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Community Medicine

A Student's Manual

Parikshit Sanyal

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4 Health and the Community

KEY FEATURES

- PEOPLE
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  - Demographic trends in India
  - Fertility
  - Family planning
- SOCIETY
  - Social medicine
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  - The family
  - Cultural factors in health and disease
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  - School health
  - Postpartum program
- THE ELDERLY
  - Problems of the elderly
  - Ideal geriatric health services
- INFORMATION, EDUCATION AND COMMUNICATION
  - Common terms
  - Communication
  - Health education

PEOPLE

Because Community Medicine is all about taking health care to the people, it is time that we study the anatomy and physiology of the population, before we could move on to pathology and medicine. **Demography** is the study of population, of their size, composition and distribution. It is equivalent to anatomy and physiology in internal medicine.

There are five processes which control the size, composition and distribution of any population.

- Fertility—How many are being added to the population?
- Mortality—How many of them are dying?
- Marriage—Which will eventually (though not always) lead to fertility?
- Migration—How many of them are going elsewhere or coming in?
- Social mobility—The change of social status of an individual or family overtime (i.e. if a street child manages to get a decent job and a home for himself and his family, he is said to be 'upwardly mobile' or have 'climbed the social ladder').

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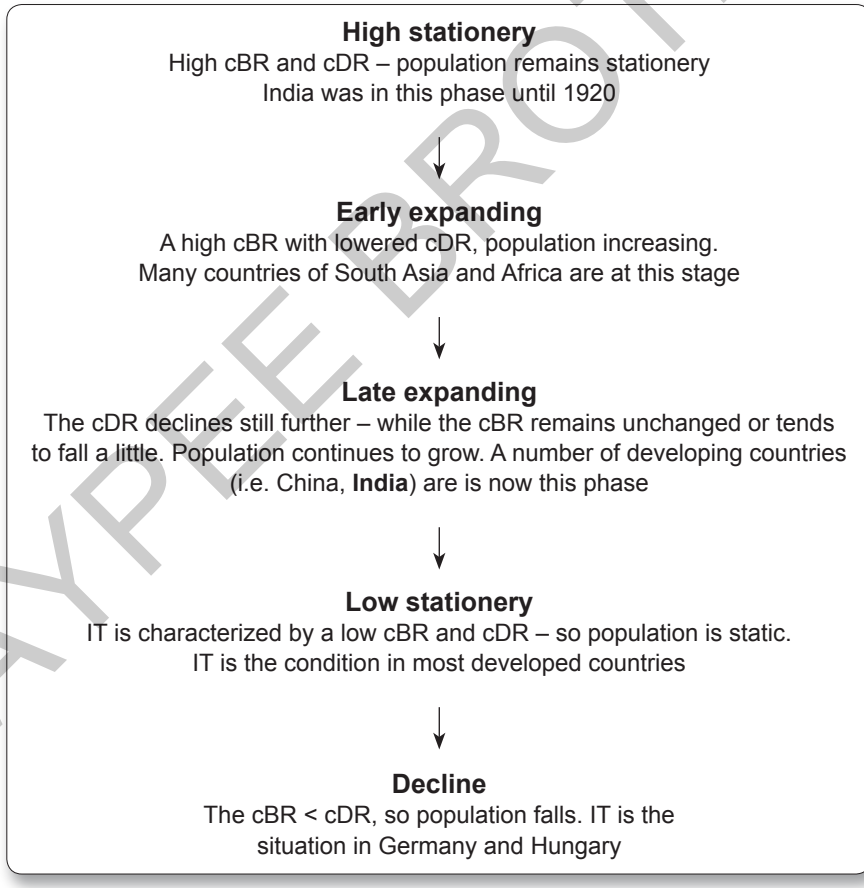
Demographic data can be collected from
1. Census.
2. National Sample Survey (an central government organization which conducts population surveys independent of census).
3. Registrations of birth, death and marriage.
4. Ad hoc demographic studies.

