Fecundity Curve of Contemporary Europe

Marcus Immonen Hagley[1], Katja Köppen[2], Eva Beaujouan[1]

[1] Wittgenstein Centre (UNIVIE, IIASA, VID), University of Rostock[2]

marcus.immonen.hagley@univie.ac.at

1. Introduction

- The widespread use of contraception to prevent unwanted births, coupled with the diffusion of assisted reproduction, has led individuals and societies to **take the ability to have children for granted**

- However, **historical fecundity curves** show a decrease in fecundity with age, and women and men are having children later and later

- On the other hand, **technological shifts** (assisted reproduction) may **alter age-specific fecundity patterns** and change the age at which people should start trying to ensure they have a child

- **We investigate the contemporary fecundity curve**, by sex and in vitro fertilization (IVF) use

2. Background

- Whether human fecundity is changing or fixed has polarized science (1)

- Estimates of women's chances of ever having a child by age at first attempt, based on 18th and 19th-century data from high-fertility populations in natural reproduction settings, are numerous (2–6).

- **Technological and cultural** advances should **increase** the fecundity risk while pollution and bad habits may lead to a decrease.

- Recently, **assisted reproductive technology** (ART) has been a breakthrough in improving **reproductive capacity**, although its efficacy diminishes with age (8)

4. Assisted Reproduction is compensating very little the decrease in fecundity with age

Figure 1. Fecundity curve, probability of live birth, compared to historical estimates.
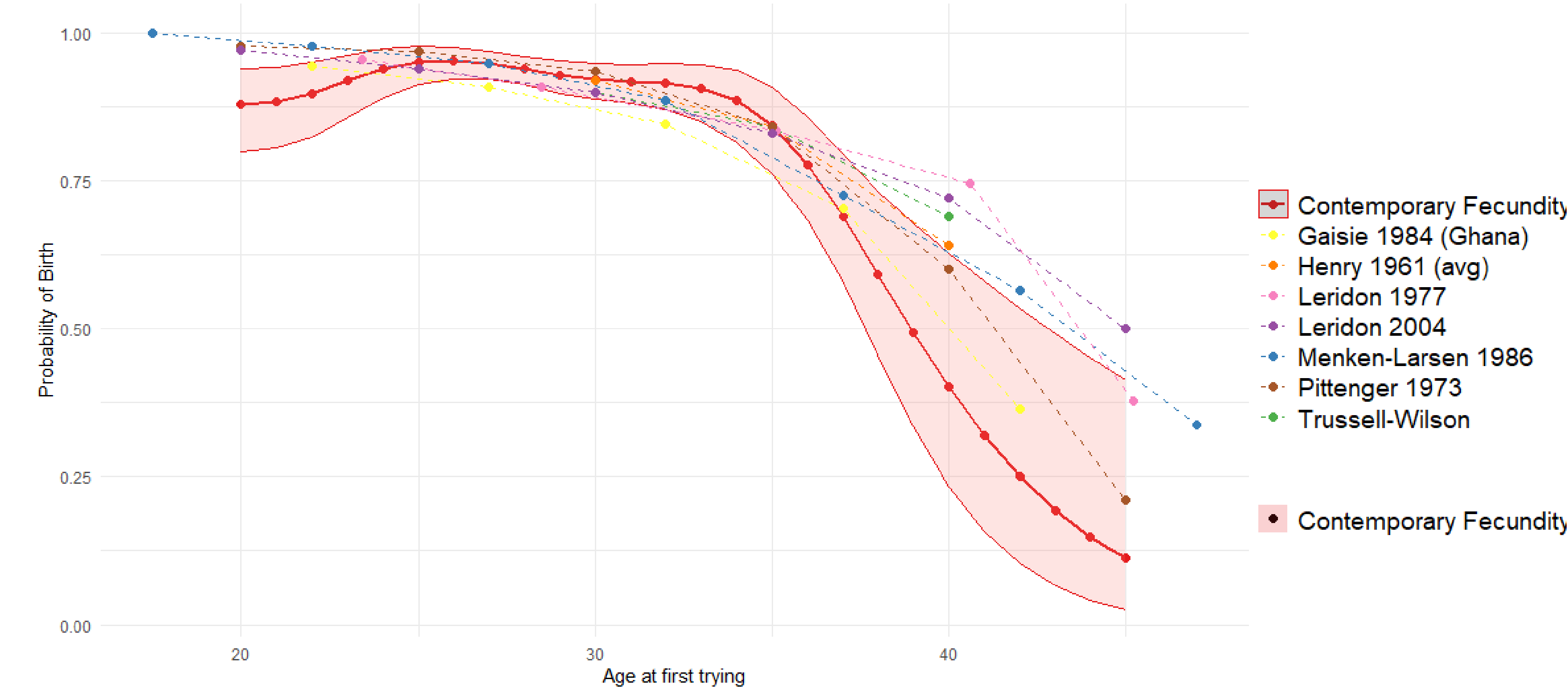

