

# MANUAL ON HEALTH STATISTICS IN INDIA



सत्यमेव जयते

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## PREFACE

One of the mandates of the Central Statistics Office (CSO) is laying down and maintenance of norms and standards in the field of statistics, evolving concepts, classification, definitions and methodology of data collection, processing of data and dissemination of results for various fields of official Statistics. Preparation of “Manual on Health Statistics in India” is one such step undertaken by the CSO with a view to bringing out a comprehensive manual on the subject.

I hope this manual will be found very useful and serve the purpose of a Comprehensive and informative reference book for both beginners and practitioners and other stakeholders concerned with the collection, compilation & utilisation of Health Statistics, working either within or outside the Health System. Although it is expected that the manual will primarily be used by the relevant staff/statistical functionaries, including the field functionaries working at the various levels in the Health System and trainers on the subject, the manual is also designed to be useful and will largely meet the requirements of researchers, academicians, university students, policy makers and planners in understanding the concepts, definitions, metadata, methodology, policies and programmes, data sources relating to Health Statistics and various associated indicators and its usage for Monitoring and Evaluation. This manual is also expected to facilitate data aggregation and data comparison, both at inter-state and intra-state levels, besides international comparisons.

This manual has been prepared with the support of the Tata Institute of Social Sciences (TISS) Mumbai under the overall Coordination, Guidance and Supervision of the Training Division of Central Statistics Office, under the overall guidance of the Steering Committee and the Experts Committee for Preparation of Manuals on Statistical Indicators headed by the Chief Statistician of India and Director General, CSO respectively. I congratulate the team of officers, from the Training Division comprising Shri T.V. Raman, Additional Director General, Training cum Director National Statistical System Training Academy (NSSTA), Ms. Rashmi Verma, Director and Shri Shrikant Kale, Deputy Director for their excellent work done in bringing out this manual. I would also like to thank the Ministry of Health and Family Welfare (MoHFW) especially Dr Ratan Chand, Chief Director and Shri Biswajit Das, Director for providing necessary support from time to time in the preparation of this manual.

I also take the opportunity to thank the entire team of experts who have contributed to the different chapters of the manual, under overall supervision and coordination of Prof. S. Siva Raju of TISS.

I hope that the manual will serve as a useful reference document on the subject. Any suggestion to improve the contents and the layout of the manual are gratefully welcome.

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# MANUAL ON HEALTH STATISTICS IN INDIA

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## **List of abbreviations and acronyms used in the Manual:**

AfDB –African Development Bank

ANM-Auxiliary Nurse Midwife

ART- Anti-Retroviral Therapy

ASFR-Age specific Fertility Rate

ASHA-Accredited Social Health Activist

AYUSH- Ayurveda, Yoga & Naturopathy, Unani, Siddha & Homoeopathy

CBR-Crude Birth Rate

CHC-Community Health Centre

COTPA- Cigarettes & Other Tobacco Products Act

CRS-Civil Registration System

CSSM- Child Survival and Safe Motherhood

CSU- Central Surveillance Unit

CVD – Cardiovascular Disease

DES- Directorate of Economics and Statistics

DGHS- Directorate General of Health Services

EAG- Empowered Action Group

FSU- Field Survey Units

FSW- Female Sex Workers

GDP – Gross Domestic Product

GFR-General Fertility Rate

GIS – Geographic Information System

GOI-Government of India

GRR-Gross reproduction rate

HALE-Health Adjusted Life Expectancy

HIV/AIDS – Human Immunodeficiency virus / Acquired Immuno Deficiency Syndrome

HMIS –Health Management Information System

ICPD –International Conference on Population and Development.

ICTC- Integrated Counseling and Testing Centre

IDSP- Integrated Disease Surveillance Programme

IEC – Information Education and communications

IMCI- Integrated Management of Childhood Illness

IMF- International Monetary Fund

IMR – Infant Mortality Rate

IPHS – Indian Public Health Standards

ISM &H –ISM and Homeopathy

ISRO -Indian Space Research Organization

ISS-Indian statistics service

IYCF – Infant and young child feeding

JSSK- Janani ShishuSurakshaKaryakarm  
JSY- Janani SurakshaYojana  
LBW- Low birth weight  
LHV- Lady Health Visitor  
M & E-Monitoring and Evaluation  
MCH- Mother and Child Health  
MCTFC- Mother and Child Tracking Facilitation Centre  
MDGs - Millennium Development Goals  
MHW-Male Health worker  
MIES- Monitoring of Information and Evaluation Systems  
MMR –Maternal Mortality Rate  
MOHFW – Ministry of Health and Family Welfare  
NACO –National AIDS Control Organisation  
NACP –National AIDS Control Programme  
NEP –National Environment Policy  
NFHS-National Family Health Survey  
NGO – Non- governmental Organisation  
NHM-National Health Mission  
NHP – National Health Policy  
NIC - National Informatics Centre

NIDDCP- National Iodine Deficiency Disorders Control Programme

NLEP- National Leprosy Eradication Programme

NMHP- National Mental Health Programme

NMMU- National Medical, Mobile Unit

NPAN – National Plan of Action on Nutrition

NPC – National Policy for Children

NPCB- National Programme for Control of Blindness

NPCDCS-National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and Strokes

NPHCE -National Programme for Health Care of the Elderly

NPPCD -National Programme for the Prevention and Control of Deafness

NPPCF -National Programme for Prevention & Control of Fluorosis

NRHM –National Rural Health Mission

NRR-Net reproduction rate

NSS – National service Scheme

NSSO-National sample survey Organisation

NUHM- National Urban Health Mission

NVBDCP- National Vector Borne Disease Control Programme

NYKS –Nehru Yuva Kendra Sangathan

NYP – National Youth Policy

OPD –Out Patient Department

OT-Operation Theatre

PHC-Primary Health Centre

PLHA- Persons living with HIV/AIDS

PMSSY- Pradhan MantriSwasthyaSurakshaYojana

PPP – Public Private Partnership

QA- Quality Assurance

R & D –Research and Development

RBSK-RashtriyaBalSwasthyaKaryakram

RCH – Reproductive Child Health

RKSK-RashtriyaKishorSwasthyaKaryakram

RKS-RogikalyanSamiti

RMNCH- Reproductive, Maternal, New-born, Child and adolescent Health Services

RNTCP- Revised National TB Control Programme

RTI - Reproductive tract Infection

SAARC – South Asian Association for Regional Co-operation

SAARCSTAT – SAARC Statistical Organisations

SAGE-Study on global Ageing and adult health

SC-Sub centre

SDH- Sub-District Hospitals

SRS-Sample Registration System

STI –Sexually Transmitted Infections

TFR-Total Fertility Rate

UHC – Universal Health Coverage

UIP- Universal Immunisation Programme

UNICEF –United Nations International Children Emergency Fund

VHSNC- Village Health Sanitation and Nutrition Committee

WHO – World Health Organisation

# CHAPTER 1

## INTRODUCTION

### **Overview:**

The Introduction Chapter covers topics like the background and importance of the manual on health statistics. The purpose, objective, scope as well as intended learning from the Manual are described. It also describes the Millennium Development Goals (MDGs) and the emerging scenario for the MDGs in 2015. The chapter also explains how the manual has operationalized a uniform frame work for health statistics for India and other SAARC countries. Since the manual is expected to cater to the needs of professionals even after 2015, the emerging scenario post 2015 has also been covered in the Manual. The chapter also gives a brief about all the other chapters the Manual includes.

### **1.1 Introduction**

Health Statistics is a branch of official statistics that is mainly meant to cater to the needs of statisticians, professional and institutional users of official statistics. Apart from administrative data on health related parameters, it also covers measures, estimates and counts derived from survey and census results.

Health statistics are crucial for decision making at all levels of health care systems. It facilitates better decisions in policy design, health planning, management, monitoring and evaluation of programmes and services including patient care and facilitate improvements in overall health services performance and outcome. Health management information incorporates all the data needed by policy makers, clinicians and health service users to improve and protect population health. Few countries in the world today have effective and comprehensive systems in place to gather this data.

The present volume on Manual on Health Statistics for India is attempted first, with a view to gain insight for the preparation of Manual on Health Statistics for SAARC countries in the next stage. The manual on Health Statistics for India will be shared with the other SAARC countries so as to provide them the framework which was adopted for India while bringing out various chapters in Manual on Health Statistics. By obtaining necessary health data for each of the indicators as listed in the manual for India, from the

other SAARC countries, the data will be tabulated for each indicator across SAARC countries so as to depict the variations among them. The Manual on Health Statistics for India is thus done in order to maintain a uniform structure throughout the other manuals on Health statistics for other SAARC countries.

## **1.2 Importance of health statistics and Millennium Development Goals (MDGs)**

The need for statistical health information has been on the rise, in recent times. The world community has turned its attention to meeting the targets set by the Millennium Development Goals (MDGs). In terms of health care, more resources are going towards the prevention and treatment of high burden diseases such as HIV/AIDS, tuberculosis and malaria. The World Health Organization (WHO) has also duly emphasized that investment in Health Management Information Systems (HMIS) could reap multiple benefits such as:

- helping decision makers to detect and control emerging and endemic health problems, monitor progress towards health goals , and promote equity;
- empowering individuals and communities with timely and understandable health related information , and drive improvements in quality of services;
- strengthening the evidence base for effective health policies , permitting evaluation of scale -up efforts , and enabling innovation through research and;
- improving governance, mobilizing new resources and ensuring accountability in the way they are used

In this regard, decision makers need to be well equipped to measure whether policies and programmes are directed at the right beneficiaries, are meeting set targets and whether appropriate monitoring and evaluation tools are in place. Donors are also increasingly placing more emphasis on performance, linking the release of funds to performance based measures.

Further the post-2015 development agenda emphasizes on poverty eradication especially in the developing countries, which was identified at Rio+20 as the greatest global challenge. Despite impressive gains in poverty eradication, this remains the central challenge facing us today. People in developing countries continue to be the most poor and deprived and despite impressive growths rates, there remains a yawning gap between the developing and developed countries on practically all indicators- per capita

income, energy consumption, resource consumption, human development index. (*National Consultation Report, Post-2015 Development Framework: India, 2013*)

Given that there is growing inequality and regional poverty in India, the post-2015, a futuristic agenda with a more inclusive bottom-up process needs to be brought out for addressing the emerging areas of concern, including inequality, demographics, climate change and space for new development partnerships. Human development and poverty eradication, along with issues of equality, must be the focus of a future framework.

Limitations of data especially in developing countries are a real concern, as available data is not reliable. Post-2015 presents an opportunity to think beyond what data is available so that countries can invest in capacity building to get it. (*CIGI, TISS, KDI, Post-2015 Development Goals, Targets and Indicators: Indian Perspectives, Mumbai, India / Meeting Report, August, 2012*)

Rio+20 recognized the importance of universal health coverage. Unlike the MDGs which focused on communicable diseases, the post-2015 development agenda should start focusing on non-communicable diseases such as diabetes, heart diseases and also the neglected tropical diseases. For inclusive development, creation of basic infrastructure in developing countries is identified as major bottleneck. Lack of effective infra also hampers progress on other indicators such as health and education facilities. There needs to be enough policy space for developing countries to focus on this important aspect of development.

### **1.3 Purpose, objective and scope of the manual**

For any HIMS to succeed in achieving efficiency, three critical components need to be fulfilled. The first is the sensitization and capacity building at the grassroots level. The second is ensuring coverage, quality, relevance and reliability of data so that the information available through HMIS is effectively used for health management. The third is analyses, timely dissemination and feedback on the information available through the system. Efforts on all these fronts are crucial to improve the quality of data to sustain the HMIS and its effective utilization by health policy planners and implementers and can be a source for official health statistics in the near future.

In the pursuit of accomplishing MDGs, countries should improve the availability, accessibility and utilization of quality health care, particularly for vulnerable groups such

as the poor, women, children and the elderly. Broad strategies and plans may thus be developed to accomplish goals and specific objectives which can be measured and for which people can be held accountable. To achieve the above defined goals, the HMIS should play a key role in achieving these goals. Some of the implications of this for the design of the HMIS may be as follows:

- creation of an integrated data warehouse which can serve as a focal point of data entry and report generation;
- provision of various analytical tools for quality data verification and triangulation and provision of systems capable of entering all data in the required formats and generation of all reports;
- containing a dashboard that is capable of monitoring targets and tracking progress and outputs;
- containing infrastructural data so as to be able to compare existing facilities with the Indian Public Health Standards (IPHS) norms and identify gaps and means to mend them and;
- integrating Geographic Information Systems (GIS) to enable spatial tracking of relevant institutions under health care systems

Given the above, it was instituted in the Third Meeting of the Heads of SAARC Statistical Organisations (SAARCSTAT), to bring out a Manual on Health Statistics for SAARC countries to operationalize a uniform framework for the health statistics to be elicited for wider dissemination and overall utility towards meeting the objectives stated so far.

The manual thus is expected to serve the purpose of a comprehensive and step-by-step reference book for both, beginners and practitioners, as well as other stakeholders concerned with the collection, compilation and utilization of health statistics working within and outside the health system. Though the manual will primarily be used by relevant staff and statistical functionaries including field functionaries working at the national, regional and grassroots levels, it will also meet the requirements of researchers, academicians, students, industry and trade associations, policy makers and planners in their attempts to understand concepts, definitions, metadata, methodology and policies and programme in relation to health statistics and their usage in monitoring and

evaluation through various indicators and for the formulation of various policies and programmes. This manual is also expected to facilitate data aggregation and data comparison both at inter and intra-regional levels besides international comparisons. Considering the high priority being assigned to the health programmes by SAARC countries, such a manual would certainly enhance the abilities of government policy and programme formulation to introduce, implement and monitor health programmes.

#### **1.4 Intended learning**

Keeping in view the definition of Health Statistics, the Manual on Health Statistics is envisaged:

- To be broadly determined by health systems for data monitoring and indicators on quality of care, as well as better policies to prevent disease, and
- Improve health system efficiency via care coordination and the implementation of information technologies.

#### **1.5 Organization of the Manual**

The broad organization for the manual on Health Statistics is as follows:

The manual has eight chapters which will serve the purpose of a comprehensive reference book for both beginners and practitioners and other stakeholders concerned with the collection, compilation & utilization of health statistics working within and outside the health system. The chapters are described as follows:

##### **Chapter 1 (Introduction):**

The Introduction Chapter covers topics like the background and importance of and covers the way ahead by describing the emerging scenario for the MDGs in 2015. The purpose, objective, scope as well as intended learning from the manual are also described. The chapter also gives a brief about all the other chapters the manual includes.

##### **Chapter 2 (Overview of Population and Health Policies and Programmes in India):**

The Chapter on, ' Overview of Population and Health Policies and Programmes in India' outlines the various policies and programmes related to health in India. It also elaborates upon Constitutional and legal provisions, international conventions and treaties ratified by the Government and lastly it describes the public institutions and development

programmes in the health sector.

### **Chapter 3 (Health Statistics)**

Chapter 3 explains the concepts and definition of health statistics covering rates, ratios, prevalence, incidence rates, Kaplan-Meier and life tables, their types and also construction of life tables. The concept and definition of basic measures of health and demography like attack rate, secondary attack rate, case fatality rate, duration of illness or sickness and other measures like relative risk, attributable risk and odds ratio are elucidated. Methods of estimation of health and demographic measures are also described. Basic measures of fertility and indicators of National Aids Control Programme are also included.

### **Chapter 4 (Sources and Quality of Health Data)**

Chapter 4 on, 'Sources and Quality of Health Data' explains the National Systems of Health Statistics, explicitly giving information about administrative statistics, distribution of statistical responsibilities in different parts of the country, sources of data, nodal agencies involved and their role in co-ordination, data recording and compilation processes – organisation of data – types of data in organized forms, HMIS and limitations. The Chapter also presents various sources of health data namely Vital Registration System, surveys and Census statistics. Management of international classifications of diseases and methods of assessing quality of health statistics are also discussed.

### **Chapter 5 (Indicators for Measuring Health Status)**

This Chapter covers the concept of indicators, their types and hierarchy (input, process, output, outcome, impact), in general; and focuses on health status indicators like disease burden and epidemiological indicators; and reproductive and child health indicators. Health care resources and their burden are also explained in this Chapter. A brief write-up on Universal Health Coverage (UHC) with special emphasis on gaps its measurement, data gaps in outcomes, impacts and discrimination in the use of data is included.

### **Chapter 6 (Health Expenditure and Financing)**

Chapter 6 of the manual outlines the indicators of health expenditure and financing. It

also sheds light on topics like types of expenditure, sources of funding, linkage with Gross Domestic Product (GDP) and lastly Public Private Partnerships (PPPs) in health care systems.

### **Chapter 7 (Projection and Forecasting of Health Indicators)**

Chapter 7 discusses the projection and forecasting of health indicators. It explains need for projections, methods of population projection and health indicators. It also discusses the limitations and sources of errors in projection. It covers only basic and simple methods of projections. Projections on health related requirements in areas like infrastructure, RCH programmes and ageing programmes are also made.

### **Chapter 8 (Health Statistics for Monitoring and Evaluation of Health Programmes)**

The Chapter on, 'Health Statistics for Monitoring and Evaluation of Health Programmes' explains basic concepts and definitions of monitoring and evaluation. It also discusses logical frame-work approach results based management and monitoring indicators of development programmes. The Chapter also includes the illustrations which specify monitoring and evaluation of health programmes.

### **1.6 Conclusion:**

The manual thus attempts to describe health statistics scenario in India. It is expected to help various stakeholders associated with health care in India and those working at the international level for global action and also provides valuable inputs for the formulation of new health policies and programmes.

The sequencing of the manual covering various chapters is done in such a pattern so as to make the various stakeholders give a holistic view of the health systems in the country. Beginning with the overview of the health scenario and related policies and programmes, the manual tries to explain about health statistics, its sources and indicators. Further, it explains the level of expenditure on health, the need of projection and forecasting of health indicators as well monitoring and evaluation of health programmes. The manual is also expected to facilitate for health related data aggregation and comparison at various levels.

# CHAPTER 2

## OVERVIEW OF POPULATION AND HEALTH POLICIES AND PROGRAMMES

### Overview:

Government of India is committed to the goal of 'Health for All'. The obligation of the Government to ensure the highest possible health status of India's population and access to quality health care has been recognized by a number of key policy documents. This chapter discusses the salient features of the health policy of India and the relevant health-related components of other important policy instruments such as policies for population, older persons, youth, children, women and policies on nutrition, environment, AIDS, pharmaceuticals etc. India's commitment to health goals is further highlighted by the brief discussion of relevant constitutional and legal provisions as well as health related international treaties and conventions ratified by the government of India. In a vast country like India, efficient implementation of policies depends on the infrastructure created over the years. The chapter describes in detail the composition of India's health sector with focus on the role of public and private sector, role & functions of central and state governments in the implementation of health policy, government health infrastructure in rural and urban areas and organisational structure of the MOHFW. The list of important public institutions in the health sector is also provided. Finally even the very well conceived policies need to be translated into suitable strategies to reach the desired goal. National Health Mission, various health programmes and major recent health initiatives of the government of India like PMSSY are discussed in detail. Building the required data base is a precondition for periodical monitoring and evaluation of the policies and programmes. The chapter concludes with a brief discussion on data requirements, data availability and key role of the health information management system (HIMS) in India.

### **1.1 Introduction**

There are strong linkages between population, health and development. India's health challenges are not only huge in magnitude due to its large population but they are complex due to its diversity and the chronic poverty and inequality. There are extreme inter-state variations, caused by not only the cultural diversity but because the states are

at different stages of demographic transition, epidemiological transition and socio-economic development. Along with the old problems like persistence of communicable diseases and high maternal mortality in some parts, there is an urgent need to address the emerging issues like the threat of non-communicable diseases, HIV AIDS and health problems of the growing aged population. Accelerating demographic transition is not only necessary for the population stabilisation but it is closely related to health goals. Mortality reduction obviously depends on the morbidity reduction and is closely linked with the success of the health programmes. Contraceptive use and fertility reduction, though finally result into slower population growth, are very important for reduction in maternal mortality, infant and child mortality and thus lead to improvement in the health of women and children.

Government of India is committed to the goal of ‘**Health for All**’. The obligation of the Government to ensure the highest possible health status of India's population and access to quality health care has been recognized by a number of key policy documents.

## **1.2 National Policy Instruments- Salient Features**

The policy directions of the "Health for All" declaration became the stated policy of Government of India with the adoption of the National Health Policy Statement of 1983. Driven by this declaration there was some expansion of primary healthcare in the eighties. Further, the National Health Policy of 2002 and the Report of the Macro-Economic Commission on Health and Development (2005) emphasized the need to increase the total public health expenditure from 2 to 3 percent of the GDP. They also stressed the need to strengthen the role of public sector in social protection against the rising costs of health care and the need to provide a comprehensive package of services without reducing the prioritization given to women and children's health.

This section on Policy Instruments gives the Salient features of the National Population Policy, 2000 and National Health Policy, 2002 describing the broad objectives, overall approach, time bound goals, policy prescriptions for achieving them and the important features of the strategy envisaged by the policy regarding the delivery of National Health Programmes.

The section also covers the relevant health-related features of other policies (e.g. policies for children, youth, elderly, and women) because different age groups as well as men and

women have different health needs. Besides, health is a multidimensional subject Apart from access to health services; it depends on other dimensions like nutritional status, availability of and access to pure drinking water, lack of environmental pollution etc. Hence, it is a matter of multi-.sectoral co-ordination. Hence relevant features of important policies like water policy, environmental policy are also given.

### **2.2.1 National Population Policy, 2000(Health related components)**

#### **Objectives**

##### *Immediate Objective:*

To address the unmet needs for contraception, health care infrastructure & health personnel and to provide integrated service delivery for basic reproductive and child health care.

##### *Medium Term Objective:*

To bring Total Fertility Rate to replacement level by 2010 through vigorous implementation of inter-sectoral operational strategies

##### *Long Term Objective:*

To achieve a stable population by 2045 at a level consistent with requirements of sustainable economic growth, social development & environmental protection

#### **Health –related Goals for 2010**

- Reduce IMR to below 30 per 1000 live births
- Reduce MMR below 100 per 100,000 live births
- Achieve universal immunisation of children against all vaccine preventable diseases
- Achieve 80 per cent institutional deliveries and 100 per cent deliveries by trained personnel
- Achieve universal access to information/counselling & services for fertility regulation and contraception with wide choice
- Achieve 100 per cent registration of births, deaths, marriages & pregnancies

- Contain the spread of AIDS, promote integration between management of RTI, STI & NACO
- Prevent and control communicable diseases
- Integrate ISM in the provision of RCH services
- Bring about convergence of the implementation of related social sector programmes to make family welfare people centred programme

For the achievement of these goals, the policy identified the following 12 strategic themes which are to be pursued by adopting the operational strategies given in the action plan in the policy document

a) Decentralised planning & implementation

- Convergence of service delivery at village level
- Empowering women for health & nutrition
- Child health & survival
- Meeting unmet need for family welfare services
- Focus on underserved groups ( like urban slums,tribals, migrants, displaced persons, adolescents)
- Increased participation of men in planned parenthood
- Diversifying categories of RCH health care providers by including private practitioners and reviving system of licensed medical practitioners
- Collaboration with NGOs & private sector
- Research on medical technology & RCH
- Providing for the older people
- IEC

## Legislation, New Structures & Funding

The policy the government to implement the action plan, the policy recommended creation of National & State/UT Commissions on Population, creation of the co-ordination cell in the planning commission and doubling of the annual budget of the Dept. of Family Welfare. It also suggested some motivational measures to promote small family.

### 2.2.2 National Health Policy (NHP), 2002

#### Objectives & Approach

To achieve an acceptable standard of good health amongst the general population of the country by adopting the following approach

- Increasing the access to the decentralized public health system
- Establishing new infrastructure in deficient areas,
- Upgrading the infrastructure in the existing institutions.
- Ensuring a more equitable access to health services across the social and geographical expanse of the country.
- Increasing the aggregate public health investment through a substantially increased contribution by the Central Government
- Strengthening the capacity of the public health administration at the State level to render effective service delivery.
- Enhancing the private sector contribution to providing health services, particularly for the population group which can afford to pay for services.
- Giving primacy to preventive and first-line curative initiatives at the primary health level through increased sectoral share of allocation
- Emphasising rational use of drugs within the allopathic system.
- Ensuring Increased access to tried and tested systems of traditional medicine

#### Goals to be achieved by 2000-2015

Eradicate Polio and Yaws by 2005	Eliminate Leprosy by 2005
Eliminate Kala Azar by 2010	Eliminate Lymphatic Filariasis by 2015
Achieve Zero level growth of HIV/AIDS by 2007	Reduce Mortality by 50% on account of TB, Malaria & other Vector and Water borne diseases by 2010
Reduce Prevalence of Blindness to 0.5% by 2010	Reduce IMR to 30/1000 & MMR to 100/Lakh by 2010
Increase utilization of public health	Establish an integrated system of

facilities from current level of less than 20 to more than 75 by 2010	surveillance & National Health Accounts and Health Statistics 2005
Increase health expenditure by Government as a % of GDP from existing 0.9 to 2% by 2010	Increase share of Central grants to Constitute at least 25% of total health spending by 2010
Increase State Sector Health spending from 5.5% to 7% of the budget 2005 investment	Further increase to 8% by 2010

## Policy Prescriptions

### Financial Resources

- It is planned, under the policy to increase health sector expenditure to 6 percent of GDP, with 2 percent of GDP being contributed as public health, by the year 2010. In the first phase, by 2005, states would be expected to increase the commitment of their resources to 7 percent of the Budget and, by 2010, to increase it to 8 percent of the Budget. Central Government's contribution would rise to 25 percent from the existing 15 percent by 2010.
- For reducing various types of inequities and imbalances NHP-2002 sets out an increased allocation of 55 percent of the total public health investment for the primary health sector; the secondary and tertiary health sectors being targeted for 35 percent and 10 percent respectively.

### Delivery of National Public Health Programmes

*NHP envisages --*

- Key role for the Central Government in designing national programmes, provisioning of financial resources & technical support, monitoring and evaluation
- Gradual convergence of all health programmes under a single field administration to bring about a desirable optimisation of outcomes through a convergence of all public health inputs.
- Programme implementation be effected through autonomous bodies at State and district levels, having State Government officials, social activists, private health professionals and MLAs/MPs on their management board to ensure greater operational flexibility & well informed decision making

- Kick-starting the revival of the Primary Health System by providing some essential drugs under Central Government funding through the decentralized health system
- Great reliance on the strengthening of the primary health structure for the attaining of improved public health outcomes on an equitable basis
- Expanding the pool of medical practitioners to include a cadre of licentiates of medical practice, as also practitioners of Indian Systems of Medicine and Homoeopathy
- NHP recognizes the need for States to simplify the recruitment procedures and rules for contract employment in order to provide trained medical manpower in under-served areas.
- Urges all State Governments to consider decentralizing the implementation of the programmes to local self govt. Institutions by 2005.
- Emphasises the need to introduce urgently under the provisions of the Indian Medical Council Act and Indian Nursing Council Act minimal statutory norms for the deployment of doctors and nurses.
- Envisages the setting up of a Medical Grants Commission for funding new Government Medical and Dental Colleges in different parts of the country.
- NHP identifies the need-based, skill-oriented syllabus, with a more significant component of practical training, in order to make fresh doctors useful immediately after graduation.
- Recognises the need to expose medical students, through the undergraduate syllabus, to the emerging concerns for geriatric disorders and to raise the proportion of postgraduate seats in the disciplines of 'public health' and 'family medicine' in medical training institutions, to reach a stage wherein  $\frac{1}{4}$ <sup>th</sup> of the seats are earmarked for these disciplines.
- Emphasizes the need for an improvement in the ratio of nurse's vis-à-vis doctors/bed and for establishing training courses for super-speciality nurses required for tertiary care institutions.
- Emphasizes the need for basing treatment regimens, in both the public and private domain, on a limited number of essential drugs of a generic nature
- Envisages that not less than 50% of the requirement of vaccines/sera is sourced from public sector institutions.

- Envisages a two-tiered urban health structure (to be funded jointly by the local self-government institutions and State and Central Govts.) - primary centre as the first-tier, covering a population of one lakh with a dispensary providing an OPD facility and essential drugs, and a Government general hospital, where reference is made from the primary centre as the second tier.
- Envisages a network of decentralised mental health services for ameliorating the more common categories of disorders.
- Envisages an IEC policy, with focus on the dissemination of information using not only the mass media but the inter-personal communication, folk and other traditional media to bring about behavioural change
- Envisages giving priority to school health programmes which aim at preventive-health education, providing regular health check-ups, and promotion of health-seeking behaviour among children
- Envisages an increase in Government-funded health research to a level of 1 percent of the total health spending by 2005; and thereafter, up to 2 percent by 2010 focused on new therapeutic drugs and vaccines for tropical diseases, such as TB and Malaria, as also on the sub-types of HIV/AIDS
- Commits higher priority to central govt. funding of programmes related to women's health
- Envisages implementation of a code of ethics to avoid irrational or profit driven medical regimen
- Strengthening technical expertise and laboratory facilities in food & drug administration
- Periodic screening of health condition of workers for high risk disorders associated with their occupation
- Envisages provision of medical facilities to overseas users on payment basis

### **Health Statistics**

For moving closer to the objective of evidence-based policy-making, based on robust information system, the Policy envisages

- The completion of baseline estimates for the incidence of the common diseases – TB, Malaria, Blindness – by 2005.
- The periodic updating of these baseline estimates through representative sampling, under an appropriate statistical methodology.
- Recognizes the need to establish, in a longer time-frame, baseline estimates for non-communicable diseases, like CVD, Cancer, Diabetes; and accidental injuries, and communicable diseases, like Hepatitis

In an attempt at consolidating the data base and graduating from a mere estimation of the annual health expenditure, NHP-2002 emphasises the need to establish national health accounts, conforming to the `source-to-users' matrix structure. Also, the policy envisages the estimation of health costs on a continuing basis. Improved and comprehensive information through national health accounts and accounting systems would pave the way for decision makers to focus on relative priorities, keeping in view the limited financial resources in the health sector.

### **2.2.3 Other Policies which have Health related Component**

#### **i. National AIDS Prevention & Control Policy, 1992**

*Goal: Zero level of new infections by 2007*

*Objectives & Strategies*

1. Providing care & support to people living with HIV AIDS
2. Overcoming stigmatisation, discrimination & seclusion associated with HIVAIDS
3. Preventing women, children & socially weak groups from becoming vulnerable to HIV AIDS
4. Controlling STDs among vulnerable sections
5. Promoting condom use
6. Reinforcing traditional Indian values
7. Emphasis on HIV testing, counselling, strong surveillance system

8. Implementation through NACO & State AIDS cells
9. Ensuring availability of adequate safe blood & blood products by ( Budget allocation by NACO to National Blood Transfusion Council & making latest transfusion technology available to them, encouraging blood donation, creating awareness about blood banking services through NGOs, taking steps for the legislation to eliminate profiteering in blood banks)

## **ii. National Blood Policy, 2002**

Government of India published in the year 2002 the National Blood Policy. The objective of the policy is to provide safe, adequate quantity of blood, blood components and products. The main aim of the policy is to procure non remunerated regular blood donors by the blood banks. The policy also addresses various issues with regard to technical personnel, research, and development and to eliminate profiteering by the blood banks by selling blood. The policy also envisages that fresh licences to stand alone blood banks in private sector shall not be granted and renewal of such blood banks shall be subjected to thorough scrutiny.

## **iii. National Nutrition Policy, 1993**

It was adopted by the Government of India in 1993 under the aegis of the Department of Women and Child Development. It advocated a multi-sectoral strategy for eradicating malnutrition and achieving optimum nutrition for all. The policy advocates the monitoring the nutrition levels across the country and sensitizing government machinery on the need for good nutrition and prevention of malnutrition. The National Nutrition Policy also includes the Food and Nutrition Board, which develops posters, audio jingles and video spots for disseminating correct facts about breastfeeding and complementary feeding.

### **✓ Goals**

- Reduction in the incidence of moderate and severe anaemia
- Reduction in the incidence of low birth weight to less than 10%
- Elimination of blindness due to Vitamin A deficiency
- Reduction in iron deficiency anaemia among pregnant women to 25%
- Universal iodisation of salt to reduce iodine deficiency

- Emphasis on geriatric nutrition

✓ ***Direct Interventions***

- ICDS, fortification of essential foods-salt with iodine, bread with iron, popularisation of low cost, nutritious food, Vitamin A deficiency prophylaxis programme, Nutritional Anaemia. Prophylaxis programme. National Plan of Action on Nutrition (NPAN) was formulated in 1995, with commitments from 14 related ministries. National Nutrition Mission was set up in 2002.

**iv. National Policy for Empowerment of Women, 2001**

It reiterates NHP's demographic goal regarding IMR & MMR to be achieved by

- Ensuring equal access to comprehensive, affordable quality health care
- Eliminating all forms of violence against women & girls
- Safeguarding reproductive rights of women
- Ensuring access to safe, effective & affordable family planning methods of their choice
- Making special efforts to address the problem of nutrient deficiencies among women especially pregnant women provision of safe drinking water, toilet facilities and sanitation within accessible reach of households

**v. National Policy for Children 2013**

Earlier, the NPC 1974 recognised the need for national programmes for children so that they grow to become 'robust citizens, physically fit, mentally alert and morally healthy' Further, National Charter of Children adopted by India in 2004 underlined the intent to secure for every child right to enjoy a healthy and happy childhood and all root causes that negate the healthy growth of children To affirm this commitment, Government of India adopted in the NPC 2013, a long term, sustainable, multi-sectoral, inclusive and integrated approach for the development and protection of children i.e. 0 -18 age group. Survival, health, nutrition, development, education, protection and participation are the key priorities of the policy. It reiterates the State's commitment to ensure equitable access to essential, preventive, promotive, curative and rehabilitative health care for all

children. Towards this goal, NPC envisages that state shall take measures to

- Improve maternal health care( pre-natal, natal, post-natal)
- Provide universal access to services for informed choices related to births and spacing
- Address key causes of child mortality through appropriate interventions including access to safe drinking water and sanitation
- To improve new born and child care practices
- To protect children from water borne, blood borne, vector borne ,communicable and other childhood diseases by providing universal and affordable access to appropriate services
- Prevent disabilities ,physical and mental through timely measures to take pre-natal, natal, peri-natal and post –natal care of mother and child
- Ensure availability of services, support and provisions for nutritive attainment in a life cycle approach with focus on infant and young child feeding (IYCF) practices and on the health and nutrition needs of adolescent girls and other vulnerable groups
- Prevent HIV infections at birth and ensure proper treatment to infected children
- provide the adolescents access to information regarding ill effects of alcohol and substance use and support for the choice of healthy life style

The state commits to allocate the required financial, material and human resources for the implementation of NPC 2013 The Ministry of Women & Child Development is the nodal ministry for implementation of NPC.

#### **vi. National Youth Policy, 2014**

National Youth Policy 2014, provides a holistic vision for the youth (Age 15-29) in India which is to empower the youth to achieve their full potential and through them enable India to find its rightful place in the community of nations One of the 5key objectives of the policy is to develop a strong and healthy generation to take on future challenges. Among the 11 priority areas to achieve 5 key objectives two refer to health viz. I) Health & Healthy Lifestyle, II) Sports.

Future imperatives towards the health objectives in NYP are as follows-

- Improve service delivery
- Awareness about health, nutrition and preventive health care

- Targeted disease control programme for the youth
- Increased access to sports facilities and training, promotion of sports culture among youth& support to talented sports persons.

The NYP discusses the need to review the efficiency of the primary health care and implement correction mechanisms where existing strategies are proved to be ineffective. It also envisages creation of large pool of trained doctors, nurses, health workers, to incentivise them to work in remote areas and to develop Anganwadi centres as hubs in rural areas. Active participation of the private sector in setting up the training institutions is expected to support the over-burdened government machinery. For women youth, greater natal and pre-natal care for vulnerable age group 14-18 years, campaign against female feticide will be implemented. Awareness programme for youth about nutrition choices, ill-effects of drugs/substance use and inclusion of health and nutrition in the curriculum of schools and colleges are the other initiatives mentioned in NYP. As under ‘Saksham Scheme, progressive adolescents and youth volunteers from NSS and NYKS are envisaged to play important role in this. Under the targeted disease control programme for the youth, NRHM, NACP and on-going NGO programmes are to be leveraged for awareness, early detection and treatment programme for control of HIV / AIDS, STD and TB among youth.

#### **vii. National Policy on Older Persons, 1999**

It envisages state support to ensure health care of older persons, protection against abuse and exploitation, development of social support system, strengthening of the capacity of families to take care of old persons, provision of health care facilities in hospitals to handle geriatric cases, mobile medicare units, Jan Arogya scheme to provide cover up to Rs. 5000/- for to70+ persons who can’t afford high cost of medical care.

#### **viii. National Pharmaceutical Policy**

- Independent body- National Pharmaceutical Pricing Authority- is entrusted with the task for price fixation and revision of essential drugs and blood products.
- Foreign investment permitted to give impetus to R& D in Drug sector

## **ix. National Policy on Indian System of Medicine & Homeopathy, 2002**

### *Objectives:*

- To promote good health through outreach through preventive, promotive, curative interventions through ISM & H and integrate ISM & H with health care delivery system
- To improve the quality of teachers & clinics in ISM & H
- To reorient research in ISM & H.

## **x. National Water Policy, 2012**

The objective of National Water Policy, 2012 is

- i) to spread cognizance of the existing situation regarding water resources-the scarcity, availability, wastage, mismanagement, pollution and its inefficient use taking into account the needs of growing population and the impact of climate change
- ii) to propose a framework for creation of system of laws and institutions and a plan of action for efficient management of water resources with a unified national perspective

As far as health is concerned, the policy emphasises needs to address the problems of environmental and health hazards. a) Industrial effluents affecting the availability of safe drinking water, b) Inadequate sanitation and c) Lack of sewage treatment which results in water pollution.

NWP lays down those public policies on water resources which need to be governed by the following principles—

- Equity and social justice
- Planning, development and management of water resources needs to be governed by common integrated perspective considering local, regional, state and national context; keeping in view the human, environmental, social and economic needs.
- Water needs to be managed as a common pool community resource through a National level legal framework, under public trust doctrine to achieve food security, livelihood, and equitable and sustainable development for all. Existing water Acts may have to be modified accordingly.

The policy recognises the need to optimise the utilisation of water for diverse uses such as domestic, agricultural, industrial, navigation, recreation, hydro-power, thermal power but emphasises that the centre, states and local bodies must ensure access to a minimum quantity of potable water for essential health and hygiene to all its citizens, within easy reach of the household.

The policy emphasises the need for i) rainwater harvesting and de-salinisation of water in urban and industrial areas, ii) integration of urban water supply and sewage treatment schemes and iii) provision of improved water supply and proper sewerage facilities in rural areas.

After discussing the supply & demand aspects and suggesting appropriate institutional framework for efficient management of water resources, it recommends that a National Water Informatics Centre should be established to collect, collate and process data on water.

#### **xi. National Environment Policy, 2006**

NEP deals with adverse effects on health air pollution, water pollution and noise pollution. It emphasises use of solar energy, promotion of low cost strategy of sewage treatment, public/private partnership in setting up and operation of sewage treatment plants, formulation of urban transport strategy to reduce air pollution, formulation and implementation of noise emission norms appropriate to various activities.

## 2.3 Constitutional Provisions, Laws & Statutes

Government of India performs its role for the pursuit of the goal - Health for All, as per the policy instruments described within the broad framework of the **Constitutional provisions regarding rights, jurisdiction, distribution of functions and legislative authority** and as guided by the **International Treaties and Conventions** ratified by the Government of India. The relevant constitutional provisions are given below:

### 2.3.1 Constitutional Provisions (M. C. Gupta ,2002)

- Article 21 guarantees the fundamental right to life - casts an obligation upon the state to preserve the life of every person by offering immediate medical aid.
- Article 23 prohibits traffic in human beings – important in the context of prostitution, STD & HIV AIDS
- Article 24 prohibits child labour ( below age 14) – (relevant to child health)
- Article 32 empowers every citizen of India to move the courts for violation of fundamental rights.
- Article 38 enjoins upon the state to minimise the inequalities in income, facilities (including health facilities)and opportunities
- Article 39 reads ‘the state shall direct its policy towards securing health and strength of men, women & children and to see to it that they are not abused’
- Article 41 is about the provision of public assistance in case of old age, sickness and disablement
- Article 42 is about provision of just & humane conditions of work and maternity benefits

- Article 47 reads 'The State shall regard raising the level of nutrition and the standard of living of its people and improvement of public health as among its primary duties. The State shall endeavour to bring about prohibition of the consumption, except for medical purposes, of intoxicating drinks and of drugs injurious to health
- As per the 7<sup>th</sup> schedule of the constitution, provision of health care is the responsibility of the State governments but the central government also plays a vital role in supporting them in their efforts to ensure all people the access to quality health.
- Article 246 pertains to a scheme of distribution of legislative powers between centre and states as given in the 7<sup>th</sup> schedule of the constitution.

**Union List-** Marine hospitals, quarantine, safety in mines, oil fields, manufacture and regulation of salt production.

**State list-** Public health, sanitation, hospitals, dispensaries, production etc. of intoxicating liquors, relief of the disabled, burial grounds, water supplies.

**Concurrent list** – Population control, family planning, vital statistics, lunacy & mental deficiency, adulteration of food stuffs & other goods.

- Article 243G is inserted as the 73<sup>rd</sup> amendment of the constitution 1992 to endow the Panchayats with various powers including matters related to drinking water, health, sanitation, PHCs, Family welfare, women & child development and welfare of the handicapped and mentally retarded
- Article 243W, inserted by the 74<sup>th</sup> Amendment in 1992 pertains to the powers given to Municipalities to perform the functions entrusted with them regarding water supply (domestic, industrial, commercial purposes), public health, sanitation & solid waste management, vital statistics registration, regulation of slaughter houses, tanneries.
- Article 263 provides for the formation of interstate council for investigating subjects in which states and centre have common interest and recommending the action for better co-ordination

### 2.3.2 Acts, Statutes and Laws under Constitutional Provisions

From time to time, government of India passes various acts and laws to implement specific policies and in course of time state governments adopt the respective legislations.

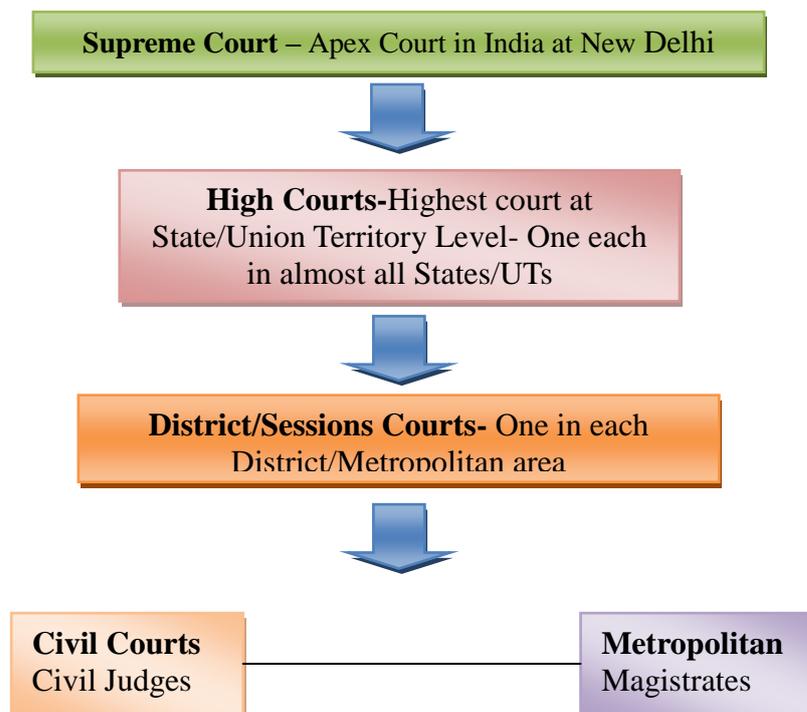
**List of business with which the Central Government deal in a Legislative capacity for the Union & in both Legislative and Executive capacities for All Union Territories-**

All Matters relating to-

- (a) The Medical profession and medical education.
- (b) The nursing profession and nursing education.
- (c) Pharmacists and Pharmacy education.
- (d) The dental profession and dental education.
- (e) Mental Health.
- (f) Drugs Standards.
- (g) Advertisements relating to drugs and medicines.
- (h) Prevention of the extension from one State to another of infectious or contagious diseases affecting human beings.
- (i) Prevention of adulteration of foodstuffs and drugs.

### Institutes for Legal Action in India

**Figure 1: The Indian Judicial Structure**



**The Supreme Court** has original, appellate and advisory jurisdiction. Its exclusive original jurisdiction extends to any dispute between the Government of India and one or more States or between the Government of India and any State or States on one side and one or more States on the other or between two or more States, if and insofar as the dispute involves any question (whether of law or of fact) on which the existence or extent of a legal right depends. In addition, Article 32 of the Constitution gives an extensive original jurisdiction to the Supreme Court in regard to enforcement of Fundamental Rights. The Supreme Court also deals with 'Public Interest Litigations' i.e. matters in which interest of the public at large is involved and the Court can be moved by any individual or group of persons either by filing a Writ Petition **The High Court** stands at the head of a State's judicial administration. Each High Court has power to issue to any person within its jurisdiction directions, orders, or writs there is an Advocate General for each State, to give advice to State Governments upon such legal matters and to perform such other duties of legal character, as may be referred or assigned to him by the Governor. Besides this, there are **Lok Adalats**, which are voluntary agencies monitored by the State Legal Aid and Advice Boards. They have proved to be a successful alternative forum for resolving of disputes through the conciliatory method. The Legal Services Authorities Act, 1987 provides for setting up of Legal Services Authorities at the Central, State and District levels. These authorities will have their own funds. Further, Lok Adalats which are at present informal agencies will acquire statutory status.

### **Some Important Legislation related to Health (J. Kishore,2007)**

1. Registration of Births and Deaths Act 1969
2. Spread of Epidemics Disease Act 1994
3. The Cigarettes & other Tobacco Products (Prohibition of trade, commerce, production, supply & distribution) Act, 2003

The following act/statutes come under the jurisdiction of MOHFW

- The Prevention of Food Adulteration Act, 1954 (37 of 1954)
- Medical Termination of Pregnancy Act, 1971 (34 of 1971)
- Pre-conception and Pre-natal Diagnostic Techniques (Prohibition of Sex Selection) Act, 1994 (57 of 1994)
- The Food Safety and Standards Act, 2006 (34 of 2006)
- The Clinical Establishments (Registration & Regulation) Act 2010, enacted by the Central Government with a view of prescribing the minimum standards of facilities and services provided by them. The act is applicable to all kinds of clinical establishments from the public and private sectors of all the recognised systems of medicine including single doctor clinics (Only exception will be establishment run by armed forces). It applies to the States of Himachal Pradesh, Arunachal Pradesh, Sikkim, Mizoram, Union Territories and any other state which adopt the act under clause (1) of the article 252 of the constitution. The National Council for Clinical Establishments appointed as per the composition given in the act will compile the list of all clinical establishments, classify them and develop the minimum standards and review periodically. Every state and Union Territory also shall constitute similarly a State / UT Council .The act lays down the procedure of registration, rules and the penalties for violation of rules by the clinical establishments.

## **2.3 International Treaties and Conventions Ratified by India**

### **2.3.1 Alma Ata Declaration**

The Declaration of Alma-Ata was adopted at the International Conference on Primary Health Care (PHC), Almaty (Kazakhstan) in September 1978. It expressed the need for urgent action by all governments, all health and development workers, and the world community to protect and promote the health of all people. It was the first international declaration underlining the importance of primary health care. The primary health care approach has since then been accepted by member countries of the World Health Organization (WHO) as the key to achieving the goal of "Health for All"

The conference was called for urgent and effective national and international action to develop and implement primary health care throughout the world and particularly in developing countries in a spirit of technical cooperation and in keeping with a New International Economic Order. It urged governments, the WHO, UNICEF, and other international organizations, as well as multilateral and bilateral agencies, non-governmental organizations, funding agencies, all health workers and the world community to support national and international commitment to primary health care and to channel increased technical and financial support to it, particularly in developing countries. The conference called on the afore mentioned was to collaborate in introducing, developing and maintaining primary health care in accordance with the spirit and content of the declaration. The declaration has 10 points and is non-binding on member states.

The declaration reaffirms the WHO definition of health as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity." The definition seeks to include social and economic sectors within the scope of attaining health and reaffirms health as a human right.

### *Equity*

The declaration highlighted the inequity between the developed and the developing countries and termed it politically, socially and economically unacceptable.

- Health as a Socio-Economic Issue and As a Human Right

The declaration called for economic and social development as a pre-requisite to the attainment of health for all. It also declared positive effects on economic and social development and on world peace through promotion and protection of health of the people. Participation of people as a group or individually in planning and implementing their health care was declared as a human right and duty.

- Role of the State

It emphasized on the role of the state in providing adequate health and social measures. It defined 'Health for All' as the attainment by all peoples of the world by the year 2000 of a level of health that will permit them to lead a socially and economically productive life. The declaration urged governments, international organizations and the whole world community to take this up as a main social target in the spirit of social justice.

- Primary Health Care and Components

It urged signatories to incorporate all components of the primary health care in their health systems as the most efficient and cost-effective way to organize a health system and urged international cooperation in better use of the world's resources towards achievement of the goal "Health for All. Primary health care has since been adopted by many member nations.

### **2.3.2 International Conference on Population & Development (ICPD) Cairo, 1994**

It was a milestone in the history of population policy and in the history of women's rights. ICPD programme of action was signed by 179 nations. Consensus was reached on 'women's equality and empowerment' as global priority. This was recognized not only as universal human right but as an essential step towards eradicating poverty and stabilizing population growth. Women's ability to access reproductive health and rights is recognized as the cornerstone of her empowerment. ICPD programme of action emphasizes

- Providing universal access to family planning 7 sexual and reproductive health services
- Gender equality, women's empowerment & equal access to education for girls
- Addressing the individual, social & economic impact of urbanization and migration
- Addressing environmental issues associated with population changes with focus on sustainable development
- Partnership with Non-govt. sector

Adoption of this approach led to the formulation of a truly comprehensive population policy for India in 2000. Replacement of MCH approach by RCH approach, target free approach to family planning, identifying 12 strategic themes beyond family planning as mentioned earlier were the key features of this policy. Later ICPD + 5 reviews led to formulation of Millennium Development Goals

### **2.3.3 United Nations Millennium Declaration, 2000**

The **Millennium Development Goals (MDGs)** are eight international development goals that were established following the Millennium Summit of the United Nations in 2000, following the adoption of the United Nations Millennium Declaration. All 189 United Nations member states at the time (there are 193 currently) and at least 23 international organizations committed to help achieve the Millennium Development Goals by 2015, the goals follow:

**Goal I:** To eradicate extreme poverty and hunger -Halve between 1990 & 2015 the proportion of poor people

**Goal II:** Universal primary education- 100% primary completion rate for all children by 2015

**Goal III:** Promote gender equality and empower women- eliminate gender disparity in primary & secondary education by 2005 and at all levels by 2015

**Goal IV:** Reduce child mortality by 2/3rds between 1990 and 2005

**Goal V:** Improve maternal health – Reduce 1990 maternal mortality levels by 3/4ths by 2015

**Goal VI:** Combat HIV+ and related diseases – To halt them by 2015 and reverse their spread

**Goal VII:** Ensure environmental sustainability

**Goal VIII:** Develop a global partnership for development

To accelerate progress, the G8 Finance Ministers agreed in June 2005 to provide enough funds to the World Bank, the International Monetary Fund (IMF) and the African Development Bank (AfDB) to cancel \$40 to \$55 billion in debt owed by members of the Heavily Indebted Poor Countries (HIPC) to allow them to redirect resources to programs for improving health and education and for alleviating poverty.

### **2.3.3 WHO Framework for Tobacco Control- WHO Geneva, Convention 2003**

Following the framework adopted in WHO convention, Government of India enacted Cigarettes & Other Tobacco Products ( Prohibition & Advertisement ) Act 2003(COTPA) with a view to achieve improvement of public health in general and to prohibit advertisement of and to provide for regulation of trade, commerce, production, supply and distribution of cigarettes and other tobacco products in the country. Act is enforced since May 2004. Important features of COTPA

1. Ban on smoking in public places (including work places after 2008)
2. Ban on advertising of tobacco products
3. Ban on sale of tobacco products to minors & within 100 yards from educational institutions
4. Mandatory display of pictorial health warning on all tobacco product packages

## **2.4 Health Sector in India - Structure, Roles & Functions**

### **2.4.1 Public & Private Sector**

Private health sector in India consists of dispensaries, clinics, nursing homes and hospitals (practicing Allopathic, /Ayurvedic, / Homeopathic, / Unani systems) owned and run by individuals or by groups of Individuals. They are to some extent registered under and regulated by the organisations like Medical Council and now will be registered under and regulated by the National/State Councils constituted under the Clinical Establishment Act as described earlier.

Public Sector consists of (a) dispensaries, clinics, nursing homes and hospitals (practicing Allopathic,/Ayurvedic,/ Homeopathic,/ Unani systems ) owned and run by charitable institutions, religious organisations like churches and NGOs (b) Countrywide network of government health facilities i.e. sub-centres, primary health centres, Community Health Centres And rural hospitalising rural areas and in urban areas, urban health centres, Municipal & other government hospitals. These come under the Ministry of Health & Family Welfare (MOHFW). (c) In addition there are dispensaries, clinics & hospitals specifically for the employees of other public sector bodies such as Atomic Energy, Railways, Port Trust, Reserve Bank, Armed Forces, which come under the

respective ministries.

In addition Pharmaceutical companies, chemist shops, research organisations, medical colleges and other health related training and research institutes; laboratories are also a part of the health sector, private or public according to their ownership.

#### **2.4.2 Administrative Structure of MOHFW**

At the Centre, MOHFW is headed by the Union Cabinet Minister and a State Minister. The Ministry of Health & Family Welfare comprises the following four departments, each of which is headed by a Secretary to the Government of India, assisted by joint, Deputy and undersecretaries

1. Department of Health & Family Welfare
2. Department of Health Research
3. Department of AIDS Control

Department of AYUSH has been separated from the Ministry of Health & Family Welfare and now is a separate ministry.

**Organisational Charts of the Department of Health & Family Welfare are given in the Annexure.**

Directorate General of Health Services (DGHS) is an attached office of the Department of Health & Family Welfare and has subordinate offices spread all over the country. The DGHS renders technical advice on all medical and public health matters and is involved in the implementation of various health schemes.

The administrative structure of public health services in India is 'two-winged'. First, there is the secretariat of the health ministry and second there is the technical wing, which is called the directorate of health services. Both these wings are under the Ministry of health, the former under the Secretary of the Ministry and the latter under the Director General (Director in States). For some of the programs/schemes, there are directors, advisors and commissioners and their deputies and assistants.

This elaborate structure at the Central government level shows the extent of involvement of the centre in the implementation of various health programmes in the States. The same elaborate administrative structure (more or less) is repeated at the state level. There is a minister, secretary and a Director of Health with their deputies, assistants etc. in each

state. To facilitate interaction between the central government and state governments there is central Council of Health and Family Welfare, which comprise the health ministers and secretaries from all states and a few nominated members. This council is also the primary advisory and policy-making body for health care in the country. The Planning Commission also has a health cell that supports this advisory and policy-making function besides preparing detailed plans for the health sector of the country.

Health is a matter of inter-sectoral co-ordination. Many diseases are water-borne or some are related to pollution. Similarly different age-groups have different health needs as seen in the policy instruments section. Hence though Health is primarily the responsibility of MOHFW, other ministries such as Ministries of women & child development, environment, water resources, rural development, urban development, human resources, have strong linkages with public health and sanitation. Hence they also have an indirect role in the health related activities. Besides, increasingly, there is a trend of public –private partnership to involve NGOs and private sector functionaries and /institutions in the implementation of the government programmes

## **2.5 Role & Functions of Central and State Governments in the Implementation of Health Policy & Programmes**

Private sector is mainly concerned with curative aspect while government health facilities are responsible for public health i.e. disease prevention & control as well as sanitation. As far as public health is concerned, areas of operation have been divided between Union Government and State Governments in view of the federal nature of the Constitution. As discussed earlier, Seventh Schedule of Constitution describes three exhaustive lists of items, namely, Union list, State list and Concurrent list. Though some items like public health, hospitals, sanitation etc. fall in the State list, the items having wider ramification at the national level like Family Welfare and Population Control, Medical Education, Prevention of Food Adulteration, Quality Control in manufacture of Drugs etc. have been included in the Concurrent list. The health policy and planning framework has been provided by the central government. The central government has also provided to the States funding as well as the design and components of various national programs such as vertical programs for leprosy, tuberculosis, blindness, malaria, smallpox, diarrhoea, filaria, goitre and now HIV/AIDS. These programs are implemented uniformly across the length and breadth of the country. The states also

implement the centrally funded and designed programs of family planning and universal immunisation. The Union Ministry of Health & Family Welfare is instrumental and responsible for implementation of various programmes on a national scale in the areas of health and family welfare, prevention and control of major communicable diseases and promotion of traditional and indigenous systems of medicines. In addition, the Ministry also assists states in preventing and controlling the spread of seasonal disease outbreaks and epidemics through technical assistance. Expenditure is incurred by Ministry of Health & Family Welfare either directly under Central Schemes or by way of grants-in-aids to the autonomous/statutory bodies' and NGOs. In addition to the centrally sponsored family welfare programmes, the Ministry is implementing several World Bank assisted programmes for control of AIDS, Malaria, and Tuberculosis in designated areas. Besides, State Health Systems Development Projects with World Bank assistance are under implementation in various states. The projects are implemented by the respective State Governments and the Department of Health & Family Welfare only facilitates the States in availing of external assistance. All these schemes aim at fulfilling the national commitment to improve access to Primary Health Care facilities keeping in view the needs of rural areas and where the incidence of disease is high.

