Principles of Population & Demography

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**Training Course in Sexual and Reproductive Health Research
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Outline of presentation

- Definitions of population & demography
- Population & demography related indicators
- Why family planning is still important
  - MDG, RH Strategy, UNSG Strategy
- Key indicators on family planning
  - Contraceptive Prevalence
  - Unmet need for FP
- Special target populations groups
- Key messages

Population: definition

- " Group of individuals of same species living in the same geographic area at the same time"

- A population is often defined by demographers according to the specific needs of the research and researcher. Three processes are relevant to demography:
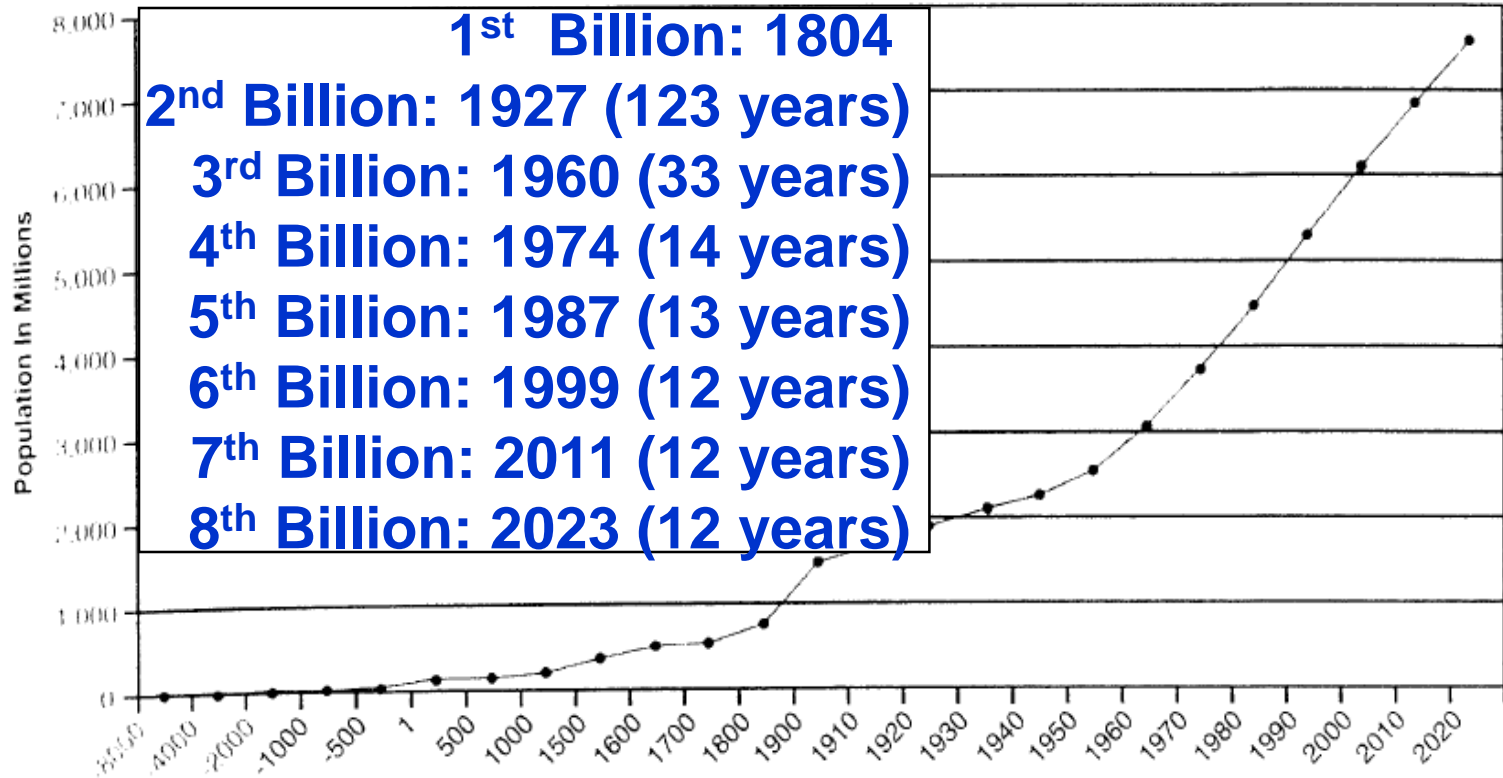 - Fertility, Mortality, and Migration

Population: basic concepts

- There are only **two** ways to **enter** a population by birth and by in-migration.
- There are **two** ways to **leave** a population, by death and by **out-migration.**

□ For example, the population of interest may be that of students attending a specific university during a specific year. In this situation, the students are born (i.e., enter) into the population when they enroll, and they die (i.e., leave) when they graduate

Global population developments

- Demographic change has been more rapid and more universal in the past five decades than any other period in human history, with birth, death and population growth varying widely across the world regions

- Fertility rates have declined to below three births per women in all regions except sub-Saharan Africa

- Global population reached 7 billion individuals in 2011

- Africa: doubles in size between 2010-2050 (e.g. Niger triples)

- If projection holds: grown by more than ten-folds i.e. 0.8 to 10 billion - between 1800 and 2100

- Pressure on public services and infrastructure, i.e. health care, education

Trends in global population growth

Population In Millions

1st Billion: 1804
2nd Billion: 1927 (123 years)
3rd Billion: 1960 (33 years)
4th Billion: 1974 (14 years)
5th Billion: 1987 (13 years)
6th Billion: 1999 (12 years)
7th Billion: 2011 (12 years)
8th Billion: 2023 (12 years)

Reference: United Nations Population Division. *World Population Prospects*. (http://esa.un.org/unpd/wpp/)

Projecting future populations

- Human Population since 1980 is J-shaped curve
- Population is increasing however growth rate (r) has started to decline
- Projections for 2050 (2007)
  - Low = 7.7 billion
  - High = 10.6 billion
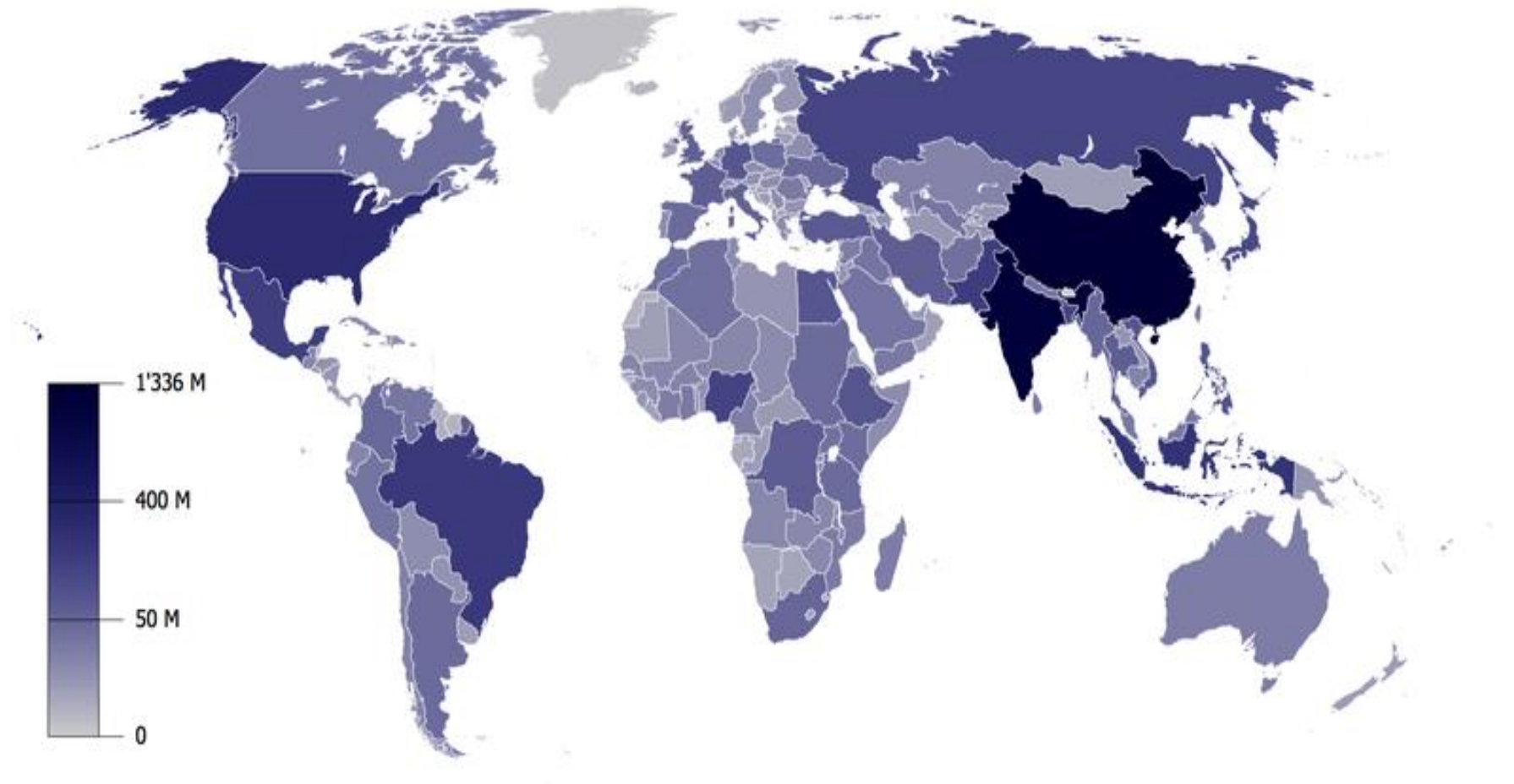 - Most likely = 9.1 billion
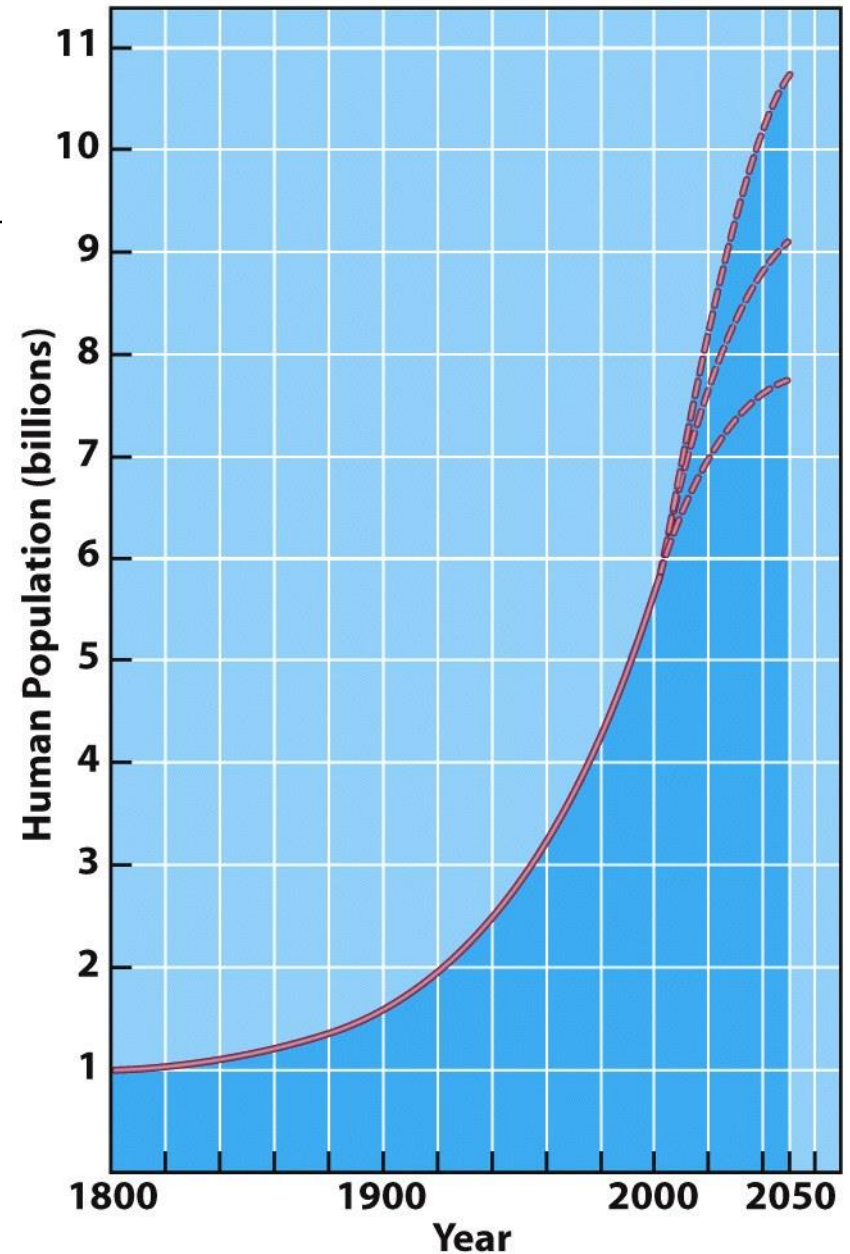
Reaching the 7 billion mark…