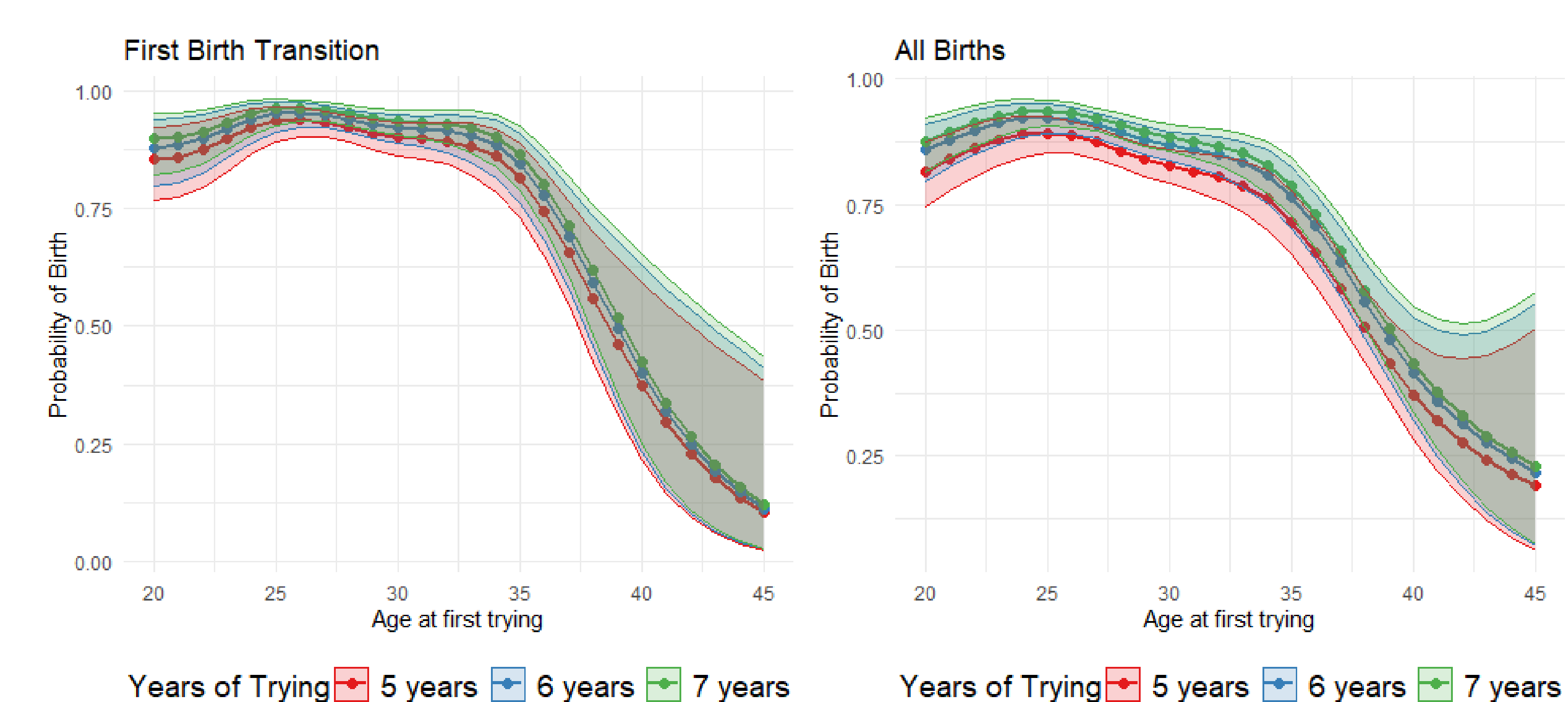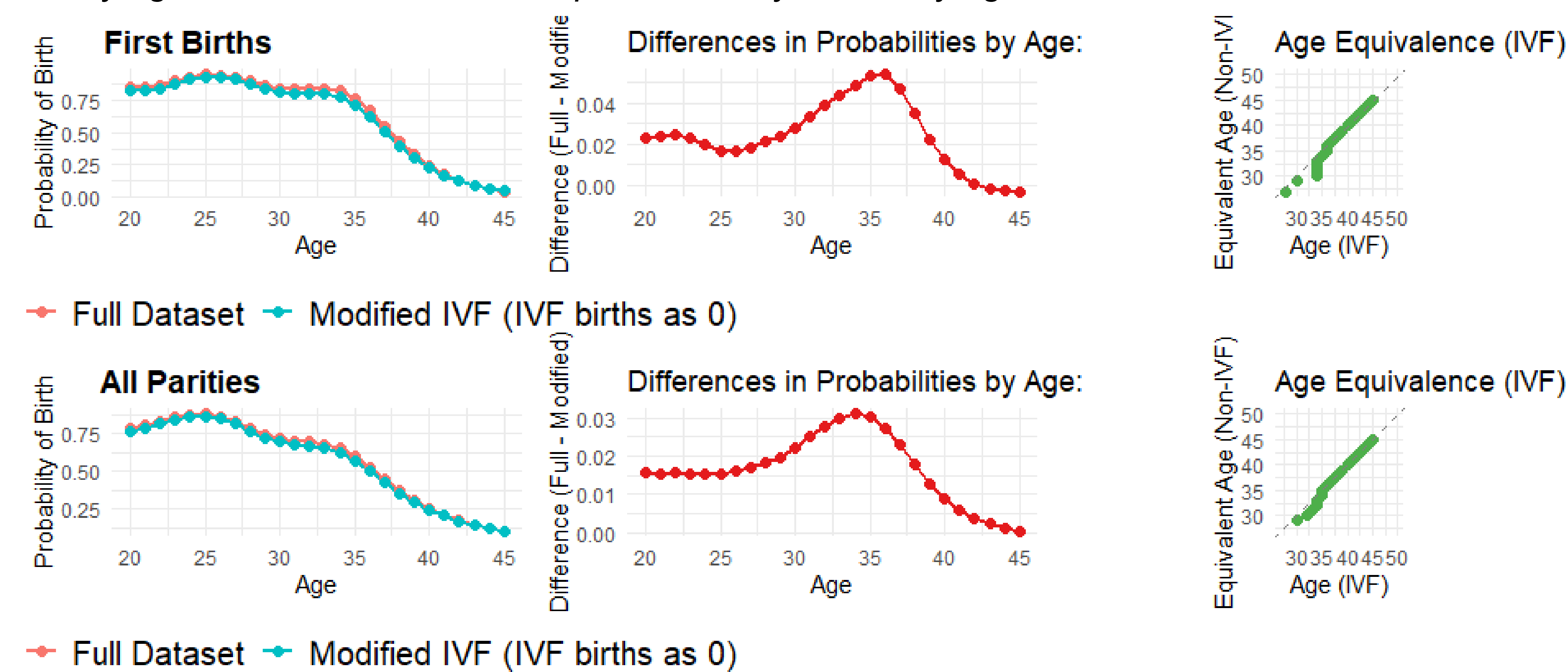*Figure 2. Fecundity curve after 5, 6 and 7 years trying, first and all births.*