## **2.6 Government Health Infrastructure in Rural & Urban Areas For the Delivery of Health Services--Roles & Functions of Different Health Facilities**

The large cities, depending on their population have a few state run hospitals (including teaching hospitals). At the district level on an average there is a 150 bedded Civil General Hospital in the main district town and a few smaller hospitals and dispensaries spread over the other towns in the district and sometimes in large villages. In the rural areas of the district there are rural hospitals, Community health centres, primary health centres and sub-centres that provide various health services and outreach services.

### **2.6.1 Sub-centre**

One per 5000 population in plain area & 3000 population in hilly/tribal area), is the first peripheral contact point between Primary Health Care system and the community. It is manned by at least one Female (Auxiliary Nurse Midwife) and also one Male Health

Worker, One Lady Health Visitor (LHV) is provided for six such Sub-Centres. Sub-centres are assigned task relating to Maternal and Child Health, Family Welfare, Nutrition, immunization, Diarrhoea and Pneumonia Control and control of Communicable Diseases. ANMs and also provided drugs for minor ailments and for essential material and child health care. ANMs also provide Family Planning counselling and supplies.

### **2.6.2 Primary Health Centre**

One per 30,000 population in plain area & 20,000 population in hilly/tribal area, PHC is the first contact point between village community and the Medical Officer. It is manned by a Medical Officer and other support staff. It acts as a referral Unit for 6 Sub-Centres and many PHCs as 4-6 beds for patients. It provides curative, preventive, promotive and Family Welfare services. The PHCs are being strengthened under NRHM to provide a package of essential public health services, and support for outreach services including for regular supplies of essential drugs and equipment, upgrading single doctor PHC to 2 doctors PHC by posting AYUSH practitioners at PHC level, provision of 3 Staff Nurses in a phased manner based on patient load and delivery load. The States/UTs have to incorporate their proposals and requirement of funds in their Programme Implementation Plans under NRHM.

### **2.6.3 Community Health Centre**

one per 1,20,000 population in plain area & 80,000 population in hilly/tribal area, CHC is established and maintained by the State Governments and as per standards it is supposed to be manned by four Medical specialists i.e. Surgeon, Physician, Gynaecologist and Paediatrician supported by 21 paramedical and other staff. It normally has 30 indoor beds with one OT, X-ray, and Labour room and Laboratory facilities and serves as a referral centre for 4 PHCs. It provides facilities for emergency obstetrics and specialist consultations. Indian Public Health standards lays down that this CHC should be manned by 6 Medical Specialists including an Anaesthetics and Gynaecologist supported by 24 paramedical and other staff with inclusion of two nurse midwives in the present system of seven nurse midwives

With efforts to decentralise governance many of the functions are being transferred to the district level under the Panchayat Raj Acts in various states These large beaurocracies at

the centre and state level and in a few states even at the district level “direct and administer” the various health programs through officials and medical personnel at the district and lower levels and in metropolitan city hospitals.

The city hospitals and the civil hospitals are basically curative centres providing outpatient and in-patient services for primary, secondary and tertiary care. In contrast the rural institutions provide mainly preventive and promotive services like communicable disease control programs, family planning services and immunisation services, in addition to curative services.

## **2.7 Some Important Public Institutions under Ministry of Health and Family Welfare**

These institutions are either under the MOHFW or are autonomous bodies fully or partly funded by MOHFW and they play important role in India’s pursuit for ‘Health for All’

- i. Central Research Institute
- ii. All India Institute of Hygiene and Public Health
- iii. National Centre for Diseases Control
- iv. Central Drugs Laboratory
- v. Central Institute of Psychiatry
- vi. Dr. Ram Manohar Lohia Hospital ,
- vii. Safdarjang Hospital,
- viii. Medical Stores Organisation
- ix. B.C.G. Vaccine Laboratory
- x. Central Food and Standardisation Laboratory
- xi. All India Institute of Physical Medicine and Rehabilitation.
- xii. National Tuberculosis Institute.
- xiii. Central Leprosy Teaching and Research Institute.
- xiv. Port Quarantine (sea and air) seamen's and marine hospitals.
- xv. Dental Council of India.
- xvi. Indian Nursing Council
- xvii. Pharmacy Council of India
- xviii. National Cancer Research Centre.
- xix. All India Institute of Medical Sciences.

- xx. All India Institute of Speech and Hearing.
- xxi. National Institute of Mental Health and Neuro-Science
- xxii. National Commission on Population.
- xxiii. International Institute of Population Sciences, Mumbai.
- xxiv. National Institute of Health & Family Welfare
- xxv. Indian Council of Medical Research

## **2.8 Major Health Initiatives of MOHFW & Important Health Programmes**

The Ministry of Health & Family Welfare is implementing various schemes, programmes and national initiatives to provide universal access to quality healthcare. The approach is to increase access to the decentralized public health system by establishing new infrastructure in deficient areas and by upgrading the infrastructure in the existing institutions.

### **2.8.1 National Health Mission (NHM)**

The National Health Mission (NHM) has time-bound quantifiable goals to be achieved through specific road maps with appropriate linkages and financial allocations for strengthening the health infrastructure. A continuous flow of good quality information on inputs, outputs and outcome indicators, is essential for monitoring the progress of NHM at closer intervals. Integral to this process is using information for decentralized planning where the States prepare Integrated District Health Action Plans (IDHAP) culminating to the State Health Action Plans or Programme Implementation Plans (PIP) through which resource mobilization takes place.

At the national level, various steps have been taken to improve the Monitoring & Evaluation system by strengthening support systems for an effective MIS system in terms of dedicated manpower, their training, IT interventions and dedicated funds.

Nodal Information Officer has been identified at various levels - the State, District, and facility levels so that she/he functions as the focal point for submission and dissemination of information. The States have been requested to synergise the monitoring and IT infrastructure across health programmes to minimise redundancy.

As a part of the plan process, many different programmes have been brought together under the overarching umbrella of the National Health Mission (NHM) with National

Rural Health Mission (NRHM) and National Urban Health Mission (NUHM) as its two Sub-Missions. The NHM envisages achievement of universal access to equitable, affordable & quality health care services that are accountable and responsive to people's needs. The main programmatic components of NHM include Health System Strengthening in rural and urban areas- Reproductive-Maternal- Neonatal-Child and Adolescent Health (RMNCH+A), and Communicable and Non-Communicable Diseases.

### **2.8.2 National Rural Health Mission (NRHM):**

NRHM seeks to provide accessible, affordable and quality health care to the rural population, especially the vulnerable groups. Under the NRHM, the Empowered Action Group (EAG) States as well as North Eastern States, Jammu and Kashmir and Himachal Pradesh have been given special focus. The thrust of the mission is on establishing a fully functional, community owned, decentralized health delivery system with inter-sectoral convergence at all levels, to ensure simultaneous action on a wide range of determinants of health such as water, sanitation, education, nutrition, social and gender equality.

#### **2.8.2.1 Major Initiatives under NRHM**

1. ASHAs – About 9 lakh volunteers called Accredited Social Health Activists have been engaged under the mission to work as a link between the community and the public health system. ASHA is the first port of call for any health related demands of deprived sections of the population, especially women and children, who find it difficult to access health services in rural areas

2. **Rogi Kalyan Samiti (Patient Welfare Committee) / Hospital Management Society** is a simple yet effective management structure. This committee is a registered society whose members act as trustees to manage the affairs of the hospital and is responsible for upkeep of the facilities and ensure provision of better facilities to the patients in the hospital. Financial assistance is provided to these Committees through untied fund to undertake activities for patient welfare. So far 31,109 Rogi Kalyan Samitis (RKS) have been set up involving the community members in almost all District Hospitals (DHs), Sub-District Hospitals (SDHs), Community Health Centres (CHCs) and Primary Health Centres (PHCs) till date.

**3. The Untied Grants to Sub-Centres (SCs)** for better equipment e.g. Blood Pressure measuring equipment, Haemoglobin (Hb) measuring equipment, stethoscope, weighing machine etc giving more confidence to ANMs

**4. The Village Health Sanitation and Nutrition Committee (VHSNC)** Untied grants of Rs. 10,000 are provided annually to each VHSNC under NRHM, which are utilized through involvement of Panchayati Raj representatives and other community members in many states. Till date, 5.12 lakh. VHSNCs have been set up across the country

**5. Janani Suraksha Yojana (JSY)** aims to reduce maternal mortality among pregnant women by encouraging them to deliver in government health facilities. Under the scheme, cash assistance is provided to eligible pregnant women for giving birth in a government health facility. Since the inception of NRHM, 7.04 crore women have benefited under this scheme

**6. Janani Shishu Suraksha Karyakarm (JSSK):** Launched on 1st June, 2011, JSSK entitles all pregnant women delivering in public health institutions to absolutely free and no expense delivery, including caesarean section. This marks a shift to an entitlement based approach. The free entitlements include free drugs and consumables, free diagnostics, free diet during stay in the health institutions, free provision of blood, and free transport

**7. Mother and Child Tracking System (MCTS):** MoHFW has introduced web based name based tracking system called Mother & Child Tracking System (MCTS) across all the States & UTs to facilitate timely delivery of antenatal and postnatal care services to all the pregnant women and immunization to all the children. MCTS is an innovative IT system providing alerts to health service providers about the services due list and service delivery gaps. Furthermore, the system also provides ready reference about the status of services / vaccination delivered to pregnant women and children.

Under MCTS, appropriate health promotion messages to beneficiaries that are relevant according to the month of pregnancy or date of birth of the child are being sent on mobiles of beneficiaries. MCTS is also being used for transfer of JSY benefits to pregnant women after delivery as is presently being done in over 120 districts.

The data collection formats of MCTS have been revised so that more comprehensive RCH related information may be captured. Unstructured Supplementary Services Data (USSD) based solution has been introduced for real time updation of MCTS database by ANMs using their existing mobile phones. Efforts are being made to develop tablet based applications which will allow health workers to register and update service delivery information from tablets, resulting in timely registration and updation of information and better micro-planning.

8. Other initiatives such as **National Medical, Mobile Unit (NMMU), National Ambulance Services, Mainstreaming of AYUSH facilities.**

### **2.8.2.2 New Initiatives of NRHM**

1. **Rashtriya Bal Swasthya Karyakram (RBSK):** This initiative was launched in February 2013 and provides for Child Health Screening and Early Intervention Services through early detection and management of 4 Ds i.e. Defects at birth, Diseases, Deficiencies, Development delays including disability.

2. **Rashtriya Kishor Swasthya Karyakram (RKSK):** Launched in January 2014 to reach out to 253 million adolescents in the country in their own spaces and introduces peer-led interventions at the community level, supported by augmentation of facility based services. This initiative broadens the focus of the adolescent health programme beyond reproductive and sexual health and brings in focus on life skills, nutrition, injuries and violence (including gender based violence), non-communicable diseases, mental health and substance misuse.

3. **Mother and Child Health Wings (MCH Wings):** 100, 50, and 30 bedded Maternal and Child Health (MCH) Wings have been sanctioned in public health facilities with high bed occupancy to cater to the increased demand for services.

4. **Free Drugs and Free Diagnostic Service:** To address the issue of high out of pocket expenditure, Ministry introduced an incentive to the extent of 5% of the state's Resource Envelope under NRHM for those states that implemented free essential drugs scheme for all patients accessing public health facilities.

5. **National Iron+ Initiative** Besides pregnant women and lactating mothers, it aims to

provide IFA supplementation for children, adolescents and women in reproductive age group. Weekly Iron and Folic Acid Supplementation

**6. Reproductive, Maternal, Newborn, Child and adolescent Health Services (RMNCH+A):** A continuum of care approach has now been adopted under NRHM with the articulation of strategic approach to Reproductive Maternal, Newborn, Child and Adolescent health (RMNCH+A) in India. This approach brings focus on adolescents as a critical life stage and linkages between child survival, maternal health and family planning efforts.

**7. Identifying “Delivery Points”** with the objective of providing comprehensive reproductive, maternal, new-born, child and adolescent health services (RMNCH+A) services at the facilities identified as high demand, high performance facilities

**8. Universal Health Coverage (UHC):** - a key goal of the 12th Plan. The National Health

Mission is the primary vehicle to move towards UHC. India has charted a path that depends largely on provision of affordable, quality health care by the public health system as its main form of social protection, with supplementation from the private sector to close gaps. UHC pilot projects would be supported in at least one district of each state.

**9. Mother and Child Tracking Facilitation Centre (MCTFC):** MCTFC has been operationalized from National Institute of Health and Family Welfare (NIHFW). It is being operated by 80 Helpdesk Agents (HAs). It will validate the data entered in MCTS in addition to guiding and helping both the beneficiaries and service providers with up to date information on Mother and Child Care services through phone calls and Interactive Voice Response System (IVRS).

**10. Quality Assurance (QA):** The present strategy is a shift in focus from fragmented approach of different quality systems to one comprehensive approach of Quality Assurance. Based on best practices of existing quality system and on the scientific literature, a comprehensive operational guideline on Quality assurance has been launched wherein National Quality Assurance standards have been published.

**11. ASHA Certification:** Certification of ASHAs to enhance competency and

professional credibility of ASHAs by knowledge and skill assessment would be done by National Institute of Open Schooling.

12. **NGO Guidelines:** Guidelines for NGO involvement under NHM during Twelfth Five-year Plan have been issued recently. to envisage greater state ownership for NGO led programmes and are intended to provide a broad framework to the States to partner with NGOs and facilitate their participation in capacity building, support for community processes service delivery, develop innovations through research and documentation, advocacy, and for supplementing capacities in key areas of the public health system to improve health care service delivery.

### **2.8.2.3 National Programmes under NRHM**

- National Vector Borne Disease Control Programme (NVBDCP), which includes Malaria, Lymphatic Filariasis, Kala Azar, Japanese Encephalitis, Dengue fever and Chikungunya
- National Leprosy Eradication Programme (NLEP)
- Revised National TB Control Programme (RNTCP),
- National Programme for Control of Blindness (NPCB),
- National Iodine Deficiency Disorders Control Programme (NIDDCP)

### **2.8.3 National Urban Health Mission (NUHM):**

The National Urban Health Mission (NUHM) as a submission of National Health Mission (NHM) has been approved by the Cabinet on 1st May 2013. NUHM envisages to meet health care needs of the urban population with the focus on urban poor, by making available to them essential primary health care services and reducing their out of pocket expenses for treatment.

This will be achieved by strengthening the existing health care service delivery system, targeting the people living in slums and converging with various schemes relating to wider determinants of health like drinking water, sanitation, school education, etc. implemented by the Ministries of Urban Development, Housing & Urban Poverty Alleviation, Human Resource Development and Women & Child Development. NUHM would endeavour to achieve its goal through:-

- Need based city specific urban health care system to meet the diverse health care needs

of the urban poor and other vulnerable sections.

- Institutional mechanism and management systems to meet the health-related challenges of a rapidly growing urban population.
- Partnership with community and local bodies for a more proactive involvement in planning, implementation, and monitoring of health activities.
- Availability of resources for providing essential primary health care to urban poor.
- Partnerships with NGOs, for profit and not for profit health service providers and other stakeholders.

NUHM would cover all State capitals, district headquarters and cities/towns with a population of more than 50000. It would primarily focus on slum dwellers and other marginalized groups like rickshaw pullers, street vendors, railway and bus station coolies, homeless people, street children, construction site workers. The centre-state funding pattern will be 75:25 for all the States except North-Eastern states including Sikkim and other special category states of Jammu & Kashmir, Himachal Pradesh and Uttarakhand, for whom the centre-state funding pattern will be 90:10. The Programme Implementation Plan (PIPs) sent by the states are appraised and approved by the Ministry. In the 12th Plan an allocation of Rs. 15,143 crores has been made for National Urban Health Mission.

#### **2.8.4 Other Major National Health Programmes**

- National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and Strokes (NPCDCS)
- National Tobacco Control Programme
- National Mental Health Programme (NMHP),
- National Programme for the Prevention and Control of Deafness (NPPCD)
- National Programme for Prevention & Control of Fluorosis (NPPCF)
- National Programme for Health Care of the Elderly (NPHCE)
- National STD Control Programme

#### **2.8.5 Other Important Programmes - Old & New**

Some aspects of some of these programmes are covered in NHM strategies

**1. Maternal Health Programme** to reduce maternal mortality and ensure maternal health. The strategies include schemes under NHM & other schemes such as, demand promotion under schemes like JSSK, essential emergency & Obstetric care, comprehensive abortion care services, Management of RTI & STI, iron supplementation, , Maternal death review, village health& Nutrition Days, mother and child tracking, capacity building through training programmes, Menstrual hygiene scheme

**2. Child Health Programme** to reduce infant and child mortality through strategies like interventions for new-born care (facility based and home based), interventions for infant & young child feeding, Nutritional Rehabilitation Centres, Initiatives for Integrated management of neo-natal and childhood diseases (Acute Respiratory Infections, Diarrhoea, Rashtriya Bal Swasthya Karyakram (RBSK), Universal Immunisation Programme (UIP) for children and pregnant women.

**3. Pulse Polio Immunisation programme** launched in India in 1995, following WHO resolution for Polio Eradication in 1988 was a part of the Global Initiative Children age 0-5 were administered polio drops during National and Sub-national rounds every year. About 172 million children were immunised during each National Immunisation Day. On 27<sup>th</sup> March 2014, WHO regional Certification Commission certified India as Polio Free Nation.

**4. Family Planning Programme-** Since its inception in 1952 as the first govt. family planning programmes in the world it has undergone many transformations. It is a big transition from the simple clinical approach in the early fifties. To MCH and CSSM approach and then to the present holistic RCH approach. From the earlier target bound programme to the present target free approach it is a paradigm shift after ICPD, Cairo The comprehensive approach is reflected in the 12 strategic themes identified in the National Population Policy 2000. In the present programme there is emphasis on spacing methods, IUD and male sterilisation while Minilap and Laparoscopie are promoted as terminal female methods. Present strategies include emphasis on quality assurance, home delivery of contraceptives, and easy availability of Pregnancy testing kits. Post-partum family planning services, emergency contraceptive pills, public private partnership for increasing the access to FP services and social marketing of condoms.

5. **Integrated Disease Surveillance Project/ Programme (IDSP)** was launched with World Bank assistance in November 2004 to detect and respond to disease outbreaks quickly. The project was extended for 2 years in March 2010. From April 2010 to March 2012, World Bank funds were available for Central Surveillance Unit (CSU) at NCDC & 9 identified states (Uttarakhand, Rajasthan, Punjab, Maharashtra, Gujarat, Tamil Nadu, Karnataka, Andhra Pradesh and West Bengal) and the rest 26 states/UTs were funded from domestic budget. The Programme continues during 12th Plan under NRHM with outlay of Rs. 640 Crore from domestic budget only. Surveillance units have been established in all states/districts (SSU/DSU). Central Surveillance Unit (CSU) established and integrated in the National Centre for Disease Control, Delhi. Training of State/District Surveillance Teams and Rapid Response Teams (RRT) has been completed for all 35 States/UTs. IT network connecting 776 sites in States/District HQ and premier institutes has been established with the help of National Informatics Centre (NIC) and Indian Space Research Organization (ISRO) for data entry, training, video conferencing and outbreak discussion. Under the project weekly disease surveillance data on epidemic prone disease are being collected from reporting units such as sub centres, primary health centres, community health centres, hospitals including government and private sector hospitals and medical colleges. States/districts have been asked to notify the outbreaks immediately to the system. On an average, 30-40 outbreaks are reported every week by the States. 553 outbreaks were reported and responded to by states in 2008, 799 outbreaks in 2009, 990 in 2010, 1675 outbreaks in 2011, 1584 outbreaks in 2012 and in 2013, 1898 outbreaks have been reported till 8th December.
6. **Drug De addiction Programme (DDAP):** The Drug De addiction Programme in the Ministry of Health & Family Welfare was started in the year 1987-88 which was later modified in 1992-93. The programme was initiated as a scheme with funding from the central government and implementation through the states. Under the scheme, a onetime grant in aid of Rs.8.00 lakhs was given to states for construction of each Drug De addiction Centre and a recurring grant of Rs.2.00 lakhs was given to Drug De addiction Centres established in North Eastern Regions to meet the expenses on medications and other requirements. At present 122 such Centres have been established across the country including centres in Central Government hospitals and institutions of which 43 centres have been established in the North Eastern Region. Under this programme, a national nodal centre, the “National Drug Dependence Treatment Centre”, has been

established under the All India Institute of Medical Sciences (AIIMS), New Delhi which is located in Ghaziabad while two centres i.e. NIMHANS, Bangalore and PGI, Chandigarh have also been upgraded by this Ministry. The purpose of these centres was to provide de-addiction and rehabilitation services to the patients and to conduct research and provide training to medical and paramedical staff in the area of drug de addiction. (*Substance use Disorders: A Manual for paramedical Staff, Rakesh Lal and Atul Ambekar, 2009*)

7. **National AIDS Control Programme (NACP)** India has the third highest number of estimated people living with HIV in the world. According to the HIV Estimations 2012, the estimated number of people living with HIV/AIDS in India was 20.89 lakh, with an estimated adult (15-49 age group) HIV prevalence of 0.27% in 2011. India has demonstrated an overall reduction of 57% in the annual new HIV infections among adult population from 2.74 lakh in 2000 to 1.16 lakh in 2011, reflecting the impact of various interventions and scaled-up prevention strategies under the National AIDS Control...The first phase of was launched by the Government of India in 1992 to combat the HIV infection and AIDS in the initial stage itself. However, with the evolving trends of the HIV/AIDS epidemic, the focus of the subsequent phases of the programme (NACP-II in 1999 and NACP-III in 2007) shifted from raising HIV/AIDS awareness to behaviour change, from a national response to a more decentralised response and to increasing involvement of NGOs and networks of People Living with HIV (PLHIV).

### 7.1 Preventive strategies

- Targeted Interventions for High Risk Groups (Female Sex Workers, Men who have Sex with Men, Transgender/ Hijras, Injecting Drug Users) and Bridge Population (Truckers & Migrants)
- Needle-Syringe Exchange Programme and Opioid Substitution Therapy for IDUs
- Prevention Interventions for Migrant population at source, transit and destination
- Link Worker Scheme for HRGs and vulnerable population in rural areas
- Prevention & Control of Sexually Transmitted Infections/Reproductive Tract Infections
- Blood Safety
- HIV Counselling & Testing Services
- Prevention of Parent to Child Transmission

- Condom promotion
- Information, Education & Communication and Behaviour Change Communication (BCC).
- Social Mobilisation, Youth Interventions and Adolescence Education Programme
- Mainstreaming HIV/AIDS response
- Work Place Interventions

## **7.2 Care, Support & Treatment Services**

- Laboratory services for CD4 Testing and other investigations
- Free First-line & Second-line Anti-Retroviral Therapy (ART) through ART centres and Link ART Centres (LACs), Centres of Excellence (CoE) & ART plus centres.
- Paediatric ART for children
- Early Infant Diagnosis for HIV exposed infants and children below 18 months
- Nutritional and Psycho-social support through Care and Support Centres (CSC)
- HIV/TB Coordination (Cross-referral, detection and treatment of co-infections)
- Treatment of Opportunistic Infections
- Drop-in Centres for PLHIV networks

For prevention and control of HIV/AIDS the Department of AIDS Control has formulated policies and developed standards, guidelines norms. Strategies developed for programme implementation include finalisation of State action plans, financial planning & management, budgeting, release of funds and monitoring expenditures at National and State levels, strategic information management including programme monitoring, surveillance and research, institutional strengthening, human resource management, capacity building, technical and administrative support as well as guidance to State AIDS Control Societies.

8. **Pradhan Mantri Swasthya Suraksha Yojana (PMSSY)** aims at correcting the imbalances in the availability of affordable healthcare facilities in the different parts of the country in general, and augmenting facilities for quality medical education in the under-served States in particular. The scheme was approved in March 2006. The first phase in the PMSSY has two components - setting up of six institutions in the line of AIIMS; and up gradation of 13 existing Government medical college institutions.

Spread over 10 states In the second phase of PMSSY, the Government has approved the setting up of two more AIIMS-like institutions, one each in the States of West Bengal and Uttar Pradesh and up gradation of six medical college institutions In the third phase of PMSSY, it is proposed to upgrade seven existing medical college institutions from 5 states

### **2.8.6 Data Requirements & Availability**

In a vast country like India, full of diversity and disparities, it is a big challenge to implement, the various programmes in the health sector following the policy guidelines within the constitutional and legal framework and to achieve the desired impact on all sections of the population, especially the deprived ones. In order to plan, design, implement and monitor these programs and to evaluate their performance and impact, statistical data on a large number of indicators are required,

Data on these indicators are required not only at All India level but also for the state/UT and district level. It is also essential to have the indicators by the background characteristics particularly by economic status (income or expenditure class or standard of living Index), by sex, by education, by caste (SC/ST/ OBC) because it is important to see that the programmes have reached the poor and the deprived.

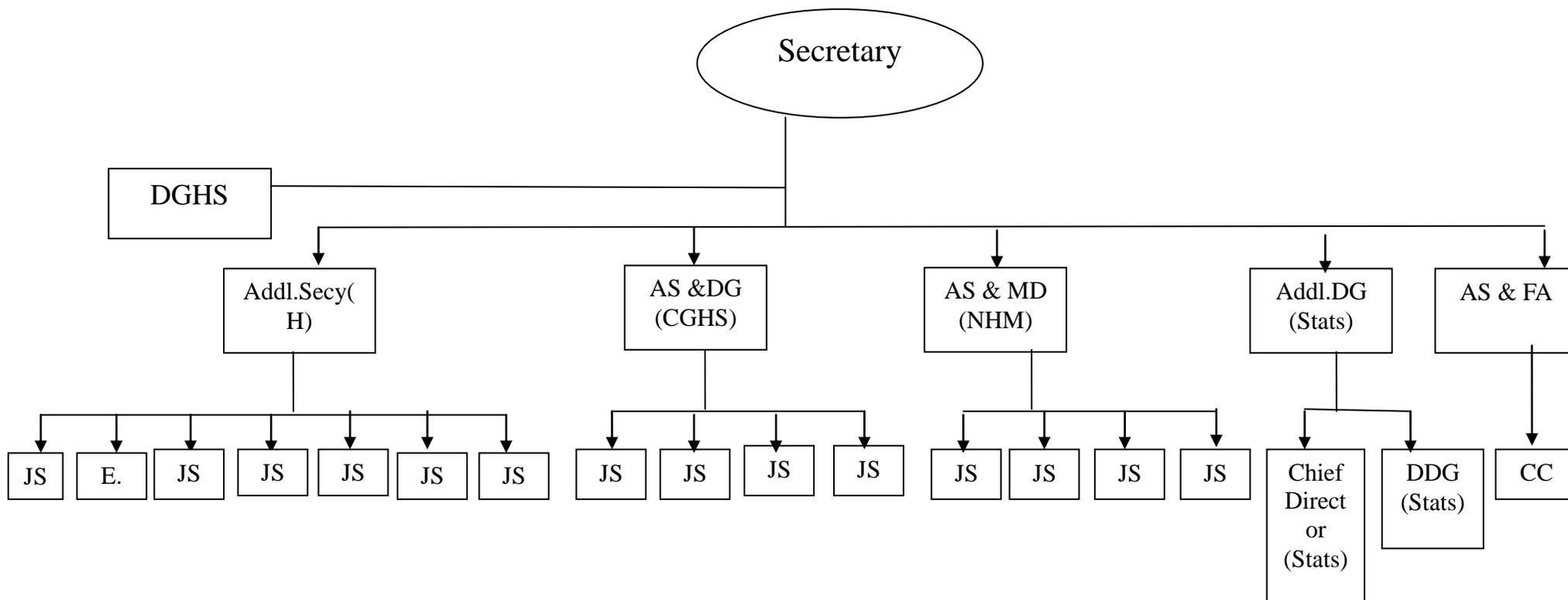
Indicators required can be classified as , Background Variables,, Impact indicators (fertility Indicators, Mortality Indicators, Morbidity Indicators ,Nutrition Indicators),Programme Performance Indicators, Health Infrastructure Indicators, Accessibility Indicators, Amenities indicators, Financial Indicators. Data on most of the above indicators is available in successive rounds of the Census of India, Sample Registration System, National Family Health Survey, District level Household & Facility Survey, National Sample Survey, and Official Statistics available in Health & Family Welfare Yearbooks and other publications of govt. of India. Comparability of data over the period and between the sources, however, needs to be taken into account. Indicators & data sources are discussed in detail in other chapters.

### **2.8.7 HMIS - Use of Health Management Information System in Monitoring and Evaluation of Health Programmes**

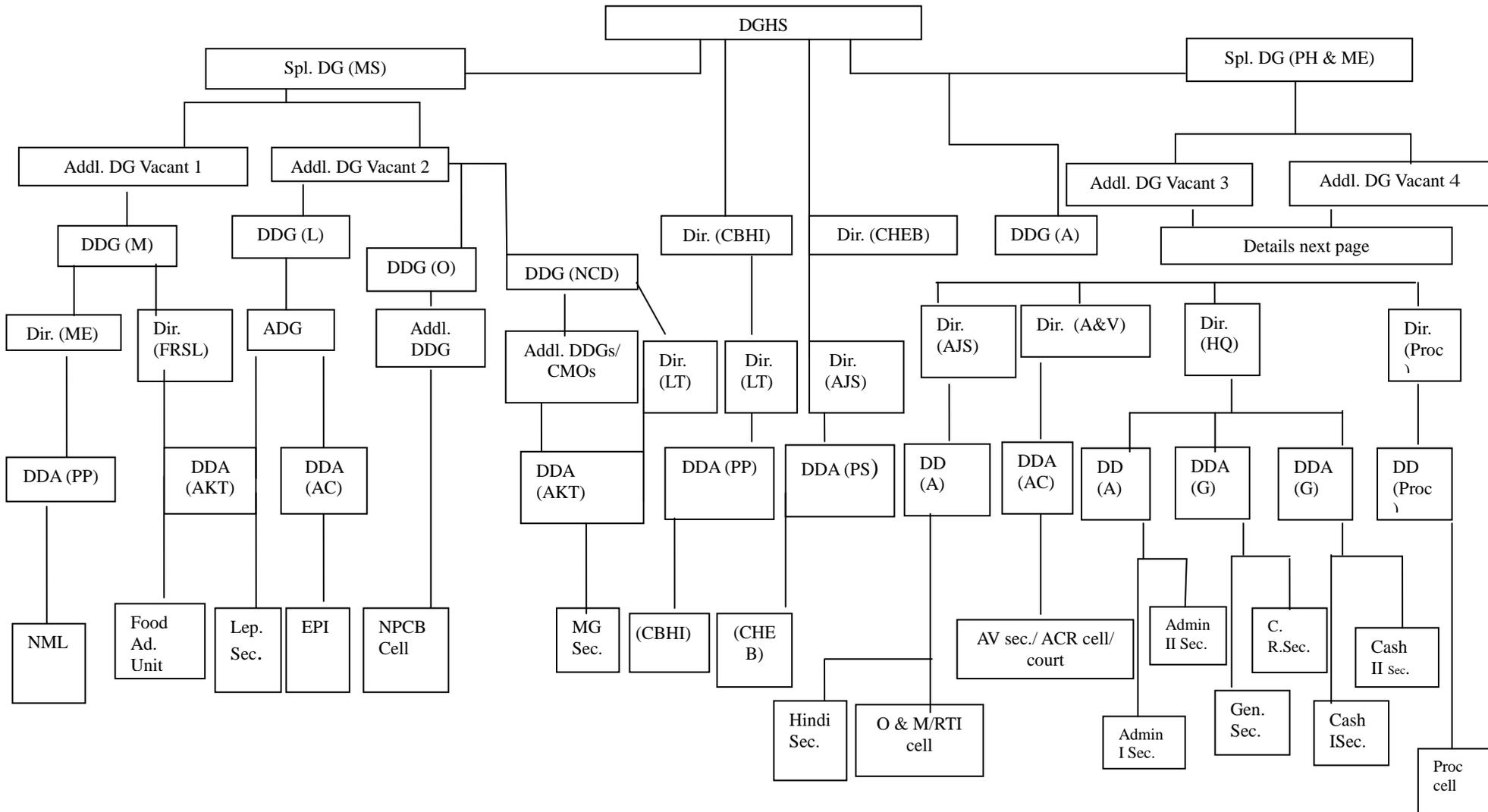
There has been a growing emphasis in India on Health Management Information System (HMIS) as a part of the National Rural Health Mission (NRHM) initiative to enable capturing of public health data from both public and private institutions in rural and urban areas across the country in order to strengthen the evidence based planning of health programmes. Hence, one of the core strategies of NRHM in achieving its goals is to strengthen capacities for data collection, assessment and review for evidence based planning, monitoring and supervision.

Management Information System is designed to collect and report information on a programme, which allows managers at all levels to plan, monitor, and evaluate the operations and the performance of the whole programme. HMIS is a systematic process of collection, compilation, reporting, analysis and use of information on health care services. The information is generally helpful in planning, problem solving and decision making in health care service provisioning. Health management information incorporates all the data needed by policy makers, service providers/clinicians and health service users to improve and protect population health. Any user, who has a password to login HMIS web portal, can generate the customised HMIS reports as per his/her requirement based on information on a given item 1. across States & Periods 2. Across Districts and Periods Proper use of HMIS is expected to contribute significantly to improve the health program performance and ultimately achieving its stipulated goals.

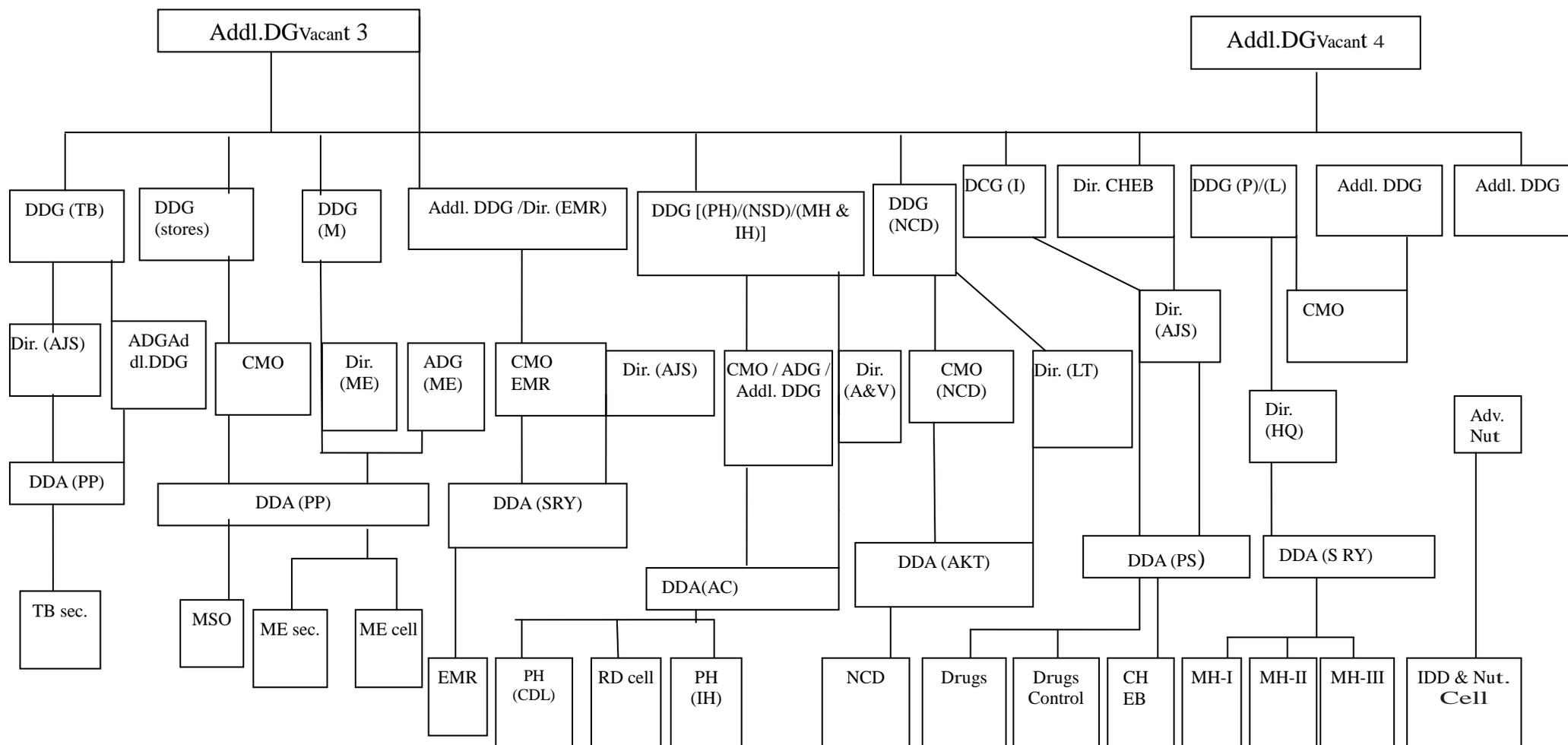
**Annexure  
Organisational Chart of Dept. of Health & Family Welfare, MOHFW  
Govt. of India**



**Organization chart of Directorate General of Health Services  
(Administrative and ME Wings)  
(As on 20th May, 2014)**



## Organisation Chart of Directorate General of Health Services



# CHAPTER 3

## HEALTH STATISTICS

### Overview:

The chapter explains the concepts and definition of health statistics covering rates, ratios, prevalence, incidence rates, Kaplan-Meier and life tables, their types and also construction of life tables. The concept and definition of basic measures of health and demography like attack rate, secondary attack rate, case fatality rate, duration of illness or sickness and other measures like relative risk, attributable risk and odds ratio are elucidated. Methods of estimation of health and demographic measures are also described. Basic measures of fertility, reproductive rates and indicators of National Aids Control Programme are also included.

### 3.1 Concepts and definitions

#### 3.1.1 Rates:

A rate is used to compare two quantities with different units. It is written as  $\frac{a}{b} * K$  where “a” and “b” are two different quantities and K is a multiplicative factor and it may be 100,1000,10000 etc. For example 5 persons died with malaria in 5000 population in a town during year 1990, then malaria death rate is  $\frac{5}{5000} * 1000 = 1$  per 1000 population during 1990 in that town.

Example:

Infant mortality rate:

$$\frac{\text{Number of children in the age group 0-1 died during x year in a given area} \times 1000}{\text{Number of births occurred during that year in that area}}$$

$$\text{Death rate: } \frac{\text{Number of deaths occurred in a geographical area in a year} \times 1000}{\text{Total number of persons living in the same geographical area in year x}}$$

Points to remember:

A rate refers to a given period of time that has to be specified. Rates are generally calculated for a period of one year (annual) and can be calculated for a shorter period eg: daily or monthly rates or for a longer period.

In rate considering denominator is very important. In the above example while calculating

Death rate, it should be considered “midyear population”. Since Population size is different in the beginning of year when compare to end of year..

### 3.1.2 Ratio:

A ratio is a comparison of two quantities with the same units. For example if we require comparing Male and female in a community consisting of 5000 male and 2000 female then:

**Sex Ratio:** (M/F).\*1000= 5000/2000 \*1000= 2500.Hence for each 1000 females there are 2500 males in that community or for each one female there are 2.5 males in that community.

### 3.1.3 Incidence (I):

Incidence is defined as the occurrence of new cases of disease that develop in a population over a specific time period.

Incidence rate (I) = (Number of **new cases** of a particular disease in a fixed time period / Number of people at risk.)

Usually the period of study is chosen to be one year, in which case it would be called as the **annual incidence**.

Calculating the incidence rate has some limitations.

- a) Everyone being studied has to be followed for the complete year, but during the study period, some may die from some other cause or be lost to follow-up which makes the resulting calculation uncertain.
- b) Many diseases can occur more than once and we have to decide how to handle recurrences. An alternative is to express **incidence as a rate: number of cases per time of observation, or the number of cases per person-year of observation**. The incidence rate gives an instantaneous reading of the frequency with which the disease will occur. The use of incidence is generally restricted to acute conditions of disease.

### 3.1.4 Prevalence (P):

While incidence measures the frequency with which new disease develops, prevalence measures the *frequency of existing disease*.

Prevalence (P) = (Number of people **with the disease at a given time** / Number of people at risk). That is proportion of the total population that is diseased. There are two types of prevalence measures-point prevalence and period prevalence. *Point prevalence* refers to the proportion of the population that is diseased at a single point in time. The point can be either a particular calendar date. *Period prevalence* refers to the proportion of the population that is diseased during specified duration of time (a

particular year).The period prevalence include the number of cases that were present at the start of the period as well as the number that developed during the period.

$$\text{Point Prevalence} = \frac{\text{Number of existing cases of disease at a point of time}}{\text{Number of total population at the same point of time}}$$

$$\text{Period Prevalence} = \frac{\text{Number of existing cases of disease during a period of time}}{\text{Number of total population}}$$

In the above two measures, the numerator (existing cases) is a subset of the denominator (total population).The numerator includes all currently living cases regardless of when they first developed. The denominator includes everyone in the population either sick, healthy, at risk, and not at risk. Because prevalence is a proportion, it is dimensionless and its possible values range from zero to one or 0 to 100%.

**Example: Point Prevalence:**

On 26<sup>th</sup> December 1996, 1,000 have hypertension among 10,000 females residing in town A. The prevalence of hypertension among women in town A on this date is calculated as:

$$1,000/10,000 = 0.1 \text{ or } 10\%$$

- Prevalence is a useful measure for quantifying the burden of disease in a population at a given point in time
- Calculating prevalence of various conditions across different geographical areas or amongst different sub-groups of the population and then examining prevalence of other potential risk factors can be of particular use when planning health services
- Prevalence is not a useful measure for establishing the determinants of disease in a population

**Uses of Prevalence:**

- Prevalence helps to estimate the magnitude of health/disease problem in the community and identify potential high-risk population.
- Prevalence rates are especially useful for administrative and planning purposes e.g. hospital beds, manpower needs, rehabilitation facilities etc.,

### 3.1.5 Relationship between Prevalence and Incidence:

Prevalence depends on the rate at which new cases of disease develop (i.e. incidence rate) as well as the duration or length of time that individuals have the disease. The relationship between prevalence and incidence is as follows:

$P / (1-P) = I \times D$ , where P=Proportion of the total population with the disease and I is incidence rate and 1-P is the proportion of the total population without the disease.

A population, in which the numbers of people with and without the disease remain stable, is known as a steady-state population. In such (theoretical) circumstances, the point prevalence of disease is approximately equal to the product of the incidence rate and the mean duration of disease. That is  $P=I \times D$

### 3.2 Life Table, Kaplan-Meier

One important method of assessing the health of a population is to ask how long people can expect to live. Life expectancy, usually reported at birth although it can be applied to other ages as well, is a commonly used summary measure which can also be used to compare against countries. Life expectancy is calculated by using life tables.

#### 3.2.1 Life tables

Life table is a mathematical table which shows, for a person at each age, what the probability (chances) is that they die before their next birthday. The hypothetical group or cohort of people loses a predetermined proportion at each age, and thus represents a situation that is artificially contrived. From this starting point, a number of statistics can be derived and thus also included in the table is:

- the probability of surviving any particular year of age
- the remaining life expectancy for people at different ages
- the proportion of the original birth cohort still alive.

Life tables are usually constructed separately for men and for women because of their substantially different mortality rates.

Life tables are used by epidemiologist, physicians, zoologists, manufacturers and other scientists.

#### 3.2.2 Types of Life Tables:

- I) Current Life Table and Cohort Life Table.

- a) Current Life Table is based upon the mortality experience of a community for a short period of time viz: One year, three years etc for which the mortality of community has not changed substantially.
- b) Cohort or generation life table is based on the mortality experience of a birth cohort (persons born during one particular year).Cohort life table would observe the mortality experience of that particular birth cohort from its beginning till the death of all the cohort members.

II) Complete and Abridge Life Table: In complete life table information is given for every single year of age from birth until the last applicable age In abridged life tables information is give only for broader age interval such as  $x$  to  $x+5$  years.

III) Single Decrement and Multiple Decrement Life Table: The Life Table which describes the attrition caused by a given single factor (e.g.: mortality) is called a single decrement life table. On the other hand the life table that considers attrition to the size of a group from two or more causes is called multiple decrement life tables.

### 3.2.3 Construction of life tables

Age specific mortality rates are applied to a notional (hypothetical) population, typically of 100,000 (Radix). Starting at birth, the probability of dying in each period is applied to the number of people surviving to the beginning of the period, so that the initial figure slowly reduces to zero. The different elements required for a life table include (using standard notations)

Age	Age interval $x$ to $x+n$
$nq_x$	Probability of dying in the age interval $x$ and $x+n$ for those alive at the beginning of the interval
$l_x$	Number of survivors (alive) at age $x$ (Radix)
$nD_x$	Number of deaths between age $x$ and $x+n$
$nL_x$	Number of person years lived between age $x$ and $x+n$
$T_x$	Total number of person years lived after age $x$
$e_x$	Life expectancy at age $x$

This sort of life table is based on current age-specific death rates for each age or age interval and is called period life tables. In contrast, actual life expectancy of a particular birth cohort can only be calculated when everyone in this cohort is dead. This approach uses a cohort life

table.

### 3.2.4 Assumptions Involved in Construction of Life Tables:

1. People die (mortality) at each age according to a schedule that is fixed in advance and does not change.
2. At each age, excepting first few years of life, deaths are evenly distributed between one birthday and the next.
3. The cohort originates from a fixed number of births (radix i.e. 1000,10000 etc births). This facilitates for comparison between different life tables.
4. The age specific death rates (ASDR) in the life table population are the same as the age specific death rates in the actual population during a specific period.

### 3.2.5 Life Table for Clinical Data:

In Life table given mortality rates experienced by hypothetical cohort, expectation of life is calculated. In clinical setup it may not possible because the onset of a disease (incidence) and person dying. Hence it is necessary to construct a life table by considering number of persons surviving with the disease, likely to die (out of cohort) after certain time. Hence it is possible to estimate the chances of surviving with the disease through survival analysis. Survival analysis (also known as the **time-to-event** analysis) includes similar concepts to both the incidence risk and the incidence rate.

Survival analysis answers to the questions of the chance of survival after being diagnosed with the disease or after beginning the treatment. The event can be any other health event not only just death. Survival analysis handles variable time of entry and variable time of withdrawal of individuals from population. It also calculates cumulative event-free probabilities and generates a survival curve.

#### **Example:**

A group of 200 subjects were followed for **three years**. The event (death due to cancer) occurred throughout the three years period. It is required to find out what is the chance of surviving at the end of the three years.

**Table: Survival Analysis (No censored data)**

Time since beginning of follow-up (years)	Number at beginning	Deaths due to cancer	probability of dying during the time interval	Probability of surviving in the time interval	Cumulative probability of surviving at the beginning of the interval
Interval	$l_t$	$d_t$	$q_t = d_t/l_t$	$p_t = 1 - q_t$	$P_t$
(1)	(2)	(3)	(4)	(5)	(6)
1	200	40	0.2000	0.8000	1.00
2	160	50	0.3125	0.6875	0.80
3	110	60	0.5454	0.4546	0.55
					0.25

**Calculation:**

**Col: 1 Time Since beginning of follow-up (time-interval in Years).**

**Col:2: Number at beginning (Data collected from clinical observation.)**

**Col:3: Deaths due to cancer**

**Col:4: Probability of dying during the time interval (40/2000= .2000)**

**Col:5: Probability of Surviving in the time interval (1-.2000=0.8000)**

**Col:6: Cumulative Probability of Surviving at the beginning of interval ( $P_1=1$ ,  $P_2 = p_1 * P_1$ ,  $P_3 = p_2 * P_2$  and so on)**

From the above table we can derive:

1. The cumulative probability of surviving at the beginning =1.0 (all survived)
2. The cumulative probability of surviving to the **beginning of the second year** =0.80
3. The cumulative probability of surviving at the end of the first year=0.80
4. The cumulative probability of surviving at the beginning of forth year or end of third year =0.25

From the above survival table we can derive probability of surviving at the beginning of interval. In the above example of finding out probability of surviving of cancer persons, there may be patients who might have migrated to different place or refused to participate in the study for further period are considered as lost to follow up. Such kind of lost to follow up cases are eliminated from the study and life table can be constructed. The cases which are “lost to follow up” for different reasons are identified as “**Censored**” cases and probability of surviving with the disease can be estimated as follows:

**Table: Survival Analysis for Censored data**

Time since beginning of follow-up (years)	Number at beginning	Deaths due to cancer	Number withdrew (Censored)	Adjusted number at risk of the event in the interval	probability of dying during the time interval	Probability of surviving in the time interval	Cumulative probability of surviving at the beginning of the interval
Interval	$l_t$	$d_t$	$W_t$	$l'_t$	$q_t = d_t/l'_t$	$p_t = 1 - q_t$	$P_t$
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	200	40	50	175	0.2285	0.7715	1.0000
2	160	50	30	145	0.3448	0.6552	0.7715
3	110	60	30	95	0.6315	0.3685	0.5055
							0.1863

Those who are censored during an interval are assumed to have been followed, on average, for half the interval. Hence  $l'_t = l_t - W_t/2$

The cumulative probability of surviving at the beginning of fourth year or end of third year = 0.1863 with censored observations. Survival analysis method can be adopted for time interval data also.

**Assumptions:**

1. There are no changes in survivorship over calendar times.
2. The experience of individuals who are lost to follow-up is the same as the experience of those who are followed.
3. Withdrawal occurs uniformly within the interval
4. Event occurs uniformly within the interval.

**3.2.6 Kaplan-Meier Method of Life Table Construction:**

Kaplan-Meier is also a survival analysis method. It is very similar to clinical life table method but it uses the **exact times that event occurred**, rather than the intervals of follow-up. In this method the probability of the event is equal to the number of events at that time divided by the number at risk at the point in time. Further if there are withdrawals before the time event, they are subtracted from the number at risk.

**Example:**

8 patients were admitted with cardiovascular disease. Among that 5 patients died at 5th, 10th, 14th, 24th month and 26 month. There were 3 lost to follow-up occurred before 10 months and before 24, before 26 months.

**Table: Kaplan-Meier Survival Table:**

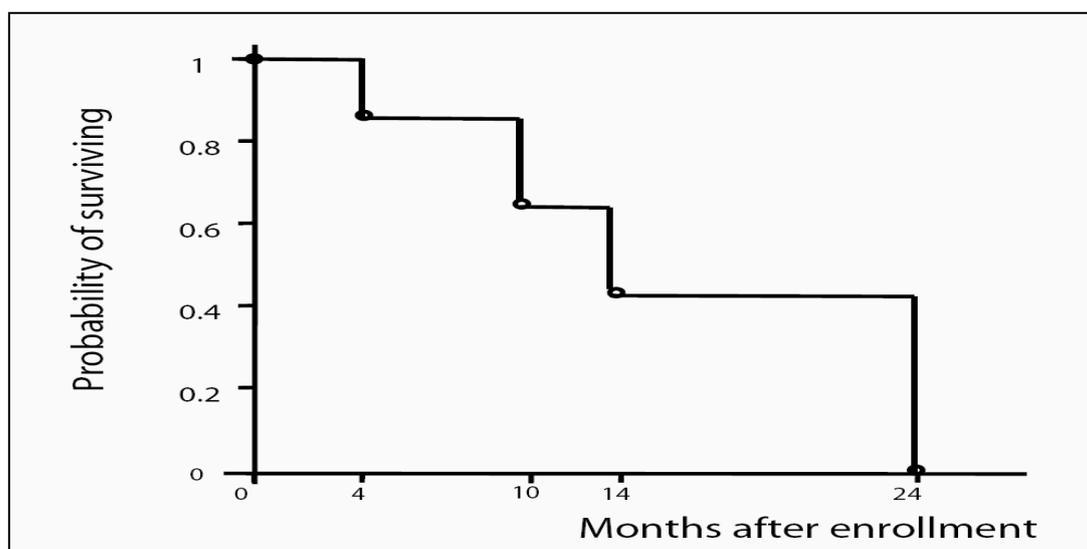
Time to Deaths (months)	Number alive	Lost to follow-up	died	$q_t$	$p_t$	$P_t$
(1)	(2)	(3)	(4)	(5)	(6)	(7)
5	8	1	1	0.1429	0.8571	0.8571
10	6	0	1	0.1667	0.8333	0.7142
14	5	1	1	0.2500	0.7500	0.5357
24	3	1	1	0.5000	0.5000	0.2678
26	1	0	1	1.0000	0.0000	0.0000

Kaplan-Meier Table is similar to the clinical life table. Instead of intervals, it uses the exact time of events. In the above example, the events occurred at 5,10,14,24 and 26 months. All other calculations viz:  $q_t$ ,  $p_t$  and  $P_t$  are the same. The calculated cumulative probability of surviving is for that time point. Up to that time point, the cumulative probability of surviving takes on the value of the previous time point, thus leading to a step function (see K-M plot).

### 3.2.7 Use of Kaplan-Meier Method:

1. K-M method takes advantage of all information available in the calculation and is useful for small sample size.
2. Clinical studies use K-M plots to display prognosis over time and K-M estimates can be used for comparison purpose in clinical trials when groups are similar and adjustment is not needed.

### 3. Kaplan- Meier Plot:



## 1.3 Basic Measures of health and demography

### 3.3.1 Concepts and definitions:

**1. Health:** According to WHO, Health is defined as “Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity”. It is difficult to measure health according to above definition; however it remains as ideal definition. Health is also identified the state of “not well”, “ill “or “morbidity” or “sickness”. Further “death”, which is caused by illness or sickness, reflects the condition of Health. Hence measurement of “Mortality” and “Morbidity” reveals of Health condition of a community.

**2. Morbidity:** A “Morbid condition” appears due to any attack of one or more “diseases” or “injury”. The term “disease” denotes a disturbance in the normal physical and/or mental health. And “injury” is a condition produced by an external cause such as violence, accidents, poisoning or misadventure

Health is a state of “relative equilibrium of body form and function which results from its successful dynamic adjustment to forces tending to disturb it. It is not passive interplay between body substance and force impinging upon it but an active response of body forces working toward readjustment”.

‘Health’ does not merely means obscene of disease or provision of diagnostic, curative and preventive services. The state of positive health implies “perfect functioning” of the body and mind.

### 3.3.2 Measures:

Disease, illness or sickness measured by calculating:

1. Incidence rate,
2. Prevalence rate: Period Prevalence Rate, Point Prevalence Rate.
3. Attack Rate, Secondary Attack Rate.
4. Case fatality Rate
5. Attack Rate
6. Case Fatality Rate
7. Duration of illness or sickness
8. Other measures: Relative Risk, Attributable Risk and odds ratio

Item 1 to 2 has been discussed earlier in this chapter.

#### 1. Attack Rate:

When a population is exposed to the risk of a disease for a limited period of time , then the

incidence rate may be termed as “attack rate”. It relates the number of cases in the population at risk and reflects the extent of the epidemic.

$$\text{Attack rate} = \frac{\text{Number of new cases of specified disease during its specified time interval}}{\text{Total population at risk during the same interval}} \times 100$$

## 2. Secondary attack Rate:

Secondary attack rate is defined as “the number of exposed persons developing the disease within the range of the incubation period, following exposure to the primary case”

$$\text{Secondary attack} = \frac{\text{Number of exposed persons developing the disease within the range of the incubation period}}{\text{Total number of exposed "susceptible" contact}} \times 100$$

## 3. Case fatality rate:

Number of new cases of illness or injury ( $I_i$ ) for a specific cause, during a specified period and  $D_i$  is the deaths due to that specific cause in the same period and community:

$$\text{Case Fatality Rate} = \frac{D_i}{I_i} \times 1000$$

The case fatality rate is intended to measure the risk of death from a specific condition among those suffering from it. Case fatality rate usually computed only for acute conditions of a relatively short duration.

Case fatality rate represents the “number of persons died” due to a disease. The time interval is not specified. Case fatality rate is typically used in acute infections such as measles, cholera, food poisoning etc.,

## 4. Duration of Illness:

$$\text{a) Average duration of illness} = \frac{\text{Total days of illness of all sick persons}}{\text{Total Population Exposed}}$$

Per **person**

$$\text{b) Average duration of illness} = \frac{\text{Total days of illness of all sick persons}}{\text{Number of persons fell ill}}$$

Per **person sick**

$$\text{c) Average duration of illness} = \frac{\text{Total days of illness of all sick persons}}{\text{Number of spell of illness}}$$

Per **spell**

## 5. Other measures:

1. Relative Risk (risk ratio)
2. Attributable Risk
3. Odds Ratio (cross product ratio)

These above measures depend on study design; in a cohort study Relative risk and Attributable risk can be calculated. In Case Control study Odds ratio can be calculated.