- World Population to surpass 7 Billion in 2011 and will reach seven billion on 31st October, a milestone that offers unprecedented challenges and opportunities to all of humanity, according to UNFPA

World population distribution: global overview

Population projections 2010-2050

	Population (Billions)		% increase
	2010	**2050**	**2010-50**
Africa	1.02	2.19	114%
Sub-Saharan	0.86	1.96	129%
Asia	4.16	5.14	23%
China	1.34	1.30	-3%
Latin America and Caribbean	0.59	0.75	27%
Europe	0.74	0.72	-3%
USA and Canada	0.34	0.45	30%
World wide	6.90	9.31	35%

Reference: Data from UN World Population prospects: The 2010 Revision (UN medium variant)

Population density

- Population density
  - The number of individuals of a species per unit area or volume at a given time
- Ovals below have same population, and different densities
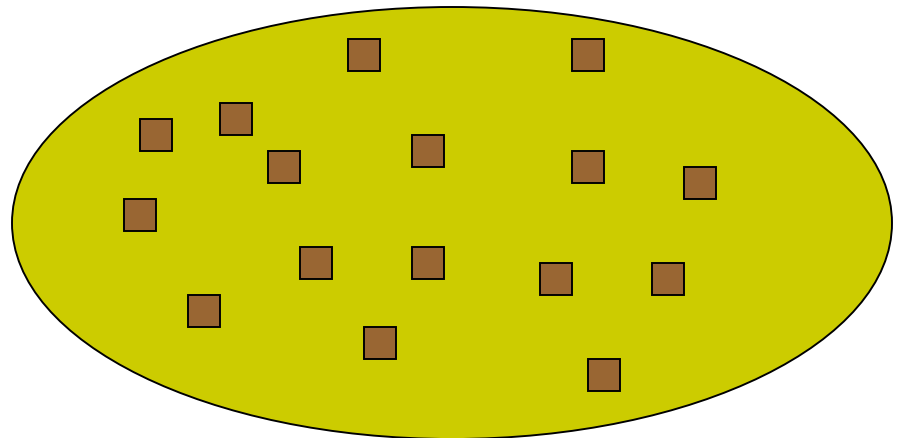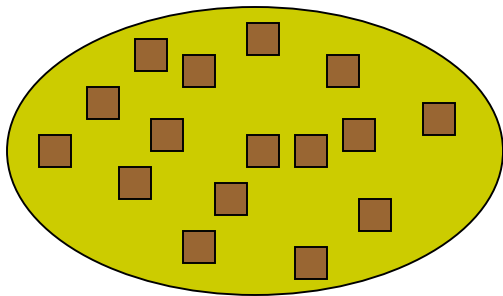
Population density of countries

Country	2006 Population (in millions)*	Population Density (per mi²)
China	1311.4	355
India	1121.8	884
United States	299.1	80
Indonesia	225.5	307
Brazil	186.8	57
Pakistan	165.8	539
Bangladesh	146.6	2637
Russia	142.3	22
Nigeria	134.5	377
Japan	127.8	876

* These figures are from mid-2006. At the end of 2006, the United States reached a population milestone of 300 million people.

Effects of overpopulation *(contd)*

Some of the global effects of overpopulation include:

- Ultimate shortages of energy sources and other natural resources
- Famine
- Serious communicable diseases in dense populations
- Shortage of arable land (where food crops will grow)
- Little surplus food
- Mass extinctions of plants and animals as habitat is used for farming and human settlements
- War over scarce resources such as land area.

Effects of overpopulation

- High birth rates
- Lower life expectancies
- Lower levels of literacy
- Child poverty
- Higher rates of unemployment, especially in urban
- Poor diet with ill health and diet-deficiency diseases (e.g. rickets)
- Low per capita GDP
- Increasingly unhygienic conditions
- Government stretched economically
- Increased crime rates resulting from people stealing resources to survive

Demography: historical perspective

- **Demography** is the study of human population dynamics.

Achille Guillard first used the title on his book:
"Eléments de Statistique Humaine ou Démographie Comparée".

- Two Greek roots:
  - **demos** (people)
  - **graphy** (branch of knowledge regarding a particular science in this case, human populations).

- Guillard then defined demography as: 'the mathematical knowledge of populations, their general movements, and their physical, civil, intellectual and moral state' (Guillard 1855:xxvi).

Today demography encompass…

- …the determinants and consequences of population change and is concerned with **virtually everything** that influences or can be influenced by:

- Population Size
- Population growth or decline
- Population processes (levels and trends in mortality, fertility and migration that are determining population size and change).
- Population characteristics (education, religion, or ethnicity)
- Population structure (how many by age)

Population pyramid: age structure

☐ The number and proportion of people at each age in a population
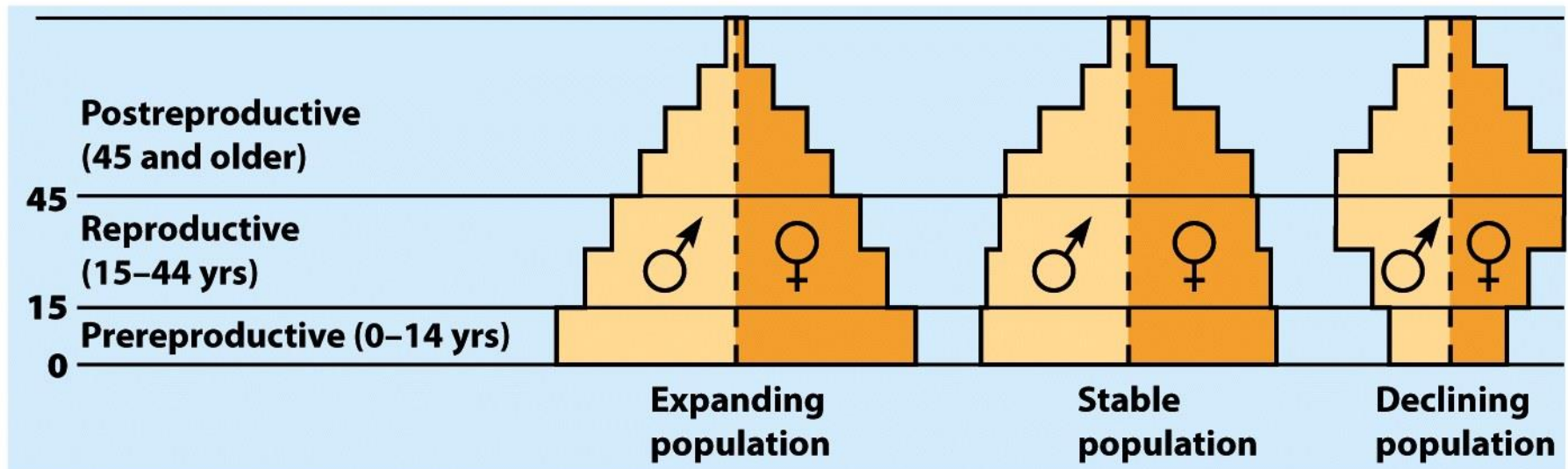
Demographics of specific countries

(a) Rapid growth
Nigeria

(b) Slow growth
United States

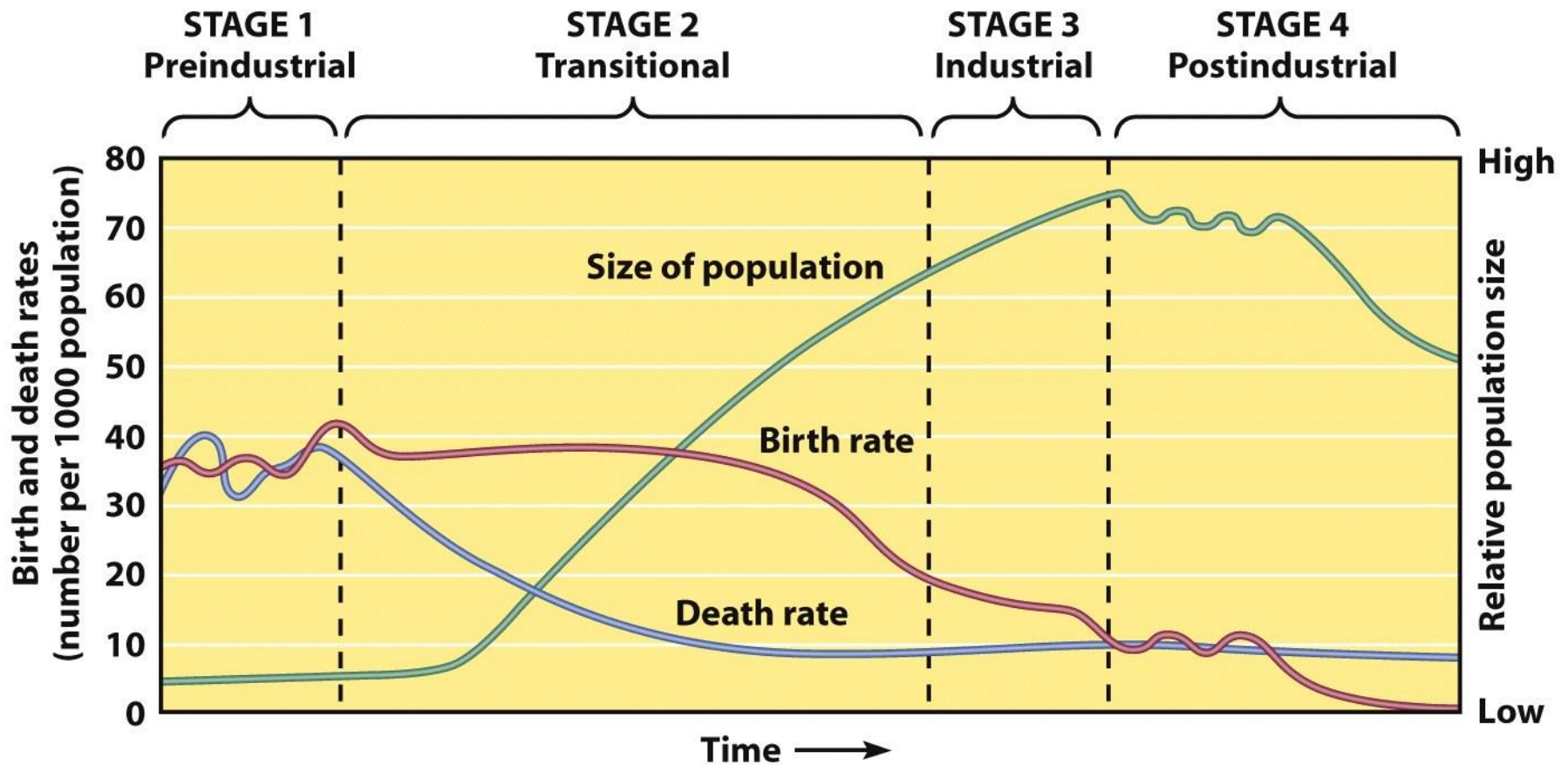(c) Decline in growth
Germany
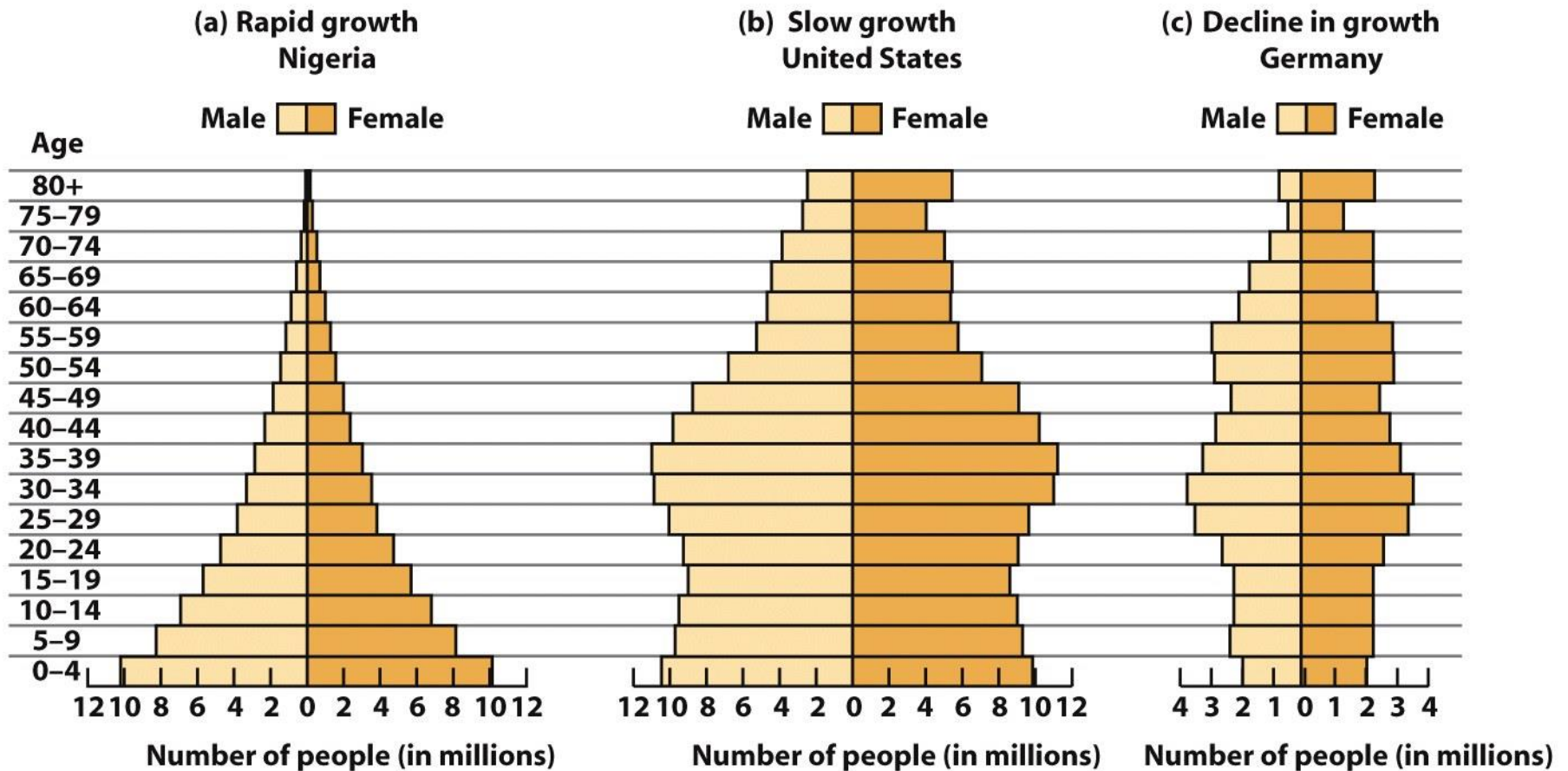
Demographic stages