Two fundamental indicators

Crude Birth rate (cBR) is the number of live births per 1000 people in estimated mid year population, in a given year. It is given by the formula (number of live births during the year/estimated mid year population) × 1000. **Crude Death rate** is similarly defined for deaths in a year.

The demographic cycle

This is not truly a cycle, but a series of phase transitions that most of the nations go through.



World population trends

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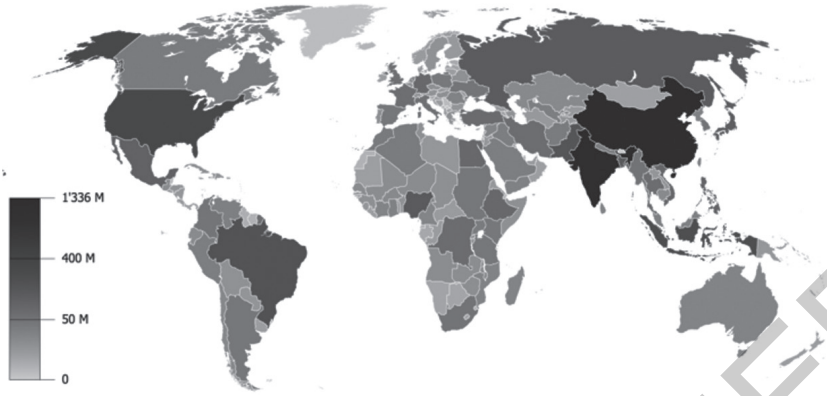


Figure 4.1. Distribution of world's population [Wikipedia user Emilfaro, under the Creative Commons Attribution Share Alike 3.0 License] based on the GeoHive estimates (www.geohive.com), obtained on the March 3, 2009

The world population touched 6 billion in 1999, and estimated to be 6.6 billion in 2007. It is no small wonder that the four countries of the South Eastern Asia Region (and five, if you include China), show up in the top 10 populous nations (Fig. 4.1) (India, Bangladesh, Pakistan, Indonesia). *Bangladesh*? You wonder. It is the size of a medium-sized state, and yet more populous than Canada or Egypt or France, all much larger in area. It seems India still fares better than its close neighbors.

The growth rate

The annual growth rate = (cBR – cDR + immigration rate - emigration rate) × 100. The **doubling time** of a population is approximately = 70/GR.

Table 4.1. State of nations according to growth rate

Slow growth	< 0.5
Moderate growth	0.5–1
Rapid growth	1–1.5
Very rapid growth	1.5–2

India is **very rapidly growing**, i.e. GR = **1.64** [2011 census provisional report].

World. In 2009 the estimated annual growth rate was 1.10%.[99] The growth rate is on the decline in recent times, although the population is still growing in actual numbers.

The demographic gap

IT is the factor cBR – cDR.

Demographic trends in India[100]

With a population of 1210 billion (2011 census) India houses 17.5% of world population) with 2.4% of its land.

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Very rapid growth

The population is climbing since 1921, the year which is said to mark the 'big divide'. As per 2011 census, growth rate in India is 1.64 - very **rapid growth**. The population has increased by more than 181 million during the decade 2001–2011, however, 2001–2011 period is the first decade with exception of 1911–1921 which has actually added lesser population compared to the previous decade. Among the states and union territories, Uttar Pradesh is the most populous state and Lakshadweep the least.

Young age distribution

A **population pyramid** shows the age-sex composition of population in a single chart. India has a broad population base, i.e. huge number of dependent people below 15 years. Remember that every little toddler playing in the streets with a tire and a stick counts as one whole human being, and you will soon get the big picture. India is teeming with children, some of them have homes, parents, go to school and get two square meals a day, but most of them are lacking one or more of these.

