Chances to have a child in a late fertility society

Eva Beaujouan & Katja Köppen

University of Vienna (Wittgenstein Centre); University of Rostock

Context

- Biological factors will certainly become increasingly important for future fertility levels
  - given the increase in age at first birth
  - and the decrease in capacity to give birth to a live child with age
- We want to embed knowledge on sterility and assisted reproduction into fertility research
  - In depth study of infertility by age, including importance of ART
- We thus need to quantify the variation in biological capacity to reproduce with age

Ability to give birth to a live child: large range of (old) estimations, particularly above age 35

Figure. Percent chance to give birth to a live child by age at first trying
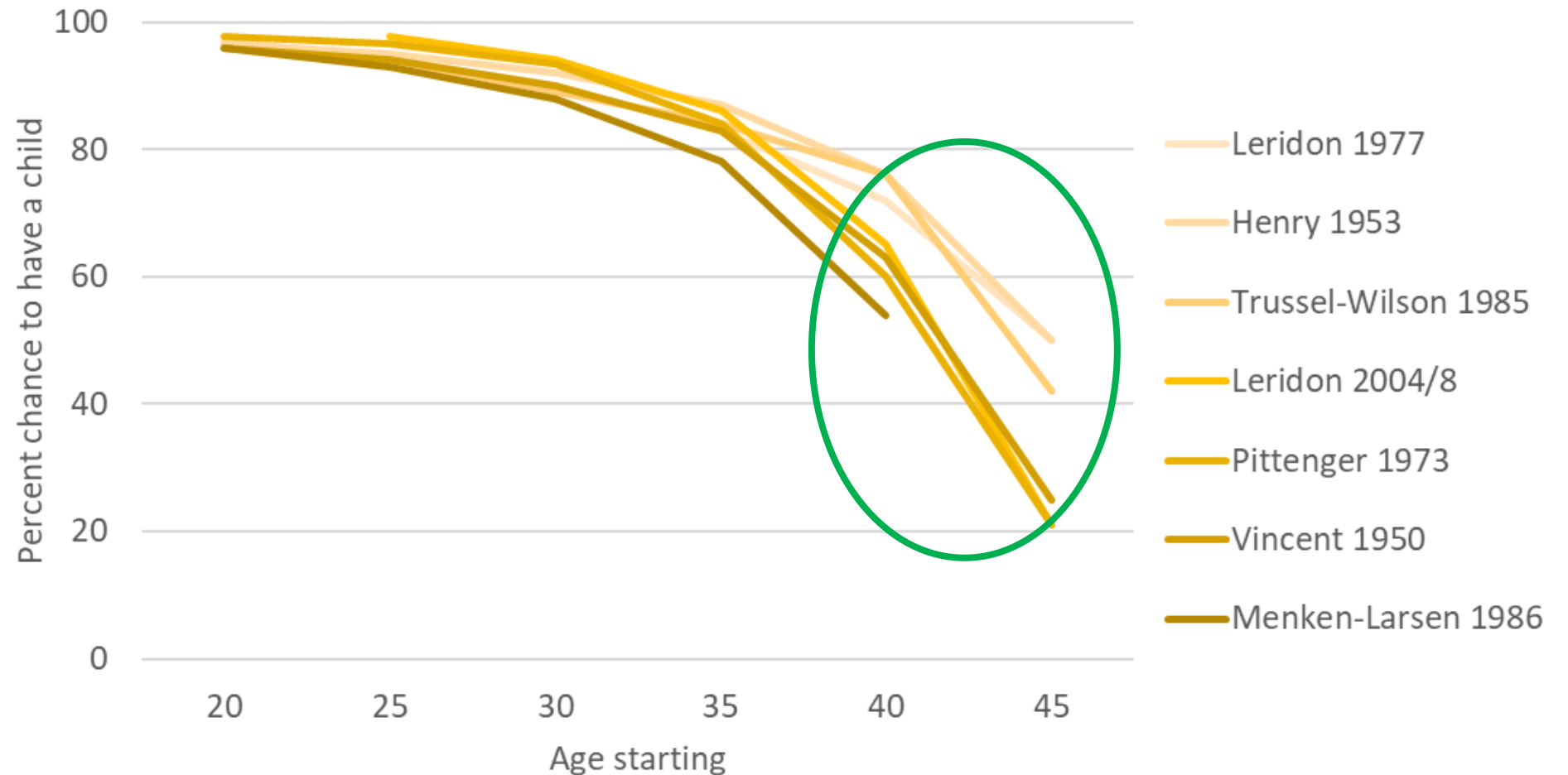
Source: Leridon 2008

Aim

Provide a clear and **up to date** assessment of the chances of women **and men** to have a child depending on the age at which they start trying.

Method and data

- Data: panel

- Method: survival probability

- Sample selection

Data: pairfam panel

- pairfam (starting in 2008)
  - German yearly panel data (waves 1-12)
  - Three birth cohorts aged 15-17, 25-27 and 35-37 years, respectively in 2008

- Survey sample and attrition
  - Response rate about 50%
  - 13,891 "anchors" in 2008, top up sample afterwards: 9,435 respondents in 2018
  - Attrition: 23% Wave 1-2, then decrease to about 7% each year
  - We use the survey's calibrated design weights that (possibly partly) correct for attrition (Wetzel et al. 2021)

Survey question (asked at each wave)

- Have you tried to have a child since the last interview (males)? Have you tried to get pregnant since the last interview (females)?
  - Filter: respondents who had sexual intercourse or dk/na, who are not expecting a child, who are not first-time responder
  - Almost 5% of all observation spells were spent trying to have a child (excluding those who already tried at first observation)
- Births between waves also asked

Method: survival probability to (not) have a child within 7 years

- Estimates of capacity to give birth by age
- Population at risk: people trying to have a child
- Event: birth of a live child (any incl. ART births to start with)
- Data are censored, so we use survival probabilities
- Kaplan Maier survival probability
  - Probability to not have experienced the event of having a child at duration t while still trying
    - at very long duration, this corresponds to probability to be sterile
  - We stratify by age groups
  - We calculate the inverse of the survival probability $(1 - S_7)$, which corresponds to the probability to have had a child within 7 years