- Pre-industrial Stage
    - Birth and death rates high
    - Modest population growth
- Transitional Stage
    - Lowered death rate
    - Rapid population growth
- Industrial Stage
    - Birth rate decline
    - Population growth slow
- Post Industrial Stage
    - Low birth and death rates
    - Population growth very slow

Demographic stages

Demographic indicators

- Because demography is interested in changes in human populations, demographers focus on specific indicators of change.

- Two of the most important indicators are birth and death rates, which are also referred to as *fertility* and *mortality*.

- Additionally, demographers are interested in migration trends or the movement of people from one location to another.

Fertility and fecundity

- **Fertility**, in demography, refers to the ability of females to produce healthy offspring in abundance. **Fecundity** is the potential reproductive capacity of a female. Some of the more common demographic measures used in relation to fertility and/or fecundity include:

    - **Crude birth rate**
    - **General fertility rate**
    - **Age-specific fertility rate**
    - **Total fertility rate**
    - **Gross reproduction rate**
    - **Net reproduction rate**

Replacement level fertility

- It refers to the number of children that a woman (or monogamous couple) must have in order to replace the existing population. Replacement level fertility is generally set at 2.1 children in a woman's lifetime (this number varies by geographic region given different mortality rates).

- The reason the number is set to 2.1 children per woman is because two children are needed to replace the parents and an additional one-tenth of a child is needed to make up for the mortality of children and women who do not reach the end of their reproductive years.

Total fertility rate

- The **total fertility rate** (**TFR**) of a population is the average number of children that would be born to a woman over her lifetime if;

  - (1) she were to experience the exact current age-specific fertility rates (ASFRs) through her lifetime, and
  - (2) she were to survive from birth through the end of her reproductive life. It is obtained by summing the single-year age-specific rates at a given time.

World historical and predicted total fertility rates (1950–2100) UN, 2010

Years	TFR	Years	TFR	Years	TFR
1950–1955	4.95	2000–2005	2.62	2050–2055	2.15
1955–1960	4.89	2005–2010	2.52	2055–2060	2.12
1960–1965	4.91	2010–2015	2.45	2060–2065	2.11
1965–1970	4.85	2015–2020	2.39	2065–2070	2.09
1970–1975	4.45	2020–2025	2.33	2070–2075	2.08
1975–1980	3.84	2025–2030	2.29	2075–2080	2.06
1980–1985	3.59	2030–2035	2.25	2080–2085	2.05
1985–1990	3.39	2035–2040	2.22	2085–2090	2.04
1990–1995	3.04	2040–2045	2.19	2090–2095	2.04
1995–2000	2.79	2045–2050	2.17	2095–2100	2.03

Trends in TFR 1950-2050

Trends in Total Fertility Rate by Region, 1950-2050.
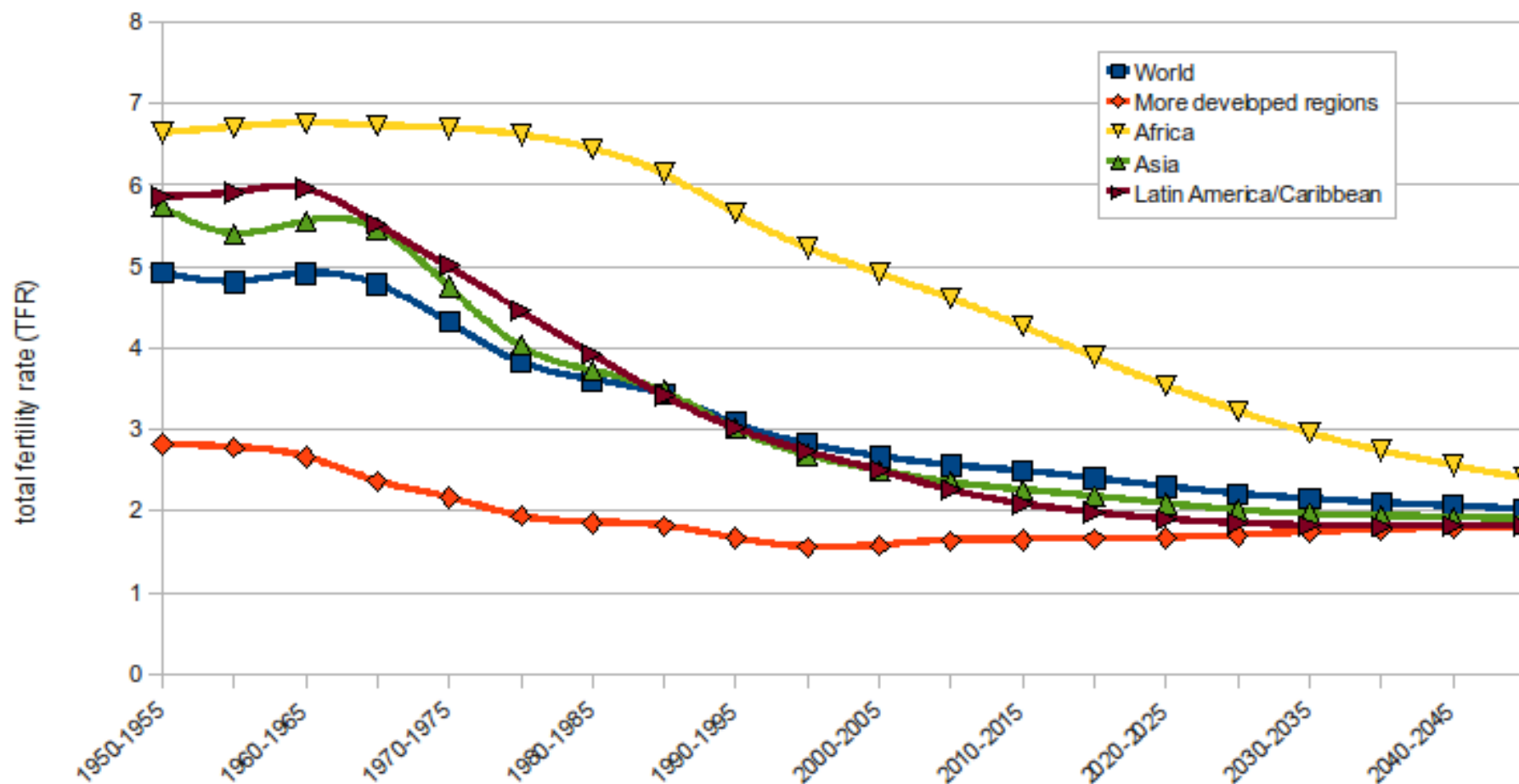
Mortality

- **Mortality** refers to the finite nature of humanity: people die. Mortality in demography is interested in the number of deaths in a given time or place or the proportion of deaths in relation to a population. Some of the more common demographic measures of mortality include:

  - **crude death rate**: the annual number of deaths per 1000 people
  - **infant mortality rate**: the annual number of deaths of children less than 1 year old per thousand live births
  - **life expectancy**: the number of years which an individual at a given age can expect to live at present mortality rates

Infant mortality rate by region 1950-2050
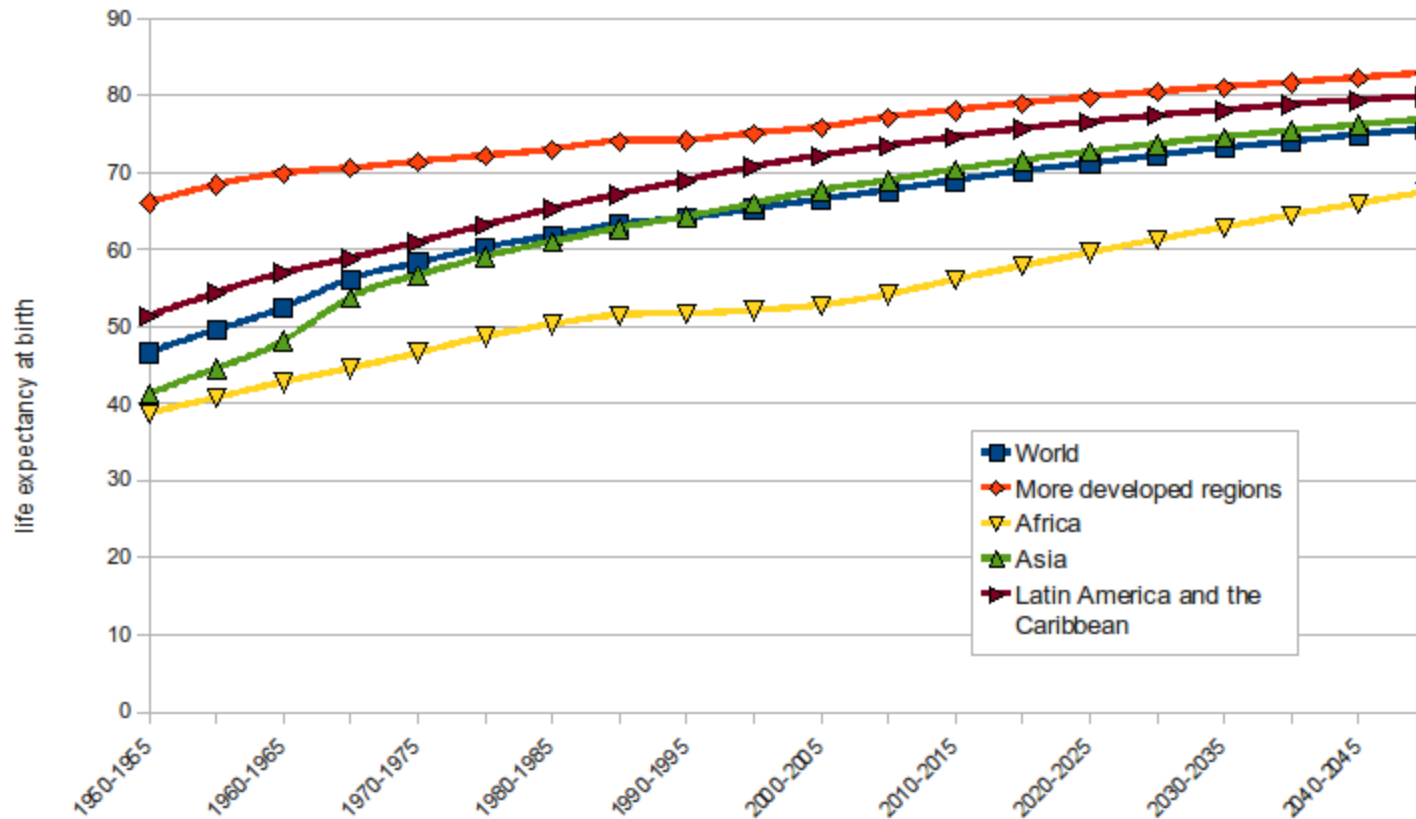

Infant Mortality Rate by Region, 1950-2050.

