

<<NOTE TO USER: Please add details of the date, time, place and sponsorship of the meeting for which you are using this presentation in the space indicated.>>

<<NOTE TO USER: This is a large set of slides from which the presenter should select the most relevant ones to use in a specific presentation. These slides cover many facets of the problem. Present only those slides that apply most directly to the local situation in the region.>>

<<NOTE TO USER: This module presents several examples of risk factors that affect reproductive health. You can find more detailed information in other modules of the training package that deal with specific risk factors, such as lead, mercury, pesticides, persistent organic pollutants, endocrine disruptors, occupational exposures; or disease outcomes, such as developmental origins of disease, reproductive effects, neurodevelopmental effects, immune effects, respiratory effects, and others.>>

<<NOTE TO USER: For more information on reproductive health, please visit the website of the Department of Reproductive Health and Research at WHO: www.who.int/reproductivehealth/en/>>

LEARNING OBJECTIVES

After this presentation individuals should be able to understand, recognize, and know:

- ❖ Mechanisms by which environmental toxicants may affect female reproduction
- ❖ Examples of ovarian, uterine, and pubertal disorders
- ❖ The potential role of the environment in the etiology of female reproductive disorders

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<<READ SLIDE.>>

According to the formal definition by the World Health Organization (WHO), *health is more than absence of illness. It is a state of complete physical, mental and social well-being. Similarly, reproductive health also represents a state of complete physical, mental and social well-being, and not merely the absence of reproductive disease or infirmity.*

This presentation will introduce you to the basics of female reproductive health disorders and the potential role that the environment may play in the development of these disorders.

Refs:

- WHO. Department of Reproductive Health and Research, Partner Brief. Geneva, Switzerland, *World Health Organization*, 2009. WHO/RHR/09.02. Available at whqlibdoc.who.int/hq/2009/WHO_RHR_09.02_eng.pdf – accessed 15 June 2011
- WHO. Preamble to the Constitution of the World Health Organization as adopted by the International Health Conference. New York, United States of America, *World Health Organization*, 1946.

OUTLINE

- ❖ Considerations in female infertility and fecundity
 - ❖ Potential connections to environmental exposures
- ❖ Potential mechanisms of action of environmental contaminants on reproductive health
- ❖ Overview of female hormonal disorders
 - ❖ Ovarian disorders
 - ❖ Uterine disorders
 - ❖ Pubertal development alterations

<<READ SLIDE.>>

<<NOTE TO USER: You may decide to delete certain parts of the presentation depending on time. Please correct the outline accordingly.>>

INFERTILITY AND FECUNDITY

- ❖ **Primary infertility**- failure to bear any children after 12 months of unprotected sexual intercourse
- ❖ **Secondary infertility**- failure to have a second child after a first birth
- ❖ **Fecundity**- the ability of a couple to conceive after a certain time of attempting to become pregnant



WHO

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The World Health Organization defines the term primary infertility as the inability to bear any children, whether this is the result of the inability to conceive a child, or the inability to carry a child to full term after 12 months of unprotected sexual intercourse. Primary infertility is sometimes known as primary sterility. However, in many medical studies, the term primary infertility is only used to describe a situation where a couple is not able to conceive.

Secondary infertility is defined as the inability to have a second child after a first birth. Secondary infertility has shown to have a high geographical correlation with primary infertility. Fecundity describes the ability to conceive after several years of exposure to risk of pregnancy. Fecundity is often evaluated as the time necessary for a couple to achieve pregnancy. The World Health Organization recommends defining fecundity as the ability for a couple to conceive after two years of attempting to become pregnant.

The terms infertility and infecundity are often confused. Fertility describes the actual production of live offspring, while fecundity describes the ability to produce live offspring. Fecundity cannot be directly measured, though it may be assessed clinically. Typically, fecundity may be assessed by the time span between a couple's decision to attempt to conceive and a successful pregnancy.

Ref:

•Rutsein S and Iqbal S. *Infecundity, infertility, and childlessness in the developing world*. Geneva, Switzerland, *World Health Organization and ORC Macro*, 2004. DHS Comparative Report, No. 9.

Image: WHO

PROXIMATE DETERMINANTS OF FERTILITY

- ❖ Biological and behavioral factors that influence individual reproductive behavior
 - ❖ Explain why women do not have as many children as possible in lifetime
- ❖ Biological constraints
 - ❖ Breastfeeding
 - ❖ Pathologies
- ❖ Behavioral constraints
 - ❖ Single most important factor: use of contraception

A variety of internal and external factors may influence female fertility!