Life table – people at risk when trying to have a child
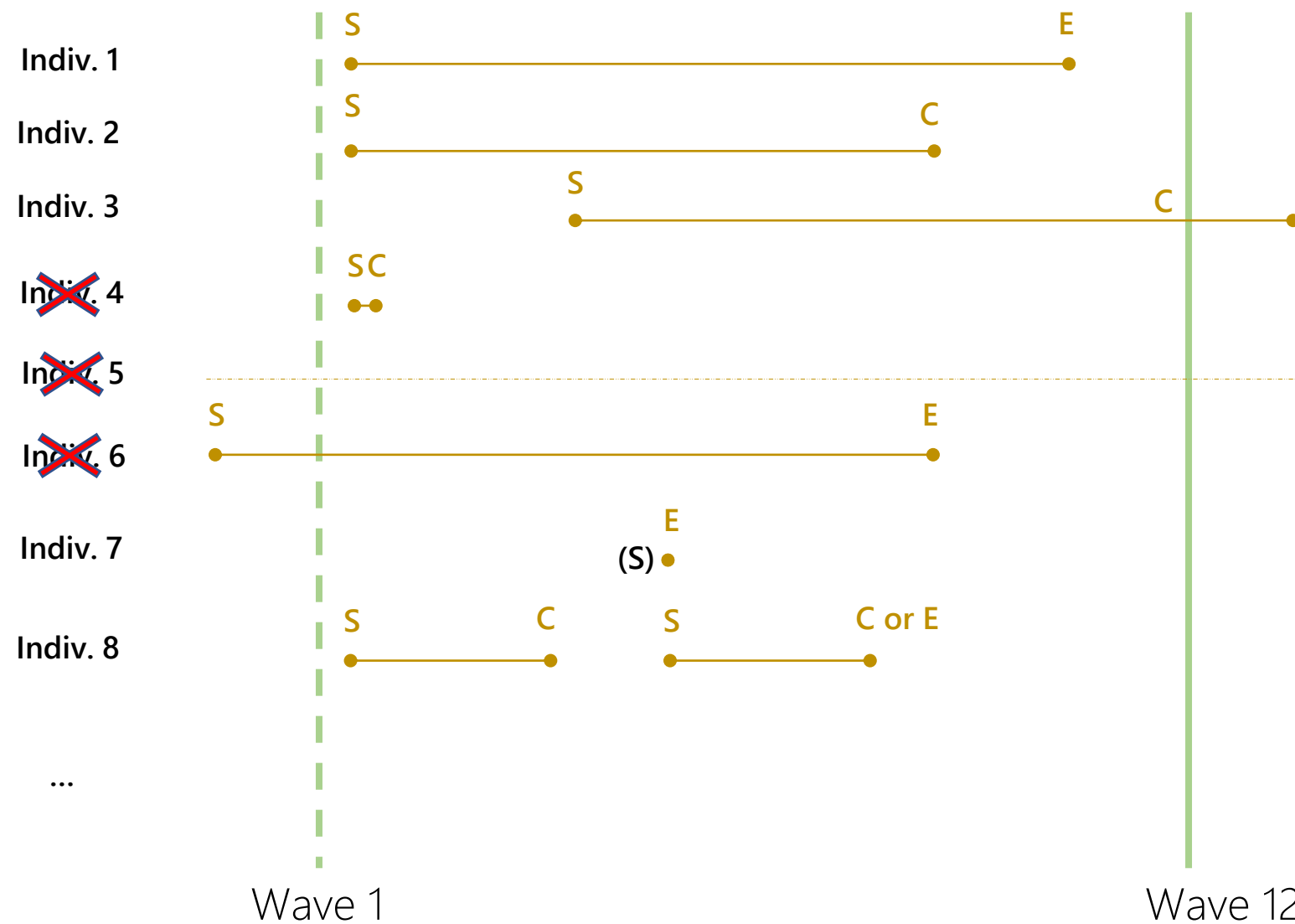
S: Start of episode: started trying to have a child
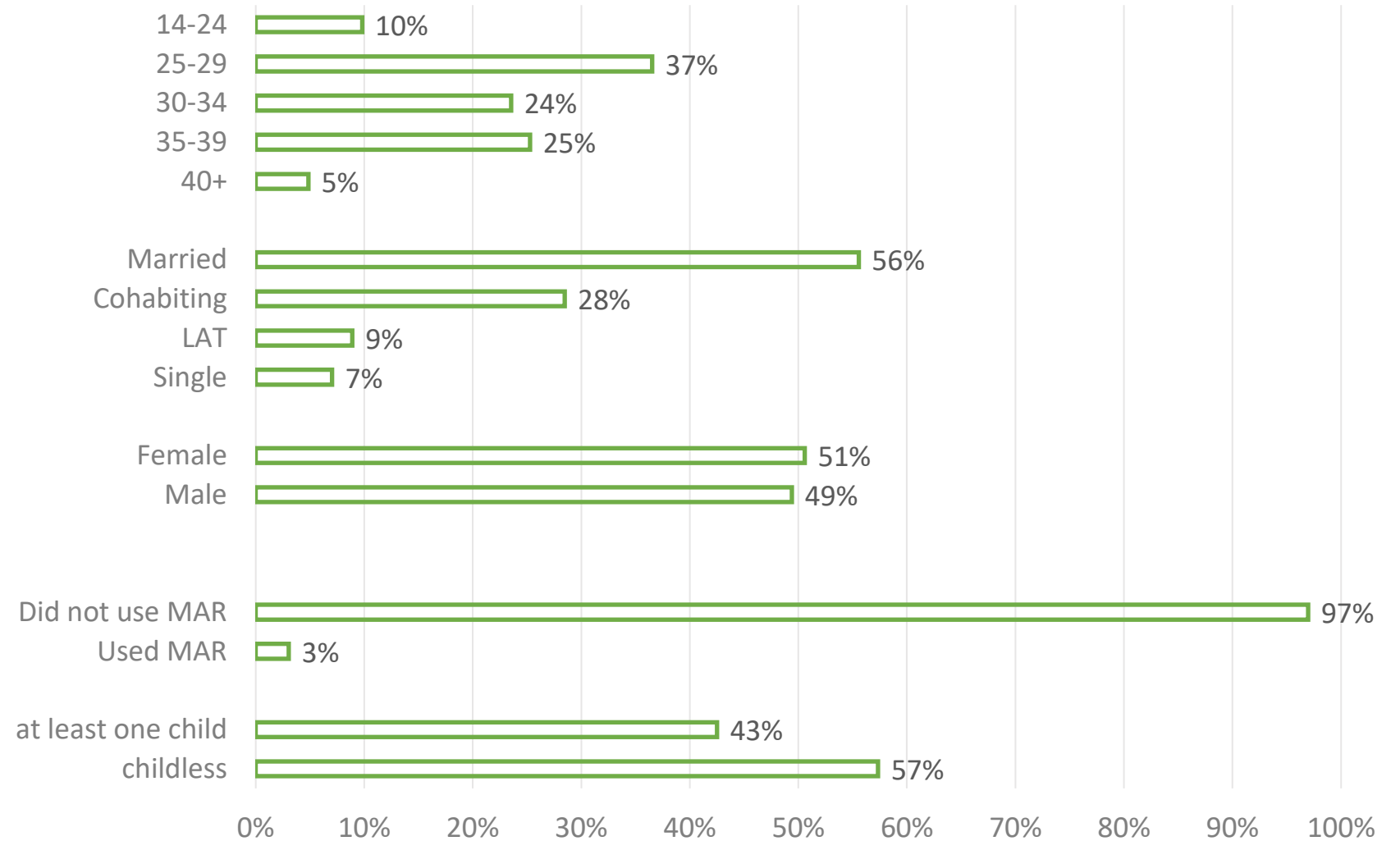
E: pregnancy leading to a live birth OR change in parity