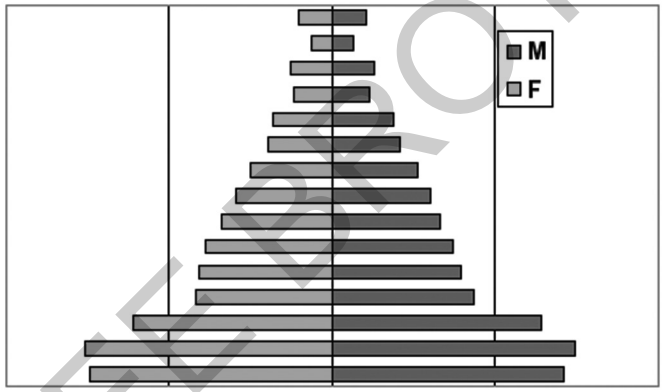


Figure 4.2. Population pyramid in India

In developed countries, this pyramid is thick at its waste, i.e. it is no pyramid at all but looks like a boem. Gradually, when each generation reproduces less than its forebearers, the pyramid will turn into an upside down. This upside down pyramid is the aim of the National Population Policy (an also its logo).



Figure 4.3. The logo of the National Family Welfare Program

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Societal dependency ratio

It is the ratio of (people > 65 + people <15)/people of 15–65 years (working age). The large chunk of dependants in India are children (young age dependants). However, the dependancy ratio is an oversimplification, because everybody in the age group 15–44 is not employed, and many children under 15 have to support their families.

Sex ratio

It is the number of females per thousand males = 940 in India. Only two states are female predominant, Kerala and Pondicherry. However, the **child sex ratio** (0–6 years) is a dangerously low **914**, which is lowest since independance.

Why? It is a sordid truth that nobody in India wants a girl until she has turned sixteen. It is shocking to see the expression of profound gloom over the face of the minute old mother, when she is informed that she has delivered a girl. A boy is, supposedly, borne by God's infinite grace, and is presumed to be the returns of many prayers of the mother. If she comes home with a boy, her-in-laws are sure to hold her in high esteem than ever before, and the boy is reared with all the care the family can afford. A girl, in the other hand, is a scourge to majority of Indian families. Mothers are afraid even to mention that she has had a girl, and stories of the mother asphyxiating the newborn girl is not rare. If the girl child survives the neonatal period, she is treated with utmost indifference and disgust in many rural families, her health and education is usually ignored for the sake of her brother, if any, and she is pushed into housework 'to make a good wife'. And despite all this neglect, if she still manages to survive until her menarche, the parents get anxious to find a boy to hand this burden over. Girls in rural India are forced into marriage before they are through their teens, and their obstetric career is kick started by the husband, backed by his family. And soon, the girl child finds herself in the same position as her mother (if not, due to malnutrition or anemia, she dies of an obstetric accident). Add to this the problem of **trafficking** of women out of the country into the middle east for prostitution. Of course there are exceptions, and there are waves of change, but India still remains one of the worst places to be a girl.[101]

Density

The population density in India is **382/km^2**. The distribution of population is, however, very uneven and Bihar is the most population dense state. The effect of such a dense population is ↑ facilities and quality of life, and burgeoning pressure on natural resources.

Urbanization

Proportion of urban population in India is 27.8% in 2009.[102] There are two reasons

- The alarming tendancy of villagers to abort their native profession and gather in big cities for more profitable jobs, better health care, entertainment and chance of social mobility; however, most of them end up in slums, running small shops and adding to the already overcrowded city.
- Cities themselves are expanding at a drastic rate.

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Literacy

A literate, by definition, is one who is > 7 years and can read and write any language **74.04%** of Indian population falls in this category.

Family size

It is the total number of children a woman has borne at a point of time. It depends on the duration of marriage, education of the couple, the number of live births, preference of male children (uneducated couples will go on reproducing until they have a boy), etc. The average family size in India is **2.8** (2006).