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Fertility is a concept directly related to a number of both biological and behavioural factors. These factors mediate the influence of socio-economic status, living conditions, cultural beliefs, and other determinants on individual reproductive behaviour. These biological and behavioural factors are known as proximate determinants of fertility. These determinants define how social and economic environments can influence individual reproduction. Essentially, these factors explain why women do not have the maximum number of children they could potentially have in their lifetime.

Biological constraints on fertility include not only the time lost during pregnancy, but also the time required for a woman to recover from pregnancy and childbirth. This time frame is referred to as postpartum infecundity and includes necessary maternal functions such as breastfeeding. The averaged estimated time of postpartum infecundity is approximately 1.5 months but may vary widely between females. Other biological constraints may include such factors as sterility induced by age or pathology. The term "total fecundity" is used to describe the natural limit in physiological capability of childbearing for an average female due to biological constraints.

Several behavioural considerations also exist that influence the fertility of a woman. However, these include factors that pertain mostly to the possibility of conception. For example, the time a woman spends in a sexual relationship or married directly affects her engagement in sexual intercourse and thus potential pregnancy. The most important behavioral consideration relates to the woman's decision to utilize contraception. This may include traditional methods or modern methods of family planning.

Ref:

• Frank O. The demography of fertility and fecundity. Geneva, Switzerland, *World Health Organization*, 2007. Available at www.gfmer.ch/Books/Reproductive_health/The_demography_of_fertility_and_infertility.html – accessed 10 June 2010

FEMALE REPRODUCTIVE DISORDERS

- ❖ Disorders related to female reproductive health may develop during fetal development, childhood, adolescence, or adulthood
- ❖ Multiple causes for changes in female reproductive functioning
- ❖ Recent focus on potential environmental causes



UNDP/UNFPA/WHO/World Bank, 2009

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Some female reproductive disorders linked to fertility and fecundity may occur during fetal development. Female reproductive organs begin to develop between the fourth and fifth week of pregnancy, and continue until the 20th week of pregnancy. Due to the complexity of the development of the reproductive system, many factors may alter the healthy growth of these essential tissues, organs, and hormonal messaging pathways. Alterations may be the result of genetic abnormalities from external factors that may change the normal development of specific tissues. The mechanisms of action of various female disorders will be discussed in upcoming slides. You may also refer back to module 1 for more information about reproductive health abnormalities and their etiologies.

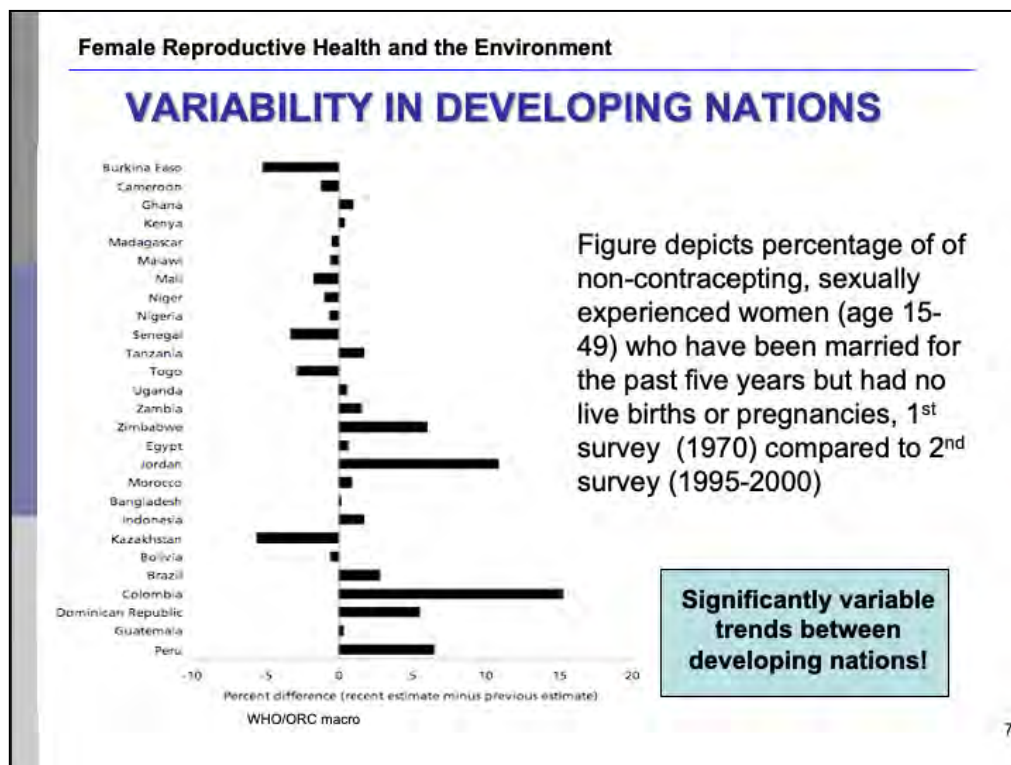
However, it is important to note that female reproductive disorders may also develop during various life phases of the female. Alterations in proper reproductive functioning may be the result of various occurrences and experiences throughout childhood, adolescence, or adulthood.