**Example:** It is intended to measure association between Cancer and smoking.

Cigarette Smoking	Developed Cancer	Not Developed Cancer	Total
Yes	80 (a)	3200 (b)	4000 (a+b)
No	6 (c)	4994 (d)	5000 (c+d)

**Relative Risk (RR)** =  $\frac{\text{Incidence of disease (or death) among exposed}}{\text{Incidence of disease (or death) among non-exposed}}$

$$\text{Relative Risk} = (a/a+b) = 80/4000 \times 1000 = 2.0$$

$$\text{Relative Risk} = (c/c+d) = 6/5000 \times 1000 = 1.2$$

$$\text{Relative Risk} = (a/a+b) / (c/c+d) = 2.0/1.2 = 1.67$$

Relative risk is a ratio and direct measure of the strength of the association between suspected cause (Cigarette smoking in the above example) and effect (Developed Cancer). Relative risk greater than one suggest “positive” association. In the above example Relative risk is 1.67 means that cigarette smoking causes cancer 1.67 times more among smokers than non-smokers. A relative risk less than one indicates a reduction in the incidence rate in exposed individual as compared with the unexposed.

### Attributable Risk (AR):

Attributable risk (AR) is the difference in incidence rates of disease (or death) between an exposed group and non-exposed group. Attributable risk is often expressed as a percent.

$$\text{AR} = \frac{\text{Incidence of disease rate among exposed} - \text{Incidence of disease rate among non exposed}}{\text{Incidence rate among exposed}} \times 100$$

Incidence rate among exposed

$$\text{Considering data from the above table: AR} = \frac{2.0 - 1.2}{1.2} \times 100 = 66 \text{ per cent}$$

Attributable risk indicates to what extent the disease under study can be attributed to the exposure. In the above example 66 per cent of the cancer among smokers was due to their smoking.

### Odds Ratio:

Odds Ratio is a measure of the strength of association between risk factor and out come between case and control.

**Example:** A case control study of smoking and cancer.

	Case	Control
Cigarette Smoking	Developed Cancer	Not Developed Cancer
Smoker	84 (a)	32 (b)
Non Smoker	6 (c)	28 (d)
Total		

$$\text{Odds Ratio} = \frac{ad}{bc} = \frac{(84 \times 28)}{(6 \times 32)} = \frac{2352}{192} = 12.25$$

Results show that smokers showed a risk of cancer 12.25 times that of non-smokers.

## 3.4 DEMOGRAPHIC MEASURES:

### 3.4.1 MORTALITY RATES

1. Crude death rate
2. Specific death rate: Age specific death rates, Sex specific death rate, Cause specific death rate  
Infant Mortality rate  
Neonatal Mortality rate  
Post Neonatal mortality rate  
Perinatal mortality rate  
Foetal Death rate  
Still Birth
3. Method of Indirect Estimation of Infant Mortality
4. Maternal Mortality rate
5. Proportional mortality rate (ratio)
6. Expectation of life at birth
7. Survival rate

#### 1. Crude Death Rate:

The simplest measure of mortality is the “Crude death rate (CDR); It is defined as:

$$\text{Crude Death rate} = \frac{\text{Number of deaths during the year in a given Geographic area}}{\text{Midyear population in the same year and same area}} \times 1000$$

**Example:**

The CDR for Greater Bombay for year 1989 may be computed as follows:

Total number of deaths during the year 1989 = 73469

Total population at the middle of the year i.e., midyear population during 1989 = 8243405

Therefore, the CDR for greater Bombay for 1989 =  $\frac{73469}{8243405} * 1000 = 8.9$

Crude Death rate (CDR) summarises the effect of two factors:

a). Population Composition and

b). Age specific death rates.

Hence Crude death rate is a “crude” measure. To overcome the limitations, rates have been calculated by age, sex and cause.

If satisfactory estimates of under-registration of deaths and under-enumeration of population are available, CDR may be adjusted according to the formula:

$$\text{CDR} = \frac{\text{Deaths} / \% \text{ completeness of registration of deaths}}{\text{Deaths} / \% \text{ completeness of the census count (population count)}}$$

**Monthly Death Rate:**

Crude Death rate is the annual rate. However, the seasonal variation in mortality within the year can be examined through the monthly death rate as follows:

$$\frac{\text{Deaths in a particular month}}{\text{Average Population in that month}} \times 365 \times 1000$$

**2. Specific Death Rates:**

Specific death rate is calculated for 1. **Age-specific,-Sex specific** and 2. **Cause or disease specific** viz: tuberculosis, cancer, accident etc. Rates can also be made specific for many other variables such as income, religion, caste, housing etc., specific death rates can help us to identify particular groups “at risk”.

$$\text{Age Specific Death Rate (15-19 years)} = \frac{\text{Number of deaths in the age group 15-20 years in a given year and in a given Geographic area}}{\text{Mid-year population of persons in the age group 15-19 in same year and in a given Geographic area}} \times 1000$$

Similarly Age Specific Death Rates can be calculated for the age groups 20-24, 25-29, 30-34, 35-39, 40-44, 45-49 and other age groups according to the availability of the data about

deaths in that specific age group and deaths in the same age.

$$\text{Cause Specific Death Rate} = \frac{\text{Number of deaths due to particular cause in a given year and in a given Geographic area}}{\text{Mid-year population in same year and in a given Geographic area}} \times 1000$$

(Cause may be Cancer, TB etc)

$$\text{Sex Specific Death Rate} = \frac{\text{Number of Male deaths in a given year and in a given Geographic area}}{\text{Mid-year male population in same year and in a given Geographic area}} \times 1000$$

Sex-Age-cause specific death rate:

$$\text{Cause Specific Death Rate} = \frac{\text{Number of Male aged 60-65 deaths due to cancer in a given year and in a given Geographic area}}{\text{Mid-year male population 60-65 in same year and in a given Geographic area}} \times 1000$$

The denominator of cause specific death rate can be refined “persons suffering with particular cause, according to availability of data. This adjustment is done in case fatality rate.

### 3. Infant Mortality:

The deaths under one year of age are called infant deaths. The infant mortality rate is defined as the number of infant deaths occurring in a community within a specified calendar year per 1000 live births in the same community during the same calendar year.

$$\text{Infant mortality rate} = \frac{\text{Number of deaths in the age group 0-1 year after birth in a year}}{\text{Total number of live births in that year}} \times 1000$$

#### Example:

The Infant mortality rate for Greater Bombay for year 1989 may be computed as follows:

Total number of deaths (below 1 year) during 1989 = 10794

Total number of registered live births = 209325

Therefore, the Infant Mortality Rate for greater Bombay for 1989,

$$= \frac{10794}{209325} * 1000$$

= **51.6** per 1000 live births

To calculate Infant mortality rate **for a given calendar year** following information is required:

1. Total number of registered infant deaths in a particular area during in a calendar year
2. Total number of registered live births in that area during same calendar year

Infant Mortality rate is considered as the most sensitive indicator of general health and medical facilities available in the community. If mortality conditions improve, the infant mortality rate is affected. In the health centres, data on births, deaths during one year has been recorded. With this it is possibility of calculating correct IMR.

Infant Mortality rate calculation depends up on a) Number of deaths and b) number of live births in that calendar year. Formula given about can be corrected as follows:

Year	Live Birth	Infant deaths to the	
		Same year Births	Previous Year Birth
First Year (1)	B1	DSY1	DPY1
Second Year (2)	B2	DSY2	DPY2
Third Year (3)	B3	DSY3	DPY3

#### *Numerator Separation Method*

$$IMR = \frac{D2 * (1-f) + f * D2}{B2 + B1} * 1000$$

Where  $D2 = DSY2 + DPY2$      $f = DPY2 / D2$

DSY2: Number of Infant deaths to the second year births

DPY2: Number of infant deaths to the previous year births

#### *Denominator Separation Method:*

$$IMR = \frac{D2}{(1-f) B2 + f B1} * 1000$$

Where  $D2 = DSY2 + DPY2$      $f = DPY2 / D2$

B1 Number of births in the first year

B2: Number of births in the second year

**4. Neonatal Mortality Rate:** Mortality in the first year of life is frequently divided into neonatal mortality and post neonatal mortality that is mortality in the first four weeks of life and mortality between four weeks up to end of infancy (one year of life).

Neonatal Mortality is mortality in the first four weeks of life.

$$\text{Neonatal mortality rate:} = \frac{\text{Number of deaths between 0-4 weeks of life}}{\text{Total number of life births in that year}} \times 1000$$

**Example:**

The Neonatal mortality rate for Greater Bombay for year 1989 may be computed as follows:

Total number of deaths (between 0-4 weeks) during 1989 = 6673

Total number of registered live births during 1989 = 209325

Therefore, the neonatal Mortality Rate for greater Bombay for 1989 =  $\frac{6673}{209325} * 1000 = 31.87$

**5. Post Neonatal mortality:** Post Neonatal mortality is mortality between four weeks up to end of first year (12 months).

$$\text{Post Neonatal mortality rate:} = \frac{\text{Number of deaths between 4 to one year of life}}{\text{Total number of life births in that year}} \times 1000$$

$$\text{Or} = \frac{\text{Infant deaths} - \text{Neonatal deaths}}{\text{Total number of life births in that year}} \times 1000$$

**Example:**

The post neonatal mortality rate for Greater Bombay for year 1989 may be computed as follows:

Total number of deaths (1-4 year) during 1989 = 4121

Total number of registered live births during 1989 = 209325

Therefore, the Post neonatal Mortality Rate for greater Bombay for 1989

$$= \frac{4121}{209325} * 1000$$

$$= 19.68$$

Or

$$\text{Post Neonatal mortality rate} = \frac{\text{Infant deaths} - \text{Neonatal deaths}}{\text{Total number of live births in that year}} \times 1000$$

$$= 10794 - 6673 / 209325 * 1000 = \mathbf{19.68}$$

**Note:** The cause of death in infancy period is due to endogenous (biological) and exogenous (environmental) factors. Endogenous causes are related to congenital malformation, genetic disorder other biological factors. It is difficult to control exogenous factors. The Deaths due to environmental causes can be reduced by improvement in public health measures and practices.

The neonatal and post neonatal mortality rates are components of Infant mortality, which reflect the influence of biological and environmental factors respectively. With the decline of infant mortality, the proportion of neonatal mortality increases while the proportion of post neonatal mortality decreases, indicating improvement in public health measures.

**6. Perinatal Mortality:** Deaths between the periods of seven months of gestation (still birth) to the first week of life. The Perinatal mortality rate is defined as the number of deaths during the Perinatal period (the sum of late foetal deaths and early neonatal deaths) occurring in a community during specified year expressed as per 1000 of the sum of live births and still births during the same year.

$$\text{Perinatal mortality ratio} = \frac{\text{Stillbirths} + \text{Early Neonatal Deaths}}{\text{Still births}} \times 1000$$

$$\text{Perinatal mortality rate} = \frac{\text{Stillbirths} + \text{Early Neonatal Deaths (0 to one week)}}{\text{Live births} + \text{still births}} \times 1000$$

## 7. Foetal Deaths:

A foetal death is defined as a death prior to **Live Birth**. Foetal death is defined as a “death or disappearance of life prior to the complete expulsion or extraction from its mother as a product of conception, irrespective of the duration of pregnancy and the foetus does show any other evidence of life, such as beating of the heart, pulsation of the umbilical cord or definite movement of voluntary muscles”. Foetal mortality is also referred as intra-uterine mortality. Foetal deaths include all events such as “miscarriages”, “abortions” and “still births”.

**Foetal Death Ratio:** The foetal death ratio is defined as the number of foetal deaths reported in a year per 1000 live births reported in the same year

$$\text{Foetal death ratio: } \frac{\text{Foetal Deaths in a year}}{\text{Total live births in that year}} \times 1000$$

In the above measure the numerator is not part of the denominator. If the numerator forms part of the denominator the ratio becomes a rate given by:

$$\text{Foetal death rate: } \frac{\text{Foetal Deaths in a year} \times 1000}{\text{Live births} + \text{Foetal deaths in that year}}$$

**8. Stillbirth:** Mortality after the twenty-eighth week of the gestational life is known as still birth also called late foetal deaths.

$$\text{Stillbirth ratio} = \frac{\text{Number of stillbirths}}{\text{Total live births}} \times 1000$$

### Example:

The Still birth ratio for Greater Bombay for year 1989 may be computed as follows:

Total number of still births, 1989 = 6174

Total live births = 209325

Therefore, the Still birth Ratio for greater Bombay for 1989 =  $\frac{6174}{209325} * 1000 = 29.49$

$$\text{Stillbirth rate} = \frac{\text{Number of stillbirths}}{\text{live births} + \text{Stillbirths}} \times 1000$$

**Example:**

The Still birth rate for Greater Bombay for year 1989 may be computed as follows:

Total number of stillbirths, 1989 = 6174

Total live births =209325

Therefore, the Still birth Rate for greater Bombay for 1989 =  $\frac{6174}{209325+6174} * 1000 = 28.64$

**9. Maternal Mortality:**

Maternal mortality represents all deaths of women attributed to complications of pregnancy, child birth and the puerperium occurring within 42 days after the termination of pregnancy. Puerperium is the period of 42 days after the child birth.

The Maternal mortality rate is defined as the number of female deaths due to puerperal causes among the residents of a community during a specified year per 10,000 live births.

**Maternal Mortality rate (MMR)** =  $\frac{\text{Number of female deaths due to puerperal causes}}{\text{Number of Live Births during same year}} \times 10000$

The Maternal Mortality rate provides a crude measure of the puerperal risk. For true measure the denominator of MMR should take in to considerations of pregnancies instead of live births. But such information is not available. Hence, an approximation is used by adding the available foetal deaths to live births, with adjustment for multiple births.

**Example:**

The Maternal mortality rate for Greater Bombay for year 1989 may be computed as follows:

Total number of live births during 1989 = 209325

Total number of female deaths due to puerperal causes during 1989 =118

Therefore, the maternal Mortality Rate for greater Bombay for 1989 =  $\frac{118}{209325} * 10000 = 5.63$

**10. Proportional mortality rate (Ratio):**

To consider variation of deaths by age and cause, Proportional mortality rate has been derived. Proportional mortality rate expresses the “number of deaths due to a particular cause for a specific age group per 1000 total deaths”. Proportional mortality rate is a measure of health status of a particular age group in relation to total population.

Proportional mortality rate for aged 60 and above

$$\frac{\text{Number of deaths in the age group } 60+x}{\text{Total Number of deaths of all age groups in that year}} \times 100$$

Under -5 proportionate mortality rate

$$\frac{\text{Number of deaths under 5 years of age in a given year}}{\text{Total Number of deaths during in that year}} \times 100$$

**Example:**

Under-5 proportional mortality rate (ratio) for Greater Bombay for year 1989 may be computed as follows:

Total number of deaths under 5years age during 1989 = 14915

Total number of deaths of all age during 1989 =73469

Therefore, the proportional mortality rate (ratio) for greater Bombay for 1989 =  $\frac{14915}{73469} * 100$   
**=20.3**

Proportional mortality rate from a specific disease

$$\frac{\text{Number of deaths from the specific disease in a given year}}{\text{Total Number of deaths from all causes in that year}} \times 100$$

Proportional mortality rate is computed usually for communicable diseases and for a specific disease of major public health importance, such as cancer, coronary heart disease etc.,

**Example:**

The proportional mortality rate (ratio)from a specific disease (Tuberculosis) for Greater Bombay for year 1989 may be computed as follows:

Total number of deaths from specific disease (Tuberculosis) during 1989 = 7011

Total number of deaths from all causes during 1989 =73469

Therefore, the proportional mortality rate (ratio) from a specific disease (Tuberculosis) for greater Bombay for 1989 =  $\frac{7011}{73469} * 100 = 9.5$

## 11. Survival Rate:

$$\frac{\text{Total number of patients alive after } X \text{ years}}{\text{Total number of patients diagnosed or treated}} \times 1000$$

Total number of patients diagnosed or treated

X=5 years, 6 years or 10 years etc.

### 3.4.2 Method of Indirect Estimation of Infant Mortality

**Feeney in 1980** proposed a method to estimate IMR by age of mother and reference period. Using CEB and children surviving data and mean age at childbearing, one can easily estimate IMR and years prior to census (i.e. reference period of IMR). The mean age at childbearing can be estimated using either ASFR or average parity by age. If ASFR ( ${}_5f_x$ ) is available one can use formula to estimate mean age of child bearing (M).

$$M = \frac{\sum_{15}^{45} x + 2.5 \cdot {}_5f_x}{\sum_{15}^{45} {}_5f_x}$$

In case, ASFR is not available then M can be calculated:

$$M = 2.25 \frac{P_3}{P_2} + 23.95$$

The proportion of deceased by age of mother can be calculated using CEB and CS data. For  $i^{\text{th}}$  age group it is given as:

$$Q = \frac{CEBi - CSi}{CEBi}$$

$$= 1 - \frac{CSi}{CEBi}$$

After estimating M and Q, the IMR and reference time are estimated using following table:

#### Estimation of IMR from Proportions of Deceased Children among Children Born to Women in Five Years Age Groups and the Mean Age at Childbearing

Age group	IMR	Years prior to census
20-24	$(-44.7 + 30.5M)Q_2 - 2.6$	$11.8 - 0.325M - 0.17Q_2$
25-29	$(294 + 14.9M)Q_3 - 2.9$	$16.5 - 0.424M + 0.16Q_3$
30-34	$(357 + 10.4M)Q_4 - 2.8$	$20.6 - 0.49M + 0.77Q_4$
35-39	$(362 + 9.77M)Q_5 - 7.8$	$24.9 - 0.556M + 0.80Q_5$
40-44	$(282 + 11.0M)Q_6 - 8.5$	$38.1 - 6.33M + 0.87Q_6$
45-49	$(216 + 11.1M)Q_7 - 7.5$	$33.4 - 0.641M + 1.58Q_7$

The method discussed above is applicable when fertility and mortality for a population had remained constant.

### 3.4.3 BASIC MEASURES OF FERTILITY

The four basic measures of fertility that are commonly used in fertility analysis are:

1. Crude Birth Rate
2. General fertility Rate
3. Age specific fertility rate
4. Total Fertility Rate
5. Gross reproduction rate (GRR)
6. Net reproduction rate (NRR)

All other measures of fertility that is used in the analysis of fertility is the extensions of the above four measures. For instance marital, order and parity specific fertility rates, etc are the extended versions of the above four basic measures.

#### 1. Crude Birth Rate:

It is defined as the ratio of total live births in a calendar year in a particular area to the total midyear population of that area multiplied by K.

Symbolically,

$$CBR = \frac{B}{P} * 1000$$

Where, **B** is total number of live births in a year

**P** is the total population in the middle of the year; and

**K** is constant, called radix and usually taken as 1000.

#### Illustration:

For example, the CBR for India in 2001 is obtained as:

Total number of live births: 4899

Total population in the Ward A of the greater Bombay is: 168218

$$CBR = 4899 / 168218 * 1000$$

$$CBR = 29.12$$

## 2. General fertility Rate:

General fertility rate is defined as the ratio of total number of births in a year to the midyear female population of child bearing ages either 15-44 or 15-49

Symbolically,

$$\text{GFR} = \frac{B}{F_{15-49}} * 1000 \text{ or}$$

$$\text{GFR} = \frac{B}{F_{15-44}} * 1000$$

Where B is total number of Births

$F_{15-49}$  /  $F_{15-44}$  is midyear female population of child bearing ages either 15-44 or 15-49

For example, the GFR for India in 2011 is obtained as:

$$\text{GFR} = \frac{20308167}{311602551} * 1000$$

$$\text{GFR} = 65.1733$$

## 3. Age specific fertility rate:

The Age specific fertility rate is defined as the number of births per year 1000 women of a specified age. Age specific fertility rates may be computed either for single years of age or for age intervals. When defined for 5years age groups ASFR may be written as:

ASFR = Number of live births to mothers of a specified age group / Midyear female population of the specified age group / 1000

Symbolically,

$${}_5f_x = {}_5B_x / {}_5F_x * 1000, x = 15, 20, 25, 30, 35, 40, 45$$

For single years of age:

$$f_x = B_x / F_x * 1000, x = 1, 2, 3, \dots, 49.$$

Where,  ${}_5f_x$  is ASFR of women aged x to x+5 years,

${}_5F_x$ : The number of females aged x to x+5 years

${}_5B_x$ : The number of births to women aged x to x+5 years

For example: In 1997-2000, ASFR for Egypt\* obtained as:

Age Group x- x+5	Number of women of specified age 5F <sub>x</sub>	Number of Births to women of specified age 5B <sub>x</sub>	Age specific fertility rate(per 1000 women) 5f <sub>x</sub>
(1)	(2)	(3)	(4)
15-19	14893.	764	51
20-24	11747	2304	196
25-29	9602	1994	208
30-34	8805	1295	147
35-39	7549	564	75
40-44	6643	161	24
45-49	4498	19	4

\*DHS data for Egypt

#### 4. Total Fertility Rate:

Total fertility rate is defined as the number of children which a woman of hypothetical cohort would bear during her life time if she were to bear children throughout her life at the rates specified by the age specific fertility rate for the particular year if none of them dies before crossing the age of reproduction. TFR is computed as the sum of the age specific fertility rates of women by single years of age from 15-44 (or 15-49) and is expressed 'per woman' ie, the sum is divided by 1000. If the ASFRs are given for 5 year- age intervals, the sum is to be multiplied by 5 and divide by 1000. If the ASFRs are given per women then there is no need to divide by 1000.

Symbolically,

For single years of age data TFR per woman is given by

$$TFR = \sum_{x=15}^{49} f_x / 1000, x = 15,20,25,30,35,40,45$$

For 5 years of age groups of data TFR per woman is given by

$$TFR = \frac{5 * \sum_{x=15}^{49} 5f_x}{1000} = \frac{5 * \sum_{x=15}^{49} \frac{5B_x}{5F_x}}{1000},$$

Where,  $B_x$  and  $F_x$  are number of births and number of women in the age-group x to x+5

Illustration:

$$\begin{aligned} \text{TFR} &= 5 \cdot (51 + 196 + 208 + 147 + 75 + 24 + 4) / 1000 \\ &= 5 \cdot 705 / 1000 \\ &= 3.525 \end{aligned}$$

The TFR for Egypt (Demographic and Health Survey, 2000) was 3.525 births per woman or 3525 births per 1000 women.

### 3.4.4 MEASURES OF REPRODUCTION:

#### 1. Gross reproduction rate (GRR):

The gross reproduction rate (GRR) is the average number of daughters that would be born to a woman (or a group of women) if she passed through her child-bearing years and conformed to the age-specific fertility rate of a given year.

For single year age data:

$$\text{GRR} = \sum_{x=15}^{49} fF_x, x = 15, 16, \dots, 49$$

For 5year age data:

$$\text{GRR} = \sum_{x=15}^{49} \left( \frac{{}_5B_x^f}{{}_5F_x} \right) = 5 \cdot \sum_{x=15}^{49} {}_5f_x^F$$

$$x = 15, 20, 25, 30, 35, 40, 45$$

Where,

${}_5B_x^f$  is the number of female live births to mothers of the age group  $x-x+5$

${}_5F_x$  is the midyear female population of the age group  $x-x+5$

${}_5f_x^F$  is the number of female births per woman of age group  $x-x+5$

Illustration: The GRR of India in 2001 is obtained as:

Age Group	Number of women of specified ages	Number of daughters born to women of specified ages	Age specific maternity (or female fertility) rate
x- x+n	${}_5F_x$	${}_5B_x^f$	${}_5f_x^f$
(1)	(2)	(3)	(4)
15-19	46275899	628806	0.0136
20-24	43442982	3036215	0.0699
25-29	41864847	2688718	0.0642
30-34	36912128	1489590	0.0404
35-39	34535358	781086	0.0226
40-44	25859582	391358	0.0151
45-49	22541090	434379	0.0193
Total	-	-	0.2451

$$GRR = \sum_{k=15}^{45} \left( \frac{{}_5B_{kx}^f}{{}_5F_x} \right) = 5 * \sum_{k=15}^{45} ({}_5f_{kx}^f) = 5 * 0.2451 = 1.2254$$

The GRR of India in 2001 was 1.2 births per woman.

## 2. Net reproduction rate (NRR):

The net reproduction rate (NRR) indicates the experience of a hypothetical cohort of females which undergo the current schedule of fertility and mortality. It is the average number of daughters that would be born to a female (or a group of females) if she passed through her lifetime conforming to the age-specific fertility and mortality rates of a given year.

For single year age data:

$$NRR = \sum_{k=15}^{49} f_{kx} * \left( \frac{L_x}{l_0} \right), x = 15, 16, \dots, 49$$

For 5year age data:

$$NRR = \sum_{k=15}^{49} {}_5f_{kx} * \left( \frac{L_x}{l_0} \right), x = 15, 16, \dots, 49$$

$$x = 15, 20, 25, 30, 35, 40, 45$$

Where,

${}_x F_x$  is the age specific fertility rates (considering only female births);

And  $\frac{{}_5 L_x}{l_0}$  is the number of person years per woman in the hypothetical cohort (taken from a female Life table)

Illustration: The NRR of India in 2001 is obtained as:

Age Group	Number of women of specified ages	Number of daughters born to women of specified ages	Age specific maternity (or female fertility) rate
$x - x+n$	${}_5 F_x$	${}_5 B_x^f$	${}_5 f_x^f$
(1)	(2)	(3)	(4)
15-19	0.0136	4.3691	0.0594
20-24	0.0699	4.3199	0.3019
25-29	0.0642	4.2649	0.2739
30-34	0.0404	4.2080	0.1698
35-39	0.0226	4.1482	0.0938
40-44	0.0151	4.0831	0.0618
45-49	0.0193	4.0002	0.0771
Total	-	-	1.0377

Source: SRS based abridged life tables, 1999-2003

$$NRR = \sum_{k=15}^{45} \left( \frac{{}_5 B F_x}{{}_5 F_x} \right) * \left( \frac{{}_5 L_x}{{}_5 L l_0} \right)$$

$$= 1.0377$$

# CHAPTER 4

## SOURCES AND QUALITY OF HEALTH DATA

### Overview:

The Chapter on, 'Sources and Quality of Health Data' explains the National Systems of Health Statistics, explicitly giving information about administrative statistics, distribution of statistical responsibilities in different parts of the country, sources of data, nodal agencies involved and their role in co-ordination, data recording and compilation processes – organisation of data – types of data in organized forms, HMIS and limitations. The Chapter also presents various sources of health data namely vital registration system, surveys and census statistics. Management of international classifications of diseases and methods of assessing quality of health statistics are also discussed in the chapter.

### 4.1 National Systems of Health Statistics

#### 4.1.1 Administrative Statistics

Administrative data refers to information collected primarily for administrative (not research) purposes. This type of data is collected by government departments and other organisations for the purposes of registration, transaction and record keeping, usually during the delivery of a service. Administrative data is the set of units and data derived from an administrative source. Any data generated by any government agency other than the National Statistical Office and its counterparts at the state level. An alternative way of defining administrative data is when the specific identity of the respondent or data source is central to the use of the data. Though this data is similar to survey data in many aspects the main difference is that this has been collected from administrative records rather than direct contact with respondents. The source of administrative statistics is the register of units and data associated with an administrative regulation or group of regulations.

Administrative data is mainly collected for following three broad categories of purposes:

- (a) Monitoring of government programmes and other forms of government intervention;
- (b) Enabling regulatory activities and audit actions; and
- (c) Targeting outcomes of government interventions.

In India, a very large volume of data is generated by administrative ministries and state governments for each of these purposes.

#### **4.1.2 Distribution of statistical responsibilities in different parts of the country**

The Indian federal structure has influenced the administrative statistics. The division of administrative functions between the Government of India and the State Governments is on the basis of the subject classifications under the Union, State and Concurrent Lists as detailed in the Constitution of India. At the Centre, the responsibilities are further divided amongst the various ministries and departments, according to the Allocation of Business Rules, 1961 that are amended from time to time. The collection of statistics on any subject generally vests in the authority (Central Ministry or Department or State Government Department) that is responsible for that subject according to its status in the Union, State or Concurrent Lists. By and large, the flow of statistical information emanates from the States to the Centre except in cases where the State-level operations are an integral part of Centrally- sponsored schemes or data are collected through national sample surveys.

#### **4.1.3 At the Centre**

The collection of statistics for different subject-specific areas, like health, agriculture, labour, commerce, industry, etc. vest with the corresponding administrative ministries. More often than not, the statistical information is collected as a by-product of administration or for monitoring the progress of specific programmes. Some of the ministries, like Agriculture, Water Resources, Health, etc. have full-fledged statistical divisions, while most others have only a nucleus cell. Large-scale statistical operations like the Population Census, Annual Survey of Industries, Economic Census, etc. are generally centralised, and these cater to the needs of other ministries and departments, as well as State Governments. In important ministries, officers of the Indian Statistical Service (ISS) and subordinate statistical staff perform the statistical functions. The Central Statistical Office (CSO) in the Ministry of Statistics and Programme Implementation (MoS&PI) is the nodal agency for a planned development of the statistical system in the country and for bringing about coordination in statistical activities among statistical agencies in the Government of India and State Directorates of Economics and Statistics.

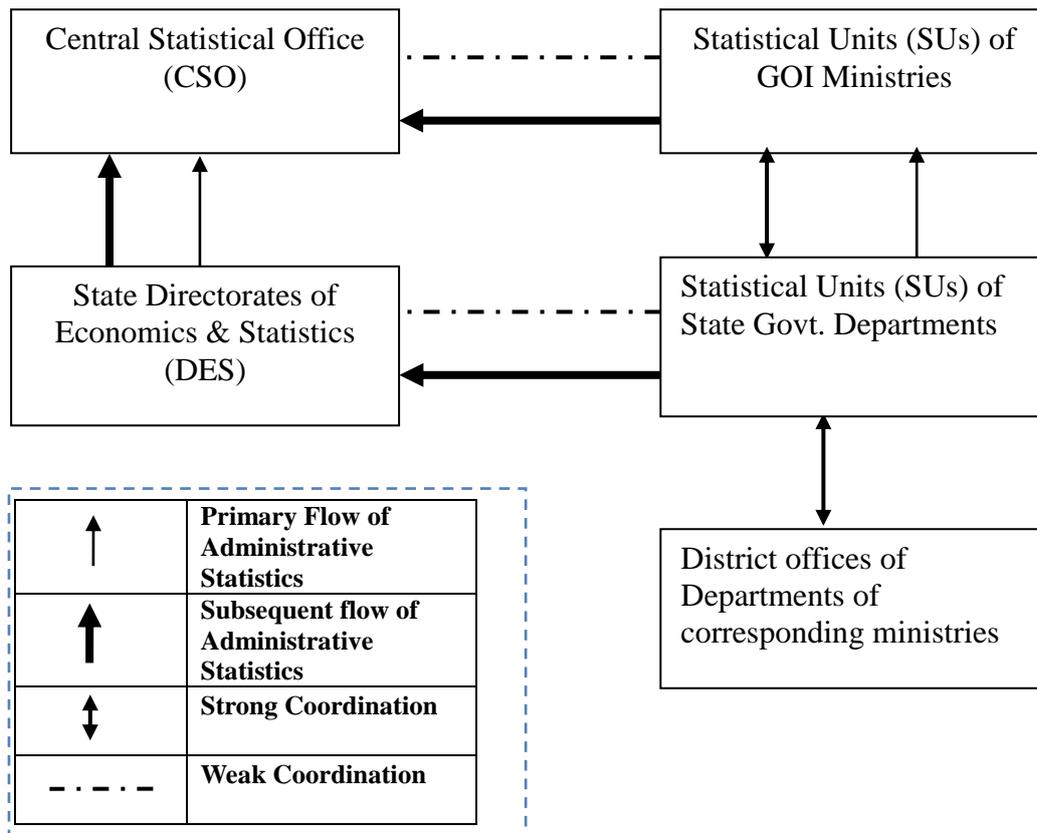
#### **4.1.4 At the State level**

The Statistical System in the States is similar to that at the Centre. It is generally decentralised laterally over the Departments of the State Government, with major Departments, such as, health or agriculture, having large statistical divisions for the work of departmental statistics. At the apex level is the Directorate (formerly Bureau) of Economics and Statistics (DES), which is formally responsible for the coordination of statistical activities in the State. The DESs have large organisations at the headquarters, with statistical offices in the districts and, in some cases, in the regions of the State. The statistical activity of the DESs is more or less uniform. They publish statistical abstracts and handbooks of the States, annual economic reviews or surveys, district statistical abstracts, and State budget analysis; work out the estimates of the State Domestic Product and Retail Price Index Numbers and engage in such other statistical activities as is relevant to the State. Most of them participate at least on a matching sample basis in the national Sample Survey Programme, and some of them carry out an Annual Survey of Industries for factories not covered by the ASI of the NSSO. Generally, the States do not have a common statistical cadre.

#### **4.4.5 System Flow**

The flow chart is given below attempts to depict a simplified version of the present Indian Statistical System, the flow of Administrative Statistics, and the links between different statistical offices and the strength of those links. It is a system built upwards from district offices of State Government departments, to the level of these departments, and from there to the corresponding ministries at the Centre. This is its true representation: a collection of State-level systems forming a National system.

*Flow Chart: Indian Statistical System*



**The main features of the Indian Statistical System can be thus summarised as:**

- (a) The Administrative Statistics System is its major component;
- (b) It is laterally and vertically decentralised;
- (c) In it, not only data collection but also compilation, processing and preparation of results are carried out by the States for most of the sectors; and
- (d) It is the State-wise results, which flow to the Centre, and statistics at the all-India level are obtained as the aggregates of State-level statistics.

**Table 1: Sources of vital statistics in India and their usability**

Source	Periodicity	Estimated Parameters	Small area estimates	Usability
SRS	Annual, Since 1970	Fertility & Mortality Indicators like CBR, TFR, CDR, IMR, NNMR, PNNMR, U5MR, Sex Ratio (0-4)	State level estimates for big states, recently, intra state regions and National Level	Representative sample, Regular reports, Reliable.
Census	10 Years	Population count by age sex, area, IMR & Child Mortality	Population count down to village level, Mortality: District level.	Reliable & valid population data in about 2 years. About 8 years lag for indirect estimation of Fertility & Mortality
CRS	Annual, 1958	Fertility & Mortality Indicators	District level and Sub-district level (large cities with 10000 population)	Yearly data for causes of death disaggregated by age, sex, type of residence; Data on trends related to vital events.
NFHS	6 Years I:92-93, II:98-99, III:05-06	Fertility & IMR (Indirect Estimates)	State level estimates	Indirect estimates. Quick estimates available within a year. Small sample size.
NFHS –IV	IV: 13-14	Fertility & IMR (Indirect Estimates)	District level estimates	Indirect estimates. Quick estimates available within a year. Increased sample size to around 6 lakh to provide reliable estimates at the district level
National Nutritional Monitoring bureau	Yearly	Nutritional Intake and Nutritional Status\	10 States: Kerala, TN, Andhra, Karnataka, Gujarat, WB, MH, UP, MP and Odisha	
SAGE	DK	Health Problems and prevalence	For few states	
NSSO	Rounds	CBR, CDR, Health Problems and prevalence	National and State level	Provides the reliable estimates
Annual Health Survey (AHS) (Now merged in NFHS)	Annual	CBR, CDR, IMR, Neo-natal MR, U5MR, MMR, SRB, Sex Ratio (0-4), Sex Ratio (All Ages)	District level (284 Districts) of Only EAG States & Assam	To yield benchmarks of core vital and health indicators at the district level and to map changes therein on an annual basis
Jansankhya Sthirata Kosh(National Population Stabilization Fund)	Annual	BPL Population in India. Literacy Rate in India.	State Level Health facility GIS Maps District Level Health Data	
WHO- Global Health Observatory Weekly epidemiological record World health statistics quarterly World health statistics Annual	Weekly Quarterly Annual	Wide variety of morbidity and mortality statistics	National level	

#### **4.1.6 Sources of Data:**

##### **1. WHO Reports**

**Global Health Observatory:** The Global Health Observatory (GHO) is an initiative of the World Health Organization to share data (through their website) on global health, including statistics by country and information about specific diseases and health measures. The GHO website is organized around themes. For each theme, key statistics are presented on the associated webpage, and more detailed data and reports are available for download. The themes include:

- Millennium Development Goals
- Estimates of mortality and global health
- Health systems
- Public health and environment
- Health Equity Monitor
- International Health Regulations Monitoring framework
- Urban health
- Women and health
- Non-communicable diseases
- Substance use and mental health
- Infectious diseases
- Injuries and violence

**Weekly epidemiological record, World health statistics quarterly, World health statistics**

##### **Annual:**

WHO's annual World Health Statistics reports present the most recent health statistics for the WHO Member States. These reports disseminate immense variety of morbidity and mortality statistics. All reports are available for download in Adobe PDF and excel when applicable.

##### **2. WORLD BANK**

Data from World Bank cover health systems, disease prevention, reproductive health, nutrition, and population dynamics. Data are from the United Nations Population Division, World Health

Organization, United Nations Children's Fund, the Joint United Nations Programme on HIV/AIDS, and various other sources.

**Health Stats-** It is World Bank's comprehensive database of Health, Nutrition and Population statistics.

**World development Indicators-** Data is available on large number of health indicators.

#### **4.1.7 Health Management Information Systems (HMIS):**

##### **Why Health Information System?**

- Good management is a prerequisite for increasing the efficiency of health services.
- Improved health information system is clearly linked to good management.
- Information is crucial at all management levels of the health services from periphery to the centre. It is required by policymakers, managers, health care providers, community health workers.
- "Changing the way information is gathered, processed, and used for decision-making implies changing the way an organization

##### **Definition:**

- **System** - Any collection of components that work together to achieve a common objective.
- **Health System** - All the activities whose primary purpose is to promote, restore or maintain health.
- **Information** - Meaningful collection of facts or data.
- **Information System** - Systems that provide specific information support to the decision-making process at each level of an organization.

- **Health Information System** - A set of components and procedures organized with the objective of generating information which will improve health care management decisions at all levels of the health system.
- *The ultimate objective of health information system is not “to gain information” but “to improve action”*

National Rural Health Mission (NRHM), which was launched by the Government of India in April 2005. NRHM has a mandate to bringing about dramatic improvement in the health system and the health status of the people, especially those who live in the rural areas of the country. Apart from several mechanisms that would be established under NRHM, one of the core strategies is the “Strengthening capacities for data collection, assessment and review for evidence based planning, monitoring and supervision”. As a step in this direction, the Ministry of Health and Family Welfare, GOI, has established a dedicated Health Management Information System (HMIS) portal for all Public Health related information. The HMIS web portal was launched in October, 2008 to enable capturing data from both public and private institutions in rural and urban areas across the country. The portal is envisaged as a “Single Window” for all public health data for the Ministry of Health and Family Welfare. The web portal also has data from NFHS, DLHS, and SRS etc. It is envisaged that it will also have data from Concurrent Evaluation of NRHM when the data is available. This HMIS has been initially rolled out up to the district level and as it stabilises, it will then be expanded to sub-district/block level. This HMIS portal captures data to be collected as per the revised HMIS formats on a web-based system at the District level so that primary data can be easily aggregated and the information/reports flow quickly to the Ministry directly from the districts. The system also enables information to be entered for each facility so that MIS reporting can be of a better quality as well as help in assessing facility-wise performance (Pandey et al., 2010).

The Health Statistics Information Portal (available at <http://www.nrhm-mis.nic.in>) will provide periodic reports on the status of the health sector. The MoHFW has evolved this HMIS web portal as an “Information Dissemination” media for all health related information which would facilitate various stakeholders to encourage debate and promote informed decision making in fine tuning health related policy initiative. The reports emanating from the data committed by the

States will be available in the public domain. The web portal, apart from various user friendly features, gives authorised users a provision for logging on to the portal and generating reports based on provisional data as well. The web portal has a “Notifications” section which contains important letters and instructions sent to the States regarding Monitoring and Evaluation as well as MIS activities.

In addition, one of the welcome steps envisaged under RCH-II/NRHM or strengthening the Monitoring of Information and Evaluation Systems (MIES) is the validation of data by triangulation to minimize the potential of misreporting. To be effective for policy development and programme management; triangulation of data will allow comparisons over time and lateral comparisons between target groups simultaneously. At the same time, it will enable increased participation by all stakeholders in managing and developing accountable and responsive services and supports, participatory decision making based on data reflecting enabling factors and implementation bottlenecks. Given these advantages of the approach, the M&E division of GOI is finalizing an appropriate methodology for triangulation of data in reproductive health. Although, under NRHM it is proposed that, the component of community reporting has to be evolved in a formalized manner since it is a new concept and a proper methodology for community monitoring mechanism and later triangulation process are being piloted. On the basis of the experience gained in the pilot study, a practically feasible methodology for triangulation will be evolved and introduced as part of the MIES.

Further, one of the important initiatives in HMIS has been undertaken recently by National Health Systems Resource Centre (NHSRC). As a nodal technical support agency for the NRHM, NHSRC is providing different forms of technical assistance to MoHFW. While particularly assistance on HMIS includes technical redesign of the HMIS to create architectural corrections in health systems; design, development and customization of free and open source HMIS software to meet the needs of the states; as well as training and capacity building on the use of information for action. The HMIS application customized by NHSRC incorporating various reporting formats and monitoring indicators under NRHM is called District Health Information Software-Version 2 (DHIS 2). This DHIS 2 has been deployed in different degrees in the States of Gujarat, Jharkhand, Kerala, and Madhya Pradesh, etc. At present data reporting from

states is being completed by using DHIS2 software and further state and district level aggregated data are being uploaded on to the national HMIS web-portal (Pandey et al., 2010).

Health Management Information System (HMIS) is a web-based monitoring system that has been put in place to monitor its health programmes and provide key inputs for policy formulation and interventions. It was launched in October 2008 and States / UTs were initially reporting district wise data on HMIS portal. To make HMIS more robust and effective and in order to facilitate local level monitoring, all States/UTs were requested to shift to “facility based reporting” from April, 2011. At present, 640 districts (out of 676) across 35 States/UTs are reporting facility wise data while rest are uploading district consolidated figure on the HMIS web portal. The data is being made available to various stakeholders in the form of standard & customized reports, factsheets, score-cards etc and these are available in public domain (*nrhm-mis.nic.in*).

HMIS data is widely used by the Central / State Government officials for monitoring and supervision purposes. MoHFW conducts periodic review meetings, workshops, training etc. to discuss data quality, conceptual issues and the latest developments including new reports, features available on the HMIS portal. To enhance the analytical capabilities of National and State level users, they have been provided SAS WRS and SAS- VDD software. The process to make the HMIS as GIS enabled is in progress. Efforts are on to introduce third party data quality checks to improve data quality and to increase data use at various levels.

### **What is wrong with current health MIS?**

- Irrelevance of the information gathered
- Poor quality of data
- Duplication and waste among parallel health information system
- Lack of timely reporting and feedback
- Poor use of information
- The difference in culture between data people and decision makers: Planning and management staff relies primarily on “gut feeling” to formulate ad hoc decisions rather seek pertinent data.

## **Service delivery functions in health units**

### **First level (dispensaries)**

- To provide curative care for the most common health problems
- To provide prenatal care services
- To organize under-5 clinics (including immunization)
- To provide family planning services
- To provide IEC services in the catchment area

### **Secondary level (First referral level)**

- To organize out-patient referral clinics
- To provide in-patient services
- To manage medical, surgical & gynecological emergencies
- To provide X-ray and laboratory facilities

### **Tertiary level**

- To provide all types of surgical interventions
- To provide specialized care

## **Management functions in a health service system**

- **The central level (Ministry of Health) is responsible for:**
  - ✓ Health policy formulation, including policy on inter-sectoral activities
  - ✓ Production of national health plans and guidelines for local planning
  - ✓ Advisory role on allocation of resources, particularly capital funds
  - ✓ Source of high level technical advice for specific programmes
  - ✓ Training and regulation of health personal development
  - ✓ Regulation of private profit and nonprofit health organization
  - ✓ Control of national health organizations and research institutes
  - ✓ Liaison with international health organizations and aid agencies

- **State level is responsible for:**
  - ✓ State health planning and Programme monitoring
  - ✓ Co-ordination of all regional health activities
  - ✓ Employment and control of the health personnel
  - ✓ Budgeting and Auditing the health expenditure
  - ✓ Managerial and technical supervision of district health teams
  - ✓ Provision of supplies and other logistical support
  
- **The Districts have the following main functions:**
  - ✓ Organizing and running the district hospital
  - ✓ Managing all other government health facilities
  - ✓ Implementing all community-based health programmes
  - ✓ Managing and controlling local health budgets
  - ✓ Co-ordination and supervision of all government, non-government and private health services within the district
  - ✓ Promoting active links with local government departments
  - ✓ Promoting community participation in local health service planning
  - ✓ Preparing an annual health plan
  - ✓ Raising additional local funds
  - ✓ In-service training of health workers
  - ✓ Supervising and controlling all community health workers in the district
  - ✓ Collecting and compiling routine health information and forwarding it to regions and ministries of health

### **Steps involved in restructuring of Health MIS**

Step 1: Identifying information needs and feasible indicators

Step 2: Defining data sources and developing data collection instruments for each of the indicators selected

Step 3: Developing a data transmission and processing system

Step 4: Ensuring use of the information generated

Step 5: Planning for health MIS resources

Step 6: Developing a set of organizational rules for health information system management

#### **4.1.8. Limitations:**

Health information and statistics are important for planning, monitoring and improvement of the health of populations. However, the availability of health information in developing countries is often inadequate.

- The available information related to non-communicable diseases and injuries was poor. This is a significant gap as India is undergoing an epidemiological transition with these diseases / conditions accounting for a major proportion of disease burden.
- Information on infrastructure and human resources was primarily available for the public health sector, with almost none for the private sector which provides a large proportion of the health services in India.
- Majority of the information was available at the state level with almost negligible at the district level, which is a limitation for the practical implementation of health programs at the district level under the proposed decentralization of health services in India.

#### **4.1.9 Central Bureau of Health Intelligence**

Established in 1961, Central Bureau of Health Intelligence (CBHI) is the National nodal Institute in the Directorate General of Health Services (Dte. GHS), Ministry of Health & Family Welfare, Govt. of India. CBHI headquarter is located at Nirman Bhavan, New Delhi.

CBHI is headed by Director, has four divisions viz.

- i. Policy & Infrastructure – headed by a Joint Director
- ii. Training, Collaboration & Research– headed by a Joint Director
- iii. Information & Evaluation – headed by a Joint Director and
- iv. Administration– headed by Director / Deputy Director Administration

It has Six Health Information Field Survey Units (FSUs) located in different Regional Offices of Health and Family Welfare (ROHFW) of GOI at Bangalore, Bhopal, Bhubaneswar, Jaipur, Lucknow & Patna; each headed by a Dy. Director with Technical & Support staff, who function under the supervision of Regional Director (HFW/GOI).

Regional Health Statistics Training Centre (RHSTC) of CBHI at Mohali, Punjab (near Chandigarh) and Other Training Centres viz. (i) Medical Record Department & Training Centre of Safdarjung Hospital, New Delhi and (ii) JIPMER Puduchery; conduct CBHI inservice Training Courses.

### **Health Information System for Central Bureau of Health Intelligence (CBHI)**

CBHI under the Directorate General of Health Services is an agency involved in collection, compilation, analysis and dissemination of information on broad range of indicators related to health status and health services in the country. CBHI apart from creating a credible database, it regularly brings out its annual publication in the form National Health Profile based on the health data collected from all Health Directorates of states and union territories. A web-based application has been designed and developed covering formats regarding incidence and prevalence of disease, health risks and performance of health systems. The data collected through this application is helping CBHI in building some of the major components of National Health Database / National Health Profile which are of great significance to the planners, policy makers, health administrators, research workers and others who are engaged in raising the health and socio-economic status of the community. The system provides a wide range of state-wise / district wise reports on morbidity patterns covering 36 types of diseases (both Communicable and non-communicable). Data on various important subjects like Causes of Death and other important issues is also available in the publications.

#### **4.1.10. National Health Profile:**

It is published by CBHI on an annual basis since 2005. It consists of six chapters and provides information about the Millennium Development Goals, WHO collaborating centres for the family of International Classification for diseases and also gives information about CBHI. NHP highlights most of the relevant information about the various health indicators in different chapters. NHP is a major data source of information about diseases that are not covered under any other major programme.

- First Chapter- Demographic indicators- Population statistics and vital statistics
- Second Chapter- Socio-economic indicators- Education, Social indicators, Economic indicators, Employment, Housing and amenities, Drinking water and Sanitation.
- Third chapter- Health status indicators- Common communicable and non-communicable diseases, RCH, Tobacco use
- Fourth Chapter- Health Finance indicators- pattern of investment, expenditure, sources of funding and proportion of allocation of money in health sector in different five year plans
- Fifth Chapter- Human resources in Health Sector
- Sixth chapter- Health infrastructure educational and service

## **4.2. Vital Registration System**

### **4.2.1. Importance of vital registration system**

Vital statistics are statistics on live births, deaths, foetal deaths, marriages and divorces. The most common way of collecting information on these events is through civil registration, an administrative system used by governments to record vital events which occur in their populations. Efforts to improve the quality of vital statistics will therefore be closely related to the development of civil registration systems in countries.

#### **1. Civil Registration System (CRS)**

Civil Registration System (CRS) is a system of continues recording of vital events such births, deaths, marriages and divorces etc. It is generally a compulsory recording done according to legal requirements of country as per provisions made by official order or rule. Unlike census which gives idea of a population of a given area at point of time, it helps in understanding in a continues manner the additions and exits of people in the area apart from maintenance of per month records on births, deaths and marriages as legal documents and estimates of changes in the population. It is also extremely important for need based development plan. It helps in understanding of the progress of different socioeconomic programmes including maternal and child health care programmes. In India the registration of vital events has been in vogue for more than a century. In 1969 registration of births and death act was implemented. The registration of births and deaths was made compulsory and the act unified the system of registration replacing

the diverse laws existed earlier. The CRS in India at the national level works under the Registrar General of India (RGI). He coordinates the activities of the chief registrars of the states who are the chief executive authorities in the state for carrying out the provisions made in the act of 1969.

The system collects a variety of information on each birth and death recorded. For birth we have date of occurrence/registration; place of birth; order of birth; sex of child; age of mother; literacy; occupation and religion of parents and type of medical attendance at birth are noted. In case of death the system provides the data on date of occurrence/registration; place of death; age; sex; marital status; religion; and occupation of the deceased; cause of death and whether it is medically certified and type of medical attendance received.

While the number of births and deaths can be obtained by enumeration at certain points in time (e.g. censuses and surveys), civil registration collects this information on a continuous basis and is the only source that provides individuals with a legal document. For instance, the importance of birth registration as the first legal recognition of the child is emphasized in Article 7 of the Convention on the Rights of the Child which states that “the child shall be registered immediately after birth and shall have the right from birth to a name, the right to acquire a nationality and, as far as possible, the right to know and be cared for by his or her parents”. United Nations Children’s Fund (UNICEF) and a number of non-governmental organizations (Plan International, Save the Children Fund, World Vision, etc.) have particularly promoted the human rights aspects of registration, while the United Nations Statistics Division (UNSD), United Nations Population Fund (UNFPA) and World Health Organization (WHO) have focused more on the statistical aspects of civil registration.

Many civil registration systems also collect information on causes of death. Statistics based on these death records are of particular importance in public health for identifying the magnitude and distribution of major disease problems, and are essential for the design, implementation, monitoring, and assessment of health programmes and policies.

#### **4.2.2 Current status**

Level of reporting helps in reviewing the registration system and defining measures that would be necessary to improve registration levels across the country. It is around 89.9% of the

registration units at national level during 2010. Such reporting level by rural and urban registration units are about 89.9% and 91.8% respectively.

### **Birth Registration:**

- The number of reported registered births has more than doubled in the year 2010 as compared to 1981 (increased to 21.4 million in 2010 from 8.6 million in 1981).
- The share of registered births to total estimated births under SRS is increasing year by year which in result shows the significant improvement in birth registration.
- The share of male registration is more than the female for registered births.
- Share of Institutional births in total registered births has increased to 65% during 2010 as compared to 56% during 2009. 35% of the total registered births are non-institutional in the year 2010. It is based on information received from 23 States/UTs.
- The level of registration of births has increased from 58.0 per cent in 2000 to 82.0 per cent in 2010.
- 14 States/UTs have achieved the target of cent per cent level of registration of births during 2010.
- 10 among 19 major States have crossed the level of registration of births of 90 percent. These States are Assam, Gujarat, Haryana, Karnataka, Kerala, Maharashtra, Odisha, Punjab, Rajasthan and Tamil Nadu.
- After excluding 2 most populous and poor performing States namely Bihar and Uttar Pradesh, the level of registration of births comes out to be 91.6%.
- The level of registration of births for other States/UTs is higher than that of Southern as well as EAG States & Assam persistently over the period of 2001-2010.
- The birth rate worked out to 18.1 per thousand populations during 2010 as compared to 22.1 from SRS birth rates.
- The gap between the birth rates based on CRS and SRS is narrowing down over the year which is a good indication of improvement in the functioning of CRS.
- Birth Rate reported under CRS in some of the better performing States namely Assam, Gujarat, Kerala, Maharashtra and Punjab is on higher side than that of SRS birth rate. This difference may be due to the fact that SRS estimates are based on usual

residence while events registered at the place of occurrence irrespective of the place of residence under CRS.

- The Sex Ratio at Birth for the year 2010 comes out to be 857.
- Highest Sex Ratio has been reported by Assam (1244) followed by Karnataka (1025) during 2010.
- Lowest Sex Ratio has been reported by Bihar (323) followed by Manipur (770). This is due to poor netting of events especially female in Bihar.

### **Death Registration:**

- The number of registered deaths has also more than doubled in the year 2010 as compared to 1981 (5.7 million in 2010 from 2.7 million in 1981). There is slight improvement in total number of registered deaths during 2010 as compared to 2009.
- The share of registered deaths to total estimated deaths under SRS is increasing year by year with fluctuating trend.
- Male share in total registered deaths is more than the female.
- Share of Institutional deaths in total registered deaths has increased to 43% during 2010 as compared to 40% during 2009 and 22% of deceased did not receive any medical attention at the time of death. This information is based on information received from 21 States/UTs.
- The level of registration of deaths has increased from 52.2 per cent in 2001 to 66.9 per cent in 2010.
- 6 States/UTs have achieved the target of cent per cent level of registration of deaths during 2010.
- 5 among 19 major States have crossed the level of registration of deaths of 90 percent. These States are Karnataka, Kerala, Maharashtra, Punjab and Tamil Nadu. During 2009, only 3 major States were in this category.
- During 2010, there are only 7 States who have achieved the target of 90% in case of both birth and death registration.
- After excluding 2 most populous and poor performing States namely Bihar and Uttar Pradesh, the level of registration of deaths comes out to be 76.8%.

- The death rate worked out to 4.8 per thousand populations during 2010 as compared to 7.2 from SRS death rates.
- More infant deaths have been registered in urban area than the rural area.
- A substantial gap can be seen in the level of registration of births and deaths between three groups,
  - i) Empowered Action Group (EAG) & Assam,
  - ii) Southern States and
  - iii) Other States/UTs over the period 2001-2010.
- Notwithstanding the difference in approach of data collection between CRS and Sample Registration System (SRS), a comparison of vital rates based on these two sources helps in evaluating the performance of CRS over SRS. Crude birth & death rates based on registered events for most of the better performing states are in close proximity to that from SRS.
- There is a significant gap in the IMR based on CRS with that of from SRS in almost all States/UTs. The netting of infant deaths under the CRS continues to be a major concern (CRS, 2010).

#### **4.2.3. Uses of civil registration**

Civil registration has a dual purpose – legal on the one hand, and statistical, demographic and epidemiological on the other.

##### **Uses of civil registration records for administrative purposes**

Live birth records are the basis for many public health programmes for post-natal care of mother and child, and may be used, when needed, for programmes of vaccination and immunization, premature-baby care, assistance to disabled persons. Death records are used to provide legal permission for burial or other disposal of deceased individuals. They can also provide information of epidemiological importance, and indicate the need for preventive control measures. Death records are also necessary to clear a number of administrative files, such as disease-case registers, population registers, social security files, military service files, electoral rolls, identity files and tax registers.

## **Uses of civil registration records for Individuals**

For the individual, the birth registration records provide legal proof of identity and civil status, age, nationality, dependency status etc., on which depend a wide variety of rights. The birth registration record may be required for establishing:

(i) Identity and family relationships for settling inheritance or insurance claims and arranging transfer of property.

(ii) Proof of age for admission in schools, entry into services and professions, obtaining a driving license, exercising voting rights, entering into legal contracts, inheritance claims, marriage etc.

(iii) Nationality or citizenship by birth, to obtain passport for foreign travel, qualify for voting privileges, own property

(iv) Because of the increased national and international mobility of the population, vital records have taken on additional importance. For the migrant, it has become essential to have access to documents that can prove his or her civil status and nationality. To facilitate the process of identification, those documents should conform to internationally accepted standards. This is another reason to establish in each country a civil registration process capable of registering vital events on a current basis, including efficient procedures for providing documentation in cases where timely registration has not taken place.