Fertility

In between 15–45 years, a woman can give birth to 15 children (a feat which is, however, seldom achieved). The number of actual children born to a woman is called **fertility**. (*Fecundity* is the capability to bear children). Causes of increased fertility in India are

1. **Universality of marriage**—Irrespective of financial safety, Indian families do not feel 'complete' until every child has been married.
2. **Low age of female marriage**—The Child Marriage Restraint Act (1978) still prohibits a marriage of girls before 18 and boys before 21. Whilst the mean age of female marriage in India has reached 20.5,[103] in rural areas 7.4% of all married women are between 15–19.[104] Girls who are forced to marry earlier produce a lot of kids, and are more prone to die of obstetric complications.
3. **Literacy**—Although about 74% in India are literate, only 65% of women are literate in contrast to 82% of men. The National Family Health Survey - 3 shows that duration of education is inversely proportional to fertility. People who have completed at least 10+2 have an average family size of only 1.80, whilst those with no education have an average 3.55 children.[105]
4. **Limited use of contraceptives**—*Spacing* the birth of each children by one year reduces fertilty. However, most spacing methods have not gained popularity in India.
5. **Tradition**—Ill placement of women in society, low value of girl children (couples usually want at least a boy, so if a girl is born – they usually go on reproducing), low standards of living, cast and religions are other contributing factors. Muslims seem to have a higher fertility rate than Hindus.
6. **Early childhood mortality**—A mother would not undergo tubectomy (or her husband would not allow) unless the doctor ensures her of safe births of at least two children.
7. **Economy**—It is seen that people with a low income bear more children[106] (when they are in no position to raise them). It may be with the anticipation that more children means more earning members for future. The NFHS-3 shows a 0.92 more TFR in rural people than urban ones.

Fall in death rate

This is because of absence of natural checks (famines are not so frequent nowadays), mass control of some diseases, medical advance, increased food supply

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(specially after the green revolution), international aids and success of health programs.

Life expectancy

At a given age, the life expectancy is the years the person of that age may expect to live according to mortality pattern of that country. According to 2011 census, the life expectancy in India is 63.90 (men) and 66.90 (women). (The recent values, for male and female are, respectively, 67.4 and 72.61 years.[107]

Life expectancy is used in life insurance and studies of survival rate in malignancy, and also in the calculation of DALY and health adjusted life expectancy (HALE). *Expectancy at 1 year* is a better indicator than at expectancy at birth, because of the high infant mortality in India.

Table 4.2. India – core health indicators (WHO)

Indicator	Value (year)
Life expectancy at birth (years) males	61.0 (2004)
Life expectancy at birth (years) females	63.0 (2004)
Healthy life expectancy (HALE) males	53.3 (2002)
Healthy life expectancy (HALE) females	53.6 (2002)
Probability of dying (per 1000 population) between 15 and 60 years (adult mortality rate) males	275 (2004)
Probability of dying (per 1000 population) between 15 and 60 years (adult mortality rate) females	202 (2004)
Probability of dying (per 1000 population) under 5 years of age (under-5 mortality rate) males	81 (2004)
Probability of dying (per 1000 population) under 5 years of age (under-5 mortality rate) females	89 (2004)
Total expenditure on health as percentage of gross domestic product	4.8 (2003)
Per capita total expenditure on health at international dollar rate	82 (2003)
Population (in thousands) total	1,103,371 (2005)
Per capita GDP in international dollars	1,830 (2004)
Percentage of attended deliveries	42.5

Fertility

Indicators of fertility

Fertility is the actual bearing of children (c.f. fecundity which is the potential to bear children).

Crude birth rate

It is the number of live births during the year/estimated MYP × 1000. It is crude in the sense that the denominator includes (a) men (b) women other than reproductive age. It is 23.5/1000[108] in India in 2007.

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Generalized fertility rate (GFR)

It is the (number of live births during the year/mid year female population aged 15–49) × 1000. The generalized *marital* fertility rate includes one more clause, *married*, in the denominator. These two indicators, one feels, have more meaning than cBR (only women who can give birth are included in denominator).