Figure 3. IVF or no IVF in contemporary populations. Probability of birth while trying, transition to first and all parities. Six years of trying.

3. Data

- Dataset: **PAIRFAM,** selection of women who were **trying to have a child in previous year**. Final sample consist of 1 815 individuals (3 198 person-years). Outcome = live birth.

- Method: We **estimate the fecundity** risk by using a cox model with **p-splines** to smooth the age and examine at 5, 6 and 7 years of trying.

Conclusion

- Fecundity in contemporary populations is close to historical levels

- Trying to have a child beyond 6 years only marginally improves the chances of live birth

- ART increases the probability to have a child mostly up to age 35, but efficiency decreases quickly afterwards.

- ART is not very efficient overall: Probability to have a child at age 35 including ART is equivalent to probability at age 34 without ART.

References

1. M. M. Smarr, K. J. Sapra, A. Gemmill, L. G. Kahn, L. A. Wise, C. D. Lynch, P. Factor-Litvak, S. L. Mumford, N. E. Skakkebaek, R. Slama, D. T. Lobdell, J. B. Stanford, T. K. Jensen, E. H. Boyle, M. L. Eisenberg, P. J. Turek, R. Sundaram, M. E. Thoma, G. M. Buck Louis, Is human fecundity changing? A discussion of research and data gaps precluding us from having an answer. *Hum. Reprod.*, humrep;dew361v1 (2017)

2. P. Vincent, La stérilité physiologique des populations. *Popul. Fr. Ed.*, 45–64 (1950)

3. J. Menken, J. Trussell, U. Larsen, Age and Infertility. *Science* **233**, 1389–1394 (1986)

4. H. Leridon, Can assisted reproduction technology compensate for the natural decline in fertility with age? A model assessment. *Hum. Reprod.* **19**, 1548–1553 (2004)

5. L. Henry, Fertility and population regulation: Some data on natural fertility. *Biodemography Soc. Biol.* **29**, 145–156 (1982)

6. J. C. Barrett, The estimation of natural sterility. *Genus*, 23–31 (1986)

7. A. Jewett, S. Mardovich, Y. Zhang, M. Sunderam, C. DeSantis, A. Cofie, A. Yartel, L. Hannon-Hall, C. Buxton, D. M. Kissin, 2020 Assisted Reproductive Technology Fertility Clinic and National Summary Report. (2022)