(v) Marriage and divorce records provide documentation for the establishment of the civil status of individuals for such purposes as receipt of alimony allowances, claims for tax benefits, provision and allocation of housing or other benefits related to the marital status of a couple, and changing nationality on the basis of marriage. In addition, records of divorce are important for establishing the right of an individual to remarry and to be released from financial and other obligations incurred by the other party.

## **Use of Vital Records**

**Some common uses of vital records in vital statistics are:**

1. Preparing population estimates and projections;

2. Cohort and period studies;
3. Construction of life tables;
4. Preparing health indicators, such as infant mortality rates, neonatal mortality rates, post-neonatal mortality rates, maternal mortality rates, etc.;
5. Starting points in retrospective epidemiological studies;
6. Public health programmes in the absence of morbidity data, or for health education;
7. Maternal and child health services for planning and evaluation;
8. Fertility data in family planning.

#### **4.2.4 Sample Registration System in India**

The Government of India, in the late 1960s, initiated the Sample Registration System that is based on a Dual Recording System. In the Sample Registration System, there is a continuous enumeration of births and deaths in a sample of villages/urban blocks by a resident part-time enumerator and then, an independent six monthly retrospective survey by a full time supervisor. The data obtained through these two sources are matched. The unmatched and partially matched events are re-verified in the field to get the correct number of events. At present, the Sample Registration System (SRS) provides reliable annual data on fertility and mortality at the state and national levels for rural and urban areas separately. In this survey, the sample units, villages in rural areas and urban blocks in urban areas are replaced once in ten years.

SRS estimates are vital rates are being extensively used for policy making and planning purposes. In the absence of reliable CRS data the SRS has been the authoritative source if vital rates as national and state level. Registrar General of India also uses SRS data for obtaining abridged life table at national and state level. However it is not a substitute for CRS. It does provide estimate at lower level of aggregation. Even at the state level questions are being raised about the sample size of the SRS to provide reliable estimate. The sampling units in SRS are revised at an interval of 10 years (Registrar General of India,2011).

**Table 2: Table below provides the statistics available from SRS**

Information	Statistics	Availability & Location
Population Distribution	Pop by 5Y age sex groups, 0-4 to 70+ until 1994 and to 85+ since 1995	Table-1 in all annual reports from 1970.
Fertility	Population by marital status	From 1992 as Table-2
	Age specific & marital fertility rates	Table-3 since 93. Earlier T2-4
	Age sp. fertility rates by education	From 1996 as Table-4
	Birth-order & birth-interval wise distribution of births	From 1990, Tables 4, 5&6 until 95. Later Tables 5,6&7
Mortality	Age Sp. Death Rates by 0, 1-4, and 5Y age groups from 5-9 up to 70+ Or 85+	Table-8 since 1996. Earlier Table 4, 5 or 7
	Mortality indicators: Crude Death Rate, Child Mortality, IMR etc.	Table-9 since 1996. Earlier 3, 4, 5, 8 or 9.
	% distribution of deaths by age.	Since 1997, Table-10
Access to Medical Care	Medical attention at birth	Statements (St) 25, 30, 31, 34, 35, 38, 39 or 40.
	Medical attention at death	St 42, 44, 47, 48, 51, 53, or 55-57.

### 4.3 Surveys and Census Statistics

#### 4.3.1. Surveys

Surveys, where information is collected on sample basis are used to provide variety of information with fair degree of precision. Using a scientifically adopted sample design the sampling error can be controlled to a large extent. Also careful planning, elaborate training of investigators and supervisors and effective monitoring and supervision can help in controlling non-sampling error. The total error in a careful and well-designed sample survey can be less than that in a complete enumeration survey. Sample surveys have become a viable tool for collecting information on a variety of demographic and health related indicators. **Large Scale Surveys:** The Ministry has been conducting large scale surveys periodically to assess the level and impact of health interventions. These surveys include National Family Health Survey (NFHS), District level Household Survey (DLHS), Annual Health Survey (AHS) etc. The main aim of these surveys is to assess the impact of the health programmes and to generate various health related indicators at the District, State and National level.

## **1. National Family Health Survey (NFHS)**

In India since 1990, there has been a noticeable change in the availability of large scale surveys in the field. Three rounds of National Family Health Survey (NFHS) have been conducted so far, same surveys conducted in other countries are known as Demographic Health Survey (DHS) and fourth round is about to be started. NFHS-1 was conducted in 1992-93 wherein 88562 households and 89777 ever married women aged 13-49 were interviewed to furnish estimates on different demographic and health parameters for the country as a whole. It provided information on fertility, family planning practices, mortality including infant and child mortality, utilization of maternal and child health care services, nutritional status of children apart from usual socioeconomic and demographic characteristics of a household. NFHS-2 which was conducted in 1998-99 covered 92486 households and 90303 ever married women aged 15-49 were interviewed and included estimates in addition to the national level all the states that existed at that time. In addition to information collected in NFHS-1, it included information on quality of family welfare services, prevalence of reproductive morbidity among women, extent of involvement of women in decision making and domestic violence. Another feature of NFHS-2 has been the collection of data on the hemoglobin level in the blood of women and their children aged 6 to 35 months. Information from NFHS has been widely used by planners, policy makers and academicians.

### **NFHS- 3**

Like NFHS-1 and NFHS-2, NFHS-3 was designed to provide estimates of important indicators on family welfare, maternal and child health, and nutrition. In addition, NFHS-3 provides information on several new and emerging issues, including family life education, safe injections, perinatal mortality, adolescent reproductive health, high-risk sexual behaviour, tuberculosis, and malaria. Further, unlike the earlier surveys in which only ever-married women age 15-49 were eligible for individual interviews, NFHS-3 interviewed all women age 15-49 and all men age 15-54. Information on nutritional status, including the prevalence of anaemia, is provided in NFHS-3 for women age 15-49, men age 15-54, and young children.

A special feature of NFHS-3 is the inclusion of testing of the adult population for HIV. NFHS-3 is the first nationwide community-based survey in India to provide an estimate of HIV prevalence in the general population. It provides estimates of HIV prevalence among women age 15-49 and men age 15-54 for all of India, and separately for Uttar Pradesh and for Andhra Pradesh, Karnataka, Maharashtra, Manipur, and Tamil Nadu, five out of the six states classified by the National AIDS Control Organization (NACO) as high HIV prevalence states. No estimate of HIV prevalence is being provided for Nagaland, the sixth high HIV prevalence state, due to strong local opposition to the collection of blood samples.

All the three rounds of NFHS were conducted by International Institute for Population Sciences (IIPS), Mumbai, an autonomous institute under the administrative control of ministry of health and family welfare Govt. of India with technical support from ORC Macro, Maryland USA and East West centre Hawaii, USA. The ministry of health and family welfare designated IIPS as nodal agency to carry out the survey. Funding for NFHS-3 was provided by the United States Agency for International Development (USAID), DFID, the Bill and Melinda Gates Foundation, UNICEF, UNFPA, and MOHFW. NACO and the National AIDS Research Institute (NARI) provided technical assistance for the HIV component of NFHS-3.

#### **NFHS- 4**

In 2014-2015, India will implement the fourth National Family Health Survey (NFHS-4) like its predecessors, NFHS-4 will be conducted under the stewardship of the Ministry of Health and Family Welfare, Government of India coordinated by the International Institute for Population Sciences, Mumbai, and implemented by a group of survey organizations. These survey organisations will be selected by following a rigorous selection procedure. Technical assistance for NFHS-4 will be provided by ICF International, USA. NFHS-4 will receive financial support from the United States Agency for International Development (USAID), DFID, the Bill and Melinda Gates Foundation, UNICEF, UNFPA, the MacArthur Foundation and the Ministry of Health and Family Welfare, Government of India.

## Specific Objectives and Scope of NFHS-4

Each successive round of the NFHS has had two specific goals: a) to provide essential data on health and family welfare needed by the Ministry of Health and Family Welfare and other agencies for policy and programme purposes, and b) to provide information on important emerging health and family welfare issues. To meet the first of these two aims, NFHS-4 will:

- Provide estimates of the levels of fertility, infant and child mortality, and other family welfare and health indicators by background characteristics at the national and state levels; and
- Measure trends in family welfare and health indicators over time at the national and state levels. Similar to the NFHS-3, NFHS-4 will also provide information on several other emerging issues including:
  - Peri-natal mortality, adolescent reproductive health, high-risk sexual behaviour, safe injections, tuberculosis, and malaria;
  - family welfare and health conditions among slum dwellers;
  - non-communicable diseases;
  - use of emergency contraception; and
  - HIV prevalence for adult women and men at the national level and for 11 groups of states/union territories (UTs) including all high HIV prevalence states. The HIV prevalence estimates from the survey will be used to calibrate the HIV estimates that are based on surveillance data.

In addition to these similarities, the scope of NFHS-4 has been greatly expanded over NFHS-3:

- In addition to the 29 states, NFHS-4 will also include all six union territories for the first time. Also for the first time, NFHS-4 will provide estimates of most indicators at the district level for all 640 districts in the country as per the 2011 census. This time, the sample will also be designed to provide information on sexual behaviour; husband's background and woman's work; HIV/AIDS knowledge, attitudes and behaviour; and domestic violence only at the state level and the national level, while rest of the indicators will also be provided at the district level. Indicators will also be made available separately for slum and non-slum areas in the same eight cities that were covered in NFHS-3.

- NFHS-4 will provide information on HIV prevalence for women aged 15-49 years and men aged 15-54 years at the national level and for 11 groups of states/UTs. The exact grouping of states for HIV prevalence estimates has been finalized in consultation with the National AIDS Control Organisation (NACO). Similar to NFHS-3, blood samples will be collected from women and men in the form of dried blood spots (DBS) on filter paper cards and sent for HIV testing to the designated laboratories.
- Given the need to report most demographic and health indicators at the district level, the NFHS-4 sample size is expected to be approximately 568,200 households, as compared to 109,000 households in NFHS-3. The survey will use three questionnaires (Household, Woman's and Man's), and information will be collected from all women aged 15-49 years and, in a sub-sample of households, men aged 15-54 years. This is expected to yield a total sample of 625,014 women and 93,065 men eligible for the interview. In these households, information on 265,653 children below aged 5 years will be collected in the survey.
- Data will be collected using Computer Assisted Personal Interviewing (CAPI) on mini computers.
- Anaemia testing and height and weight measurements for women (aged 15-49 years), men (aged 15-54 years) and children under aged 5 years will also be included in NFHS-4. All related estimates will be provided at the district level.
- The domain of clinical, anthropometric and biochemical testing (CAB) is being further expanded in NFHS-4 to include blood glucose and hypertension measurements with estimates to be reported at the district level. As with anaemia, testing of these new CAB components in the field will be conducted using portable equipment. A recently developed, improved model of the HemoCue instrument will be used for anaemia testing. A battery-operated portable glucometer, which is currently being used in the DLHS-4, will be used for blood glucose testing. Lancets and all blood-contaminated materials will be disposed of in a biohazard bag according to an established protocol. Only medical or other personnel with specific training on

the procedures and on universal precautions regarding blood-borne pathogens will be involved in conducting the anaemia and blood glucose testing and collecting blood samples for HIV testing.

- NFHS-4 will be conducted in two phases, and each phase will carry almost equal number of states/group of states to be surveyed. The two phases will help to manage the whole operation of implementation more efficiently (*RFP NFHS-4, IIPS, 2014*).

## **2. District Level Household Survey (DLHS)**

There have been quiet few other notable surveys in the field in India in recent years. One such survey which was also conducted by IIPS is rapid household survey in reproductive and child health: District Level Household Survey (DLHS). The District Level Household and Facility Surveys (DLHS) were initiated with a view to assess the utilization of public health services and to know people's perception about the quality of services. DLHS is designed to provide district level estimates on important indicators on maternal and child health, family planning and other reproductive health services and impact of important public health interventions. .

Since the indicators estimated through SRS and NFHS are confined to state level only, the concept of providing similar indicators at district level had been perceived through DLHS. Now district level area planning is based on district data obtained in DLHS. While first round of DLHS was undertaken in 1998-1999, the second DLHS was undertaken in 2002-2004. The results of second round of DLHS were used as the baseline survey for NRHM. The DLHS 2 covered 1000 households per district. And DLHS 3 have a varying sample size ranging from 1000 to 1500 households in each of 600 odd districts in the country depending on the variability of health parameters. All eligible women aged 15-44 and unmarried women 15-24 in selected household were also selected for interview. The objective of the survey was to understand the process indicators of reproductive and child health in a district (IIPS 2001). Specifically, it collected information on marriage pattern, antenatal care, delivery care, child care practices like breast feeding and immunization, use of contraception, choice of contraceptive methods among women and men, utilization and quality of government health services, awareness about RTI/STI and HIV/AIDS among women and men and prevalence of RTI/STI (symptoms) among women and men.

The fourth round of District Level Household and Facility Surveys (DLHS-4) was conducted during 2012-13. As part of the Survey, a number of Clinical Anthropometric and Biochemical (CAB) tests were carried out to produce district level estimates for nutritional status and prevalence of certain life style disorders. The major constituents of the CAB component are height, weight, and blood pressure, estimation of hemoglobin (Hb), blood sugar and test for iodine content in the salt used by households. The District/State Fact sheet from DLHS-4 are now available for 21 States UTs (*nrhm-mis.nic.in*).

### **3. National Sample Survey Office (NSSO)**

The National Sample Survey Office (NSSO) was known as National Sample Survey Organisation. It is a unique setup to carry out surveys on socio-economic, demographic, agricultural and industrial subjects for collecting data from households and from enterprises located in villages and in the towns. It is a focal agency of the Govt. of India for collection of statistical data in the areas which are vital for developmental planning. The National Sample Survey Directorate was first setup in the country in the ministry of finance in 1950. The directorate was subsequently transferred to the cabinet secretariat in 1957 and subsequently in 1970 it became a part of NSSO in the department of statistics under the ministry of planning. Since 1999 it is under the newly created Ministry of Statistics and Programme Implementation (MOSPI). (NSSO, 2001)

The Director General and Chief Executive Officer (DG&CEO) heads the NSSO. He is responsible for implementing all activities of the organisation. The NSSO has four Divisions namely, the Survey Design and Research Division (SDRD), Field Operations Division (FOD), Data Processing Division (DPD), and Coordination and Publication Division (CPD), with each Division headed by an Additional or Deputy Director General. The headquarters of both the SDRD and the DPD are located at Kolkata. The DPD has Data Processing Centres at Ahmedabad, Bangalore, Delhi, Giridih, Kolkata and Nagpur. While the headquarters for the CPD are located at Delhi, the headquarters for the FOD are located at Delhi and Faridabad with a network of Zonal Offices, Regional Offices and Sub-Regional Offices spread over the country (NSSO, 2001).

The NSS is carried out in the form of successive rounds. A unique feature of the NSS is that all the State and Union Territory Governments except the Union Territories of Andaman and

Nicobar Islands, Dadra and Nagar Haveli, and Lakshadweep participate in the programme at least on an equal *matching sample* basis. Since its inception in 1950, the NSS has collected data on a large number of subjects of interest.

- **Objectives of NSSO**

- i) To provide statistical and other information for the purpose of state or national planning and policy requirements.
- ii) To evolve statistical techniques for the analysis of statistical data, the solutions of administrative problems and estimation of future trends.
- iii) To collect and publish information which will be of use to those engaged in economic activities in the country.
- iv) To provide and analyse information which are useful to research workers in socioeconomic fields.

- **Functions of NSSO**

- i. To conduct large scale sample surveys on subjects like household consumer expenditure, employment and unemployment, health and medical services etc.
- ii. It decides the topics to be covered in a particular survey round in consultation with National statistical commission (NSC).
- iii. Agricultural wing of FOD, NSSO has the overall responsibility of assisting the states by developing suitable survey techniques for obtaining reliable and timely estimates of crop yield.
- iv. It conducts annual survey of industries (ASI) every year.
- v. NSSO every year brings out reports on status of estimation of agricultural production in India.
- vi. NSSO has the central responsibility of coordinating the results of the crop estimation surveys conducted by the states.

#### **4. Annual Health Survey (AHS)**

The Ministry of Health and Family Welfare, in collaboration with the Registrar General of India (RGI), had launched an Annual Health Survey (AHS) in the erstwhile Empowered Action Group

States (Bihar, Jharkhand, Madhya Pradesh, Chhattisgarh, Uttarakhand, Uttar Pradesh, Orissa and Rajasthan) and Assam. The annual health survey (AHS) was conceived in 2005 to monitor the performance of health interventions carried out under the National Rural Health Mission (NRHM) at annual intervals. Three rounds of Annual Health Survey (AHS) were conducted for providing district level estimates on major health indicators, besides estimates of impact indicators like Total Fertility Rate (TFR), Infant Mortality Rate (IMR), Under Five Mortality Rate (U5MR), Maternal Mortality Ratio (MMR), etc. Under the AHS, 284 districts in the nine States were covered. The AHS was conducted during 2010-11, 2011-12 and 2012-13 and the results are now available.

Further, Clinical, Anthropometric and Bio-chemical (CAB) tests data are also collected on height & weight measurement, blood test for anaemia and sugar, blood pressure measurement and testing of iodine in the salt used by households. The processing of CAB data component is under progress. Other RCH indicators like Ante-natal care, Institutional delivery, immunization, use of contraceptives are also available. The health ministry has discontinued the annual health survey since 2013. The move is in line with the health ministry's decision to combine the district-level, the annual and the national family health surveys into one comprehensive national survey.

## **5. The Longitudinal Ageing Study in India (LASI)**

LASI is a multidisciplinary, internationally harmonized panel study designed to be nationally representative of India's population aged 45 and older. Fieldwork for a four-state pilot study funded by the National Institute on Ageing (NIA, USA) was successfully implemented in late 2010. LASI full wave aims to collect information conceptually comparable to that gathered by the Health and Retirement Study (HRS) and its sister surveys in Asia, Europe, and elsewhere. It also features the collection of physical measures of health and dried blood spot (DBS) specimens.

LASI will be a national landmark in scientific research that will allow a better understanding of India's adult health problems and population ageing processes and will inform the design of appropriate evidence-based policies for adults and older people in India.

LASI data will advance scientific knowledge and inform policymakers in India and elsewhere. Our public, internationally harmonized data will allow for cross-national comparative research studies on ageing.

The LASI team in IIPS successfully conducted the 2010 LASI pilot survey in the four states of Karnataka, Kerala, Punjab, and Rajasthan to test survey tools and protocols and to learn lessons for the main wave. The analysis of LASI pilot data revealed insightful evidence on reported and measured health status, social network characteristics, income and consumption, retirement, and pensions.

The full-scale, national LASI survey will be fielded in 2014 with self-representing samples for 29 states and 6 union territories and in four metropolitan cities of India.

The target sample for LASI is non-institutionalized Indian residents aged 45 and older and their spouses (irrespective of age).

The main objective of LASI is to provide a comprehensive evidence base on health and wellbeing of elderly population in India. LASI will focus on demographics, household economic status, health and biomarkers, health insurance and health care utilization, family and social network, work and employment, and retirement. LASI is designed to cover five major subject and policy domains of adult and older population of India namely:

- Health: Disease burden & risk factors (reported and measured),
- Health care and health financing,
- Social: Family and social network,
- Economic: income, wealth and expenditure
- Work and employment, Retirement and Pension

## **6. Study on Global Ageing and Adult Health (SAGE)-India, 2006**

The WHO Multi-Country Studies unit coordinates the Study on global AGEing and adult health (SAGE) as part of an ongoing program of work to compile comprehensive longitudinal information on the health and well-being of adult populations and the ageing process. The core SAGE collects data on adults aged 50 years and older, including a smaller comparison sample of younger adults aged 18–49 years, from nationally representative samples in six countries: China, Ghana, India, Mexico, Russian Federation and South Africa.

In India, SAGE is being conducted in six states – Assam, Karnataka, Maharashtra, Rajasthan, Uttar Pradesh and West Bengal. SAGE will cover a sample of 10600 households across the six states. The International Institute for Population Sciences, Mumbai in collaboration with the

World Health organization, Geneva has undertaken the Study on Global Ageing and Adult Health (SAGE), 2007 in India.

SAGE will follow-up the same PSUs and the sample households covered across these six states in the World Health Survey (WHS), India, 2003. SAGE is expected to run for up to 10 years with follow-up waves for every two years.

The primary objective of SAGE is to assess health and well-being of the elderly persons in age 50 and above and their social determinants. SAGE aims to gather evidence base on socio-economic background, health state description, burden of disease, health care utilization, quality of life and well-being. Besides these self-reported information based on interview, SAGE adopt improved health measurement techniques by using a range of biomarkers-blood pressure, lung-function, vision, grip strength, time walk, a battery of cognitive tests, anthropometry and blood test for anaemia, diabetes, heart disease, and hepatitis-B.

SAGE Field work and data entry have been completed during 2007-08. Funding for SAGE is being provided by the World Health Organization, Geneva and USAID, New Delhi.

#### **4.3.2. Census**

The Indian Census is the largest single source of a variety of statistical information on different characteristics of the people of India. With a history of more than 130 years, this reliable, time tested exercise has been bringing out a veritable wealth of statistics every 10 years, beginning from 1872 when the first census was conducted in India non-synchronously in different parts. To scholars and researchers in demography, economics, anthropology, sociology, statistics and many other disciplines, the Indian Census has been a fascinating source of data. The rich diversity of the people of India is truly brought out by the decennial census which has become one of the tools to understand and study India.

Population census is defined as “Population census is the total process of collecting, compiling, analyzing or otherwise disseminating demo-graphic, economic and social data pertaining, at a specific time, of all persons in a country or a well-defined part of a country. As such, the Census provides a snapshot of the country’s population and housing at a given point of time.”

The responsibility of conducting the decennial Census rests with the Office of the Registrar General and Census Commissioner, India under Ministry of Home Affairs, Government of India. It may be of historical interest that though the population census of India is a major administrative function; the Census Organisation was set up on an ad-hoc basis for each Census till the 1951 Census. The Census Act was enacted in 1948 to provide for the scheme of conducting population census with duties and responsibilities of census officers. The Government of India decided in May 1949 to initiate steps for developing systematic collection of statistics on the size of population, its growth, etc., and established an organisation in the Ministry of Home Affairs under Registrar General and ex-Officio Census Commissioner, India. This organisation was made responsible for generating data on population statistics including Vital Statistics and Census. Later, this office was also entrusted with the responsibility of implementation of Registration of Births and Deaths Act, 1969 in the country.

The census collects information on

- Demography
- Economic Activity
- Literacy & Education
- Housing & Household Amenities
- Urbanization
- Fertility and Mortality
- Scheduled castes and Scheduled Tribes
- Language, Religion & Migration

It is a complete coverage and accurate enumeration of all the people in respect to:

- Who and how many
- What do they do and how often
- Kind of houses they live in
- Household amenities and assets
- Individual level information

## **Evaluation Activities:**

The Ministry also conducted a Concurrent Evaluation in 187 districts spread over all States / UTs in the Country in 2009-10. Fact Sheets and National Report based on the collected data have been brought out. Further, there are 7 Regional Evaluation Teams (RETs) located in the Regional Offices of the Ministry which undertake evaluation of the NHM activities including Reproductive and Child Health Programme (RCH) on a sample basis by visiting the selected Districts and interviewing the beneficiaries. These teams generally visit two adjoining districts in a State every month and see the functioning of health facilities and carry out sample check of the beneficiaries to ascertain whether they have actually received the services. Reports of the RETs are sent to the States/UTs for taking corrective measures on issues highlighted in the reports

## **4.4 Harmonization of International classifications**

### **4.4.1. International Classification of Diseases - 10<sup>th</sup> Revision (ICD): On diagnosis and health condition, but not on functional status**

The World Health Organization (WHO) produces international classification systems for health that provide a consensual common language for governments, providers and consumers. These systems are used to facilitate the compilation of nationally consistent health data, to conduct research on health and to form the basis of diagnostic categorization for providers and consumers. These systems include the International Classification of Diseases (ICD), the International Classification of Functioning Disability and Health (ICF) and the International Classification of Health Interventions (ICHI). The International Classification of Diseases (ICD) is the standard diagnostic tool for epidemiology, health management and clinical purposes. This includes the analysis of the general health situation of population groups. It is used to monitor the incidence and prevalence of diseases and other health problems.

It is used to classify diseases and other health problems recorded on many types of health and vital records including death certificates and health records. In addition to enabling the storage and retrieval of diagnostic information for clinical, epidemiological and quality purposes, these records also provide the basis for the compilation of national mortality and morbidity statistics by WHO Member States. It is used for reimbursement and resource allocation decision-making by countries.

ICD-10 was endorsed by the Forty-third World Health Assembly in May 1990 and came into use in WHO Member States as from 1994. The 11th revision of the classification has already started and will continue until 2017.

- The ICD is the global health information standard for mortality and morbidity statistics.
- ICD is increasingly used in clinical care and research to define diseases and study disease patterns, as well as manage health care, monitor outcomes and allocate resources.
- More than 100 countries use the system to report mortality data, a primary indicator of health status.
- This system helps to monitor death and disease rates worldwide and measure progress towards the Millennium Development Goals.
- About 70% of the world's health expenditures (USD \$ 3.5 billion) are allocated using ICD for reimbursement and resource allocation
- ICD has been translated into 43 languages. (WHO)

#### **4.4.2. International classification of diseases**

The ICD also provides a basis that can be adapted for use in other fields e.g., dentistry, oncology and ophthalmology.

As in previous revisions, the ICD-10 is arranged in 21 major chapters.

- i. Certain infectious and parasitic diseases' (A00 - B99)
- ii. Neoplasms (C00 - D48)
- iii. Diseases of the blood and blood forming organs and certain disorders involving the immune mechanism (D50 - D89)
- iv. Endocrine, nutritional and metabolic diseases (E00 - E90)
- v. Mental and behavioural disorders (F00 - F99)
- vi. Diseases of the nervous system (G00 - G99)
- vii. Diseases of the eye and adnexa (H00 - H59)
- viii. Diseases of the ear and mastoid process (H60 - H95)
- ix. Diseases of the circulatory system (I00 - I99)

- x. Diseases of the respiratory system (J00 - J99)
- xi. Diseases of the digestive system (K00 - K93)
- xii. Diseases of the skin and subcutaneous tissue (L00 - L99)
- xiii. Diseases of the musculoskeletal system and connective tissue (M00 - M99)
- xiv. Diseases of the genitourinary system (N00 - N99)
- xv. Pregnancy, childbirth and puerperium (000- 099)
- xvi. Certain conditions originating in perinatal period (p00 - P96)
- xvii. Congenital malformations, deformations and chromosomal abnormalities (Q00-Q99)
- xviii. Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified (R00 - R99)
- xix. Injury, poisoning and certain other consequences of external causes (S00 - T98)
- xx. External causes of morbidity and mortality (V01 - Y98)
- xxi. Factors influencing health status and contact with health services (Z00 - Z99)

### **The coding system**

The first character of the ICD-10 code is a letter and each letter is associated with a particular chapter, except for the letter D, which is used in chapter II and chapter III, and letter H which is used in chapter VII and chapter VIII. Chapter I, II, XIX and XX use more than one letter in the first position of their codes.

Each chapter contains sufficient three -character categories to cover its contents. Not all the available codes are used, allowing space for future revision and expansion. The range of categories is given in parentheses after each block title.

Although not mandatory for reporting at the international level, most of the three-character categories are subdivided by means of a fourth numeric character after a decimal point, allowing upto 10 subcategories. Where a three - character category is not subdivided, it is recommended that the letter "X" be used to fill the fourth position so that the codes are of a standard length for data - processing.

Examples: Chapter XXI - Factors influencing health status and contact with health services (Z00 - Z99)

- Z 72 - Problems relating to lifestyle
- Z 72.0 Tobacco use
- Z 72.1 Alcohol use
- Z 72.2 Drug use
- Z 72.3 Lack of physical exercise
- Z 72.4 Inappropriate diet and eating habits
- Z 72.5 High-risk sexual behaviour

The unused "U" code: Codes U 00 - U 49 are to be used for provisional assignment of new diseases of uncertain aetiology. Codes U 50-U 99 may be used in research, e.g., when testing an alternative sub classification for a special project (WHO, 1993).

The ultimate purpose of ICD is to contribute to a uniform classification that can be' used throughout the world to make accurate comparisons of morbidity and mortality data for decision-making in prevention, in management of health care and in facilitating research on particular health problems (PARK, 2011).

#### **4.4.3. International Classification of Functioning, Disability and Health (ICF):**

- **ICF complements ICD -10, looking beyond mortality and disease**

Like ICD-10, ICF is a core classification in the WHO-FIC. Where ICD-10 provides users an etiologic framework for the classification of diseases, disorders, and other health conditions, ICF classifies functioning and disability associated with health conditions. ICD-10 and ICF are complementary classifications, and WHO encourages users to use both systems together to create a broader and more meaningful picture of the health of individuals and populations. Information on mortality (provided by ICD-10) and information about health and health-related outcomes (provided by ICF) can be combined to provide more complete information on population health.

Developed by WHO, ICF represents a revision of the International Classification of Impairments, Disabilities, and Handicaps (ICIDH). The focus of ICIDH was “consequences of

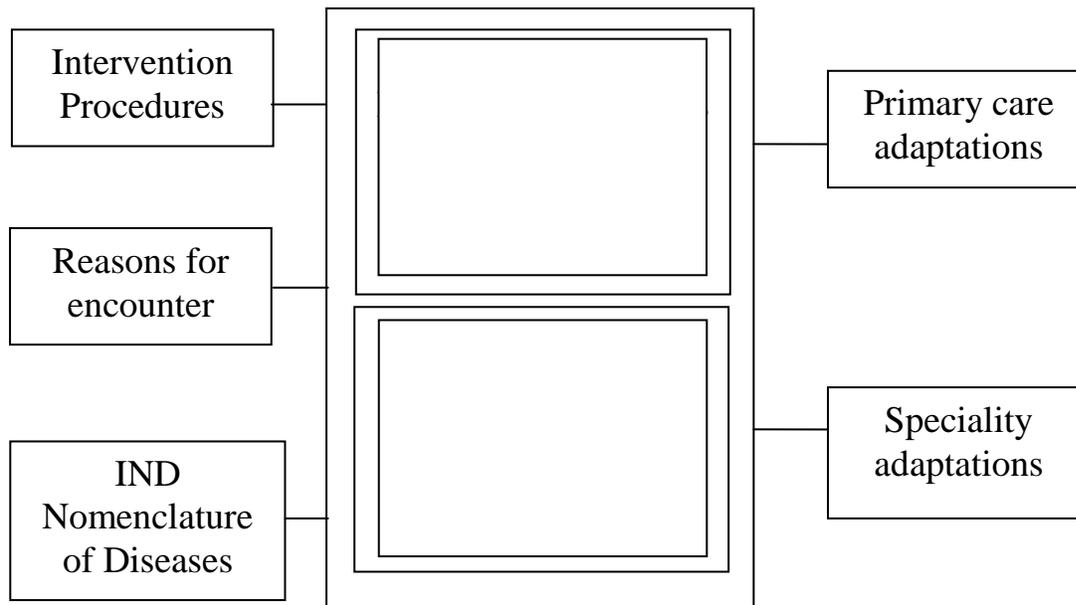
disease,” whereas the focus of ICF is “components of health.” ICF is a classification of health and health-related domains that describe body functions and structure, activities, and participation. Since an individual’s functioning and disability occur in a context, ICF also includes a list of environmental factors.

The information on diseases and other health conditions provided by ICD-10 is enriched by the additional information on functional status provided by ICF. ICD and ICF together offer a more complete picture by identifying both an individual’s health condition and how the individual functions in society with that condition. Together, information on diagnosis plus functioning provides a broader and more meaningful picture of the health of people or populations (Bowman, Sue. 2004). ICF was originally developed to provide this broader picture of the health of populations by gathering data in a consistent way around the world to allow for data comparability.

Information on mortality provided by ICD-10 and information on health outcomes provided by ICF may be combined in summary measures of population health, which can be used for monitoring population health and observing its distribution patterns, and also for assessing the contributions of different causes of mortality and morbidity.

ICF is a tool for measuring functioning in society, no matter what the reasons for one’s impairments. So it becomes a much more versatile tool with a much broader area of use than a traditional classification of health and disability (Giannangelo et al., 2005).

**Figure 1: Assimilation of ICF and ICD**



Source: <http://www.asha.org/slp/icf/>

ICF provides a common language for describing health, functioning, and disability. ICF is a multipurpose classification designed to serve various disciplines and different sectors. Its intended to:

- Provide a scientific basis for understanding and studying health and health-related states, outcomes, and determinants
- Establish a common language for describing health and health-related states in order to improve communication between different users
- Permit comparison of data across countries, healthcare disciplines, services, and time
- Provide a systematic coding scheme for health information systems

### **THE MODEL OF ICF:**

Two major conceptual models of disability have been proposed. The *medical model* views disability as a feature of the person, directly caused by disease, trauma or other health condition, which requires medical care provided in the form of individual treatment by professionals. Disability, on this model, calls for medical or other treatment or intervention, to

'correct' the problem with the individual. The *social model* of disability, on the other hand, sees disability as a socially- created problem and not at all an attribute of an individual. On the social model, disability demands a political response, since the problem is created by an unaccommodating physical environment brought about by attitudes and other features of the social environment.

### **Key Points**

- The ICF is not based on etiology or "consequence of disease," but as a component of health. Thus, while functional status may be related to a health condition, knowing the health condition does not predict functional status.
- The World Health Organization defines "health" as "the complete physical, mental, and social functioning of a person and not merely the absence of disease." In this definition, functioning as classified in the ICF is an essential component of health.
- The ICF describes health and health related domains using standard language.
- The purposes of the ICF include:
  - Collection of statistical data
  - Clinical research
  - Clinical use
  - Social policy use
- The ICF is stated as the framework for the field in both the Scope of Practice for Speech-Language Pathology (2001) and the Scope of Practice for Audiology (2004).

### **Components of ICF**

The ICF framework consists of two parts: **Functioning and Disability** and **Contextual Factors**. These parts are further broken down in the following manner:

Functioning and Disability includes:

- **Body Functions and Structures**—describes actual anatomy and physiology/psychology of the human body.

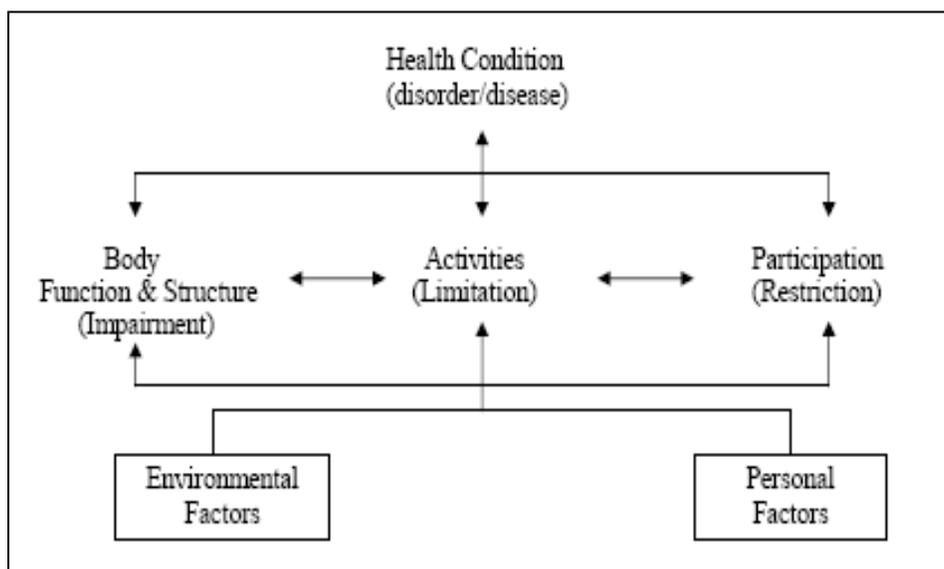
- **Activity and Participation**—describes the person's functional status, including communication, mobility, interpersonal interactions, self-care, learning, applying knowledge, etc.

**Contextual Factors include**

- **Environmental Factors**—factors that are not within the person's control, such as family, work, government agencies, laws, and cultural beliefs.

**Personal Factors**—include race, gender, age, educational level, coping styles, etc. Personal factors are not specifically coded in the ICF because of the wide variability among cultures. They are included in the framework, however, because although they are independent of the health condition they may have an influence on how a person functions.

*Figure 2: Illustrates ICF by showing the overall organization of the classification.*



Source: Organization of the International Classification of Functioning, Disability and Health (ICF). National Institute for Disability and Rehabilitation Research. "Notice of Proposed Long-Range Plan for Fiscal Years 2005–2009." Federal Register, July 27, 2005, available at <http://www.ed.gov/legislation/FedRegister/other/2005-3/072705d.html>.

**a. ICF Coding**

b=body functions

s=body structures

d=activities and participation

e=environmental factors

The letters are followed by a numeric code that starts with a one digit chapter number, a second level denoted by two-digits, and third and fourth levels represented by one digit each.

**Table 3: The following chart sets out the complete list of chapters in the ICF**

<b>Body</b>	
<b>Function:</b> Mental Functions Sensory Functions and Pain Voice and Speech Functions Functions of the Cardiovascular, Haematological, Immunological and Respiratory Systems Functions of the Digestive, Metabolic, Endocrine Systems Genitourinary and Reproductive Functions Neuro-musculo skeletal and Movement-Related Functions Functions of the Skin and Related Structures	<b>Structure:</b> Structure of the Nervous System The Eye, Ear and Related Structures Structures Involved in voice and speech Structure of the Cardiovascular, Immunological and Respiratory Systems Structures Related to the Digestive, Metabolic and Endocrine Systems Structure Related to Genitourinary and Reproductive Systems Structure Related to Movement Skin and Related Structures
<b>Activities and Participation</b>	
Learning and Applying Knowledge General Tasks and Demands Communication Mobility Self Care Domestic Life Interpersonal Interaction and Relationships Major Life Areas Community, Social and Civic Life	
<b>Environmental Factors</b>	
Products and Technology Natural Environment and Human-Made Changes to Environment Support and Relationships Attitudes Services, Systems and Policies	

Source: *Toward a common language for functioning, disability and health ICF (WHO Geneva 2002)*

ICF is an essential basis for the standardization of data concerning all aspects of human functioning and disability around the world.

ICF is used by persons with disabilities and professionals alike to evaluate health care settings

that deal with chronic illness and disability, such as rehabilitation centres, nursing homes, psychiatric institutions, and community services.

ICF is useful for persons with all forms of disabilities, not only for identifying their health care and rehabilitative needs, but also in identifying and measuring the effect of the physical and social environment on the disadvantages that they experience in their lives.

ICF is WHO's framework for health and disability. It is the conceptual basis for the definition, measurement and policy formulations for health and disability. It is a universal classification of disability and health for use in health and health-related sectors.

#### **4.4.4. WHO Family of International Classifications (WHO- FIC)**

- **Combines ICD and ICF**

The WHO Family is a suite of classification products that may be used in an integrated fashion to compare health information internationally. Internationally endorsed classifications facilitate the storage, retrieval, analysis, and interpretation of data and their comparison within populations over time and between populations at the same point in time as well as the compilation of internationally consistent data. Populations may be Nations, States and Territories, regions, minority groups or other specified group

**The purposes of the WHO-FIC are to:**

- Improve health through provision of sound health information to support decision making at all levels;
- Provide a conceptual framework of information domains for which classifications are, or are likely to be required for purposes related to health and health management;
- Provide a suite of endorsed classifications for particular purposes defined within the framework;
- Promote the appropriate selection of classifications in the range of settings in the health field across the world,
- Establish a common language to improve communication; permit comparisons of data within and between member states, health care disciplines, services and time; and to

- Stimulate research on health and the health system. In order to achieve its purpose, members of the WHO Family must:

**In order to achieve its purpose, members of the WHO Family must:**

- be based on sound scientific and taxonomic principles;
- be culturally appropriate and internationally applicable;
- focus on the multi-dimensional aspects of health;
- meet the needs of its different and varied users;
- enable derivation of summary health measures; and
- provide a platform for users and developers

**The following are included within scope for WHO-FIC purposes.**

Health status	Environmental health
Healthcare(including rehabilitation)	Food standards and hygiene
Health policy and planning	Health screening
Disability policy and planning	Prevention of hazardous and harmful drug use
Communicable disease control	Public health research
Selected health promotion	External causes of injury
Organised immunisation	Occupational health

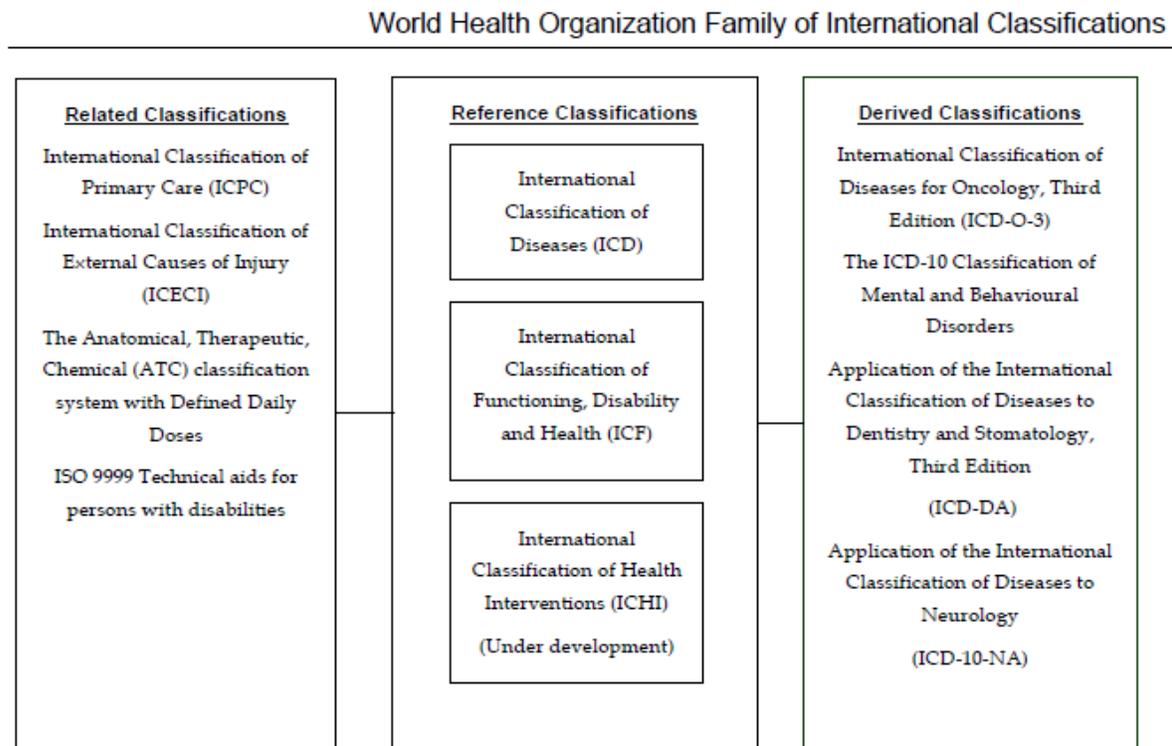
*Source: World Health Organization Family of International Classifications: definition, scope and purpose Revised: August 2004 Retrieved from <http://www.who.int/classifications/icd/docs/en/WHOFICFamily.pdf>*

WHO has developed two reference classifications that can be used to describe the health state of a person at a particular point in time. Diseases and other related health problems, such as symptoms and injury, are classified in the International Classification of Diseases, now in its 10th revision (ICD-10) (WHO, 1994). Functioning and disability are classified separately in the International Classification of Functioning, Disability and Health (ICF) (World Health Organization (WHO, 2001). A third reference classification, the International Classification of Health Interventions (ICHI), is under development. The WHO-FIC has sought consistency with the United Nations Statistical Division (UNSD) approach.

The WHO-FIC provides a framework to code a wide range of information about health (e.g., diagnoses, functioning and disability, reasons for contact with health services) and uses a standardized common language permitting communication about health and healthcare across the world in various disciplines and sciences. These classifications provide a valuable tool for describing and comparing the health of populations in an international context. Classification systems in the WHO-FIC include those that are derived from or related to ICD and serve special

niches or needs, including primary care, clinical specialties, and clinical interventions (procedures). Specialty-based adaptations in the family include oncology (ICD-O-2), dentistry and stomatology, psychiatry, dermatology, pediatrics, and rheumatology and orthopedics.

**Figure 3: Schematic representation of the WHO-FIC**



Source: Source: World Health Organization Family of International Classifications: definition, scope and purpose Revised: August 2004 Retrieved from <http://www.who.int/classifications/icd/docs/en/WHOFICfamily.pdf>

<b>Table 4: WHO- FIC: Schematic representation and Area of application</b>							
Area of Application	Factors influence health and wellbeing <sup>1</sup>		Health and well being		Interventions / Services	Resources	
	Environmental	Personal	Health Condition / disease/ problem	Functioning and disability	Prevention <sup>3</sup> Assessment/ diagnostic Therapeutic Maintenance <sup>4</sup>	Research, Evaluation Monitoring, Other information, Financial, Material, Human	
<u>Mortality</u> (cause of death)	<b>ICD-10</b>	The United Nations maintains classifications of a range of variables relevant to this, including Industry and Occupation. These standard classifications, or classifications which are compatible with them, are to be used in health data collection. Some personal factors have not been defined and classified e.g. genetic profile or coping styles.	<b>ICD-10</b>			The United Nations maintains classifications of a range of variables relevant to these, including Industry and Occupation. These standard classifications, or classifications which are compatible with them, are to be used in health Data collection.	
<u>Self-report</u> e.g. Population health survey and reason for encounter	<b>ICF</b>			<b>ICF</b>			
<u>Population and Environmental health</u>	<b>ICF</b>		<b>ICD-10</b>	<b>ICF</b>	<u>ISO9999</u>		
<u>Primary Care</u> <sup>5</sup> -General practice -Emergency -Other	<b>ICF</b> - <u>-ICECI</u>		<u>-ICPC-2</u> - -	<b>ICF</b> - -	<u>-ICPC-2</u> - -		
<u>Acute hospital admissions</u>	<b>ICD-10</b> (Ch XX)		<b>ICD-10</b>	<b>ICF</b>	<b>ICHI</b> <u>ATC/DDDISO9999</u>		
Specialised care <sup>2</sup> (residential or non-residential)	<b>ICF</b>		<i>ICD-0-3</i> <i>ICD-DA</i> <i>ICD-NA</i> <i>ICD</i> <i>Mental health</i>	<b>ICF</b>	<u>ATC/DDDISO9999</u>		

Source: World Health Organization Family of International Classifications: definition, scope and purpose Revised: August 2004 Retrieved from <http://www.who.int/classifications/icd/docs/en/WHOFICFamily.pdf>

#### 4.5. Methods of assessing quality of health statistics

Data quality is defined as “the totality of features and characteristics of a data set that bear on its ability to satisfy the needs that result from the intended use of the data” (William Braithwaite, et al. 2006). High quality data effectively satisfies its intended use in decision making and planning. In a 1994 study, Wang et al. analyzed the different attributes of good quality data and organized them into fifteen different categories (Abate, M., et al., 1998).

1. **Access Security:** Data must be restricted and kept secure to ensure confidentiality and the protection of civil liberties.
2. **Accessibility:** Data must be available or easily retrievable.
3. **Accuracy:** Data must be correct and free of errors.
4. **Appropriate Amount of Data:** The quantity of data must be appropriate.
5. **Believability:** Data must be regarded as true and credible.
6. **Completeness:** Data must be sufficient in breadth, depth, and scope for its desired use.
7. **Concise Representation:** Data must be represented without being overwhelming.
8. **Ease of Understanding:** Data must be clear.
9. **Interpretability:** Data must be in appropriate language and units.
10. **Objectivity:** Data must be unbiased.
11. **Relevancy:** Data must be applicable to the task at hand.
12. **Representational Consistency:** Data must be presented in a consistent format.
13. **Reputation:** Data must come from a trusted source.
14. **Timeliness:** Data should be recorded as quickly as possible and used within a reasonable time period.
15. **Value-Added:** Data must provide valuable insight.

There are a lot of attributes that are characteristic of high quality data. The appropriate set of attributes and acceptable levels of these attributes may differ depending on the research situation and setting. It is also important to note that many of these attributes are interdependent. For example, data that arrives too late, or takes too long to gather, will no longer be relevant. Similarly, data must be interpretable (in the appropriate language and units) in order for them to be easily understood.

- **Ensuring Quality Data**

To ensure quality data, the data must be managed correctly from the time of collection until the time of analysis. The data first must be recorded properly on the desired survey or questionnaire. Measurement errors and faulty recording must be avoided during this step. To ensure accurate measurements and responses, there must be mutual trust and understanding between the participants and the research staff because when participants trust the researchers, they are more likely to provide reliable responses. Thus, it is very important to choose local staffs that are familiar with the culture and language of the study population to conduct the data collection. In order to ensure accurate responses, it is also important that the staff collecting the data receive training in culturally-sensitive household entry procedures, and it is important to have legible handwriting and an accurate recording of responses. Next, the data needs to be verified and analyzed. Data analysis should be conducted by trained personnel and is normally done by inputting the data into an electronic database. Programming errors and computer misreads must be avoided during this step. Lastly, post-entry data cleaning and extraction into a data set for analysis must be done carefully and without data cleaning errors (Van den Broeck, J., et al., 2007).

- “Poor and inaccurate information is hampering global aid efforts to improve the lives of the world’s poor”(Poor Data Quality Hampers Effective Aid to Developing World 2010). Good public health decision making is dependent on accurate and timely statistics and data. It is critical that quality health data be obtained in order to assess the magnitude and distribution of the disease burden, so that programs can be developed to address health needs worldwide. Vital statistics, such as births, deaths, and causes of death are also critical for addressing health needs and recording progress towards the Millennium Development Goals and other developmental objectives (Setel, P., 2010). In a clinical setting, quality data is important because it can improve the care provided. For example, a study on child mental health services showed that 58% of the patients had improved outcomes after a data quality improvement project was implemented (William Braithwaite, et al. 2006). It is also equally important that the researcher does not utilize inaccurate data for programming or planning purposes since the associated medical errors can lead to long term damage or death in patients, as well as economic losses.

- **Obtaining Quality Data- Challenges**

- I. Lack of Data**

All high-income countries have national civil registration systems that record births and deaths, and the countries generate statistics. Unfortunately, these statistics and registration systems are not usually available in lower income countries where premature mortality and infant mortality are highest.

- II. Lack of Infrastructure**

In resource-poor settings, poor roads, political instability and crime may reduce the completeness and accuracy of the collected data. Lack of technology and data management infrastructure also present a challenge to data management and collection (Van den Broeck, J., et al., 2007).

- III. Population Demographics**

In resource-poor settings, populations are often highly mobile. Thus, problems collecting data may arise when the household heads are away for extended periods of time in search of food, water, or casual work (Wiseman, V. et al., 2010). In addition, cultural and linguistic differences between the research staff and respondents may lead to misreporting.

**Table5: Key data sources on health information in India**

<i>Type of Source</i>	<i>Description</i>	<i>Strengths</i>	<i>Limitations</i>
Population census	Primary source of information about the population; its geographical distribution; and the social, cultural, demographic & economic characteristics of its people	Covers the whole population; small geographic units; equity information; Data for mortality and fertility for different levels of geographic areas; important source for planning and implementation of various activities and programs at smallest geographic unit	Long intervals between censuses conducted on a 10 year basis with few questions related to health issues; Data analysis and dissemination of census information is often time consuming
Civil Registration System	Population based systems that record vital events such as births, deaths and causes of death based on Civil Registration System/Sample Registration	Yearly data for causes of death disaggregated by age, sex, type of residence; Data on trends related to vital events	Incompleteness and poor quality of data on causes of death recording; Lack of proper implementation at lower geographical unit
Surveys	National population surveys are based on a national sample of households and respondents; Includes only interviews or with biomarkers	Information on the entire population and covering a wide range of health issues; Major vehicle for biological and clinical data collection; Data disaggregation and data analysis possible mainly at state level (using NFHS) and at district level (using DLHS); Data in the public domain with clear standards possible	Reporting biases for several health conditions; Low pre-valence conditions or rare events needs excessive survey sample size; High resource requirements to ensure high quality data
Service Records	Service-generated data derived from various health facilities and patient provider interactions covering morbidity type and mortality by cause, care offered, quality of care, treatment administered, and services rendered	Used for service management; Yearly data on services rendered, Monthly data possible and in few cases monthly data are being compiled; Basis for disease surveillance systems to detect outbreaks; Useful in measuring performance of facilities and its monitoring; Generates data on state specific schemes for local planning and surveillance	Excludes those not accessing the services (in-built selection bias); Incompleteness and data quality, Reporting problems, irregularity and Data duplication & inconsistency; Private sector often not included; Lack of data analysis including disaggregation and use of service statistics in local area planning
Administrative Records	Information on financial resources, human resources ,health infrastructure	Single source of data for health resources; Useful in resource planning; Cadre review& HR management	Data bases often incomplete and out-of-date; Private sector not included

*Source: Borrowed from the article "Health Information System in India: Issues of Data Availability and Quality" by Arvind Pandey et al. (2010) Demography India Vol. 39, No. 1 (2010), pp. 111-128*

# CHAPTER 5

## INDICATORS FOR MEASURING HEALTH STATUS

### Overview:

This Chapter covers the concept of indicators, their types and hierarchy (input, process, output, outcome, impact), in general; and focuses on health status indicators like disease burden and epidemiological indicators; and reproductive and child health indicators. Health care resources and their burden are also explained in this Chapter. Universal Health Coverage (UHC) with a special emphasis on its measurement, data gaps in outcomes, impacts and discrimination in the use of data is also covered in the chapter.

### 5. Indicators

#### 5.1. What is an Indicator?

- An indicator is a key statistical measure selected to describe a situation, track progress and performance, and act as a guide to decision making.
- An *indicator* is a measure that is used to demonstrate change in a situation, or the progress in, or results of, an activity, project, or programme
- Health indicators are quantifiable characteristics of a population which researchers use as supporting evidence for describing the health of a population
- Health indicators are summary measures that are designed to describe particular aspects of health or health system performance. Health indicators are generally developed in the context of a conceptual framework

#### A health indicator should have the following characteristics:

1. It should defined in such a way that it can be measured uniformly internationally
2. It must have statistical **validity**
3. The indicator must be data which can **feasibly** be collected.

4. It should be **reliable** and objective. That is the answers should be the same if measured by different people in similar circumstances.
5. The analysis of the data must result in a recommendation on which people can make changes to improve health

A key characteristic of indicators is the ability to “track progress and performance, and act as a guide to decision making”. Presenting indicators is generally only useful if comparison can be included viz: comparison over time, comparisons by population or provider subgroups, international comparison and comparisons against a target or standard,

## **5.2. Type of Indicators:**

Indicators are categorized in to two categories:

1. Quantitative Indicators,
2. Qualitative Indicators

Quantitative indicators are those that measure quantity, usually as *rate or ratio*. For example Infant Mortality rate is a quantitative indicator which is derived by **counting** the number of infant deaths among total life births in a given area and given time period. Similarly birth rate is a quantitative indicator, derived by **counting** number of births occurred in a geographic area in a given time period among midyear population.

Qualitative indicators can be defined as people’s judgment or perception about a subject. For example “perception towards “HIV/AIDS” affected person”, or “Quality of life” of elderly in a community. Qualitative indicator measure changes in a population’s health.

### **5.2.1. Hierarchy of indicators for a health:**

Evaluation of health programs are made by identifying and analyzing through” **input, process, output, outcome and impact**” indicators; they are tools for performance based decisions about program strategies and activities and also used for evaluate project or program success.

## **Example for hierarchy of indicators for a health education campaign:**

### **1. Input Indicator**

Measure the quantity, quality and timeliness of resources viz: Human, financial and material, technological and information provided for an activity/project or program.

-- Number of literature material available for distribution

### **2. Process indicator**

**Process indicators** refer to indicators to measure whether planned activities took place.

Examples include holding of meetings, conduct of training courses, and distribution of medicines, development and testing of health education materials.

--Number of people who receive the literature

### **3. Output Indicator:**

**Output indicators** add more details in relation to the product (“output”) of the activity, e.g. the number and categories of health providers trained in case management or communications skills, the number and type of radio spots produced and broadcast.

**Example:** the output of a training course on case management may be the number of medical assistants trained and, consequently, the number or proportion of them with improved knowledge and skills in case management. Indicators should also monitor the **quality** of the activities conducted, based on a number of established quality criteria or standards.

**Example:** indicators to monitor the quality of a communication training course may include the ratio facilitator to participant, the total duration of the training, the percentage of total training time spent practicing the communication skills, the number of caregivers counselled per participant, the proportion of participants trained that were followed up with skill reinforcement visits within 4 weeks of training.

These indicators are useful management tools to monitor implementation and its quality. However, they do not provide information on the results and impact of the activity.

#### 4. Outcome indicators

**Outcome indicators** refer more specifically to the objectives of an intervention that is its ‘results’, its outcome. These indicators refer to the reason why it was decided to conduct certain interventions in the first place. They are the result of both the “quantity” (“how many”) and quality (“how well”) of the activities implemented.