Source: UN World Population Prospects, 2008.
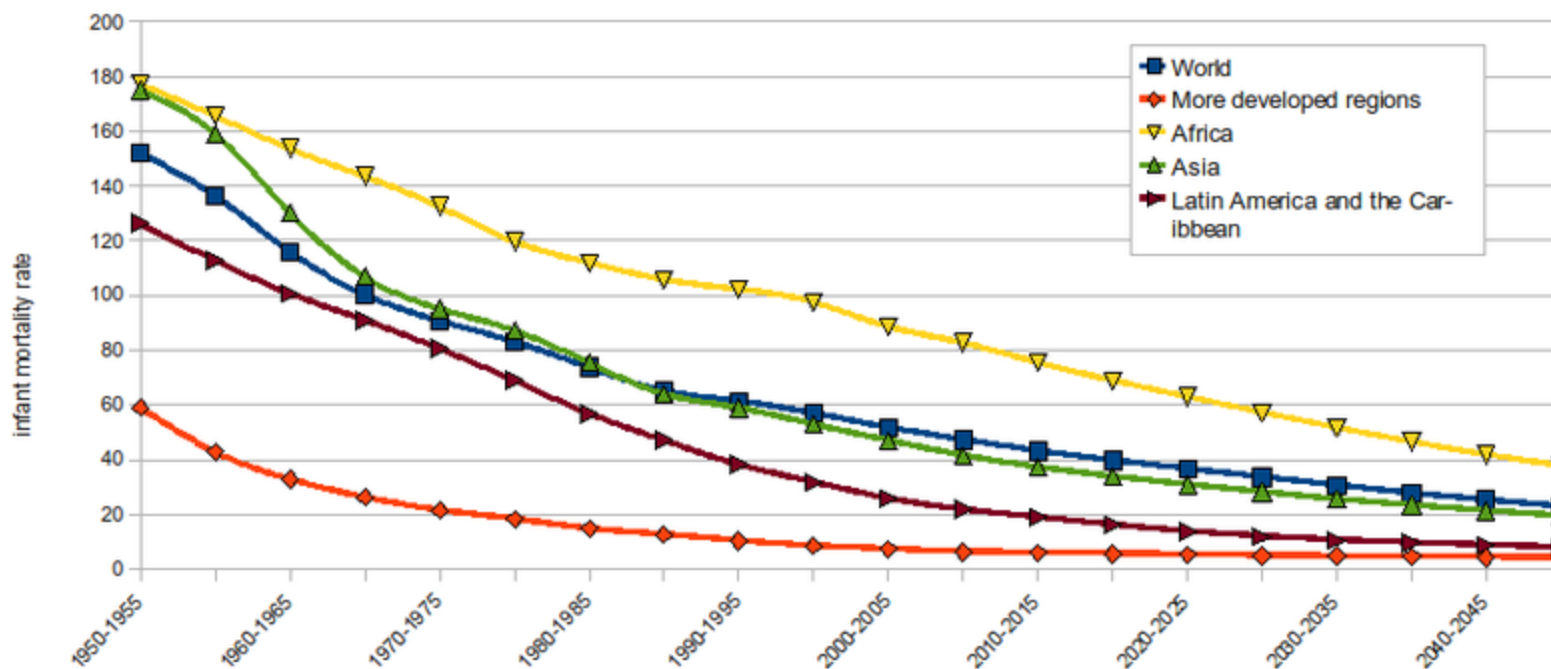
Life expectancy at birth by region, 1950-2050

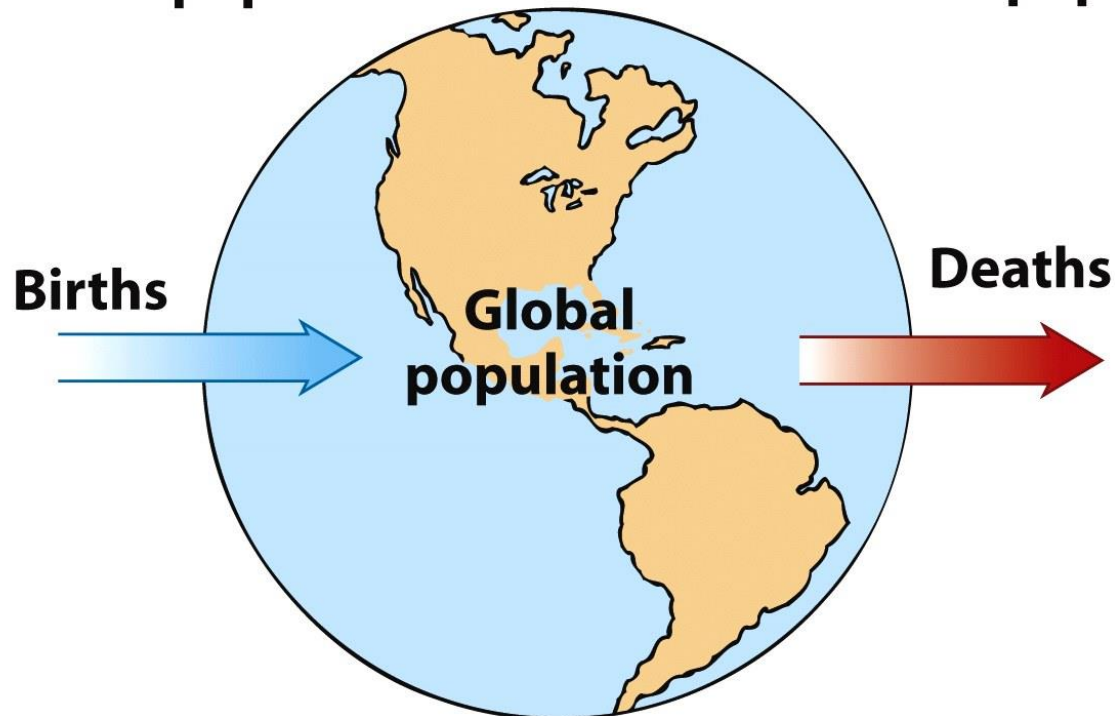Life Expectancy at Birth by Region, 1950-2050.

Source: UN World Population Prospects, 2008.

Change in population size
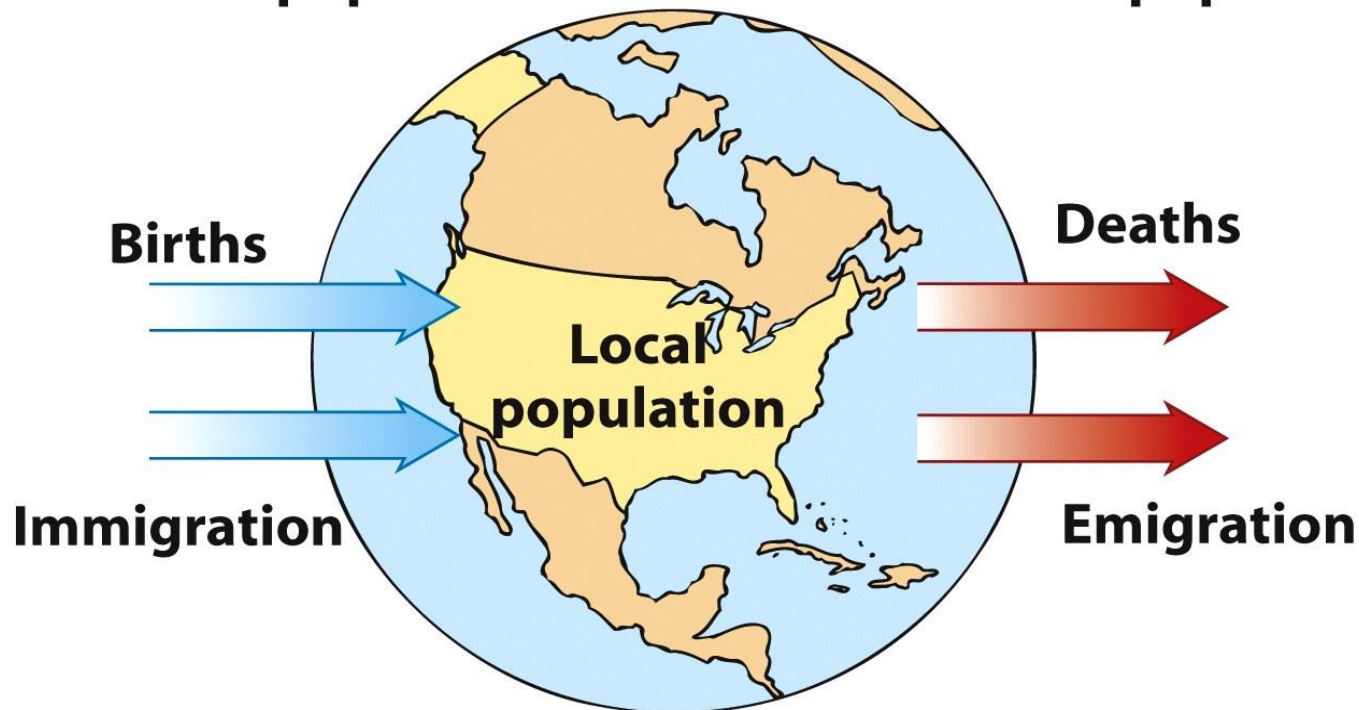

Increases population:

Decreases population:

Births

Global population

Deaths

On global scale the change in a population is due to the number of births and deaths.

Migration : change in population size

In local populations, such as the population of the United States, the number of births, deaths, immigrants, and emigrants affect population size.

Calculating population change

Growth rate ↓   **Death rate** ↓   **Emigration rate** ↓

$$r = (b - d) + (i - e)$$

↑ **Birth rate**   ↑ **Immigration rate**

Birth (b), Death (d), Immigration (i) and Emigration (e) are calculated per 1000 people

Family planning: why it is still important

Family planning allows …

… individuals and couples to anticipate and attain their desired number of children and the spacing and timing of their births. It is achieved through use of contraceptive methods and the treatment of involuntary infertility.

– *World Health Organization,*
Department of Reproductive Health and Research

Current situation on family planning
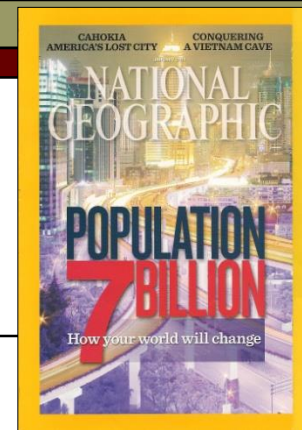
Constraints:

- 26 countries have CPR below 20%

- 222 million couples have an unmet need for family planning

- Decreased investment in contraceptive research and development by industry, despite increased demand

- Shifting international priorities in the past decades

- Mis and dis-information

Opportunities:

☐ MDG 5b: Universal access to reproductive health

- FP and other SRH services

☐ Renewed interest in supporting family planning internationally

Contraception technology: playing its part

- The number of women who have an unmet need for modern contraception in 2012 is 222 million.

