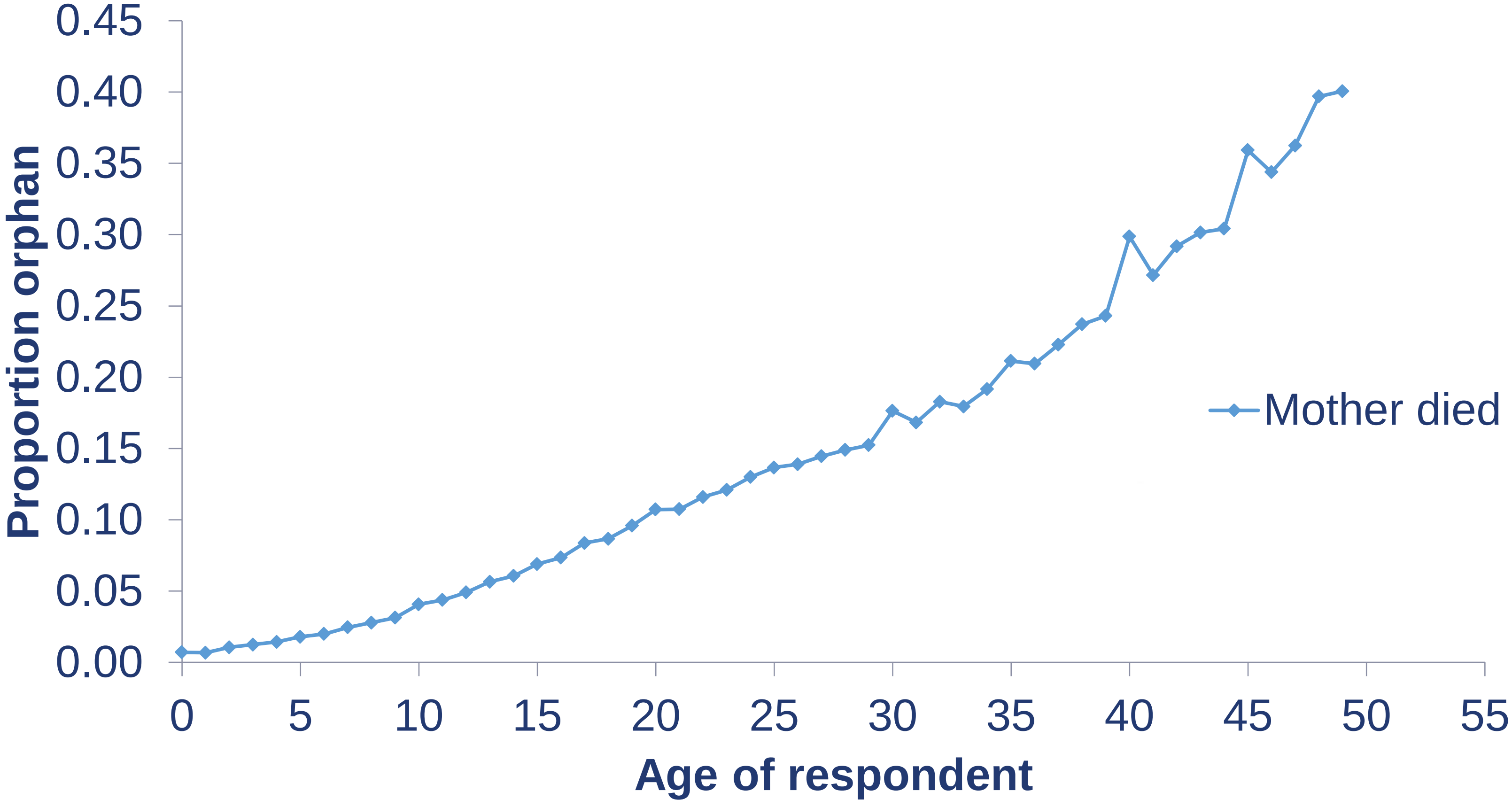
# 1) Age structure, Kenya 2009



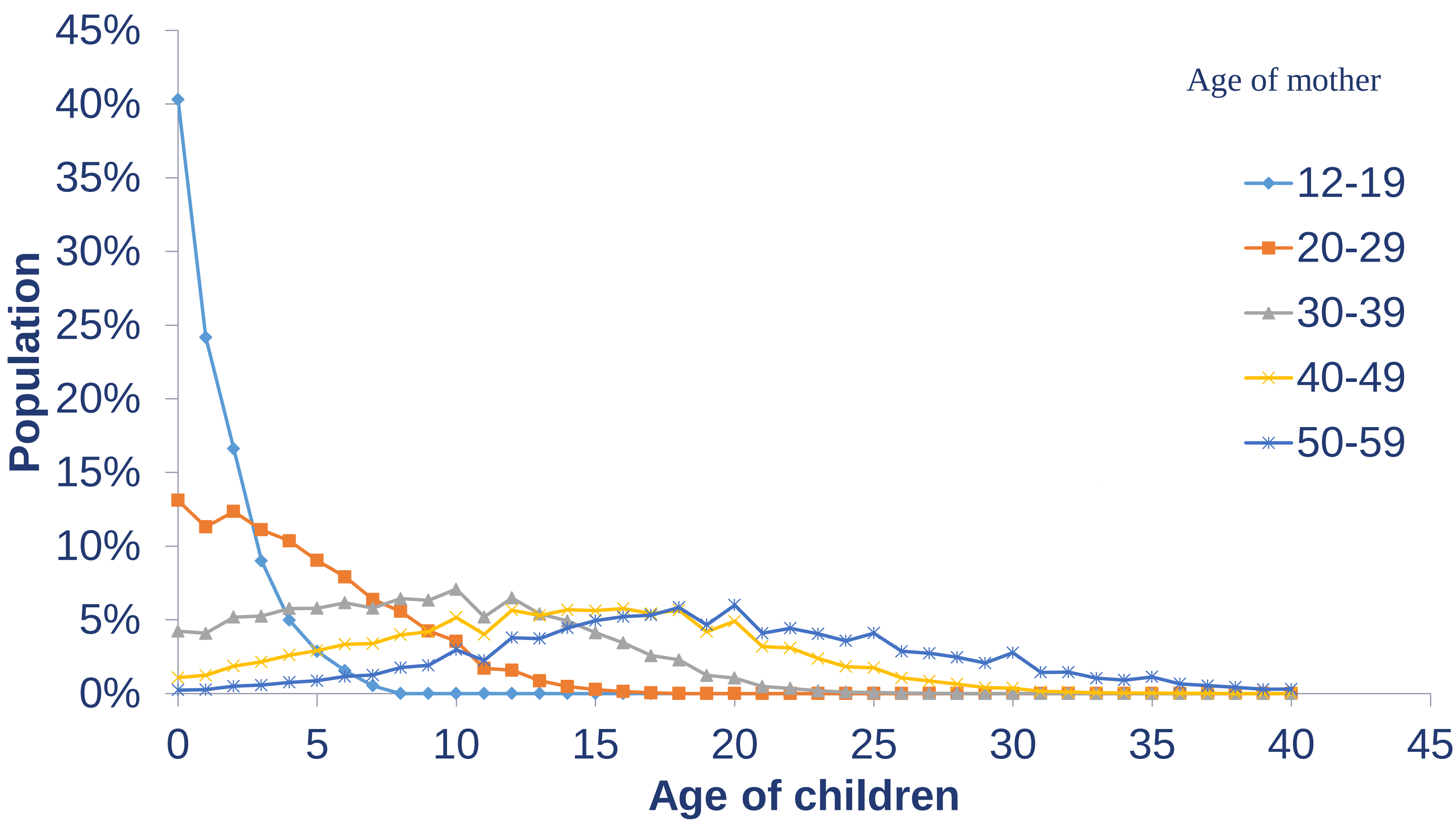
# 2) Fertility: children ever-born



# 3) Maternal