WHY IS IT AN EMERGING ISSUE?

Infertility is not a new problem. However, in the last decade it has attracted increasing attention, focussing on three concerns:

1) A **medical/clinical concern** that an increasing number of couples are seeking Medically Assisted Reproduction (MAR) and that some risk factors for infertility are increasing.

2) An **economic/demographic concern** regarding decreasing birth rates, leading to reduced labor force.

3) A **human rights concern** that couples have fewer children than they wish.

INFERTILITY

By Siri Tellier & Josephine Obel*

Each of these concerns is important. However, to identify trends and suggest appropriate action, it is important not to confuse them with each other.

TERMINOLOGY

Terminology related to infertility is extraordinarily complex, referring to all three of the above concerns.

The medical/clinical definition (from WHO) refers to Infertility as "*a disease of the reproductive system defined by the failure to achieve a clinical pregnancy after 12 months or more of regular unprotected sexual intercourse*" [1]. The focus is on the capacity to achieve pregnancy, not on

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SUMMARY:

• Estimates of infertility vary depending on the definition and method utilized. However, patterns are becoming increasingly clear.

• There is little evidence that levels of global infertility have greatly changed in recent decades. Sub-Saharan Africa and South Asia have previously had higher levels, which seem recently to have improved due to better health care including treatment for infections. Present levels are similar across regions.

• Estimates of life-time infertility (couples having ever experienced infertility, even temporarily) are generally in the range of 16-26%.

• The factors behind are multiple and affect both sexes. They include infections, life style factors such as smoking, obesity/under-weight, possibly environmental factors. A main risk factor is also age, especially female age.

• No matter how it is measured, infertility is to be considered as a public health problem, both in HICs and L/MICs, with great social and economic effects at individual and societal levels. WHO/World Bank estimate infertility to be the 5th largest cause of disability for people under 60 in L/MICs.

• Whereas contraception is now increasingly available, treatment for infertility is rarely available in L/MICs.

• Policy considerations may consider to improve data availability, fertility awareness and prevention programmes, improved access to treatment, socio-economic policies which enable prospective parents to combine education/work and child bearing, as well as giving this issue attention in global high policy.

carrying it to term or on live birth. The time period is significant: estimates are that more than two-thirds of couples who experience infertility during a 12 month period subsequently achieve pregnancy within 24 months, without MAR [2].

On the other hand, demographic literature refers to fertility to denote actual number of births. For example the 'total fertility rate', TFR, refers to the average number of children born per woman. The term fecundity is used to refer to the capacity to deliver a baby [3]. Demographic literature often uses a cut-off period of five years.

Some measures also include the issue of unwanted childlessness, by estimating the gap between intended and actual number of births. They therefore address human rights concerns.

A distinction in both medical/demographic literature is made between primary infertility, occurring in women who have never achieved pregnancy/delivered a child, and secondary infertility, defined as infertility in women who have already achieved pregnancy/delivered a child [1].

For practical reasons, many measures refer to females only, although infertility is equally an issue for males.

Each measure has a purpose. For example a clinician may wish to detect infertility as early as possible to offer appropriate treatment. If such treatment is successful, it may be seen as a medical concern, but not necessarily a human rights or demographic concern.

However, it also means that determining the level and trend of infertility depends on the definition used, and comparison across studies is difficult. In particular, the different cut-off points for 'time-to-pregnancy', and the focus either on fecundity or actual births are significant and yield widely different estimates.

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SITUATION – LEVELS AND TRENDS

We found only one recent study giving global estimates of infertility, over time. It uses the demographic definition of failure to bear a child over a 5-year exposure, with the intention to become pregnant.

The researchers found that in 2010, 1.9% of women aged 20-44 years who wanted to have children were unable to have their first live birth (primary infertility), and 10.5% of women with a previous live birth were unable to have an additional live birth (secondary infertility).

The study found that levels of infertility in 2010 were similar to those in 1990 in most world regions, apart from declines in primary and secondary infertility in Sub-Saharan Africa and primary infertility in South Asia.

The study notes that, as women desire a declining number of children, unwanted childlessness also declines [4]. Other studies support the finding that levels have previously been much higher in sub-Saharan Africa [5].

Studies using the *medical definition*, have found higher levels. Recent studies from Western countries have found 16-26% lifetime infertility, that is, couples who have ever experienced infertility, even if temporary [6].

WHO/World Bank in their 2011 report on disability put infertility as the 5th ranking cause of moderate/serious disability for populations under 60, in Low- and Middle-Income Countries (L/MICs) [7].