- Current contraceptive use will
  - prevent 218 million unintended pregnancies in developing countries in 2012, and
  - in turn, will avert 55 million unplanned births,
  - 138 million abortions (of which 40 million are unsafe),
  - 25 million miscarriages and,
  - 118,000 maternal deaths.

Reference: Singh and Darroch, Adding it up. 2012

MDG 5: improve maternal health

- **5 A**:Reduce by three quarters, between 1990 and 2015, the maternal mortality ratio
  - 5.1 Maternal mortality ratio
 - 5.2 Proportion of births attended by skilled health personnel

- **5.B**: Achieve, by 2015, universal access to reproductive health
  - 5.3 Contraceptive prevalence rate
    5.4 Adolescent birth rate
    5.5 Antenatal care coverage (at least one visit and at least four visits)
    5.6 Unmet need for family planning

UN Secretary General's Global Strategy for Women's and Children's Health: 2010

Components

- Country-led health plans
- Comprehensive, integrated package of essential interventions and services
- Integrated care
- Health systems strengthening
- Health workforce capacity building
- Coordinated research and innovation

GLOBAL STRATEGY FOR WOMEN'S AND CHILDREN'S HEALTH

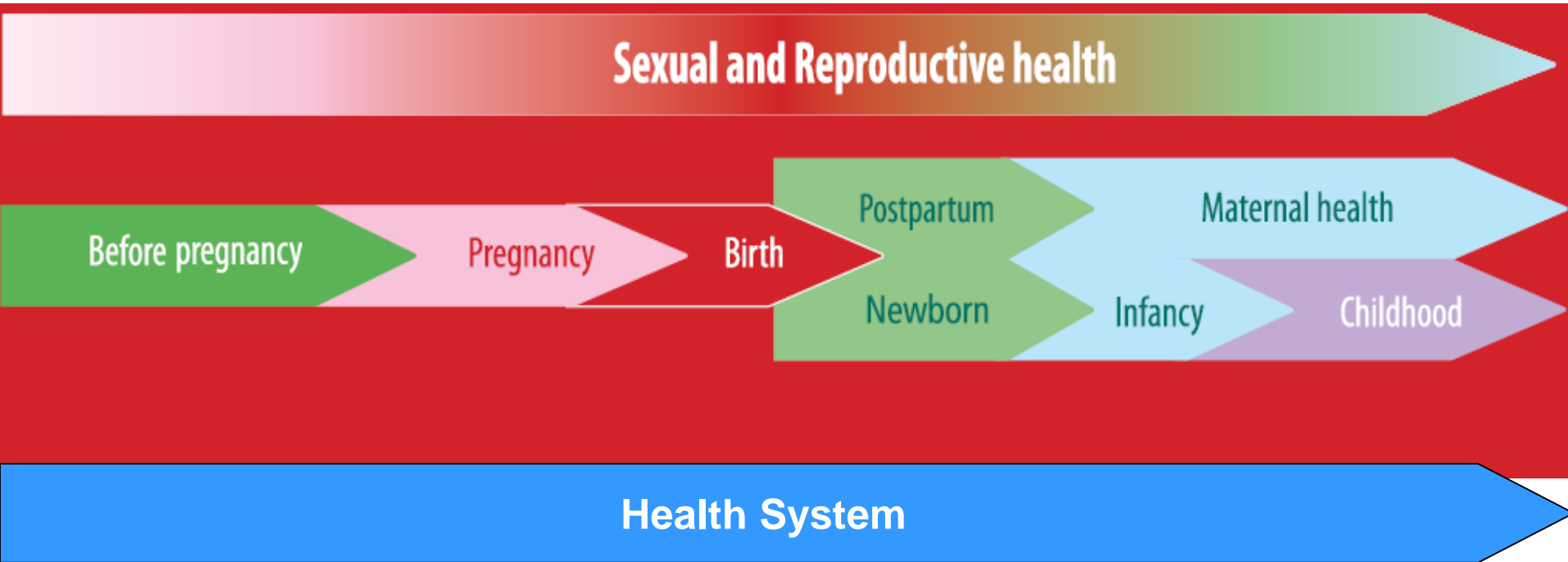United Nations Secretary-General Ban Ki-moon
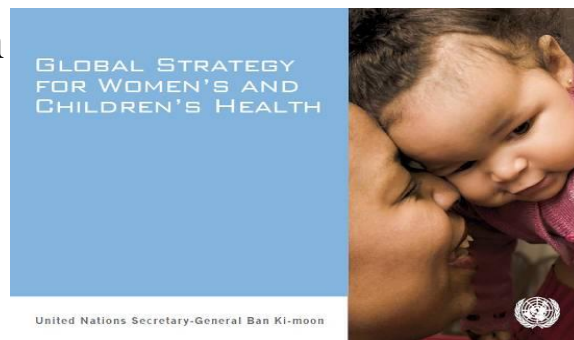
Role of UN agencies

- Define norms, regulations and guidance to underpin efforts
- Help countries align their national practices
- Work together and with others to strengthen technical assistance to scale-up
- Encourage links between sectors and integration with other international efforts
- Support systems that track progress and identify funding gaps
- Generate and synthesize research-derived evidence and provide a platform for sharing

Accelerating progress in achieving MDG 5: Trends and lessons from countries

- Effective policies and coordination of stakeholders at national level in improving maternal health (Nepal)
- Increasing the utilization of skilled health personnel for delivery services (Benin)
- PMTCT as an integrated element of reproductive/maternal health programme (Botswana)
- H4+ coordination in countries – challenges and successes (Ethiopia)
- Accelerating progress in achieving MDG 5 – the international response (Dr M. Chan, for H4+)

September 2010, World Summit, UN General Assembly

This event is co-sponsored by **hrp**

UNDP - UNFPA - WHO - WORLD BANK
Special Programme of Research, Development
and Research Training in Human Reproduction

Evidence-based packages of interventions to improve SRH (H4+) and partners

Sexual and Reproductive health

Before pregnancy → Pregnancy → Birth

Postpartum / Newborn → Maternal health / Infancy → Childhood

Health System

Components
Benefits and potential impact of interventions, including Family planning
Health system requirements
Service delivery recommendations
Indicators

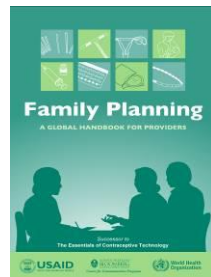# Family planning guidelines and tools

Medical Eligibility Criteria

Selected Practice Recommendations
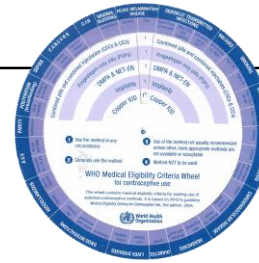
The Medical Eligibility Criteria Wheel

CIRE
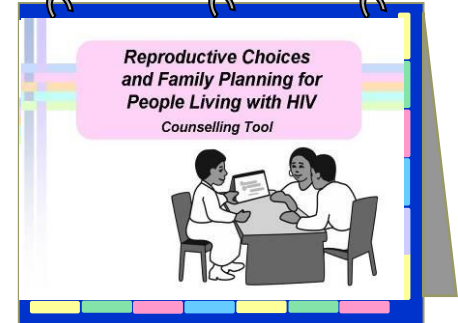
Reproductive Choices and Family Planning for People with HIV

4th edition just published!
2010

Decision-Making Tool

**Global Handbook**

New →

Guide to family planning for health care providers and their clients
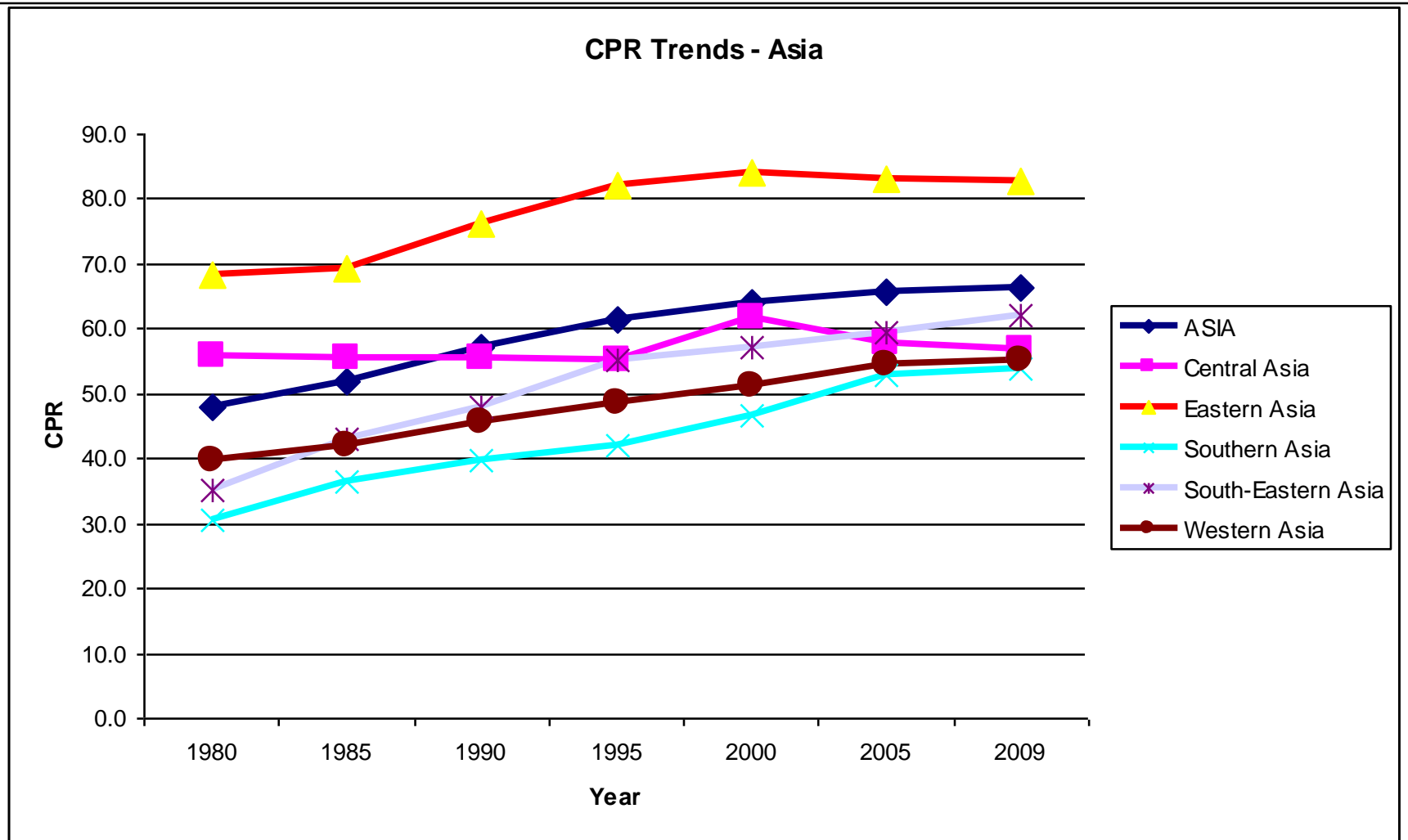
Indicators on family planning

Contraceptive prevalence rate

□ Contraceptive prevalence is the percentage of women who are currently using, or whose sexual partner is currently using, at least one method of contraception, regardless of the method used.

    □ It is usually reported for married or in union women aged 15 to 49.