orphanhood



# 4) Distribution of age of children by age of mother



# Results

Kenya, 2009 census

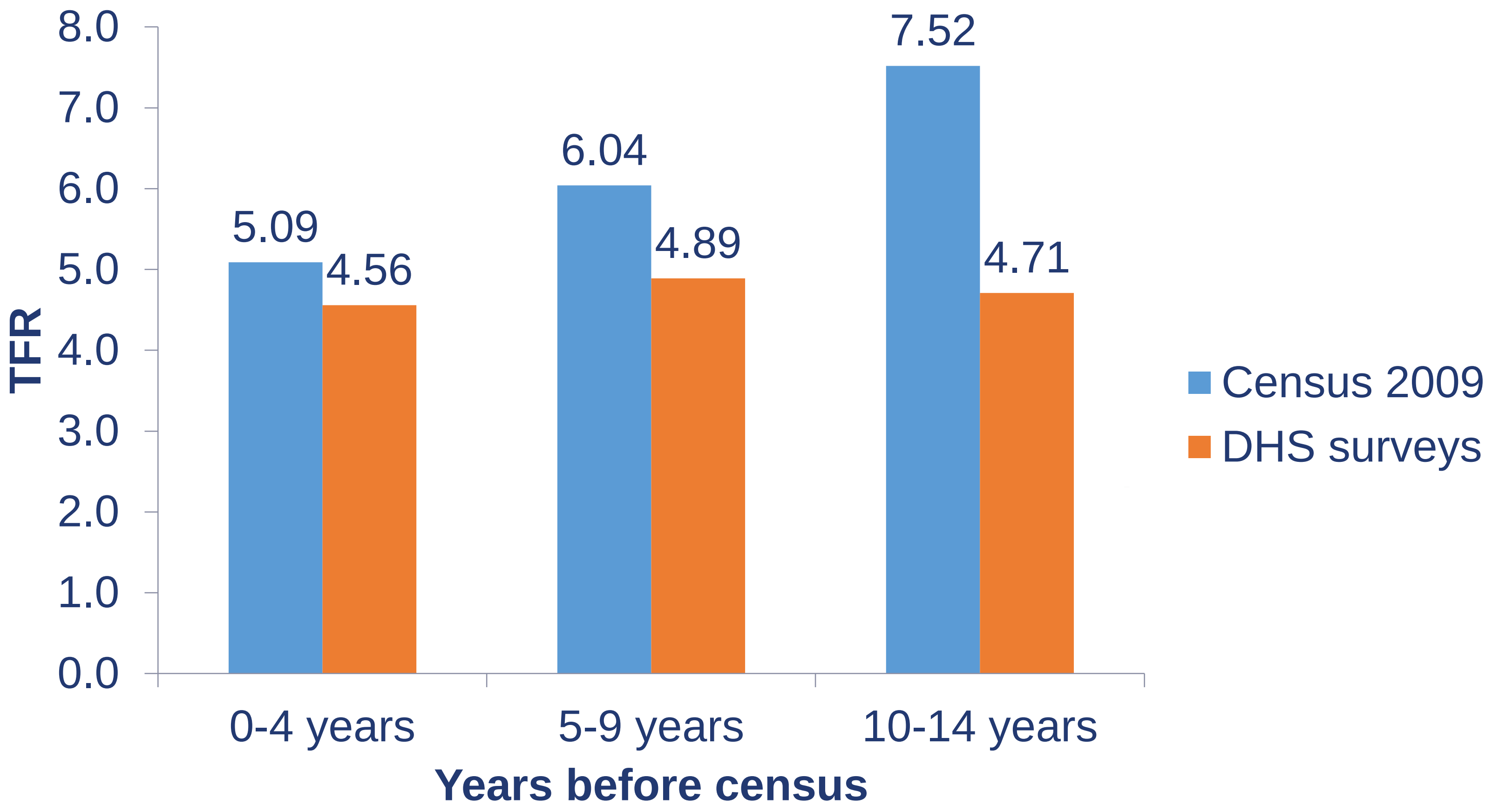
Level of fertility (TFR)