**Example:** the outcome of a training of health providers in the Integrated Management of Childhood Illness (IMCI) should be improved management of sick children under 5 years old, e.g. the proportion of sick children correctly managed by the trained health providers.

These indicators are usually measured through surveys. Coverage indicators measure the extent to which the target population (e.g. children under-five) has received—and therefore has been reached by—the intervention.

**Examples:** proportion of under-five children with suspected pneumonia treated with antibiotics, proportion of under-five children with diarrhoea given oral rehydration therapy, proportion of infants 0-5 months old who are exclusively breastfed.

These indicators, therefore, allow us to know whether the desired outcome has been generated.

It may take time before final outcomes can be measured. A number of intermediate outcome indicators should therefore be identified for all the intermediate changes that the intervention is expected to bring about and that will eventually lead to the final outcome. This helps us know whether we are progressing towards achieving the expected final outcome.

#### 5. Impact indicators

Measure the quality and quantity of long-term results generated by programme outputs (e.g. measurable change in quality of life, reduced incidence of diseases, increased income for women, reduced mortality, improved child nutritional status).

These indicators do not show progress over relatively short periods of time. It is then the logical flow of indicators described above which enables a more regular and frequent monitoring of changes.

### **5.3. INDICATORS OF HEALTH STATUS:**

#### **5.3.1. Disease burden and epidemiological indicators:**

WHO defines health in positive terms as “a state of complete mental, physical and social well-being and not merely the absence of disease” This WHO definition is widely quoted where health is defined in very broad term. It is not seen to be simply the absence of disease but a state of well-being at all levels of human existence. Measure of health status must address health versus illness or disability. Extensive research has been carried out to develop more general measures of non-fatal health outcomes that are commensurate with time lost due to premature mortality. Since Sullivan’s (1971) proposal in the late 1960’s of composite index of health status that incorporates mortality and morbidity, there has been much debate on the value of these indicators (Murray 1994). In the recent times, researchers at the World Bank and Harvard University in collaboration with other organization started a project called “Global Burden of Disease” and produced volume of work related to measure the Burden of Disease. The selected indicators are given below:

#### **2. QALY: Quality Adjusted Life Year:**

Torrance et al (1972) developed a measure in which health status between perfect health and death are weighted by the utility to the individual of time spent in each of these states. QALY refers to a time-based measure which includes life expectancy and non-fatal health outcomes where time spent with non-fatal outcomes is adjusted by a preference weight. QALY measures years of survival weighted for the quality of life, which people may be expected to have in the context of different states of illness.

**3. DALY: The Disability Adjusted Life Year** The Disability Adjusted Life Year (DALY) is a health gap measure that extends the concept of potential year of life lost due to premature death (PYLL) to include equivalent years of “healthy” life lost by virtue of being in states of poor health or disability. In simple DALY is calculated by adding Years of life Lost (YLL) and the Years Lived with Disability (YLD). The YLL is determined using the West model life-table to determine age-sex-specific life expectancies.

Years Lived with Disability (YLD), is calculated on the basis of the incidence and duration of conditions resulting in non-fatal outcomes and are weighted according to the severity of the disability of the sequel. Similarly another explicit value is attached to the time lived with a disability to make it comparable to time lost due to premature mortality.

**4. HALE: Healthy life expectancy:** To reducing the incidence, duration and severity of minor diseases that cause morbidity but not mortality and to reducing their impact on people's lives, it is important to capture both fatal and non-fatal health outcome in a summary measure of average levels of population health. Healthy Life Expectance (HALE) at birth is one of such indicator explains the expectation of life for different health status, adjusted for severity distribution making it sensitive to change over time or difference between countries.

HALE is defined as Average number of years that a person can expect to live in "full health", by taking into account years lived in less than full health due to disease and/or injury.

**5. YLL :Years of life lost (percentage of total) :** Year of life are lost (YLL) take into account the age at which deaths occur by giving greater weight to deaths at younger age and lower weight to death at older age. The years of life lost (percentage of total) indicator measured the YLL due to a cause as a proportion of the total YLL lost in the population due to premature mortality.

YLL are calculated from the number of deaths multiplied by a standard life expectancy at the age at which death occurs.

**5. DFLE: Disability free Life Expectancy:** The institutionalization rate (derived from census) and the prevalence of various states of functional disability (from disability survey) are incorporated with the years lived at various ages by the population of a life table. The period life expectancy for the modified table is calculated in the traditional manner yielding the value of Disability free Life Expectancy.

## 5.3.2 INDICATORS FOR COMMUNICABLE DISEASES

### 1. Tuberculosis mortality:

Prevalence of Tuberculosis and deaths due to Tuberculosis are direct indicators of the burden of disease due to tuberculosis (TB). It is defined as estimated number of deaths due to TB per 100000 population per year, which includes all forms of TB, and deaths from TB in people with HIV.

### 2. Incidence of Tuberculosis:

Incidence (cases arising in a given time period) gives an indication of the burden of tuberculosis (TB) in a population, and of the size of the task faced by a national TB control programme. Incidence can change as the result of changes in transmission or changes in the rate at which people infected with *M. tuberculosis* develop TB disease.

### 3. Prevalence of Tuberculosis:

Prevalence and mortality are direct indicators of the burden of tuberculosis (TB), indicating the number of people suffering from the disease at a given point in time, and the number dying each year. Prevalence of Tuberculosis is defined as the number of TB cases of all forms per 100000 population at a given point in time (point prevalence).

### 4. Tuberculosis: DOTS cases detection rate:

The proportion of estimated new smear positive cases which are detected by DOTS programmes provides an indication of how effective national tuberculosis programmes are in finding people with tuberculosis and diagnosing the disease. The case detection rate is calculated as the number of cases notified divided by the number of cases estimated for that year, expressed as a percentage.

**5. Probability of dying (per 1000) between ages 15-60 years (adult mortality rate):** The disease burden from non-communicable diseases among adults is rapidly increasing in developing countries due to ageing and health transitions. Hence Level of adult mortality is becoming an important indicator for the comprehensive assessment of the mortality pattern in a population.

It is defined as the probability that a 15 year old person will die before reaching his/her 60<sup>th</sup> birth day. It can be redefined as –The probability of dying between the ages of 15 and 60 years (per 1000 population) per year among a hypothetical cohort of 100000 people that would experience the age specific mortality rate of the reporting year.

#### **6. Estimated rate of adults (15+) dying of HIV/AIDS (per 1000) and Estimated rate of children below 15 years of age dying of HIV/AIDS (per 1000):**

It is defined as estimated mortality due to HIV/AIDS is the number of adults and children that have died in a specific year based in the modelling of HIV surveillance data using standard and appropriate tools.

It can be further defined as: Adult mortality rate and children mortality rate, that is the number of deaths divided by the number of population at risk during a certain period of time and expressed as rate per 100000 people. Data can be obtained from HIV surveillance data derived from sentinel surveillance and or household surveys.

#### **HIV/AIDS**

HIV prevalence among the population aged 15-49 years

Deaths due to HIV/AIDS per 100 000 population: (The estimated number of adults and children that have died due to HIV/AIDS in a specific year, per 100000 population)

Percentage of Population aged 15-24 years with comprehensive correct knowledge about HIV/AIDS

#### **Core Indicators of National AIDS Control Programme:**

- Percentage of districts or local health administration units with at least one health facility providing ART in line with national standards
- Percentage of ARV storage and delivery points meeting the minimum quality criteria  
Number of health workers (by type) newly trained or retrained on ART delivery in accordance with national or international guidelines during the preceding 12 months

- Number of health workers (by type) newly trained or retrained on ART delivery in accordance with national or international guidelines during the preceding 12 months
- Percentage of facilities with ART services which also provide comprehensive care, including prevention for HIV-positive clients, or which refer to such services if they are not available on site.
- Percentage of people with advanced HIV infections who are currently receiving antiretroviral Combination therapy.
- Percentage of individuals who are still on treatment and who are still prescribed a standard first-line regimen after 6, 12 and 24 months from the initiation of treatment
- Percentage of people alive and known to be on treatment at 6, 12, 24, 36, etc. months after initiation of treatment
- Proportion of HIV-positive registered TB patients given ART during TB treatment

#### **Preventive interventions for HRG (Targeted Interventions)**

- Percentage of districts which have updated HRG mapping data
- Number & percentage of specific HRG population reached by intervention reporting use of condoms with their most recent client
- Percentage of men reporting use of condoms in the last time they had anal sex with a male partner
- Percentage of men reporting use of condoms in the last time they had anal sex with a male partner
- Percentage of IDU population reporting use of sterile injecting equipment at last injection
- Percentage of IDU reporting use of condoms at last sex – UNGASS
- Percentage of FSW, MSM, and IDU's with STI symptoms, seeking services from qualified medical providers.
- Percentage of sex workers or MSM who refused to have sex with a client/no regular partner in the last 12 months because of not having or refusing to use a condom
- Percentage of PLHA registered in TI linked to basic aids care and support
- Percentage of targeted interventions reporting condom stock out
- Percentage of TI projects reporting no interference from local power structures

### **Prevention interventions for Bridge Population**

- Percentage of men reporting being clients of sex workers in the last year
  - Percentage of truckers reporting use of condoms with last commercial sex partner
- Number & Percentage of High risk men

### **Interventions for Vulnerable Populations (women, children, adolescents and workers)**

- Proportion of vulnerable population (women, children and youth) who access HIV care services (e.g. ICTC/STI/PPTCT/ ART (Relevant indicators analyzed by gender and age)
- Percentage of youth using youth resource centers /clubs in their town/district
- Percentage of workers who have access to information and services on HIV/AIDS at their work place (by formal and informal sectors)

### **STI**

- Percentage of general population males with STI seeking treatment from qualified personnel
- Percentage/List of clinics reporting a stock out of essential STI drugs
- Percentage of STI patients partners who attend STD clinics for treatment

### **ICTC (including PPTCT)**

- Percentage of FSW, MSM, and IDU who received HIV testing in the last 12 months and who know their results
- Percentage of persons who return for test report at ICTC by gender and age Percentage of HIV positive persons referred to ART center, by gender
- Percentage of pregnant women newly diagnosed as HIV positive at ICTC, whose sexual partner has been tested.
- Percentage of ICTC reporting inadequate quantities of HIV test kits
- Percentage of ICTCs having pregnant women as their clients

### **Condoms**

- Percentage of persons reporting condom use at last sex with non-regular partners
- Number of condoms distributed by social marketing programs

- Number of free condoms distributed through TI and STD clinics
- Percentage of persons who have had sex with non-regular partners who perceive that condoms are easily accessed at the time of sex act
- Number of non-traditional outlets selling socially marketed condoms

### **Blood banks and blood Safety**

- Percentage of blood units screened for HIV in a quality assured way
- Percentage of blood being processed into components
- Percentage of general population adults and youth who both correctly identify ways of preventing sexual transmission of HIV and reject misconceptions about HIV transmission by gender
- Percentage of out of school youth reached by HIV awareness programme
- Percentage of students covered under School AIDS program
- Percentage increase in media coverage on HIV/AIDS issues

## **CARE, SUPPORT AND TREATMENT AND IMPACT MITIGATION**

Total number of persons who are HIV positive

### **Antiretroviral Therapy**

- Number of service outlets providing ART services, by public/private facility
- Number and percentage of eligible PLHA (by CD4 count) who initiate ART – by age, gender, and public/private facility
- Percentage of persons put on ART who report (95%) adherence at the end of 12, 24, 36 months, by age and gender
- Percentage of HIV positive incident TB cases that received treatment for TB and HIV
- Percentage of HIV positive incident TB cases that received treatment for TB and HIV

### **Care & Support**

- Number of service outlets providing treatment for opportunistic infections (OI)
- Number of PLHA who access OI treatment
- Number of NGOs involved with provision of care and support to affected children

- Number of PLHAs (and their family members) receiving services from NGOs/CBOs by gender and age

### **5.3.3. Communicable Diseases:**

#### **1. Malaria**

Malaria Blood Examination rate (expressed as percent)

Malaria Slide Positive rate expressed as a percentage

Annual Malaria Parasite incidence

Annual Falciparum incidence

Estimated percentage of Population using Malaria prevention

#### **2. Leprosy**

Number of reported cases of Cholera (confirmed cholera, including those confirmed clinically, epidemiologically or by laboratory investigation)

Number of confirmed diphtheria cases

Number of reported cases of leprosy

Number of reported cases of measles

Number of reported cases of mumps

Number of reported cases of neonatal tetanus

Number of reported cases of pertussis (whooping cough)

Number of reported cases of plague

#### **3. Poliomyelitis**

Number of reported cases of poliomyelitis

Number of confirmed cases of Poliomyelitis

Non-Poliomyelitis Acute Flaccid Paralysis Rate

Percentage of Acute Flaccid Paralysis with adequate stools

### **5.3.4. Non Communicable Diseases**

#### **1. Coronary Artery Disease**

Prevalence of Coronary Artery Disease

Prevalence of stroke

#### **2. Diabetes**

Prevalence of Type II Diabetes

Prevalence of impaired Glucose Tolerance

#### **3. Cancer**

Age Standardized incidence Rate of Breast Cancer

Age Standardized incidence Rate of cancer of the mouth

Age Standardized incidence Rate of Lung Cancer

Age Standardized incidence Rate of Cancer of the Larynx

Age Standardized incidence Rate of Urinary Bladder Cancer

Age Standardized incidence Rate of Skin Cancer

Age Standardized incidence Rate of Prostate Cancer

Age Standardized incidence Rate of Cancer of the colorectal

Age Standardized incidence Rate of Lymphoma

Percentage of women clinically screened for Breast Cancer

#### **4. Mental Illness**

Prevalence of minor Mental Illnesses

Prevalence of major Mental Illnesses

Total Number of substance Abusers

#### **5. Others: Disabilities:**

Prevalence of Physical and Mental Disability

Prevalence of the nature of Disability

Prevalence of Blindness

Number of people with Bilateral Blindness

Prevalence of Functional low vision

Prevalence of Hearing impairment

#### **6. Risk Factor Prevalence**

Proportion of persons overweight and obese

Proportion of persons underweight

Proportion of persons who are daily smokers

Proportion of adults with high blood pressure

Proportion of adults with high blood cholesterol

Proportion of adults who are physical inactive

Incidence of low birth weight among live born babies

Proportion of people with diabetes mellitus who have received an annual cycle of care with general practice.

## 5.4 REPRODUCTIVE AND CHILD HEALTH INDICATORS (INDIA)

### 5.4.1. Comprehensive reproductive health care Indicators:

Reproductive health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity, in all matters relating to the reproductive system and to its functions and processes. Reproductive health therefore implies 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. It also includes sexual health, the purpose of which is the enhancement of life and personal relations.

Reproductive Health indicators are developed on the basis of Program performance of following issues:

- :Counselling, information, education, communication and clinical services in family planning;
- Safe motherhood, including antenatal care, safe delivery care (skilled assistance for delivery with suitable referral for women with obstetric complications) and postnatal care, breastfeeding and infant and women's health care;
- Gynaecological care, including prevention of abortion, treatment of complications of abortion, and safe termination of pregnancy as allowed by law;
- Prevention and treatment of sexually transmitted diseases (including HIV/AIDS), including condom distribution, universal precautions against transmission of blood borne infections, voluntary testing and counselling;
- Prevention and management of sexual violence;
- Active discouragement of harmful traditional practices such as female genital mutilation; and
- Reproductive health programmes for specific groups such as adolescents, including information, education, communication and services.

### 5.4.2. Antenatal Care (Women who had live/still birth during given time period)

Percentage of Mothers who received any antenatal check-up

Percentage of Mothers who had antenatal check-up in first trimester

Percentage of Mothers who had three or more Antenatal Check-up

Percentage of Mothers who had at least one tetanus toxoid injection

Percentage of Mothers whose Blood Pressure taken

Percentage of Mothers who consumed 100 Iron Folic Acid tablets

Percentage of Mothers who had full antenatal check-up

#### **5.4.3. Delivery Care** (Women who had live/still birth during given time period)

Percentage of women delivered at Government Institutions

Percentage of women delivered at home

Percentage of deliveries at home conducted by skilled health personnel

Percentage of Safe delivery

Percentage of Births attended by skilled health personnel

Percentage of Mothers who received post-natal care within two weeks of delivery

Percentage of Mothers who received financial assistance for delivery under JSY

Percentage of births by caesarean section

Percentage of low birth weight among birth cohorts

#### **5.4.4. Child Care Indicators:**

Prevalence of low birth weight

Number of live born babies who weigh less than 2500 g x 100

Low birth weight (LBW): less than 2500 g (up to and including 2499 g

Very low birth weight: less than 1500 g (up to and including 1499 g .

Extremely low birth weight: less than 1000 g (up to and including 999 g

Percentage of overweight (Weight-for-height greater than +2 standard deviation) among children aged 0-5 years

Percentage of underweight (Weight-for-age less than -2 standard deviation) among children aged 0-5 years

Percentage of stunting (Height-for-age less than -2S.D.) among children aged 0-5 years

Percentage of wasting (weight for Height less than -2S.D)among children aged 0-5 years

Percentage of children aged less than 5 years with ARI symptoms receiving antibiotics (Percentage of children aged 0-59 months with suspected pneumonia receiving antibiotics)

Probability of dying under age five years (Under five mortality rate)

Probability of dying (per 1000) under age one year (Infant mortality rate,  $oq_1$ )

Probability of dying (per 10000) between ages 15-60 years (adult mortality  $1q_5$ )

Neonatal mortality rate per 1000 live births

Perinatal mortality rate

Percentage of death of children under five by cause

#### **5.4.5. Child Immunization**

Percentage of children 12-23 months fully immunized

Percentage of children 12-23 months not received any vaccination

Percentage of children 12-23 months who have received BCG vaccine

Percentage of children 12-23 months who have received three doses of DPT vaccine

Percentage of children 12-23 months who have received three doses of polio vaccine

Percentage of children 12-23 months who have received measles vaccine

Percentage of children 9 months and above received at least one dose of vitamin A supplement

#### **5.4.6. Child Feeding Practices:**

Percentage of children under three year's breastfed within one hour of birth

Percentage of children age 0-5 months exclusively breastfed

Percentage of children age 6-35 months breastfed for at least six months

Percentage of children age 6-9 months receiving solid/semi-solid food and breast milk

#### **5.4.7. Treatment of Childhood Diseases:**

Percentage of Children with diarrhoea in the last 2 weeks who received Oral rehydration therapy

Percentage of children with diarrhoea in the last 2 weeks who sought advice/treatment

Percentage of children with acute respiratory infection or fever in last 2 weeks who sought advice/treatment

Percentage children less than five years who received treatment with any ant malarial medicine

#### **5.4.8. Maternal Health Indicators**

Availability of basic essential obstetric care:

The number of facilities with functioning basic essential obstetric care per 500 000 population

**Numerator:** Number of facilities with functioning basic care X 500 000

**Denominator:** Total population

Availability of comprehensive essential obstetric care :

The number of facilities with functioning comprehensive essential obstetric care per 500 000 population

**Numerator:** Number of facilities with functioning basic care X 500 000

**Denominator:** Total population or Total number of live births

Prevalence of positive syphilis serology in pregnant women:

The percentage of pregnant women aged 15–24 years attending antenatal clinics with a positive

serology for syphilis **Numerator:** Number of pregnant women aged 15–24 years attending antenatal clinics, whose blood has been screened for syphilis, with a positive serology for syphilis during a specified period x 100 **Denominator:** Total number of pregnant women aged 15–24 years attending antenatal clinics, whose blood has been screened for syphilis during the specified period

Prevalence of anaemia in women:

The percentage of women of reproductive age screened for haemoglobin levels that have levels below 110 g/l (pregnant women) and 120 g/l (non-pregnant women). **Numerator:** Number of women of reproductive age screened for haemoglobin levels who have levels below 110 g/l (pregnant women) and 120 g/l (non-pregnant women) during a specified period x 100 **Denominator:** Total number of women of reproductive age screened for haemoglobin levels during the specified period

Percentage of obstetric and gynaecological admissions owing to abortion:

The percentage of admissions for (spontaneous or induced) abortion-related complications to service delivery points providing inpatient obstetric and gynecological services, among all admissions (except those for planned termination of pregnancy)

**Numerator:** Admissions for abortion-related complications x100

**Denominator:** All admissions, except those for planned termination of pregnancy

#### 5.4.9. Other Reproductive Health Problems:

Percentage of women had primary or secondary infertility

Percentage women had problem of obstetric fistula

Prevalence of infertility in women

The percentage of women of reproductive age (15–49 years) at risk of becoming pregnant (not pregnant, sexually active, not using contraception and not lactating) who report trying for a pregnancy for two years or more **Numerator:** Number of women of reproductive age (15–49 years) at risk of becoming pregnant (as defined above) who report trying unsuccessfully for a

pregnancy for two years or more x100 **Denominator:** Total number of women of reproductive age at risk of becoming pregnant

### *Millennium Development Goals (Target and Indicators)*

#### **Goal 4: Reduce Child Mortality**

**Target 4: A:** Reduce by two-thirds, between 1990 and 2015, the under-five mortality rate

Indicators:

- 4.1 Under-five mortality rate
- 4.2 Infant mortality rate
- 4.3 Proportion of 1 year-old children immunised against measles

#### **Goal 5: Improve maternal health**

**Target 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

**Target 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

#### **Goal 6: Combat HIV/AIDS, malaria and other diseases**

**Target 6.A:** Have halted by 2015 and begun to reverse the spread of HIV/AIDS

- 6.1 HIV prevalence among population aged 15-24 years
- 6.2 Condom use at last high-risk sex
- 6.3 Proportion of population aged 15-24 years with comprehensive correct knowledge of HIV/AIDS
- 6.4 Ratio of school attendance of orphans to school attendance of non-orphans aged 10-14 years

**Target 6.B:** Achieve, by 2010, universal access to treatment for HIV/AIDS for all those who need it

6.5 Proportion of population with advanced HIV infection with access to antiretroviral drugs

**Target 6.C:** Have halted by 2015 and begun to reverse the incidence of malaria and other major Diseases

6.6 Incidence and death rates associated with malaria

6.7 Proportion of children under 5 sleeping under insecticide-treated bed nets

6.8 Proportion of children under 5 with fever who are treated with appropriate anti-malarial drugs

6.9 Incidence, prevalence and death rates associated with tuberculosis

6.10 Proportion of tuberculosis cases detected and cured under directly observed treatment short course

#### **5.4.10. Environmental Indicators:**

##### **1. Water & Sanitation**

##### **2. Household amenities and infrastructure facilities:**

Percentage of population (Household) using improved drinking water sources:

- Piped water within dwelling, plot or yard
- Public tap/stand pipe
- Tube well/borehole
- Protected dug well
- Protected spring
- Rainwater collection
- unprotected dug well
- Tanker truck
- Surface water

Percentage Population using improved sanitation facilities

Age-standardized death rate per 100000 by cause

### **3. Tobacco Smoking**

Prevalence of smoking

Prevalence of smokeless tobacco use

Prevalence of passive smoking

Prevalence of current (daily or occasional) tobacco smoking among adult (15 years and above)

Prevalence of current tobacco use among adolescents aged 13-15 years (%)

Prevalence of current tobacco use among adults aged  $\geq 15$  years (%)

Percent distribution of males age 15 and above who are current tobacco users by tobacco use pattern

Percent distribution of females age 15 and above who are current tobacco users by tobacco use pattern

Percent distribution of ever daily tobacco users age 20-34 by age at tobacco use initiation and gender

Percent distribution of age at initiation among ever daily tobacco users age 20-34 by age at tobacco use initiation

Percentage of adults age 15 and above who are current smokers of various smoked tobacco products

Percentage of females age 15 and above who are current smokers of various smoked tobacco products

Percent distribution of current daily cigarette smokers age 15 and above by number of cigarettes smoked on average per day and gender

Percentage of adults age 15 and above by use of smokeless tobacco

Percentage of females age 15 and above by use of smokeless tobacco

Percentage of adults age 15 and above who are current users of various smokeless tobacco products

#### **4. Human Resources (Health care)**

Percentage of Population covered under Primary Health Centre

Percentage of Population covered under Community Health centre

Percentage of Population covered under Sub Centre

Percentage of Population covered under District Hospital

Number of villages having ASHA

Percentage of villages covered by ASHA

Percentage of villages within 3 K.M distance from Sub Centre

Percentage of villages within 10 K M distance from PHC

Percentage of sub-centre with ANM

Percentage of sub-centre with male health worker

Percentage of sub-centre with additional ANM

Percentage of ANM's living in Sub Centre quarters

Percentage of Sub-centre located in Government building

Percentage of PHCs having Medical Officer

Percentage of PHCs having Lady Medical Officer

Percentage of PHCs having at least 4 beds

Percentage of PHCs having residential quarters of Medical Officer

Percentage of PHCs functioning on 24 hours basis

Percentage of PHCs having new born care services

Percentage of PHCs having referral services for complicated pregnancy/delivery

Percentage of PHCs conducted at least 10 deliveries during last month.

Number of Physicians per 1000 population

Number of Nurses per 1000 population

Number of Midwives per 1000 population

Number of Pharmacists per 1000 population

Number of Public and environmental health workers per 1000 population

Number of laboratory health workers per 1000 population

Number of health management and support workers per 1000 population

Number of hospital beds per 10000 populations

**5. Health Expenditure** (Detailed description is given in chapter-6)

Total expenditure on health as percentage of GDP

Public health program expenditure as proportion of total health expenditure

Differential rates for specialist service use (public outpatient and out-of hospital private patient) per 1000 population.

Out-of-pocket costs as a proportion of cost of service (GP and specialist medical services, pharmaceutical and dental services)

Total cost per medical specialist (MBBS) service

Number of accredited and filled clinical training positions

Capital expenditure as proportion of total health and aged care expenditure

Proportion of GDP (health expenditure) spent on health research and development

### **5.5. Universal Health Coverage :( UHC)**

WHO defines a list of over 750 indicators under the following domains: Demographics, Health Equity Monitor, Health service coverage, Health systems resources, Mortality, Risk factors, Socioeconomics and Morbidity. In order to monitor the health system progress and performance, 47 indicators have been identified. (WHO, 2011).

Government of India in 12<sup>th</sup> five year health sector plan focused on “achieving Universal health coverage” and developed indicators for international reporting. The Universal Health coverage (UHC) defined as “Ensuring equitable access for all Indian citizens in any part of the country, regardless of income level, social status, gender, caste or religion to affordable, accountable and appropriate, assured quality health services ( promotive , preventive, curative and rehabilitative) as well as services addressing wider determinants of health delivered to individuals and populations, with the Government being the guarantor and enabler, although not necessarily the only provider of health and related services’. The plan also encompasses the National Health Mission (NHM) with an objectives of universal immunization, reduction of maternal mortality and providing affordability care by reducing out of pocket expenditure.

The Ministry of Health and Family Welfare (MoHFW) in Result Framework Document (RFD) referred indicators as follows:

1. Universal access to primary health care services-10 Indicators
2. Improving maternal and child health—3 Indicators
3. Population stabilization in the country- 4 Indicators

4. Developing human resources for health to achieve health goals- 5 Indicators
5. Reducing overall disease burden of the society: Indicators for malaria, filariasis, Kala-azar, leprosy, tuberculosis, and blindness
6. Strengthening secondary and tertiary health care linked to nursing teaching colleges, hospitals, and medical colleges.
7. Reducing burden of leprosy with quality services and enhance Disability Prevention & Medical Rehabilitation (DPMR) services.

**Gaps:**

For achieving universal health coverage, an ideal health system strengthening framework needs to be linked to the UHC viz: to improved population coverage, to improved service delivery and to improved sharing of costs.

- Population coverage indicators need improved emphasis on covering children, informal workers, women, girls, aged, and those living in remote areas.
- For service delivery it needs an indicator framework carving out entire continuum of care - preventive, promotive, treatment and rehabilitative over both communicable and non-communicable diseases.
- For costs sharing and affordability service delivery needs to be linked to regional, geographic, gender and socio economic inequalities in all indicators.
- The framework needs to be standardized across states taking into account the epidemiology and population characteristics

**Sources of Data:**

**Population based surveys:**

- Census, <http://censusindia.gov.in/>
- The Sample Registration System (SRS):[http://www.censusindia.gov.in/vital\\_statistics/SRS\\_Bulletins/Final-MMR%20Bulletin-2007-09\\_070711.pdf](http://www.censusindia.gov.in/vital_statistics/SRS_Bulletins/Final-MMR%20Bulletin-2007-09_070711.pdf)

[http://www.censusindia.gov.in/vital\\_statistics/SRS\\_Bulletins/Bulletins.html](http://www.censusindia.gov.in/vital_statistics/SRS_Bulletins/Bulletins.html)

- District Level Health and Facility Surveys: DLHS-1 (1998-99), DLHS-2 (2002-04) and DLHS-3 (2007-08)  
<http://www.rchiips.org/>
- The National Family Health Survey (NFHS): NFHS-1 (1992-93), NFHS-2 (1998-99), NFHS-3 (2005-06), NFHS-4 (2014-initiated).  
<http://www.nfhsindia.org>
- The Annual Health Survey (AHS) for three years (2010, 2011 and 2012)  
<http://www.censusindia.gov.in/2011-Common/AHSurvey.html>
- Coverage Evaluation Survey (CovES) population based survey supported by MOHFW and UNICEF (2005, 2006 and 2009)
- The Morbidity and Health Care Surveys (NSSO): 1986-87, 1995-96 and 2004.
- Study on Global Ageing and Adult Health (SAGE)
- World Health Survey (WHS 2003)

**Administrative Data:**

- Central Bureau of health Intelligence (CBHI)
- National Health Policy 2012 (NHP-2012)
- Rural Health Statistics in India (2012)
- The Civil Registration System (CRS)
- Health Management Information System (HMIS)
- NRHM (National Rural Health Mission) Monitoring data

# CHAPTER 6

## HEALTH EXPENDITURE AND FINANCING

### Overview:

This chapter focuses on major indicators of health expenditure and finance. It presents current evidence regarding the situation in India. The chapter is organised in the following manner. First section of the chapter discusses how the boundaries of health care are delineated from the perspective of expenditure and finance. Major indicators of health expenditure and finance are discussed in the second section. Public-Private Partnership in health is the subject matter of the third section. Finally, concluding observations are made.

### 6. Introduction

Financial burden of health care has significant 'impoverishing' effects on households in a developing country like India. Low public spending on health and exorbitant out of pocket expenditure by households characterize Indian health care system. Poor quality of preventive care, epidemiological changes, demographic transition, and increased awareness has implications for higher demand for health care in coming years. This coupled with medical inflation may pose higher financial burden on households.

Some stylized facts about contemporary scenario of health expenditure in India are bothersome. India's rank is 143 among 190 countries in terms of per capita expenditure on health (\$146 PPP in 2011). It has 157<sup>th</sup> position according to per capita government spending on health which is just about \$44 PPP. India's per capita health spending is 35 per cent and about one-third of China and Thailand respectively. India's per capita government spending is one of the lowest in the World. It is less than one fifth of China and about 15 per cent of Thailand (WHO 2014). In this context, unprotected financial risk of health care poses serious concern which the health care system must address. Comprehensive and consistent evidence on financial aspect of a health care system is a prerequisite for assessing the situation and to bring about necessary reforms. Periodic assessment of standard indicators of health expenditure and finance helps in long term planning.

## 6.1. Health and Health Related Expenditure

There is a distinction made between health and health related expenditure. Apart from core health services, expenditure on water, sanitation, and nutrition is considered to have direct impact on health outcome. Hence, a broad definition considers expenditure on these components apart from the expenditure on core health to get a sense of total expenditure commitment towards health care.

Different approaches are adopted by various institutions in defining the boundary of health care. WHO defines total health expenditure as all expenditure whose primary purpose is to restore, improve and maintain health for nation and for individuals during a defined time period (WHO, World Bank, and USAID 2003). As per this definition, health expenditure comprises expenditure incurred towards curative health care services, disease prevention, reproductive and child health programmes, health promotion, administration of health services, medical education, training and research, and capital investment for health purpose. National Health Accounts (NHA), India adopts this definition and accordingly, expenditure on water supply and sanitation, Integrated Child Development Schemes, drug abuse etc are kept outside the boundary of health accounts (NHA, 2001-02).

Concept of “health care” as per the System of Health Accounts (OECD) includes the sum of activities performed either by institutions or individuals pursuing, through the application of medical, paramedical and nursing knowledge and technology, the goals of: promoting health and preventing disease; curing illness and reducing premature mortality; caring for persons affected by chronic illness who require nursing care; caring for persons with health-related impairment, disability, and handicaps who require nursing care; providing and administering public health; providing and administering health programmes, health insurance and other funding arrangements. As per this definition, goods and services purchased from informal and possibly illegal health care providers are included in the accounting. Providers who are not even medically qualified are possibly included. Similarly, purchases from providers in the alternative systems, who may not use western or allopathic medical technology, may also be included.

In India, NHA provides comprehensive information on financial aspects of the health system since 2005 (see Box 1 for an introduction to NHA).

### **Box 1: National Health Accounts, India**

National Health Accounts is an accepted methodology for representing the financial aspects of the national health systems with all its intricacies and inter-linkages. Some of the critical aspects of the health expenditure and financing, which hitherto remained invisible and opaque, become apparent and comprehensible with NHA. While methodological issues pertaining to NHA continue to be clarified and further refined, adoption of this system renders answers to many basic but critical questions on financial aspects of health. A well developed NHA aids not only in figuring out the current status of resources and actors in the health system but also supports prospective planning and reform of the health system.

Health accounting procedures of NHA has its roots in the System of Health Accounts (SHA) of the Organization for Economic Cooperation and Development (OECD). SHA introduced the International Classification for Health Accounts (ICHA) which offers guidelines for the classification system of health care entities and type of expenditure. Subsequently, the United States Agency for International Development (USAID), the World Bank (WB), and the World Health Organisation (WHO) jointly developed a manual, 'A Guide to Producing National Health Accounts: with Special Applications for Low and Middle Income Countries', generally known as the Producers Guide. The Producers Guide, keeping in view the pluralistic and complex health systems of low and middle income countries, brings out an expanded system of SHA classification with further level of disaggregation.

National Health Policy (NHP), 2002 acknowledged the significance of adopting NHA framework for India and provided a roadmap for introducing the system by 2005. Accordingly, Ministry of Health and Family Welfare has released NHA volumes for 2001-02 (in 2005) and 2004-05 (in 2009). It is committed to release such reports from time to time.

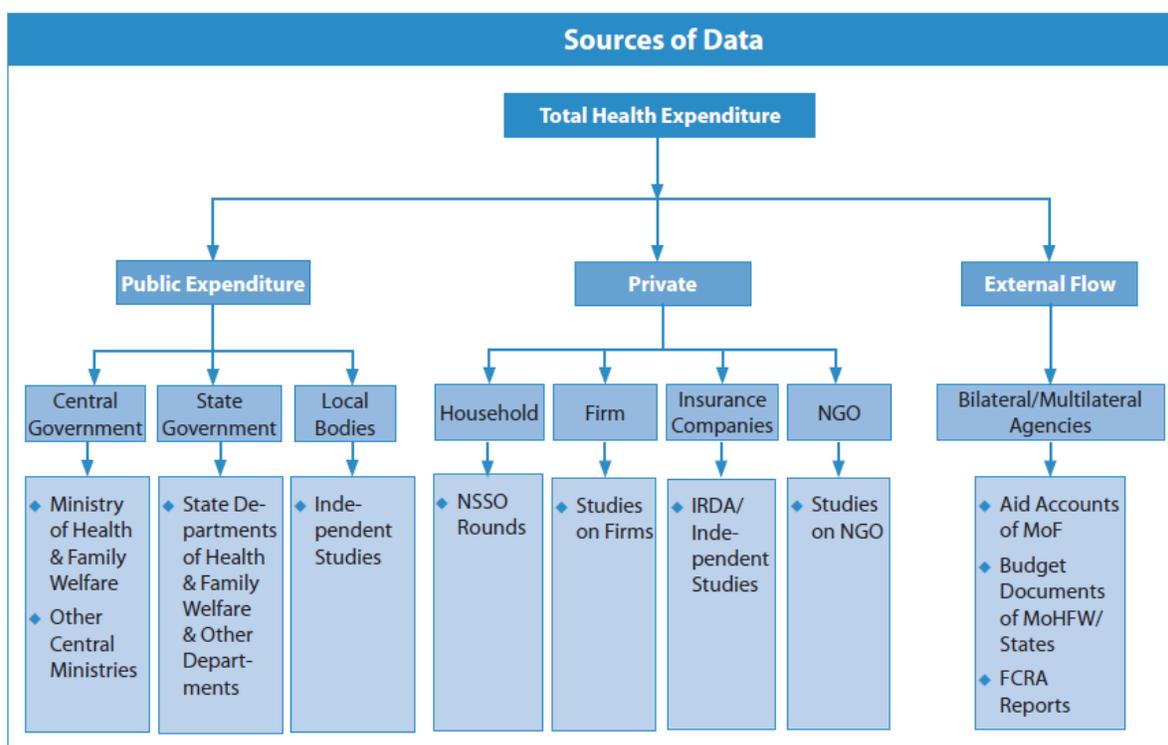
NHA traces flow of funds between four major entities in the health sector: Financing Sources (FS), Financing Agents (FA), Providers (P), and Functions (F). NHA employs a system of 'source-to-user' matrices to trace the flow of resources in the health sector. Flow of funds is presented in the 2×2 matrix format in a tri-axial system to reveal the linkages between the financial, institutional and functional aspects of the health sector. Three core matrices in NHA representing flow of funds are: from financing sources to financing agents (FS×FA), from financing agents to providers (FA×P), and financing agent by function (FA×F).

In Indian context, budget classification of health expenditure do not permit adherence to ICHA format *in toto*. NHA, India brings about necessary modifications in the international template to adapt to Indian realities. It has introduced refinements in conceptual, methodological and estimation procedures to represent Indian situation. It collates information from various sources to arrive at the total health expenditure in the country. It uses proxies in some cases where health expenditure is not directly available.

NHA 2004-05 brought about some improvements like refinement in existing classification and classification of non-classified items, collection of information hitherto not available. However, there are certain issues which affect the estimation. Lack of reliable data and methodological challenges are many in the preparation of NHA. First, information on fiscal aspects of local bodies is either not available or the existing data not reliable. Information on expenditure on health by local bodies is collected through sample surveys. For NHA 2004-05, sample survey could not be successfully completed and data based on a study conducted for 35 urban local bodies was relied on as a proxy for estimation of health expenditure for all local bodies. Again, a survey is conducted to get information on health expenditure incurred by firms. Such a survey could not be conducted for 2004-05 and information presented in National Commission on Macroeconomics and Health, 2005 was relied on as a proxy. There is a need to strengthen the database on health system. While methodological improvements shall be a gradual process, NHA India remains the sole source of comprehensive information for financial aspects of the health system in India.

### 6.1.1. Public and Private Expenditure and Sources of Data

Total health expenditure by source is classified under two main heads: public and private. Apart from these internal sources, there are external sources of funding. Public sector expenditure includes expenditure incurred by government and social security funds. In Indian federation, total public expenditure includes health expenditure by the Central, State and Local governments. Private sector expenditure includes expenditure by households, NGOs, firms and insurance programs excluding social security. Budgets and government documents are the sources of information for public expenditure. Data provided in Budgets, Aid accounts of ministry of Finance and Foreign Contribution (Regulation) Act (FCRA) reports are compiled to arrive at the total external sources of health expenditure. There is no direct evidence available to arrive at the precise estimate of total private health expenditure. Macro level household surveys conducted by National Sample Survey Organisation (NSSO) for consumption expenditure are relied upon to estimate out-of-pocket expenditure of the households on health. Separate surveys are devised for firms and NGOs to find out their health expenditure or findings of other research studies are used as proxy estimates. IRDA reports or findings of independent studies are the sources of information regarding the insurance sector.



Source: NHA 2004-05

## 6.2. Indicators

Major indicators of health expenditure and finance are discussed in this section. Current evidence for India for these indicators is presented in the course of discussion. In the inter-state analysis, general and special category states are separately discussed given their distinct politico-economic context.

### 6.2.1 Health Expenditure Per Capita

Health expenditure per capita is the average health expenditure, incurred from all sources, per person in a country or a specific region.

$$\text{Health expenditure per capita} = \frac{\text{Total Health Expenditure}}{\text{Population}}$$

Total expenditure on health includes final consumption of health goods and services (i.e. revenue expenditure on health) and capital investment in health sector. Expenditure incurred by both public and private entities are accounted for to arrive at the total expenditure on health. Expenditure by public entities in India, with a three tier system of governments, includes expenditure incurred by central, state and local level governments. Apart from the expenditure incurred by the Ministry of Health and Family Welfare (MoHFW), expenditure on health incurred by other Ministries/ Departments and Public Sector Units (PSUs) are also included in total health expenditure of the public sector.

International comparison of health expenditure is presented in Table 1. India's per capital health expenditure is \$146 PPP, which is negligible in comparison to OECD nations. It is lower than that of China, Malaysia, Thailand and Sri Lanka. Share of government expenditure in total health expenditure of India is just 30 per cent, which is the lowest among these 16 countries.

Information on per capita health expenditure for general and special category states for 2000-01 and 2004-05 is presented in Fig 1 and Fig 2 respectively. Average per capita expenditure on

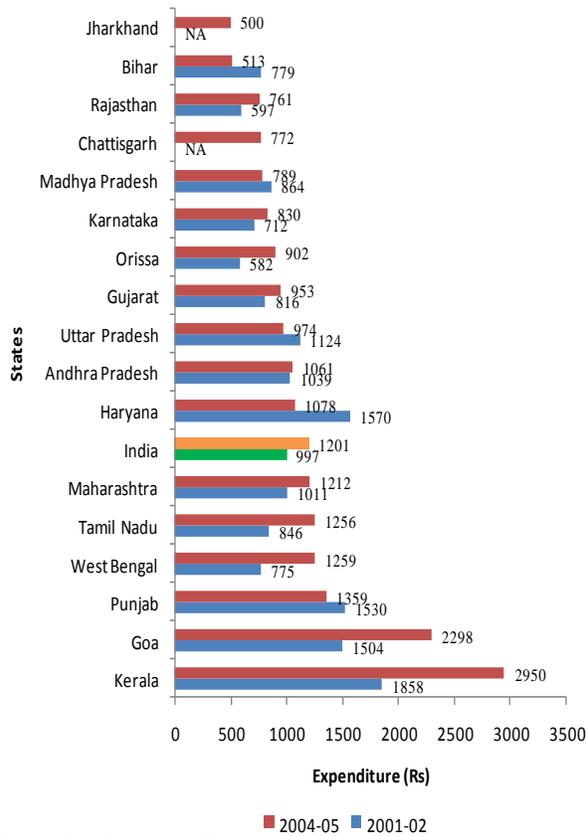
health for the country as a whole is Rs. 1201 in 2004-05. In that year, relatively higher per capita expenditure on health is reported for Kerala (Rs. 2950) and Goa (Rs. 2298) among the general category states. Punjab (Rs. 1359), West Bengal (Rs. 1259), Tamil Nadu (Rs. 1256), and Maharashtra (Rs. 1212) also have health expenditure higher than all-India average for 2004-05. The lower expenditure states include Jharkhand (Rs. 500), Bihar (Rs. 513), Madhya Pradesh (Rs. 789), and Rajasthan (Rs. 761). Highest per capita expenditure (Kerala) among the states is almost 6 times that of the lowest per capita expenditure (Jharkhand). Many states such as Punjab, Haryana, Uttar Pradesh, Madhya Pradesh, Bihar, Nagaland, and Jammu & Kashmir have shown a decline in per capita health expenditure from 2001-02 to 2004-05. Among the special category states, Himachal (Rs. 1511), Sikkim (Rs. 1507), Tripura (Rs. 1486), and Arunachal Pradesh (Rs. 1454) are better than other states in 2004-05 in terms of per capita health spending.

**Table 1: International Comparison of Health Expenditure, 2011**

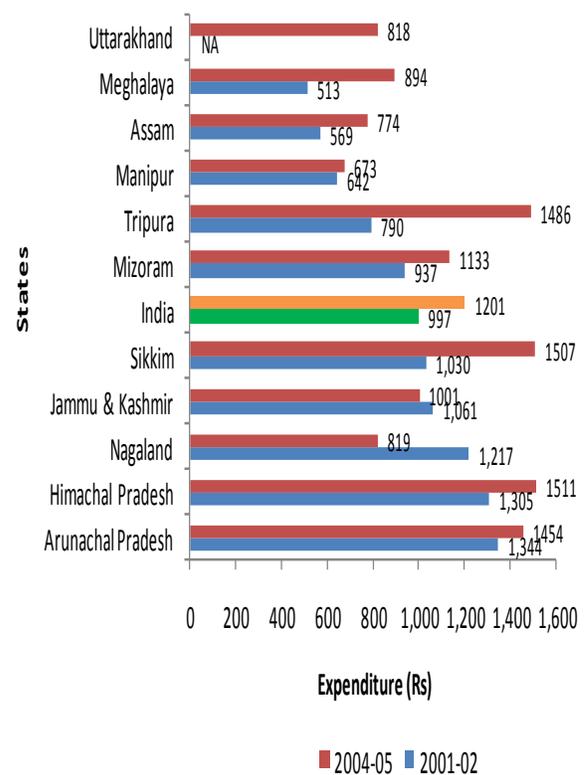
Country	Per Capita Government Expenditure (PPP\$)	Per Capita Total Expenditure (PPP\$)	Share of Government Expenditure in Total (%)
USA	4047	8467	47.8
Germany	3420	4474	76.4
France	3169	4128	76.8
Canada	3197	4541	70.4
U.K	2728	3364	81.1
Brazil	474	1035	45.8
Mexico	505	1004	50.3
China	236	423	55.8
Malaysia	341	619	55.1
Indonesia	50	132	37.9
Thailand	289	372	77.7
Pakistan	26	83	31.3
Srilanka	77	183	42.1
Bangladesh	26	67	38.8
Nepal	39	85	45.9
<b>India</b>	<b>44</b>	<b>146</b>	<b>30.1</b>

Source: WHO, 2014

**Fig 1. Health Expenditure Per Capita (general category states), 2001-02 & 2004-05**



**Fig 2. Health Expenditure Per Capita (special category states), 2001-02 & 2004-05**



### 6.2.2 Health Expenditure in Relation to GDP

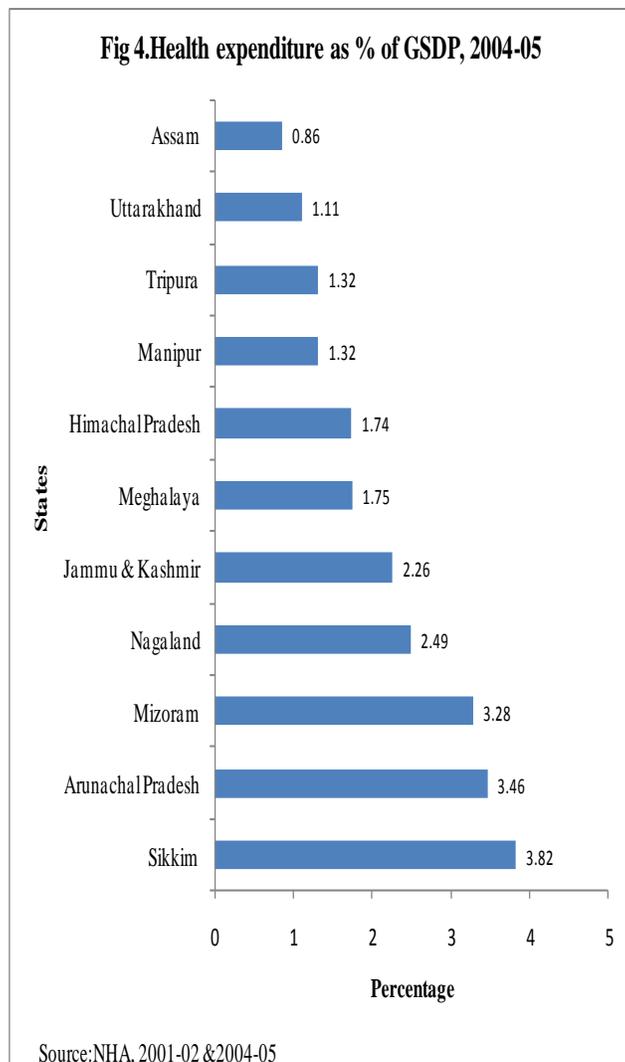
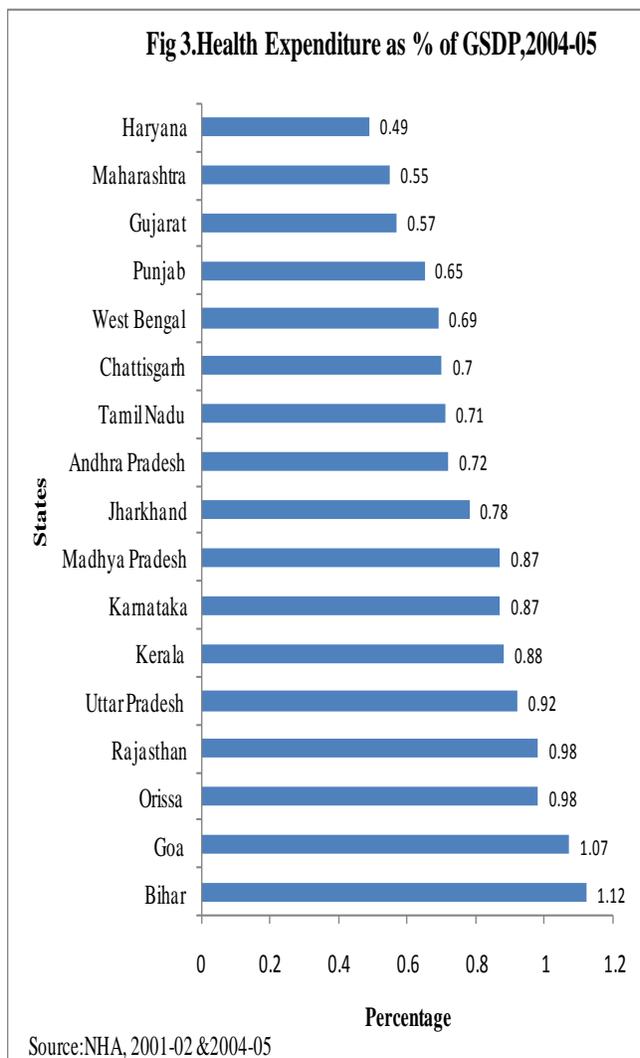
Health expenditure in relation to GDP indicates what fraction of country's resources are committed to or spent on health. It shows how change in health expenditure compares with the growth in the economy as a whole. Health expenditure as a percentage of GDP is the standard measure for such comparison.

$$\text{Health expenditure in relation to GDP} = \frac{\text{Total Health Expenditure}}{\text{GDP}} \times 100$$

Gross Domestic Product (GDP) is the value of all goods and services produced in an economy

during a defined period, generally a financial year. It includes final consumption, gross capital formation and net exports. Final consumption expenditure comprises of consumption of final goods and services by individuals and communities. Consumption expenditure is incurred by households. It is also incurred by government or by non-profit institutions, which ultimately serve the needs of the households.

Gross National Income (GNI) may be taken instead of GDP for countries where a large part of GDP flows out to other countries as profits. GNI is value of all goods and services produced by the nationals of a particular country during a defined period irrespective of the location of production. If GDP exceeds GNI by a great margin, it indicates that a large part of GDP is accruing to foreigners who are associated with production activities in our country. Hence, GDP does not reflect the economic strength of a nation very well and GNI is a better indicator. In other cases, such as ours, GDP is a meaningful indicator for comparison. Gross State Domestic Product (GSDP) is considered in case of states.

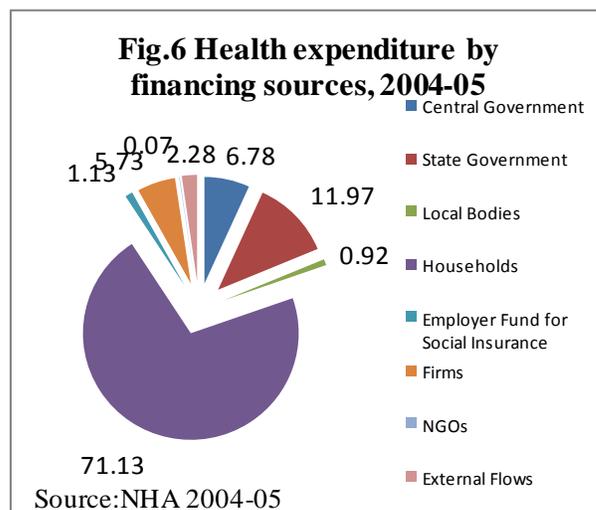
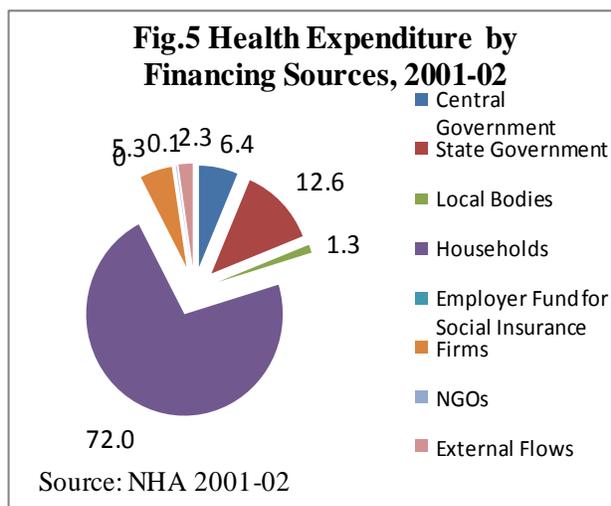


Total health expenditure in India was 4.25 per cent of GDP in 2004-05. Share of government expenditure on health was less than 1 per cent. There is an urgent need to increase this share to 2-3 per cent of GDP. Fig 3 and Fig 4 present health expenditure as percentage of GSDP for general and special category states respectively. Here, we find that Bihar (1.12%), Goa (1.07%), Orissa (0.98%), Rajasthan (0.98%), Uttar Pradesh (0.92%) and Kerala (0.88%) are states demonstrating better health expenditure. States like Haryana (0.49%), Maharashtra (0.55%) Gujarat (0.57%) are worst performing states. Among special category states, Sikkim (3.82%), Arunachal Pradesh (3.46%), Mizoram (3.28%) and Nagaland (2.49%) have better shares.

### 6.2.3 Health Expenditure by Sources and Agents

Financing of health care can be understood by analyzing the flow of funds to the health sector with reference to the sources of funding (institutions or entities who provide funds) and financial agents (institution or entities that channel funds provided by the financing sources and use those funds to pay for or purchase the activities in the health accounts boundary). Financing sources mobilize and financing agents manage and organize funds for health care. Classification of financing sources as per NHA India are as follows: central, state and local (urban and rural) governments, households (out of pocket expenditure), firms (public and private), non-profit institutions serving households/NGOs, external flow. Financing agents in NHA India are: Ministry of Health and Family Welfare, other central government Ministries, state department of health and family welfare, other state departments, local governments, social security funds, insurance providers (public and private), NGOs, public/private firms, households.

Thus, as per the broad classification, public financing consists of expenditure by government and social security funds. Private financing includes households' out of pocket payments, private health insurance and other private funds (NGOs and private firms).



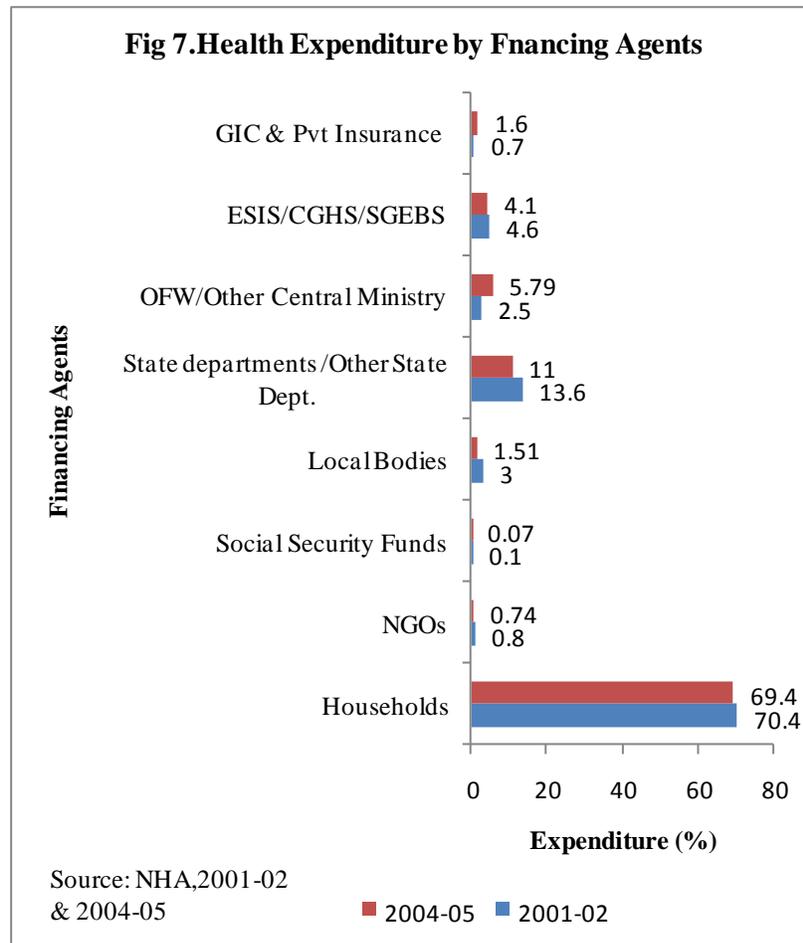


Fig 5 and Fig 6 present health expenditure by financing sources for 2000-01 and 2004-05 respectively. Almost three-fourth of the total health expenditure is raised by households out of pocket. The situation remained similar in 2001-02 and 2004-05. State governments spend around one-eighth followed by central government and firms (6-7%). Other entities have relatively small contribution. There seems to be no significant change in the major sources of health care expenses and their relative contribution during these two time periods.