    □ A union involves a man and a woman regularly cohabiting in a marriage-like relationship.
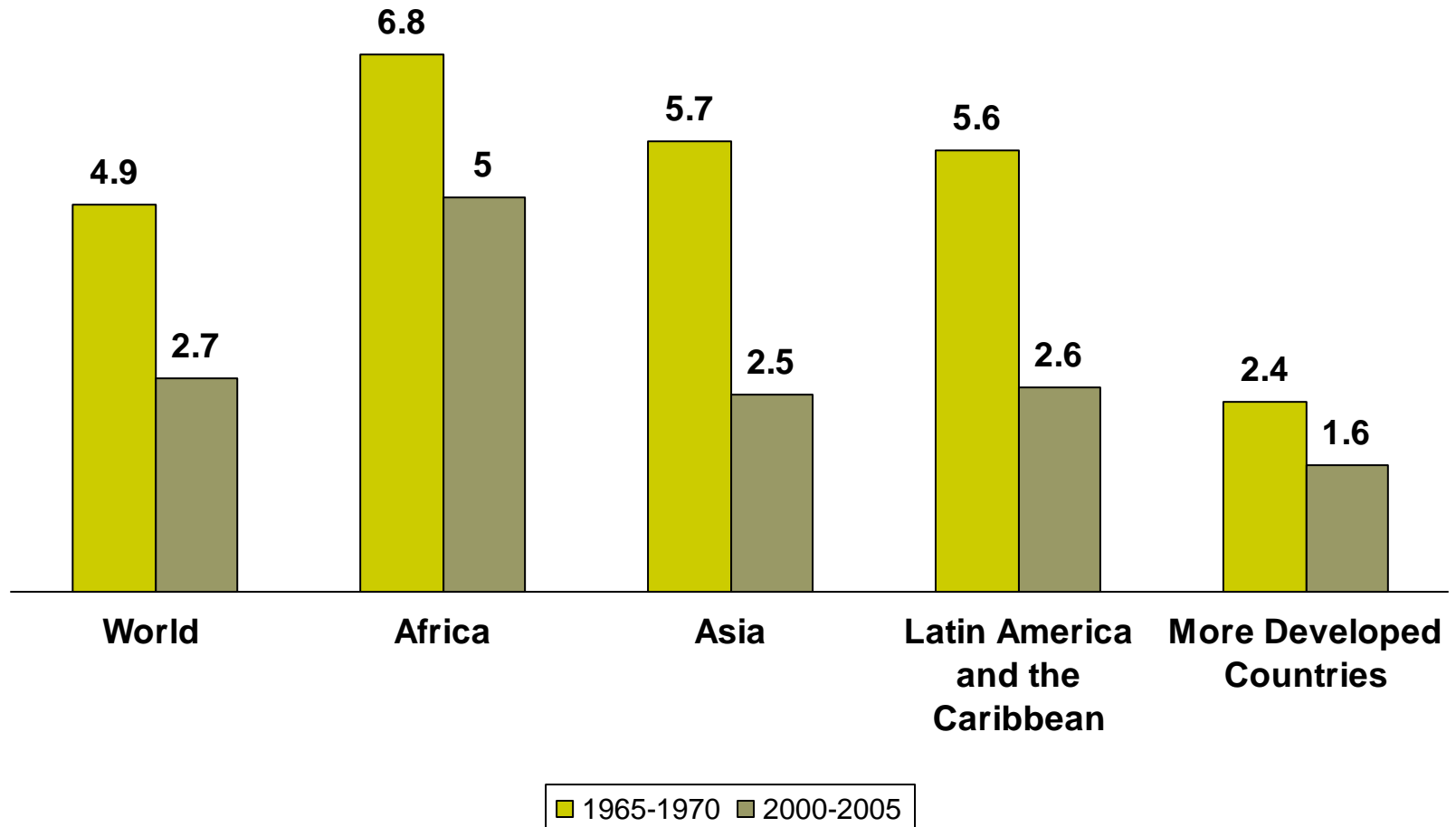
Global contraceptive prevalence rate
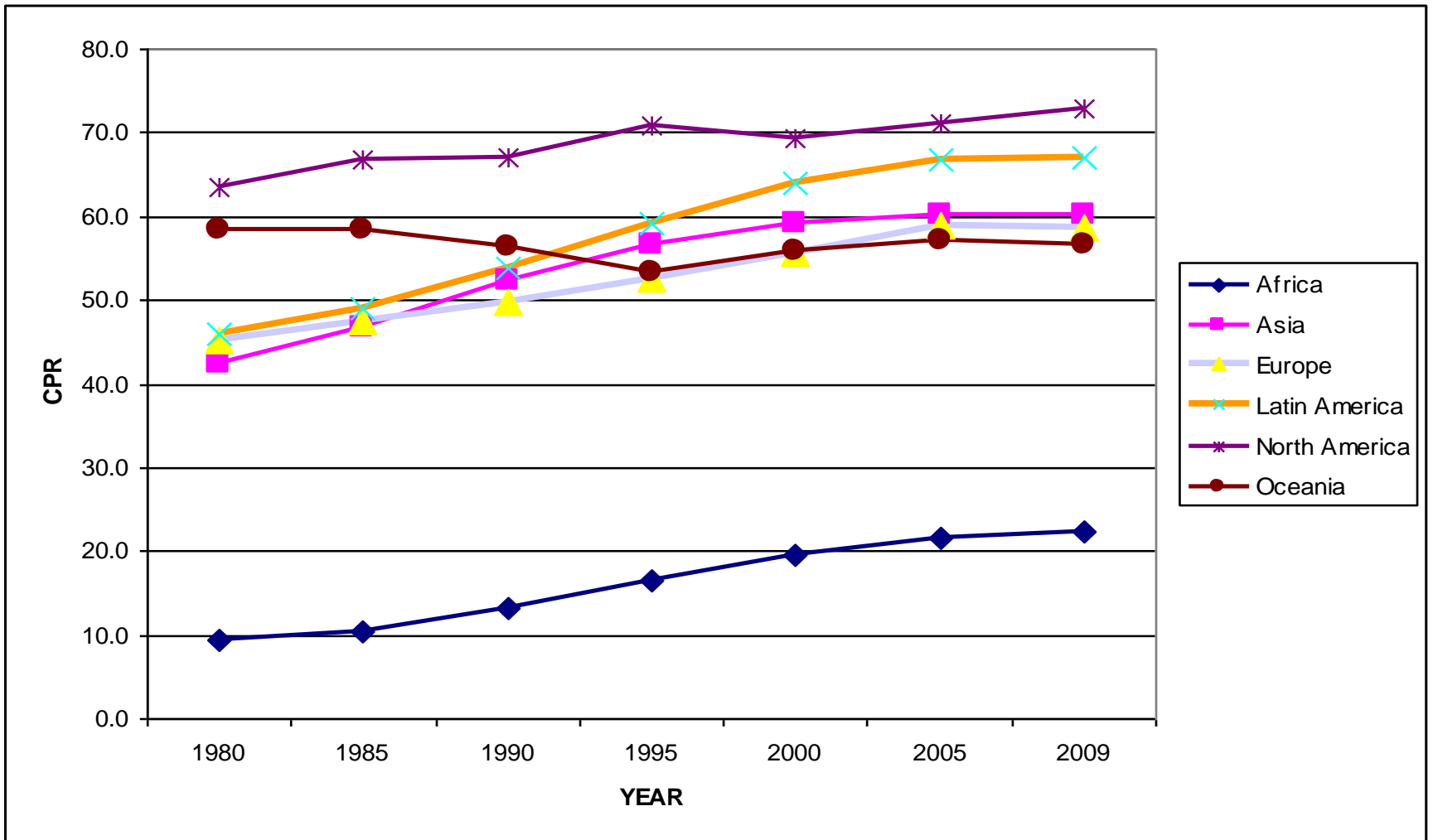
Contraceptive prevalence rate in Asia

Trends in childbearing, by region

Average number of children per woman

Bar chart data:

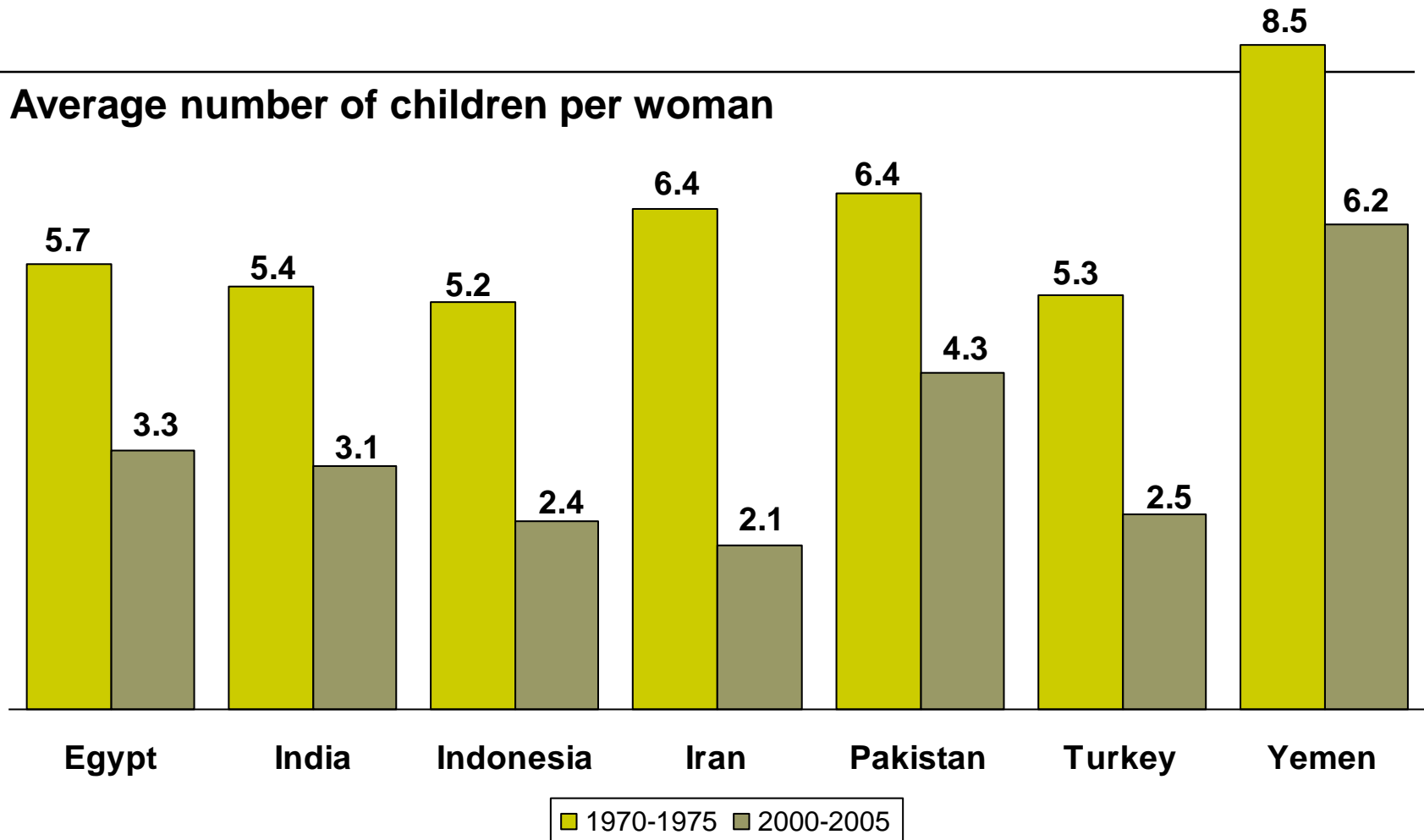| Region	1965-1970	2000-2005
World	4.9	2.7
Africa	6.8	5
Asia	5.7	2.5
Latin America and the Caribbean	5.6	2.6
More Developed Countries	2.4	1.6

Legend: 1965-1970, 2000-2005

Source: United Nations, *World Population Prospects: The 2004 Revision*, 2005.