C: censoring event (Birth OR Separation OR Panel attrition OR stop trying)

Clock is duration since trying **in years**

Distribution of characteristics of our final sample

Figure.

Socio-demographic characteristics of respondents who tried to get pregnant (distribution of person.years)

Category	Percentage
14-24	10%
25-29	37%
30-34	24%
35-39	25%
40+	5%
Married	56%
Cohabiting	28%
LAT	9%
Single	7%
Female	51%
Male	49%
Did not use MAR	97%
Used MAR	3%
at least one child	43%
childless	57%

Data source: pairfam; Weights: calibrated design weights
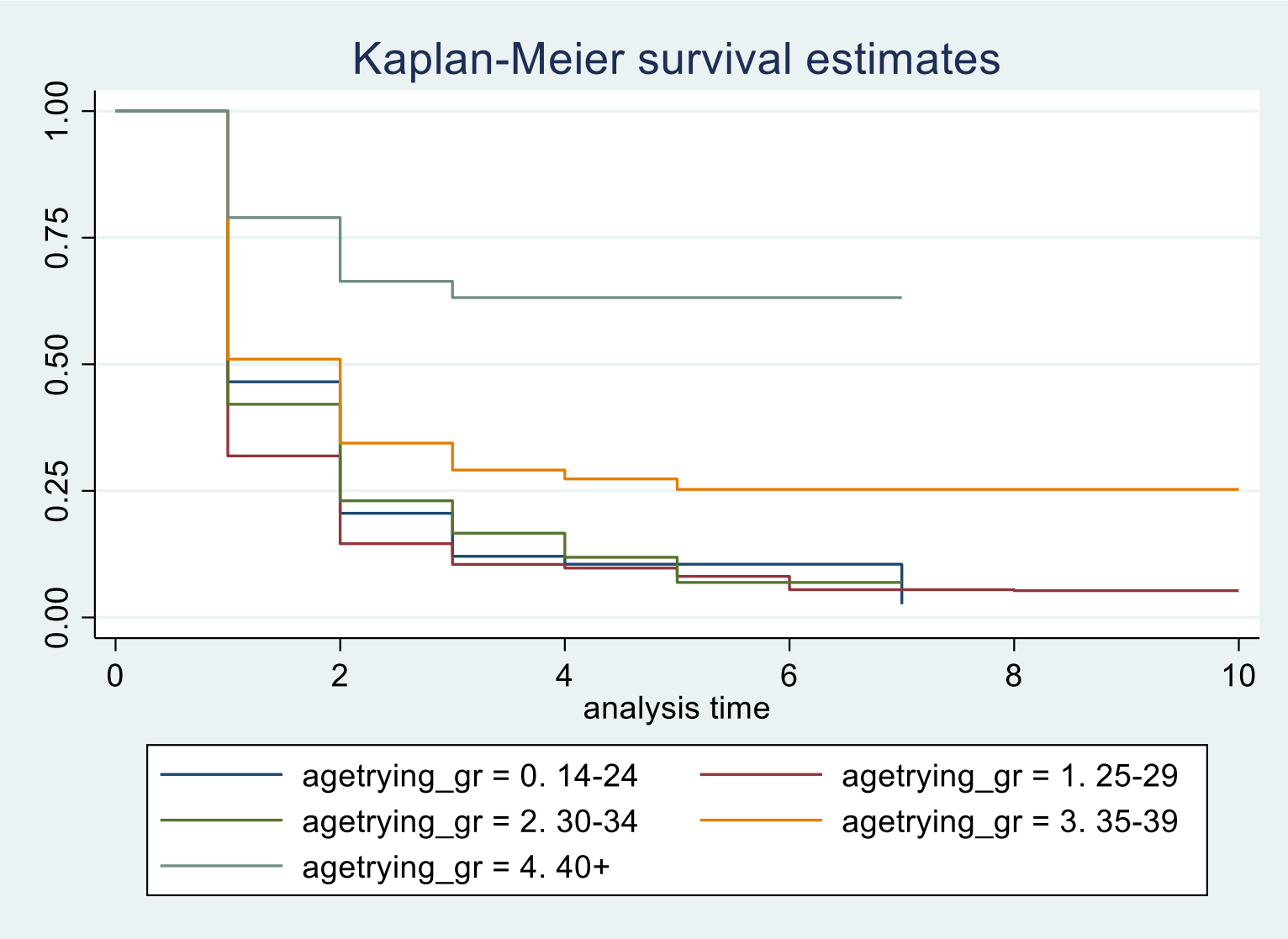Sample: 5,325 person.years for 2,198 respondents