Another approach to measuring medical/clinical infertility is to estimate how many births occur with MAR. In Denmark, this level has increased rapidly and is now at 8-10% of all

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BIRTHS, OECD34, 2000-2011 (IN MILLION)

Source: OECD
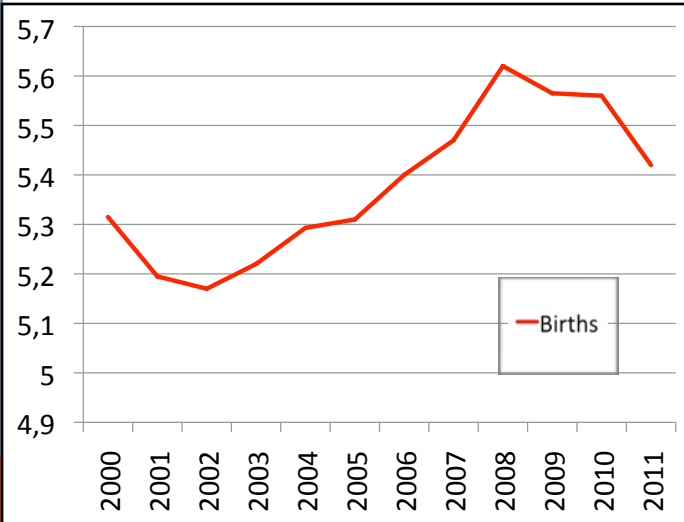
live births, the highest in Europe. However, Denmark also has some of the highest rates for other procedures, e.g. pre-natal screening for Down's syndrome. It is generally attributed to high accessibility of health care services rather than high levels of infertility [8] and a high level of public reimbursement.

Many authors state as a reason for their concern that Total Fertility Rates (TFR) have fallen below the 'replacement level' of 2.1 children per woman. It should be noted that the replacement level should not be considered a constant (being dependent on two variables, namely mortality and sex ratio) nor is it a norm.

In HICs such as the OECD, birth rates decreased over the period 1950-2000, showed an unexpected increase 2000-2008, and a renewed decrease since then. This is generally attributed to the economic environment, rather than a sudden epidemic of infecundity.

With respect to timing of births, worldwide, and especially in HICs, female age at first birth has increased. In Denmark, the female age at first birth was 22.7 years in 1965, increasing to 29.4 in 2012 [9].

AGE SPECIFIC FERTILITY RATES, DENMARK 1970-2015

Source: UN Pop Prospects 2012
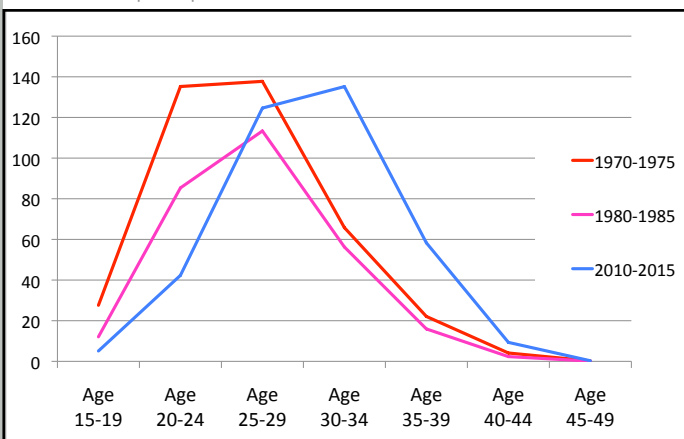
However, this shift did not automatically result in lower TFR - fertility simply shifted to older ages, as can be seen in the graph. Nor has it, thus far, resulted in historically high levels of cohort childlessness – in 1900 childlessness was estimated at 25% [9].

With regard to the human rights concern of unwanted childlessness, in OECD countries, both women and men have fewer children than their stated ideal number, with one study indicating an average gap of around 0.3 children in

2011. [10].

In L/MICs women on average have more children than they wish. However, this average conceals the important fact that some couples/women experience infertility.

SITUATION – DETERMINANTS

The determinants of infertility are varied, often inter-related, and frequently unknown.

For females, untreated reproductive tract infections, maternal sepsis, and unsafe repeat abortions may result in fallopian tube occlusion and subsequent infertility. This has been, and remains, a major cause of infertility, not least in L/MICs where health care may be less accessible (11).

Various other health conditions have been identified as having a negative effect, including endocrine disorders, endometriosis, genetic, anatomical or immunological problems.
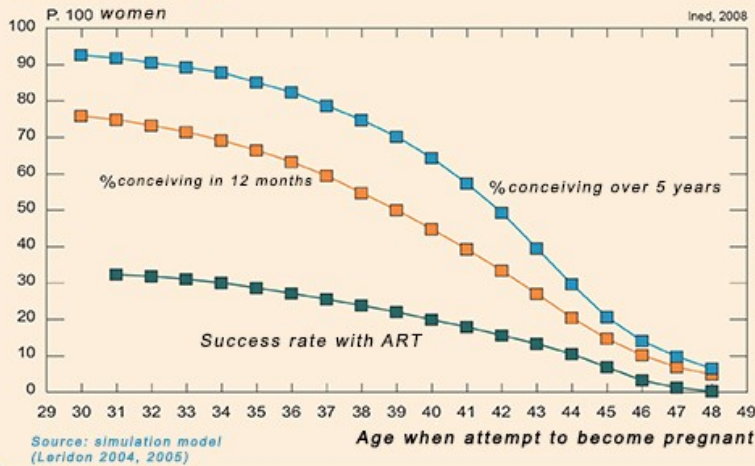
Numerous studies note a connection between infertility and behavioural factors, including smoking, coffee consumption, alcohol intake, as well as over- and underweight. On the other hand, high stress levels have not been conclusively found to increase infertility [4,8].