Fig 7 presents health expenditure by financing agents. It shows that in 2004-05, large chunk of expenditure on health is managed and organized by the households (69.4%) followed by state department of health (10.73%), firms (5.73%), MoHFW, Union government (5.36%), CGHS/ Medical benefits (2.5%), and GIC companies (1.46%). Again, the situation is similar in 2001-02 and 2004-05.

#### ***6.2.4 Health Expenditure by Public and Private Entities***

Health care is considered as a merit good. In case of such goods, evaluation (of its merit or demerit) “derives not simply from the norm of consumer sovereignty but involves an alternative norm” (Musgrave, 1988, p. 452). In the context of health it implies, irrespective of the desire of the consumers regarding the use of health care goods and services, government has a responsibility to ensure their provision. It is important, therefore, to assess the relative role of the public sector in health care provision. There are four indicators which are relevant here. These are share of public expenditure in total health expenditure, share of government expenditure on health in total government expenditure, relative shares of various levels of government, out of pocket expenditure by services.

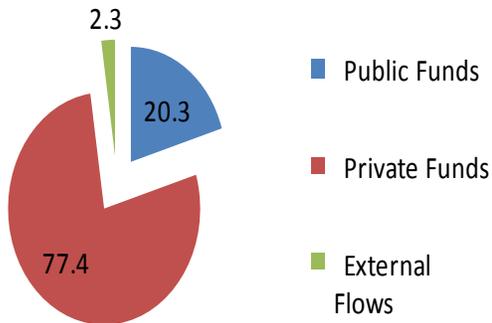
##### *a. Share of Public Expenditure on Health*

This indicator reflects on the relative contribution of public sector in total health expenditure. It is calculated in the following manner:

$$\text{Share of Public Expenditure on Health} = \frac{\text{Public Expenditure on Health}}{\text{Total Expenditure on Health}} \times 100$$

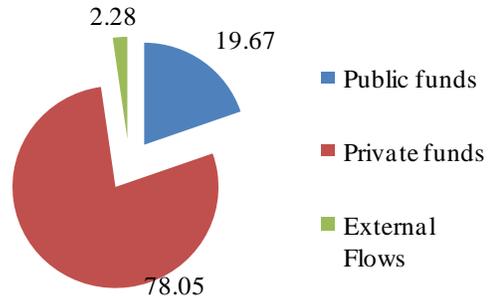
Around one-fifth of the total health expenditure is contributed by the public sector in India which is very low by all standards (see Fig 8 & Fig 9). Information on share of public expenditure in total health

**Fig 8. Fund Flow to Health Sector, 2001-02**



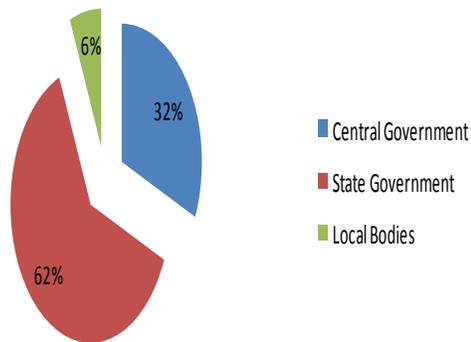
Source: NHA, 2001-02

**Fig 9. Fund Flow to Health Sector, 2004-05**



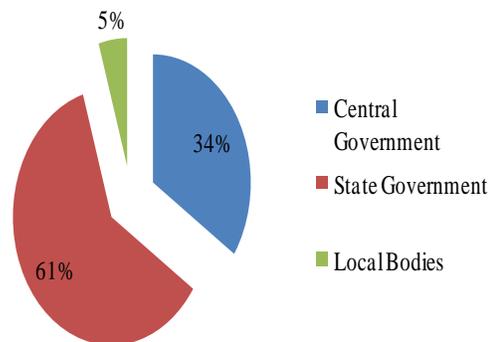
source: NHA, 2004-05

**Fig 10. Public Funds to Health Sector, 2001-02**



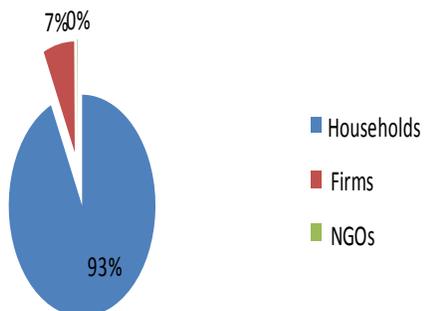
Source: NHA, 2001-02

**Fig 11. Public Funds to Health Sector, 2004-05**

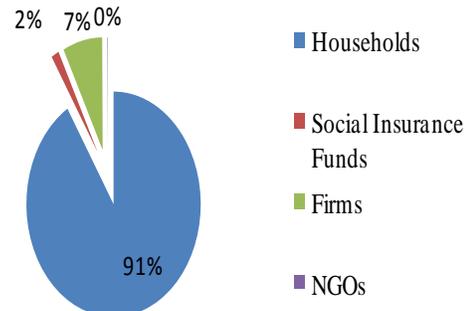


Source: NHA, 2004-05

**Fig 12. Private Funds to Health Sector, 2001-02**

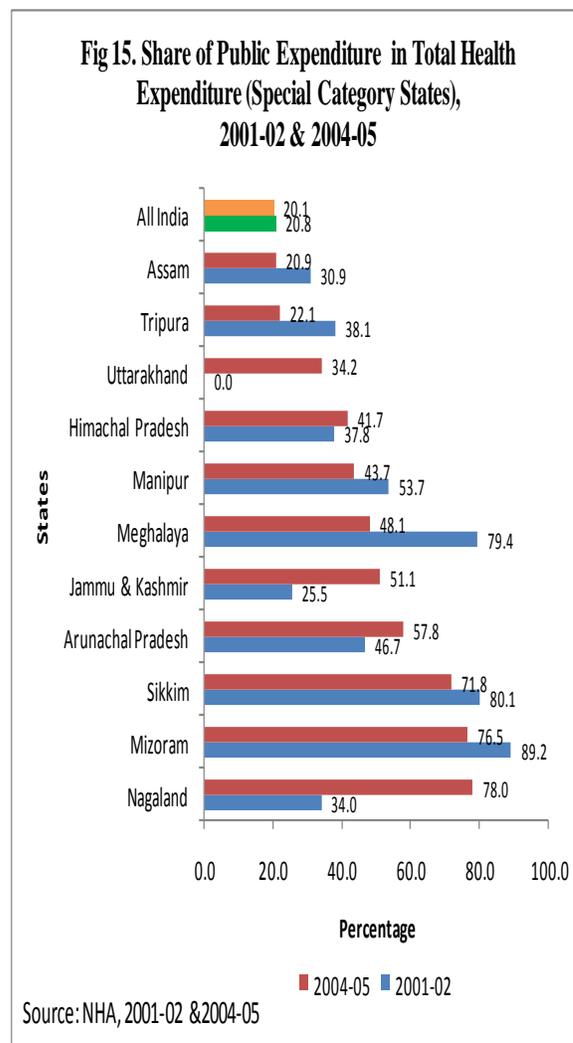
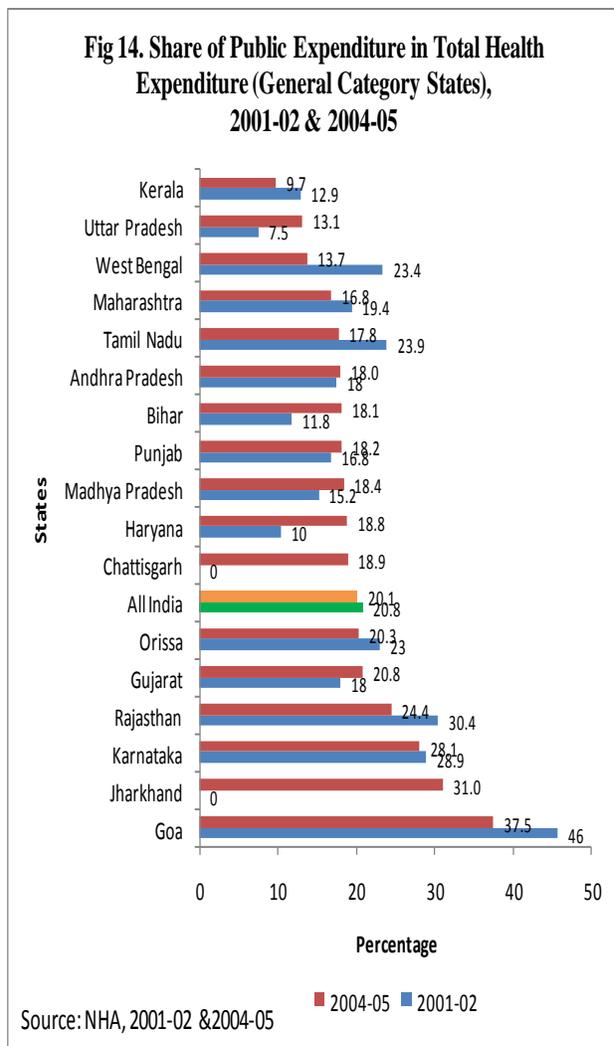


**Fig 13. Private Funds to Health Sector, 2004-05**



Source: NHA, 2004-05

expenditure for general and special category states is presented in Fig 14 and Fig 15. Among the general category states, Goa (37%), Jharkhand (31%), Karnataka (28.1%), Rajasthan (24.4%), Gujarat (20.8%) and Orissa (20.3%) demonstrated high public expenditure as a share of total expenditure in 2004-05. States like Kerala (9.7%), Uttar Pradesh (13.1%), and West Bengal (13.7%) show lower shares of public expenditure. Among special category states, Nagaland (78%), Mizoram (76.5%), Sikkim (71.8%), Arunachal (57.8%) and Jammu & Kashmir (51.1%) show higher shares of public expenditure in 2004-05. States such Goa, Rajasthan, Tamil Nadu, West Bengal, Kerala, Mizoram, Sikkim, and Meghalaya show a major decline in this share since 2001-02.



*b. Share of Health in Government Expenditure*

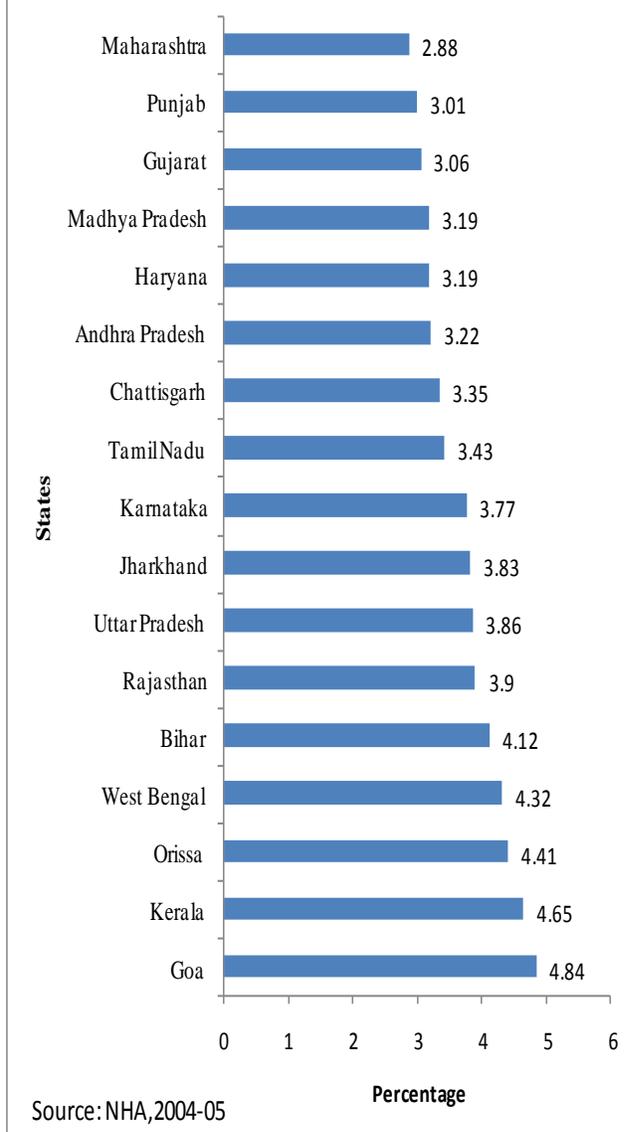
Another approach to gauge the significance that government assigns to health sector is to decipher the magnitude of health budget in overall budget of the government. Thus,

Share of Government Expenditure on Health in Total Government Expenditure =

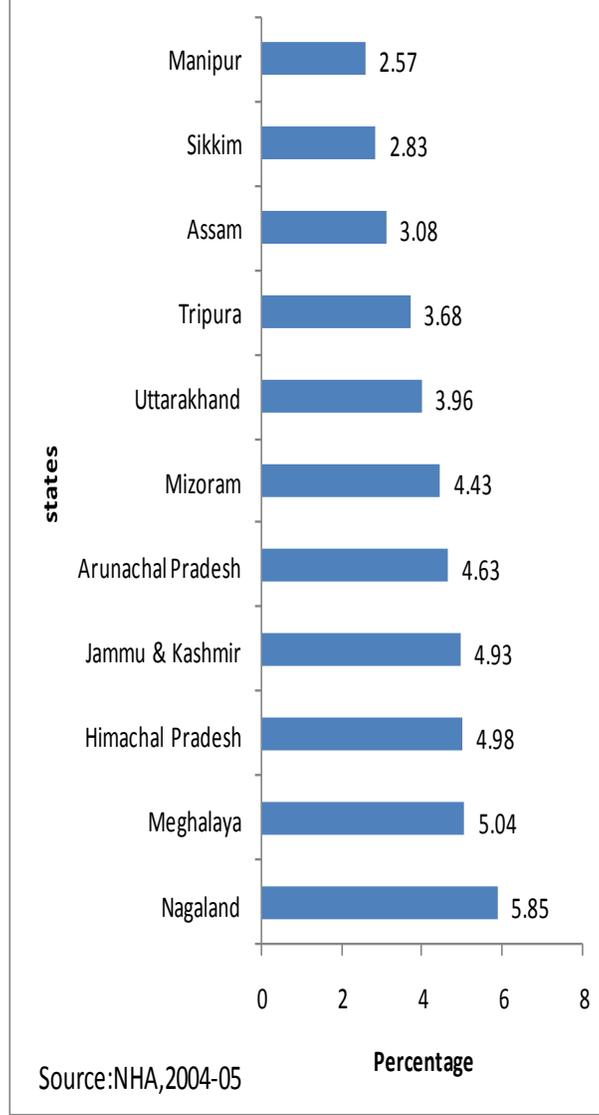
$$\frac{\text{Government Expenditure on Health}}{\text{Total Government Expenditure}} \times 100$$

Health expenditure as a share of total expenditure by states in 2004-05 is presented in Fig 16 and Fig 17. States such as Goa (4.84%), Kerala (4.65%), Orissa (4.4%), West Bengal (4.32%), Bihar (4.12%) and Rajasthan (3.9%) have better health expenditure as per this indicator. In contrast, Maharashtra (2.88%), Punjab (3.01%), Gujarat (3.06%) and Madhya Pradesh (3.19%) have spent relative lower share of government expenditure on health. Percentage of total government expenditure devoted to health in Goa is twice that of Maharashtra. Clearly, some of the underdeveloped states have increased their allocations for health sector in recent times. Among the special category states, the share of health expenditure in total government expenditure is much higher for states like Nagaland (5.85%), Meghalaya (5.04%) and Himachal Pradesh (4.98%). States like Manipur (2.57%) and Sikkim (2.83%) have lower shares which need improvement.

**Fig 16. Health Expenditure as Share of Total Government Expenditure, 2004-05**



**Fig 17. Health Expenditure as Share of Total Government Expenditure, 2004-05**



*c. Health Expenditure by Levels of Government*

Major chunk of public funding (about three-fifth) comes from the states (see Fig 10 & 11). There is a gradual centralisation of social sector expenditure observed in last two decades and health sector is not an exception (Rath, 2013). Family welfare, by clear mandate, is highly centralised now. Centre's relative share in total public expenditure (centre+states) on family welfare has

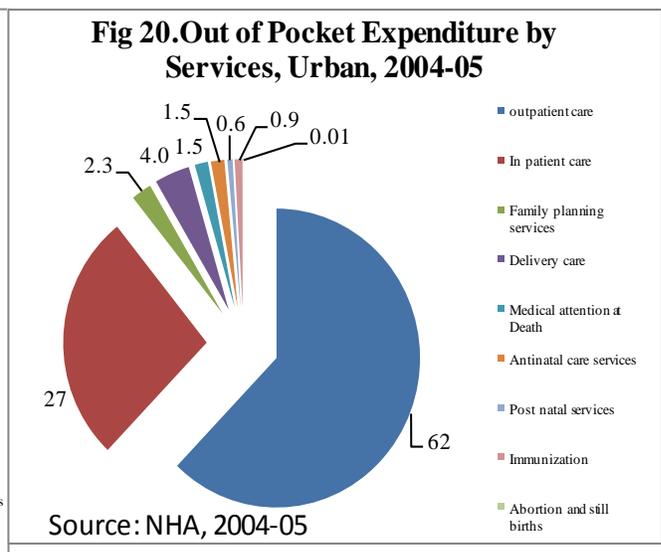
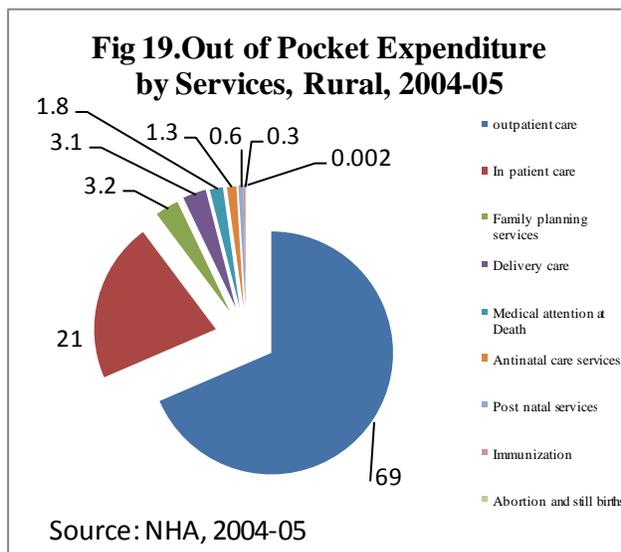
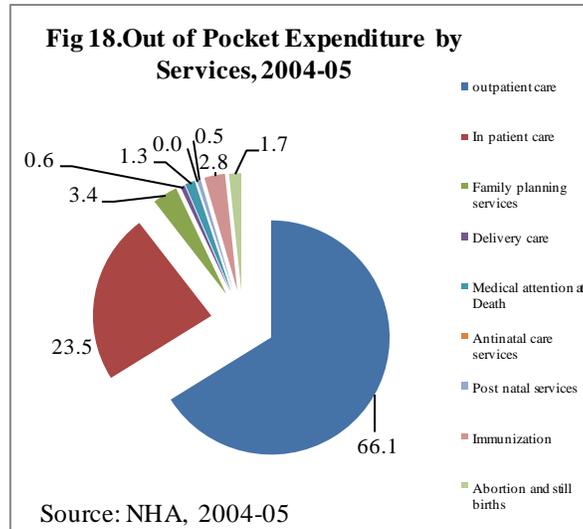
gone up from 7 per cent in 1990-91 to 63 per cent in 2007-08. Centre's share in the combined expenditure on medical, public health, water supply and sanitation increased from 9 per cent in 1990-91 to 16 per cent in 2007-08.

Relative share of centre and states in public health expenditure is affected by how we account for the inter-governmental transfers. Central transfers to states are accounted for in the state governments' accounts. To avoid double counting, these transfers are not reflected in central government's accounts. But, in recent times, higher centralisation of health expenditure is partly due to the fact that central transfers are not routed through the state treasuries but are directly sent to various societies which finally manage these funds. Higher society transfer, in contrast to treasury transfers, implies that transfers to states are reflected in central accounts.

These differences in accounting practices have implications for comparing the actual spending and expenditure targets for a particular level of government. If the transfers are accounted for in central accounts then the share of expenditure of the centre and states is around 40:60 (Choudhury and Amar Nath, 2012). Hence, a consistent approach must be followed in understanding the relative shares of various levels of government over time.

#### *d. Out of Pocket Expenditure of Households by Services*

Major burden of health expenditure falls on the households (see Figs 12 & 13). More than 90 per cent of private funding for health is generated by households. Hence, it is important to periodically analyse the out of pocket expenditure of households by the kind of health care services. Such information is provided in Figs 18-20 for combined, rural and urban areas. Out-patient care imposes a large burden on the households. Around 60 per cent and 70 per cent of the total out of pocket expenditure of urban and rural households respectively are spent on out-patient care. In-patient care involves around 30 per cent and 20 per cent of the total in urban and rural segments respectively. Family planning services and delivery care take away around 6 per cent of the total in both rural and urban areas.



### 6.2.5 Health Expenditure by Functions

NHA India defines health expenditure by function under three broad heads: personal health care services (curative care, rehabilitative care, long term nursing care, ancillary services and medical goods), collective services (prevention and public health services as well as health administration and health insurance), and health related functions (capital formation of provider institution, education and training of personnel, R&D in health, and food hygiene and drinking water control). An alternative classification of health function includes: primary care (excluding RCH and public health services), secondary care, tertiary care, expenditure on public health program, general health administration, capital expenditure and others.

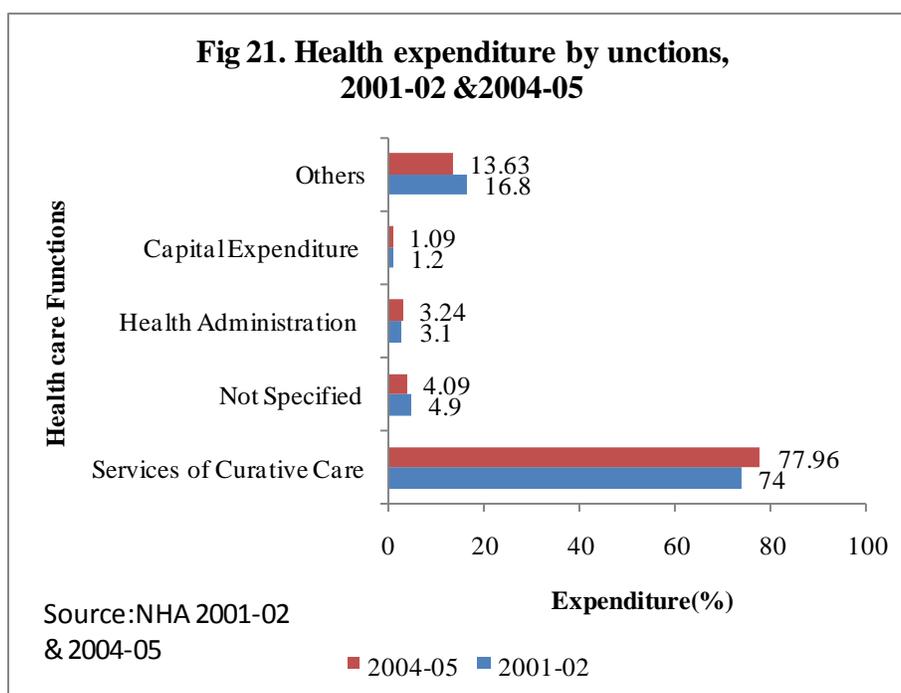
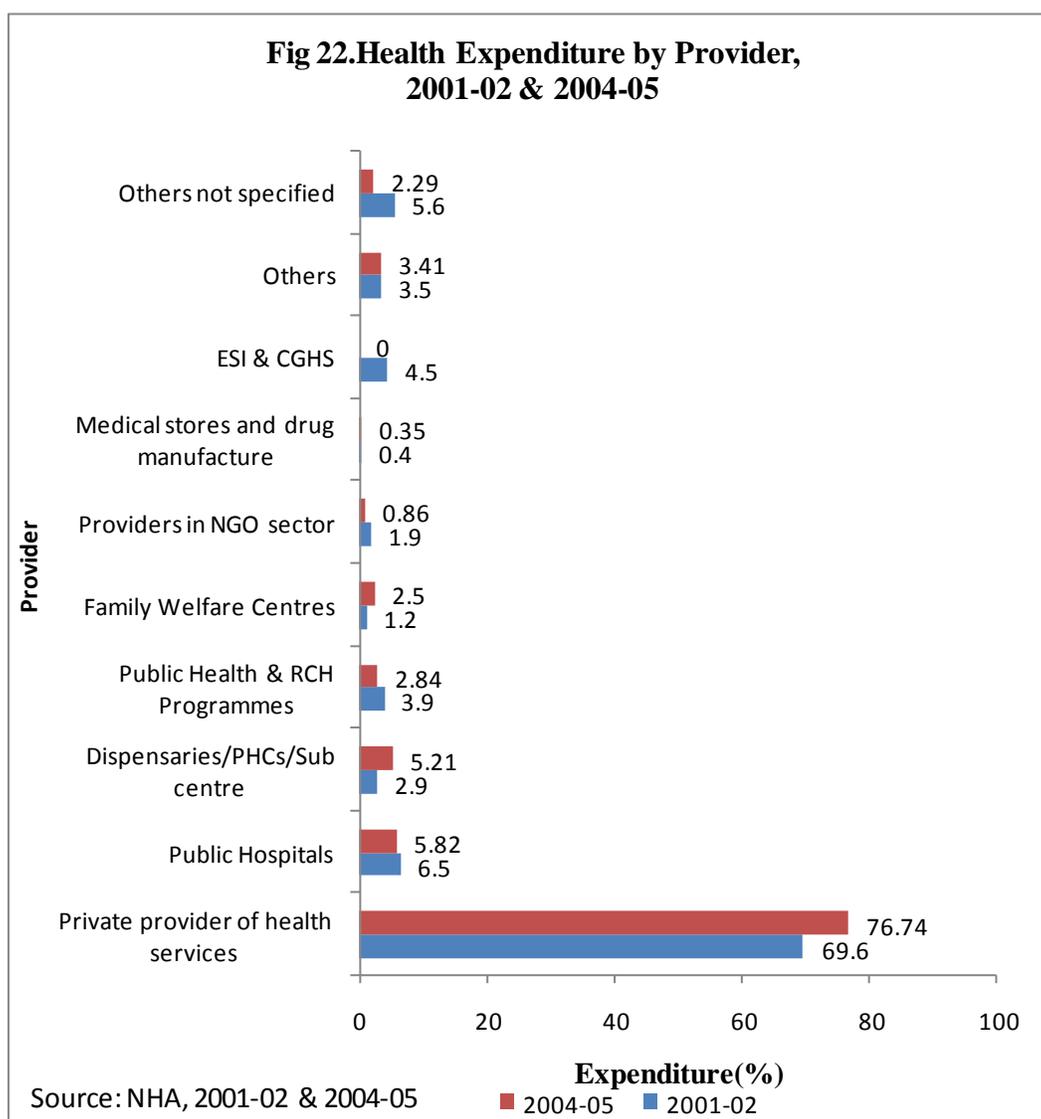


Fig 21 presents health expenditure by health care functions. It reveals that curative care involves four-fifth of the total expenditure. Reproductive and childcare (8.07%) and health administration (3.24%) are other functions involving higher share of total expenditure. Situation is similar in two time periods, 2001-02 and 2004-05.

### 6.2.6 Health Expenditure by Providers

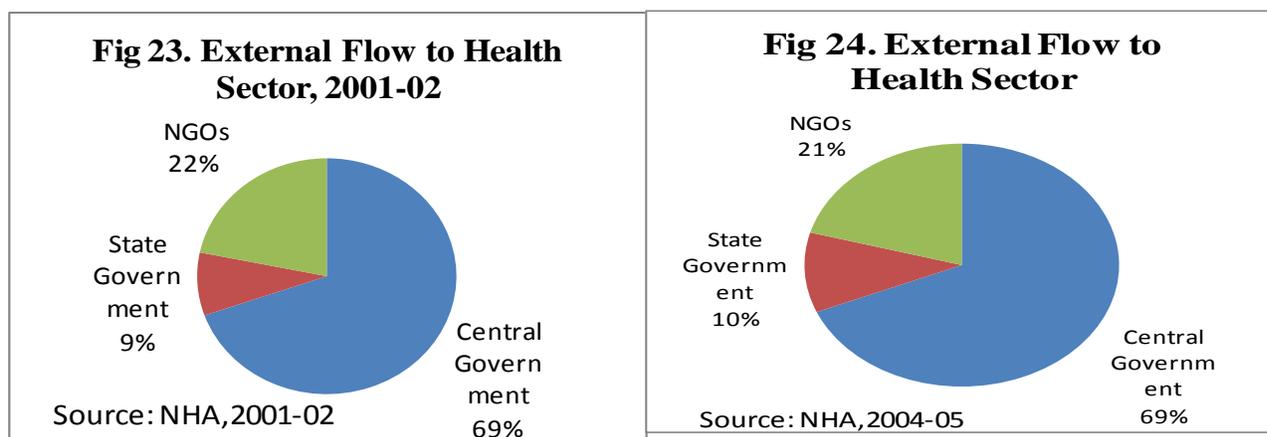
Providers are entities that receive money in exchange for or in anticipation of producing activities inside the health accounts boundary. NHA India adopts the following classification of providers: hospitals and dispensaries under MoHFW and state governments, speciality hospitals, PHC/sub-centre/ family welfare centres, ambulatory health care including blood banks and ambulances, provision and administration of public health and RCH programmes, health administration and health insurance, medical education, research and training institutions, hospitals and dispensaries under local bodies, private hospitals, private dispensaries and doctors, drug outlets/shops, diagnostic centres, hospitals and dispensaries under charitable institutions/ NGOs, and hospitals and dispensaries under institutions run by corporate sector.



Information on health expenditure by health care provider is presented in Fig 22. Private sector is the highest health care provider which provided goods and services worth 77 per cent of the total health spending in the nation. Public hospitals (5.82%) and dispensaries /PHCs/sub centres (5.21%) were other important providers in 2004-05. Not much variation is observed in this scenario during 2001-02 to 2004-05.

### 6.2.7 Financing of Health by External Sources

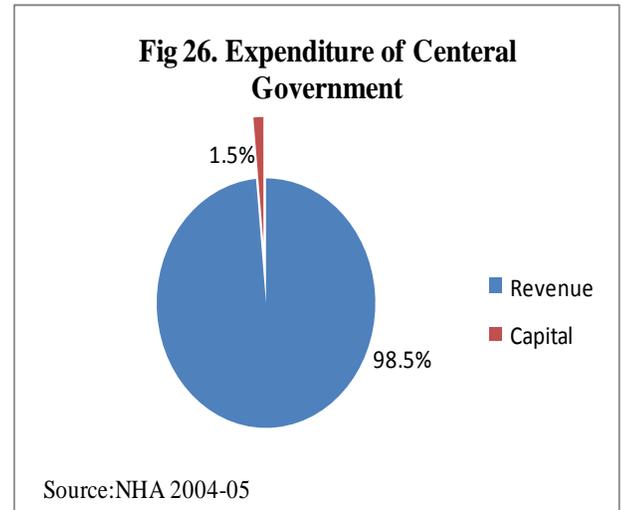
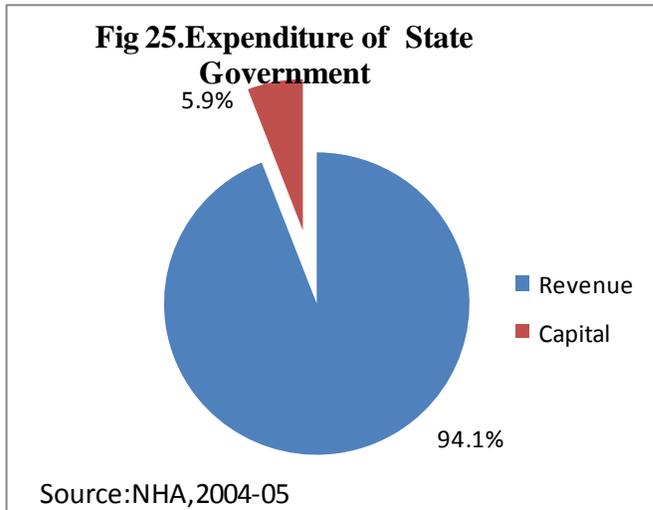
External flows of funds have been insignificant in total but it has provided crucial support to different programmes and schemes. Reproductive and child health, immunization, family welfare programmes, AIDS control programmes have received support from bilateral and multilateral agencies. Recipients of such funding are central government, NGOs and state governments.



Figs 23 and 24 present information on the recipients of external funding in 2001-02 and 2004-05 respectively. It shows that central government receives bulk of the external funds, which is around 70%. NGOs receive one-fifth of the total amount. State governments get the rest of the external funds.

### 6.2.8 Health Expenditure by Economic Classification

Total expenditure is categorized as revenue and capital depending on whether it has led to the creation of a capita asset or not. If the expenditure in the health sector has led to the creation of health infrastructure in the form of hospital buildings, diagnostic instruments etc. then it is capital expenditure. Revenue expenditure does not affect asset/ liability position of a government.



The revenue and capital expenditure of states and central government are presented in Figs 25 and 26. Four-fifth of the revenue expenditure and almost 95 per cent of capital expenditure is incurred by the states. Centre's expenditure is mainly revenue expenditure. States spend about 6 per cent of their expenditure towards capital expenditure. As the capital expenditure is very low this would have long term implications for accumulation of infrastructure and other capital formation in health care sector.

### 6.2.9 Health Expenditure in Real Terms

Health expenditure in real terms represents health expenditure in constant prices of a base year. This facilitates comparison of health expenditure over time and across regions. Changes in prices of health goods and services shall impact the health expenditure. Expenditure figures in real terms controls for such impact. Hence, it suggests actual increase/ decrease in health goods and services available in a society. Health expenditure in real terms is also known as health expenditure in constant prices. Nominal figures are in current prices. Unless otherwise indicated, expenditure figures reported in various documents are nominal figures, i.e. they are in current prices.

Appropriate deflation factors must be used for arriving at the real values. GDP implicit deflator may be used to arrive at health expenditure in constant prices if a well developed health price

index is not available. If there is an increase in general price level, the growth rate of health expenditure in real terms would be lower than that in nominal terms.

$$\text{Health Expenditure}_{\text{real}} = \text{Health expenditure}_{\text{nominal}} \times \frac{\text{GDP Real}}{\text{GDP Nominal}}$$

Table 2: Per Capita Health Expenditure (Nominal, Real & Growth Rates)

States	Current Prices		Constant Prices		Growth Rate	
	2001-02	2004-05	2001-02	2004-05	Current	Constant
Andhra Pradesh	1,039	1061	963	885	2.1	-8.1
Bihar	779	513	753	466	-34.1	-38.1
Goa	1,504	2298	1341	1577	52.8	17.6
Gujarat	816	953	749	771	16.8	3.0
Haryana	1,570	1078	1436	878	-31.3	-38.9
Karnataka	712	830	668	666	16.6	-0.2
Kerala	1,858	2950	1806	2549	58.8	41.2
Madhya Pradesh	864	789	797	656	-8.7	-17.7
Maharashtra	1,011	1212	936	996	19.9	6.4
Orissa	582	902	563	734	55.0	30.4
Punjab	1,530	1359	1374	1150	-11.2	-16.3
Rajasthan	597	761	590	672	27.5	14.0
Tamil Nadu	846	1256	798	1049	48.5	31.5
Uttar Pradesh	1,124	974	1088	832	-13.3	-23.5
West Bengal	775	1259	747	1075	62.5	43.9

Source: Estimated from the data provided in 1. NHA, 2001-02 & 2004-05; 2. RBI, 2013 for NSDP Figures.

In Table 2, health expenditure per capita for 2001-02 and 2004-05 in the constant prices of 1999-00 are presented for select general category states. Net State Domestic Product (NSDP) deflator is used here for calculation. As can be observed, real health expenditure is lower than the nominal expenditure for every state. Growth rate of health expenditure between these two periods for the constant series is much lower in comparison to that in current series.

### 6.2.10 Regional Variability in Health Expenditure

A standard measure of dispersion can be employed to get a precise idea about the regional variability in health expenditure. For example, Coefficient of Variation (CV) of health expenditure per capita would reflect on the variability of health expenditure per capita of the states about the average relative to average. Results of estimation of CV for 2001-02 and 2004-05 for all states (except three) are presented in Table 3. Some observations can be made

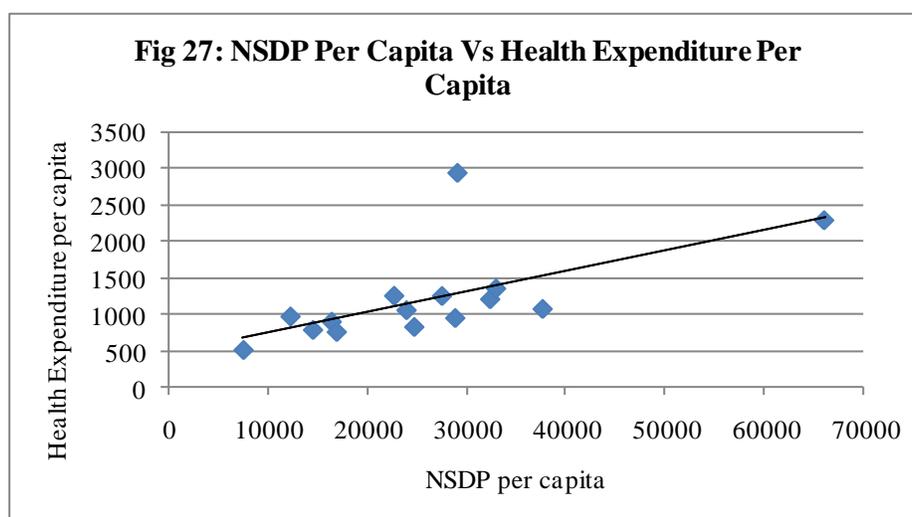
regarding the variability of health expenditure across states based on this information. First, variability has increased in 2004-05 in comparison to 2001-02. The increase in variability is higher in private expenditure in comparison to public expenditure. Second, in both years, variability in public expenditure is higher in comparison to private expenditure.

Table 3: CV of Health Expenditure Per Capita\*

Component	2001-01	2004-05
Public	0.70	0.74
Private	0.54	0.64
Total	0.34	0.48

Note:\* Excludes Chattisgarh, Jharkhand, and Uttaranchal due to data unavailability.

Source: Estimated from data provided in NHA, 2001-02 & 2004-05.



It would be useful to decipher how health expenditure is associated with certain socio-economic characteristics of the states. This would reflect on the factors that might be contributing to lower expenditure by certain states. For example, correlation coefficient between health expenditure per capita and NSDP per capita calculated for 15 general category states is 0.62. It shows a positive association between these two factors. Thus, variation in health expenditure per capita across states is positively correlated with income levels by states. A scatter plot of these variables in Fig 27 also indicates a positive association.

### **6.3. Public-Private Partnership (PPP) in Health Sector**

Increased cooperation between public and private sector is encouraged in the health sector to address the unmet needs. PPP is an institutional arrangement for implementing government programmes or schemes in partnership with the private sector. Here, private entities include all non-government agencies such as corporate sector, voluntary organization, self-help group, partnership firms, individuals, and community based organizations. PPP connotes a shift in emphasis in the role of public sector from direct delivery of services to that of service management and coordination (GoI, 2004). Government of India's position on PPPs, in general, is articulated in the following statement: “Public Private Partnerships (PPPs) present the most suitable option of meeting targets, not only in attracting private capital in creation of infrastructure but also in enhancing the standards of delivery of services through greater efficiency”(GoI, 2013, p.iii). In recent years, India Infrastructure Finance Company and a scheme to meet Viability Gap Funding (VGF) of PPP projects have been launched to support PPPs in physical infrastructure.

PPP in health is not a new phenomenon in India. Nonetheless, there is a change in emphasis as well as in the nature and magnitude of PPPs in health in recent times. Partnership is a nebulous concept and can assume many forms. Following definitions of PPPs are instructive. WHO defines PPP as “A means to bring together a set of actors for the common goal of improving the health of a population based on the mutually agreed roles and principles” (WHO, 1999).

As per GoI, 2010 “PPP means an arrangement between a government or statutory entity or government owned entity on one side and a private sector entity on the other, for the provision of public assets and/ or related services for public benefit, through investments being made by and/or management undertaken by the private sector entity for a specified time period, where there is a substantial risk sharing with the private sector and the private sector receives performance linked payments that conform (or are benchmarked) to specified, pre-determined and measurable performance standards”.

PPP for physical infrastructure is defined by GoI, 2013 as “Partnership between a public sector entity (Sponsoring Authority) and a private sector entity (a legal entity in which 51 percent or more of equity is with the private partner/s) for the creation and/or management of infrastructure for public purpose for a specified period of time (concession period) on commercial terms and in which the private partner has been procured through a transparent and open procurement system”.

PPP India database maintains information on projects in physical infrastructure which are above Rs 5 crores. It reveals that as on July 31, 2011 there were only 8 projects in health sector, which was around 1 per cent of all projects across sectors. The total value of contracts was Rs. 1833 crores, which was not even 0.5 per cent of value of all contracts across sectors. However, there are many other projects in the health sector being currently pursued which may not be in physical infrastructure. There is considerable variation in the PPPs in health in terms of design and outcomes. Major forms of PPP in health are presented in Box 2.

#### **Box 2: Types of PPPs in Health**

*Contracting in-* It is a form of outsourcing which is non-clinical or support services to private contractors. For example, maintenance of buildings, housekeeping, canteen, pharmacy and medicine stores, diagnostic facilities, transport, security and communication.

*Contracting out-* Refers to a situation in which private providers receive a budget to provide certain services and manage a government health unit. For example, government may transfer the physical infrastructure budget and personnel of a health unit to the selected agencies.

*Joint Venture-*Joint ventures require pre-defined equity participation of government and the private sector. Joint ventures are mostly in building large scale establishments or super-speciality ventures where government involvement is either not feasible or politically unsound.

*Build-Operate-Transfer (BOT)-*Requires part financing of projects by the government, financial guarantees, subsidised land at prime locations and assurance of reasonable returns. BOT model is used to build large hospitals and to ensure quality services at reasonable rates to the poor.

*Franchising-* It is a business model in which sale of a product or service is given as an exclusive right to a local entrepreneur (franchise) to conduct the business in a delimited territory in a prescribed manner as per mutual agreement. Branded clinics are subsidiary outlets of larger establishments that use the brand value of the parent organization.

*Social Marketing-* Seeks to influence behaviours to benefit the target audience and society in general. Social marketing refers to donor funded programmes designed to make them accessible to needy population with the help of multi-media communication campaigns. The product based social marketing approach has two variations- the NGO based model and the manufacturers model. NGO often uses donated products and sells them at prices that only allow partial recovery of marketing and distribution cost. In contrast, the manufacturer's model products are marketed at commercially viable prices through existing distribution network.

*Others-*Voucher schemes, donations and philanthropic contributions, collaborating/ mobilising resources, technical expertise from corporate or commercial sector, and grants-in-aid payments are other forms of partnership.

Source: Compiled from Raman and Bjorkman (2009)

Source: Compiled from Raman and Bjorkman (2008)

### **Box 3: Public–Private Partnerships (PPP) in Health Sector**

*Tertiary Care: Rajiv Gandhi Super-speciality Hospital, Raichur, Karnataka*

Contracting Arrangements: Government of Karnataka and Apollo Hospitals

Type of Partnership: Joint Venture (Management Contract)

Services: Provides super-speciality clinical care services and management of Hospital. Free Out-patient services for BPL patients.

*Rural Health Care Delivery and management of PHCs*

Contracting Arrangements: Karuna Trust and Government of Arunachal Pradesh

Type of Partnership: Contracting in

Services: Manages 11 PHC's, provides health care facilities to the local population.

*Labs, Drug Supply and Diagnostic Services: Hindlabs*

Contracting Arrangements: MoHFW and HLL Life Care Ltd

Type of Partnership: Contracting in

Services: A novel initiative, delivers high end diagnostic services at CGHS rates

*Health Insurance: Community Health Insurance Scheme*

Contracting Arrangements: Karuna Trust, National Insurance Co. and Government of Karnataka

Type of Partnership: Joint Venture

Services: A community health insurance scheme to improve the access and utilisation of health services

*Outreach/Health Delivery: Mobile Health Service in Sunderban, W. Bengal*

Contracting Arrangements: Government of West Bengal and Non-profit NGO

Type of Partnership: Contracting in (Joint Venture)

Services: Mobile boat based health services and access to health services in remote areas

*RCH Services: Merry Gold Health Network (MGHN) and SAMBHAV Voucher Scheme in UP*

Contracting Arrangements: Joint endeavour of Government of India and USAID through UP SIFPSA

Type of Partnership: Social Franchising network and Voucher system

Services: Provide FP/RCH services through accredited private providers

Source: GoI, 2013b

Most prevalent form of PPP in health is the contracting in and contracting out of health care services and the least prevalent is the social franchise. Some recent examples of PPP in health in India are cited in Box 3.

## 6.4 Data Limitations and Suggestions

NHA India provides information on health expenditure and finance in recent years. It fulfills the gap in information on this important aspect of the health system to some extent. However, there are issues to be addressed. Major limitation of NHA exercise has been the non-availability of reliable information on health expenditure incurred by local bodies, firms, and NGOs. In the absence of reliable information, NHA uses proxies for various entities which are not completely reliable.

NHA Cell initially made an attempt to conduct a study of urban and rural local bodies on a sample basis for 2004–05 albeit without success. Subsequently, it relied on the findings of a study of 35 major municipal corporations to estimate the expenditure of local bodies in 2004-05 as proxy. Fiscal decentralization has been limited in India and the share of local bodies' expenditure in the total expenditure of all levels of government was about 6.7 per cent in 2007-08 as per the data provided by the Thirteenth Finance Commission (Oommen, 2010). However, providing public health services is one of the core functions assigned to local bodies by 73<sup>rd</sup> and 74<sup>th</sup> Constitutional Amendment and large local bodies also support secondary and tertiary health centres and thus, magnitude and structure of their health expenditure should be accounted for to get a comprehensive picture. Currently, the only source of data on the overall finances of local bodies is the National Finance Commission (FCs). FCs have repeatedly expressed concern over the quality of such information. Various FCs have allocated funds for strengthening the information system of local bodies and standardization of their accounting procedure. Ministry of Health and Family Welfare can collaborate with concerned Ministries to support the local bodies in maintaining separate account for health as per NHA requirement and guide them to compile and share such information with the Ministry periodically.

Again, there is a challenge in obtaining reliable information on health expenditure incurred by firms and NGOs. NHA 2004-05 relied on indirect sources like data presented in the Report of National Commission on macroeconomics and Health 2005 which provided such information for public and private enterprises and public sector banks for 2001-02. Estimations for 2004-05 were arrived at by making certain restrictive assumptions. Tracking of the health expenditure of firms

and NGOs is possible only through a sample survey and adequate response can be ensured through proper communication regarding the survey in advance through different forms of media and proper follow up. Macro level organizations like NSSO or CSO can also be requested to conduct such surveys periodically.

An important gap in health expenditure in India is the lack of State level Health Accounts as state level decision making is crucial in shaping the health sector performance as currently, more than 80 % of public expenditure on medical, public health, water supply and sanitation is incurred by the state governments (Rath, 2013).

Again, certain kinds of information are not available. Information on disease specific and age specific expenditure is not available. Differential access to public health facilities by various socio-economic groups is highlighted by some studies. In this context, disaggregated information on expenditure by socio-economic groups is important. Government expenditure to some extent is available at disaggregated level for certain groups. Gender budgets or tribal and scheduled caste sub-plans for specific Ministries and Departments offer some information. However, there are several issues with this data as well. Again, there is absence of reliable information on medical inflation. There are sector specific price indices developed for certain sectors like Residex for the real estate sector. There is a need to develop price index for the health sector. Hence, strengthening and standardization of the database is one of the foremost requirements at this stage.

# CHAPTER 7

## PROJECTION AND FORECASTING OF HEALTH INDICATORS

### Overview:

The chapter discusses the projection and forecasting of health indicators. It explains the need for projections, methods of population projection and health indicators and covers only basic and simple methods of projections. It also discusses the limitations and sources of errors in projection. It Projections on health related requirements in areas like infrastructure, RCH programmes and ageing programmes are also made.

### 7. Introduction:

Projections of health infra-structure and health expenditure are the two important functions of health planning of the national Governments committed to provide health for all. The National Health Policy 2002 of India aims at achieving an acceptable standard of health for the general population of the country. To achieve the objective, provision of individual health care, public health, sanitation, clean drinking water, access to food and knowledge of hygiene and feeding practices are the essential components of the planning process.

The topic of health planning is quite complex. In brief, as shown in the following table, it involves the projections of population, beneficiaries, facilities, human resources, medicines, equipments and ultimately finances. Both, Government and private sector provide health care to the population, and the projections of health sector involve projections of both. The major problem involved in projections is the availability of necessary inputs in terms of disease prevalence rates, requirement of persons affected by different diseases in terms of hospitalization, medicines, cost per patient etc.

Item	Projections required of	Parameters required for future
Population	Population by age-sex and residence	Vital statistics
Beneficiaries	Number of persons having specific <ul style="list-style-type: none"> <li>• Acute morbidity</li> <li>• Communicable diseases</li> <li>• Chronic diseases</li> <li>• Disabilities</li> </ul>	Disease prevalence rates
Facilities	Number of health facilities <ul style="list-style-type: none"> <li>• Government teaching hospitals</li> <li>• District hospitals</li> <li>• Sub-district hospitals</li> <li>• Primary health centres</li> <li>• Sub-centres</li> <li>• Private hospitals</li> <li>• Private clinics</li> <li>• Number of diagnostic centres</li> </ul>	Norms in terms of patients or beneficiaries per facility
Human resources	<ul style="list-style-type: none"> <li>• Number of Doctors</li> <li>• Number of specialists</li> <li>• Number of Nurses</li> <li>• Number of pathologists</li> <li>• Number of ANMs</li> </ul>	Norms in terms of patients or beneficiaries per health functionary
Equipments and Medicines	<ul style="list-style-type: none"> <li>• Equipments</li> <li>• Medicines</li> <li>• Vaccines</li> <li>• Other consumables</li> </ul>	Requirements per patient/ beneficiary
Finances		

Though projections of the health sector is very complex exercise, keeping in view the major Government programs and major health needs this chapter presents methodology of projecting health indicators and population. Following table summarizes different public health programs and the beneficiaries of the programs.

Serial No.	Component	Beneficiary group	Programs
1	Clean drinking water	All households	
2	Sanitation-Toilet facilities	All households	
3	Access to food	All households	
4	Program for Reproductive, Maternal, New born, Child and Adolescent Health	All pregnant women	Provision of Registration of pregnancy, Ante-natal check-up, two TT injections, supply of IFA tablets
		All women delivered live/ still birth	Provision for institutional delivery
		All live-births	Immunization at birth, polio zero and Hepatitis zero

		All infants	All vaccination
		All children	Booster doses of vaccines and micro-nutrient supplementation
		All children having diarrhoea, ARI, fever	Provision of ORS during diarrhoea
		All adolescent girls aged 15-19	IFA tablets
		Currently married women aged 15-49	Family planning services
5	Control of communicable diseases	All population	
6	School Health program	Children aged 6-14	
7	ICDS program	<ul style="list-style-type: none"> <li>• Pregnant women</li> <li>• Lactating mothers</li> <li>• Children aged 6-35 months</li> <li>• Children aged 3-6</li> </ul>	Nutrition supplementation
8	AIDS Control	All ages	
9	Special programs for old age people	Population aged 60+	

The present chapter restricts methodology of projections of

1. Estimates of total number of households in rural and urban areas
2. Total population in rural and urban areas
3. Population by age and sex
4. Number of beneficiaries of Reproductive, New-born, Child and adolescent Health programs
5. Number of elderly with chronic morbidities, disabilities and requirement of disability aids and assistance
6. Requirements for Sub-centres, PHCs and CHCs

### 7.1. Population Projections

The present section describes different method of projection of total population, population by age and sex, population in rural and urban areas and total number of households. The contents of the section are:

1. Mathematical Methods of Population Projection
2. Cohort Component Method of Population Projection
3. Ratio Method
4. Projection of Urban Rural Populations
5. Projection of Number of Households

### 7.1.1. Mathematical Methods of population projection:

Mathematical methods of population projections are simple and mechanical and are generally used for estimating inter-censal and post-censal estimates though they can be used for estimating future population estimates also. Mathematical methods involve fitting of mathematical curves to the past population data. Mathematical methods consist of expressing the population total of a country or region as a mathematical function of time  $t$ . The parameters of the function are estimated with the help of available population totals from earlier censuses. Once the parameters are estimated, then the population total at any time  $t$  can be estimated by substituting the value of  $t$  in that function. The common curves used for depicting population trend and thus for estimating population growth are given below:

1.  $P_t = P_0(1+rt)$  (Arithmetic law of population growth)
2.  $P_t = P_0(1+r)^t$  (Geometric growth model)
3.  $P_t = P_0e^{rt}$  (Exponential growth model)
4.  $P_t = a + bt + ct^2$  (Second degree curve)
5.  $P_t = ka^{bt}$  (Gompertz model)
6.  $P_t = a + b.c^t$  (Modified exponential)
7.  $P_t = K/(1 - e^{-a+bt})$  (Logistic model)

The only inputs the mathematical methods require is population totals from past censuses. Prior to 1960's when most of the developing countries lack demographic data related to fertility and mortality, these mathematical methods were in common use. However, future population depends on demographic dynamics, which is too complex to capture in mathematical equations. Once, the developing countries started collecting data on vital events and had vital rates, they stopped using the mathematical methods for projection purpose.

At present, the arithmetic, geometric or exponential growth models are still used for intercensal and post-censal estimation. However, they are used for short term projections spanning only a few years.

**1. Linear Growth Function:** The functional form of curve is  $P_t = P_0(1+rt)$ , which implies that every year population is growing by a constant magnitude. As it is absurd to expect that every year population will increase or decrease by the same magnitude, this model is rarely used.

**2. Geometric Law of Population Growth:** The geometric law of population growth is given by the equation-

$$P_t = P_0 (1 + r)^t$$

Where  $P_t$  = Population of a region at time 't';

$P_0$  = Population of a region at time '0';

$r$  = Geometric rate of population growth per person per year during time 0 and t; and

$t$  = Time in years elapsed from year 0.

The equation implies that an increase in a population during any year t-1 to t is proportional to the population in year t-1, i.e.,  $P_{t-1}$ .

**3. Exponential law of population growth:** The exponential growth of population leads to the equation -

$$P_t = P_0 e^{rt}$$

where  $P_t$  = Population in time 't';

$P_0$  = Population in time '0';

$r$  = Exponential rate of population growth expressed as per person per year; and

$t$  = Period in years elapsed from year 0 to t.

The exponential law of population growth assumes that population growth at any moment is proportional to the population total a moment earlier.

Following table shows the estimation of intercensal and postcensal estimates using geometric and exponential curves.

<b>Year (t)</b>	<b>Population at time t- P (t)</b>	<b>Method used</b>
<b>1</b>	<b>2</b>	
2001	1,028,610,328	
2011	1,210,569,573	
2008	1,152,837,492	Using Geometric curve
2014	1,265,866,424	Using Geometric curve and growth rate of 1.5%
2014	1,266,289,500	Using Exponential curve and growth rate of 1.5%

### 7.1.2. Cohort Component Method of Population Projection:

The mathematical methods though require data only on population totals do not give estimates of population by age. For different health programs beneficiaries are from different age-groups and hence mathematical methods are of very little use.

The most widely used method for population projections is the Cohort Component Method. As the name suggests, this method projects each of the sex-age cohort separately. Also the method involves projection of each of the component of population growth, namely, fertility, mortality, and migration, separately. Before starting the discussion about the method, we will get introduced to a few terms.

**Base Year of the Projection:** The year from which projection starts is the base year. Usually it is taken as the last census year, as the age-sex distribution of the population is available for that year.

**Projection Period:** It is the period from the base year, for which projections are extended. Generally, it is 15 to 20 years, though a few projections extend over a longer period, sometimes even a century. Mostly, a projection period is taken as a multiple of 5 years. If the age distribution for the base year is available in 5 year age-groups, then it is essential to have a projection period in multiples of 5 years.

The input data necessary for the application of the method are :

1. **The age sex distribution of the population for the base year:** The age-sex distribution should be free from all types of errors. Hence, it is necessary to evaluate the age distribution to judge the quality of age data and if necessary adjust the age distribution.