While much is known about the female reproductive system, its development, and many causes of specific disorders, the research pertaining to the mechanisms of action for certain pathologies is still largely unknown. However, exposure to environmental contaminants has been proposed in recent years to potentially contribute to female reproductive disorders. Research has been focused on exposures that occur during critical periods of development, however this is an emerging field of research that demands greater scientific investigation.

Refs:

- Caserta D et al. Impact of endocrine disruptor chemicals in gynaecology. *Human Reproductive Update*, 2008, 14:59–72.
- Foster WG et al. Environmental contaminants and human infertility: hypothesis or cause for concern? *Journal of Toxicol Environmental Health: Critical Review*, 2008, 11:162–76.

Image: WHO. Biennial Report of HRP (2008-2009). Special programme of research, development and research training in human reproduction (HRP). Geneva, Switzerland, World Health Organization, 2009. Available at whqlibdoc.who.int/hq/2010/WHO_RHR_HRP_10.09_eng.pdf - accessed 7 July 2010.



Though evidence from demographic surveys in the industrialized world showed a clear decrease in fertility, surveys conducted in association with the WHO in the developing world demonstrate different trends throughout various nations. This figure portrays either a positive or negative change in the percentage of of non-concepting, sexually experienced women (age 15-49) who have been married for the past five years but had no live births or pregnancies. The bars compare the positive or negative difference between the first survey that occurred in 1975 and the second survey that occurred between the years of 1995 and 2000. You can see that some nations, such as Colombia, Peru, and Jordan, experienced a very large increase in the percentage of women who experienced no live births or pregnancies despite being sexually active during five years marriage and not using contraception. This trend may indicate a decrease in overall fertility and potentially fecundity. However, notice that some nations, such as Burkina Faso, Senegal, and Kazakhstan experienced a decrease in the percentage of women who experienced no live births or pregnancies despite being sexually active during five years marriage and not using contraception.

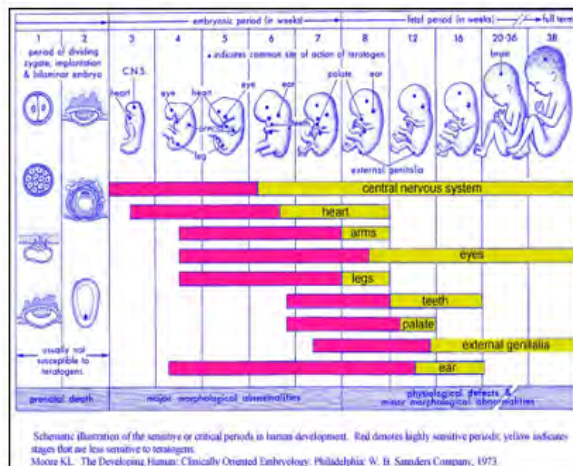
Ref:

- ORC Macro and the World Health Organization. *Infecundity, Infertility, and Childlessness in Developing Countries*. Calverton, Maryland, USA, ORC Macro and the World Health Organization, 2004. DHS Comparative Reports No. 9.

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CRITICAL WINDOWS OF SUSCEPTIBILITY

Sensitive time interval during development when environmental exposures can interfere with physiology of cell, tissue, or organ



Exposure at specific windows may result in adverse and irreversible effects

A critical window of susceptibility is a period in which there are numerous changing capabilities in the developing fetus. Exposures to environmental contaminants during this window may result in permanent damage to a fetus and may have lifelong impacts on health. Given that development continues after birth, critical and sensitive windows occur before, during, and shortly after the fertilization of the egg. Critical windows of development are also present during pregnancy, infancy, childhood, and puberty. The diagram provided demonstrates the particular windows of susceptibility for the developing fetus. The maternal environment at these specific temporal windows has important implications for the healthy development of the reproductive organs of a developing fetus. However, disorders related to female reproductive health may develop during sensitive windows throughout fetal development, childhood, adolescence, or adulthood.

<< NOTE TO USER: For further information, please refer to the module on "Developmental and Environmental Origins of Disease">>

Ref:

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https://www.yunbaogao.cn/report/index/report?reportId=5_28628