Age pattern of fertility

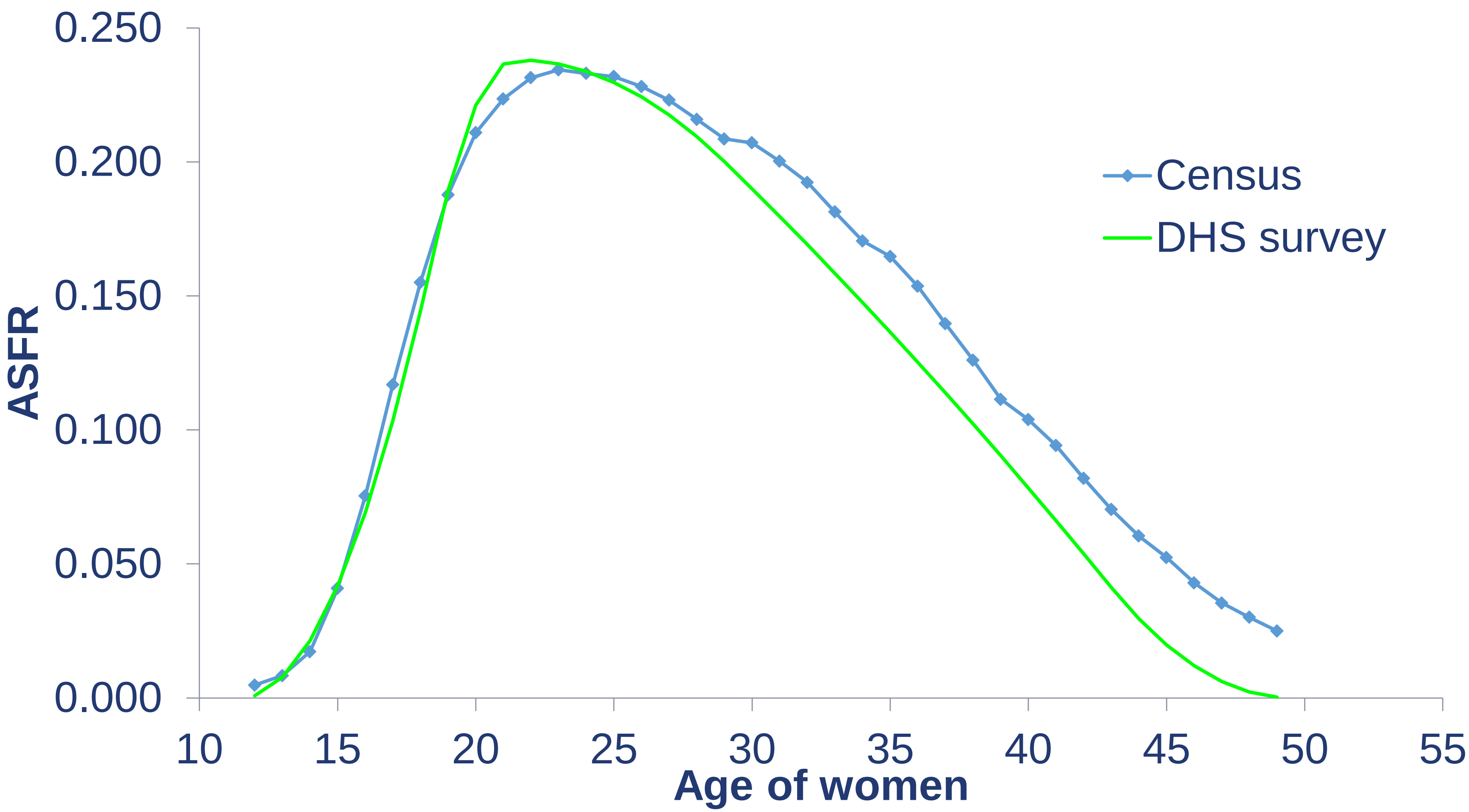
Fertility trends

Comparison with 2008 DHS survey

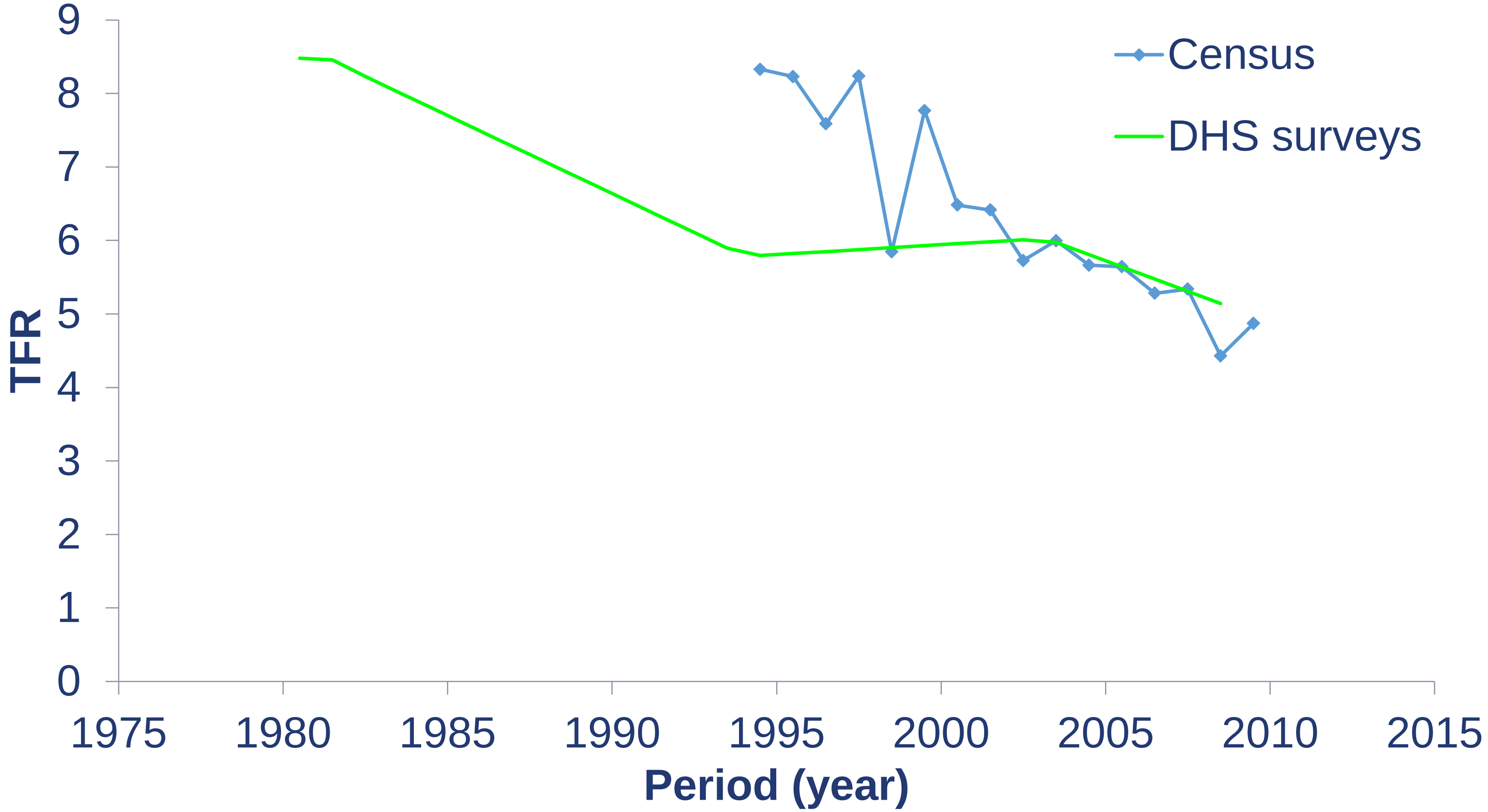