Age specific fertility rates

It is the usual 'age specific' variable which defines fertilities of women in different age groups between 15–45 (i.e. number of children borne by all women in an age group/total number of women in that age group).

Total fertility rate

It is the **average number of children a woman would have if she were to pass through her reproductive years bearing children at the same rates as the women now in each age group**, (i.e. this hypothetical woman symbolizes *all* child bearing women). It is actually Σ age specific fertility rates.

TFR is the accepted indicator for fertility, and indicates the average family size. According to National Population Policy, it should be 2.1. The TFR in India is 2.8 [Sample Registration System, report 4 of 2007] or 2.72 in 2009.[109]

Gross reproductive rate

It is the average number of *girl* children that would be born to a woman if she experiences current fertility pattern throughout her reproductive period, assuming no mortality of the children she has borne. It is TFR × (female births/total births). The GRR is 1.3 in India.

Net reproductive rate

It is the average number of girl children that would be born to a woman if she experiences current fertility as well as child mortality pattern throughout her reproductive period (i.e. if she gives birth to the number of children corresponding to each age group as she passes through those ages, and also some percentage of her children die, corresponding to child death rate in that age group). An **NRR=1** means one woman *replaced* by another of the next generation.

Child woman ratio

It is the number of children of 0–4 years/women of reproductive age × 1000. There are **439** children per 1000 women of reproductive age in India.[110]

Measures to check the Indian population

1. National Family Welfare Program.
2. National Population Policy.
3. Community participation—Community need assessment and cafeteria approach.
4. Delivery of family planning services at PHC and postpartum units.
5. Education on small family, spacing, timing, age of marriage and pregnancy.
6. Better primary health care and ensuring child survival.
7. Universal access to contraception.

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8. Social engineering— ↑ age of marriage, female literacy and women empowerment, planned parenthood, antipoverty program, 20 point and minimum needs program.
9. Free and compulsory school education upto 14.
10. Coordination with NGOS.
11. Major changes in approach–No incentives, bottom up, ↑ quality of care, risk approach, life cycle approach.

Family planning

It is a way of

- Thinking and living that is
- Adopted *voluntarily*
- Upon the basis of knowledge, attitude and responsible decision
- By individuals and couples
- In order to promote the health and welfare of the family and group
- Thus contributing to the social development of the country.

Aims

Welfare states just cannot equate family planning with contraception. The aims of the 'family welfare services' are much broader.

1. Prevent unwanted pregnancy.
2. Bring about *wanted* pregnancy.
3. Regulate interval between pregnancies.
4. Time births between 20–30 years.
5. Set number of children.

Family planning from a swear word to a right

Because people will usually reproduce if given a chance, and abstinence is not very popular except among ascetics, family planning is not natural but must be artificially practised. There was once a time when 'Nirodh' used to be a swear word, unacceptable in social setting. However, it is a healthy sign that we have taken these matters more seriously, and began to speak more frankly. The UN has vested each nation with the responsibility to provide its citizens accessible means of family planning (i.e. no couple should have the excuse 'we could not afford a condom, and thus Chotu was born'; the state must provide both knowledge and means of family planning). In recent times, the right to be (or not to be) pregnant by choice is regarded a fundamental right of women.

Goal

SOCIAL DEVELOPMENT of the country

Scope[111]

1. Birth control
2. Management of sterility
3. Advice regarding parenthood
4. Education regarding STDs

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5. Genetic counseling
6. Premarital and marital guidance
7. Services for unmarried mothers
8. Medical termination of pregnancy
9. Screening for reproductive tract disease.

Benefits

1. For the woman— ↓ morbidity and mortality due to pregnancy.
2. For the child— ↓ congenital anomaly, ↓ mortality, ↑ growth and development (more the number of children, more the competition for nutrition and survival).
3. For the society—DEVELOPMENT.