Results

- Survival curves

- Survival within 7 years

# Probability not to have a child by time since trying, all women (irrespective of parity)

Kaplan-Meier Survival Estimates

by age group and time since start trying (n=1.210 women)

Kaplan-Meier survival estimates

Legend:
- agetrying_gr = 0. 14-24
- agetrying_gr = 1. 25-29
- agetrying_gr = 2. 30-34
- agetrying_gr = 3. 35-39
- agetrying_gr = 4. 40+

Probability to have a child within 7 years by starting age

Figure. Probability to have a child **within 7 years** from starting trying
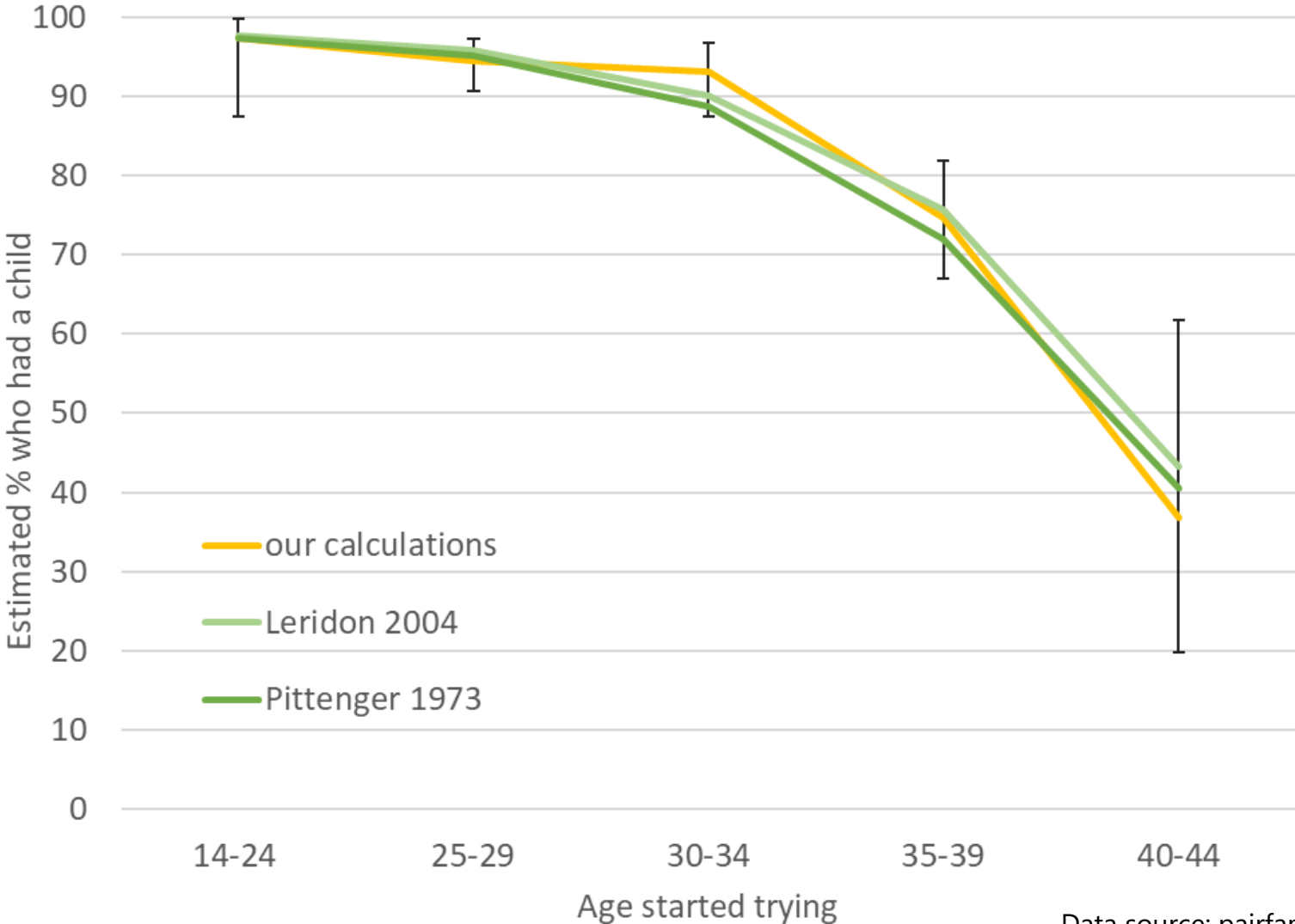