For males, infertility may be associated with similar factors as for females: untreated infections, cancer/treatment, diabetes, endocrine or genetic disorders/malformations, as well as behavioural aspects. Several studies have found falling semen quality in Western countries possibly due to environmental factors, but to which extent environmental factors influences semen quality, and fecundity, is still intensively debated [4,8,12].

Female age is the single major predictor of infertility, partially because it incorporates many of the other factors [2], and fecundity is at its peak in the 20s. However, it is important not to oversimplify: to date there is no evidence that

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unwanted childlessness has risen, merely that time to pregnancy may be longer [13].

Figure 1 Probability of becoming pregnant (viably, leading to a live birth) by age at which attempt begins: spontaneously in 12 months, or over 5 years with ART (two attempts at in-vitro fertilization [IVF]).

P. 100 women
Ined, 2008

%conceiving in 12 months
%conceiving over 5 years

Success rate with ART

Age when attempt to become pregnant

Source: simulation model (Leridon 2004, 2005)

As seen in the graph, MAR can reduce, if not entirely eliminate, infecundity. Other factors, e.g. frequency of intercourse, may outweigh the risks associated with age. Male age also influences fecundity, and a combination of high ages for both partners is particularly significant both for ability to conceive and avoiding miscarriage.

Beyond the medical, fertility is not only an issue of the ability to bear children. A vast literature has developed over the last decades, exploring the socio-economic determinants of whether they wish to do so.

Such determinants include being able to find a partner, attitudes toward child-bearing out of wedlock, the level of male support/availability of external child care, the flexibility of the educational system and labour market, as well as the economic situation.

The overall conclusion is that the decision is more likely to occur where especially women are able to combine work and family obligations. This trend is recent. In 1980 the OECD countries with the highest TFR were those where female employment was the lowest, whereas in 2012 the reverse was true. [14].

In summary, although the levels vary among different studies, so far there seems little reason to conclude that levels of infertility have increased in any region over the last few decades. On the contrary, levels in sub-Saharan Africa have probably declined. However, some of the risk factors may have increased, and utilization of MAR also.

SITUATION – CONSEQUENCES FOR THE INDIVIDUAL AND SOCIETY

In HICs, unwanted childlessness, as well as undergoing treatment with MAR, can lead to devastating distress and reduced quality of life [6]. In L/MICS with limited public old age security, where aged parents rely on their children for support, and where social status depends on 'reproductive success', unwanted childlessness can be an even more serious psychological and financial problem [15].

For economic/demographic concerns, there is vocal concern that birth rates are decreasing. However, thus far, there is little evidence to indicate that infertility is the main cause [14].

In general, the evidence is not systematical and consistent, and causality can be difficult to assign [8].

RESPONSE

Global consensus documents refer more or less explicitly to infertility as an integral part of sexual and reproductive health and rights (SRHR). The 1994 International Conference on Population and Development refers to reproductive health as implying '*that people are able to have a satisfying and safe sex life and that they have the capability to reproduce and the freedom to decide if, when and how often to do so*' [16]. This is reconfirmed in the World Health Assembly Reproductive Health Strategy from 2004.

However, whereas there has been good progress in other areas of SRHR, infertility has received limited attention, especially in L/MICS [17,18]. Many reasons have been proposed for this lack of attention, including the high cost of treatment, an unfortunate view that the problem in L/MICs is one of hyper-fertility rather than sub-fertility, as well as the confusion of terminology and consequently on trends [11,19]. As pointed out by Inhorn, in many settings infertility is still perceived as a purely female issue [20], and management often is mistakenly female based [1].

Nevertheless, some progress is being made.

For the medical/clinical concern, WHO is updating global technical guidelines, including on terminology [11]. At the national level, much attention has been focused on MAR, but legislation and regulations diverge greatly among countries. In Denmark, MAR is supported by health insurance (at an estimated cost of 76.413 DKK per live birth) [21] but in L/MICs, few countries provide subsidized infertility services [17]. Infertility can be viewed as a public health threat yet few countries seem to have instituted programmes of prevention to reduce infertility rates, with recent initiatives in Denmark and Australia being apparent exceptions [9].

To meet the demographic/economic concern about declining birth rates, several countries have adopted measures to limit access to family planning to increase birth rates. The European Commission, distancing itself from any such measures, has instead identified measures which make it easier for prospective parents to combine work and family obligations [14].

The same is true of the International Planned Parenthood Federation. On the basis of a review of national laws in the European Region, it concludes that providing a "*comprehensive package of support measures for women and their families is a much more effective approach than measures to limit access to contraception or safe abortion in order to stimulate population growth*" [22].

A number of studies are also appearing which point to the danger of encouraging a public discourse which is overly simplistic and dramatic, and places all responsibility on young women [23].

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