The Indian scenario

- Couple Protection Rate = 46.6%[112]
- Unmet need for contraception = 12.8%[113]
- One child is born every 1.25 seconds[114]
- 50–60% of births are of 3rd order or more
- With increasing teenage sex, there is rise in unplanned pregnancies and abortions.

Contraceptives

These are substances, devices to prevent pregnancy.

Table 4.3. Contraceptives

Terminal methods	**Vasectomy, tubectomy**
Spacing (i.e. to 'space' births)	Intrauterine contraceptives Barriers ('conventional contraceptives' which have to be used *during* intercourse) 1. Physical—Condom (m,f), diaphragm, polyurethane 2. Chemical—Spermicidal (nonoxynol) foam tablet/suppository/jelly 3. Combined—Vaginal sponge soaked in nonoxynol (TODAY) Hormonal 1. Oral—Combined, progesterone only pills 2. Injectable—DMPA, NET-EN, DMPA-subcutaneous 3. Implant—Norplant 4. Vaginal ring Postconceptional 1. Medical termination of pregnancy nonhormonal (Centchroman)
Traditional (Behavioral)	Abstinence (don't have sex) Coitus interruptus (withdraw before ejaculation) Rhythm (avoid sex between days 10–17 of menstrual cycle)
Natural	Rise in basal body temperature 'Ferning' of cervical mucus

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A good contraceptive is:
1. 100% effective
2. Safe
3. Reversible
4. Of low cost
5. Convenient
6. Long acting
7. Acceptable.

Effectivity of contraceptives: Pearl index

Failure rate per 100 women-year of exposure = **number of accidental pregnancies (including abortion and stillbirths)/total woman years of exposure** × 100. At least 600 women-months should be studied to make it valid.

If a pregnancy occurs, 10 months need to be deduced from the denominator (4 months for an abortion).

What does a pearl index = 10 mean?

100 woman years will have 10 accidental pregnancies, so, 1 woman year will have 0.1 accidental pregnancies; reproductive period of a woman is usually 25 years, so she will have 0.1 × 25 = 2.5 accidental pregnancies through her reproductive period.

Eligible couples

An eligible couple is where

1. Female is in the reproductive age group (15–44)
2. Staying together

The number of eligible couples is maintained at each subcenter in the Eligible Couple and Child register. **Number of eligible couples in India = 168/1000 population**.[115]

Unmet needs

Women who feel they need contraception but are not actually using are said to have an 'unmet need' for contraception. This may be due to
1. Insufficient health services
2. Lack of information
3. Fear about contraception
4. Opposition from husband or relatives.

12.8% of married women in India have an unmet need for a contraceptive.

Recommended contraceptives (by National Family Welfare Program)

1. OCPs
2. Condoms
3. IUD
4. Sterilization.

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Acceptance of contraceptives

The **Couple protection rate** = % of eligible couples using one of a recommended contraceptive. It is **46%** in India. The recommended target is 60% to achieve a **TFR 2.1** or **NRR 1**. This is because a CPR of 60% will cut out all births of order 3 or more (50–60% births belong to this class).

Condoms

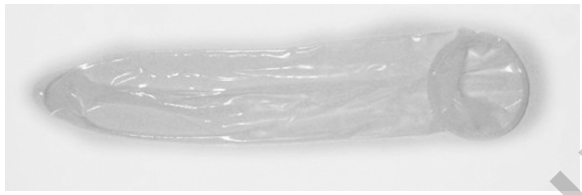


Figure 4.4. A condom

Condoms are sacs made of latex[116] with a teat infront to hold any excess sperm. Every latex condom is tested for holes with an electrical current. If the condom passes, it is rolled and packaged. In addition, a portion of each batch of condoms is subject to water leak and air burst testing.[117] Condoms are effective (pearl index = 2/100 woman year or 2% failure rate,[118] however may vary upto 14 due to incorrect use), and have some noncontraceptive benefits too (prevents most STDs like gonorrhea, chancroid, herpes, HIV, human papillomavirus infection and thereby, cervical cancer).

