

# **Is Human Fecundity Changing? A Workshop on Our Reproduction, Our Health, and Our Future**

Conference Summary  
September 10–11, 2015

Researchers gathered at a workshop at the NIH Natcher Conference Center in Bethesda, Maryland, in September 2015 to consider the current scientific evidence of patterns in human fecundity. They were asked, “Is human fecundity changing?” The attendees’ responses to the question were, in part, a series of additional questions: Is this the right question? What is the definition of fecundity? How is the question answered? Does fecundity matter? In short, the answers to these questions are, respectively: perhaps, it can vary, it’s complicated, and yes.

Workshop attendees reviewed recent data on a variety of topics to discuss how the question might best be answered. To do that, terms and definitions must be clear.

## **What is Fecundity?**

Even within the group of researchers assembled, the definition of fecundity differed. Meeting organizer Germaine Buck Louis clarified that fertility tells us about births whereas fecundity tells us about the biologic capacity for reproduction, such as how long it takes to conceive. Many researchers rely on fertility or live birth data as a surrogate outcome of fecundity, which is not uniformly readily available.

Once the definitions are sorted, the question still remains: Is human fecundity changing? How can we tell? Comparing research from previous decades is fraught with challenges given the small number of studies and variety of methodologies. There are only a select number of studies purposefully designed to assess the time it takes for a woman to become pregnant, leaving few data for comparison, and only newer studies include both male and female fecundity data. With these types of challenges, establishing a “baseline” fecundity to monitor for change requires care.

## **Does Fecundity Matter?**

Monitoring fecundity requires surmounting numerous challenges, including obtaining an accurate representation of a population and measuring social factors like contraception use and family planning. Despite these challenges, an important consideration of monitoring is the known link between fecundity and general health for both men and women. In men, diminished

semen quality and fertility has been linked to an increased risk for mortality and conditions including hypertension and heart disease.<sup>1 2 3</sup> In women, infertility increases the risk of some cancers, particularly in the breast and ovary.<sup>4</sup> Endometriosis, which is an important cause of infertility, has also been linked to increased risk of ovarian cancer.<sup>5</sup> Workshop researchers urged inclusions of sexual health in general health assessments.

Monitoring fecundity can also help assess environmental impacts on reproduction, including chemical exposure, air and water quality, and diet. An exposure may not only influence the female; it could affect either partner's ability to conceive. Further, timing of exposure potentially could affect future generations' fecundity via damage to gametes of the developing fetus. A specific exposure might affect fecundity in other ways, like reducing the reproductive window for women, diminished sperm quality in men, or inducing pregnancy loss.

Monitoring can also allow comparisons of fertility treatments that may help improve outcomes. Importantly, monitoring may help detect subfecundity, which has implications for the long-term health of each family member and the fecundity and health of future generations.

### **Age is Just a Number—Or is it?**

It has been long known that the age of a woman is a predictor of whether the woman will be able to conceive.<sup>1 2</sup> There is a global trend for couples to delay becoming parents; the mean age of women at their first birth has risen in countries in Europe, Japan, and the United States.<sup>3 4</sup> Older age contributes to an increased likelihood of problems with infertility, the need for assisted reproduction, and a trend toward having fewer children. This delay in family planning adds to the challenge of monitoring fecundity over time.

Although the age of the father has received less attention, some researchers at the meeting suggested that male age might affect infant health or the health and fecundity of future generations.

### **Answering the Question of Changing Fecundity**

Suggesting a change in human fecundity can provoke strong emotions because it contains economic, social, and societal implications for individuals and the world as a whole. Several speakers at the meeting challenged an assumption that human fecundity is decreasing, despite fertility data indicating lower birth rates in later generations.<sup>5</sup> At the global level, fertility data are more available, but this information is not sufficient to measure changes in fecundity due to changing trends in family planning and contraception use.

To answer the question of whether fecundity is changing, the population must be considered carefully. Cultural practices may significantly affect monitoring of fecundity. When comparing

countries, factors to consider include health, nutrition, age, genetics, lactation, contraception, and varying social mores. Study designs that work in one part of the world may not work in another.

## Challenges and Potential Solutions

A significant challenge to studying fecundity is recruiting research subjects. Not everyone plans when they will get pregnant. Others may not consider participation in a study until they realize that they are having trouble trying to conceive; a fertility clinic population is not representative of the population as a whole. Additionally, an apparent lack of male study participants was noted by meeting participants. Including data from both partners is critical to obtaining a more accurate representation of fecundity.

Capturing representative fecundity data is difficult at the population level, but many meeting attendees urged creative use of technology to expand access to information. Using the Internet or social media are viable and inexpensive options for populations with access to technology. Currently, there are numerous social media apps that monitor health or fertility; some of this information is tied to wearable technology that allows easy, consistent monitoring. These data, and perhaps marketing data, may help researchers fill in information gaps regarding pregnancy planning, health measures, and the average length of time to conception.

## Emerging Ideas

Cohesive monitoring systems could allow improved analysis of fecundity trends. One suggestion at the workshop included a “time capsule” of information, with a portfolio of existing, enhanced, and new components to track over time. This capsule might include analysis of pregnancy intentions, specific study designs, and outcomes of the full spectrum of current fertility treatments with inclusion of data on couples. These ideas could employ newer technology that would allow a broader reach within some populations. A researcher at the workshop also suggested adding data on time to pregnancy on birth certificates.

Another suggestion was the creation of a risk-assessment model, similar to that established for cardiovascular disease, to assess a person or couple’s ability to conceive a child. This assessment could be part of general health monitoring.

## Looking Ahead

The question, “Is human fecundity changing?” remains. In June 2014, the Centers for Disease Control and Prevention released a [National Public Health Action Plan for the Detection, Prevention, and Management of Infertility](#), which highlights some of the challenges and existing data gaps for measuring fecundity. Areas of focus include the need to strengthen existing

systems to monitor fecundity at the population level, including the use of consistent measures for both public health and clinical practice.

Careful planning related to monitoring human fecundity will allow more rigorous and meaningful comparisons in the future to enable assessment of change. Joseph Stanford quoted Oren Lyons of the Onondaga Nation, “We are looking ahead...to make sure and to make every decision that we make relate to the welfare and well-being of the seventh generation to come...” Indeed, human fecundity influences the entire lifespan and general health for mother, father, child, and future generations.

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<sup>1</sup> Dunson DB, Colombo B, Baird DD. Changes with age in the level and duration of fertility in the menstrual cycle. *Hum Reprod* 17(5):1399–1403 (2002).

<sup>2</sup> Centers for Disease Control and Prevention, National Center for Health Statistics, National Survey of Family Growth, 1982, 1995, and 2006–2010.

<sup>3</sup> Bongaarts J, Blanc AK. Estimating the current mean age of mothers at the birth of their first child from household surveys. *Popul Health Metr* 13:25 (2015).

<sup>4</sup> Frejka T, Sardon J-P. First birth trends in developed countries: persisting parenthood postponement. *Dem Res* 15:147–180 (2006).

<sup>5</sup> Jensen TK, Sobotka T, Hansen MA, Pedersen AT, Lutz W, Skakkebaek NE. Declining trends in conception rates in recent birth cohorts of native Danish women: a possible role of deteriorating male reproductive health. *Int J Androl* 31(2):81–92 (2008).