Diverging trends in fertility reduction

Average number of children per woman

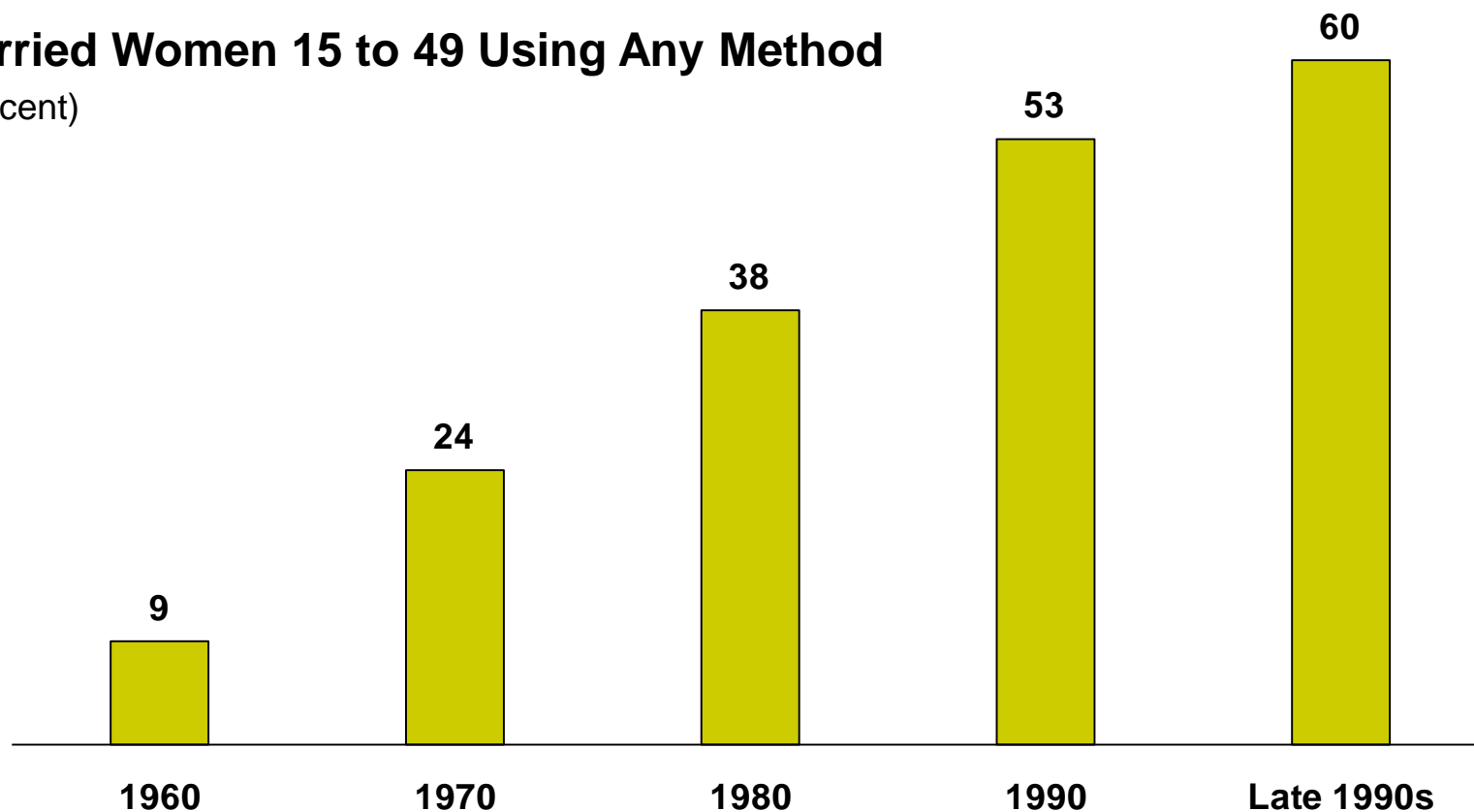|	Egypt	India	Indonesia	Iran	Pakistan	Turkey	Yemen
1970-1975	5.7	5.4	5.2	6.4	6.4	5.3	8.5
2000-2005	3.3	3.1	2.4	2.1	4.3	2.5	6.2

Source: United Nations, *World Population Prospects: The 2004 Revision*, 2005.
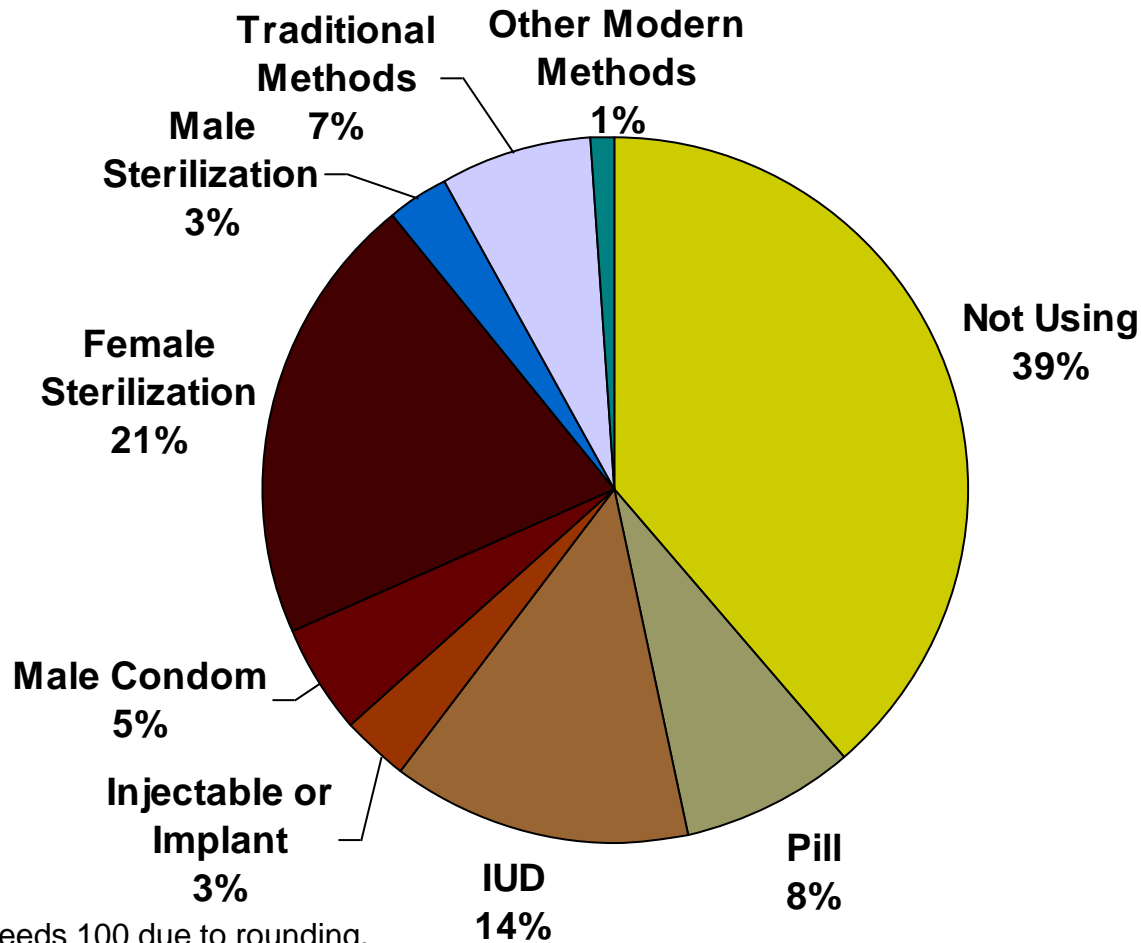
Rising family planning use, developing countries

Married Women 15 to 49 Using Any Method

(Percent)

1960	1970	1980	1990	Late 1990s
9	24	38	53	60

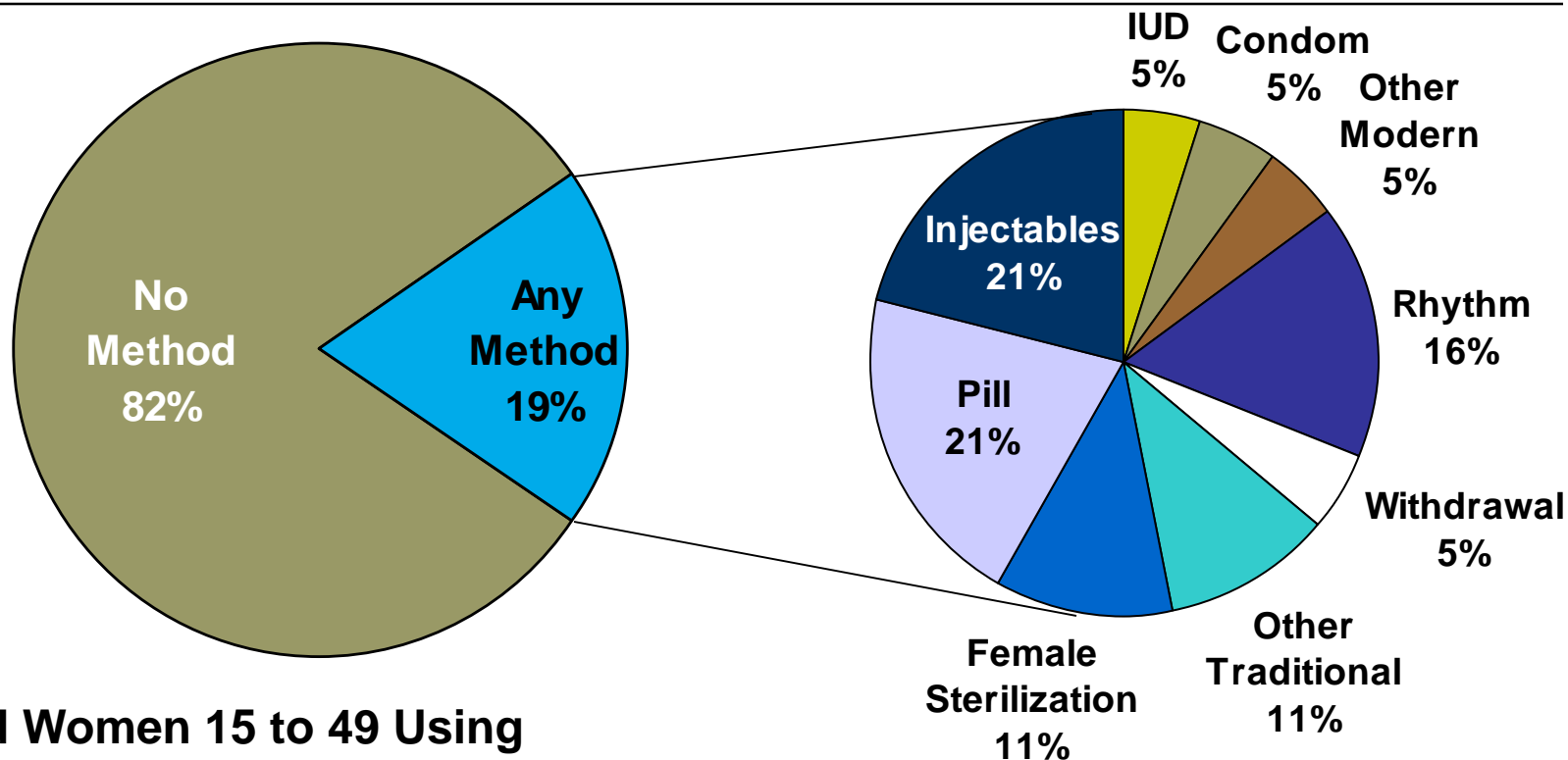Source: Population Reference Bureau, *Family Planning Worldwide 2002 Data Sheet*.

Family planning methods, worldwide

Note: Total exceeds 100 due to rounding.
Source: United Nations Population Division, *World Contraceptive Use 2005.*

Family planning methods, Sub-Saharan Africa

Married Women 15 to 49 Using Family Planning, Late 1990s

Note: Total exceeds 100 percent due to rounding.

Source: Population Reference Bureau, *Family Planning Worldwide 2002 Data Sheet*.