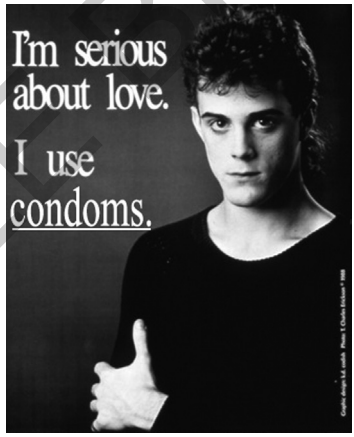


Figure 4.5. Are you serious about love?[119]

Condoms are also used for plastic repair of vaginal agenesis, and as a catheter.

Procedure

Wear a condom over erect penis without letting air in → use only water soluble lubricants, if required (oil based lubricants damage the latex, and are one of the causes of condom failure[120]) → after intercourse is over, remove it while the penis is still erect (or else it will slacken and semen may spill over in vagina) → the

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condom should be disposed in the garbage bin (and not the drain, which it can block).[121] Use a new condom for each sexual act. The shelf life of a latex condom is 3 years.

Need

72 condoms/couple/year on average (6 unsafe days a month × 12 months).

Ideal candidates

1. AIDS endemic area.
2. Female with heart disease, thromboembolic disease or jaundice (can't be given OCP), pelvic inflammatory disease (contraindication IUD).
3. Lactating female.
4. When the female has missed OCP for 2 consecutive days.
5. First two months of starting OCPs.

Causes of failure

- Slippage
- Tear (more likely with new users than experienced users)
- Use of oil based lubricants
- Experimentation without a condom (let's have a go)
- Using two condoms at once (double bagging)
- Reusing condoms.

Female condom

Since 1988, the female condom is available. The female condom is a pouch made of polyurethane with two flexible rings at each end. The ring inside the pouch is inserted deep into the vagina, which blocks the external os. The other end of the pouch is open and stays outside the vagina.

Advantages. Female condoms can be reused, can be used for anal sex, and overall gives women a heightened sense of control over sexual intercourse.

Disadvantages. Female condoms cost more, less efficacious than male condoms, hard to put on and the open end hanging outside the vagina can be a turn off for many men.

Diaphragm

It is a soft latex or silicone cap with a spring molded into the rim. The spring creates a seal against the walls of the vagina, thus blocking the cervix. The failure rate of diaphragms vary between 6–39%[122,123] depending on proper usage.



Figure 4.6. A diaphragm

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Community Medicine

A Student's Manual

Community medicine is the application of medical science to the society at large. It covers such diverse areas ranging from vaccination and control of epidemics to sanitation and town planning. This textbook is an attempt to present the subject of community medicine at a most introductory level to undergraduate medical students. It provides an extensive coverage on the concepts of health, disease and epidemiology. It provides solid conceptual foundation of biostatistics. Major areas of community medicine, including communicable and noncommunicable diseases, environmental health, mother and child's health, immunization, nutrition and national health programs are covered extensively. However, care has been taken as not to burden the memory of the student with irrelevant details at any point.

Regarding style, the book shapes into an easy-to-learn format. Important definitions presented in an informal and simple manner emphasizing on keywords. Consistent use of highlight boxes improve the readability of the text and underline key facts. It is written in a manner akin to classnotes, with a basic framework which every student can follow, while also providing additional material for the interesting areas.

The book is enriched with only the latest facts, figures and guidelines from international (WHO, CIA, UNICEF, etc.) and national (Ministry of Health and Family Welfare) agencies. Website references to topics, online libraries and sources of reliable information are provided in the references to each chapter. Profusely illustrated both by original and public domain artwork and imagery, it is also a very pleasant read. In short, it is an introductory text to the fresher as well as a pre-examination review for the MBBS students.

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