# Level of fertility, Kenya



# Age pattern of fertility, Kenya
## (5 years before census)



# Fertility trends, Kenya



# Sources of bias

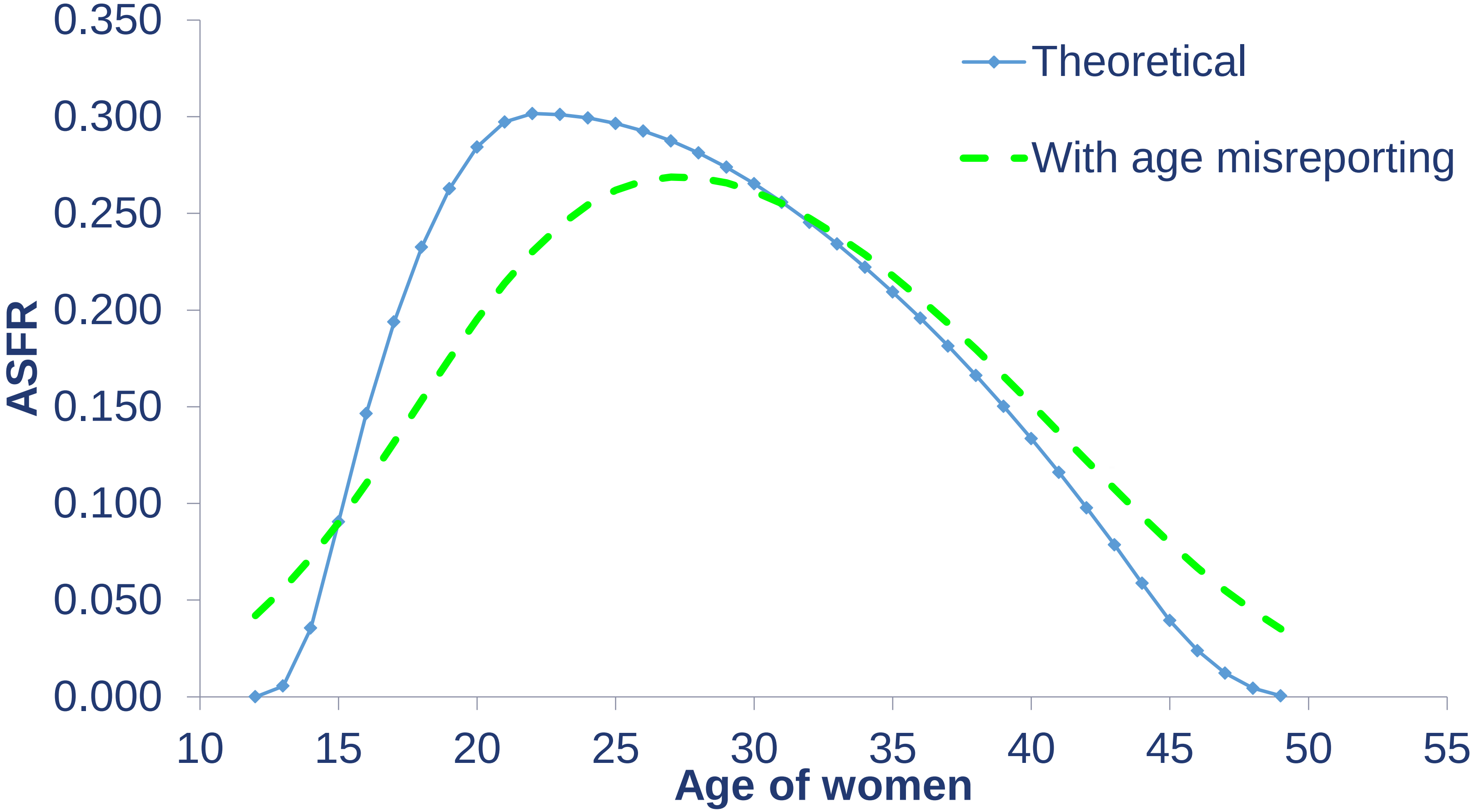
H1: Accurate age of mother