Data source: pairfam
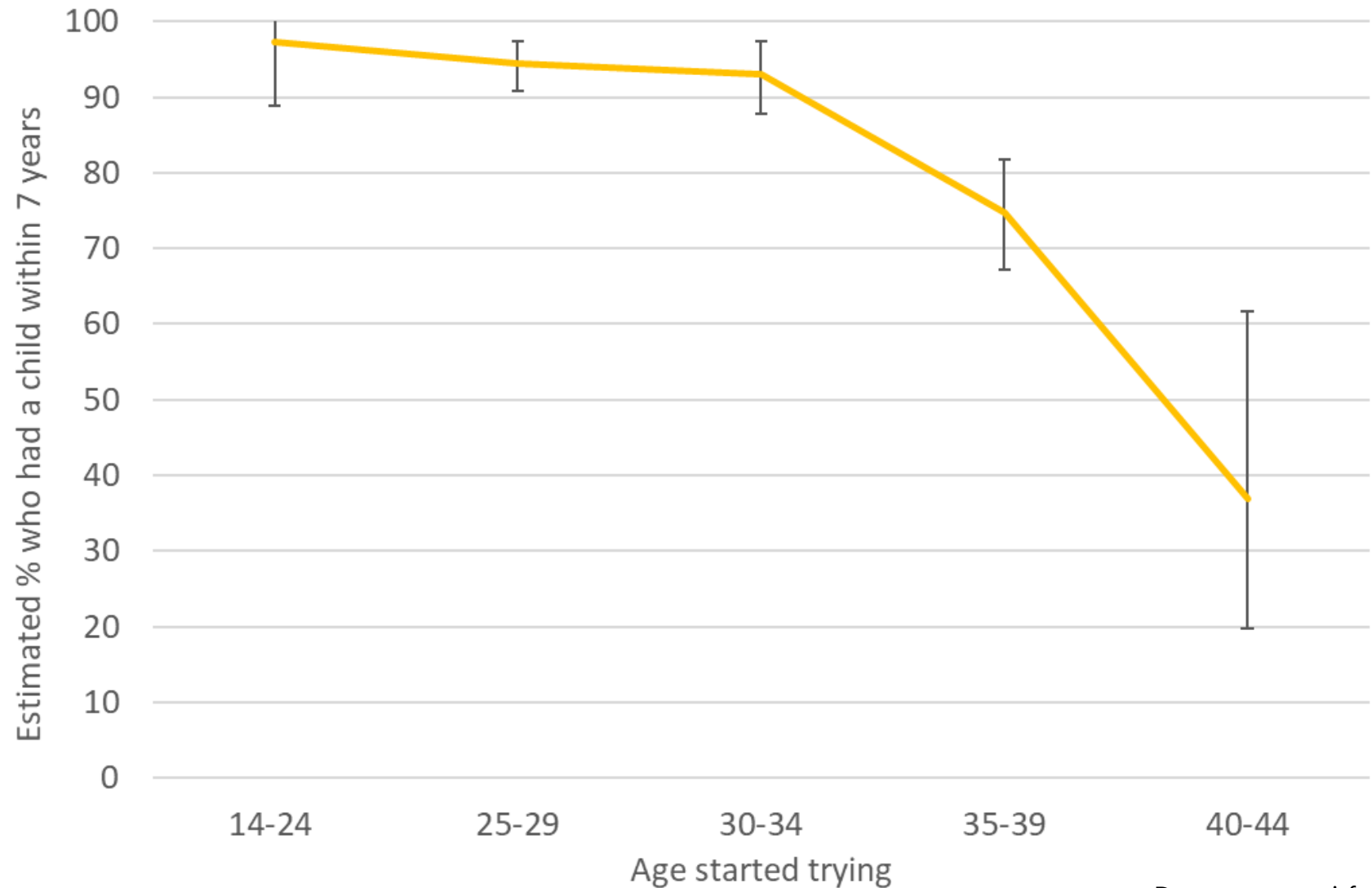
Overall, rather well aligned with the most recent and frequently used estimation (Leridon 2004)

Figure. Probability to have a child **within 7 years** from starting trying (our estimation)

vs.

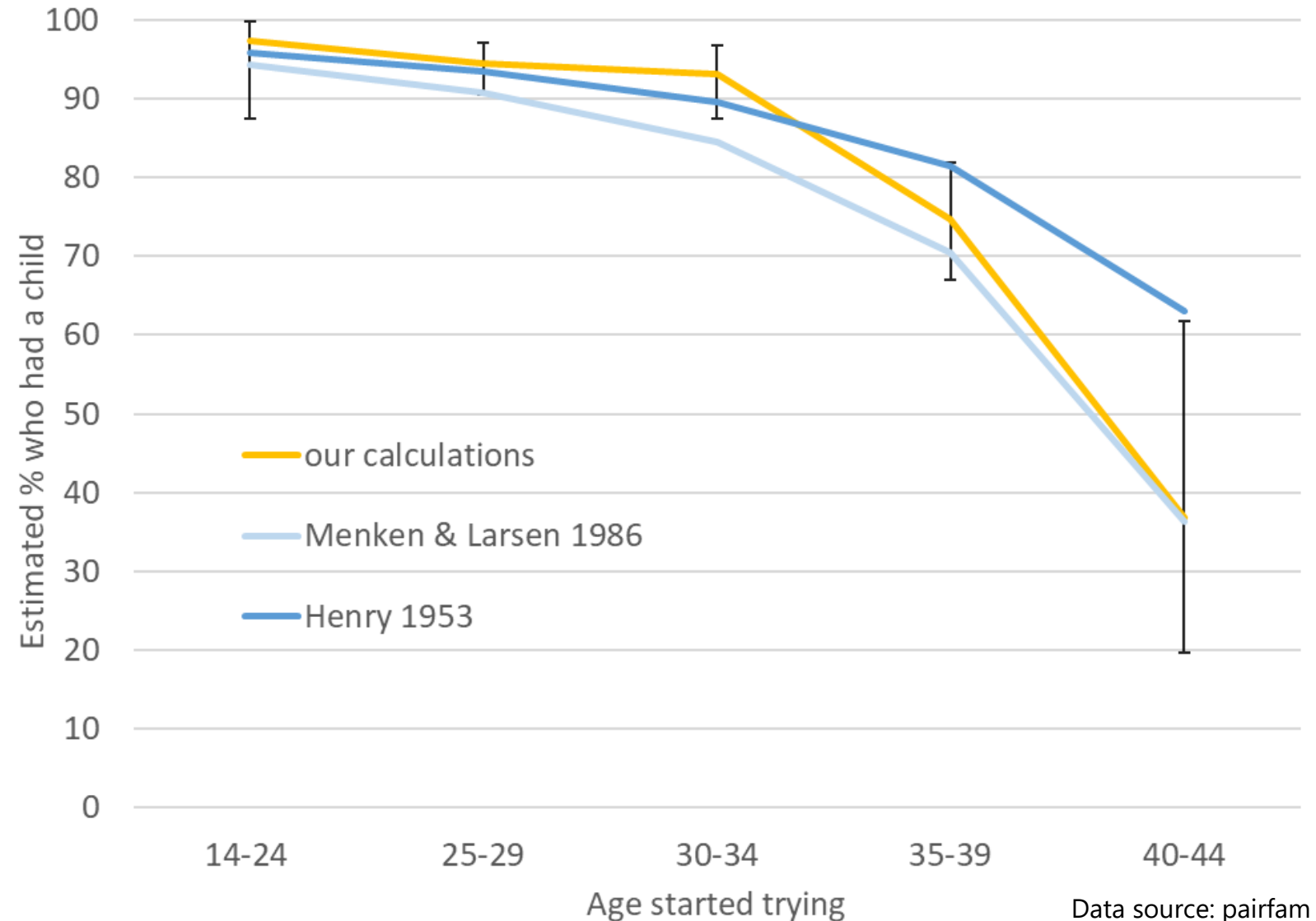Chances to have a child by age first trying estimated from historical data