2. **Mortality:** Life table survival ratios in the five year age-groups for males and females for the base year and estimates of survival ratio's for each succeeding five-year intervals of projection periods. In most of the cases, survival ratios are borrowed from the model life tables. In such situations, the necessary input data are estimates of life expectation at birth for males and females for the base year and their estimates for each succeeding five-year intervals and knowledge about the model age pattern of mortality closer to the population for which projections are carried out.
3. **Fertility:** Estimates of any of the period fertility measures like General Fertility Rate or Age Specific Fertility Rates, Total Fertility Rate (TFR), etc. for the base year and for each of the succeeding five year intervals are needed.
4. **Sex ratio at birth:** Estimates of sex ratio at birth for all the projection periods are also required.
5. **Migration:** Estimates of either volume of net migration or rate of net-migration by age-group and sex for the base year and for each of the succeeding five-year intervals.

The steps involved in the cohort component method are described below:

1. Surviving base year (year  $t$ ) population of males and females in five year age-groups for the next five year by multiplying number of persons in each group by survival ratios. Persons in the age-group 0-4, 5-9, 10-14, ----- in the base year  $t$  will be five year older in the year  $(t + 5)$ . For example females in the age-group 20-24 in year  $t$  will be in the age-group 25-29 in the year  $(t+5)$ . However, all the females in the age-group 20-24 in year  $t$  will not survive till year  $(t+5)$ , as some of them will die during time period  $(t, t+5)$ . The multiplication of the number of females in the age-group 20-24 at time  $t$  by survival ratio consistent with the life expectancy for females during time period  $(t, t+5)$  will remove the number of deaths.
2. With the application of step 1, it is possible to estimate number of persons aged 5 and above in the year  $(t+5)$ . However, number of children aged 0-4 in year  $(t+5)$  need to be estimated.
3. The number of children aged 0-4 in year  $(t+5)$  were not present in year  $t$ . These children were born during time period  $(t, t+5)$ . However, some of the children born during  $(t, t+5)$  may die before year  $(t+5)$ .
4. The number of births during time period  $(t, t+5)$  are given by the number of women in the age-group 15-49. The number of women is estimated by taking average of number of women aged

15-49 in year  $t$  and the number of women aged 15-49 in year  $t+5$ . The average number of women is then multiplied by either General Fertility Rate (GFR) or Age Specific Fertility Rates (ASFRs) assumed to prevail during time period  $(t, t+5)$ .

5. The computation in step 4 gives an estimate of births in one year as the measures of fertility like GFR or ASFRs are annual rates. To obtain births during five year period, these births are multiplied by five.
6. Total number of births during time period  $(t, t+5)$  are further split into male births and female births by applying sex ratio at birth assumed to prevail during  $(t, t+5)$ .
7. Once the male and female births are available, they are multiplied with the appropriate survival ratios to obtain child population aged 0-4 in year  $(t+5)$ .
8. In cases where migration is assumed, the net number of migrants of a given sex is added to or subtracted from, the population of each five year age-group at the end of each time interval, i.e., after surviving them for 5 years.

The methodology of the projection as described in the steps, is simply an arithmetic exercise which can be done if the base population by sex and five-year age-groups, the survival ratios, the fertility rates and the volume of net migration or net migration rate by sex are available. The computer software Spectrum, developed by Futures Group, Washington, is very helpful in carrying out population projections by cohort component method. If all the inputs are entered in the software, then projection results are available instantly. However, the main issue is how to formulate assumptions regarding the future levels of mortality, fertility and migration.

Usually, mortality is assumed to decline in a non-linear way. As mentioned earlier, mortality assumptions are formulated in terms of life expectancy at birth by sex. At lower levels of life expectancy, an increment is assumed to be lower. Improvement in life expectancy is assumed to be increasing with the level of  $e_0^0$ . However, beyond certain levels of  $e_0^0$ , again it is assumed that improvement in life expectancy declines. In other words, at very low and very high levels of  $e_0^0$ , the improvement is slow and at the middle level in general, when  $e_0^0$  lies between 50 and 60, the improvement is fast. Usually, female  $e_0^0$  is assumed to increase at a faster rate compared to male  $e_0^0$ . These are based on empirical observation. For example, the model used for estimating future levels at  $e_0^0$  by Expert Committee on Population Projections, Government of India, was as follows:

## Annual Increase in $e_0^0$ for Males & Females for Various Base Levels of $e_0^0$

Base Level of $e_0^0$	Annual increase in	
	$e_0^0$ Males	$e_0^0$ Females
30 - 34.9	0.20	0.25
35 - 39.9	0.30	0.35
40 - 44.9	0.40	0.45
45 - 49.9	0.50	0.55
50 - 59.9	0.60	0.65
60 - 64.9	0.40	0.45
65 - 69.9	0.20	0.25

The current trend in the fertility projection in all the countries having fertility control programme is to assume that in future all countries will reach a level of Net Reproduction Rate of one and then fertility will stabilize at the level of  $NRR = 1$ . So in all the countries, where fertility levels are above  $NRR = 1$ , fertility is assumed to decline to  $NRR = 1$ . Whereas for all those countries where  $NRR$  is already below 1, it is assumed that, in future, fertility levels in these countries would remain constant at that level.

### **Official Population Projections in India**

Beginning from 1958, it has been customary for the Office of the Registrar General and Census Commissioner, India to undertake the exercise of population projection on behalf of the Planning Commission of India. The first Expert Committee on Population Projections was set up by the Planning Commission in 1958 under the chairmanship of the Registrar General, India to provide a set of population projections for India and States for use in the preparation of the Third Five Year Plan. Thereafter, this Committee was revived from time to time to revise the existing official projection figures on the basis of the latest available census data.

The latest population projections were done in 2006 spanning the period of 25 years from the census 2001 to 2026.

## Population Projections by United Nations:

United Nations prepare population projections for every county in the world by using Cohort Component method. The projections are periodically reviewed and modified based on the latest data available. The latest round was prepared in 2012.

### 7.1.3. Ratio Method of Population Projections

The cohort component method of population projection is a comprehensive method of projections that takes into account each component of population growth and each age-group separately. However, there are some practical problems the method poses in its application to sub-national or smaller administrative areas.

- (i) The cohort component projection method requires reasonably accurate estimates of mortality and fertility for the base year which is generally not available for smaller areas.
- (ii) In the population growth of smaller areas, the migration component contributes significantly, sometimes even higher than that by of natural increase (i.e., net of births and deaths). So at the sub-national level, the migration component assumes a major role in population projections in contrast to the case of national population projection. It is comparatively difficult to project the migration component, i.e., either the volume of net-migration or the net migration rate of smaller areas.

Due to non-availability of data on fertility and mortality for smaller administrative areas and due to uncertainty involved in the projection of migration component for smaller administrative areas, usually for projecting population of smaller administrative areas the Ratio Method is applied.

The Ratio method can be used for population projections of district or *tahsil*, town or any smaller administrative area. The only prerequisite for this method is that the population projections for larger areas should be available.

The method is as follows:

Let  $P_c^{t-30}$ ,  $P_c^{t-20}$ ,  $P_c^{t-10}$ ,  $P_c^t$  denote population of the larger area in the census years of t-30, t-20, t-10 and t respectively, where t is the latest census year.

Let  $P_a^{t-30}$ ,  $P_a^{t-20}$ ,  $P_a^{t-10}$ ,  $P_a^t$  denote the population of a smaller area in the census years at t-30, t-20, t-10 and t respectively, where t is the latest census year.

Then,

$$R_a^{t-30} = \frac{P_a^{t-30}}{P_c^{t-30}} \quad R_a^{t-20} = \frac{P_a^{t-20}}{P_c^{t-20}} \quad R_a^{t-10} = \frac{P_a^{t-10}}{P_c^{t-10}} \quad R_a^t = \frac{P_a^t}{P_c^t}$$

are the ratios of the population of smaller area to population of larger area at time t-30, t-20, t-10 and t respectively.

$P_c^{t+10}$ ,  $P_c^{t+20}$ ,  $P_c^{t+30}$  are the projected population of larger area in years of t+10, t+20 and t+30 respectively and  $R_a^{t+10}$ ,  $R_a^{t+20}$  and  $R_a^{t+30}$ , are the ratios at time t+10, t+20, t+30 then the projected population of smaller area A are -

$$\begin{aligned} P_a^{t+10} &= P_c^{t+10} \times R_a^{t+10} \\ P_a^{t+20} &= P_c^{t+20} \times R_a^{t+20} \\ P_a^{t+30} &= P_c^{t+30} \times R_a^{t+30} \end{aligned}$$

The critical part in this method is to project the ratios of population of smaller areas to population of larger area, for the future years. The common procedure for projecting ratios is to extrapolate the trend in the ratios to future years. For the extrapolation of the trend it is necessary to have ratios at least at two points.

Following is the example of ratio method applied to project population of five districts of Maharashtra, viz. Nashik, Satara, Sangli, Kolhapur and Nagpur for the years 2016, 2021, and 2026.

Census Year	Population in thousand					
	Maharashtra	Nashik	Satara	Sangli	Kolhapur	Nagpur
1981	62,784	2,992	2,039	1,831	2,464	2,589
1991	78,937	3,851	2,451	2,210	2,990	3,287
2001	96,879	4,994	2,809	2,584	3,523	4,068
2011	112,374	6,107	3,004	2,822	3,876	4,654

The above table gives population of the districts and the state for the census years 1981 to 2011. The following table gives ratio of the district population to state population. The next table gives change in the ratios during each of the inter-census period and annual change during the 30 year period from 1981 to 2011. The ratio of district population and state population shows continuous increase in Nashik, continuous decrease in Satara, Sangli and Kolhapur and very small change in Nagpur. In case of Nashik the increase in the ratio during inter-censal period is increasing whereas in Satara, Sangli and Kolhapur the decrease in the ratio during inter-censal period is decreasing. For projecting the ratios the annual change observed during 1981 to 2011 is assumed. The projected levels of ratios for the years 2016, 2021 and 2026 are shown in the following table.

Census Year	Ratio of district population to state population				
	Nashik	Satara	Sangli	Kolhapur	Nagpur
1981	0.0477	0.0325	0.0292	0.0392	0.0412
1991	0.0488	0.0311	0.0280	0.0379	0.0416
2001	0.0515	0.0290	0.0267	0.0364	0.0420
2011	0.0543	0.0267	0.0251	0.0345	0.0414

	Change in the ratios during				
	Nashik	Satara	Sangli	Kolhapur	Nagpur
1981 & 1991	0.0011	-0.0014	-0.0012	-0.0014	0.0004
1991 & 2001	0.0028	-0.0021	-0.0013	-0.0015	0.0003
2011 & 2011	0.0028	-0.0023	-0.0016	-0.0019	-0.0006
Annual change during 1981 & 2011	0.00022	-0.00019	-0.00014	-0.00016	0.00001

Projected ratios for Nashik:

$$\begin{aligned}
 \text{Ratio in year 2016} &= \text{Ratio in year 2011} + 5 \times \text{Annual change during 1981 to 2011} \\
 &= 0.05430 + 5 \times 0.00022 \\
 &= 0.05430 + 0.00110 \\
 &= 0.0554
 \end{aligned}$$

Similarly ratios for all the years are projected.

Census Year	Ratio of district population to state population				
	Nashik	Satara	Sangli	Kolhapur	Nagpur
2011	0.05430	0.02670	0.02510	0.03450	0.04140
2016	0.05546	0.02577	0.02444	0.03370	0.04145
2021	0.05658	0.02482	0.02376	0.03291	0.04147
2026	0.05769	0.02386	0.02309	0.03212	0.04150

Once the ratios for the future years are estimated and the projected population for the state is available, then the population of the districts can be estimated by multiplying state population by projected ratios as shown in the following table.

$$\begin{aligned} \text{Projected population of Nashik in 2016} &= \text{Projected population of Maharashtra in 2016} \times \\ &\text{Projected ratio of Nashik in 2016} \\ &= 120,076 \times 0.05546 = 6,659 \end{aligned}$$

Similarly for all the years district-wise population is projected.

Census Year	Population in thousand					
	Maharashtra	Nashik	Satara	Sangli	Kolhapur	Nagpur
2011	112,374	6,107	3,004	2,822	3,876	4,654
2016	120,076	6,659	3,095	2,934	4,047	4,977
2021	127,082	7,190	3,154	3,020	4,182	5,271
2026	133,333	7,692	3,181	3,078	4,282	5,534

#### 7.1.4. Projection of Urban and Rural Population:

The ratio method is utilized for the projection of urban and rural population. As in the case of sub-national projections, before proceeding for the urban-rural population projections, population projection of the combined rural and urban areas is already attempted and projected population figures are available.

**Methodology of Projecting Urban-Rural Population:** The most widely used method among them is the one developed by the United Nations and popularly known as Urban-Rural Growth Difference (URGD) method.

As in the case of sub-national area, population projection by ratio method, this method also does not involve the projection of population of urban or rural area but it involves the projection of the ratio of urban population to the total population and then by applying these projected ratios of urban population to the total population (i.e. projected levels of urbanization) to the predetermined (already projected) total population of the area, estimates the urban population. Once the volume of urban population is projected, then the volume of rural population in future can be estimated by subtracting the projected urban population from the projected population of the total area.

The method uses the concept of Urban Rural Growth Difference (URGD) for projecting the proportion of urban population into the future. The difference in the annual exponential growth rates of urban and rural populations is the measure of tempo of urbanization. The urbanization, i.e., the proportion of urban population to total population is assumed to proceed according to a logistic curve. At the initial stage when the level of urbanization is low, the speed of urbanization is slow but progressively increasing. This increasing speed of urbanization continues till the level of urbanisation reaches 50 per cent. Beyond the level of 50 percent, though the level of urbanization increases the rate of increase in urbanization decreases till the level of urbanization reaches an asymptote.

With following notations,

<b>0</b>	<b>Initial year</b>
<b>T</b>	<b>Final year</b>
<b>U<sub>0</sub></b>	<b>Urban population at time 0</b>
<b>U<sub>t</sub></b>	<b>Urban population at time t</b>
<b>R<sub>0</sub></b>	<b>Rural population at time 0</b>
<b>R<sub>t</sub></b>	<b>Rural population at time t</b>
<b>P<sub>0</sub> = 100*U<sub>0</sub>/(U<sub>0</sub> + R<sub>0</sub>)</b>	<b>Percentage of population in urban areas or level of urbanization at time 0</b>
<b>P<sub>t</sub> = 100*U<sub>t</sub>/(U<sub>t</sub> + R<sub>t</sub>)</b>	<b>Percentage of population in urban areas or level of urbanization at time t</b>
<b>U</b>	<b>Annual rate of increase in urban population during (0 to t)</b>
<b>R</b>	<b>Annual rate of increase in rural population during (0 to t)</b>
<b>d = u-r</b>	<b>Difference between urban and rural population growth rates</b>

$$\begin{aligned}
 U_t &= U_0 e^{ut} \\
 R_t &= R_0 e^{rt} \\
 U_t/R_t &= U_0 e^{ut} / R_0 e^{rt} \\
 &= (U_0/R_0) e^{(u-r)t} \\
 &= (U_0/R_0) e^{dt}
 \end{aligned}$$

$100 \cdot U_t / (U_t + R_t) = 100 \cdot U_t / (U_t + R_t) =$  Percentage of urban population in total population at time t or level of urbanization at time t.

So for projecting the proportion of urban population of any time ‘t’ in future, the required quantities are 1) the ratio of urban and rural population at any time ‘0’, usually the latest census year, before t and 2) ‘d’ the difference in the rate of increase in the urban and rural population during time period between ‘0’ and ‘t’.

The ratio of urban population and rural population is available for the latest census year, and the assumption is made about the difference in the growth rates of urban and rural population. The most important issue in this method is projecting URGD. Usually, the Urban Rural Growth Difference –URGD- observed during recent inter-censal period is assumed to remain same for the future period. The Expert Committee on Population Projections also assumed the URGD to be same as observed during 1991-2001 for all the future period till 2026.

Following table illustrates projection of urban population of India for the period of 2011-2026. Table \* gives the computations of the annual exponential growth rate and URGD during 2001-2011.

Following equation gives the formula necessary to estimate r the exponential growth rate.

$$P^{2011} = P^{2001} * \exp (10*r)$$

Year	2001	2011	P2011/ P2001	Ln (P2001/ P1991)	Growth rate (2001-2011)	URGD = D = Urban GR- Rural RGR
Rural	742,490,639	833,463,448	1.1225	0.1156	0.0116	
Urban	286,119,689	377,106,125	1.3180	0.2761	0.0276	0.01605
Total	1,028,610,328	1,210,569,573				
% Urban	0.2782	0.3115				

The annual exponential rate of increase in urban and rural areas of India during the decade 2001-2011 was 2.761% and 1.156% respectively, and hence the Urban Rural Growth Difference (URGD) was 0.01605. It is assumed that URGD of 0.01605 observed during the decade 2001-2011 will remain constant during 2011-2026.

Table \* gives estimation of proportion urban using URGD during 2016-2026. Following steps illustrate the computation.

1. The first row of the table shows the estimation of proportion urban for the year 2016. The entries in the Column 4 (0.312) and column 5 (0.689) give proportion of urban and rural population in 2001, and the column 6 (0.312/ 0.689 = 0.4524) gives the ratio of proportion urban and rural population.

2. With the assumption of URGD (D) during five year period 2001-2006 as 0.01605,  $D*t$  works out to be  $0.01605 * 5 = 0.0803$  as seen in column 7.
3. Column 8 gives exponential of  $D*t$ , i.e., 0.0803 as 1.0836.
4. In column 9, the ratio of proportion urban and proportion rural in year 2016 is estimated as = Ratio of proportion urban and proportion rural in 2011 multiplied by exponential of  $5*D$  or  $0.4524 * 1.0836 = 0.4902$ .
5. Column 10 gives proportion of urban population in 2016 estimated as Ratio of proportion urban and proportion rural / (1+ Ratio of proportion urban and proportion rural) or  $0.4902 / 1 + 0.4902 = 0.329$ .

Table 8: Estimation of Proportion of Urban Population for the Years 2016, 2021 and 2026, India

Year (0)	URGD = D = Urban Growth Rate - Rural Growth Rate	t = Period	Proportion Urban at time '0'	Proportion Rural at time '0'	Ratio (Prop Urban/ Prop Rural) at time '0'	D * t	Exp (D*t)	Ratio (Prop Urban/ Prop Rural) at time t = (Exp (D*t)) * (Prop Urban/ Prop Rural) at time t	Proportion Urban at time 0+t
1	2	3	4	5	6	7	8	9	10
2011	0.01605	5	0.312	0.689	0.4524	0.0803	1.0836	0.4902	0.329
2016	0.01605	5	0.329	0.671	0.4903	0.0803	1.0836	0.5313	0.347
2021	0.01605	5	0.347	0.653	0.5314	0.0803	1.0836	0.5758	0.365
2026	0.01605	5	0.365	0.635	0.5748	0.0803	1.0836	0.6228	0.384

United Nations carry out projections of urban population for each country in the world, using the concept of URGD. The projections are revised periodically.

The method for projecting URGD used by United Nations in 2011 revision of the World Urbanization Prospects, is as follows:

The projection of the proportion urban is carried out based on a projection of the urban-rural growth differential. It is assumed that the most recent observed urban-rural growth difference for the most recent period available in a given country, instead of remaining constant, is linearly converging to the hypothetical urban-rural growth difference - or world norm - over a period of 25 years. The hypothetical urban-rural growth difference is estimated with the regression equation

$$hrur = 0.0327211 - 0.0254696' Pu_{t_0}$$

where  $Pu_{t_0}$  is the proportion urban at the time of the initial census.

The hypothetical urban-rural growth difference, denoted by  $hrur$ , which has been obtained by regressing the initial observed percentage urban on the urban-rural growth difference for the 148 countries or areas with 2 million or more inhabitants in 2011. The resulting regression equation estimated on 1,047 observations (with 906 observations covering the period 1950-2011 and 141 observations for the period 1800-1949).

The above regression equation implies that, as the initial level of urbanization increases,  $hrur$  decreases. When the initial proportion urban is zero, an urban-rural growth difference of 0.0327211 can be expected; when the proportion urban is 0.5, a value of  $hrur$  of 0.0199863 can be expected; and when the proportion urban is 1, an  $hrur$  of 0.0072515 can be expected.

### 7.1.5. Projection of Number of Households

The projection of the households assumes an importance in the field of Public Health, as for many of the amenities relevant in the public health beneficiaries are the households and not the individuals. Decent housing with the adequate supply of water and sanitation facilities are crucial for the betterment of the health of the population. Additionally, in the context of programs like 'Food for All' the beneficiaries are households.

It is pertinent to get clear idea of the different concepts of 'House', 'Household' and 'Family'. Indian census defines a 'Census House' as a building or part of a building used or recognized as a separate unit because of having a separate main entrance from the road or common courtyard or staircase etc. It may be occupied or vacant. It may be used for a residential or non-residential purpose or both.

A 'household' is defined as a group of persons who normally live together and take their meals from a common kitchen unless the exigencies of work prevent any of them from doing so. The

persons in a household may be related or unrelated or a mix of both. However, if a group of unrelated persons live in a Census house but do not take their meals from the common kitchen, then each such person is treated as a separate household. The concepts of 'household' and 'family' are often used interchangeably but they refer to two different concepts. As discussed earlier, the concept of the household is based on the arrangement made by the persons for providing themselves with food or other essentials of living, whereas the term 'family' is defined primarily by reference to the relationship between them, either through blood, adoption or marriage.

The concept of Headship Rate is used for the purpose of Projections of households. Headship rate is defined as the number of heads of households per 100 population. The headship rate is an inverse (reciprocal) of average household size, i.e., average number of persons per household.

Methodology of projecting number of households:

Among the available methods for projecting households, we are going to discuss the headship rate method.

We have already seen that for any year t,

$$\text{Headship rate in year } HR^t = \frac{\text{No. of heads in year } t}{\text{Population in year } t} \times 100$$

Number of heads of households in year t which is equivalent to the number of households in year t (as each household has one head) = Population in year t X headship rate in year t.

So if with the projected levels of headship rates and population totals total number of households are estimated.

If t is the base year of projections, then for future years of t+5, t+10, t+15...The number of households is projected as -

$$\begin{aligned} HH^{t+5} &= P^{t+5} \times HR^{t+5} \\ HH^{t+10} &= P^{t+10} \times HR^{t+10} \\ HH^{t+15} &= P^{t+15} \times HR^{t+15} \quad \text{and so on.} \end{aligned}$$

B.

Where

$HH^{t+5}$ ,  $HH^{t+10}$ ,  $HH^{t+15}$ , ..., are the projected number of households in the years t+5, t+10, t+15, ....

$P^{t+5}$ ,  $P^{t+10}$ ,  $P^{t+15}$ , ..., are projected population totals in years  $t+5$ ,  $t+10$ ,  $t+15$ , ... (predetermined) and

$HR^{t+5}$ ,  $HR^{t+10}$ ,  $HR^{t+15}$ , ..., are projected (assumed) levels of headship rate in years  $t+5$ ,  $t+10$ ,  $t+15$ ,.....

As the pattern of household formation or headship rates differ in rural and urban areas, it is better to project the households in rural and urban areas separately and then summed them to estimate the total number of households in a region.

Once the number of households is projected, then the housing units can be estimated as equal to the number of households, under the assumption that each household occupies one housing unit.

The main methodological issue is making assumptions about the future levels of headship rates.

The common procedures used for projecting headship rates are:

- (a) *Assume a constant headship rate*, i.e., assume that for all future years (usually spanning two to three decades), the headship rates remain at a level the same as observed in the last census.
- (b) *Extrapolation of the trend* : In this approach, the past trend observed in 3 to 4 census years is extrapolated.

While selecting the approach for formulating an assumption about the future headship rate, it is necessary to note a few points. A process of household formation and in turn headship rate is determined by a variety of demographic, social, economic as well as cultural factors. It also depends upon the housing situation. So while making assumption about the future headship rates, it is necessary to foresee all the likely changes in the above-mentioned factors. For example, in India, in the past the joint family system was prevalent but now slowly the system is replaced by the nuclear family system. In future, this may lead to a higher headship rate. However, again in many areas, especially in urban areas, the housing problem may forcibly make people live together which may not result in increasing the headship rate.

In following table an example of projection of households for India for the year 2021 is presented. Based on the data on the number of households and total population for the past three censuses in

the years 1991, 2001 and 2011, headship rates are estimated separately for the rural and urban areas of the country. The levels and rural-urban differentials in the headship rates shows that; 1) headship rates in urban areas are higher than those in rural areas and 2) over the years, in both rural and urban areas, headship rates are increasing and 3) the rate of increase in the headship rates is also increasing.

During the latest inter-censal period of 2001-2011 headship rates in rural and urban areas have increased by 9% and 10%. With the assumption that during the next ten year period also they will increase by the same rates, the headship rates for the year 2021 are projected as 22.05 for the rural areas of India and 23.59 for the urban areas. Applying these projected headship rates to projected population in urban and rural areas in the year 2021 by Expert Committee the number of households in rural and urban areas are estimated as 199.98 million and 102.08 million respectively.

An alternative assumption is made that the headship rate of the year 2011 will remain constant for the year 2021. With this assumption, the number of households in rural and urban areas in the year 2021 is estimated as 183.51 million and 92.80 million respectively.

Table 9: Projection of Number of Households				
Year	Number of Households (in million)	Total Population (in million)	Headship Rate (%)	% Increase in Headship Rate
Rural				
1991	112.50	628.70	17.89	--
2001	137.75	742.49	18.55	3.68
2011	168.57	833.46	20.23	9.02
2021*	199.98	907.12	22.05	9.00
2021*	183.51	907.12	20.23	0.00
Urban				
1991	40.70	217.60	18.70	--
2001	55.83	286.12	19.51	4.32
2011	80.89	377.11	21.45	9.93
2021*	102.08	432.62	23.59	10.00
2021*	92.80	432.62	21.45	0.00
Total				
1991	153.20	846.30	18.10	--
2001	193.58	1028.61	18.82	3.96
2011	249.45	1210.57	20.61	9.49
2021*	302.06	1339.74	22.55	9.41
2021*	276.31	1339.74	20.62	0.09
<ul style="list-style-type: none"> <li>• Projected population</li> </ul>				

## 7.2. Number of beneficiaries of Reproductive, Newborn, Child and adolescent Health program

### 7.2.1. Reproductive Health Program

The main components of Reproductive Health program and their respective beneficiaries are presented in the next table.

Sr No	Program	Beneficiaries
1	<ul style="list-style-type: none"> <li>Maternal health care including antenatal care,</li> <li>Care during delivery and postnatal period</li> </ul>	<ul style="list-style-type: none"> <li>Pregnant women</li> <li>Pregnant women with anaemia</li> <li>Women delivering live-birth or still-birth</li> </ul>
2	Treatment for infertility	Currently married women aged 15-49 with no live-birth
3	Treatment for reproductive tract infections (RTI) and sexually transmitted infections (STI)	Women aged 15-49 having symptoms of RTI/STI
4	Family planning services	<ul style="list-style-type: none"> <li>Currently married women aged 15-49</li> <li>Currently married women aged 15-49 wanting no more children or wanting to postpone the next birth but they/ their husband not using any family planning method</li> </ul>
5	Medical Termination of Pregnancy	Currently married women aged 15-49

- Projections of pregnant women: The number of pregnant women in any year can be estimated by estimating number of live births and then applying by a fixed factor. The number of live-births corresponds to the number of pregnancies. However, all pregnancies do not terminate into live-births and the number of live-births may underestimate number of pregnancies. Secondly, there are few multiple births, thus number of live-births may overestimate number of pregnancies.

The number of live-births is estimated by applying crude birth rate (CBR) to the total population.

For example, the number of pregnant women in year 2021 =

Number of live-births in year 2011 =

CBR in year 2021 X Total population in year 2011/ 1,000.

**Assuming CBR in 2021 to be 18.0 per 1,000 population and projected population of 1,339,741,000 in 2021 the projected number of live-births in 2021 =**

$$1,339,741,000 \times 18.0 / 1,000 = 24,115,338$$

The number of pregnant women or the number of pregnancies in a year =  
Number of live-births X 10/ 100

**The number of pregnant women or the number of pregnancies in 2021 =  
24,115,338 X 1.1 = 26,526,872**

The factor of 10 per 100 is for taking into account the number of pregnancies that may end up in still births or miscarriages. Once the probable number of pregnancies is estimated this also will be the projected number of antenatal registrations as well as probable number of deliveries.

According to the number of antenatal registration the other maternal health services e.g. ANC visits, TT doses, IFA administration can be estimated. It has also assumed that 15 percent of the antenatal women registered in a population are usually high risk. Thus to estimate the number of high risk women that an ANM can expect she should compare her figures with a number which is 15% of the expected antenatal registration. It has also been observed that 50% of the antenatal cases registered are anaemic. Thus the number of pregnant women who are anaemic and require additional doses of IFA can be estimated.

**The number of high risk pregnant women in 2021 =  
26,526,872 X 0.15 = 3,979,030**

**The number pregnant women with anaemia in 2021 =  
26,526,872 X 0.50 = 13,263,436**

- Projections of currently married women aged 15-49: The beneficiaries of most of the maternal health programs, especially family planning services are the currently married women in the reproductive ages of 15-49. Component method of population projections gives the female population by age-groups or single year of age. The projected number of currently married women is obtained by applying projected proportions of currently married women in each age group by corresponding projected number of women in respective age-group. The method of population projection is explained in earlier section. Following table explains projection of proportions of currently married females by age.

The pattern of proportions of currently married women by age shows, that the proportion is quite low in the youngest age-group but increases till age 30-34, the age-group by which almost all the women are married. Thereafter the proportion of married women decreases, basically due to increasing incidence of widowhood by age. Over the years, as observed during 1991 and 2001, there is an overall decrease in the proportion of currently married women in the reproductive age-group of 15-49. The decrease in the proportion of married women in the youngest age-group of 15-19 is quite large but the magnitude of decrease in the proportion of married women decreases with age. During 1991-2001, there is hardly any change in the proportion of currently married females after age 35. In future also the increase in age at marriage and subsequent decrease in the proportion of married is expected. However, the pace of decrease may be slowed down. For projecting the proportion of currently married women in first four age-groups the exponential growth rate observed during 1991-2001 is kept constant. In the last three age-groups, the proportions of married women are kept constant at the 2001 level. The assumption is subjective and may be suitably adjusted. With the assumption of exponential growth rate in the proportion of currently married women in the age-groups till 30-34 and constant proportion of currently married women from 35-49 till 45-49 proportion of currently married women in the year 2011 is projected.

Age-group	Proportion of currently married women in year		Exponential rate of change during per year 1991-2001	Proportion of currently married women in 2011
	1991	2001		
15-19	0.35277	0.24453	-0.0366	0.1695
20-24	0.81811	0.75728	-0.0077	0.7010
25-29	0.93967	0.92150	-0.0020	0.9037
30-34	0.95144	0.94226	-0.0010	0.9332
35-39	0.94419	0.93189	-	0.9319
40-44	0.90652	0.90054	-	0.9005
45-49	0.87560	0.86914	-	0.8691
15-49	0.80176	0.76616		

Once the projected proportions of currently married women are available, the number of currently married women can be estimated using projected population totals.

Currently married women in the reproductive ages are beneficiaries of family planning program, and the younger married women with unmet need for family planning spacing methods are prospective users of spacing methods. Surveys like District Level Household

Surveys (DLHS) or National Family Health Survey (NFHS) provide estimates of unmet need by age or proportion of childless women or proportion of women having symptoms of RTI/ STI. Using these estimates, the number of beneficiaries of different reproductive health program can be estimated.

### 7.2.2. Child Health Program

The components of child health programs are presented in the following table. The beneficiaries of the child program are basically the children by single year of age.

Sr No	Program	Beneficiaries
1	New-born care Facility based Home based care	All the live-births delivered at Health institutions Home
2	Nutrition Micro-nutrient supplementation Management of severely undernourished children	All children aged 9 months to 59 months for Vitamin A supplementation and IFA supplementation Children aged 0-5 years who are severely underweight
3	Immunization • BCG • DPT • OPV (Oral Polio Vaccine) • Hepatitis B vaccine Measles	Infants aged 0-11 months for routine immunization Children aged 16-24 months for booster of DPT, polio and second dose of measles Children aged 5 for second booster of DPT
4	Management of common childhood illnesses of diarrhoea by making provision of ORS and Acute Respiratory Infections (ARI) by provision of antibiotics	Children aged 0-4 years suffering from diarrhoea and having symptoms of ARI

The beneficiaries of different immunization programs are children by single year of age. Most of the population projections provide population in five year age-groups. With the help of multipliers, like Sprague's multipliers it is possible to split the five year population into single year. Following table presents Sprague's multipliers. If G1, G2, G3 and G4 are population totals of first four age-groups, i.e., 0-4, 5-9, 10-14 and 15-19, then splitting G1 (age-group 0-4) into five ages of 0, 1, 2, 3 and 4, Sprague's multipliers are used.

Population at age zero is obtained by multiplying population totals of first four age-groups, i.e., 0-4, 5-9, 10-14 and 15-19 by four multipliers in the first row respectively, and then adding them.

For example, population at age zero =

$$114102 \times 0.3616 + 113309 \times (-0.2768) + 112880 \times 0.1488 + 117927 \times (-0.3360) = 41259 + (-31364) + 16797 + (-3962) = \mathbf{22730}$$

The details are shown in the next table.

<b>Sprague multipliers</b>				
	Coefficients to be applied to			
	G1	G2	G3	G4
First fifth of G1	0.36160	-0.27680	0.14880	-0.03360
Second fifth of G1	0.26400	-0.09600	0.04000	-0.00800
Third fifth of G1	0.18400	0.04000	-0.03200	0.00800
Fourth fifth of G1	0.12000	0.13600	-0.07200	0.01600
Last fifth of G1	0.07040	0.19680	-0.08480	0.01760

Age-group	Age	Population	Multiplier	Population X Multiplier
0-4		114102	0.3616	41259
5-9		113309	-0.2768	-31364
10-14		112880	0.1488	16797
15-19		117927	-0.0336	-3962
	0			<b>22730</b>
0-4		114102	0.2640	30123
5-9		113309	-0.0960	-10878
10-14		112880	0.0400	4515
15-19		117927	-0.0080	-943
	1			<b>22817</b>
0-4		114102	0.1840	20995
5-9		113309	0.0400	4532
10-14		112880	-0.0320	-3612
15-19		117927	0.0080	943
	2			<b>22858</b>
0-4		114102	0.1200	13692
5-9		113309	0.1360	15410
10-14		112880	-0.0720	-8127
15-19		117927	0.0160	1887
	3			<b>22862</b>
0-4		114102	0.0704	8033
5-9		113309	0.1968	22299
10-14		112880	-0.0848	-9572
15-19		117927	0.0176	2076
	4			<b>22835</b>

### **7.3. Number of elderly with chronic morbidities, disabilities and requirement of disability aids and assistance**

Keeping in view the recommendations made in the “National Policy on Older Persons” as well as the State’s obligation under the “Maintenance & Welfare of Parents & Senior Citizens Act 2007”, the Ministry of Health & Family Welfare launched the “National Program for the Health Care of Elderly” (NPHCE) during the year 2010, in the 11th Plan period, to address various health related problems of elderly people.

Among the ageing population, Non-communicable diseases (NCDs), including mental health, are the major disease burden. In India, with demographic transition and ageing of the population the burden of chronic diseases has been rising. In the context of Government programme for the elderly as well as in general for the preparedness of the society for taking care of the elderly, future scenario of the population needing medical help is essential. The entire projections for health care of elderly includes estimation of,

- 1) Elderly population by age and sex,
- 2) Number of elderly population having specific chronic morbidities and disabilities,
- 3) Outdoor and indoor patients services for management of chronic and disabling diseases,
- 4) Trained medical and para-medical professionals in geriatric medicine and
- 5) Equipments and medicines for special health care and 6) expenditure necessary for providing all the services.

The entire exercise for the projection of health care needs of the elderly is quite complex and requires a large number of parameters. In the absence of any data about most of the parameters, the following simple procedure is described. The procedure heavily draws on various estimates available from the a research project, Building a Knowledge Base on Population Ageing in India (BKPAI), Report on the Elderly in Select states of India by UNFPA carried out in 2011. However, whenever fresh estimates of the different parameters will be available from the future studies on elderly population, they may be used.

Considering the basic requirements of the elderly the estimates required are:

Number of elderly population aged 60 and above

1. suffering from specific chronic morbidities by age-group and sex
2. having full/partial locomotor disability
3. requiring disability aids
4. needing assistance in performing all the major activities of daily life

### 7.3.1. Number of elderly persons aged 60 and above suffering from specific morbidities.

Though there are number of chronic ailments, the six most common chronic ailments prevalent among the elderly are - arthritis, hypertension, cataract, diabetes, asthma and heart disease.

Following table gives the estimates of prevalence of these diseases among elderly by age-group and sex.

Prevalence of Selected Chronic Morbidities, 2011

Chronic Morbidity	Prevalence per 1,000 population					
	Total	Male	Female	Age-group		
				60-69	70-79	80+
Arthritis	293	243	338	263	322	393
Hypertension	210	178	239	194	239	232
Cataract	129	122	135	83	187	244
Diabetes	101	103	100	102	105	91
Asthma	77	89	67	66	86	123
Heart disease	58	65	52	53	70	58
Any of the six diseases	648	619	674	596	710	790

The projection of the number of persons with specific morbidity involves application of these prevalence rate to projected population; either total population or by sex or age-group. In the absence of any knowledge about the trend in the prevalence rate the method assumes the prevalence rates to be constant for the future years. The estimation procedure is shown below:

Chronic Morbidity	Prevalence per 1,000	Number of persons aged 60+ (in thousands) in year			Number of persons aged 60+ with specific chronic morbidity (in thousands) in year		
		2011	2021	2026	2011	2021	2026
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Arthritis	293	98,470	143,244	173,182	28,852	41,970	50,742
Hypertension	210	98,470	143,244	173,182	20,679	30,081	36,368
Cataract	129	98,470	143,244	173,182	12,703	18,478	22,340
Diabetes	101	98,470	143,244	173,182	9,945	14,468	17,491
Asthma	77	98,470	143,244	173,182	7,582	11,030	13,335
Heart disease	58	98,470	143,244	173,182	5,711	8,308	10,045
Any of the six diseases	648	98,470	143,244	173,182	63,809	92,822	112,222

Column 6 = Column 2 X Column 3/1,000

Column 7 = Column 2 X Column 4/1,000

Column 8 = Column 2 X Column 5/1,000

The same procedure may be applied with population by age-group and sex and prevalence rate by age and sex.

### 7.3.2. Number of elderly having full/partial locomotor disability

The most prevalent locomotor disability among the elderly population are, difficulty regarding vision, hearing, walking, chewing, speaking and memory. The table below shows the percentages of elderly with each of these disabilities:

Prevalence of selected locomotor disabilities (per 100)

Locomotor disability	Prevalence per 100 population					
	Total	Male	Female	Age-group		
				60-69	70-79	80+
Vision	59.0	57.3	60.6	52.7	66.9	75.5
Hearing	20.7	19.0	22.2	12.6	28.7	46.1
Walking	23.3	20.9	25.4	15.9	30.1	47.8
Chewing	28.2	27.0	29.3	20.1	37.0	52.2
Speaking	6.9	6.8	7.1	4.5	9.1	15.5
Memory	26.4	25.5	27.2	22.5	30.4	38.2

The projection of the number of persons having specific locomotor disability involves application of these prevalence rate to projected population; either total population or by sex or age-group. In the absence of any knowledge about the trend in the prevalence rate of these disabilities, the method assumes the prevalence rates to be constant for the future years. The estimation procedure is shown below:

Locomotor disability	Prevalence per 100	Number of persons aged 60+ (in thousands) in year			Number of persons aged 60+ with specific locomotor disability (in thousands) in year		
		2011	2021	2026	2011	2021	2026
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Vision	59.0	98,470	143,244	173,182	58,097	84,514	102,177
Hearing	20.7	98,470	143,244	173,182	20,383	29,652	35,849
Walking	23.3	98,470	143,244	173,182	22,944	33,376	40,351
Chewing	28.2	98,470	143,244	173,182	27,769	40,395	48,837
Speaking	6.9	98,470	143,244	173,182	6,794	9,884	11,950
Memory	26.4	98,470	143,244	173,182	25,996	37,816	45,720

Column 6 = Column 2 X Column 3/100  
 Column 7 = Column 2 X Column 4/100  
 Column 8 = Column 2 X Column 5/100

The same procedure may be applied with population by age-group and sex and prevalence rate by age and sex.

#### 7.3.4. Number of elderly aged 60+ requiring disability aids:

The persons with disability require disability aids, except for speaking and memory. Though, all the persons with locomotor disability require the aids, many may not use them depending on severity of the disability as well as affordability of these aids. Following table gives percentage of elderly persons using these disability aids. The most commonly used aids such are spectacles, hearing aids, walking sticks and dentures. The projections of these aids can be helpful even to the manufacturers of these aids.

Percentage of persons with disability using disability aids

Disability aids	Percentage of persons using disability aids					
	Total	Male	Female	Age-group		
				60-69	70-79	80+
Spectacles	53.3	57.2	50.0	54.7	51.1	52.9
Hearing aid	4.6	5.1	5.1	2.2	5.8	6.3
Walking stick	27.2	32.2	32.2	18.7	28.6	41.1
Dentures	11.2	10.0	10.0	12.7	11.2	7.9

Similar to earlier projections, the projection of the number of persons having specific locomotor disability using aids involves application of the percentage of persons using aids to the projected number of persons with locomotor disability; either total population or by sex or age-group. In the absence of any knowledge about the trend in the prevalence of use of these aids, the method assumes the prevalence rates to be constant for the future years. The estimation procedure is shown below:

Aids for Locomotor disability	Percentage using aids	Number of persons aged 60+ with specific locomotor disability (in thousands) in year			Number of persons aged 60+ with specific locomotor disability using aids (in thousands) in year		
		2011	2021	2026	2011	2021	2026
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Spectacles	53.3	58,097	84,514	102,177	30,966	45,046	54,461
Hearing aid	4.6	20,383	29,652	35,849	938	1,364	1,649
Walking stick	27.2	22,944	33,376	40,351	6,241	9,078	10,976
Dentures	11.2	27,769	40,395	48,837	3,110	4,524	5,470

Column 6 = Column 2 X Column 3/100

Column 7 = Column 2 X Column 4/100

Column 8 = Column 2 X Column 5/100

It may be noted that the projection of number of persons using disability aids requires, first estimation of persons with specific disability (as estimated in previous section) and then multiplication of these persons with disability by proportion using specific disability aids.

### 7.3.5. Number of persons needing assistance in performing all the major activities of daily life:

The 'activities of daily living' or ADLs are the basic tasks of everyday life, such as feeding, bathing, dressing, toileting, mobility (i.e., getting in and out of a bed or chair) and continence (controlling bladder and bowel movement). When people are unable to perform these activities, they need assistance either from others. The extent of familial support to those unable to execute the ADL functions gives an idea about how such informal arrangements can be expected to address the care needs. The percentage of elderly persons who require partial or full assistance to carry out six different types of ADL activities covering physical domains of functionality viz., bathing, dressing, toilet, mobility, continence and feeding are presented in following table.

Percentage of persons needing partial or full assistance in carrying out six ADL activities					
Total	Male	Female	Age-group		
			60-69	60-69	60-69
1.1	0.7	1.4	0.4	1.1	4.5

The table shows that 1.1 per 100 persons will need assistance for carrying out activities of daily life, like bathing, dressing, toilet, mobility, continence and feeding. With the projected total population of 98,470, 143,244, and 173,182 (in thousand) in years 2011, 2021 and 2026, the number of persons requiring assistance for ADL will be 1.1 percent of each population total or 1,083,000, 1,576,000 and 1,905,000 respectively.

# CHAPTER 8

## HEALTH STATISTICS FOR MONITORING AND EVALUATION OF HEALTH PROGRAMMES –

### Overview:

The Chapter explains basic concepts and definitions of monitoring and evaluation of health programmes. It also discusses logical frame-work approach; results based management and monitoring indicators of development programmes. The Chapter also includes the illustrations which specify monitoring and evaluation of some specific health programmes in India.

### 8. Introduction

Development policies and programme are meant to bring about positive changes on the lives of people and is guided by ‘Theory of Change’. Keeping the goals and objectives in mind, various interventions are designed and implemented over a period of time and it is essential to measure the changes brought about by the programme interventions. In this context, the concept of monitoring and evaluation becomes the core stone of any development programme. It helps in measuring the results of the project and provides answers to overall achievements of the programme.

The theory of change is a description of how an intervention is supposed to deliver the desired results by describing the causal logical pathways by which any programme will reach its intended outcomes and impact. Theories of change depict a sequence of events leading to outcomes and it explores the conditions and assumptions needed for the change to take place. This concept is important in those programs that seek to influence behaviour changes and it is best to develop a theory of change for a program at the beginning of its design processes. It is based on stakeholders consultation and reviewing the literature that accounts for experiences with similar programmes elsewhere, which may help verifying the contexts and assumptions behind the causal relationship in the theory of change. Further, it help specifying research questions and given the cause-and-effect relationship which is the first step in designing the monitoring and evaluation framework of the programme. Thus, monitoring and evaluations is central to the

theory of change.

The Monitoring and Evaluation (M&E) System is an integral part of program development and implementation processes. It plays multiple functions that include measurement of performance on a regular basis at stipulated time intervals, identification of mid-course corrective actions needed to achieve program objectives, assist in judicious allocation of resources and support advocacy for the benefit of other partners and organizations working in the area, . Monitoring and evaluation help program implementers to determine the extent to which the program/project is on track

- ◆ Help in strategic planning
- ◆ Make informed decisions regarding operations, management and service delivery
- ◆ Enable judicious allocation of resources and ensure its effective and efficient use
- ◆ Evaluate the extent to which the program/project is having or has had the desired impact Use the findings for advocacy at a broader level.

The M&E system should be designed at the program/project development stage and not later during the project implementation phase. This enables the project implementers to develop appropriate work-plans with a time-line and responsibilities, identify key indicators that have to be monitored/evaluated and decide on the frequency for undertaking monitoring activities and conducting evaluation studies. Synergy between program management and M&E activities of a program/project right from its formulation stage will result in better planning and implementation.

The terms ‘monitoring’ and ‘evaluation’ are often used interchangeably; however, they are conducted for different purposes. They are two distinct sets of activities, related to each other but are not identical. The common element between them is that they provide us with insights into project / programme implementation, by focusing on the following:

- Efficiency
- Effectiveness
- Impact.

**Efficiency** indicates that the input into the project work is appropriate in terms of the output. The input could be in terms of money, time, staff, equipment and so on. When projects is concerned about taking the activities to a scale or replicate it in other settings, it is very important to assess the efficiency of the interventions.

**Effectiveness** is the measure of achievement of specific objectives by the development programs or projects. If, for example, we aim to improve the qualifications of all the high school teachers in a particular area, the effectiveness will answer the query, did we succeed in improving the qualifications of the high school teachers?

**Impact** tells us whether the problem for which a program or project was implemented, made a difference. In other words, it answers whether the project strategies were useful in achieving the intended impact. In the above example, we may assess, whether ensuring that teachers were better qualified improved the pass rate in the final year of high school examination. It is important to assess the impact before we decide to take the project on to a bigger scale or replicate it elsewhere.

This brief note provides an overview of the basic concepts and definition of monitoring and evaluation and describes various components of the M&E system, including indicators, its hierarchy, conceptualization, logical framework analysis, results based management and modes of data collection.

## **8.1. Basic Concepts and Definitions**

### **8.1.1 Monitoring**

**Monitoring is concerned with progress.** It aims to ensure that the program is functioning as planned. Through regular monitoring, we can judge whether the program is on the right path to achieve its stipulated objectives. Monitoring is, therefore, *routine* tracking of the key elements of program/project performance, and it usually assesses the inputs and outputs of project activities. This is achieved through a variety of information collection systems including record-keeping, regular reporting, surveillance systems, facility observation and client surveys etc. Management

Information System (MIS) is part of the monitoring system and is basically an internal activity of the project/programme. Hence, it should be conducted by those responsible for project implementation at every level of the management hierarchy. It should be carried out regularly or at pre-specified intervals. Its primary purpose is to achieve the best possible program performance on a regular basis and provide feedback to program management at all levels. This enables the management to improve operational plans and take corrective action in the case of shortfalls and constraints during the implementation phase. The task of monitoring is to track changes that occur over time in inputs, processes and outputs by means of pre-defined indicators which can be computed through regular record-keeping and reporting systems. Following are the examples of various levels of monitoring indicators to track performances:

- ❖ **Inputs:** Refers to the resources invested in a program and includes financial, technological and human resources.
- ❖ **Process:** Refers to activities carried out to achieve the program objectives, show what is done and how well it is done.
- ❖ **Output:** Refers to the results of activities achieved at the program level, and is known as deliverables of the program.

These changes are analyzed against a framework, work-plans, time-schedules and budgets to assess the progress of the project/program activities at regular intervals.

Normally, monitoring and supervision are used synonymously. In practice, supervisory and monitoring activities do overlap but there is a thin line distinguishing the two. For instance, the direct supervisor carries out daily supervision of *inputs* and *operational processes* and reports to the manager. Monitoring on the other hand, aims to assess the *overall implementation at different levels and focuses not only on the inputs and processes but also on the project outputs*. The principle of monitoring project activities includes defining key indicators, minimum data collection load, simple and usable reporting formats and timely feedback. Thus, monitoring is a systematic process of tracking the progress of project activities on a regular basis while, supervision becomes one of the tools and components of monitoring activities.

## Monitoring involves

- Establishing key indicators to judge progress of the project activities
- Setting up systems to collect information relating to these key indicators
- Collecting and recording information as and when the project activities take place
- Analyzing the information to derive key indicators and tracking progress
- Using the information to inform day-to-day management decisions
- Providing feedback about the bottlenecks and direction to improve project implementation.

### 8.1.2. Evaluation:

**Evaluation aims to assess program performance.** It allows us to look at the results of the programme efforts, ongoing work, and makes sure that they are effective and correspond to targets and goals. Thus, evaluation is the *episodic* assessment of the changes in targeted results that can be attributed to the program/project/intervention. Evaluation attempts to *link* a particular output or outcome directly to an intervention after a period of time.

Evaluation is the application of research procedures to assess (inputs, process, outputs, and outcome/impact) and provides learning to improve ways in which policies and programs are conducted, from the earliest stages of defining and designing programs through their development and implementation (Rossi, et.al. 1993)<sup>1</sup>. Thus, evaluation adopts appropriate research methodology to find out changes in the outcome and impact level indicators which the program had aimed to achieve in terms of pre-determined targets or goals.

## Evaluation involves

- Looking at what the project or program intended to achieve – What difference did it make? What impact did it have? What was its progress towards what it wanted to achieve.
- Looking at the strategy of the project/program - Did it have a strategy? Was it effective in following its strategy? Did the strategy work? If not, why?

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<sup>1</sup> Rossi, P.H. et.al. (1993). *Evaluation: A Systematic Approach*, Sage Publications, London.

- Looking at how the project functioned - Was there an efficient use of resources? What were the opportunity costs? How sustainable is the way in which the project or program works? What are the implications for the various stakeholders?

The evaluation is defined as a collection of activities designed to determine the value or worth of a specific program and linking a particular output or outcome directly to a particular intervention. Three sequential levels or phases of evaluation are process, output and impact evaluations as described below.

**Process Evaluation:** Process evaluation aims to assess the various processes adopted in the project and examines the extent to which these processes are implemented as proposed. Further, the process evaluation provides insights into whether the intervention has reached the target audience. This gives an idea of whether it is worth undertaking the next level of effect evaluation. Some of the examples of process evaluation include documenting the process of implementation against the work-plan, extent of adherence to the work-plan, timely execution of inputs, training of human resources as planned, and whether all the inputs related to achievement of the outcome indicators have been put in place.

**Output Evaluation:** Once findings from the process evaluation are deemed adequate, then the program's short-term effects or outputs can be evaluated. With reproductive health interventions, immediate effects often relate to behaviour changes and underlying changes in knowledge, attitude and beliefs as well as coverage results. For example, increased knowledge, higher contraceptive prevalence, higher ANC coverage, increased number of deliveries in institutions, deliveries by trained skilled birth attendants etc., may be examined under output evaluation process.

**Outcome Evaluation:** Outcome evaluation aims to assess the long term effects of a program against its ultimate purpose. Once adequate evidence is available that the program is on track and related activities have been implemented, then **impact** evaluations are undertaken which is a higher level of indicator in hierarchy. Impact evaluation per se is rarely done, mainly because it takes a longer time to judge the effect of any program on the impact level indicators, and it is expensive and complex. Impact evaluation cannot always be easily distinguished from effect (outcome) evaluation, but the following examples should help to clarify the distinction.

Examples: In many family planning assessments, contraceptive use is often taken as a measure of outcome, but a reduction in unwanted or unintended pregnancies might be taken as an appropriate measure of outcome (proxy); in safe motherhood projects, the percentage of births attended by skilled birth attendants (SBAs) is a key measure of output, but the outcome should be defined in terms of reduction of proportion of complicated pregnancies and the impact will be reduction in maternal mortality (which is an impact level indicator).

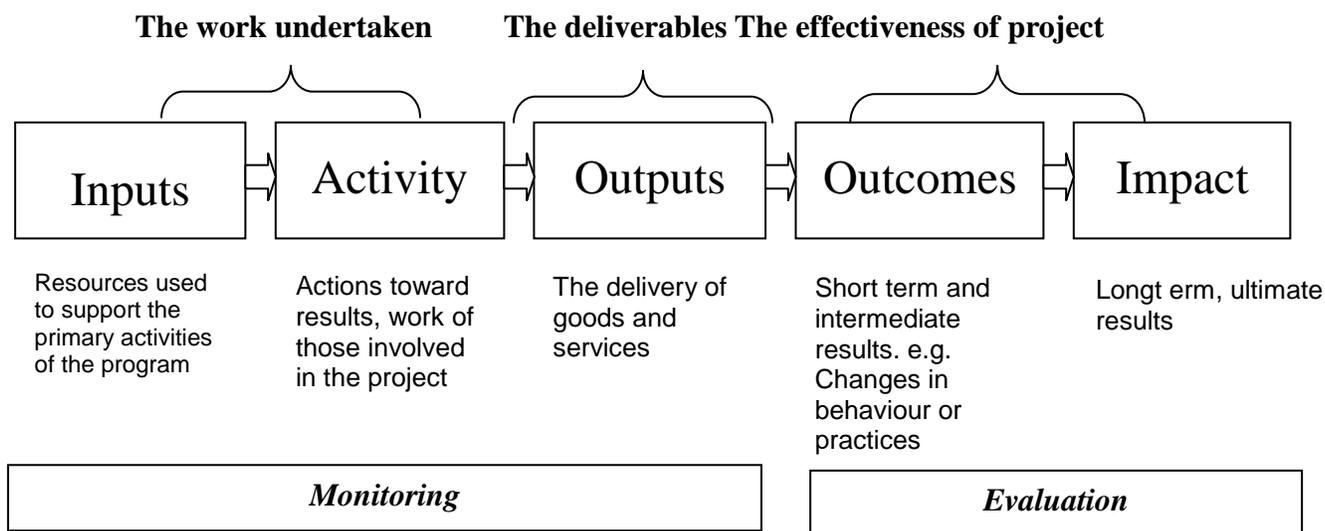
As described earlier, evaluation exercise applies sophisticated research methodology to estimate and then relate the outcome and impact with the project interventions. It tries to single out whether the change occurred is actually the result of interventions, whether it has happened due to chance or due to the influence of any other factors beyond the project interventions. For this purpose, there are various **evaluation designs** that are usually employed under the guidance of evaluation specialists.

Since evaluation designs are complex in nature, and an evaluation involves many steps such as selecting an unbiased sample and randomization of the cases, it is advised to hire evaluation specialists or a specialized agency to guide the entire process of selecting the best suited design and getting it executed.

The sequencing of monitoring and evaluation on hierarchy of the indicators are shown below-

### Sequencing of monitoring and evaluation on hierarchy of the indicators

#### Set a Goal



## 8.2. Indicators

Indicators are measurable or tangible signs that something has been done or that something has been achieved. It is a ‘marker of performance’ and can be used to track progress in the performance. It is usually helpful to classify indicators into broad categories and then select one or two from each category so that key elements of the project activities can be monitored or evaluated and overlap can be avoided. The broad categories include inputs (resources needed to carry out the program); outputs (the goods produced by the program); outcome (the knowledge, attitude, and behavioural changes that result, including coverage) and impacts (changes in health, fertility or mortality status due to the project outcomes).

The example of an indicator of community empowerment might be “increased frequency of community members speaking at community meetings”. If one were interested in the gender impact of drilling a well in a village, then one could use “increased time for involvement in development projects available to women” as an indicator. Common indicators for overall health in a community are infant /child mortality rate, maternal mortality ratio, birth rate, and nutritional status.

Indicators are an essential part of a monitoring and evaluation system because they are what we measure and/or monitor. Through the indicators we can ask and answer questions such as:

- Who?
- How many?
- How often?
- How much?

Indicators used in monitoring and evaluation can be classified as

- Quantitative or
- Qualitative.