Defining unmet need for family planning

- $\dfrac{\underline{\text{The number of women with unmet need for family planning}}}{\text{Women of reproductive age who are married or in a union}} \times 100$

- Understood by many as
  – the percentage of women who are not currently using a method of family planning and want to stop or delay childbearing

- Complete calculation
  – Is complex
  – Is not widely understood
  – Is difficult to calculate using data other than Demographic and Health Surveys (DHS)
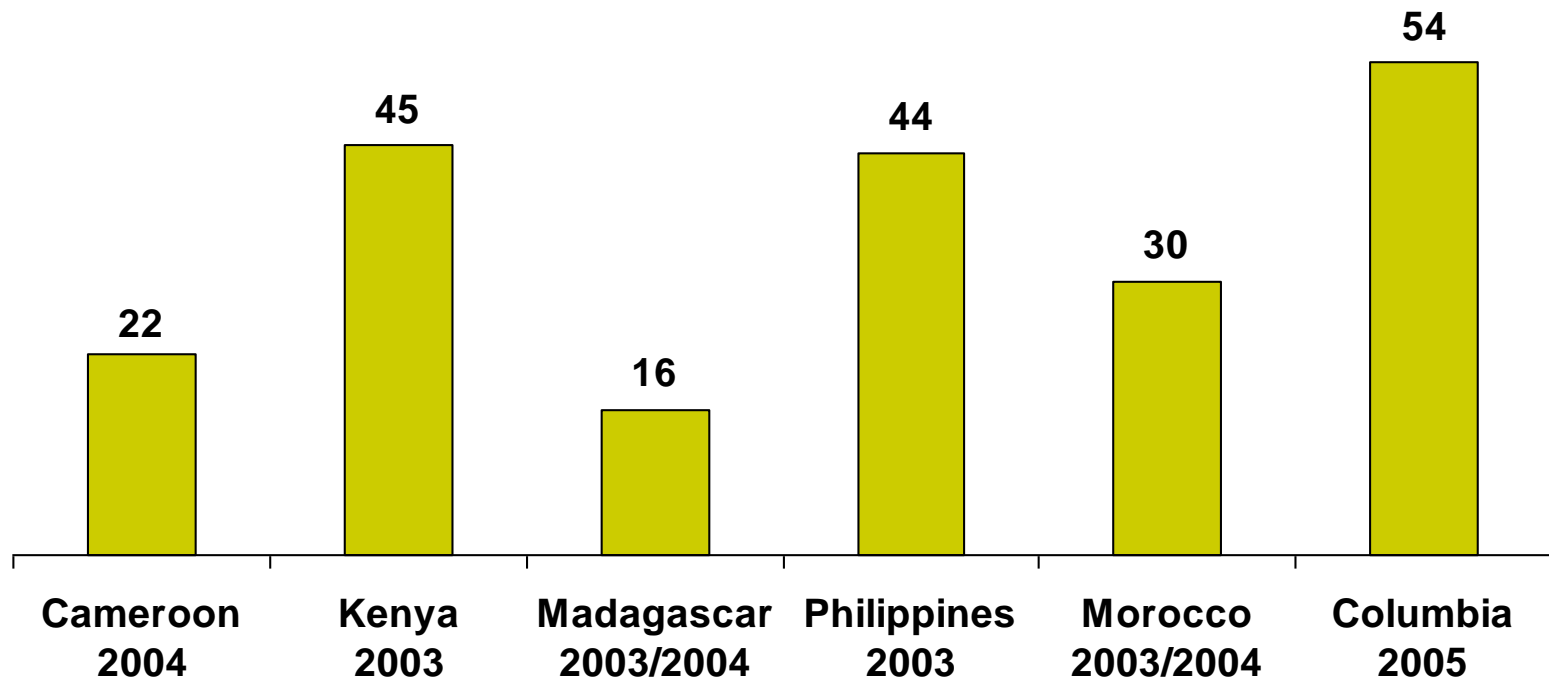
Unmet needs for family planning

□   As unmet need is increasingly used for
   – advocacy
   – development of family planning policies
   – implementation and monitoring

And has been adopted as a Millennium Development Goal (MDG) indicator (target 5b, indicator 5.6)

□   Understanding this indicator has become crucial
□   New urgency to find a definition that can be applied consistently over time and across DHS, MICS, RHS, and other surveys
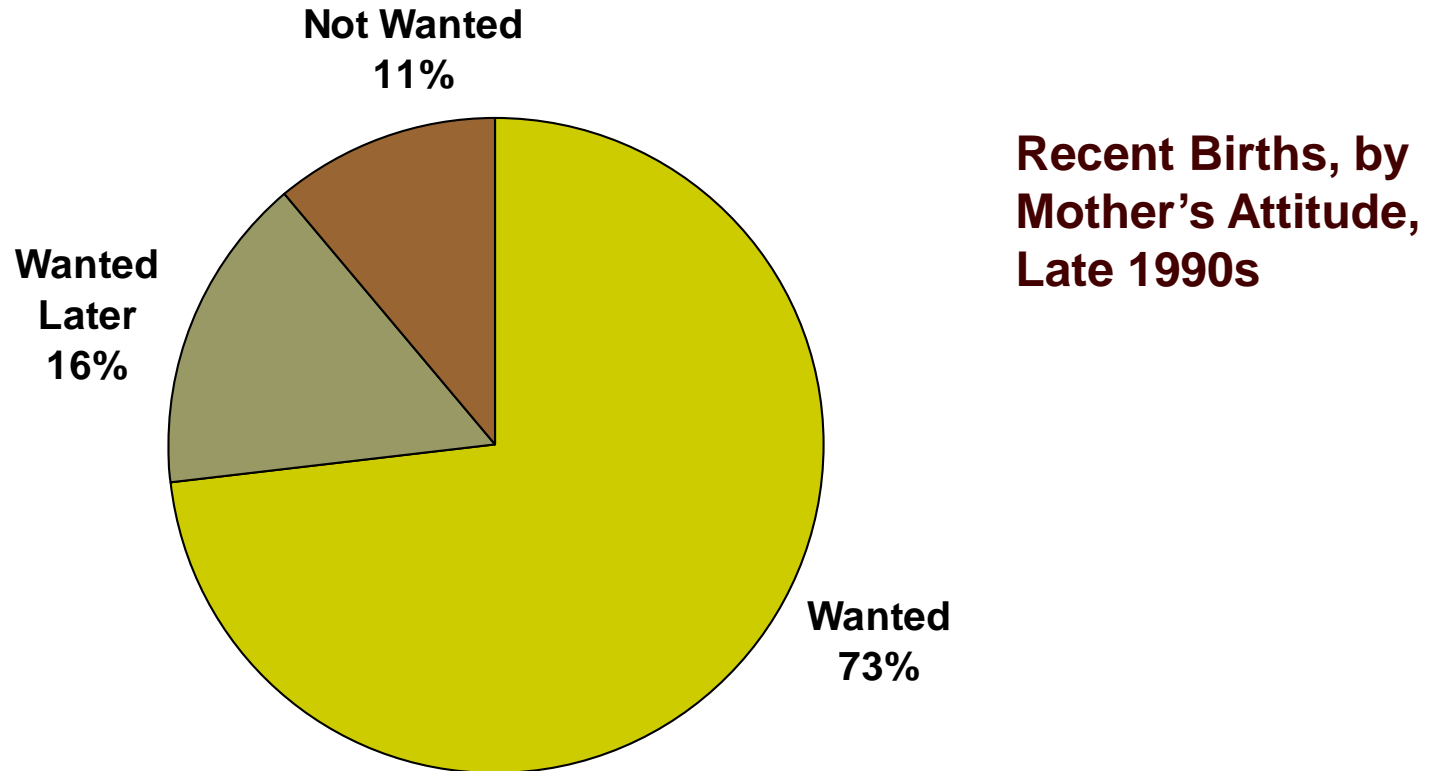
Unintended births

Births Reported by Women as Either Unwanted or Wanted Later
(Percent)

Source: DHS STATcompiler: http://www.dhsprogram.com/statcompiler

Wanted Births, Worldwide

Not Wanted 11%

Wanted Later 16%

Wanted 73%

Recent Births, by Mother's Attitude, Late 1990s
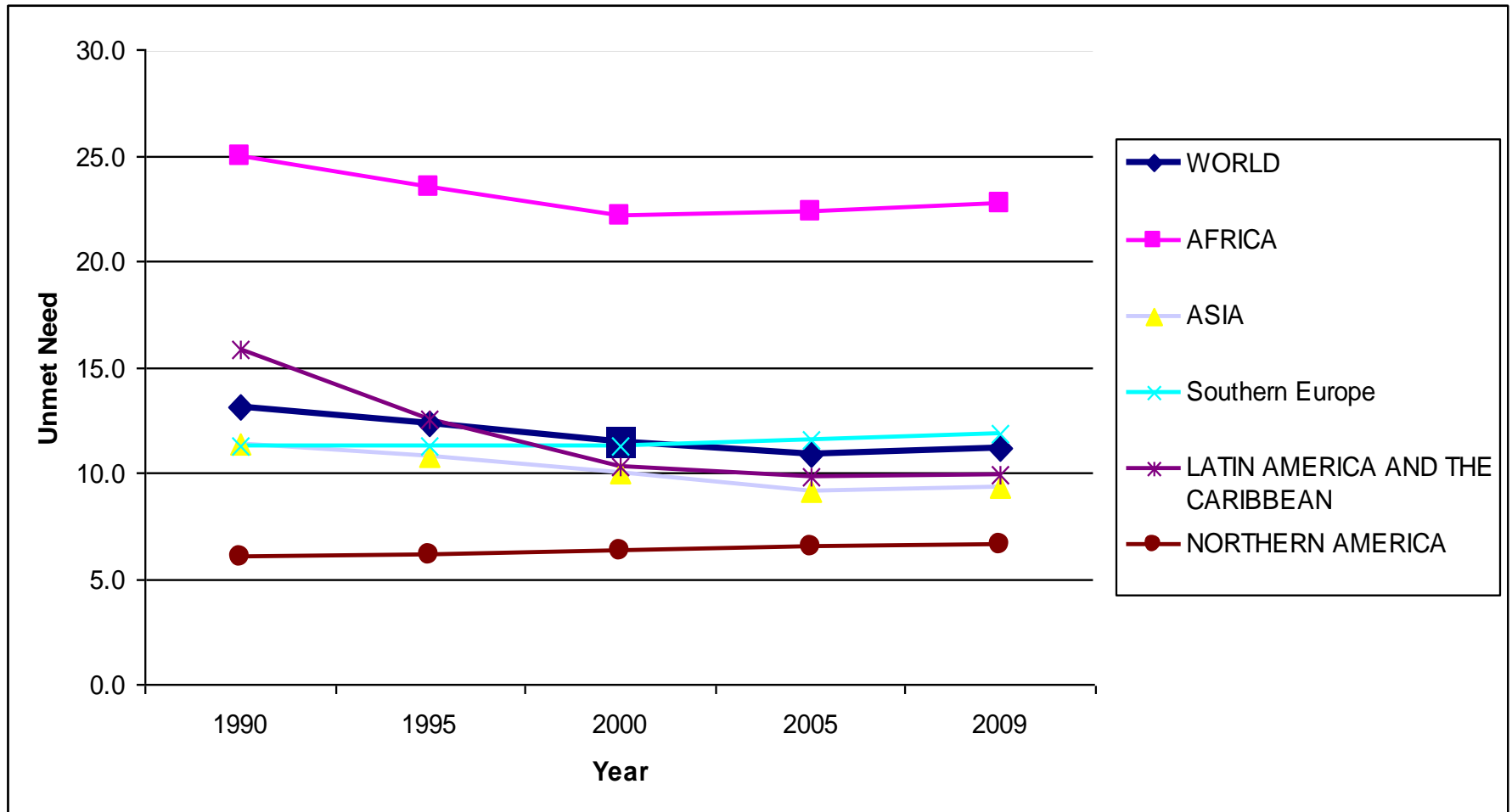
Note: Estimates based on approximately 60 percent of births worldwide.
Source: Population Reference Bureau, *Family Planning Worldwide 2002 Data Sheet*.

Global unmet need for family planning

Reasons for high unmet need

- Perceived lack of exposure to pregnancy was the most common reason cited
    - Between one-third and two-thirds of women with unmet need said they were never or infrequently having sex.
    - Believed they could not become pregnant because of menopause, breastfeeding, or another reason.
- Opposition to family planning (by women, their husbands, or others).
- Gender imbalance –
    - Men's unmet need tends to be lower because men want to have more children (or sooner) than do women
- Method-related problems were cited by about one-third of women with unmet need.
    - Problems related to side effects and health concerns
    - Cost and access also mentioned.
- Lack of knowledge about methods or sources of supply.

If unmet needs are met in developing countries…

- Serving all women in developing countries who currently have an unmet need for modern methods would prevent

  - additional 54 million unintended pregnancies,

  - 26 million abortions (of which 16 million would be unsafe) and

  - seven million miscarriages; this would

  - also prevent 79,000 maternal deaths

  - and 1.1 million infant deaths.   *Singh and Darroch, Adding it up. 2012*

Special groups: lack of access to family planning

- 215 million couples worldwide don't have access to family planning

- Groups without access:
  - Adolescents
  - Unmarried women
  - Women postponing their first pregnancy
  - People with disabilities
  - Poor, especially people in rural areas and urban slums
  - Migrants
  - Postpartum women

Key Messages

- Family planning
  - Saves maternal lives
  - Reduces abortions
  - Help prevent diseases
  - Reduces adolescent pregnancies and risk of STIs
  - Empowers women
  - Improves children health and development
  - Helps preserve the environment
  - Essential to accomplish MDG and now SDG goals