Data source: pairfam

At older ages, rather aligned with the less optimistic estimations

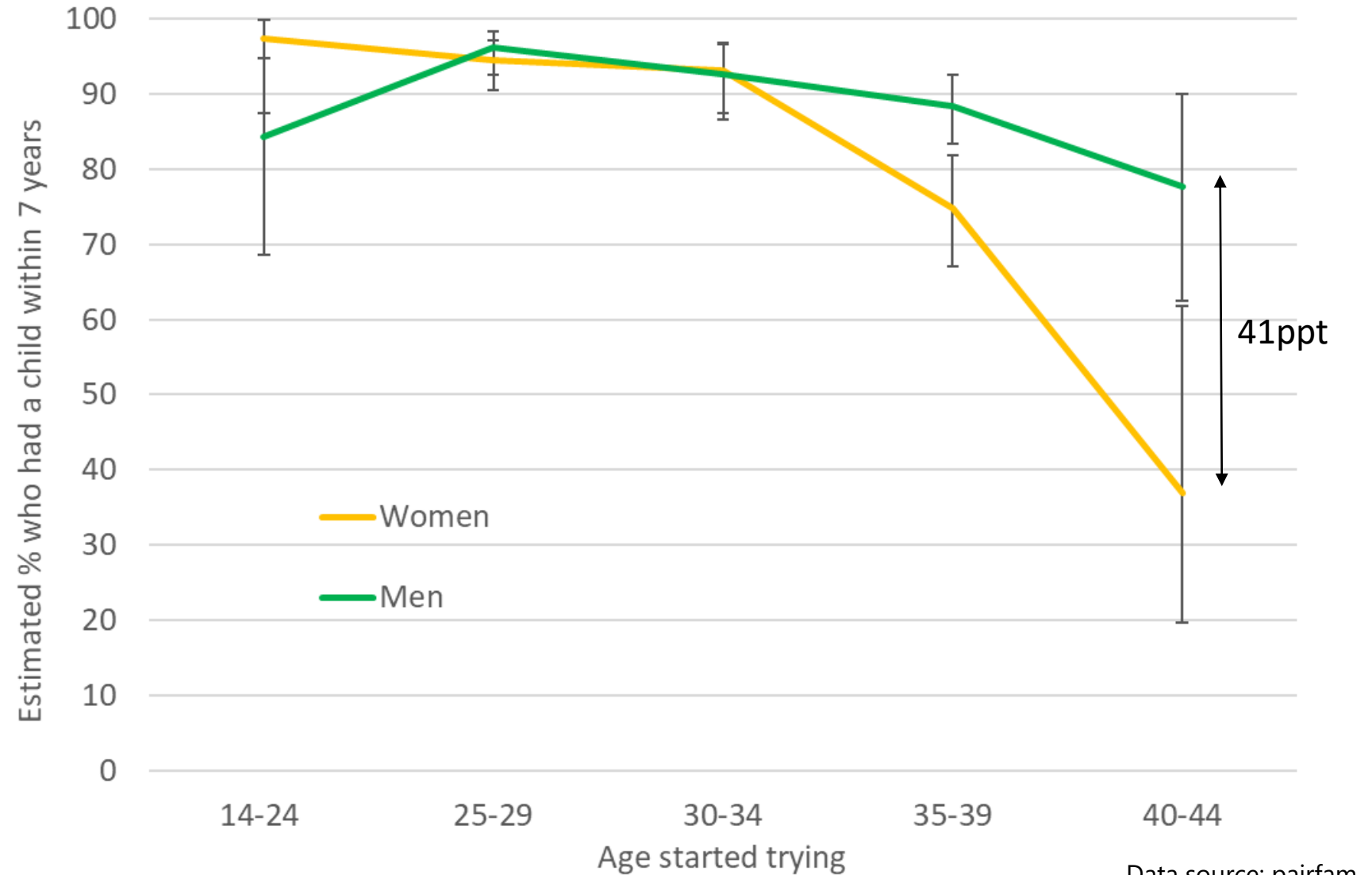Figure. Probability to have a child **within 7 years** from starting trying (our estimation)

vs.

Chances to have a child by age first trying estimated from historical data

Estimated % who had a child

- our calculations
- Menken & Larsen 1986
- Henry 1953

Age started trying

14-24   25-29   30-34   35-39   40-44

Data source: pairfam

Large difference between men and women + significant age effect for men

Figure. Probability to have a child **within 7 years** from starting trying, women and men

41ppt

Women

Men

Estimated % who had a child within 7 years

Age started trying

14-24   25-29   30-34   35-39   40-44

Data source: pairfam

Chances to have a child of childless women only are close to chances for all women