**8.2.1. Quantitative** indicators are numeric. These tell us “how much or how many”. For example, how many people attended a workshop, how many people passed their final examination, how much a publication cost, how many people were infected with HIV, how far people have to walk to get water and firewood and so on. Quantitative measurement can be expressed in absolute numbers (3 out of 241 women in the sample are infected) or as a percentage (50% of households in the area have television sets) or as an average (mean number of ANC visits, mean waiting time for a patient, or median expenditure on treatment). It can also

be expressed as a ratio (one doctor for every 30,000 population). One way or another, we get quantitative (number) information by counting or measuring.

A robust quantitative indicator must be SMART as mentioned below

<b>S</b>	Specific	Must represent the specific desired measurement
<b>M</b>	Measurable	The phenomenon could be measured
<b>A</b>	Achievable	Measure that is achievable given the conditions, resources, time period and staff ability
<b>R</b>	Relevant	It should be relevant to the intervention output/outcome/impact
<b>T</b>	Time bound	Must represent the achievement of results within a certain period of time

**8.2.3. Qualitative** indicators are non-numeric. These tell us how people feel about a situation or about how things are done or how people behave. For example, one may discover that 50% of the teachers in a school are unhappy about the assessment criteria used, this is still qualitative information, not quantitative information. We get qualitative information by asking, observing and interpreting.

Some experts find quantitative information valid – it seems solid and reliable and “objective”. They find qualitative information unconvincing and “subjective”. However, it is not true to say that “only quantitative information speaks for itself”. It requires just as much interpretation in order to make it meaningful as does qualitative information. It may be a “fact” that enrollment of girls at schools in some areas is dropping – counting of number of females enrolled can indicate that, but it does not inform about the reasons as to why this drop is taking place. In order to explore the reasons of such drop-outs, one needs to investigate through qualitative information. Thus, these two types of indicators often supplement and complement each other.

The monitoring and evaluation process requires a combination of quantitative and qualitative information in order to be comprehensive. For example, we need to know what the school enrolment figures for girls are, as well as why parents do send or do not send their children to school.

### **8.3. Logical Framework Approach**

The Logical Framework Approach (LFA) is a management tool mainly used in the design, monitoring and evaluation of development projects. The LFA is an analytical process involving a structured sequence of steps using a set of simple tools and principles. It is designed to guide effective, efficient and consistent planning and implementation of development activities. The LFA is designed to strengthen participatory processes and ensure that decision-makers have all the information that they need for appraisal..

The LFA can help planners and managers to

- Analyze activity preparation
- Establish a logical hierarchy of means by which objectives can be achieved
- Identify the potential risks to achieving the objectives and sustainable outcomes
- Establish how outputs and outcomes might best be monitored and evaluated.

#### **8.3.1. The Logical Framework Matrix (LFM)**

One standard analytical product of the LFA is the Logical Framework Matrix (LFM). It consists of a matrix with four columns and a number of rows, which summarises selected aspects of an activity design, namely

- what the activity will do, and what it will produce (Activity Description)
- the activity's hierarchy of objectives and planned results (also Activity Description)
- the key assumptions that are being made (Assumptions)
- how the activity's achievements will be measured, monitored and evaluated (Indicators and Means of Verification).

The general structure of a Log-frame Matrix is shown below

<b>Activity Description</b>	<b>Indicators</b>	<b>Means of Verification</b>	<b>Assumptions</b>
<b>Goal or Impact</b> – <i>The long term development impact (policy goal) that the activity contributes at a national or sub-national level</i>	<i>How the achievement will be measured – including appropriate targets (quantity, quality and time)</i>	<i>Sources of information on the goal, purpose, objectives and outputs indicator(s) – including who will collect it and how often</i>	<i>Assumptions concerning the Purpose to goal linkage, similarly objective to output linkages etc.</i>
<b>Purpose or Outcome</b> – <i>The medium term result(s) that the activity aims to achieve – in terms of benefits to target groups</i>			
<b>Component Objectives or Intermediate Results</b> – <i>This level in the objectives or results hierarchy can be used to provide a clear link between outputs and outcomes (particularly for larger multi-component activities)</i>			
<b>Outputs</b> – <i>The tangible products or services that the activity will deliver</i>			

A brief description of key LFA terms is given below.

**Goal/Impact** refers to the national or regional objectives which the activity is designed to contribute to, for example, increased income, improved nutritional status. The goal helps set the macro-level context within which the activity fits, and describes the long term impact that the activity is expected to contribute towards.

**Purpose/Outcome** refers to what the activity itself is expected to achieve in terms of sustainable development results, if the relevant assumptions of the activity design are correct. It is the positive developmental change which the activity would produce if it were successful (and the assumptions were accurate).

**Component Objectives/Intermediate Results:** Where the activity is relatively large and has a number of components (output/work program areas), it can be useful to give each component an

objective statement. These statements should help provide a logical link between the outputs of that component and the overall purpose/outcome.

**Outputs** refer to the tangible products (goods and services) produced by undertaking a series of tasks as part of the planned activity. For example, irrigation systems or water supplies constructed, children immunized and staff effectively trained. The delivery of outputs should be largely under the activity management's control.

**Work program** refers to the specific tasks to be undertaken as part of the planned delivery of the activity to achieve the required output. Examples for a new community water supply might include: establishing a water users' committee and maintenance procedures, site preparation, collection of local material, tank construction and pipe laying, digging soak pits, and commissioning. However, the Log-frame matrix should not include too much detail on the work program, or it will become too lengthy and potentially prescriptive. If detailed specification is required, this should be presented separately in a work schedule and not in the matrix itself.

**Inputs** refer to the resources required to undertake the work program and produce the outputs, for example, personnel, equipment and materials. However, inputs should not be included in the matrix format.

**Assumptions:** Assumptions refer to assumptions made about conditions which could affect the progress or success of the activity, but over which activity managers may have no direct control, for instance, price changes, rainfall, land reform policies, non-enforcement of supporting legislation, natural calamities. An assumption is a positive statement of a condition that must be met in order to achieve objectives. A risk is a negative statement of what might prevent objectives from being achieved.

**Indicators:** Indicators measure the progress or lack of progress towards meeting stated objectives. An indicator should provide, where possible, a clearly defined unit of measurement and a target detailing the quantity, quality and timing of expected results. In other words it should be SMART, as explained above.

**Means of verification:** Means of verification should clearly specify the expected source of the information /indicator we need to collect. We need to consider how the information will be collected (method), who will be responsible, and the frequency at which the information should be provided.

## **Developing a Hierarchy of Events - An Illustration of Indicators**

**Goal: Decline in Infant and Child Mortality**

**Outcome:** Reduced infant and child deaths due to diarrhea (**diarrhea?**)

*Indicator: Percent of infants and children died due to diarrhea*

**Output:** Reduced incidence of diarrhea

Increased use of ORS in the community by training Community Health Workers

Increased knowledge and awareness of community members

*Indicator: Percent of infants and children given ORS during diarrhea*

**Process:** CHWs trained (Access and Availability)

*Indicator: Number of ORS depots established*

*Number of ORS depots that sold at least the specified number of packets of ORS*

*Number of IEC campaigns on the use of ORS*

*Number of health functionaries trained on the use of ORS*

*Number of health functionaries trained on the treatment of diarrhea among children*

### **Input**

*Indicators: Training of trainers conducted*

*Number of CHWs and project staff trained*

*Procurement of ORS done and distributed to health facilities and CHWs*

*Relevant IEC material developed*

Results Based Management is a strategy or approach by which an organization ensures that its processes, products and services contribute to the achievement of clearly stated results. Results based management provides a coherent framework for strategic planning and management by improving learning and accountability. It is also a broad management strategy aimed at achieving important changes in the way institutions operate, with improving performance and achieving results as the central orientation, by defining realistic expected results, monitoring and evaluating progress towards the achievement of expected results, integrating lessons learned into management decisions and reporting on performance.

Many of us are used to a management approach that focuses on inputs and processes. RBM requires a slightly different approach,. It asks us to focus on:

- Analyzing the problems to be addressed and determining their causes and effects
- Identifying measurable or describable changes (results) to be achieved, based on appropriate problem analyses
- Designing strategies and activities that will lead to these changes (results)
- Balancing expected results with the resources available
- Monitoring progress regularly and adjusting the activities as needed to ensure that the desired results are achieved
- Evaluating, documenting and incorporating lessons learned into decision making and into the next phase of planning
- Reporting on the results achieved and their contribution towards reaching UNFPA's organizational goals.

#### 8.4.1. What is Result?

A result is a describable or measurable change in a state that is derived from a cause and effect relationship. This means that a result is a change that can be observed, described and measured in some way, and for which the cause can be identified.

**Two important things to remember**

RESULT = CHANGE

CAUSE → EFFECT

Results should be defined on the basis of problem analysis. Problem analysis is the cornerstone for good planning and forms the basis for designing interventions that lead to results. Problem analysis establishes cause and effect relations between negative aspects of an existing situation. These cause-effect relations when analyzed are usually presented in a logical and hierarchal manner (that is, showing effects of the central problem(s) on top and the causes below)

commonly known as a problem tree. It is critical that the changes that are to be brought about in the results are clearly linked to the problems that are to be addressed.

Results may

- appear within a short time or take years to be fully realized
- be planned or unforeseen
- be either positive or negative
- be reflected at the level of individuals, groups, institutions or society.

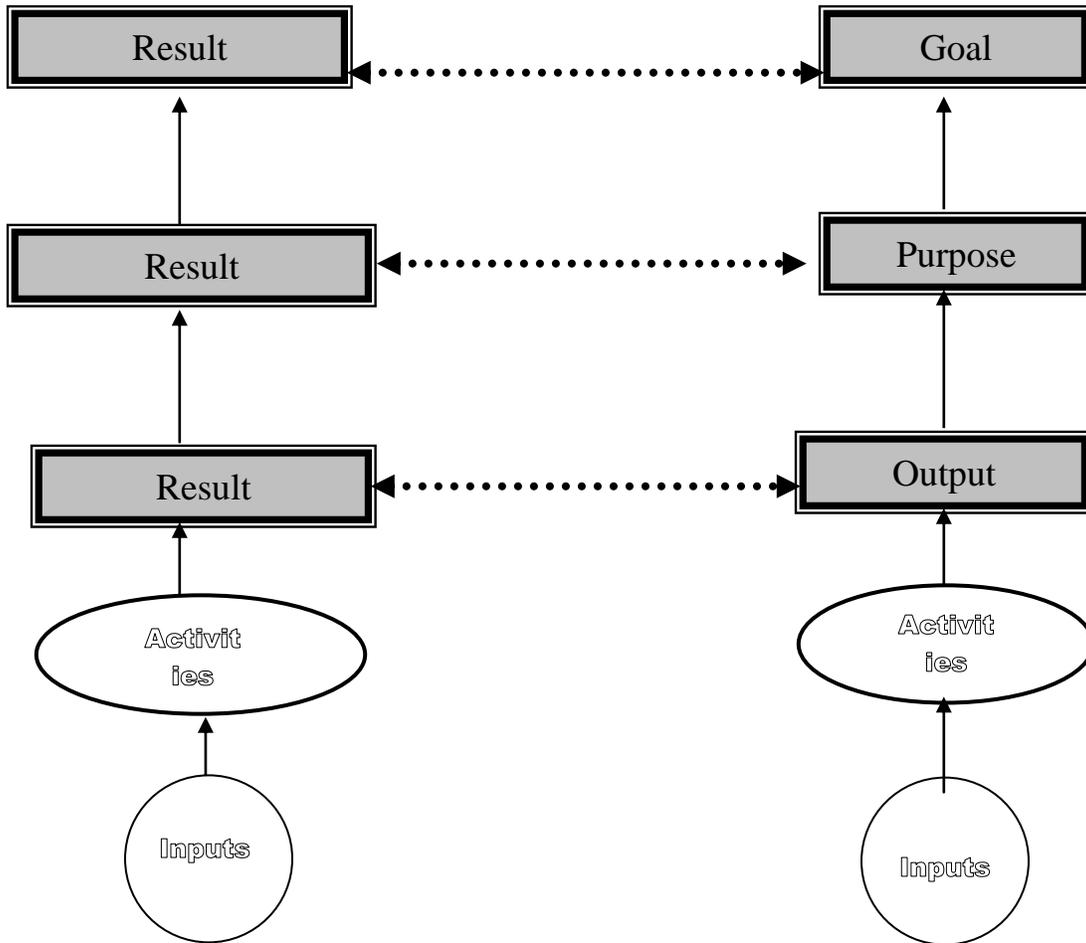
A statement of results should illustrate the type of change that may be expected to occur because of a specific intervention. It should be:

- (1) As specific as possible
- (2) Realistic in relation to the time and resources available
- (3) Describable or measurable in some way.

#### **8.4.2. Levels of Results:**

It describes that Goals, Purposes and Outputs (as defined in the logical framework matrix) are the levels of results under the RBM approach.

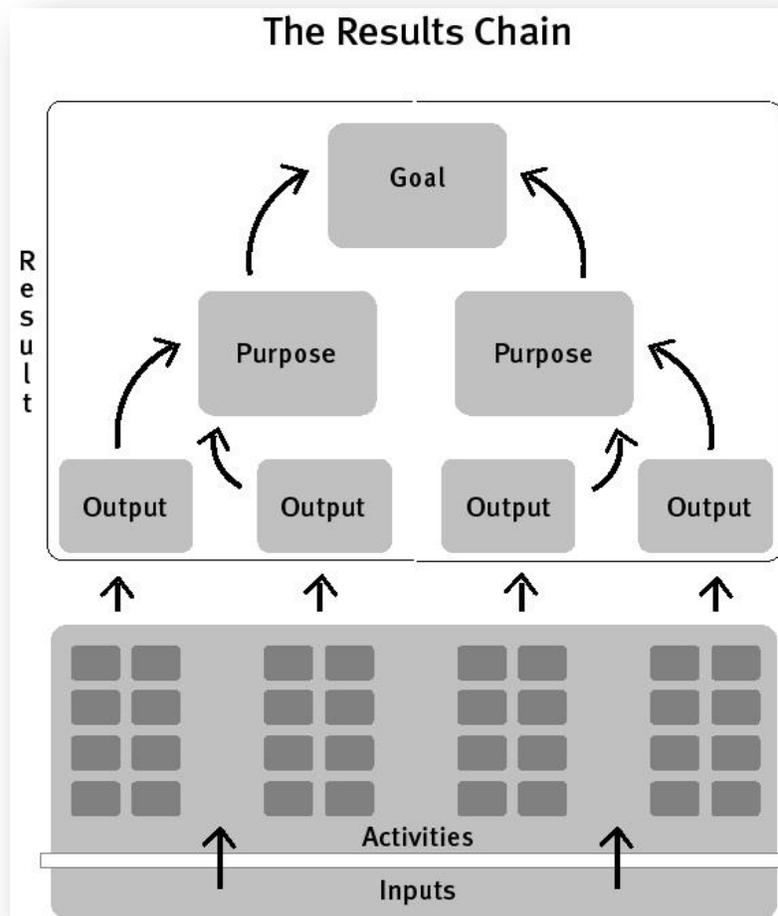
### RBM Logical Framework



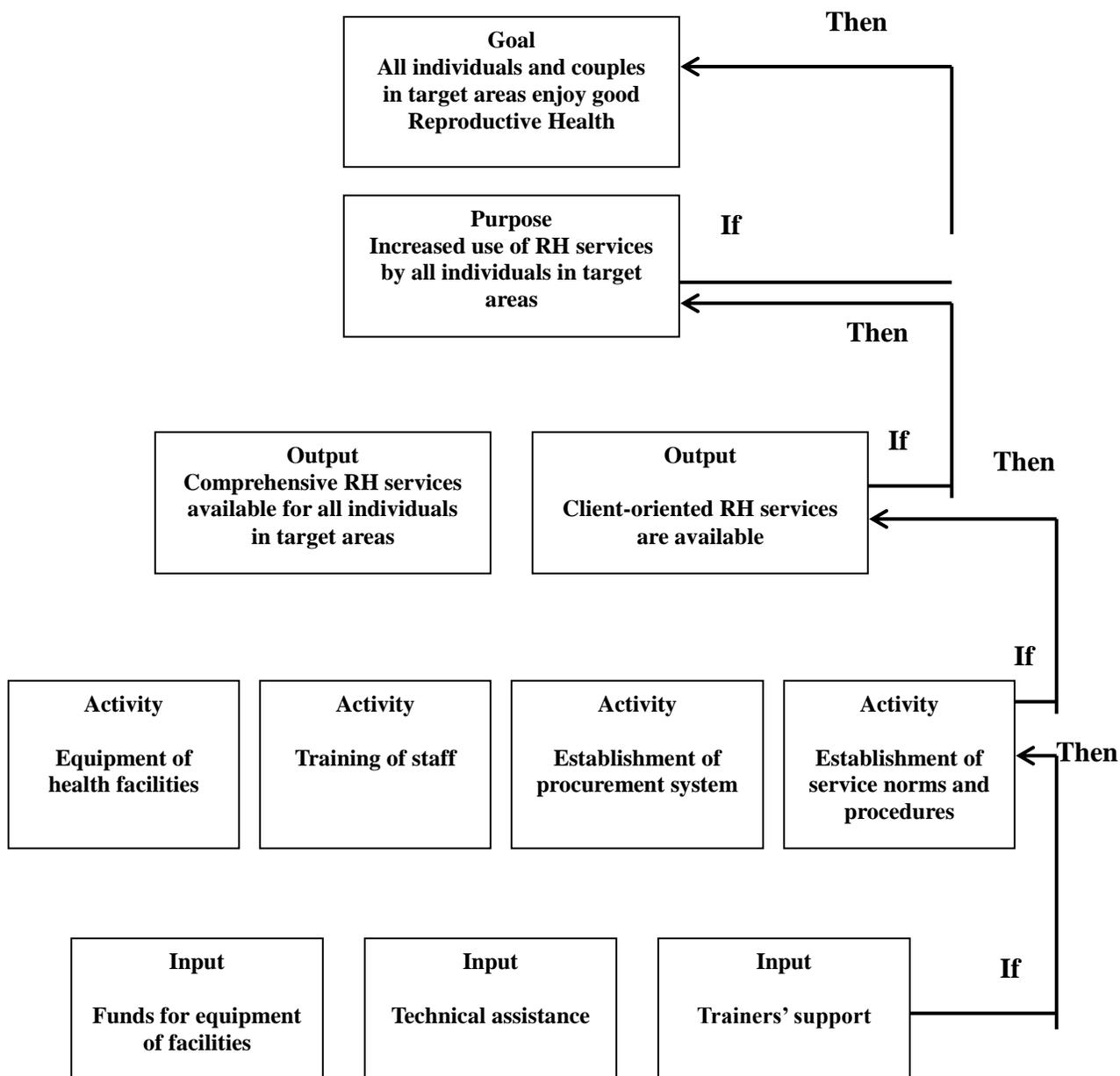
#### **8.4.3. Results Chain**

A theory of change can be modeled in various ways. The results chain is the simplest and clearest model to outline the theory of change in the operational context of development programmes. The Results Chain shows the logical links between activities and the results that may be expected to occur over a period of time, based on a theory of change that assumptions are valid and risks do not materialize. This cause and effect relationship is a central element of Results-Based Management.

The Results Chain is linked with the hierarchy of problems (that is, a problem tree) and is developed from there. The illustration below demonstrates the cause and effect relationship between activities and results. As can be seen in the illustration, the results chain is similar to the vertical logic of the logical framework matrix.



**Example of Result Chain for Reproductive Health (RH)\***



*\* This results chain is meant to be illustrative and shows only part of a bigger picture of interventions and results in the RH area of a program.*

**8.5. Methods of collecting Data**

The data for monitoring and evaluation can be collected in many ways. These methods could be broadly grouped into two categories:

**1. Primary Sources of Data Collection:** The data or information which is collected directly by the project personnel or any external agency is termed primary data. In this category, the users of the data are the same as those who have collected first hand information from the field. Primary sources of data are collected through –

- Surveys – interviewing the respondents using questionnaire mode
- Focus group discussion
- Case studies
- In-depth interviews
- Observations.

**2. Secondary Sources of Data Collection:** Secondary sources of data are those which are generated by someone and used by many others. The data and reports published by researchers, if analyzed by those who have not directly collected the information, are termed secondary data. Examples are use of research findings or indicators already published by the survey organization. Secondary data are collected through

- Government records
- Service statistics of programs
- Census Published reports.

### **8.6. Monitoring Of Development Programmes At Sub – National Level – An Illustration**

The Government of India is implementing various programmes to improve the overall health and educational status of the population and reduce levels of poverty especially among vulnerable population. These are termed as National Flagship Programmes. The philosophy of programmes has been inclusion and social justice, meaning that the benefits are reached to most vulnerable segments of the population and those who are marginalized and belonging to low strata of the society. Therefore, it becomes utmost important to track the progress of the national flagship programmes and state sponsored schemes and assess whether these are reaching those which are intended to be receiving the benefits from the programmes or the schemes.

Each of the flagship programmes of the Government of India has its own management information system (MIS). For example, the National Rural Health Mission has Health

Management Information System (HMIS), the Sarva Shiksha Abhiyan monitors its programme through the District Information System for Education (DISE) and the Rajiv Gandhi Drinking Water Mission has its Integrated Management Information System (IMIS). In almost all of these cases, the use of latest information technology has been applied for the compilation of information and for its dissemination.

However, the MIS restricts itself to collect data mainly from those who have received the benefits (numerator) from a given area or from a population group. Generally, it is seen that the programme MIS provides data on the number of beneficiaries in a given time period, but it does not provide information on the actual or potential number of beneficiaries (denominators) who should be provided the services from a given area or a population group. The purpose of MIS of any programme is not to derive higher level indicators, but in many cases some of the relevant indicators can be generated to understand the reach and direction of the programme. For deriving such indicators, there is a need to get an idea of proper denominators for local level. Though, the MIS systems of most of the programmes are able to track numerators properly and efficiently, it is important to relate these numerators with the robust estimate of the denominators to judge the exact direction and reach of the programmes benefits. Thus it becomes important to adopt a holistic approach of tracking the programme performance in terms of the inputs provided and output produced by the programme along with the coverage of the population under each of the programmes.

To estimate and track the reach of the programmes it is absolutely essential first, to get an idea about the total number of beneficiaries, population or segment of population which needs to get the benefits from the programme. Since the populations of sub-national geographic areas are available through Census, which is available only at an interval of 10 years, the office of the Registrar General of India has provided population projections. Again, these projected population figures are available at the state level and not below state (district) level.

Recently, the UNFPA has published district level population projections for the year 2006, 2011 and 2016 for eight states and the figures are available by age and sex. For population below 14 years of age, single year population projections are also available for use particularly for educational planning. Such sources of information could be used to estimate appropriate denominators for monitoring various sectoral programmes.

The following section illustrates examples of monitoring of health, education, poverty alleviation and water and sanitation programmes and focuses on tracing progress at the district levels.

### **8.6.1. Health Sector**

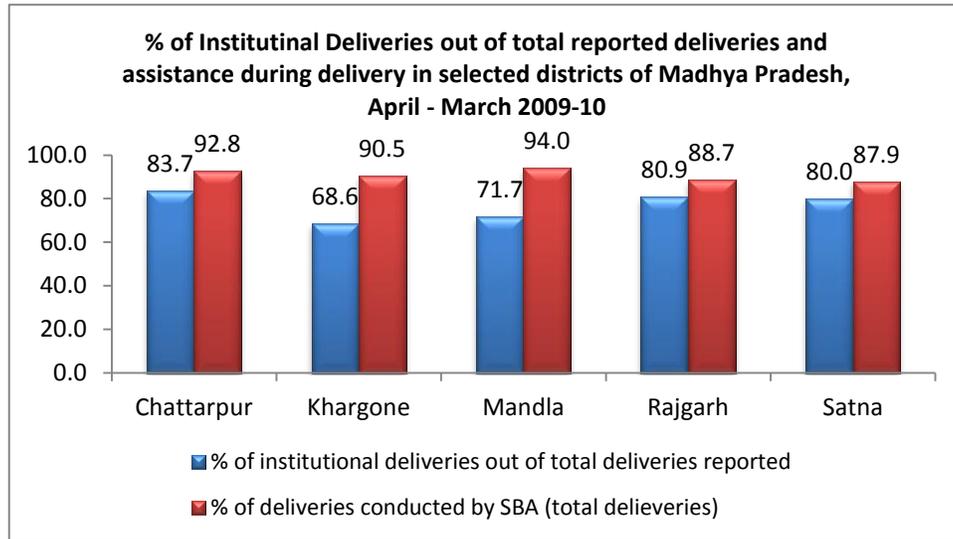
The RCH II programme and the later umbrella programme of Health department, namely the National Rural Health Mission (NRHM), has rolled out its monitoring system which is known as the Health Management Information System (HMIS). The Health Management Information System (HMIS) under NRHM captures data on various relevant aspects with the aim of tracking progress of the programme over a period of time and providing timely feedback to ensure corrective measures to improve programme implementation. The information is collected and compiled by the service providers at different levels which cover various aspects including service delivery, quality of these services, availability of the staff and human resource development, logistics and infrastructure status. As such, by design, the HMIS mainly provides information in absolute numbers. In order to convert these numbers into meaningful indicators reflecting the performance status of the programme and tracking progress over a period of time, an analytical framework of critical indicators from HMIS needs to be developed

As an illustration, some of the crucial indicators in health sector given below:

#### **1. Percentage of Institutional Deliveries**

From the HMIS data, it is possible to track percentage of the deliveries conducted in an institution out of the total number of reported deliveries. As can be seen from Chart 1, more than 80 percent of the reported deliveries were institutional in three districts of MP (Chattarpur, Rajgarh and Satna) while in the other two districts, the coverage was 69 – 72 percent.

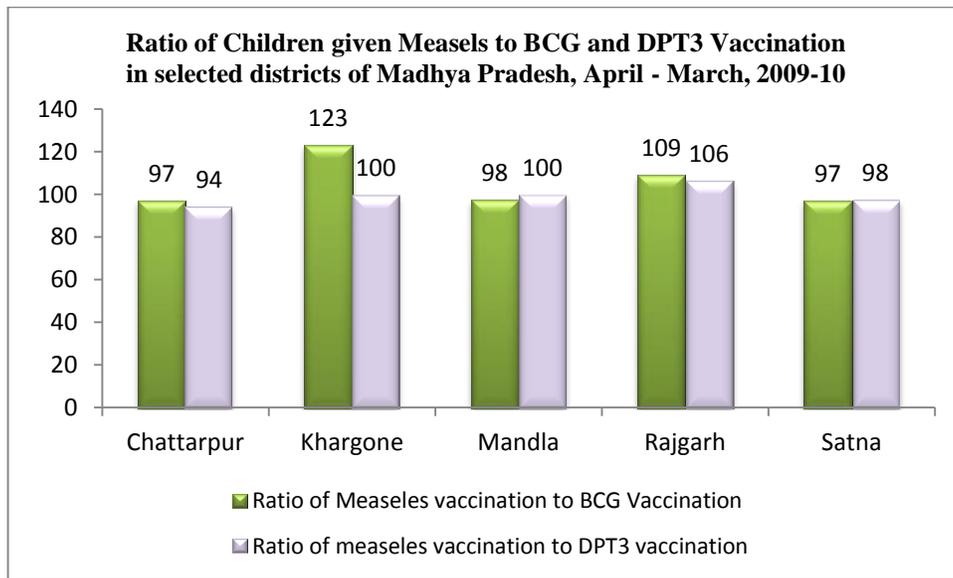
**Chart 1**



## 2. Ratio of Children given measles to BCG and DPT3 vaccination

In the area of child health, one can analyze ratio of children who were given BCG to measles doses and similarly the ratio of children given DPT3 to BCG vaccination. One would expect around the similar number of children in a population provided with these childhood vaccinations during a year and in case of discrepancies in the ratio, drop out of children could be traced. Chart 2 brings out the finding for selected districts of Madhya Pradesh for the year 2009-10. The findings suggest that in the districts of Khargone and Rajgarh, more number of children were given measles than BCG which indicates possible left out of children for BCG during the entire year.

**Chart 2**



The information for monitoring infrastructure can also be used from the HMIS system, that are listed below –

### **Process indicators**

1. Total Number of PHCs functioning on 24x7 basis
2. Number of District Hospitals working as FRUs
3. Number of Sub Divisional Hospitals working as FRUs
4. Number of CHCs and others working as FRUs

With the above information we can convert the information into indicators as below –

- % of PHCs functioning on 24x7 basis (numerator comes from HMIS and denominator comes from the government records of total number of PHCs in a district or in a state)

We can also compute indicators in another way which is to measure the number of institutions against the population norms prescribed by the Government of India. For example, we can compute the following indicators –

- % of population covered by the CHCs functioning as FRU in the state / district

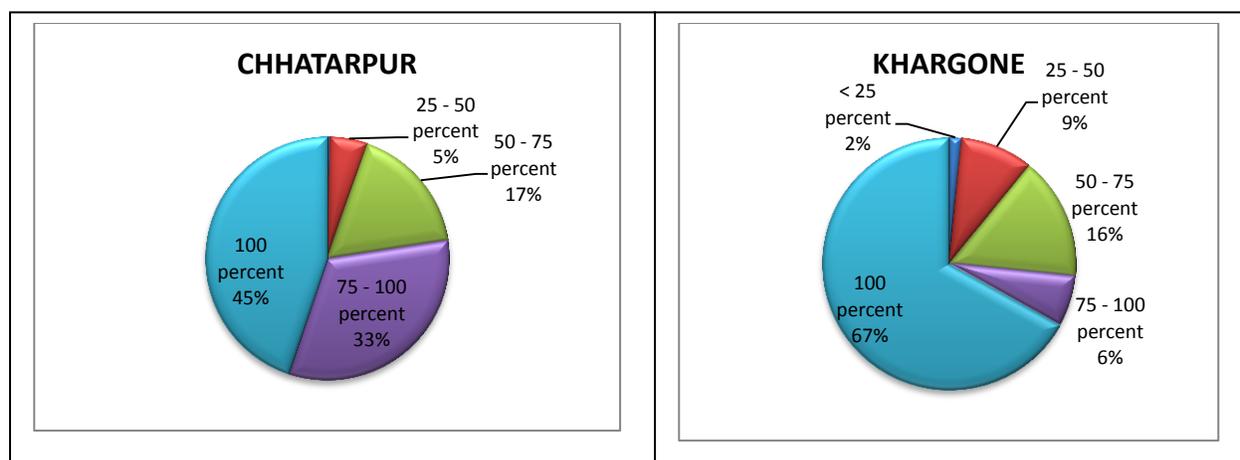
(Numerator comes from the HMIS for a district and denominator is the total rural population of the district multiplied by 100)

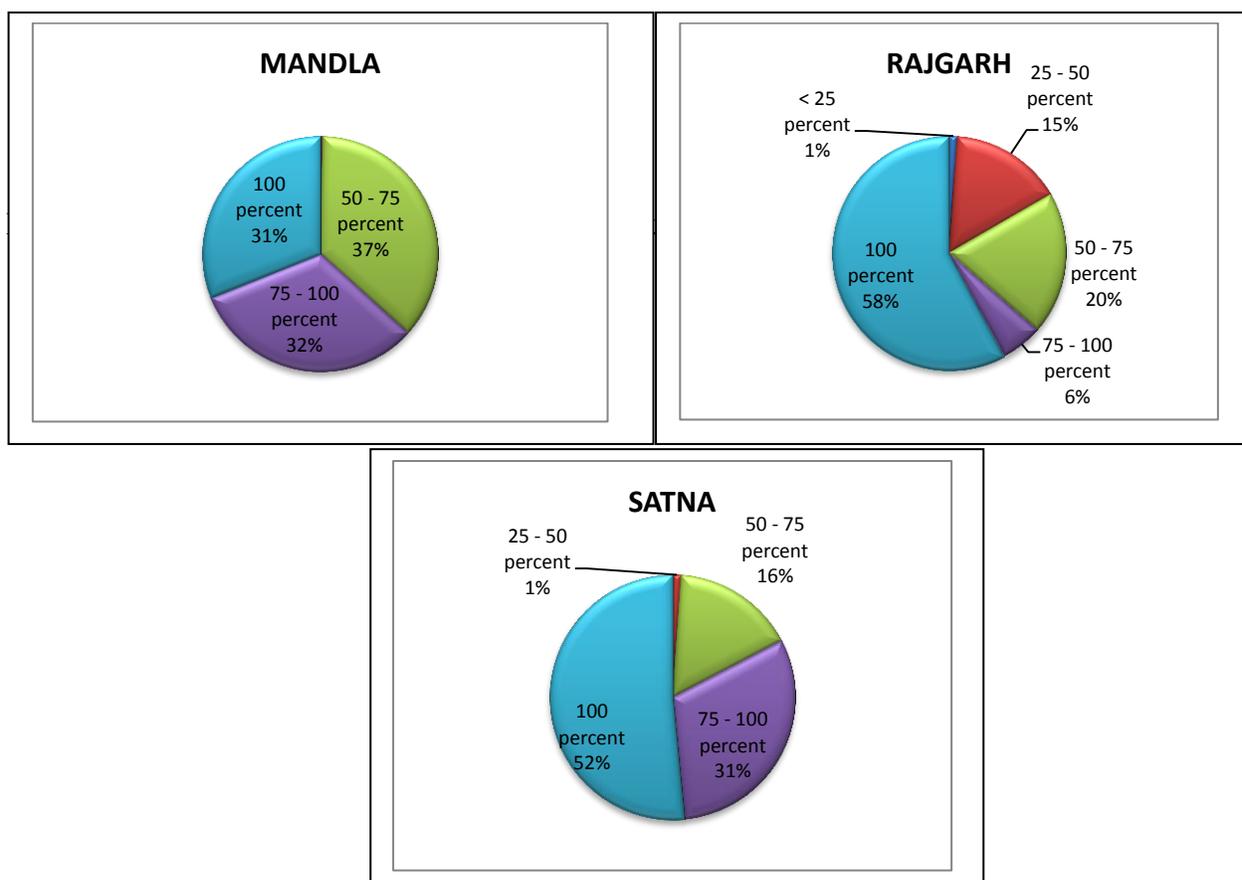
### 8.6.2. Water and Sanitation

The information on water and sanitation related to the Rajiv Gandhi Drinking Water Mission is available from the web site (<http://indiawater.gov.in/imisweb/>). The Integrated Management Information System (IMIS) of the department of Drinking Water and Sanitation provides useful information regarding the population coverage with water supply. The information is provided for each of the districts which describe the number of target habitation marked and number of habitations with population coverage by drinking water supply. The information is converted to generate percentage of habitations having varying levels of population coverage with drinking water supply within each of the habitation. Chart 10 provides the analysis of the data with percentage of habitation having varying levels of population coverage by drinking water supply in selected districts of Madhya Pradesh as on 1<sup>st</sup> April, 2010.

As can be seen from the pie diagram, only 31 percent of the habitations in Mandla district had full population coverage with drinking water supply, while in other districts it ranged from 45 to 67 percent. On the other hand, 37 percent of the habitations in Mandla was such which has provision of drinking water supply to 50 – 75 percent of the population living in the habitation

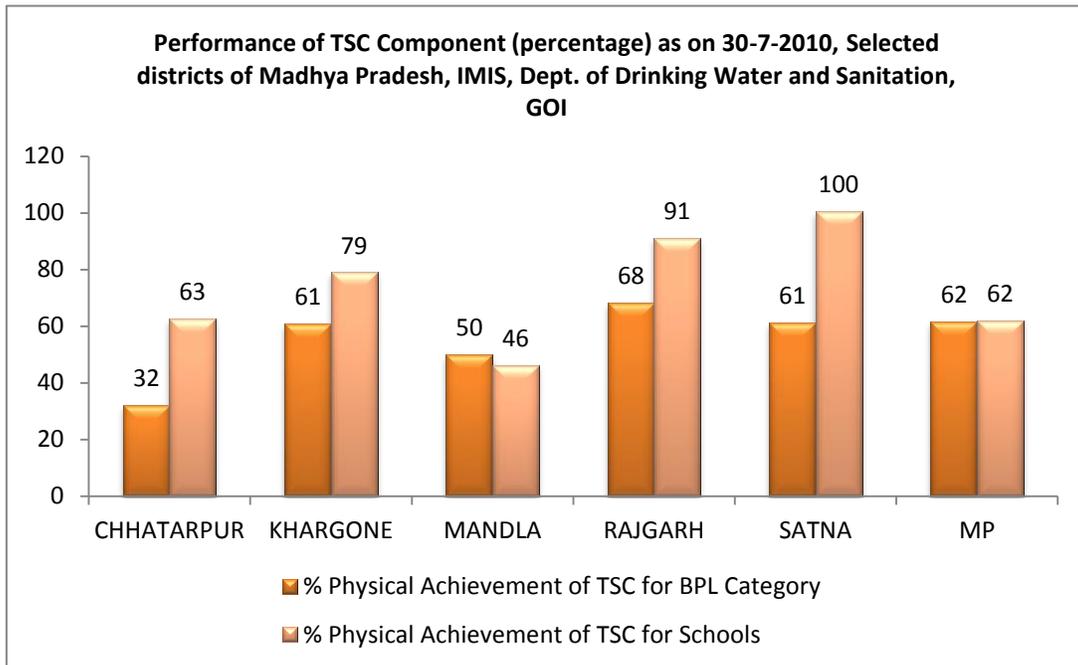
**Chart 3: Percent of habitation with Population coverage of Drinking Water Supply, Indiawater.gov, as on 1<sup>st</sup> April, 2010**





available from IMIS of the department of drinking water and sanitation. Chart 4 presents the physical achievement of TSC components in percentage terms both for BPL category as well as achievement for the schools. Percent of physical achievement under TSC for BPL category was only 32 percent in Chattarpur, while in other selected districts it ranged between 50 – 68 percent. The percent of physical achievement of TSC component for school was the lowest in Mandla district with 46 percent while some of the districts such as Satna (100%) and Rajgarh (91%) showed a higher level of performance. Rest of the districts ranged between 62 to 79% of physical achievement of school component of TSC.

**Chart 4**



### 8.7. Summing up:

The terms ‘monitoring’ and ‘evaluation’ are two distinct concepts. The purposes of these activities are also different. However, the common thing between these two is that they help us learning about the project which was implemented and help us answering questions such as efficiency, effectiveness and impact of the project activities. Monitoring and Evaluation System is an essential and integral part of program development and implementation process. It has to play multiple functions that include measurement of performance on a regular basis at stipulated time intervals, identification of mid-course corrective actions needed to achieve program objectives, playing an advocacy role for the benefit of others working in the area, and helping judicious allocation of resources. It is important to design the M&E system along with the program/project development process. This enables the development of an appropriate work-plan with time-line and responsibilities, indicators that have to be monitored/ evaluated, and the frequency of conducting monitoring and carrying out evaluation studies. Synergy between program management and the M&E unit right from the formulation stage will result in getting a better perspective of the program.

Monitoring is concerned with regular tracking of the activities to see whether they are functioning as per plan or not, while evaluation aims to assess program performance and is usually conducted either at the mid-course or at the end of project implementation.

Measurable indicators form the basis of monitoring and evaluation. These could be quantitative or qualitative. Any quantitative indicators should be specific, measurable, achievable, and relevant and time bound which is known as SMART indicators. There is a hierarchy of indicators. The lower level indicators are called input or process indicators, and the next level is the output indicators followed by outcome and impact indicators. This hierarchy is determined by the logical sequencing of indicators. There are two approaches describing the hierarchy of the indicator, one is known as Logical Framework Approach (LFA) and the other one is Results Based Management approach. In the second approach, all higher level indicators, viz. output, outcome and impact indicators are termed as 'results'.

There are different evaluation designs that could be employed for the evaluation of any project; however, the choice of design depends upon the purpose. Monitoring is based on the data generated by the program activities on a day to day basis. Most of the programs have a well defined Management Information System (MIS) and the information could be used to derive meaningful indicators to judge the progress of the project.

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# GLOSSARY

## 1. Health Status

### 1.1 Life expectancy:

The average life expectancy represents the average number of years of life which a cohort of new born babies (that is, those born in the same year) may be expected to live if they are subjected to the risks of death at each age according to the age specific mortality rates prevailing in the country at the time of which the measure refers.

### 1.2 Infant mortality:

Infant mortality includes all deaths of children from moment of birth up-to and including the 365<sup>th</sup> day of life. Infant mortality rate is ratio of infant deaths (deaths of children under one year of age) registered in a calendar year to the total number of live births registered in the same year.

### 1.3 Under –5 mortality:

Under 5 mortality is probability of dying before age 5. Under-five mortality rate is probability per 1,000 that a new-born baby will die before reaching age five, if subject to current age specific mortality rates.

### 1.4 Mortality from all causes:

All-cause mortality, in contrast, does not require judgments about the cause of death. Instead, all that this end point requires is an accurate ascertainment of deaths and when they occur.

$$\frac{\text{Annual number of deaths in an age group}}{\text{Total population in that age group}} * k$$

### 1.5 Mortality from cardiovascular disease:

Cardiovascular diseases especially the conditions that lead to heart attack or stroke, death from coronary heart diseases.

### 1.6 Mortality from cancer:

Malignant neoplasms represent a group of diseases that kill by generating uncontrolled growth and spread of abnormal cells. These cells if untreated may then metastasize (invade neighbouring tissue and organs) and cause dysfunction and death by replacing the normal tissue in your vital organs.

### **1.7 Mortality from injuries:**

Mortality from injuries includes accidental death, unintentional death, suicide and homicide.

### **1.8 Maternal Mortality:**

The WHO defines Maternal Mortality as the death of a woman who is pregnant or dies within 42 days of ending her pregnancy, with no regard to length of pregnancy or site of the pregnancy.  $MMR = \frac{\text{No of deaths from puerperal causes in a given year}}{\text{Total number of live births in the same period and population}}$ .

### **1.9 HIV/AIDS:**

AIDS (acquired immunodeficiency syndrome) is a chronic, potentially life-threatening condition caused by the human immunodeficiency virus (HIV). By damaging your immune system, HIV interferes with your body's ability to fight the organisms that cause disease. **The result is that the body becomes vulnerable to infections and cancers which are not so common in population. (By Mayo Clinic Staff)**

#### 1.10 Tuberculosis

Tuberculosis (TB) is an infection, primarily in the lungs (a pneumonia), caused by bacteria called *Mycobacterium tuberculosis*. It is spread usually from person to person by breathing infected air during close contact.

#### 1.11 Malaria

An infectious disease caused by protozoan parasites from the Plasmodium family that can be transmitted by the bite of the Anopheles mosquito or by a contaminated needle or transfusion. Falciparum malaria is the most deadly type.

#### 1.12 Diabetes

Usually refers to diabetes mellitus or, less often, to diabetes insipidus. Diabetes mellitus and diabetes insipidus share the name "diabetes" because they are both conditions characterized by excessive urination (polyuria). In diabetes, the pancreas does not make enough insulin (type 1 diabetes) or the body can't respond normally to the insulin that is made (type 2 diabetes). This causes glucose levels in the blood to rise, leading to symptoms such as increased urination, extreme thirst, and unexplained weight loss.

## **2. Determinants of Health**

### **2.1 Reproductive health:**

Reproductive health is ‘a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity, in all matters related to the reproductive system and to its functions and processes.’(ICPD Programme of Action 1994)

### **2.2 Low birth weight:**

Low birth weight (LBW) has been defined by the World Health Organization (WHO) as weight at birth less than 2500 g.

### **2.3 Breastfeeding:**

Breastfeeding is the normal way of providing young infants with the nutrients they need for healthy growth and development. Virtually all mothers can breastfeed, provided they have accurate information, and the support of their family, the health care system and society at large. Exclusive breastfeeding is recommended up to 6 months of age, with continued breastfeeding along with appropriate complementary foods up to two years of age or beyond.(WHO recommended)

### **2.4 Nutrition:**

Nutrition is the intake of food, considered in relation to the body’s dietary needs. Good nutrition – an adequate, well balanced diet combined with regular physical activity – is a cornerstone of good health. Poor nutrition can lead to reduced immunity, increased susceptibility to disease, impaired physical and mental development, and reduced productivity.

### **2.5 Underweight and overweight:**

**Overweight and obesity** are defined as abnormal or excessive fat accumulation that presents a risk to health. A crude population measure of obesity is the body mass index (BMI), a person’s weight (in kilograms) divided by the square of his or her height (in metres).

The children whose weight for age is below minus two standard deviations from the median weight for age of the standard reference population are considered as **underweight**.

### **2.6 Water and Sanitation:**

Field dealing with drinking water and hygienic aspects. (Source: EUGRIS)

### **2.7 Tobacco:**

The definition of tobacco is a plant that yields nicotine-rich leaves, or nicotine-rich leaves that have been prepared to be smoked or chewed.

### **2.8 Alcohol:**

An organic substance formed when a hydroxyl group is substituted for a hydrogen atom in a hydrocarbon. The type of alcohol used in alcoholic beverages, ethanol, derives from fermenting sugar with yeast. After alcohol is ingested, the body converts it to sugar-based fuel. Alcohol acts as a central nervous system depressant, and it may be part of solutions used as preservatives, antiseptics, or medications.

## **3. Health Care Resources and Utilization**

### **3.1 Doctors and nurses:**

Nurses include professional nurses, auxiliary nurses, enrolled nurses, and other associated personnel, such as dental nurses and primary care nurses. Nurses (per 1,000 people)

**3.2 Drugs:** A chemical substance used in the treatment, cure, prevention, or diagnosis of disease or used to otherwise enhance physical or mental well-being.

### **3.3 Diagnostic Centers:**

Diagnostic Centers is a place that offers diagnostic service to the medical profession or general public.

### **3.4 Hospital beds:**

Hospital beds include inpatient beds available in public, private, general, and specialized hospitals and rehabilitation centres. In most cases beds for both acute and chronic care are included. Hospital beds (per 1,000 people)

### **3.5 Blood Banks:**

A place where blood is collected from donors, typed, separated into components, stored, and prepared for transfusion to recipients. A blood bank may be a separate free-standing facility or part of a larger laboratory in a hospital.

### **3.6 IPD: Inpatient Load:**

Inpatient means that the procedure requires the patient to be admitted to the hospital, primarily so that he or she can be closely monitored during the procedure and afterward, during recovery.

### **3.7 OPD: Outpatients Load:**

Ambulatory medical care provided to patients who are not confined to bed can be provided at a general practitioner's clinic, a specialist clinic, a health centre or a hospital.

### **3.8 MCH:**

Promotion of maternal and child health has been one of the most important objectives of the Family Welfare Programme in India.

#### **3.8.1 Antenatal care:**

Antenatal care (ANC) refers to pregnancy-related health care, which is usually provided by a doctor, an ANM, or another health professional. Ideally, antenatal care should monitor a pregnancy for signs of complications, detect and treat pre-existing and concurrent problems of pregnancy, and provide advice and counselling on preventive care, diet during pregnancy, delivery care, postnatal care, and related issues.

#### **3.8.2 Delivery care:**

Delivery care includes proper hygienic place of delivery, assistance during delivery, information given to men and delivery characteristics ([Caesarean section](#), public or private health facilities).

#### **3.8.3 Postnatal care:**

Care of the mother after childbirth until about 6 weeks later.

#### **3.8.4 Children's Immunization:**

Child immunization measures the percentage of children ages 12-23 months who received vaccinations before 12 months or at any time before the survey. A child is considered adequately immunized against diphtheria, pertussis (or whooping cough), and tetanus (DPT) after receiving three doses of vaccine. [Source: WHO and UNICEF ([http://www.who.int/immunization\\_monitoring/routine/en/](http://www.who.int/immunization_monitoring/routine/en/))].

## **4. Health Expenditure and Financing**

### **4.1 Health expenditure per capita:**

Total health expenditure is the sum of public and private health expenditures as a ratio of total population. It covers the provision of health services (preventive and curative), family planning activities, nutrition activities and emergency aid designated for health but does not include provision of water and sanitation.

#### **4.2 Health expenditure in relation to GDP:**

The health spending to GDP ratio should be considered together with per capita health spending. Countries having a relatively high health spending to GDP ratio might have relatively low health expenditure per capita, and the converse also holds

#### **4.3 Financing of health care:**

Financing of health care is done by financing sources that are the institutions or entities that provide fund in health care system.

#### **4.4 Health expenditure by function:**

Health expenditure by function refers to the goods and services produced within the health accounts boundary.

#### **4.5 Health expenditure by provider:**

Health expenditure by providers is entities that receive money in exchange for or in anticipation of producing activities inside the health accounts boundary.

# ANNEXURE –I

## Health Statistics: India

	Value and Year	Source	Value and Year	Source
<b>Health Status</b>				
Life expectancy	66 yrs,(2012)	World health statistics Report,2014	65 yrs, (2011)	World health statistics Report,2013
Infant mortality	42,(2012)	SRS Bulletin, September 2013	44, (2011)	SRS Bulletin, October 2012
Under – 5 mortality	52 ,(2012)	SRS Bulletin, September 2013	55,(2011)	SRS Bulletin, October 2012
Mortality from all causes	27825,(2009)	Disease and Injury country Estimates ,WHO,2009	1002,(2008)	World health statistics Report,2013
Mortality from cancer	984,(2009)	Disease and Injury country Estimates ,WHO,2009	108,(2008)	World health statistics Report,2013
Mortality from Diabetes Cardiovascular disease	328,(2008)	World health statistics Report,2013		
Mortality from injuries	116,(2012)	World health statistics Report,2014	99,(2008)	World health statistics Report,2013
Maternal Mortality	178,(2010-12)	Special Bulletin on Maternal Mortality in India 2010-12	212,(2007- 09)	Special Bulletin on Maternal Mortality in India 2007-09
HIV/AIDS( <i>prevalence per 100,000 populations.</i> )	169,(2012)	World health statistics Report,2014	200,(2009)	World health statistics Report,2012
Tuberculosis ( <i>prevalence per 100,000 populations.</i> )	230,(2012)	World health statistics Report,2014	249,(2011)	World health statistics Report,2013
Malaria	2.3,(2012)	World health statistics Report,2014	2.4(2010)	World health statistics Report,2013
<b>Determinants of Health</b>				
<b>Reproductive health</b>				
Low birth weight	28%(2008-12)	UNICEF statistics, 2008-12	22%	NFHS-3,2005-06
Breast feeding(Infants exclusively breastfed for first 6 months of life)	46%(2006-12)	World health statistics Report,2014	46%(2005-12)	World health statistics Report,2013
Nutrition	36%	NFHS-2,1992-93		
Underweight	47%	NFHS-2,1992-93	43%	NFHS-3,2005-06
Overweight	1.9%(2006-12)	World health statistics Report,2014	1.9%(2005-12)	World health statistics Report,2013
Water (Population using improved drinking water sources %)	93,(2012)	World health statistics Report,2014	92,(2011)	World health statistics Report,2013

Sanitation (Population using improved Sanitation %)	36,(2012)	World health statistics Report,2014	35,(2011)	World health statistics Report,2013
Tobacco	472 million kg	India stats.com,2010-11	475 million kg	India stats.com,2011-12
Alcohol	2.7,(2008)	World health statistics Report,2013	0.6,(2005)	World health statistics Report,2010
<b>Health Care Resources and Utilizations</b>				
Doctors	858797,(2005-2011)	2005-2011,India stats.com		
Nurses	2000641,(2011)	India stats.com	1231322,(2000)	India stats.com
Drugs	130158.05	2012-13, India stats.com		
Diagnostic centers	138	2012, India stats.com		
Hospital beds(per 100,000 population)	7 (2006-10)	World health statistics Report,2014	9 (2005-10)	World health statistics Report,2013
Blood banks	2517,(2011)	NRHM, India stats.com	2609,(2009)	NRHM, India stats.com
<b>MCH</b>				
<b>Antenatal care</b>				
At least 1 visit	75,(2006-13)	World health statistics Report,2014	75,(2005-12)	World health statistics Report,2013
At least 4 visit	50,(2006-13)	World health statistics Report,2014	50,(2005-12)	World health statistics Report,2013
<b>Delivery care</b>				
Births by skilled health personnel (%)	67,(2006-13)	World health statistics Report,2014	58,(2005-12)	World health statistics Report,2013
Births by caesarean section (%)	8, (2006-13)	World health statistics Report,2014	8,(2005-12)	World health statistics Report,2013
Postnatal care (Visits within 2 days of child birth in %)	48,(2005-12)	World health statistics Report,2014	48,(2005-12)	World health statistics Report,2013
<b>Children's Immunization(among 1 year old)</b>				
Measles	74,(2012)	World health statistics Report,2014	74,(2011)	World health statistics Report,2013
DTP3	72,(2012)	World health statistics Report,2014	72,(2011)	World health statistics Report,2013
HepB3	70,(2012)	World health statistics Report,2014	47,(2011)	World health statistics Report,2013
<b>Health Expenditure and Financing</b>				
<b>Health expenditure per capita</b>				
Health expenditure per capita public sector	20.3%	National Health Accounts, 2001-02	20.18%	National Health Accounts, 2004-05

Health expenditure per capita private sector	77.4%	National Health Accounts, 2001–02	79.82%	National Health Accounts, 2004–05
<b>Health expenditure in relation to GDP</b>	4.6%	National Health Accounts, 2001–02	4.25%	National Health Accounts, 2004–05
<b>Financing of health care</b>				
Financing of health care by Private funds	77.4%	National Health Accounts, 2001–02	78.05%	National Health Accounts, 2004–05
Financing of health care by public funds	20.3%	National Health Accounts, 2001–02	19.67%	National Health Accounts, 2004–05
Financing of health care by external sources	2.3%	National Health Accounts, 2001–02	2.28%	National Health Accounts, 2004–05
<b>Health expenditure by function</b>				
Tertiary Care Services	23.6%	National Health Accounts, 2001–02	22.45%	National Health Accounts, 2004–05
Secondary Care	5%	National Health Accounts, 2001–02	15.32%	National Health Accounts, 2004–05
Primary Care Services	53.0%	National Health Accounts, 2001–02	41.6%	National Health Accounts, 2004–05
Others	18.4%	National Health Accounts, 2004–05	20.63%	National Health Accounts, 2004–05
<b>Health expenditure by provider</b>				
Health expenditure by Public sector provider	69.6%	National Health Accounts, 2001–02	20.97%	National Health Accounts, 2004–05
Health expenditure by Private sector provider	22.9%	National Health Accounts, 2001–02	76.74%	National Health Accounts, 2004–05

- ✓ Mortality from all causes, cancer and cardiovascular disease is age standardized adult mortality by cause (age 30-70, per 100,000 population)
- ✓ Mortality from injuries is age standardized mortality by cause (per 100,000 population)
- ✓ Tuberculosis prevalence per 100,000 populations.
- ✓ Malaria (cause specific mortality rate per 100,000 population)
- ✓ The numerical values show estimated HIV prevalence per 100 000 population.
- ✓ The numerical values show estimated tuberculosis mortality rate per 100 000 population.
- ✓ Nutrition is determined by women who have a BMI below 18.5, indicating a high prevalence of nutritional deficiency.
- ✓ Doctors: Total number of doctors registered with medical council of India.
- ✓ Nurses include ANM+ General Nursing & Midwives+ Lady Health Visitors
- ✓ Alcohol consumption among adults aged  $\geq 15$  years (liters of pure alcohol per person per year)
- ✓ Drugs :Funds for drugs in administrative approved under NRHM
- ✓ Diagnostic centers: Under central government health scheme in India.
- ✓ In Health expenditure by function, Primary Care Services include:
  1. PHC/Sub centers/

2. Dispensaries
  3. Public Health Programs
  4. Family Welfare
  5. Rehabilitative Care
- ✓ In Health expenditure by function, Primary Care Services include:
1. Direction and Administration
  2. Health Statistics research,
  3. evaluation and training
  4. Medical Stores Depot
  5. Drug Manufacture
  6. Medical Reimbursement
  7. Compensation
  8. Functions Not Specified
- ✓ Information on IPD: Inpatient Load, OPD: Outpatient load is unavailable.

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- National Health Accounts, 2004–05
- India stats.com
- Special Bulletin on Maternal Mortality in India 2010-12
- Special Bulletin on Maternal Mortality in India 2007-09
- NFHS-2,1992-93
- NFHS-3, 2005-06
- UNICEF statistics, 2008-12
- SRS Bulletin, September 2013
- SRS Bulletin, October 2012
- Disease and Injury country Estimates ,WHO,2009

## **ANNEXURE -II**

### **List of Major Publications on Health Statistics of India:**

- World health statistics Report, 2013
- World health statistics Report, 2014
- National Health Accounts, 2001–02
- National Health Accounts, 2004–05
- Special Bulletin on Maternal Mortality in India 2010-12
- Special Bulletin on Maternal Mortality in India 2007-09
- National Family Health Survey-2,1992-93
- National Family Health Survey -3, 2005-06
- UNICEF statistics, 2008-12
- Sample Registration System, Bulletin, September 2013
- Sample Registration System Bulletin, October 2012
- Disease and Injury country Estimates ,WHO,2009
- Annual Report of Department of Health &Family Welfare, 2013-14
- Annual Report of Department of Health &Family Welfare, 2012-13
- National Consultation Report, Post 2015 Development Framework,India,2013
- Post-2015 Development Agenda: Goals, Targets and Indicators, Special Report,2012

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