H2: Accurate age of children

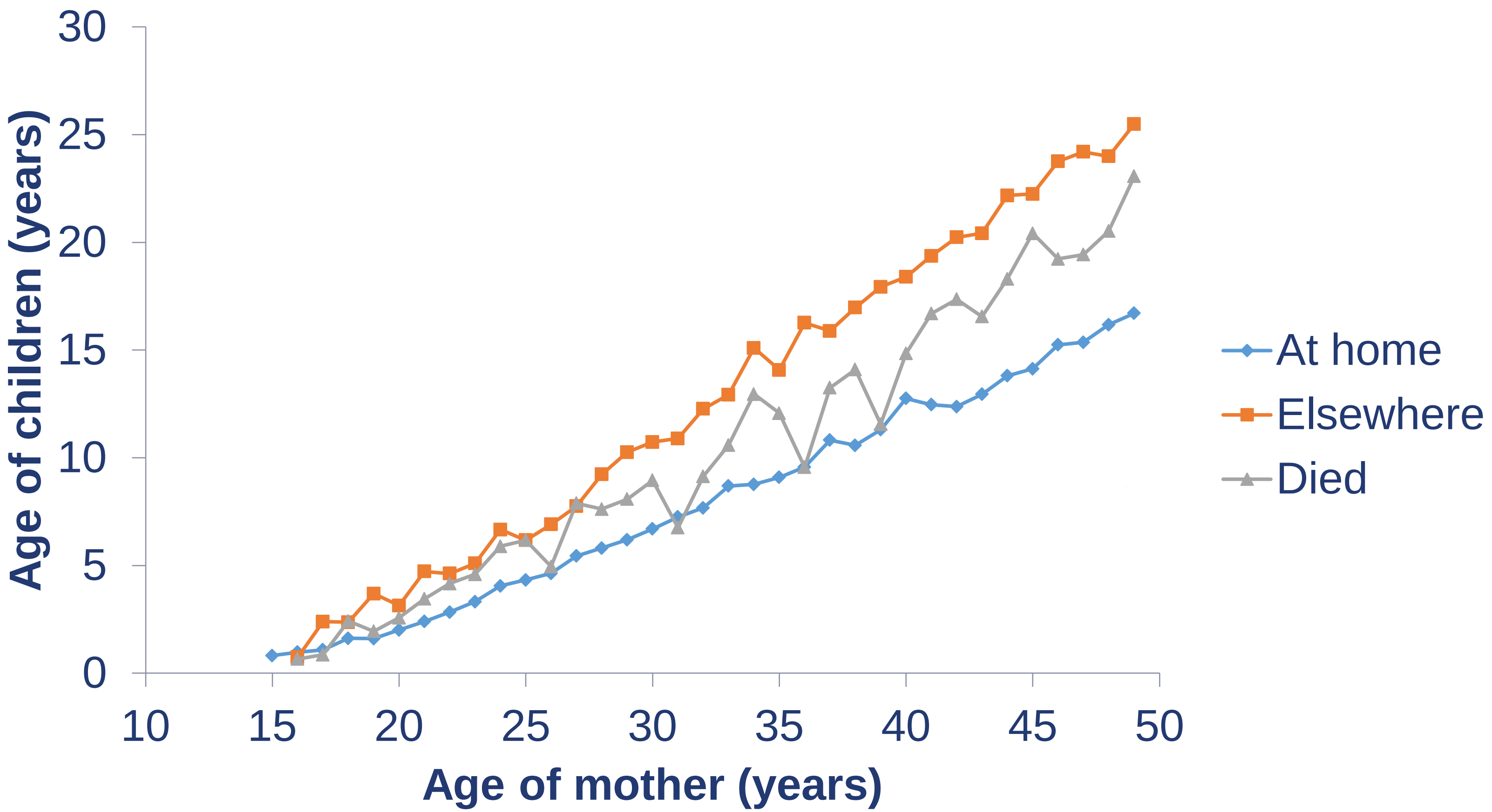
H3: Accurate matching of children with mother

H4: Same distribution of time since birth for children living with mother, children living elsewhere and children who died

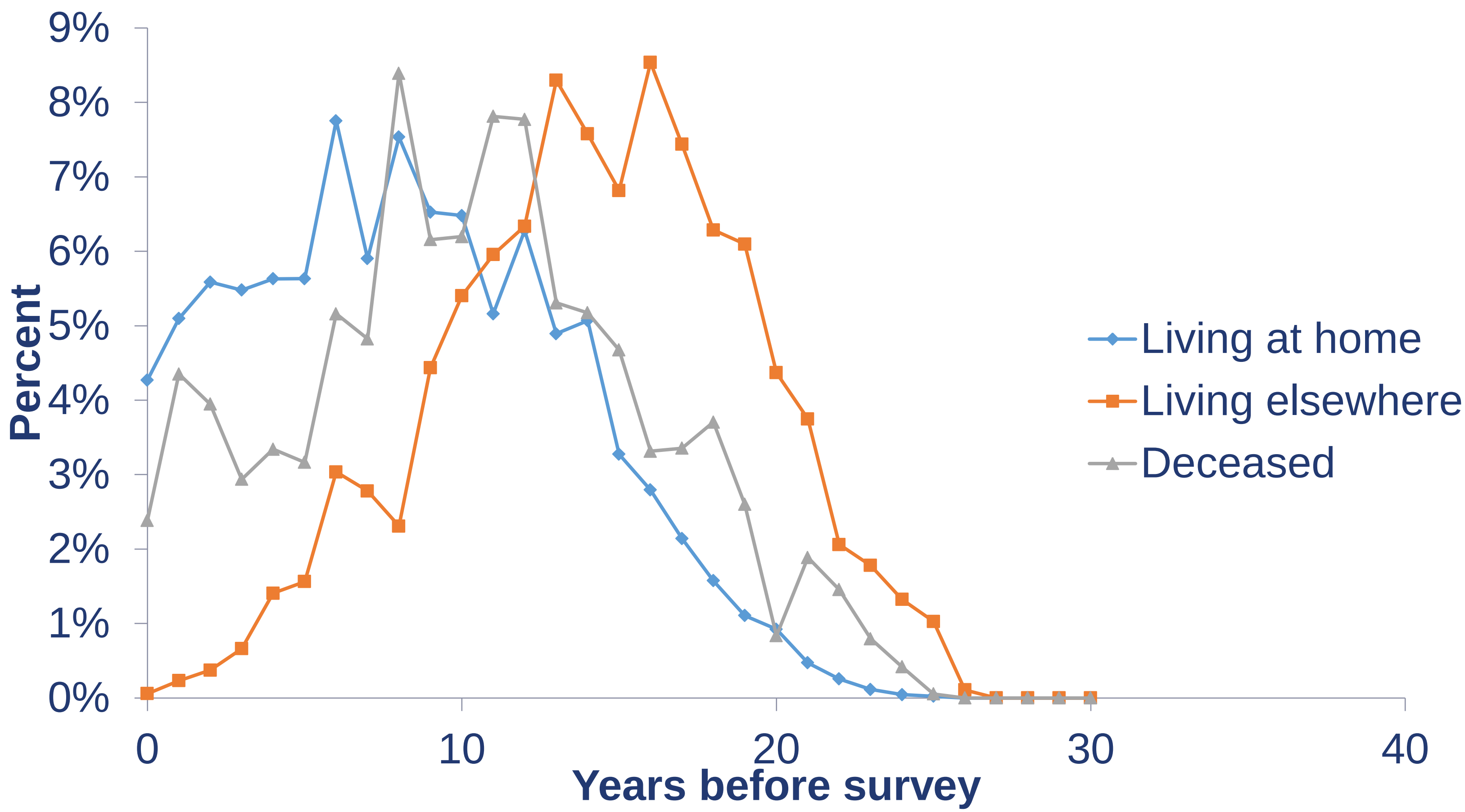
# Impact of women's age misreporting
(m= + 2, s= 5 years)



# H4: Mean age of children
## (duration since birth) Kenya, DHS, 2008



# H4: Distribution of births by year before survey (Kenya, DHS,2008)



# Conclusion on Kenya case study

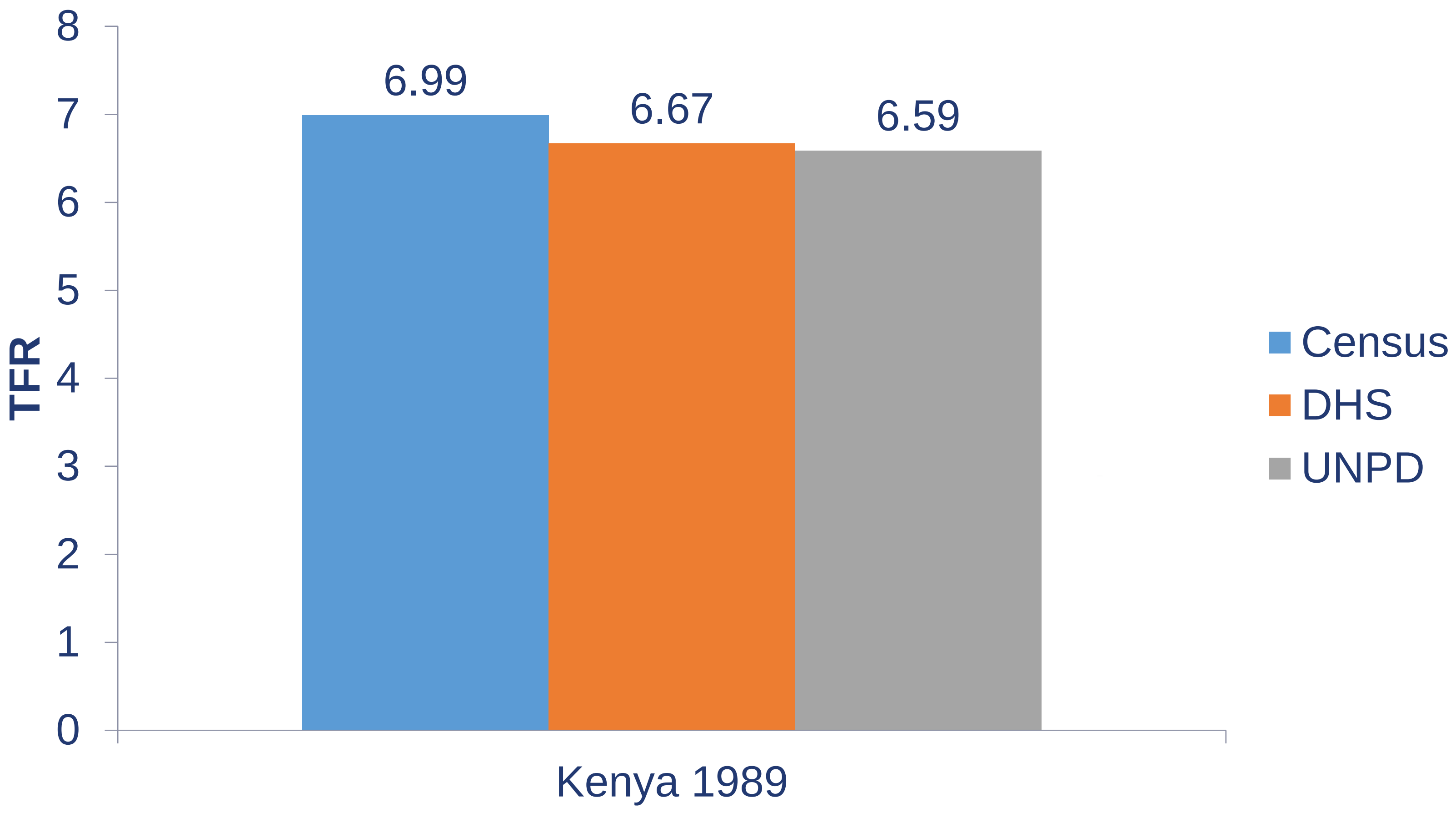
Level of fertility: acceptable for the past 5 to 6 years before census

Age pattern of fertility: biased for older women

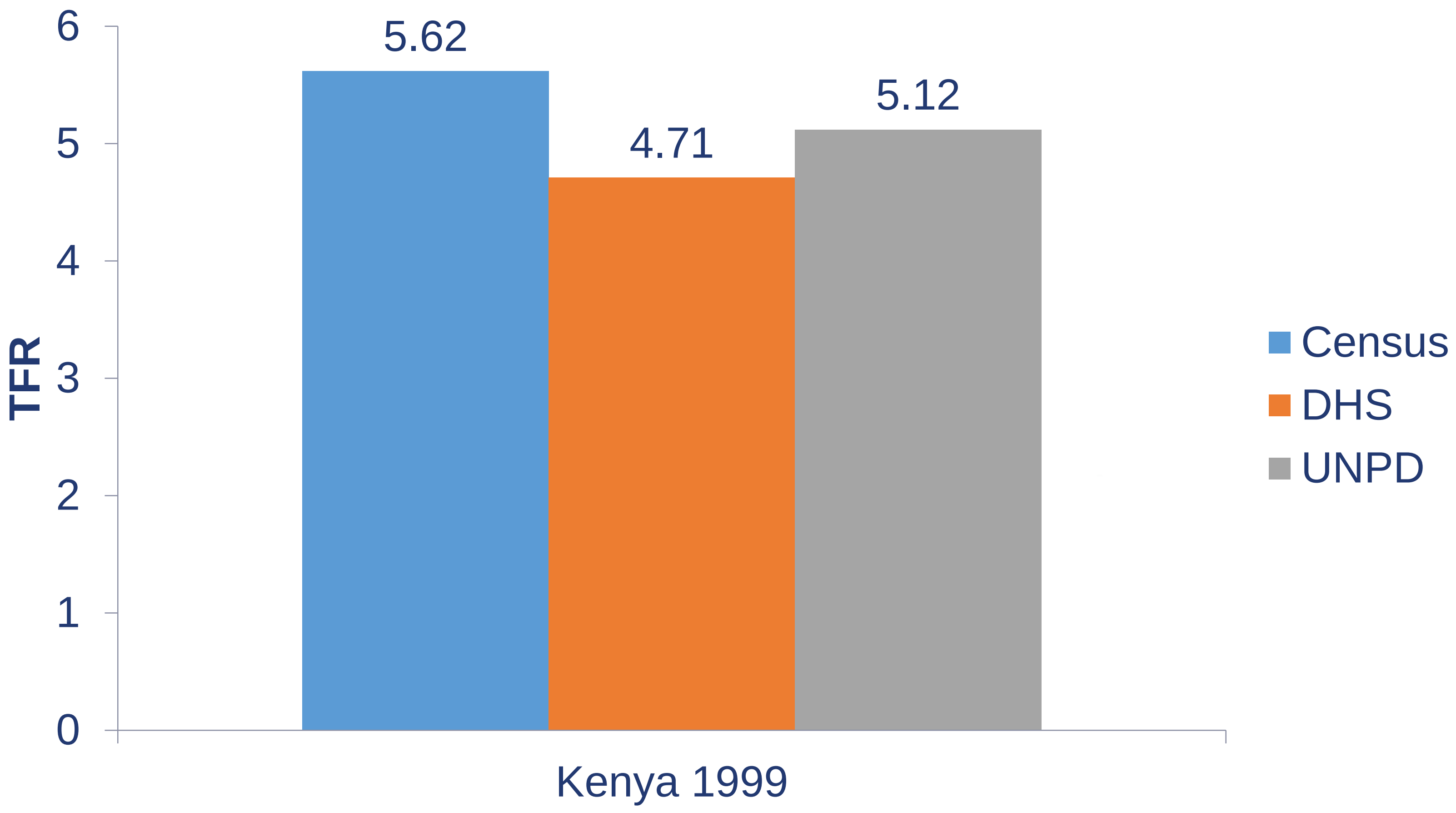
Fertility trends:

- Strongly biased for earlier periods
- More than with straightforward reverse survival

# Application to other datasets: Kenya 1989



# Kenya 1999



# Fertility trends from series of successive censuses

- Use 3 censuses from Kenya
  - Full use of own-children method
  - Restricted to past 5-6 years

# Limitations of Own-Children Method—both OWCH and OWCHMOM

- Quality of data
  - Age misreporting (children, mother)
- Violations of hypotheses
  - Independence between mortality, fertility, migration + magnitude of mortality & migration
- Compared with reverse survival (GFR)
  - More difficult to apply
  - More subject to bias
  - But provides an age pattern & series of TFRs

# Need for triangulation

Check with levels and trends from other sources

- DHS surveys
- MICS surveys
- Other censuses

# Lessons learned

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