Figure. Probability to conceive **within 7 years** from starting trying,

all women trying and *childless* women trying
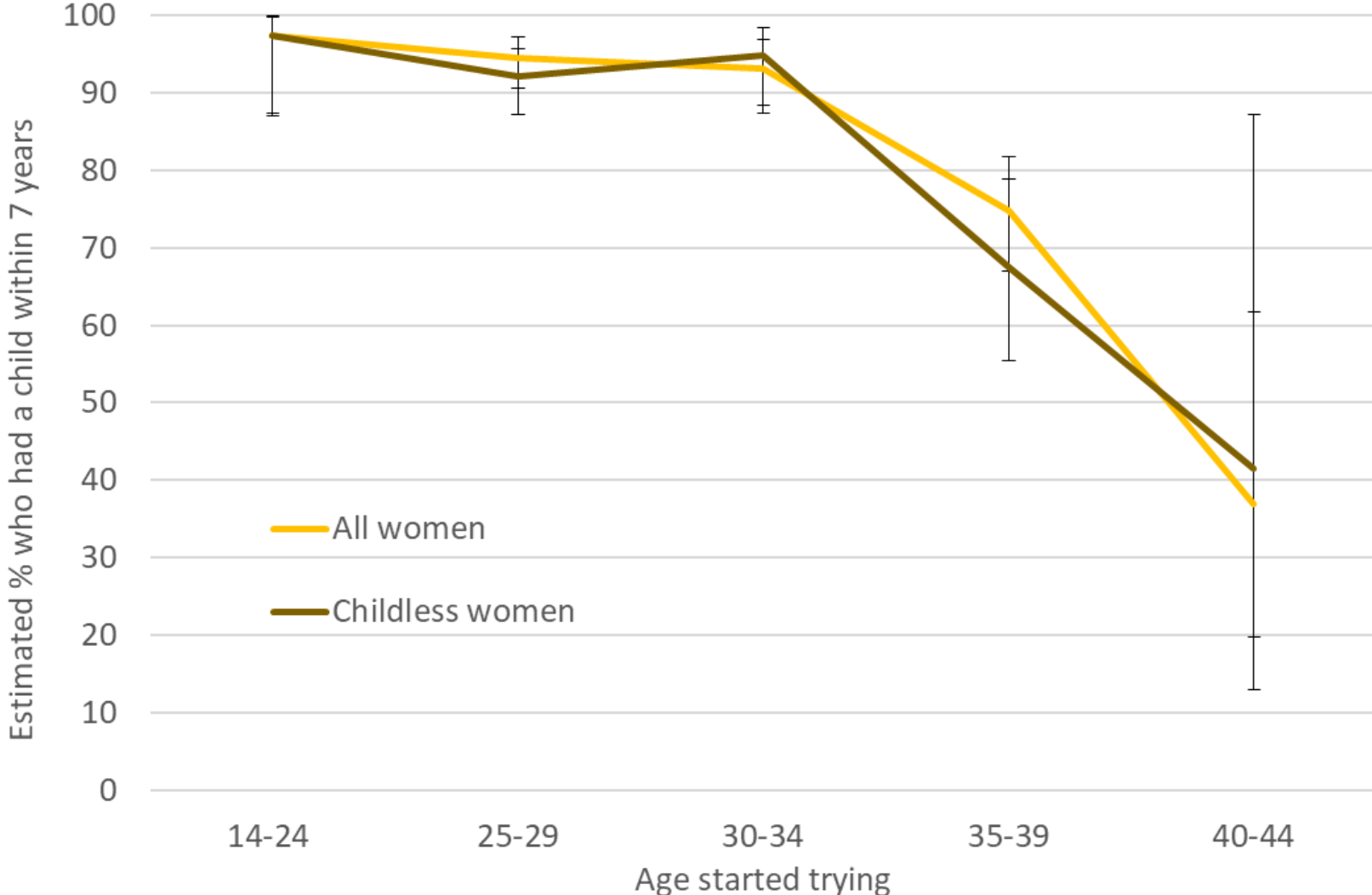
Data source: pairfam

Adjusting our estimation

- Sensitivity analysis: Tighten the group of study as much as possible
  - To limit volatility of trying
  - Only people living in a couple (7% in person.years are single)
  - But getting to quite small sample size
- Not counting births conceived via assisted reproduction
  - We keep the individuals
  - But censor them at birth without counting the birth if it was an ART birth

Small but non-significant difference when selecting only those who live together with a partner

Figure. Probability to have a child **within 7 years** from starting trying,

all women trying *versus* only those who live together with their partner

Data source: pairfam
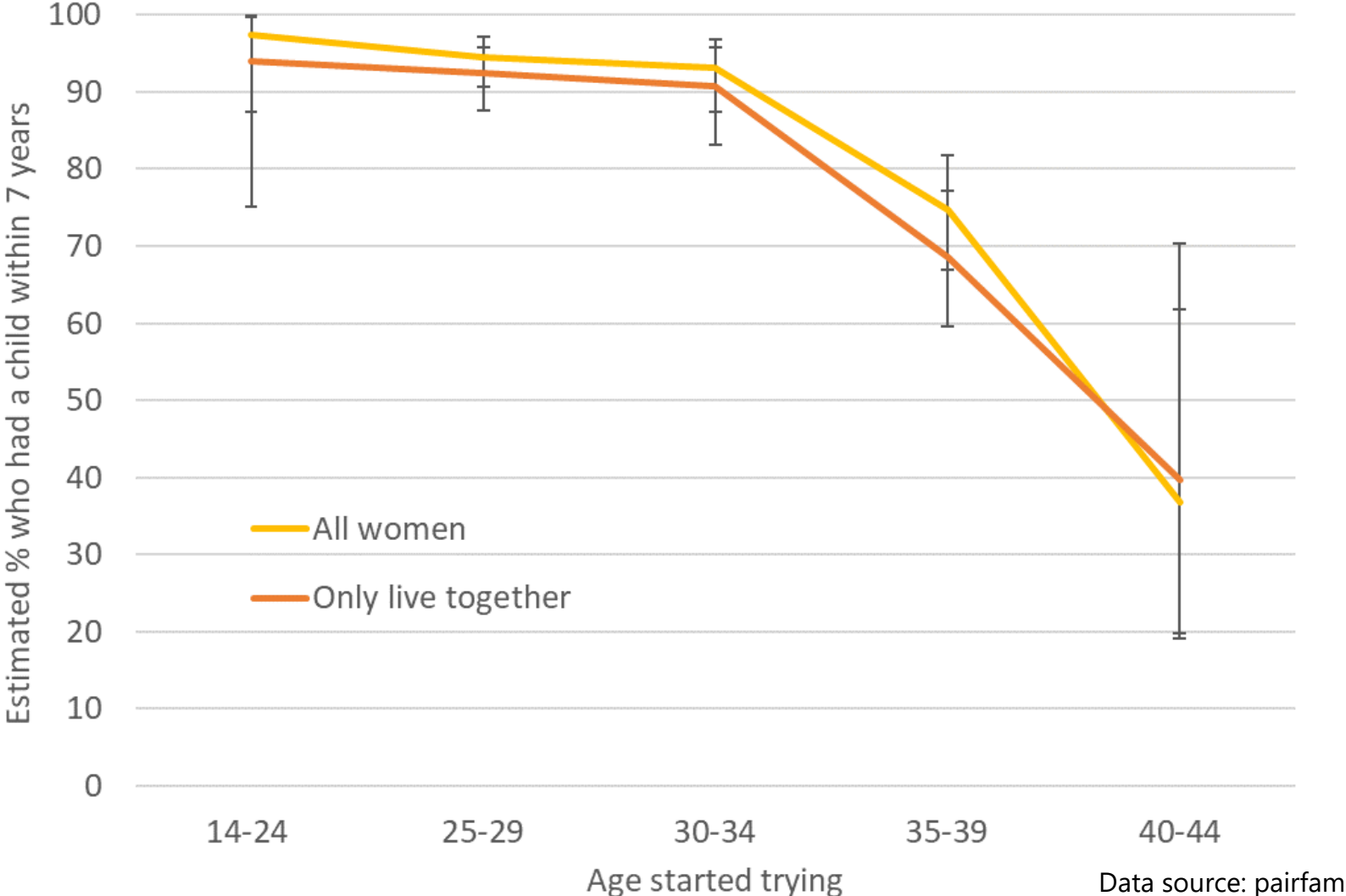
Not counting ART births: probability to have a child naturally

Figure. Probability to have a child **within 7 years** from starting trying,

all births *versus* natural births
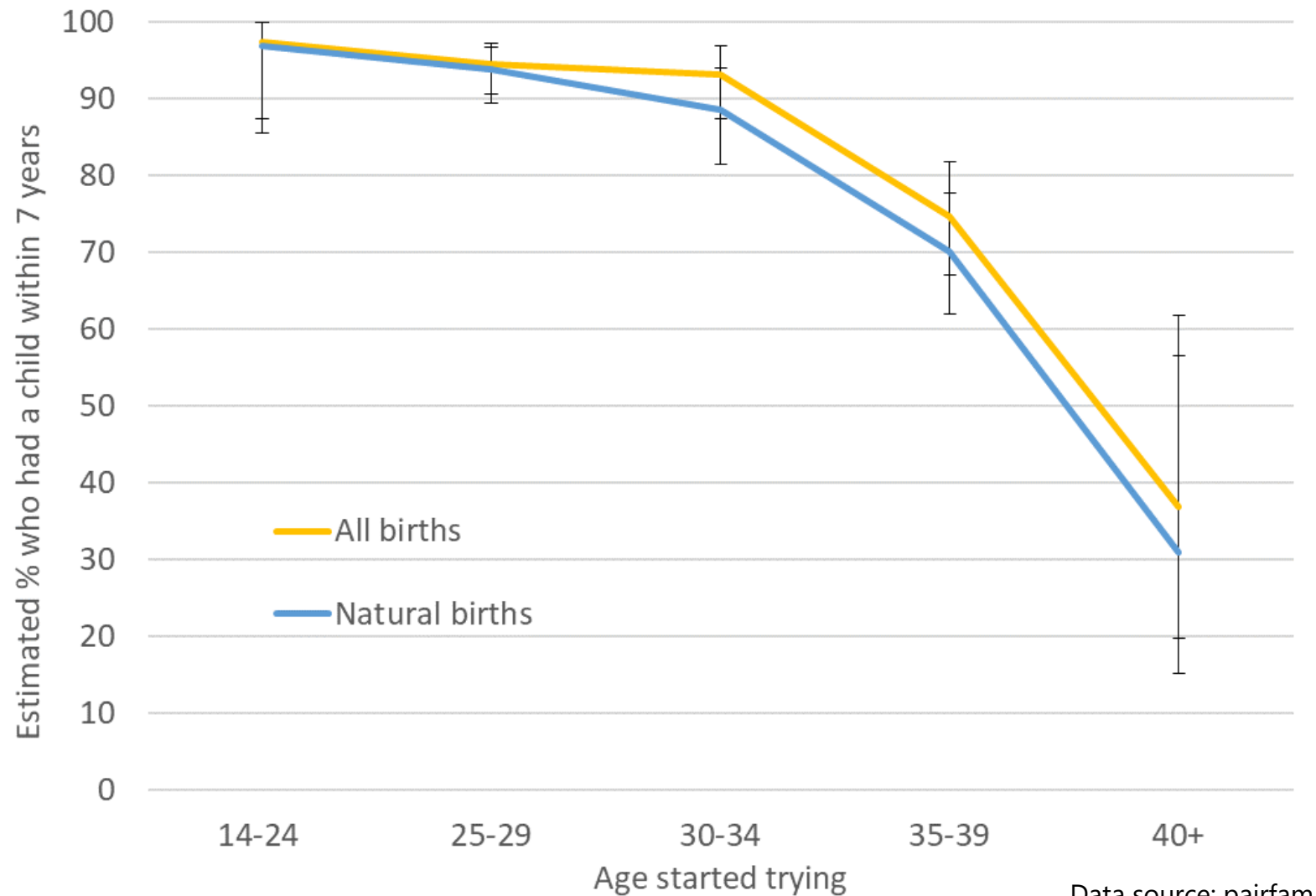
Data source: pairfam

Limits and extensions

- How to improve the estimates?

- Possible extensions

How could we better estimate physiological capacity to have a child?

- Any bias linked to attrition?
  - People with children are more likely to drop out than childless people (Wetzel et al. 2021)
  - Are people trying to have a child without managing more likely to drop out/stay?
    - The calibrated design weights account for larger attrition of persons with children - create other purposely-designed weights?
    - Or two-step Heckman model that allows to control for attrition?

- Refine the population at risk?
  - Dropping people already trying before first survey: this may create a bias
  - But if we keep them, length biased sampling (Zelen 2004) + we don't have a starting age
  - What should we do with them? Keep them and apply a distribution (Weinberg & Gladen 1986)?

Next steps

- Better understand the differences between the existing curves to take a position on the (dis)similarity of our curve with them

- Add next wave (smaller confidence interval?)

- Try another survival function (sensitivity)

- Estimate the curve as continuous with age instead of by age group
  - Because decrease not linear within age groups (e.g., Pittenger 1973)
  - Find a method that allows to smooth the outcome or to obtain a smoothed outcome
  - Maybe too limited by sample size

Acknowledgement: