Track Record

The Institute of Health Systems

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Sivananda Rehabilitation Home Campus, Kukatpally,
Hyderabad, TS 500072, INDIA

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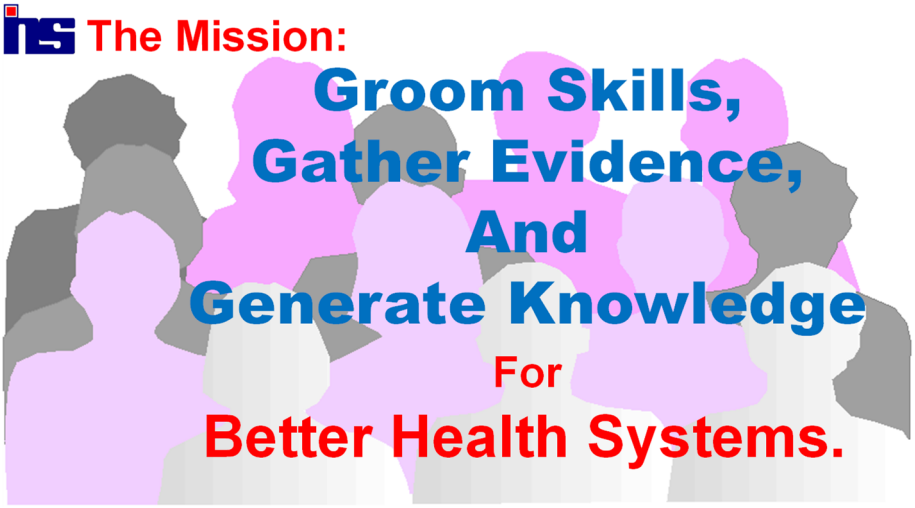
1. Organization and Structure

A. Mission and Goals

The Institute of Health System (IHS) mission is to groom skills, gather evidence and generate knowledge, for people's health. The IHS is founded on the principle of Multi-disciplinarity, Interdisciplinary wok, Health Systems Research, Application and Services for Public Health. The Institute strives to build local capacity and the global knowledge base for better health systems and public health. IHS activities fall into research, systemic, institutional and individual capacity development for health system strengthening, public health laboratory, and various other services towards public health. The Institute conducts health systems research on applied and operational issues to improve equity and efficiency of the health care sector. IHS offers training programmes to improve managerial skills and health system research capability in India.



The Institute strives to maintain a balance between various modes of learning and application to provide an environment for intellectual development, knowledge-based work; and at the same time keep the skill set of its faculty well-grounded to realities of social services delivery in India and other developing countries. While seeking to develop itself as a premier school of public health in India, the Institute has chosen a different organisational path to sustain a high level of creativity and operational efficiency. IHS is a civil society institution and has so far been entirely funded out of revenue generated by its faculty and staff through sponsored research programmes, IHS Laboratory services, tuition fee collections and other service charges.

B. Legal Status

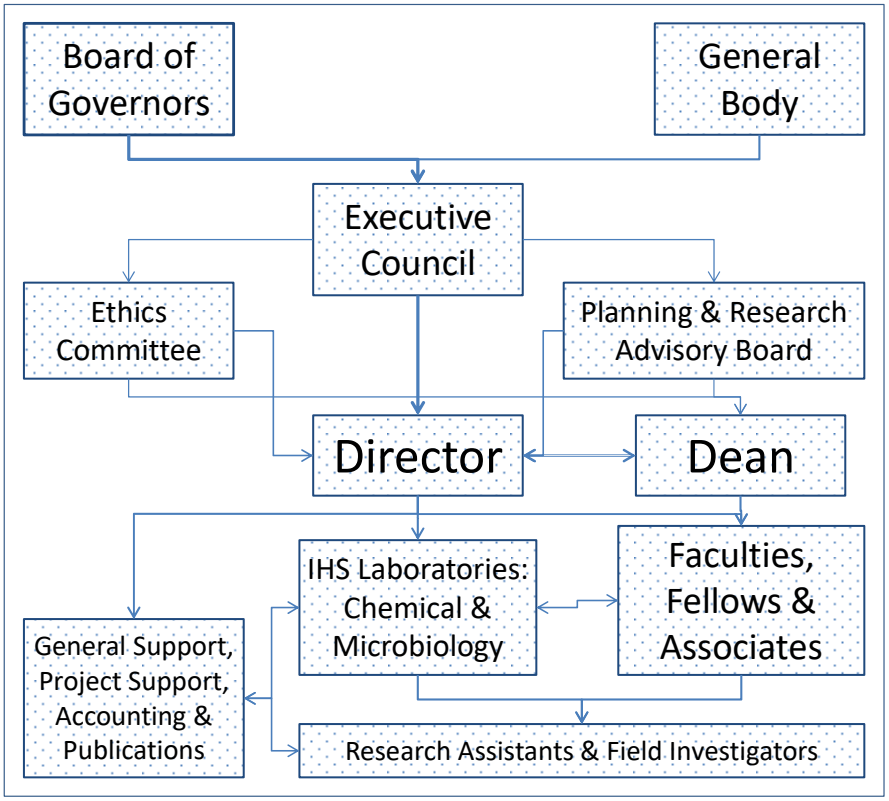
The Institute of Health Systems (IHS) is a civil society institution. It was established in 1990 and registered under the Societies Registration Act[1]. The IHS is registered as a charitable scientific institution under section 12A of the Income Tax Act[2]. Contributions to

[1] Registration number 3748/90, under the Telangana Societies Registration Act. 1350 Fasli.
[2]Unique Registration Number: AAATI0679PE20168, dated 23-09-2021, valid from AY2022-23 to AY2026-27. First registered vide Commissioner of Income Tax (CIT), Hyderabad letter No.II/12A & 80G/64/90-91 dated 19 December, 1990.

IHS are eligible for exemption under section 80G of the Income Tax Act[3]. The Institute has been registered, by the Government of India - Ministry of Home Affairs (MHA), under the Foreign Contributions Regulation Act, from time to time, since 1994[4]. The District Collector, Hyderabad, recognised and commended the welfare activities, in the field of education, taken up by the Institute[5]. Starting with the first meeting held in July 1994 annual general body meetings are conducted every year, around December. IHS files its audited accounts with the Income Tax department every year. Membership of the institute is open to any person who has consistently evinced interest and demonstrated commitment towards objectives of the institute and to institutions with complementary objectives.

C. Organisational Structure

Figure 1: The IHS Organisational Chart



The Institute is governed by a system of authorities consisting of the Board of Governors (BOG), the General Body (GB) and the Executive Council (EC). The General Body and the Board of Governors meet annually. The Executive Council oversees management of the Institute, appoints the Director and the Finance Officer. Office Bearers of the Institute consist of the Chairman and the President. The Chairman presides over the meetings of the Board of Governors and the General Body. The President chairs the

[3]Unique Registration Number: AAATI0679PE20216, dated 23-09-2021, valid from AY2022-23 to AY2026-27. First granted by CIT AP-II, Hyderabad letter no. H.Qrs. No.II/12A & 80G/64/90-91 dated December 31, 1990 and periodically renewed thereafter.

[4]FCRA Registration Number: 010230292, Nature: Educational, Validity: 01-07-2022 to 30-06-2027, vide Govt. of India, Ministry of Home Affairs letter no. 0300058842021 dated 23-05-2022. The permanent registration number allotted vide Govt. of India, Ministry of Home Affairs letter no. II/21022/61(4)/93-FCRA-III, dated 10 Jan 1994.

[5]District Collector, Hyderabad, proceedings no D1/3499/2003 dated 25/05/2003.

Executive Council and, in the absence of the Chairman, the General Body. The Director presents a report on the Institute's activities to the General Body every year, along with the Audited accounts of the Institute.

D. Ethics Committee

Research projects taken up by the institute adheres to the high moral and ethical standards in choice of methodology to test various hypotheses. The ethics committee reviews the proposals for research to assess among other considerations whether the research so designed would yield meaningful results that could not be obtained by other methods. The ethics committee also assesses whether a study has been planned in a manner so that the degree of risk taken and inconvenience caused does not exceed that determined by the humanitarian importance of the problem to be solved by the experiment. The ethics committee sees that the study will be conducted by persons who possess the requisite competence and qualities to carry out the research. The ethics committee reviews formats and procedure for voluntary and informed consent of the individuals participating in various studies. The ethics committee consists of about five members, and at least two of the members are from outside the Institute. Director of the Institute is the member-convener of the committee. The ethics committee, after examining the details of a proposal may either certify that the project has obtained the committees' clearance as such or with specific conditions, or advice appropriate modifications to methodology so as to meet social ethical considerations.

E. Planning and Research Advisory Board (PRAB):

The Planning and Research Advisory Board (PRAB) reviews and provides expert advice on research studies and consultancy projects conducted by IHS. The PRAB provides road maps for health systems research strategies, development of research proposals, and opportunities. It helps amplify research potential and advises on the suitability and relevance of the research topics so as to enhance the visibility of IHS activities and provide expert advice and help in development of research strategy. In case, funding is not forth coming for certain projects, the PRAB will review the reasons for non-receipt of funding, and propose additional and/or alternative research projects and suggest probable domain experts to consult.

F. Accreditation and Affiliations

- ✓ The Institute is recognised by Government of India – Department of Scientific and Industrial Research (DSIR) as a Scientific and Industrial Research Organisation[6].
- ✓ The Institute is registered by the Government of India Ministry of Corporate Affairs, for undertaking Corporate Social Responsibility (CSR) activities (CSR00048944)[7].
- ✓ The IHS Laboratory is registered under the T.S. Allopathic Private Medical Care Establishments Registration and Regulation Act 2002[8].

[6] Government of India Ministry of Science and Technology Department of Scientific and Industrial Research F.No.14/551/2011-TU-V dated 24th Aug 2011, and renewals from time to time. Latest renewal dated 8th April 2021 valid until 31st March, 2024.
[7] Government of India Ministry of Corporate Affairs, Office of the Registrar of Companies, CSR Registration Number: CSR00048944, vide letter dated 10-03-2023.
[8] Registration No. 8441/DM&HO/MDCL/2002 dated 27-12-2022, valid up to 26-12-2027.

- ✓ The IHS Laboratory is accredited by the National Accreditation Board for Laboratories (NABL)[9].

2. Contributions to the National Health System

A. Research & Consultancy Projects Sponsored by the Govt. of India

Evaluation of EMRI model of Emergency Response Services (ERS):

In 2011, the NHSRC commissioned the IHS for second phase of this study covering Anantapur, Visakhapatnam and Warangal districts in erst Andhra Pradesh. Objectives of the study were to; (i) Estimate the efficiency and effectiveness of Emergency Response Services (ERS), (ii) Pattern of Use, (iii) Quality of Care, (iv) Equity of Access etc. Both public and private healthcare facilities, receiving patients through EMRI were sampled. Primary data was collected by interviews of people using the EMRI services or other available ambulance, using structured questionnaire designed by NHSRC. The study found that EMRI ambulances took on average 33 minutes to reach the site of emergency and 21 minutes to reach the hospital from the emergency site / pick up point. In 62% of the cases, the stabilisation care was provided during the transportation in EMRI ambulance. About 30% of EMRI cases were maternity related and 20% were trauma cases. In almost all of the cases brought by EMRI ambulance, the concerned hospital staff attended the patient in less than 15 minutes and 77% of the patients were stabilized. The study was completed and report submitted in August 2011. IHS Publication: RP56/2011.

Tracking of State Level Health Budget & Expenditure:

The National Rural Health Mission (NRHM) envisaged an increase in public spending on health from a baseline of 0.9% of GDP to 2-3% of the GDP. Higher central funding called for improvements in state health system capacity for utilisation. Increased central funding was also expected to trigger higher allocation for health by State Governments. Tracking of health budget and expenditure would improve state capacity for better utilisation of NRHM funds and in assessing impact of fresh infusion of central funds on state budget allocation. The primary purpose of these studies commissioned by the National Health Systems Resource Centre (NHSRC) was to pilot test state-level budget and health expenditure tracking, fine tune data definitions, reporting formats for development of a budget tracking toolkit. The health budget tracking studies at the IHS covered erst Andhra Pradesh, Madhya Pradesh and Kerala. Result of these studies contributed to the NHSRC Budget Tracking Toolkit. A guide for the states to track the health budget and expenditure (regular budget and NRHM), so as to match the physical and financial achievements in a holistic manner, looking at the public health sector as a whole and not only at NRHM. The Andhra Pradesh Health Budget / Expenditure Tracking Report for the years 2004-05 to 2008-09 prepared by IHS has been included in the NHSRC Budget Tracking Toolkit as a sample state report. IHS Publications: RP49, RP50 & RP51 of 2010. NHSRC Budget Tracking Toolkit, 2012: https://nhsrcindia.org/sites/default/files/2021-06/Budget%20Tracking%20Toolkit-.pdf

[9] Accreditation certificate no. TC-7658 for Chemical discipline dated 6th Aug 2020, valid till 5th Aug 2022.

Mapping Public Health Education Courses & Institutions in India:

There is increasing recognition of the need for public health capacities in policy analysis, planning and implementation. The National Rural Health Mission (NRHM) required that public health training capacity in the country is appropriately utilized to strengthening the health system in a time bound manner. Accordingly, the National Health System Resource Centre (NHSRC) coordinated a national effort to map institutions providing post graduate level education /training in areas such as social and preventive medicine, community medicine, health management, hospital management, health behavioral sciences, community health and other public health disciplines. Apart form assessing the present situation, NHSRC sought to identify gaps and barriers to balanced development of public health capacities in various states. The NHSRC commissioned[10] the IHS, for gathering of data on public health education institutions and courses in the States of Tamil Nadu, Pondicherry, Kerala, erst Andhra Pradesh, Odisha and Karnataka. Data collected from the six states were furnished to the NHSRC and the assignment was completed in October 2009. IHS Publication: None. The data has been published in NHSRC website at http://nhsrcindia.org/ under Resources – Health System Databases – Public Health Education Courses and Institutes.

Institutional Assessment for the National AIDS Control Program:

This study was commissioned by the National AIDS Control Organization[11] to assess the institutional arrangements of the National AIDS Control Programme at the national, state and district level and to make recommendation for their strengthening, prior to the launch of the third National AIDS Control Project (NACP-III). The assessment was based on the study of documents, discussion with concerned persons and visits to four states (Delhi, erstAndhra Pradesh, Madhya Pradesh and Assam) and one district in each of them. Institutional structure, function and culture of key NACP entities were analyzed. Study of institutional structure, covered organizational resources, design, and components. Organizational systems, policies, procedures, service delivery and predefined program indicators were analysed to assess institutional functioning. Study of institutional culture covered organizational values, political will, and leadership style. The study provided recommendations for organization structure, governance framework, and staffing of key entities at the national, state and district level. In addition, the study also recommended mechanisms for convergence of NACP with the NRHM and related programs such as RNTCP. Prospects of partnerships for capacity development, program support and for service delivery were also discussed. Recommendations of the study provided inputs to the preparation of the Project Implementation Plan of the NACP-III. The study began in October 2005 and was completed in May 2006. IHS Publication:RP35/2006.

Out of Pocket Expenditure in Public Hospitals of India:

Out of pocket expenditure refers to direct and indirect costs incurred by the individual and/or household in securing or maintaining their health and includes health service user fees, contribution to health insurance, costs on drugs, medicines and diagnostics and additional

[10]NHSRC Ltr & Contract dated 13th March. 2009
[11]NACO, MoHFW, GOI contract dated: 5th Sept. 2005

cost incurred for securing and maintaining health, such as that on nutritional supplements and transport costs. National Health Accounts of 2001-02 estimated that out of pocket health expenditure contributes a significant 72% of the total health expenditure in India (GOI, 2006). The primary data source for such estimates has been the household expenditure surveys conducted by the National Sample Survey Organisation (NSSO). These data sources are useful for overall estimates of out-of-pocket expenditure. However, NSSO data is not amenable for a more in-depth analysis of out-of-pocket expenditure on specific items such as that on drugs and consumables at specific levels of care. Given the one-year recall period for expenditure on hospitalization, these data are subject to recall bias and misclassification. Further such surveys do not provide much information on the volume of drugs and investigations purchased privately by patients seeking care at public hospitals. Given that cost of the same drug can vary significantly from manufacturer to manufacturer and prevalence of unethical marketing and prescription practices, it is highly likely that patients may be actually spending more than what is required. Data for such expenditure is also not available. This study was commissioned the MoHFW, with funding from WHO Country Office[12] to gather evidence and information for development of policies regarding access to medicines, as well as appropriate allocation of resources for drugs & laboratory supplies in public hospitals. The study was completed by September 2007.

National Health Accounts (NHA) Manual for India:

The National Health Policy (NHP 2002), emphasized the need for improved and comprehensive information through National Health Accounts (NHA) and accounting systems, conforming to the `source-to-users' matrix structure, by 2005. The MOHFW, GOI has brought out the NHA for the year 2001-02 and wanted to institutionalise its preparation for the subsequent years. Several State Governments had also shown interest in their State Health Accounts. In the Indian context, state health accounts are more important, because most of expenditure and substantive resource allocation decisions happen made at the state level. The MoHFW commissioned the IHS to develop a training manual that will facilitate uniformity in NHA methodology and its replicability. The manual should assist existing and new NHA teams as well as academic researchers by imparting comprehensive theoretical knowledge and practical experience on NHA. The project was funded by the WHO Country Office[13]. The NHA Manual, prepared by IHS was released in October 2009. The manual guides teaching of NHA methodology including, with interactive 'hands-on' learning. It has training material for both trainers and trainees. The manual is helpful for both researchers, who need theoretical and practical information and policy makers who need to interpret NHA for health policy formulation. IHS Publication: BK06/2009 ISBN81-7934-29-5.

Healthcare Financing & Expenditure of Nonprofit Organizations in India:

This study was commissioned by the MOHFW, GOI and funded by the WHO Country Office, to fill in a crucial data gap of the NHA exercise[14]. The objective of the study was to: (1) Outline the methodology and procedures for estimation of total health spending by

[12]WHO India allotment: IND HSD 001 RB 06 (Sticker No. SE/07/116434), dt: 21/12/2006
[13]WHO India allotment: SE IND HFS 001 RB 06 (Sticker No. SE/06/426951), 13/11/2006
[14]WHO India Allotment No.: SE IND GPE 002 RB 04 (Sticker No. SE/05/205858),dt: 15/04/2005

non-government organisations (NGOs) (2) provide national level estimates for the years 2001-02 and 2002-03, of: (a) Revenues of NGOs by source of funding (b) Health expenditure of NGOs; and (3) Application of the NHA framework to trace the flow of funds for health care through NGOs. A database of health care NGOs was prepared and a thousand organizations were randomly selected for the study. Field visits were made to 5 states, one in each geographical region; Delhi, Tamil Nadu, Maharashtra, Assam and Odisha. Data on financing and expenditure including audited reports and FC-3 reports were collected. Data for other states were collected via a mailed survey and telephonic follow-up. The study found that household were the major source of funds of NGOs (about 42%). International agencies, central government and the state government contributed 26%, 12% and 6% of the funds respectively. Other sources of funds included: private firms, PRIs, financial agencies and own resources of NGOs. About 42% of the funds were spent on curative care services and 24% on disease prevention and health formation. The remainder was spent on research and training, dispensation of medical goods, provision of ancillary services and capital formation[15]. The study provided inputs to the NHA prepared for the country by the MoHFW. The study began in June 2005 and was completed by January 2006. IHS Publication:RP33/2005.

Burden of Disease and Socioeconomic Impact of HIV/AIDS:

This study was a collaborative effort of the National AIDS Control Organization (NACO), United Nations Development Program (UNDP), Indian Council of Medical Research (ICMR), National Council of Applied Economic Research (NCAER), and the Institute of Health Systems (IHS)[16]. The study aimed to assess the burden of disease and socioeconomic impact of HIV/AIDS in 6 high prevalence states of the country; viz Maharashtra, Karnataka, erst Andhra Pradesh, Tamil Nadu, Manipur and Nagaland. The IHS was responsible for developing the study design for estimation of burden of disease due to HIV/AIDS. The IHS organized a study workshop on 2nd and 3rd of December, 2003, towards developing reliable estimates of burden of disease and socioeconomic impact of HIV/AIDS within the country. In addition to representatives from partner organizations, other professionals with expertise relevant to the study participated in the workshop. Based on the workshop findings a study design for a HIV prevalence survey was developed and submitted to the NACO Steering Committee. IHS Publication:RP30/2004, RP36/2006.

Structure & Dynamics of Private Health Sector - Implications for India's Health Policy:

This study sought to map the structure and dynamics of the private health sector and the implications for India's health policy. The study collected primary data from three type of health care institutions (HCI), namely (a) large hospitals, (b) small hospitals, and (c) clinics or primary health centres. These were randomly selected from out of all private and public health care institutions in three urban centres and the rural areas around them. Both private and public HCIs were sampled for comparative purposes. Altogether 150 private (both forprofit and nonprofit) and 106 public HCIs were surveyed. Diagnostic facilities and

[15]C.K. George, N.S. Reddy and G.S Pattnaik, *Health Financing and Expenditure of the NonProfit Sector in India, Report Prepared for World Health Organization*: IHS RP 33/2006
[16]MOU dated 06/09/2003 between NACO, UNDP, NCEAR, ICMR, IHSUNDP India Allotment No. IND/PRO/300 (Health)

alternate private practitioners located near by the sampled institutions were also surveyed. The survey collected information about each institution and their activities. In addition client satisfaction and job satisfaction surveys were done by randomly selecting clients and employees. The study reviewed world experience with private forprofit health care providers, their relative performance vis-a-vis nonprofit and public providers. Primary data collected by this study along with secondary sources of information on private health sector in India and erstAP were analysed to understand the structure and dynamics of private health sector in erst Andhra Pradesh and how they relate to experiences from elsewhere in the world. Report of the study was submitted to the Government of India (GOI). Results of the study has also been published[17]. The study was sponsored by the Government of India Ministry of Health[18] and was paid for by the World Bank Delhi office. Started in August, 1999 and completed by March, 2002. IHS Publication: BK04/2002.

Burden of Disease Among Women and Children in India:

The GOI - Department of Family Welfare, commissioned[19] the IHS to estimate burden of disease among women and children in India. Purpose of the study was to provide required evidence and information for formulation of reproductive and child health programs for the 10th five year plan. The report had to be prepared at a very short notice. The work was assigned in April, 2001 and the report was prepared by end June, 2001. The Institute's contribution was incorporated as a chapter in the report of the Planning Commission's working group on Women and Children's Health. IHS Publication:WP67/2008.

Health Insurance and Family Health Protection Plans for India:

The Institute has developed community health insurance based family health protection plans for consideration by the government of India. An income line for health and housing higher than the poverty line has been recommended, for purposes of administration of state financing of health insurance coverage to families. The benefit package in the proposed family health protection plans include comprehensive ambulatory primary care, and access to first referral hospital services. The plans would mostly use private clinics for the ambulatory care and public or nonprofit providers for hospital services. Minimum quality of service standard have been recommended for clinics. The plans will provide better access to public hospitals and help improve their utilisation. Nonprofit mutual health organisations are envisaged to underwrite the health care coverage risk and administer the plans. The task was assigned by the GOI - Department of Family Welfare[20]. Project started in July, 2002. Final report was presented to the government by end of March, 2003[21]. IHS Publication: WP51/2003.

Health Policy Analysis Support to the Prime Minister's Office:

The Institute has made modest contributions by being available to the Prime Minister's Office (PMO) and in rendering assistance, according to its capacity. The Institute's comments

[17]Mahapatra Prasanta; Sridhar P.; Rajshree KT. Structure and dynamics of private health sector in India. A study in Andhra Pradesh, 2000. Hyderabad: Institute of Health Systems; 2001.
[18]GOI - MOHFW DO No.M-11035/7/99-BP dated 11 June, 1999 and 21st June 1999.
[19]GOI - MOHFW Dept of Family Welfare No. N.11027/3/2001-T.O.(Pt) dt. 12 June, 2001, & 27th Aug. 2001.
[20]Govt. Of India MOHFW DO No. N.23011/19/2000-Ply, dated 24 Jan. 2002, 30/3/2002, and 12 Jun. 2002.
[21]Mahapatra Prasanta, Samatha Reddy. Family Health Protection Plans for India - A Health Insurance Model. Institute of Health Systems, WP/51, 2003.

on the draft new national health policy was sought[22]. Accordingly, a presentation was made at the PMO on 17 Jan 2002. Senior officers from the PMO and various ministries of the GOI were present. Suggestions and comments about expanding the health care coverage to ex-servicemen, sought by the PMO, was submitted. In response to another requirement[23], the Institute submitted its comments and suggestions about packaged drinking water quality standards.

B. Other Research Activities of National Importance

Estimating National Burden of Disease:

World-wide interest in summary measures of population health and descriptive epidemiology intensified following the publication of the Global Burden of Disease (GBD) results in the World Development Report 1993. Subsequently, The World Health Organisation (WHO) launched a Global Program on Evidence and Information for Health Policy. The IHS has been associated[24] with the GBD studies right from the inception of these studies at the Harvard Burden of Disease Unit. The AP Burden of Disease (APBD) study was one of the first[25] National Burden of Disease (NBD) studies taken up after publication of the GBD 1993 report. The APBD study started at the IHS in 1994 in collaboration with the Administrative Staff College of India. Subsequently the study moved in 1997 to the IHS full time. The APBD study focused on the issue of anchoring of NBD estimates to local data. Accordingly, it engendered a suite of related studies, for example, the community-based health state valuation study and the cause of death studies described elsewhere. Computational tools for NBD were developed, for example the BDAP described elsewhere and DISMOD[26]. Results of the AP Burden of Disease study was published in 2001[27]. IHS Publications: BK03/2001, WP35/2000, WP41/2001.

Cause of Deaths Statistics for National Burden of Disease Study:

Reliable statistics on causes of death in a population are essential for setting of priorities in the health sector. Most developed cause of death reporting systems rely on medical certification of cause of death according to the International classification of Diseases (ICD - 10), and have invariably achieved near total coverage. Developing countries like India depend on lay reporting of the cause of death for rural areas, where adequate medical facilities are not available, using a sample registration system. Usability of the cause of death statistics in India is questioned in view of poor coverage, and poor compliance with guidelines for cause of death reporting, coding and classification. Research work on cause of

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[22]PMO Letter DO No.S20/31/C/24/2001ES2 dated 3 Jan. 2002.
[23]E-mail message dated 31 March, 2003 from Ms Pushpa Subramanyam, Director, Prime Minister's Office.
[24]The IHS President, Prasanta Mahapatra, happens to be a founding member of the Harvard Burden of Disease Unit and contributed to the GBD 1993 Estimates. See World Bank. World development report 1993. Investing in health. New York: Oxford University Press (OUP; 1993. p182.
[25]See World Bank. World development report 1993. Investing in health. New York: OUP; 1993. P27. And Notes 1 at p 67 in Murray Christopher J.L.; Lopez Alan D., Editors. The global burden of disease. A comprehensive assessment of mortality and disability from diseases, injuries, and risk factors in 1990 and projected to 2020. Boston: Harvard School of Public Health; 1996.
[26]Lotus 123 spreadsheet precursors of DISMOD was developed by the IHS President Dr. Mahapatra at IHS and Harvard Burden of Disease Unit. The DISMOD software was developed at the Harvard Burden of Disease Unit. Dr. Mahapatra happens to share the patent of this software along with others and the Harvard University.
[27]Mahapatra Prasanta. Estimating National Burden of Disease. The Burden of Disease in Andhra Pradesh 1990s. Hyderabad: Institute of Health Systems; 2001 Oct.

deaths started in IHS around 1993 and is an ongoing activity supported by various sources of funding[28] and when no funding is available, by time contributions from faculty and staff. Work at the Institute lead to identification of Maharashtra and Goa states, where a large number of deaths are medically certified. A pilot study on cause of deaths in rural areas of erst AP provided some preliminary information about the Survey of Cause of Death (SCD) Rural statistics. Accordingly, the Global Burden of Disease study, 1996[29] used the Maharashtra medically certified cause of death (MCCD) data to estimate cause of death pattern for urban areas and the applied some corrections to the SCD-Rural data to estimate the same for rural India. Further work at the IHS on cause of death reporting system in India lead to the publication of two landmark articles[30],[31] in the National Medical Journal of India. These articles reviewed the performance of cause of death reporting system in India and argued for its improvement. Review of the world literature on verbal autopsy and systematic assessment of India's verbal-autopsy based cause of death reporting system contributed to appreciation of the SCD-Rural statistics and appropriate design of the newly introduced SRS based cause of death reporting system. Results of the study to estimate cause of deaths in rural areas of AP contributed to the National Burden of Disease estimation for erstAndhra Pradesh and has provided more accurate cause of death statistics for policy analysis. IHS Publications: WP27/1998, WP36-37/2000, WP40/2001, DS03/2002.

Healthcare Quality Assurance:

Quality of health care is a matter of public concern, since technical quality of care is directly linked to health outcomes and responsiveness of health care institutions is an important contributor to patient satisfaction. Quality assurance system is needed to aid consumers in their effort to clearly identify the services that they are seeking to purchase[32].Standards and quality systems contribute to better management of health care services. The health care standards and quality subsystem has been slow to develop in India. Early efforts in this direction include; (a) the standard classification of hospitals, and basic requirements for 30 bedded hospitals by the Bureau of Indian Standards; (b) Classification, nomenclature and normative range (matrix) of services of first referral hospitals[33], specification for hospital mattresses and linen[34], and public hospital formulary[35] developed by the erstwhile Andhra Pradesh Vaidya Vidhana Parishad (APVVP). The IHS has built on these

[28]Funding agencies thus far, include the WHO, Geneva, Center for Global Health Research, St. Michael's Hospital, Toronto, Canada, and the World Bank Delhi office.
[29]Murray Christopher J.L.; Lopez Alan D. Estimating causes of death: new methods and global and regional applications for 1990. in: Murray Christopher J.L.; Lopez Alan D., Editors. The global burden of disease. A comprehensive assessment of mortality and disability from diseases, injuries, and risk factors in 1990 and projected to 2020. Boston: Harvard School of Public Health; 1996. Page 150.
[30]Mahapatra Prasanta, Chalapati Rao PV. Cause of death reporting system in India: a performance analysis. National Medical Journal of India (Natl Med J India) 2001;14(3):154-62.
[31]Mahapatra Prasanta. Priority setting in the health sector. Why is a good cause-of-death reporting system important? National Medical Journal of India (Natl Med J India) 2002;15(2):90-2.
[32]Mahapatra Prasanta. The private health sector in Andhra Pradesh. IHS Report Series, 1998; 1: 1-111.
[33]Mahapatra Prasanta. Role of Standardisation in Planning and Development of Hospital Services, Bulletin of Hospital Services, Andhra Pradesh Vaidya Vidhana Parishad,Hyderabad. 1989. 1(3) pp.8-10.
[34] Standard Specification Of Mattresses For Hospitals. Andhra Pradesh Comissionerate of Medical Services. 1990.
[35]Andhra Pradesh Vaidya Vidhana Parishad. Approved Drug List & Hospital Formulary. Andhra Pradesh Commissionerate of Medical Services. 1990.

early efforts to develop national capacity in health care quality assurance. The Institute is connected with voluntary accreditation agencies elsewhere in the world, including the American Joint Commission on Accreditation of Health Care Organisations (JCHAO). IHS personnel have spent time with hospitals in the USA to study about their accreditation and quality assurance practices. Research at the IHS on health care quality assurance started with studies[36,37] to assess the demand for quality assurance of services and the need for accreditation system. This line of research and capacity building has been sustained at the IHS through various projects. Structural standards for reproductive health services by nursing homes and private hospitals, has been developed[38]. These standards were developed with help of local experts using a consensus development process. The standards give minimum equipment and staffing requirement for basic maternity services like normal delivery, caesarian section, and medical termination of pregnancy. An integrated framework for assessment of health care quality has been developed in the context of the study on structure and dynamics of private health sector in AP[39]. The study also included an exit interview survey to compare quality of service perceptions among patients from public and private health care institutions. IHS Publications: WP06/1994, WP10/1994, WP15/1997, WP21/1998, WP25-26/1998.

District Family Health Survey (DFHS):

Conventional measures of mortality like infant mortality and maternal mortality continue to play an important role in health policy. The Sample Registration System (SRS), which so far has been the primary source of mortality statistics in India, gives estimates at the state level. This study explored the feasibility of generating mortality estimates at the district and sub-district level. This pilot study was conducted in 3 districts, namely; Mahboobnagar in Telangana and Chittoor, Nellore in Andhra Pradesh. The indirect methods of estimation such as children ever born (CEB) technique for infant mortality rate (IMR), and Sisterhood Survival method for maternal mortality rate (MMR) were used. The sample was selected using a two-stage proportional stratification followed by random selection of clusters within strata assigning probability proportionate to population size. IMR estimates showed significant variation in mortality in different districts and revenue divisions. One revenue division in Mahboobnagar district had IMR as high as 125/1000 live births, which was twice as high as the state average IMR of 66/1000 live births at that time. The results of this study highlight the importance of small area statistics to facilitate decentralised area specific planning and implementation of public health programmes in the state. The study recommended a regular system of District Family Health Surveys, till such time as the vital registration system improves to provide accurate statistics at the district and subdistrict level. The study was sponsored by the Commissioner Family Welfare, government of AP[40]. The

[36]Mahapatra Prasanta, Shailaja, R. Assessment of demand for accreditation services in Hyderabad: A pilot study. IHS Working Paper 1994; 6:1-14.
[37]Nandaraj Sunil. Situation review and analysis of accreditation system in India. IHS Working Paper 1998;21
[38]Srilatha S. An enquiry into the quality of reproductive health care provided in private hospitals and nursing homes and women's perception in Andhra Pradesh. Final Report. Hyderabad: IHS, 1998 Sep.
[39]Mahapatra Prasanta; Sridhar,P;and Rajshree,K.T. Structure and dynamics of private health sector. Hyderabad, IHS, 2002.
[40]Commissioner Family Welfare, AP Rc.No.SP/DD/(Demo)/98-99 dated 6 Aug 1999.

study started in January 2000 and report[41] published by August 2001. IHS Publications: RP08/2001, DS05/2002.

C. Human Resource Development for Public Health:

Training of ICMR Scientists in Burden of Disease Research Method:

Epidemiological transition, increasing cost of health care, the unfinished agenda of controlling infectious and parasitic diseases and persisting gaps in access to primary health care, has made the job of health care policy and planning more complex than ever. The complexities of dealing with multifarious health problems have refocused worldwide attention on descriptive epidemiology and burden of disease. Summary measures of disease burden have been developed to combine mortality and morbidity experience of a population. The burden of disease estimation method is of recent origin and has developed very fast during the 1990s and thereafter. Most countries, lack national capacity in burden of disease research methods. Fortunately, the Institute of Health Systems has been involved in this frontier area of research right from the beginning, starting with the publication of the Global Burden of Disease estimates in the 1993 World Development Report. The Indian Council of Medical Research (ICMR) approached[42] the IHS for training of their scientists and building of India's national capacity in burden of disease research methodology. A two-week workshop was designed to train epidemiologists in the burden of disease estimation method. Two scientists each from various ICMR laboratories attended the workshops conducted at the IHS in two batches during November, and December, 2001. Two scientists from the Post Graduate Institute of Medical Research, Chandigarh also participated.

Training of ICMR Scientists in Cause of Death Research Method:

Accurate cause of deaths statistics is an important input for estimation of disease burden. Unfortunately cause of death reporting system in India is poorly developed. The IHS has been pursuing research works to assess the usefulness of cause of death statistics in India, and to estimate causes of death in India. These works lead to publication of a landmark article in the National Medical Journal of India on cause of death reporting systems. The Institute's work to estimate causes of death in rural areas of Andhra Pradesh, provided the mainstay of the AP Burden of Disease study. The National Institute of Epidemiology (NIE), Chennai (an ICMR laboratory) approached the IHS for training of their scientists in cause of death research. An Independent Study on Cause of Death Reporting Systems was designed. Two scientists from the NIE visited the IHS for one week during July 2001, and received the training. The ICMR has assigned the Institute to conduct training programs in cause of death research methodology for their scientists and two batches of scientists were trained.

Training of Scientists in Health State Valuation Methodology:

Health state valuation studies are required to measure people's valuation of different morbidity or health states. Alternative terms with similar meanings include health state preferences, health status measurement, and measurement of disability weights. Disability / health state weights represent our judgment about the severity of a health state. The disability

[41]Mahapatra Prasanta; Chalapati Rao PV; Satish Kumar K. District Family Health Survey (DFHS) 2000. A pilot study in three districts of AP to estimate IMR, Fertility and Maternal Mortality. Hyderabad: IHS, RP08, 2001.
[42]ICMR letter No.5/16/24/2001-ECD-II dated 7/9/2001.

/ health state weight is a crucial input for computation of burden of disease. Measurement of functional health status has wider application in clinical medicine and biomedical research. A community-based health state valuation study was conducted at the IHS during 1998-99. Methodology and tools for community-based measurement of health state values were developed. Scientists from the National Institute for the Mental Health and Neuro Sciences (NIMHANS), Bangalore and the All India Institute of Medical Sciences (AIIMS), Delhi, needed to train their personnel to take up a study that required health status valuation. A one-week training program was organised during September, 1999 for this purpose. The participants were introduced to theoretical concepts of health status valuation and were familiarised with the health state valuation kit developed at the IHS. Participants received practical training to work with respondents and elicit their valuation of a health state.

Enterprise Development and Government Effectiveness (EDGE) Program Development for the NISIET, Hyderabad:

The IHS designed a short-term two-week course on enterprise development and government effectiveness (EDGE). The first course was offered by the National Institute of Small Industry Extension and Training (NISIET), Hyderabad during August 1998. The Institute's role was to elucidate the program philosophy, design the syllabus, resource personnel profiles, and reading materials for the first course, which was offered to a group of senior civil servants from Sri Lanka. The EDGE program believes that incidence of entrepreneurs and development of enterprises in a country, is ultimately linked to its culture. Having a vision is a necessary prerequisite but is not enough to make change happen. At a more practical level, cultural and natural resource endowments have to be exploited for economic development. That calls for an understanding of emerging technologies, forces of social change, international economic and political relationships, etc. Shared understanding of the vision, goals and the environment enables planning, coordination and program development. Finally, the plans are to be implemented. Governments can enable development, understand emerging technical, economic environment, have the skill to formulate and then execute plans. These men and women must be personally competent and skilled to comfortably deal with the emerging technical, economic environment. Thus, the EDGE program coverage includes; political - bureaucratic vision about enterprise development, economic - political environment, emerging technologies, government effectiveness, and personal skills of participants.

Verbal Autopsy Skills for the SRS Surveyors:

Starting with January 1999, the Registrar General of India shifted to a SRS based cause of death reporting system. The earlier survey of cause of death rural (SCD-Rural) was discontinued. A landmark article analysing performance of the cause of death reporting system in India, based on work at the IHS was published in the National Medical Journal of India in 2001. A small group of researchers in India and abroad got together and offered to collaborate with the RGI to systematically design the SRS based cause of death reporting system. The IHS was a cofounder of this SRS-Collaborative group. Work at the IHS as well as other centres in the country contributed to development of detailed guidelines for verbal autopsy by SRS surveyors. The IHS conducted training programs at Hyderabad, in December 2002, and Bhubaneswar, in January 2003, for SRS surveyors from erstAP and Orissa

respectively. The Institute's faculty also assisted in training at Bhopal of SRS surveyors from Madhya Pradesh.

Introduction to the Methods of Epidemiology:

Knowledge of epidemiology of diseases and health states is essential for health policy analysis and health systems research. Epidemiology deals with distribution of disease and determinants of disease frequency. This one-week full time course provided an orientation to epidemiology as a basic science for public health. It also provided the quantitative approach to measurement of disease frequency and association. Emphasis was laid on descriptive epidemiology. This course helped to build skills needed by public health professionals to interpret critically the epidemiologic literature. The course was designed for health system researchers, post graduate students in community medicine, medical officers joining biomedical research projects, public health officials, biomedical scientists, and health policy analysts. The course was organised in October, 2001 and was mostly attended by faculties and researchers working at the IHS.

Advanced Studies in Public Health (APH):

Continuing its efforts to build capacity in various areas of public health, the IHS has developed a certificate of Advanced Studies in Public Health (APH) program. The program aims to equip students with essential public health competencies in such areas as research methods, policy analysis and management. The curriculum promotes an interdisciplinary and comprehensive approach to issues related to health, development and provision of health services. The program is designed to provide multiple opportunities for students to practice public health skills and foster critical thinking about issues addressed by them. Students are drawn from a broad range of medical, allied health, technical, humanities, physical and social science disciplines. The program requires four semesters of full-time course work and two inter semester field placements. The first batch started in January 2003 with four students each coming from different parts of the country (Jammu & Kashmir, Gujarat, Andhra Pradesh, and Orissa). The Government of Gujarat sanctioned sponsorship for two candidates in the first year. After completion of this course, all the four students are well placed in various reputed organizations. The Institute has received provisional affiliation from the NTRUHS to offer the programme as a Masters' in Public Health and the Government[43] accorded permission for the same.

IHS- University of Iowa Collaboration:

The Institute entered into a three-year tie-up from 2005-2008, with the University of Iowa, US. The University of Iowa, is a comprehensive public university, established in 1847, with about 1700 faculty, 6000 professional and scientific staff and three hundred thousand students, spread over 13 colleges. The College of Public Health of the University is accredited by the American Council for Education in Public Health and is a leading public health training and research agency in the United States of America. Purpose of the collaboration was to focus on; (a) Joint educational, training and/or research activities, (b)

[43]GO Ms No 173, Health, Medical & Family Welfare (K2) Department, GoAP, dt: 19/08/2009

Exchange of scholars (faculty, research personnel, and graduate students) for study & research, etc.

D. Health Informatics Infrastructure for India:

Certificate Course in Health Intranet System Administration:

The Institute of Health Systems has made efforts to build health informatics infrastructure in India. The IHS offered a training program to build manpower to meet system administration needs of hospitals and health care organisations. This certificate course offered by the IHS was a 15-month training course consisting of three months full time training followed by one year internship. The course taught skills in administering and implementing windows NT, which was accredited to the State Board of Technical Education and Training. CHISA graduates are more versatile as they are trained for system administration PC hardware trouble shooting and building up small local area networks. The program started in 1999, with an intake of 20-30 students each year. Many students were sponsored by the SC[44] and BC[45] welfare department of the Government of Andhra Pradesh. The course was recommended by the GOI Ministry of Social Justice, to the Social Welfare administration of various states as an innovative scheme for employment[46]. 108 students were trained in four batches from 1999 to 2002.

Certificate Course in Health Care Software Development:

Application of information technology to the domain of health care delivery is referred to as Health Informatics. The IHS offers a training program in software development for health care field. This was a fifteen-month program consisting of three months full time course work and one year internship. The program started in 2000. About 15 students were trained in three batches.

Health Level 7 (HL7) Training Program:

Health Level 7 standard is for electronic data exchange in all health care environments with special emphasis on inpatient acute care facilities. The primary goal is to provide standards for the exchange of data among health care computer applications that eliminate or reduce the custom interface programming. This training is to create awareness about the HL 7 protocols for personnel who are in health care field. The program covers all major modules including patient administration, observation reporting from a developer's point of view. Software firms interested to develop health care software particularly for export usually avail of this program to familiarise their developers with the HL7 standard. These include; Citadel Health Limited, Karishma Software Limited, Pentasoft Technologies Ltd., Axsys Health tech, CDR Hospital, Quest Syscon International Pvt. Limited, and Frontier Institute of Information Technology.

[44]APSCFC Proc. No. D5/1796/APSC/99 dt 7/7/1999, 1/3/2000, 9/7/2001, & P3/1473/APSC/2002 dt 20/8/02.
[45]APBCFC Procs. No. M/956/99 dt 24/6/99, 7/2/2000, 7/6/2001, and APBCWD E2/6329/2002 dt 16/9/2002.
[46]Govt. of India Ministry of Social Justice & Empowerment (SCD) Division, ltr no. 11014/30/99-SCD-II dt 11 Jan, 2002, addressed State Secretaries in charge of the Welfare of Scheduled Castes.

3. Contributions to the Telangana Health System.

A. Monitoring Lake Water Quality in Hyderabad Metropolitan Development Area – Pilot Study:

Urban water bodies play an important role towards a healthy living environment in cities. On the other hand, urban lakes are vulnerable on account of various pressures of urbanization. These include, pollution of lake water, obstruction to natural flow affecting natural drainage pattern, encroachments into lake foreshore, tank bed and eventual extinction of lakes. Regular field observation of lake status and monitoring water quality is necessary to protect the lakes and sustain a healthy urban environment. In this context, the Telangana State Pollution Control Board (TSPCB) has commissioned a pilot study for lake water quality monitoring. Environmental Scientists and/or trained Water Safety Surveyors visit identified lakes to observe status and condition of the lake and collect samples for laboratory testing. Field observation reports and laboratory test results are furnished to the TSPCB for their record and appropriate action as needed. The pilot study has been commissioned by the TSPCB[47].

B. Development of Survey Instrument for Patient Satisfaction Survey (PSS) in Ayurvedic Hospitals in Telangana State:

Quality in healthcare consists of two aspects. While technical quality primarily deals with accuracy of diagnosis and procedures and adherence to clinical protocols, service quality refers to the manner in which the healthcare services are delivered to patients. Patients are often unable to accurately assess the technical quality of care. However, patients and their attendants are often able to assess overall quality or service and quality of service in certain functional areas. Patient satisfaction study is about overall satisfaction of patients or their attendants about the health care encounter with a service institution such as a hospital.

Subjective wellness is important component of health status. The four primary dimensions of medical care in Ayurveda (Chikitsa chatushpada) are; (a) physician (vaidyapada), (b) therapeutics (aushadhapada), (c) caregivers (upasthatapada), and (d) patient perceptions (rogipada). A treatment is said to be successful only when these four dimensions are available and effectively delivering appropriate care. Thus, patient satisfaction is a key component of ayurvedic treatment.

The Department of AYUSH (Ayurveda, Yoga & Naturopathy, Unani, Siddha and Homoeopathy), commissioned this study to design a survey instrument[48]. Taking into account the four primary dimensions of medical care in Ayurveda, review of literature on PSS, past experience of PSS in APVVP hospitals, and discussions with faculties in the BRKR Government Ayurveda Hospital, 8 dimensions were identified for measurement of inpatient satisfaction in Ayurveda hospitals. A 29-item bilingual (Telugu & English) inpatient satisfaction questionnaire was developed. The inpatient satisfaction questionnaire can be administered in whole or in parts by selecting the dimensions of interest. An 8-item bilingual

[47] TSPCB Work Order No. TSPCB/HMDA Lakes/2022- Dated 10-11-2022.
[48] Commissioner AYUSH Proceedings No: 935/C/NAM/2019 Dt: 17-03-2022.

outpatient satisfaction questionnaire was also developed. The study was commissioned in March 2022 and report submitted in August 2023.

C. Exploratory Survey of Bottled Water Plants in Hyderabad:

This is an exploratory survey of 34 commercial bottled water plants in greater Hyderabad area. Growth of BWPs in Hyderabad is driven by two broad streams of demand, namely; (a) consumer demand for safe and conveniently packaged drinking water, and (b) growing industrial demand for drinking-water in bulk. Pharmaceutical and beverage industries are a major driver of bulk drinking-water plants. All plants depend completely on groundwater, and use RO technology. Most micro and small enterprises start by packaging in the 20L drinking water can as it requires least investment and are easily sold directly to households, restaurants and small businesses in the neighbourhood. Larger and established retail plants package water into a variety of containers ranging 2 and 1 litre bottles to 200ml pouches. Bulk drinking-water plants deliver their finished water to industries mostly using 20KL tankers. Most plants do not treat their RO-reject for secondary use and do not do anything to recharge groundwater. Many plants are deficient in quality control measures. About 65% plants did not have any post-treatment disinfection unit such as ozonation, UV or microfiltration to assure microbial quality of their finished product. The promotional and regulatory environment of bottled water plants is evolving. Further developments are required for sustainable growth of the water industry, and to protect consumers right to safe bottled or bulk drinking-water.

D. Study of Consumer Complaints and Water Safety in Hyderabad:

Consumer feedback and complaints provide utilities with useful data about consumer perceptions of aesthetic water quality in the distribution system. Consumers as real-time sensors are uniquely positioned to provide feedback. These feedbacks may be specific such as chlorine smell or general such as "polluted water", "bad smell", etc. A responsive consumer-complaints handling system is an essential aid to development and implementation of water safety plans. The Hyderabad Metropolitan Water Supply and Sewage Board (HMWSSB), caters to the drinking water needs of about 9 million people living in the Hyderabad metropolitan area, in Telangana State. In the year 1999, a Metro Customer Care (MCC) service was started for 24x7 registration of consumer complaints. The MCC toll free number was changed from 1916 to 155313 from the year 2009. Call centres operatives register complaints into a database indexed by the consumer account number (CAN), call date, and nature of complaint, selected from a structured list. Time trend of call data is analysed by functional categories, such as water supply and sewerage related complaints. A random sample of 1200 complaints during a year are studied in detail. A surveyor visited each sampled consumer premises, met the consumer or a family member and gathered data about complaint resolution experience, household storage facilities, domestic and street sewer system. A sample of live metro water supply to the household and another sample of water from the concerned service reservoir, was collected for laboratory analysis.

Consumer complaints resolution experience is summarised and major consumer concerns are identified. Information about prevalence of consumer-end water access facilities and practices is gathered and analysed. Information about status of building sewers and street

sewers around is gathered and analysed. Quality of water delivered to households is tested by collecting live samples, and the health of water distribution network is assessed by comparing water quality at consumer-end with corresponding service reservoir sample. The study started in 2017-18 and five annual study reports have been completed, covering complaints in financial years 2017-18 to 2021-22.

These studies show that most of the water supply related complaints fall into four categories, namely; no-water (23% to 36%), water leakage (21% to 41%), distribution issues (12% to 25%), and polluted water (12% to 21%). About 85% to 95% of complainants evaluated MWB response as 'satisfactory' or better (good, very good and excellent). More than 95-98% complaints were attended to within the maximum of 15 days specified in the citizen's charter. About 74 to 85% complaints were attended to within 5 days. However, persistence and recurrence of problems is a major concern. About 86% households have sumps and/or overhead tanks for bulk storage, mostly of metro water. Overall, sanitary conditions of most sumps & OHTs are reasonably good.

Most importantly, the surveys show that, consumer confidence on potability of metro water is quite high. The proportion of households relying on metro water as their primary source for drinking has increased from about 86% during for the first three study periods (2017-20) to 92% for 2021-22. Proportion of households relying on bottled water decreased, from about 13% for the 2017-20 study periods, down to 7.5% for 2021-22. Aesthetic quality of metro water supplied to consumers in Hyderabad has generally been quite good. About 99% of samples from both SR & households satisfy the acceptable criteria for colour and odour. About 99% of metro water supplied to households in Hyderabad tested during the 5-year study period was found to be very palatable (TDS<=500mg/L). About 90% of service reservoir and consumer-end samples did not grow any coliforms at all. The 5-year pooled estimate of faecal coliform events in service reservoir and consumer-end samples was about 0.78%.

Overall, the HMWSSB is supplying excellently palatable, aesthetically acceptable, contamination free potable water in 99% cases. Most of the contamination is attributable to issues with distribution pipeline or consumer connection pipe line.

E. Policy Briefs on Public Health Care System

The following three policy briefs have been prepared and delivered by the end of June 2015. This work was supported by the UNICEF Hyderabad.

PB01: Primary vs Specialist Medical Care: Which is More Equitable?

PB02: Mere Institutional Delivery is Not Enough: Quality Obstetric Care is Important for Further Reductions in Maternal Mortality.

PB03: Rising Cesarean Sections: Causes & Concerns. Towards a Public Health Agenda for Quality & Safety of Maternity Services.

An article “Primary vs Specialist Medical Care: Which is More Equitable? A Policy brief” was published in National Medical Journal of India (NMJI) vide Vol 30, No 2, 2017. The policy recommendation for development of midwifery for improvement of maternity care was highlighted in a newspaper article published in the Hindu (Bring the missing

midwives back. The development of professional midwifery is key to ensuring better quality maternity care, The Hindu, 17 May 2016).

F. Community Health Workers and Access to Primary Healthcare: A Qualitative Study of Accredited Social Health Activists (ASHAs) from a Primary Health Centre in Telangana State, India:

To achieve universal healthcare (UHC), India's National Health Mission (NHM) aims to strengthen community participation through Accredited Social Health Activist (ASHA) community health workers. This study highlights the role of ASHAs in improving access to healthcare in a primary health centre (PHC) area in the state of Telangana. A Primary Health Centre (PHC) in Telangana state was purposively selected. Data were collected from field observations and semi-structured interviews of randomly selected ASHAs (n=8). The findings show that, most ASHAs were found to counsel villagers on RMNCH, but not other health concerns. They regularly dispensed medications and facilitated adherence. ASHAs mobilized villagers for immunizations and provided OTC medicines. More than half of the ASHAs were found motivating women for delivery for pregnancy at government facilities. However, the villagers' response varied: while some opted for delivery at government hospitals, others continued with private facilities. ASHAs were not sufficiently empowered to hold government health services accountable to referred patients. Conclusions made: The ASHA program as implemented in the study area has been a mixed success but represents a potential avenue for achieving UHC. Opportunities for advancing ASHA performance include improving training and improving health service functionality.

The study was by a US Fulbright-Nehru Student Researcher under the IHS Fellowship Program and guidance with the funding from Fulbright-Nehru research grant. A Working paper No 70/2019 was released by IHS.

G. Independent (Third Party) Water Quality Monitoring in Hyderabad Metropolitan Area:

The provision of an adequate supply of safe water one of the eight components of primary health care. The Hyderabad Metro Water Supply & Sewerage Board (HMWSSB) caters to drinking water needs of about 9.6 million people including those living in more than 1500 identified slums. Existing mechanisms for water quality testing are not enough to meet the challenge of a large city like Hyderabad. Therefore, the HMWSSB partnered with the IHS to augment the Board's quality control mechanisms as a third-party check. The IHS Laboratory provided independent water quality monitoring support to HMWSSB from 2005 to 2021. From March 2023, the IHS Laboratory is providing third party water quality monitoring for Hyderabad including the Outer Ring Road (ORR) areas. Water Quality Investigators (WQIs), visit service reservoirs and identified slum areas to monitor residual chlorine, collect live metro supply samples for laboratory testing. All samples are tested for "Residual Chlorine" using N,N Diethyl -P-Phenylene Diamine (DPD) method at the site itself. If Chlorine levels are unsatisfactory, a sample is taken for microbiological analysis. WQIs record their observations using the Nagar Jal Suraksha (NJS) Android developed by the Institute for this purpose. The NJS app helps the WQIs record date and time of testing and laboratory sample collection, along with information about circumstances that could have an

impact on water quality: such as: improper functioning of chlorine machines, availability of chlorine cylinders, absence of operators, power failures, damage to pipes etc. In addition, Sanitary Inspection of Service Reservoirs (SISR) is to check all accessible parts of a service reservoir to rule out vulnerabilities and pathways of contamination i.e., structural and/or operational deficiencies that could allow contamination into the water storage area and putting the public health at risk. Each report provides actionable recommendations to address sanitary deficiencies, if any and improve operational integrity of the SR.

H. Prevention of Waterborne Diseases in Urban Slums of Hyderabad:

The Institute is partnering with the Hyderabad Metropolitan Water Supply and Sewerage Board to identify risks associated with spread of waterborne diseases in slum areas of Hyderabad and provide suggestions to address these risks. As part of this partnership, the Institute regularly monitors quality of water supplied to residents of identified slums. Samples are collected from various sources and tested for residual chlorine and bacteriological contamination. IHS personnel also record their observations pertaining to any circumstances at the slum site that could have an impact on water quality, such as leakage of the tap, damage of the sewerage pipelines and sewerage overflows, cross connections with sewerage pipes, cracked or eroded tap stand, presence of open defecation in the near vicinity, presence of farm animals or industrial pollution etc. Board is notified of all sewerage overflows, with exact address. When the overflows are from within houses, respective households are informed of their potential health hazards. The status followed up during repeat visits. A key focus of the partnership is to empower residents for prevention of waterborne diseases. Field staff inform concerned residents about the potential health hazards and advice remedial action. During outbreaks, the residents were educated about good hygiene practices and measures to prevent water contamination. Community Mobilization by Focus Group Discussions with women in slum is also conducted in each slum. In addition, quality of water supplied by hotels, street vendors, eateries etc., in the slum areas are also monitored. Reports are provided on a daily, weekly, monthly and yearly basis to the Board. The presence of external monitoring and direct reporting of findings to senior most level of Board management, has to a great extent ensured that field staff are vigilant and prompt in carrying out their routine work. Data indicate that there has been an overall improvement in levels of chlorination of water supplied to the slums, during the reporting period. Further, communication of findings on a real time basis to the officers of board, ensures prompt response in taking corrective measures. The project was commissioned by the HMWSSB in February 2005 and renewed from time to time till August 2021[49]. The project has been recommissioned with from March, 2023[50].

[49] Ltr No. MD/HMWSSB/IHS/2004-05, Dt. 11/04/2005, Ltr No. MD/HMWSSB/IHS/2005-06/299, Dt. 31/03/2006, Letter No: DT/HMWSSB/HIS/2007-08, Dt. 26/06/207, 20/12/2007, Ltr No: DT/T1-S2/QAT-HIS/08-09/4907, Dt: 21/01/09, Ltr No. DT/T5-S6/QAT-IHS/10-11/195, Dt: 21/04/10, Ltr No. DT/T5-S6/QAT-HIS/10-11/1457, Dt: 16/06/10

[50] HMWSSB Agreement No. 224

I. Risk Assessment to Establish Health Based Targets for Drinking Water Safety Plans in Hyderabad:

The Hyderabad Metropolitan Water Supply and Sewerage Board (MWB) which caters to the drinking water needs of about 6.5 million people, wanted to pilot water safety plans (WSPs) in three sites, in collaboration with the WHO and the USEPA. Health based targets is a key requirement for preparation & monitoring of WSPs. These targets are to be developed taking into account the disease burden in the community, exposures that contribute most to disease and the socioeconomic determinants of exposure to risks. A Scientific Working Group considered various alternatives decided to gather site specific baseline data on self-reported gastroenteritis (GE) and use it as the major health outcome for purposes of WSP. A random sample 1500 households spread over three sites was surveyed to estimate incidence of GE, understand water supply situation, water handling & household storage practices, bacteriological quality etc. The study was commissioned by the WHO Country Office[51] and completed during August 2007. IHS Publication: RP46/2007.

J. Technical Support for Community Health and Medical Provision Impact of Neonates (CHAMPION) Trial:

Collaborative effort between Naandi Foundation and London School of Tropical Medicine and Hygiene to assess impact of systemic changes in provision and promotion of health care on neonatal mortality. The field trial is being implemented in Nagarkurnool Division of Mahabubnagar District of AP. IHS has been selected as a technical consultant for the study.The Institute has been providing technical support for developing of forms and training manuals, training of surveyors and supervisors and quality control over the length of the trial. Institute has developed survey forms, verbal autopsy tools and training manuals.The project was commissioned by the Naandi Foundation[52] and completed in Nov. 2008.

K. Cause of Death Coding for CHAMPION Trial by Naandi Foundation:

The Naandi Foundation53 joined with IHS as a partner to strengthen the trials on Community Health & Medical Provisions Impact on Neonates (CHAMPION). This was a cluster randomised control trial of a package of interventions aimed at reducing neonatal mortality in 464 villages in Nagarkurnool division of Mahbubnagar district. The trial aimed to substantially reduce the neonatal mortality through systematic changes to the provision and promotion of health care. IHS supported by assessing the Cause of Death (CoD) category and assigning ICD code using Verbal Autopsy Tool. IHS completed 17 lots (each lot will have around 50 schedules). The consultancy was completed in November 2011.

L. Air Pollution and Cause of Deaths in Hyderabad:

"The Effect of Air Pollution on Cause of Death Profile in the City of Hyderabad" was designed to study the cause of death pattern and identify deaths associated with diseases attributable to air pollution. Population, mortality, and air quality data corresponding to 21 air quality monitoring stations in the Greater Hyderabad Municipal Corporation (GHMC) area

[51]WHO India allotment: SE IND PHE 400 XD 06 4, SE IND PHE 011 RB 06 (Sticker No. SE/07/117196 & SE/07/112566), dt: 16/01/2007
[52]Naandi Foundation Contract dt: 15-02-2007
[53]Naandi Foundation Contract dt: 15-08-2008

was collected from the Vital Statistics & Census Departments. Air quality data was gathered from the State Pollution Control Board. Quality of Medically Certified Cause of Death (MCCD) data obtained from GHMC was assessed. MCCD data was tabulated according to the 10th revision of the International Classification of Cause of Death (ICD-10). The study was commissioned by the GoI - Ministry of Environment & Forests. The study started May 2005, interim and final reports were submitted in July 2009 and March 2011, respectively. The results suggest that that the cardiovascular and respiratory causes of death constitute the largest proportion of deaths occurring annually in Hyderabad. Air pollution may have contributed respiratory causes of death. IHS Publication:RP57/2011.

M. Indoor Air Pollution Exposure Atlas Study:

This household survey was part of a collaborative study to develop a predictive model of exposures to indoor air pollution (IAP) from qualitative information about fuel use, and housing characteristics. Other collaborators were; (a) Sri Ramachandra Medical College (SRMC), Chennai (indoor monitoring of RPM), and (b) the Center for Occupational & Environmental Health (COEH), University of Berkeley (modeling). About 1450 households, in 15 villages of Rangareddy, Warangal and Nizamabad districts were surveyed for qualitative information including the 420 households in which another collaborator monitored RSPM levels. A large proportion of households cook their food in the open air. Biomass fuel use was prevalent in all rural households of the three districts. Majority of the households use wood for cooking and were found to be traditional stove users (72-81%). Households using mixed fuels have the highest RSPM concentrations (732 mg/m^3). Households with poor kitchen ventilation had a twofold risk of having high kitchen concentrations compared to households with good ventilation. The project was sponsored by the World Bank - Delhi Office[54]. Work started in November, 2000 and report was prepared by March 2002.

N. Health Effects of Air Pollution in Hyderabad:

Adverse health effects attributable to air pollution is an important public health problem. Air pollutants such as particulate matter have damaging effects on human health. Estimates of the health damages associated with air pollution are required to assess the size of the problem and to evaluate the impact of specific pollution control measures. The IES programme was designed to integrate solutions for multiple benefits. The health effects analysis study aimed to identify and analyze the air quality, public health and GHG mitigation "co-benefits" in transportation and industrial sectors, to develop an initial estimation of the health impacts of PM_{10} (Particulate matter of 10 microns diameter) in Hyderabad and their social costs. The analysis was conducted for Business as Usual (BAU) and four identified alternative mitigation scenarios. The magnitude of health impacts in relation to PM_{10} exposure was calculated using both a health risk assessment approach and percentage increases of mortality or morbidity per unit increase of air pollutant concentration. The analysis was based on Concentration Response (CR) functions derived from available epidemiological studies. Health benefits were computed using Human Capital Approach (HCA) for mortality valuation, and the Cost of Illness (COI) approach for valuing morbidity. Transportation sector is the largest contributor to air emissions (approx. 70% of the total

[54]Purchase Order No. 7113080, dated Nov 10, 2000.

load) in Hyderabad. The effective bus transit mitigation scenario resulted in, 1/3rd reduction of PM_{10} concentrations compared to BAU levels, and the most significant decreases in mortality and occurrence of CVD and other respiratory diseases. The transportation sector was recognized as an area, where significant air quality and public health benefits could be realized through the IES, India Analysis. The project started in November, 2002 and was completed in June 2004, with funding from the USAID[55].

O. Obstetric Facility Assessment Study:

Although most Obstetric complications cannot be predicted or prevented, they can be treated. Since all pregnant women are at a risk of complications, they need to have access to emergency obstetric care (EmOC). This study conducted in the year 2001, assessed the infrastructure for Emergency Obstetric Care (EmOC) in Medak and Adilabad districts[56, 57]. Five categories of public health care institutions (HCI), namely; PHCs, Round-the-clock PHCs, Community hospitals, Area hospitals and District hospitals, were included. Overall, 26 HCIs in Medak and 27 HCIs in Adilabad were studied. Only the District hospitals had comprehensive EmOC facilities. All other HCIs had some deficiency or other. Effective availability of EmOC equipment was a problem in both districts. Availability of obstetricians, and anaesthetists was a major hindrance. Either available equipment is not maintained, or the required equipment was not available. On the other hand, some equipment remained unutilised. The study built up an inventory of private EmOC facilities around primary health centres (PHC) equipped to provide round-the-clock EmOC services. Functional status and adequacy of facilities in PHCs, Area and District Hospitals were assessed. The study was sponsored by the Commissioner Family Welfare, Government of AP[58], and was funded by the UNICEF office at Hyderabad. IHS Publications: RP15/2001, RP17/2001.

P. Epidemiology of Road Traffic Accidents in Hyderabad:

The process of rapid and unplanned urbanisation has resulted in an unprecedented revolution in the growth of motor vehicles worldwide. The alarming increase in morbidity and mortality owing to road traffic accidents (RTA) over the past few decades is a matter of great concern globally. In 2000, motor vehicle accidents ranked ninth in order of global disease burden and showed a rising trend. Estimates for India suggested more than 80,000 RTA deaths per year. This study sought to understand risk factors associated with high level of accidents in Hyderabad and explore causative linkages between accidents and road design, road user behaviour, traffic regulation, and road worthiness. The study was funded by the Indian Council of Medical Research (ICMR)[59]. The study started in June 2004 and final report was submitted in April 2009. IHS Publication: WP62-64/2006, RP48/2007.

[55]Third tier sub contract No. IES India/EPTRI/02 dated 6 Nov. 2002.
[56]Sridhar P. Obstetric Facility Assessment. A Study in Medak, 2001. Institute of Health Systems, RP15, 2001
[57]Sridhar P. Obstetric Facility Assessment. A Study in Adilabad, 2001. Institute of Health Systems, RP15, 2001
[58]Govt. Of AP, Office of the Commissioner Family Welfare RC.No.10103/JD(MCH)/2001 dated 27 Mar 2001.
[59]ICMR No.5/4/-5/1/ADR/NCD-1/2002 dated 27/6/2002.

Q. Data Management for Field Trial to Assess Impact of Systemic Changes in Provision & Promotion of Health Care on Neonatal Mortality:

Collaborative effort between Naandi Foundation and London School of Tropical Medicine and Hygiene. The Field Trial was implemented in Nagarkurnool Division of Mahabubnagar District. The trial covers over 400 villages with equal number of study and control villages. The field team included over 400 surveyors and about 20 supervisors. The Institute provided technical support for developing of forms and training manuals, training of surveyors and supervisors and quality control over the length of the trial. Institute has developed survey forms, verbal autopsy tools and training manuals. Surveyors were trained. The project was commissioned by the Naandi Foundation[60].

R. Socioeconomic Impact of Asthma:

During the working group[61] discussion of the socioeconomic panel of the WHO-NIHLBI "Global Strategy for Asthma Management Project", it became evident that very few studies on social, economic and cultural aspects of asthma has been done in the industrialized and developed economies. In the developing world such studies were not available at all. Without any such studies the panel was handicapped in making recommendations about socioeconomic impact of asthma all over the world. At the same time, the time table of the full project could not be held up because of this. Hence it was decided to go for a few quick exploratory studies. This study[62] was a result of the decision. The social impact of asthma advances far beyond the bar numbers of affected individuals. It creates a burden not only for the individual but also for society, with reduced productivity, quality of life, and economic costs. Social institutions, family practices and behavioral responses can all contribute towards coping with the morbidity. These social and cultural opportunities should not miss the attention of medical and public health professionals. The study[63] sought to develop tools to assess socioeconomic aspects of asthma and to describe them. It revealed that the illness 'asthma' is an easily identified problem both in rural and urban areas. In the rural area, the poor preferred to avail services from the government health facility. Majority (75%) of those suffering from the disease had to either avoid (40%) or restrict (35%) work on account of asthma. The children among them lost on an average 2.66 days of school per month and the adults lost about 1.65-days work per month. In addition to the direct burden of asthma due to loss of school or work for the affected person, families with an asthmatic experience loss of work by other members of the family to attend on the affected person and quite significant expenditure for treatment of the disease. For example, the top two causes cited by asthmatics who perceived their condition as a burden were; (a) overall cost of the treatment takes away a big chunk of the family income, (b) the need for assistance by at least one family member during attacks. Major part of the financial burden was on account of medicine purchase.

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[60]Nandi Foundation Letter & Contract dated 15th Feb 2007.
[61]Dr. Prasanta Mahapatra, President and Director, IHS was a member of WHO scientific group on Asthma
[62]The survey and writing of this paper was made possible by a grant from the NIH-WHO Global Strategy for Asthma Management Project and the Division of Lung Diseases. NHLBI . NIH . Bethesda. MD 20892. U.S.A.
[63]Global Strategy for Asthma Management and Prevention - NHLBI/WHO Workshop Report, Global Initiative for Asthma, Ch 8; pg 120-137; NIH, NHLBI, USA, 1995.

Thus, lowering of prices of asthma medication is likely to increase utilization of the drugs and reduction of morbidity. IHS Publication: WP03/1993.

S. People's Perception Towards Directly Administered Anti TB Treatment:

This study in five villages of Adilabad District, surveyed 200 households consisting of 1104 individuals. There were 348 illness episodes among them. Information about the type of illness, treatment and health facility utilization were gathered for these illness episodes. About 51% of the reported illness episodes were treated by private doctors. Prevalence of tuberculosis (TB) cases was 12 / 1000 persons. Although 95% of the respondents claimed to know about TB, their knowledge about the causes of TB did not reflect a very high level of awareness. Responding to a multiple answer question, only 46% of the respondents incriminated germs, 80% linked it to smoking, 76% to alcohol and 26% linked it to sexual indulgence. Moralistic cultural taboos appear to confound rational knowledge. Cough and blood-in-sputum were identified as major symptoms of TB by 80% and 69% respectively. Social taboo around TB was evident from the fact that about 47% respondents chose to not answer a question about TB among their friends and relatives. Regarding the mode of transmission of TB, 73% identified water, 63% attributed to spit, and only 43% cited the airborne route. Sixty four percent knew that TB is a killer disease, and nearly same percentage of people were aware that it is curable. About local sources of treatment for TB, 22% of the respondents were aware of the PHC, 23% identified Sub Centres, and 21% recognised health workers. When asked about treatment sources outside the village, respondents cited nursing homes (30%), District (28%) and Taluk (26%) hospitals. On Directly Observed Treatment for TB, about 45% of respondents expressed preference to have the drugs distributed in their houses, and another 43% asked for distribution in their village. People preferred to receive the drugs from local volunteers (15%), dais (15%), teachers (15%) or the ICDS workers (10%). For supervision of TB drugs administration people also preferred the local volunteers (40%), teachers (22%), dais (17%) and the ICDS workers (16%). Apparently, most respondents preferred local people who are somewhat educated and whom they perceive to be sincere to take up the various functions for DOT. This study was undertaken by ACTION AID, India. Analysis and study report64 was done by the IHS, in 1997. IHS Publications: RP29/2003.

T. Training of Private Health Workers in Tribal Area:

Private health workers are informal health care consultants and intermediaries helping people access medical and health care facilities. People in tribal areas largely resort to private health workers for informal consultations and in case of more serious illness, to access medical and health care facilities. The Integrated Tribal Development Agency (ITDA) Bhadrachalam, wanted to improve skills of private health workers in their area. The IHS was commissioned by the ITDA Bhadrachalam, to carry out a systematic training needs assessment (TNA), develop appropriate course material and impart training to the private health workers in their area. Inputs from the training needs assessment study, and review of

[64]George Alex; Srilatha S.People's Perception Towards Directly Administered Anti Tuberculosis Treatment Programme - A Pilot Study. Report prepared for Action Aid India. IHS Report Series - RP 29/2003, Hyderabad,

literature to design the course were used to prepare appropriate course material. The draft course material was peer reviewed by medical and nurse practitioners, public health officials, and people working in voluntary health organisations. About 50 private health workers were given training in the year 1994. Course evaluation[65] using base line and end line measurement of knowledge and awareness level showed that the program was very highly appreciated and significantly improved private health worker's skills. IHS Publications: WP52/2003

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[65]Ramesh P.; Umamaheswari; Mahapatra P., et al.Training of Private Health Workers in Bhadrachalam Tribal Area, Andhra Pradesh. Hyderabad: IHS, Working Paper 52, 2003.

4. Contributions to the State Health Systems of Telangana & Andhra Pradesh, by Projects before June 2014, in Erstwhile AP.

A. State of Civil Registration System & Vital Statistics for Monitoring & Evaluation of NRHM Goals:

The Civil Registration System Study was commissioned by the State Planning Department[66]. The aim of the study is do a comprehensive evaluation of the Civil Registration System and Vital Statistics with special reference to their contribution for monitoring and evaluation of the National Rural Health Mission (NRHM) goals.The study has been conducted in the sampled municipalities and panchayats. It was found that: There is steady improvement in the registration levels from year to year. The tabulation of events by usual residence is not happening. There are considerable number of un-tabulated events in spite of their registration. The timely and reliable forwarding of statistical parts to tabulation centers can improve completeness of registration by about 20%. There is no regularity in sending the monthly reports and the mean interval of sending the reports is very high. The tabulation and reporting activities are episodic instead of being sustained which is bound to affect the quality of tabulation. The report was furnished to the Planning department in 2012. IHS Publication:

B. Availability & Job Satisfaction of Medical Officers in Primary Health Centers (PHCs) in Remote and Rural Areas:

This study sought to measure operational availability and job satisfaction of Medical Officers in Primary Health Centers (PHCs) of erstAP. This was a follow up on an earlier study on Critical Gaps in Rural Health Infrastructure, which indicated that policy relevant variables like distance of the doctor's residence and private practice may affect operational availability. But the small sample size of that study did not allow for precise estimation of these effects. The sample for this study consisted of 186 PHCs in 22 districts and 9 ITDAs covering Telangana & Andhra Pradesh. Six PHCs were randomly selected from each ITDA, and another six PHCs were randomly selected from each district after excluding the ITDA areas.The data collection instruments were rigorously field tested and revised with the insights gained from the field work. The field work was completed and the report was submitted in January 2011. It was found that, doctors who were staying within 20 km distance from PHCs were attending to their duties most of the days in a week. The private practice by doctors staying within 20 Km of PHC headquarters did not affect availability. The study was commissioned by State Department of Planning[67]. IHS Publication: RP54/2011.

C. Technical Assistance for Setting-up Strategic Planning & Innovation Unit (SPIU) for Health Sector Reform:

In 2007, the erstwhile Government of Andhra Pradesh (Erst AP) was developing its state health policy based on the Health Sector Reform Strategy Framework and agreed prioritised milestones for achieving improved utilization of health services especially by the

[66] GO Rt. No: 59, Planning (IV) Department, GoAP, dt: 22-01-2010
[67] GO Rt. No: 133, Planning (IV) Department, GoAP, dt: 07-02-2009

poorest people and in the underserved areas. The objective of the AP Health Sector Reform Programme (APHSRP) was to reach the health MDGs, provide new models for improving systems and deliver better health services to the poor. The Institute was commissioned to assist the Department of Health, Medical and Family Welfare (DoHMFW) to plan for first year's activities so that the department is mobilized and program can be launched as soon as the funds are approved for the reform process. The IHS was asked to assist in setting up of the Programme Implementation Unit, preparation of action plans for the achieving the 1st year milestones, its integration within the annual plan of the DOHMFW, and to initiate the district planning process as well as preparation of tribal health plans. The Medium-Term Strategy and Expenditure Framework for Health and the NRHM framework served as the blueprint for initiating planning for the first year's activities of the State Health Sector Support Program. The project was funded by the United Kingdom's DfID[68]. The IHS developed Terms of Reference document for setting up of Strategic Planning and Innovation Unit, which was embedded in the Secretariat Department of Health & Family Welfare.

D. Assessment of Critical Gaps in Rural Healthcare System:

The study assessed critical gaps in health care system of rural areas in erst Andhra Pradesh and suggest remedial measures for improvement of the same. Specifically, the study aims to (1) assess the availability of health services in rural areas, (2) identify critical gaps in health infrastructure facilities in rural areas (3) identify "software gaps" in PHCs in the form of non-availability of essential manpower, i.e., Medical Officers and Nursing Personnel, (4) identify other factors contributing to the deficient health care in rural areas., and (5) suggest actionable recommendations for improvement. The study used both qualitative and quantitative research methods, using of both secondary and primary data sources. A total of 6 districts were selected for the study -one high IMR district and one low IMR district from each of the three geographical regions. The two districts from Telangana were; Karimnagar (Low IMR) and Mahaboobnagar (High IMR). The four districts from Andhra Pradesh were; Krishna (Low IMR, Andhra), Cuddapah (Low IMR, Rayalaseema), Vizianagaram (High IMR, Andhra), and Anantapur (High IMR, Rayalaseema). Six PHCs were selected at random from within each of the above six districts. Inspection of physical facilities, infrastructure, equipment, drug and consumable stores, registers etc., have been conducted as part of an observational study to assess the current status of physical facilities. In addition, health care providers, community leaders and patients were interviewed at each PHC. The study was commissioned by the State Department of Planning[69]. The study began in March 2006 and was completed by June 2007. IHS Publication: RP41/2007.

E. Baseline Assessment of Nutritional and Health Status of Primary School Children:

This study was conducted for the Azim Premji Foundation as part of their existing Educational Intervention in 200 schools in 5 districts of AP, in partnership with Government of Andhra Pradesh and was funded by the World Bank[70]. Baseline data on nutritional and

[68]DFID Contract No. CNTR/MSAP/HSR/DSC/2007/2531, Dt. 28/05/07.
[69]Department of Planning , GoAP sanction letter G.O Rt. No. 165 dated 4/3/2006
[70]World Bank Contract No: 7151113, dt: 13-05-2009

health status of about 3200 primary school children was done in which nutritional anthropometry, blood test for hemoglobin to detect prevalence of anemia, stool test for estimation of parasitic infestation, clinical screening for detection of Vitamin A deficiencies and refractive errors was done by IHS. Qualitative data was collected on knowledge attitude and practice (KAP) food and hygiene practices among Primary School children. Results of the study revealed a moderate to high prevalence of anaemia (31%), high degree of malnutrition (33-41%) and prevalence of worm infestation (4%) among the primary school children. An intervention package comprising of iron supplementation along with deworming and nutrition education was been recommended by IHS after approval by the Institutional Ethical Review Board. The intervention was carried out by the Azim Premji Foundation. The study started in June 2009 and completed in September 2009.

F. Frontiers Prevention Program (FPP) Outcome Evaluation:

Frontiers Prevention Program (FPP) aims to support the delivery of a comprehensive package of interventions on targeting populations, who are seen as key to HIV/AIDS epidemic dynamics: sex workers, men who have sex with men, and people living with HIV/AIDS. These interventions occur within specific geographic sites that are seen as potential high HIV-transmission areas. The outcome evaluation seeks to measure the effect of the interventions. The study aims to evaluate: whether the FPP empowerment for prevention approach increases the level of social capital (community trust, reliance, responsibility and civic participation) among key populations actively involved in the interventions and wider key populations exposed to the interventions; and whether increased social capital lead to increasing empowerment for prevention, actual reduction in risk behaviours and changes in knowledge attitudes and behaviour. The study also seeks to evaluate whether the FPP approach lead to an enabling environment in which stigma and discrimination are reduced; the relationship between an enabling environment and social capital; to what extent are NGOs / CBOs and the services they provide participatory, client - centered and community based, and how does this change over time as a result of capacity building and other inputs. The baseline study of the outcome evaluation was completed in December 2005 and findings published[71] Results from the study was presented at the XV and XVI International AIDS Conference. The study was sponsored by the International HIV/AIDS Alliance and Horizons (Population Council).[72] The Institute has been commissioned to conduct the end of project evaluation which was completed by August 2007[73].

G. Health Equity in erst AP:

Health Metrics Network established by the WHO is working with countries on the development of a set of standards and tools to improve synthesis, analysis and data use for major health planning and decision- making, such as health sector reviews and strategic plans. In India it has commissioned the IHS to conduct an assessment of health and equity.

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[71]Letter of contract from The International HIV/AIDS Alliance, UK, dt: 10.02.2004

[72]C.K. George , Kavitha Krishna, N.S. Reddy and B. Srikanthi, Social Context Assessment for HIV/AIDS Prevention Programmes in Andhra Pradesh. Report of the Outcome Evaluationof the Frontiers Prevention Programme : IHS RP 32/2005.

[73]Subcontract under agreement no. AI03.32A between Population Council and the International HIV/AIDS Alliance with funding from United States Agency for International Development (USAID). Dt: 25th July 2006

The study will assess different aspects of equity for some important stratifies: e.g., urban/rural inequalities, wealth inequalities, gender and education-related health inequalities on health variables such as MR, U5MR, measles vaccination, skilled birth attendance, preventive therapy of malaria in pregnant women, malnutrition in children (stunting), and combined variable called co-coverage. Some of these inequalities in health will be decomposed into the contributing factors. The study was completed by August 2007[74]

H. Trends and Analysis of Health Status in erstAP:

Health Metrics Network established by the WHO is working with countries on the development of a set of standards and tools to improve synthesis, analysis and data use for major health planning and decision- making, such as health sector reviews and strategic plans. In India it has commissioned the IHS to conduct a situation and trends analysis which will build upon existing review process and data-gathering mechanisms. The review will be based on service data, data on health resources (human resources, financing, infrastructure), health system immediate outcomes, and health status data (mortality, morbidity and causes of death). Data form different sources will be reconciled to develop best estimates and to make health projections where possible. The study was completed by August 2007[75]

I. Medium Term Expenditure Framework (MTEF) for State Health Sector:

The erstwhile Government of Andhra Pradesh wanted to develop a medium-term strategy and expenditure framework (MTEF) for health sector for the period 2006-11. The Institute was commissioned by the Department of Health and Family Welfare to develop the MTEF[7677]. The study involved analysis of health expenditure by sources of funds, functions of care, providers and resource categories; estimation of the resource envelope; costing of medium-term strategies and development of the MTEF by reconciling bottom-up estimates of the cost of carrying out policies, both existing and new with the resource envelope available for public health expenditure. Health budget data of the previous five years was analyzed up to detailed head level using National Health Accounts framework to understand trends in public health spending and make projections for a “business as usual” scenario. Data included Demand for Grants of DoHMFW and related line departments such as Department of Women and Child Welfare, Department of Labour and Department of Tribal Welfare, and receipt and expenditure statements of disease prevention and family welfare societies established by the government. Cost of medium-term health strategies were estimated using State and Nationally recommended norms. The study began in October 2005 and was completed in May 2006. The department adopted the framework and again commissioned IHS to develop MTEF for 2008-13. The report was submitted in December 2009 to rollout for the year 2011-13. IHS Publication: RP38/2006, RP52/2010.

[74]WHO, Geneva: MHI/HSE, Proj. Allot. No. GL/GLO/IER/013/XG/06.999.00, Obligation No.: HQ/06/053856, dt: 17/07/2006.
[75]WHO, Geneva: MHI/HSE, Proj. Allot. No. GL/GLO/IER/013/XG/06.999.00, Obligation No.: HQ/06/053856, dt: 17/07/2006.
[76]Contract No.: CGG/CTR/05(P)/06(2)/05-06
[77] Contract No: CGG/CTR/GRP.II/02-02/HM&FW(P6)2007-08

J. Baseline RCH Survey for RCH-II Project:

The Reproductive and Child Health (RCH) Project -II in was implemented from during 2005-2010. The RCH programme is an integrated, focused and participatory program aimed at meeting the unmet demands of the target population. It aimed to reduce the infant mortality rate from 59 to less than 30 per 1000 live births, reduce neonatal mortality rate from 36 to 15 per 1000 live birth, reduce maternal mortality ratio from 340 to less than 100 per 100,000 live births; and increase the institutional delivery from 64% to over 90 % by the end of the project period. Objectives of the baseline survey was to provide district level data on key maternal and child health indicators such as infant mortality rate, ANC coverage, delivery care, postnatal care, breastfeeding practices, prevalence of diarrhoea and ARI, contraceptive use, child immunization coverage, reproductive tract infections and awareness of selected health interventions under RCH-II. Data on these indicators were need to assess regional imbalances in health status and provision of MCH services and help formulate district-specific interventions and for allocation of resources. IHS was commissioned by the Commissionerate of Family Welfare to conduct the survey in three districts[78]. The study was completed in November 2006.

K. Reproductive Health Services and Sector Reform:

The IHS was commissioned[79] by the Government of erst AP to prepare a State Action Plan for reproductive services and health sector reform. The current status and time trend of reproductive and child health in the state was reviewed[80,81]. Reproductive and child health program implementation in the state was reviewed with the help of independent sources of outcome and process indicators and data collected from program implementation authorities. Qualitative information about implementation of reproductive and child health services in rural areas was collected using focus group discussion with ANMs[82] in the state. Further insights about delivering reproductive health services in rural areas of the state was gained from a group of randomly selected well reputed PHC Medical Officers[83]. Simultaneously, the state government had commissioned policy reviews on various aspects such as (a) workforce management, (b) decentralization, (c) rational use of infrastructure, and (d) analysis of financial systems. Available results of these policy reviews as well as the states vision 2020 health goals were referred to. Earlier the Institute has done a study to understand performance of the cold chain system in AP[84]. Results from these exercises contributed to the development of a state action plan. Major recommendations in the state action plan include; (a) basic package of services, drugs, equipment, supplies and furniture to be made available at the Sub

[78]Commissioner of Family Welfare, DoHMFW, GoAP,Rc. No.: 276/CFW/D&E- 2/2006
[79]Govt. Of AP Commissioner Family Welfare Rc.No.5001/FW/EC/2001 dated 26 May 2001.
[80]Mahapatra Prasanta, Pushpa Latha, Reproductive Health Status in Andhra Pradesh. Institute of Health Systems, WP/46, 2002.
[81]Mahapatra Prasanta, Pushpa Latha, Samatha Reddy, Child Health Status in Andhra Pradesh. Institute of Health Systems, WP/47, 2002.
[82]Mahapatra Prasanta, Samatha Reddy, Pushpa Latha, Mary Nacy, Reproductive Health Services and Health Sector Reform. Focus Group Discussions with ANMs. A Report. Institute of Health Systems, RP/18, 2002.
[83]Mahapatra Prasanta et al., Proceedings of PHC Medical Officers' Workshop on Health Services and Health Sector Reform in Andhra Pradesh. Institute of Health Systems, RP/19, 2002.
[84]Mahapatra Prasanta, Swati Gayathri, Samatha Reddy, A Study of Cold Chain System in Andhra Pradesh. Institute of Health Systems, WP/45, 2002.

center; (b) improvement of locational convenience and accessibility of PHCs and sub centres; (c) expansion of a scheme to increase institutional deliveries, using private partnerships, etc. Work on preparation of the state action plan started in August, 2001 and was completed in November, 2002.

L. Vaidya Vidhana Parishad Hospitals' Performance Analysis:

An important goal of the Vaidya Vidhana Parishad (VVP) is to improve hospital efficiency and quality of service using performance measurement and analytic techniques on a regular basis. The VVP administered about 150 first referral hospitals in erstAP consisting of Community, Area and District hospitals in Telangana and AP. The IHS was commissioned[85] to undertake a performance analysis of these hospitals on monthly basis. Every month hospital activity indicator and service mix data were collected from the first referral hospitals, and performance analysis done. Each month the Institute's researchers would visit about 20 hospitals to collect qualitative information and to verify data accuracy. These periodic analysis of hospital performance reports[86] including the field visit reports were furnished, every month, to the hospital management for further action. The Institute assisted the VVP for about three years between July 1998 to 2002. There after the VVP did the performance analysis in-house. IHS Publications: RP05/1998, RP06/1999, RP07/2000, RP23/2002.

M. Patient Satisfaction Surveys in Vaidya Vidhana Parishad Hospitals:

Patient satisfaction survey is a reliable yardstick to assess the quality of health care extended by the health institutes. The aim is to generate statistically accurate estimates of patient's feedback for each hospital, so that inter hospital comparison is possible. It generates data for theoretical importance and for practical purposes such as planning, administration and evaluation of health care services. The Institute was commissioned[87] by the APVVP to conduct patient satisfaction surveys in APVVP hospitals at half yearly intervals between June 1999 and March 2002. These surveys provide useful feedback on functioning of different areas in the respective hospital and helpful insights about patients' preference. The study obtained feedback from patients and, in case the patient could not be interviewed, the attendant. For the survey a modified version of the Patient Satisfaction Questionnaire-III originally developed by the Rand Corporation Medical Outcomes Study[88] was used. In each hospital, list of patients staying more than 5 days were obtained. The list was stratified by major wards and a random sample were drawn from each ward, proportionate to its bed

[85]APVVP Proc. Rc.No.7552/WB(D)/98 dated 24 Aug 1999, 18 Dec. 1999, 6 Apr 2000, and 12 Apr 2001.
[86]IHS; Periodic Analysis of Hospital Performance: APVVP Monthly Reports from July-December, 1998. Hyderabad: Institute of Health Systems, RP05/1998. Jan-Dec, 1999: RP06/1999; Jan-Dec. 2000: RP07/2000; and Jan-Dec 2001: RP23/2002.
[87]APVVP Proc. Rc.No.7552/WB(D)/98 dated 24 Aug 1999, 18 Dec. 1999, 6 Apr 2000, and 12 Apr 2001.
[88]Hays RD, Davies AR and Ware JE; Scoring the Medical Outcomes Patient Satisfaction Questionnaire; PSQIII. MOS memorandum, Rand Corporation, Santa Monica, 1987, reproduced in Wilkin et al., Measures of need and outcomes for primary health care, New York, Oxford Medical Publications, 1992 (p233-234).

strength. The Institute brought out five half yearly [89,90,91,92,93] beginning June 1999. IHS Publications: RP21/2002, RP24-27/2002,

N. Herbal and Traditional Medicine Policy Study:

Around the last quarter of the twentieth century, people gradually realised that subtropical forests are a rich source of medicinal herbs which the local tribes and traditional practitioners have been using for various ailments. This ethnobotanical information is likely to be lost unless cared for. Herb based pharmaceuticals have gained wider acceptance in the industrialised economies. Many modern pharmaceuticals were developed from chemicals using structural and functional insights gained from plant sources. The intellectual property rights of traditional inhabitants of an area from where the basic plant material, leading to the discovery of new drugs, is collected and has been increasingly recognized and preserved. This local knowledge about medicinal herbs has an economic significance, for the indigenous people. This study made comprehensive review of literature and highlighted the long term economic potential of ethnobotanical knowledge base in our country. MEDFLOR-India a database of medicinal flora in India was set up at the Institute. The database contains information about ethnobotanical knowledge base in erst AP. A structured format for collection of ethnobotanical information was developed[94]. The study contributed to highlight the economic importance of herbal and traditional medicine, ethnobotanical knowledge base etc. Many official efforts have followed since then. Another aspect of the same project was to review the adequacy of the formal primary health care (PHC) systems in tribal areas. It was found that the PHC System in tribal or remote areas are a simple extension of such systems in plains, with some concessions in population norms. This study highlighted inadequacy of this approach and recommended restructuring of the PHC set up in tribal areas. One of the recommendations eventually lead to creation of a separate Tribal Health Service in Andhra Pradesh. The study started in March 1991 and report[95] was prepared by to Nov. 1992. The study was sponsored by the Girijan Cooperative Corporation[96].

O. Private Health Sector in erst Andhra Pradesh:

The Institute has been actively studying various aspects of the private health sector, with special emphasis on standards and quality assurance. A computerised database of health institutions in erst AP had been set up. The private hospitals and nursing homes component of

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[89]IHS; APVVP Patient Satisfaction Survey, 1999. Hyderabad: Institute of Health Systems, RP24, 2002.
[90]Mahapatra Prasanta, Srilatha S., Subhasree Srinivasan, Sarikonda Sreenivasa. APVVP Patient Satisfaction Survey, June 2000. IHS Report Series 2000;2000(25).
[91]Mahapatra Prasanta, Sarikonda Sreenivasa. APVVP Patient Satisfaction Survey, December 2000. IHS Report Series 2002;2002(26).
[92]Mahapatra Prasanta, Gop Bhagirath. APVVP - Patient Satisfaction Survey, June 2001. IHS Report Series 2002;RP(27):1-35.
[93]Mahapatra Prasanta; Srinivas KallamAPVVP Patient Satisfaction Survey, December 2001. Hyderabad: Institute of Health Systems, RP21, 2002.
[94]IHS; Proceedings of the seminar on Medflor- India and Ethnobotanical research in Andhra Pradesh, India. Institute of Health Systems, wp04, 1992.
[95]IHS; Potentiality and relevance of herbal and traditional medicine for promotion of health and development of tribal economy in Andhra Pradesh. Institute of Health Systems, WP 05, 1992.
[96]GCC VC&MD Proc Rc.No.2625/91-MHD dated 12 Jun 1991, 6 Jan 1993, and 26 Apr 1993; and RC No.1630/93/MHD dated 31 Dec 1993.

this database was incorporated in 1993 and was further validated in 1994. Feasibility of accreditation systems in India and erst Andhra Pradesh was been explored. The IHS was commissioned[97] by the AP First Referral Health Systems Project (APFRHSP), to take stock of the private health sector in Andhra Pradesh and identify appropriate policy choices for their overall development. A workshop was organised in May 1998, with participants from the private health sector and public health officials. Result of the studies spearheaded by the IHS were presented in the workshop and various issues were discussed. A comprehensive report[98] on the private health sector in AP and policy recommendations regarding the private sector has been brought out. Although the studies and workshop were organised in the context of erst Andhra Pradesh, the issues, findings and solutions proposed here are relevant to the health systems of all states in India as well as many other developing countries. IHS Publication: RP01/1998.

P. Medium Term Financing Strategy for Health Sector in erst AP:

The IHS was appointed as the State Consultant, by the Government of AP for the development of medium-term financing strategy for the health sector[99] with financial support from the Department for International Development (DFID) of the Government of United Kingdom[100]. The health sector reform is to fulfill the State's structural adjustment targets pertaining to financing of primary health care. The Institute conducted a strategy development workshop in April 2001 to kick start the strategy development process[101]. The DFID appointed Harvard School of Public Health - International Health System Group (IHSG) to continue the strategy development work in a two-phase process. This Institute, introduced the Harvard IHSG team members to key stake holders, familiarised them with relevant official documents and literature and provided other inputs gained from our experience in working with the AP health system. In addition, the IHS reviewed existing information and analysis on burden of disease in AP, suggested important gaps in current priorities and highlighted strengths of current priorities from a burden of disease perspective[102]. Phase two of the exercise involves analysis and projection of the resource envelope for the MTFHS, development of specific strategies including the priority areas identified in phase one, and formulating Medium Term Strategy Expenditure Framework in collaboration with the state government. Phase two of the project started on 10th September, 2002. The IHS role during this second phase was to contribute towards preparation of state health accounts for AP. This work started in March 2003 and was complete by June 2003.

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[97]PD APFRHSP Proc. Rc.No.2249/WB/F/98 dated 9 April, 1998.
[98]Mahapatra Prasanta, The Private Health Sector in Andhra Pradesh. Institute of Health Systems, RP01, 1998.
[99]Govt. Of AP GO Rt. No. 338 dated 22/03/2001.
[100]Funds for the Strategy Dev. Workshop was received from the DfID India. Funds to support the IHSG team was through Harvard Univ. sub contract dt 4 Dec. 02, - DfID prime contract No. DCPS/APST/SSHE/SUP/01/463.
[101]Institute of Health Systems SDW Team. Proceedings of the Strategy Development Workshop for Health Sector in Andhra Pradesh. Institute of Health Systems, RP12, 2001.
[102]Mahapatra Prasanta and George CK. The State of Health and Burden of Disease in Andhra Pradesh, about 2000AD. Annex 6 in Berman A Peter et al., Development of Medium Term Health Sector Strategy and Expenditure Framework for Andhra Pradesh, Phase I: Final Report. Harvard School of Public Health and International Health Systems Group, Boston, July 24, 2002.

Q. State Health Accounts for erst Andhra Pradesh:

National health accounts (NHA) document total health care financing and expenditure within a particular health system. Health expenditure consists of financial outlays that service the health system. NHA trace the resources invested and consumed in the production of health and facilitates further research and meaningful policy analysis. In the Indian context, state level studies are at least as important as overall national analyses. In some respect, state health accounts (SHA) are more important, because many of the major policy decisions concerning resource allocation to health and social sector are made at the state level. The Institute has developed a comprehensive State Health Accounts for Andhra Pradesh. Secondary data pertaining to health expenditure was collected from various state government departments and central ministries, CGHS and ESIS, private insurance companies, local bodies, etc. Primary surveys were done to estimate health expenditure by NGO's, voluntary and charitable organizations, public and private sector firms. The work started in March 2003 and was completed in May 2004. The results of the study was published[103] and has been cited in national policy documents such as the report of the National Macroeconomic Commission for Health. The project was funded by the Department for International Development (DfID), Government of U.K[104]. IHS Publication: RP31/2004.

R. Health Education and Communication Strategy for Leprosy Control:

The Institute was commissioned by Lepra India[105] to assess the quality of services provided by their staff, and to strengthen its communication strategies. The study included, Knowledge, Attitude and Practice (KAP) studies of leprosy patients, family members, key informants and providers and Focus Group Discussions of leprosy patients in rural, urban and tribal areas to explore more hidden facts. In addition, a few case studies were reviewed to highlight certain social issues and need of health education. Patients and their family members who participated in the study had low levels of knowledge about leprosy. While the knowledge levels of key informants such as teachers, government employees, sarpanches, business men, students etc., were found to be high, the knowledge levels of providers such as Non-medical assistants, Nonmedical supervisors and medical officers needs to be improved. The study highlighted the need for developing communication strategies based on local needs, training of provider staff in health education, computerization of geographical details and patient data and use of available resources for health education. The study started in September 2000 and the report was submitted in February 2002[106].

S. GE Manual for Health Workers:

Government of erst Andhra Pradesh Commissioned[107] the Institute to prepare a comprehensive manual to achieve better control of the gastroenteritis (GE) situation in the state. This manual departs from traditional program implementation manuals and is addressed to every one who have a role towards control of gastroenteritis. The manual starts with a brief

[103]George C K, Pattnaik G S, Andhra Pradesh State Health Accounts 2001-02: IHS, RP 31/2004
[104]DFID Contract No: CNTR/APST/SSHE/CON/816, dt: 21/02/03
[105]Lepra India Letter No. LEP/PROG/CE dated 25 Jul 2000.
[106]Srilatha S. A Study on communication strategy in Lepra India. Institute of Health Systems, RP14, 2001.
[107]Government of AP GORt. No. 1495 dated 7/12/2000, HM&FW department.

overview of the causes of GE and basic insights relevant for an understanding of control measures. The book describes proper use of water for drinking, and personal hygiene to avoid gastroenteritis. Tips of recognition of gastroenteritis are provided. Steps for preparation of oral rehydration solution and its usefulness in management of GE are described. The book gives instructions about surveillance of drinking water and food quality, early detection of GE outbreaks and medical management of GE cases. The need for proactive information and education strategy to secure community involvement in control of GE outbreaks is emphasised. Health officers are expected to proactively release press notes giving information about the cause of outbreak, and what can people do to avoid or minimise its adverse effect. Myths and misconceptions about the role of vaccination and the futility of running after vaccination to control adverse effect of a GE outbreak is highlighted. Case studies of a few actual GE outbreaks reported by the public health department are given. To facilitate work of public health officials and empower general public in testing of water or food quality, addresses and where ever available contact telephone numbers of public health laboratories, water and / or food testing laboratories, both in public and private sector have been given. Food hygiene tips for caterers and food handlers is provided. The manual is a comprehensive handbook for health workers, health educators and a good reference for the general public. Government printed 5000 copies and distributed among health workers in the state. The book has also been published by the IHS for general reference[108].

T. Malaria Manual for Health Workers:

The Institute has developed a manual on control of malaria. The manual gives an overview of mosquito, its causative relationship with malaria and basic insights on the malaria problem. Entomological field techniques are emphasised to help build a strong surveillance system. A model syllabus on applied entomology is recommended to study of entomology in colleges and universities and their involvement in assessment of local entomological profile. Indicators to assess malaria situation are discussed. The manual helps individuals, families and neighbourhoods to recognise their role towards prevention of malaria. Importance of personal protection measures is discussed. Practice guidelines for diagnosis and treatment of malaria by medical practitioners and health care delivery institutions are presented. The environmental, chemical and biological control measures of mosquito vector is highlighted. The preparation of manual was commissioned by Government of Andhra Pradesh[109] in December, 2000 and was published by June, 2001[110].

U. Health Systems Responsiveness Survey:

Health system performance measurement is important: first as a means of identifying the shortcomings of health systems, as in explaining why countries with similar levels of income fail to achieve similar levels of health; secondly, for providing indicators that allow evaluation of a health system over time. Both these activities in turn could contribute in the future to a pool of evidence that can provide the basis for confirming or rejecting if specific

[108]Mahapatra Prasanta, Samatha Reddy. A Manual on Contro of Gastroenteritis with Special Reference to Andhra Pradesh, India. Institute of Health Systems, 2001.
[109]Government of AP GORt. No. 1495 dated 7/12/2000, HM&FW department.
[110]Mahapatra Prasanta, Sai Kumar, Dhanaraj. A Manual on Control of Malaria with Special Reference to Andhra Pradesh, India. Institute of Health Systems, 2001

financing and provision mechanisms are particularly appropriate under given conditions. Health system performance involves three discrete aspects: medical, responsiveness and fair financing. This study measured responsiveness of the health system in AP to individuals' expectations regarding the non-clinical enhancing aspects of the health system. The study used a multistage stratified random sampling procedure for selection of household clusters in rural and urban areas of Andhra Pradesh. Clusters were randomly selected with probability proportionate to the population in the cluster. A total of 221 clusters were selected statewide. From each cluster a simple random sample of 25 households was drawn. A total of 5134 households were surveyed. One adult from each household, was randomly selected to give a age sex representative respondent population. Kish tables were used for this purpose. The survey sought to measure eight distinct aspects of health system responsiveness pertaining to elements related to respect for human beings as individuals, that are largely subjective and judged primarily by the client, and the more objective elements related to how a system meets commonly expressed concerns of patients / clients and their families as consumers of health system. Anthropometric measurements, information on prevalence of 15 non communicable diseases and details of deaths in the family within the past 24 months, of each respondent was also collected. In addition, case studies of habitations and wards were done to capture valuable qualitative information.

The study provided valuable insights into responsiveness of the health system to patient/client needs and expectations. Respondents in urban areas had better access to health care institutions than those in rural areas. The average time taken for people to access health care was 56 minutes and 142 minutes in urban and rural areas respectively. It was found that people in urban areas have better access to public health care institutions than those in rural areas. Respondents in rural areas preferred to go to a private provider as they could not rely on the primary health centre for any serious health care need. Of the eight dimensions of health system responsiveness studied (respect for dignity, respect for confidentiality, respect for autonomy over treatment, prompt attention, communication, basic amenities, social support and choice of provider), 53% of the respondents rated prompt attention to their needs as most important. Communication of information relating to health condition and respect of dignity of patient was rated as most important by 23% and 14% of the respondents respectively. Only 3% of the respondents rated choice of provider as most important. The survey found that 36% of the respondents did not seek any health care because they could not afford it. About 16% of the respondents said that they were refused health care because they could not afford it. The survey also found that 31.6% of female respondents and 27.8% of the male respondents had varying degrees of Chronic Energy Deficiency (CED). About 15% of both male and female respondents were found to be obese. The obesity levels in the survey were 4 to 5 times higher than that reported by the National Nutrition Monitoring Burueau (NNMB) survey in 1996-97. The age specific death rates computed from survey data was more or less similar to SRS 1996-97 rates. The study started in 2000, and results were reported by December 2001[111]. Funding was provided by the WHO, Geneva[112].

[111]Nanda Lipika. Andhra Pradesh Health and Health Systems Responsiveness Study 2001. IHS, RP11, 2001
[112]WHO File E50-445-1. Allotment GL GLO GPE 222 XG 00 S999 00. Obligation No. HQ/00/113185.

V. Quality of Reproductive Health Care by Private Hospitals in AP:

Objectives of this study were to ascertain the perceptions and expectations of the women regarding quality of reproductive health care offered in private hospitals of erstAP, and to assess quality gaps in the provision of reproductive health care by them. A sample of 127 private hospitals and nursing homes were chosen from four districts, namely; Krishna, Nellore, Mahboobnagar, and Cuddapah. An exit survey of female patients with reproductive problems was done to assess women's expectations. Draft standards for selected reproductive health procedures, namely, normal delivery, Caesarean section, and medical termination of pregnancy, were developed by a core group in the Institute. The core group used information about women's perceptions and expectations from hospitals. A multidisciplinary standards panel consisting of stake holders consisting of obstetricians practicing in small to medium nursing homes, teaching hospitals etc., women activists, nursing and allied health personnel was formed. Satisfaction of quality of reproductive health service standard by private hospitals and nursing homes was assessed by comparing their actual facilities with the standard. The study found that a large number of inadequately trained personnel are being used by private hospitals and nursing homes to perform nursing, pharmacy and laboratory technician functions. Basic minimum infrastructure such as physical facilities, and equipment are lacking in many private hospitals and nursing homes. Management of emergencies is poorly organised. Medical record maintenance was poor. Work on the project started in March, 1996 and final report[113] released by September, 1998. Funding was provided by the John D & Catherine T Mac Arthur Foundation, Chicago[114].

W. Hospital Autonomy: A Case Study of AP Vaidya Vidhana Parishad:

The Andhra Pradesh Vaidya Vidhana Parishad (APVVP) was commissioned in 1987 to management of all secondary level hospitals in the State of AP. This is the first autonomous body of public hospitals, set up by any state in India. This experiment caught attention of the Government of India, various states in India, the World Bank and the Harvard University's Data for Decision Making office (DDM). This study was jointly conducted by the DDM and the IHS to document the case of hospital autonomy through the APVVP. The study found that full benefits of autonomy can be better realized if the right person is selected for the job. Full benefits of good leadership can be better realized if the environment is enabling. Because of its autonomous nature, APVVP has been very successful in mobilizing institutional finance and resources from public. Autonomy has also been useful in ensuring gains on other fronts, like maintenance of equipment and buildings, and to some extent, quality of care. However, autonomy has meant little or nothing to the staff employed in the organization, and has not been accompanied by any incentives for those working in the organization. While APVVP, an organization managing over 160 hospitals with a total of over 9,000 beds, is an autonomous organization, the individual hospitals, that are discrete units by themselves, are not autonomous. While the legal framework for autonomy has been in existence since the earliest days of the organization, de facto autonomy has tended to be influenced by a host of factors including the relative situation and strength of the

[113]Srilatha S. An enquiry into the quality of reproductive health care provided in private hospitals and nursing homes and women's perception in Andhra Pradesh. Final Report. Hyderabad: IHS WP25, 1998 Sep.
[114]MacArthur Foundation, Chicago, Grant No.95-33406A-POP dated 30 Jan 1996.

Commissioner vis-a-vis the Health Secretary. In effect, the organization has been as autonomous as the Commissioner has been able to make it or as much as the Health Secretary has permitted it to be, or some combination of both. The study took place between August, 1995 to August, 1996 and was funded by the USAID through the HSPH Data for Decision Making (DDM) office[115]. Results of the study has been published by the HSPH-DDM[116] and the IHS[117].

X. Analysis of Government's Health Expenditure:

The analysis of government expenditure on health in AP happens to be one of the first contributions towards building up of state health accounts in India. This study covered not only standard medical programs like curative and preventive care, but also health related activities such as primary education, water supply, sewerage, sanitation, housing, and community development. Such an approach has the important advantage of producing a much clearer picture of government's overall orientation toward social development. The study found that during the 1980s AP government expenditure on public health nearly tripled in real terms. This was complemented by large increases in health-related expenditure as well. For example, expenditures on primary education more than tripled, and the amount of funds spent on housing and community development increased more than eight-fold. This is not to say that everything went well. First referral (district and sub district level) hospitals received inadequate attention relative to urban tertiary hospitals. Too little was invested in training for nurses and paramedical personnel compared with the amounts spent on educating medical doctors. The amount provided for sewerage and sanitation programs was very low. The project was started in December, 1993 and completed by August 1994. This study was funded by the International Health Policy Program (IHPP) administered by the World Bank, Washington DC. Results of these studies have been published in journals[118],[119] and others[120] in addition to the IHS publications.

To facilitate appropriate analysis of health expenditure of the state, the Institute has compiled data on public spending on health and related areas from 1980 - 1993. This was one of the first electronic compilation of government budget and accounts data. A software called Government Expenditure Analyst (GEA) was developed to allow researchers analyse expenditure data upto the sub head level. Expertise gained at the IHS in electronic compilation of government budget data contributed to preparation of the first budget data on disk in India. The first Budget Data on Disk of the Andhra Pradesh Government was released

[115]Harvard Univ. Office of Sponsored Res. sub contract agreement No.DPE-5991-A-00-1052-00, dt 6 Jul 1995.
[116]Chawla Mukesh, George Alex. Hospital autonomy in India: The experience of APVVP hospitals. Harvard Schl of Public Health - DDM Paper #40, 1996 Jul. http://www.hsph.harvard.edu/ihsg/publications/pdf/No-40.PDF
[117]Chawla Mukesh, George Alex. Hospital autonomy in India: The experience of APVVP hospitals. IHS Working Paper 1997;16:1-69.
[118]Mahapatra Prasanta, Berman Peter A. Resource Allocation for Public Hospitals in Andhra Pradesh, India. Health Policy and Planning 1995;10(1):29-39.
[119]Mahapatra Prasanta, Berman Peter A. Allocation of Government Health Services Expenditure in Andhra Pradesh, India, During the Eighties. Demography India 1991;20(2):297-310.
[120]Mahapatra Prasanta. Government Health Expenditure in an Indian State. Government Expenditure on Health in Andhra Pradesh since the 1980s: Has it Been Appropriate? IHPP Working Paper 1996 May.

by the State Finance Minister in 1998. The IHS was one of the collaborating Institutions contributing to development and delivery of this new service.

Y. Quality of Family Planning Practices in erst AP:

This enquiry gathered information towards a wider range of contraceptive choices for women and to increase acceptance, by men, of various contraception measures. The study documented quality concerns of the users and nonusers of family planning methods[121]. Social, cultural, economic and related factors affecting the acceptance of family planning methods were studied. Data was collected from three high performing and three low performing districts. This study has found a positive appreciation of vasectomy by its adopters as opposed to the negative biases of its nonadopter males and also females, and also thrown important clues on quality of family welfare that is being provided. The study was started in April, 1996 and was completed by February, 1997. Funding was provided by the Commissioner Family Welfare[122], Government of Andhra Pradesh. IHS Publication: WP15/1997.

Z. Yogadhyayana Parishad Systems and Procedures: Assessment and Documentation

The Institute was commissioned by the erst Andhra Pradesh Yogadhyayna Parishad to develop systems and procedures relating to general functioning, academic, accounts and other management functions of the organization. The work includes: preparation of job charts of functionaries, framing of service rules, framing of rules of admission and discharge of patients and yoga trainees at nature cure centres run by the Parishad, framing of rules and regulations relating to admission and management of internship, hostels, staff accommodation etc., framing of rules and regulations relating to post graduate courses and paramedical courses affiliated to UHS. The IHS was also been asked to review and revise the bye-laws of the organization. The work was commissioned by the Department of Health and Family Welfare[123] in October 2005. The first part of the report was completed in 2008 and furnished to the department for implementation. Subsequently the client organization lost interest and hence the project was closed.

AA. Human Resource Development

Managing PHC in Remote Areas:

This two-week training program has been designed by the IHS to develop technical and managerial skills of PHC medical officers and other staff working in tribal and remote areas. Coverage includes, primary health care organisation, program management, monitoring and evaluation, working in tribal communities and remote areas, accounting & financial management, disciplinary procedures and conduct rules, office procedures, specific disease control programmes, and use of computers in health management. The courses is designed to impart down to earth managerial and technical skills. Hence every topic of coverage consists of a theory part followed by laboratory or practical work. About 30% of

[121]George Alex. Performance, Acceptability and Quality of Family Welfare Practices in AP. IHS, WP15, 1997
[122]Govt of AP Commissioner Family Welfare Rc No.4004/NTP(IPP.VI)/F/96 dated 1 Feb 1996.
[123]G.O. Rt . No. 495 HM & FW (R1) Dept. Dt: 06/05/2005

learning sessions are devoted to practicals and another 5-7% are devoted to discussion. Mid term and final examination are conducted. Personal computing skills are imparted, since they have become a common personal productivity tool. Participants are introduced to EpiInfo, the public domain epidemiological analysis and surveillance software developed by the World Health Organisation (WHO) and the United States Centers for Disease Control (CDC). The course was developed in response to a request from the Commissioner Tribal Welfare[124], Government of Andhra Pradesh. First batch of training was organised in December, 1998. This training is organised by the Institute at periodical intervals and has been redesigned to address the needs of officers working in rural area PHCs as well. So far nine batches comprising of 119 officers have been trained through this program.

Smart Use of Computers by Health Executives:

Use of computerised information systems in health care will be a part of any future scenario requiring cost-effective and high-quality health care. Computing and telecommunication technology offer opportunities in design, implementation and maintenance of robust, sustainable health care environments. This one-week course explored utility of computers in meeting needs of patients, planners, regulators, suppliers and administrators. The course focused on the use of computer applications in simple operating environments to resolve recurrent organisational and management challenges. Course sought to (a) familiarise participants with the strength as well as limitations of computers as management tool, (b) build their skills to use a word processor, a spreadsheet, personal database, and presentation graphics, all components of an office suite, and (c) provide real-life problem-solving activities using skills gained during the program. Two batches of District Coordinators of Hospital Services and Medical Superintendent of District Hospitals in AP were trained. Course objective was to enable senior public hospital managers familiar with personal computing skills, and introduce them to the potentiality of information technology, so that they would assume leadership in computerisation of public hospital operations. Altogether 22 officers were trained in two batches during March - April, 1999. The program was sponsored by the AP First Referral Health Systems Development Project[125].

Continuing Education of SPM Faculty on Cause of Death Reporting:

A workshop on “Cause of death reporting system in India” was organised in March, 1999. This 3-day workshop aimed to train medical and health personnel who were interested in revamping, studying or researching various aspects of cause of death reporting systems in India. The workshop took stock of the cause of death reporting system in urban and rural areas and sought to identify lacunae within these systems which usually lead to inaccurate and incomplete reporting. Participants also deliberated on measures necessary to revamp the existing schemes and to identify responsibilities towards achieving the revamped state. The workshop was attended by 12 participants, mostly faculties from the SPM departments of various medical colleges in AP.

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[124]Govt. Of AP Social Welfare (TW BUD.2) dept. Memo No.20621/TW.BUD-2/98-1 dated 4/11/1998 and Commissioner Tribal Welfare, letter Rc.NoF1/16344/98 dated 16/11/1998.
[125]AP First Referral Health Systems - Project Director, Proc. Rc.No.1325/WB/F/99 dated 1/3/99.

5. Contributions to the Andhra Pradesh Health System.

A. Behavioral Tracking Survey (BTS) in Guntur & Srikakulam Districts:

HLFPPT has commissioned the IHS to conduct Behavioral Tracking Survey (BTS) as part of the BMGF sponsored Avahan project that implements HIV prevention program focusing on HRGs and their clients. The BTS is being conducted in two coastal districts of Andhra Pradesh viz., Guntur and Srikakulam covering 800 FSW and 400 MSM groups. BTS provides a unique opportunity to measure the change in degree of community mobilization among HRGs. The main purpose of BTS is to track behavior change in key populations over time and inform on the community mobilization and advocacy efforts of Avahan. The behavioral outcomes of interest are those related to sexual practices, condom use, drug injecting practices, program exposure and community mobilization and advocacy, which have a bearing on the prevention of HIV and other STIs. The field work in the ongoing BTS is completed. The study was completed and report submitted. Dissemination workshop was also conducted on the findings in 2011.

B. Anantapur District Health Action Plan Under National Rural Health Mission:

Recently the Government of India constituted the National Rural Health Mission (NRHM) for achieving greater integration of national health programmes and improving the reach of the public health services. A key focus of the NRHM is local level planning and involvement of PRIs. The Institute was commissioned by the Commissionerate of Family Welfare to help prepare the District Action Plan for Anantpur district[126]. The work involved conducting of a situational analysis, eliciting views of multiple stakeholders and preparing an action plan and budget. The study was completed in December 2006. IHS Publication: RP44/2007.

C. Cause of Death Coding for AP Rural Health Initiative:

The Andhra Pradesh Rural Health Initiative is a collaborative effort of the Byrraju Foundation, The George Institute for International Health Sydney, the Centre for Chronic Disease Control in New Delhi and the CARE Foundation, Hyderabad to develop cost effective solutions for providing health care to rural communities. As a part of this Initiative, it is required to carry out mortality/morbidity surveillance in about 45 villages of East & West Godavari. Trained personnel conduct verbal autopsy using specially structured Verbal Autopsy Forms, which are sent to the IHS. At the Institute the cause of death (COD) is assigned to each form as per the ICD-10 codes. The project which began in June 2004 and completed in June 2008.s and was sponsored by the Byrraju Foundation[127].

D. Assessment of Household and Community Water Quality in Guntur, Krishna and East Godavari Districts:

The Research Triangle Institute, US along with TNS India is conducting an environmental assessment in three districts of the State. A key focus of the study is to assess

[126]Letter No. Rc. 307/CFW/D&E- 5/2006, dt: 28.07.2006
[127]Byrraju Foundation Agreement & Letter dt: 23rd June 2004

quality of household and community water supplies. The TNS has commissioned IHS to provide training for their surveyors and test the water samples. The study was completed in December 2006

E. Child Labour, Health and Education in Aqua Culture Areas:

Purpose of this study was to estimate prevalence of child labour in aqua culture industry and health effects of child labour participation, if any. A cross sectional survey of 5-15 year old children was done in the study area. Nellore and Srikakulam districts, known to have active aqua culture industry were chosen for selection of study area. A cluster of habitations with at least 2000 population from among those known for intensive aqua culture activity was selected from each of the two study districts. Altogether five habitations, with 945 households and 4653 population were studied. 77% of the 1214 children in the target age group were covered. Information about children participating as labourers in aqua culture industry and a comparison group of nonparticipating children was collected through household survey, medical examination, nonparticipant observation of the aqua culture work by children, focus group discussions with mothers of working children and community leaders. The study found that between 32-69% children in the respective villages were participating in the aqua culture industry. Almost all children above 10 years from both sexes in all habitations covered by this study participate in one or other form of work for wages. About 50% of children suffer from severe to moderate protein calorie malnutrition. Anemia, vitamin B complex deficiency, intestinal worms, dental carries, scabies, otitis media, and tonsillitis are other common childhood morbidities in the study area. But there was no significant difference in health status of child labourers and other children. Enrollment in primary school was about 60%. The study author pondered about possible causes of the child labour participation, under enrollment in schools, health problems among children and suggested remedial measures. The study, sponsored by the UNICEF's Hyderabad office[128], was started in October 1999 and report[129] prepared by August 2000.

F. Training of Medical Officers and CDPOs in Paderu Tribal Area:

In order to update and impart the necessary skills to Medical Officers and Child Development Project Officers (CDPOs) to train the ANMs and Community Health Workers, a Training of Trainers (TOT) program was coordinated by the IHS, in the tribal area of Paderu in collaboration with various other institutions. In tune with the Institute's approach that training has to be viewed as a continuous process of research and development, a survey was conducted on a systematically selected sample to understand the morbidity pattern of the area. Findings of the survey, opinion of various stake holders including officers in the Directorate of Tribal Welfare and the Integrated Tribal Development Agency (ITDA) Paderu was used to design the training program and prepare course content. Resource persons were identified to teach. The IHS compiled and distributed a collection of useful background

[128]Special Service Agreement No.SSA/INDG/99/00000060-0, dated 27-28 Sep 1999, Funding code GC/98/603-1

[129]Chalapati Rao PV, Mahapatra Prasanta, Padmavathi A. Child labour, health and education. A study on children residing near acquaculture units in Andhra Pradesh. IHS Report Series 2000(RPIII/2000):1-71.

material selected from its library. The program was conducted between July-October, 1996 and was sponsored by the ITDA-Paderu.

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6. Contributions to Other State Health Systems

A. Medium Term Expenditure Framework for Health in Orissa

The Government of Orissa is in the process of developing a medium-term strategy and expenditure framework for health in the state for the years 2006-11. The Institute was commissioned by the Department for International Development (DfID) to help prepared the MTEF. The study involves analysis of health expenditure by sources of funds, functions of care, providers and resource categories; estimation of the resource envelope; costing of medium-term strategies and development of the MTEF by reconciling bottom-up estimates of the cost of carrying out policies, both existing and new with the resource envelope available for public health expenditure. Health budget data of the last five years is analyzed up to detailed head level using National Health Accounts framework adopted by the Government of India to understand trends in public health spending and make projections for a "business as usual" scenario. Data includes Demand for Grants health and other line departments such as Department of Women and Child Welfare, Department of Labour and Department of Tribal Welfare, and receipt and expenditure statements of disease prevention and family welfare societies established by the government. Costing of medium-term health strategies using GOI, GoMP, National Macroeconomic Commission for Health (India) recommended norms. The study began in August 2007 and was completed by February 2008.

B. Medium Term Expenditure Framework for Health in MP

The Government of Madhya Pradesh is in the process of developing a medium-term strategy and expenditure framework for health in the state for the years 2006-11. The Institute was commissioned by the Department for International Development (DfID)[130] to help prepared the MTEF. The study involved analysis of health expenditure by sources of funds, functions of care, providers and resource categories; estimation of the resource envelope; costing of medium-term strategies and development of the MTEF by reconciling bottom-up estimates of the cost of carrying out policies, both existing and new with the resource envelope available for public health expenditure. Health budget data of the last five years was analyzed up to detailed head level using National Health Accounts framework adopted by the Government of India to understand trends in public health spending and make projections for a "business as usual" scenario. Data included Demand for Grants health and other line departments such as Department of Women and Child Welfare, Department of Labour and Department of Tribal Welfare, and receipt and expenditure statements of disease prevention and family welfare societies established by the government. Costing of medium-term health strategies using GOI, GoMP, National Macroeconomic Commission for Health (India) recommended norms. The study began in October 2005 and was completed by January 2007.

C. Maharashtra Hospital Data Validation and Performance Analysis:

To strengthen the Maharashtra health system, Government of Maharashtra is implementing a project titled "Maharashtra Health Systems Development (MHSDP)". There are 136 project facility hospitals under MHSDP constituting community hospitals, sub district hospitals and district hospitals. The Institute's research activity was aimed at measuring

[130]DFID Contract No.: CNTR/APMP/MHSD/CON/2006/2178, dt: 4th Aug 2006

public hospital performance periodically. The MHSDP hospital statistics is analysed for its consistency and based on the performance indicators, outlier hospitals are identified. Internal consistency of data is analyzed using a set of consistency indicators and by expert appreciation of the figures. A sub set of hospitals are identified each month for field visit to understand the potential sources of poor performance and to provide on job training to the hospital data complication personnel. The Institute was selected by the MHSDP through a National Competitive Bidding Process[131]. Work started in May, 2002 and final report given by November, 2002.

D. Verbal Autopsy Training for SRS Surveyors in Orissa:

To develop local capacity in cause of death research, two scientists from the ICMR's Regional Medical Research Centre (RMRC) Bhubaneswar were invited for a training program on verbal autopsy at Hyderabad. The IHS faculty jointly worked with the RMRC scientists and the Director Census Operations, Bhubaneswar to translate course material in local language and organise the training in verbal autopsy for SRS surveyors in Orissa. The training was conducted by the Institute in January 2003 at the RMRC Bhubaneswar campus.

E. Verbal Autopsy Training for SRS Surveyors in Madhya Pradesh:

The Institute's faculty also assisted in training, at Bhopal, of SRS surveyors from Madhya Pradesh in verbal autopsy methodology.

F. Documenting the SSY Experience in Ratlam District of MP:

The Swablamby Swasthya Yojana, a community-based health insurance experiment was launched by the then Ratlam District Administration to find a solution for petitions from the poor and needy seeking assistance for treatment of serious illness. Coverage is available to all families living in rural areas of the district. Premium is graded according to paying capacity of families. The scheme helps covered families access government hospital services for effective treatment, by providing drugs and therapeutics not available in the hospital. The key distinguishing feature of the scheme is its spontaneous appearance through the efforts of a creative district administration to meet a felt need of people. The experience of this scheme has been documented by the IHS to inform health insurance and health care financing policy debate in India. The documentation was done to help the IHS task of developing a set of community health insurance-based family health protection plans for India. The study was done with concurrence and support from the Madhya Pradesh Health department, the Ratlam District Administration.

G. West Bengal - Health Financing:

The government of West Bengal has been exploring various health financing alternatives and scope for health sector reform. In recognition of the IHS expertise in health financing and health insurance, the West Bengal Government organised a "Health Talk on Health Financing and Solidarity Schemes" at Institute of Health and Family Welfare, Salt Lake, Kolkata on 4th April, 2002. The Institute's Director was invited to make the lead presentation to the state's Health Minister about "Comparative study of health financing in

[131]MHSDP / Med.Wing / Revalidation of Hospital Activity / Pub.Open.Fin.Prop / 01, dated 6Nov. 2001.

developed countries and policy lessons for India and Relevance of European social health insurance schemes to the Indian context." The invitation was funded by the Indo-German Basic Health Project[132].

H. Gujarat - Advanced Studies in Public Health for PHC Medical Officer:

Government of Gujarat have sanctioned sponsorship[133] of two Medical Officers for the Advanced Studies in Public Health (APH) at the IHS. Objective is to build public health program delivery and health care management capacity in the state and to improve the state of preparedness for disaster response. One Medical Officer was deputed for the first batch of the APH program and successfully completed the program.

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[132]H&FW Dept. Govt. of West Bengal, Basic Health Project ltr dt. 31 Mar 2002; gtz PN97.2049.1-001.00.
[133]Govt. Of Gujarat Resolution No GHS-102003-126-T dated 24 Jan. 2003.

7. Contributions Towards Civil Society and Voluntary Health Organisation

A. Management of Financial and Material Resources in Voluntary Health Agencies:

Literature on financing of voluntary health agencies was reviewed. Financial position of selected voluntary health agencies in AP was studied. A paper on management of financial and material resources in voluntary health agencies was prepared[134]. This was the first sponsored research work taken up by the IHS. The project was sponsored by the Voluntary Health Association of India (VHAI), New Delhi with funding from the Ford Foundation.

B. Naandi Systems Development:

Naandi is a community public trust set up by a group of concerned citizens for development of Andhra Pradesh, by mobilising voluntary contributions. The foundation was set up in 1998 and launched by the Governor of AP in the presence of Chief Minister on November 1, 1998. The Foundation needed to develop its systems and procedures on a firm footing, to build an efficiently run organisation. The IHS was commissioned by the Foundation to design an organisational structure appropriate for the Foundation's role, develop operating manuals for program management and fund raising, general guide for the Foundation's employees and the Finance and Accounting manual. The systems had to be developed and manuals delivered in a time bound program. A multidisciplinary system development team was formed by the IHS, including professionals identified by the client organisation trustees. The Institute reviewed latest literature on civil society institutions, participated in National and International discussions on civil society, visited a few foundations and trusts and searched the world wide web to cull out the state of the art in organisation and management of community public trusts and civil society institutions. The insights gained by this process were used to develop systems for the Naandi Foundation. Work on systems design and manual development for the Naandi foundation started in November, 1998 and was completed by March, 1999. The project was paid for by the Naandi Foundation, Hyderabad.

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[134]Mahapatra Prasanta. Management of financial resources in voluntary health agencies. IHS, WP02, 1991.

8. Contributions to the Global Health Systems

A. BDAP - Burden of Disease Application Software:

One practical problem with summary measures of population health status is the requirement of massive data inputs and daunting computational load on the researchers who take up to generate these estimates. As a result, many country teams are discouraged to take up computation of summary measures. The problem of computation load to generate summary measures of population health status became evident during the discussion at the session on burden of disease in Forum-3 of the Global Forum for Health Research. The country presentations in this session brought out the daunting task of handling a large number of spreadsheets. Participants from many countries expressed the need for a software that can handle the hundreds of spreadsheets that have now to be manipulated to generate the estimates. By automating the task of handling such a large number of computations, the researchers can direct their energies to analyse the results and ponder over the policy implications. The BDAP software developed by the IHS meets the computation needs of Global Burden of Diseases Estimations, and allows researchers are free to concentrate more serious issues regarding data accuracy, consistency and analysis of results. Substantial funding for development of the software was made available by the WHO, Geneva[135]. Development work started August 1999 and the first version of BDAP was released in August 2000. The latest version 1.18 was released in May 2003.

B. Community Based Health State Valuation Study:

Disability / health state weights represent our judgment about the severity of a health state. The disability / health state weight is a crucial input for computation of burden of disease. Since the summary measures are ultimately intended to inform public policy, it is in fitness of things that the disability/health state weights are arrived at on the basis of population-based surveys and wide consultation to the extent feasible. This Health State Valuation Study, conducted in the year 1999, attempted to measure people's preferences about various health states. Two distinct sources of assessment were used in measuring people's opinion. Firstly, a series of workshops was conducted with the educated population from various professional backgrounds. Health state valuation was done using four procedures viz., card sort, Visual Analogue Scale, Time Tradeoff & Person Tradeoff methods. Second part of the study involved measurement of valuations given by general population through household surveys. Respondents were requested to give their valuations using card sort followed by visual analogue scales. This study happened to be the first community survey of health state valuations in the developing world. The study had to deal with the unique challenge of communicating health state descriptions to semiliterate, illiterate populations. This was overcome by development of a pictorial description system. This study is an important contribution to theoretical advances in health state valuation. The 6D5L health state description systems developed for this study[136], theoretical and empirical aspects

[135]WHO Allotment GL GLO HST 052 RB 98. Obligation No. HQ/99/115772.
[136]Mahapatra Prasanta; Nanda Lipika; Rajshree K.T. The 6D5L description system for health state valuation. Ch7.4, in: Murray Christopher JL; Salomon Joshua A.; Mathers Colin D., et al., Summary Measures of Population Health. Concepts, Ethics, Measurement and Applications. First ed. Geneva: WHO; 2002. pp. 349-67.

of community-based health state valuation, their reliability and validity issues[137] were incorporated in the WHO publication on summary measures of population health. The study also contributed to development of Health State Valuation kits, and computation tools to facilitate work by future researchers[138]. Results of this study contributed for estimation of Burden of Disease in AP[139].

C. Mauritius - Demand and Satisfaction Survey:

Following the global burden of disease (GBD) approach adopted by the World Bank's World Development Report, 1993, a National burden of disease study had been done for Mauritius. The Mauritius government wanted to utilise the burden of disease estimates, coupled with cost effectiveness studies to identify and set priorities for the health sector. This study was to estimate cost-effectiveness of various interventions in Mauritian context and combine the findings with burden of disease estimates to recommend health sector priorities. The project was orchestrated by the Burden of Diseases Unit at the Harvard Center for Population and Development Studies (HCPDS). The Institute of Health Systems conducted a sub study on the Demand for services and Satisfaction with the Mauritius Health System. The study used personal interviews and focus groups. An exit survey of a systematically selected sample of in patients (IP) and out patients (OP) was carried out. These persons who had used the health care system were interviewed using a structured questionnaire. Focus groups were conducted with members drawn from households and members of Local Health Committees (LHC) who were closely associated with the functioning of the peripheral health delivery institutions. The quantitative as well as qualitative data of this study was analysed at the Institute and a draft report of this project was submitted to HCPDS. The published HCPDS report titled "The Health Sector in Mauritius", contains substantial sections on the Demand and Satisfaction study conducted by IHS. Work on this project started in June 1995 and final report released by August, 1996[140]. The study was sponsored by the Government of Mauritius, funded by the World Bank, and executed in collaboration with the Harvard Center for Population and Development Studies - Burden of Disease Unit.

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[137]Mahapatra Prasanta; Salomon Joshua A.; Nanda Lipika. Measuring health state values in developing countries - results from a community survey in Andhra Pradesh. Ch9.3, in: Murray Christopher JL; Salomon Joshua A.; Mathers Colin D., et al., Editors. Summary Measures of Population Health. Concepts, Ethics, Measurement and Applications. First ed. Geneva: WHO; 2002. pp. 473-85.
[138]Mahapatra Prasanta; Salomon Joshua A; Nanda Lipika; Rajshree K.T. Measuring health state values in developing countries: Report of study in Andhra Pradesh, India. Institute of Health Systems, RP04, 2000.
[139]Mahapatra Prasanta; Salomon Joshua A; Nanda Lipika; Rajshree K.T. Health State Valuations Study in Andhra Pradesh: Review of Literature and Methods. Ch.6, pp 139-208; and Mahapatra Prasanta; Results from the community survey in Andhra Pradesh to measure health state valuations. Ch.7, pp 209-226, in Mahapatra Prasanta; Estimating National Burden of Disease. The Burden of disease in AP, 1990s. IHS, 2001.
[140]George Alex. Study on Demand of Satisfaction of the Mauritius Health System. IHS, WP17, 1997.

9. IHS Laboratory

Laboratory service is a backbone of health systems. Laboratories play a vital role in clinical medicine and in public health.

A clinical or medical laboratory primarily serves patients to aid in diagnosis and treatment. Clinical laboratories are healthcare facilities that provide a wide range of laboratory procedures which aid the physicians in carrying out the diagnosis, treatment, and management of patients. The modern clinical laboratory emerged along with development of hospitals which could house and utilize developing diagnostic tools such as the microscope and X-ray. Today, most of the clinical laboratories are situated within or near hospital facilities to provide access to both physicians and their patients. Aside from its known value to individual patients, clinical laboratories do play a role in screening and surveillance of diseases significant to public health.

Public health laboratories emerged to investigate sanitary conditions of water supplies by laboratory methods. The realization that germs were responsible for epidemic outbreaks of infectious disease, coupled with development of microbiology tools and techniques expedited further development of public health laboratories, mostly established by municipal, state and national governments. Although almost all such laboratories were established by various public authorities, the key distinguishing feature of a public health laboratory is it scope. Public health laboratories primarily test environmental samples such as water, study spread of pathogenic microbes and viruses, and personal samples for purposes of screening for diseases, or to study transmission dynamics of epidemics.

Public health laboratories are vital for assessing, investigating, and analyzing the health needs, effects, and community health status. Public-health laboratories provide, what economists call, public goods to the community by way of outbreak investigation, epidemic surveillance, or epidemiologic research. This is the major reason why public-health laboratories developed largely in the public sector. State public health authorities have to function in sync with government policies and priorities. Although services of government public health laboratories are open to general public, access is often limited due to various factors.

During the course of preparing a manual for control of gastroenteritis commissioned by the Health Department of the Government of in Andhra Pradesh it was noticed that the capital city of Hyderabad, had the highest incidence of gastroenteritis in the state, despite substantive investments in water supply and sewerage systems. This triggered the idea of public health laboratory to enhance access and empower the general public in water quality monitoring. Purpose is to provide appropriate support for people's action towards improvement of people's health.

The IHS Laboratory was inaugurated, on 16th March, 2004, by the then Secretary to Government of India, Ministry of Health and Family Welfare. Smt. G. Shyamala, who had recently retired as Chief Water Analyst from the Institute of Preventive Medicine, Government of Andhra Pradesh, helped establish the Water Quality Testing service. The water quality testing services has been operational since March 2004. Testing services are made available to general public and housing colonies. The IHS Laboratory played a

significant role in the response to the outbreak of hepatitis in Hyderabad, in March 2005. Water samples in affected areas were tested, key water quality issues identified and feedback was provided to the government for required action.

The IHS Laboratory is accredited by the National Board of Accreditation for Testing and Calibration Laboratories (NABL) India (Lab Id: T-417). The IHS Laboratory is gradually developing itself as an easily accessible Public Health Laboratory for laboratory tests that are relevant to safeguarding and improvement of people's health. Keeping with this objective, new test services are introduced to meet felt needs. The IHSL follows sound quality assurance mechanisms and adopts standard test methods for all tests including newly introduced tests. However, immediate accreditation by NABL may not be feasible, for various reasons. Thus, at any point of time, the laboratory would have a set of NABL accredited parameters, and other parameters for which NABL accreditation is not yet available. To avoid any misrepresentation, the IHSL we adopt a strict policy of using NABL symbol in test reports only if all test results included in the report are within the scope the accreditation.

The IHS laboratory provides comprehensive facilities for testing water quality, including chemical and bacteriological analysis in the laboratory, field testing and sample collection services. The laboratory follows National Accreditation Board of Laboratories (NABL) guidelines, adopting Indian and/or American Public Health (APH) standards for testing of various water quality parameters. The Institute provides a wide range of water quality related services such as the following:

a) Accessible Water Testing & Analytical Services for Public Health (AWTASPH),
b) Water Quality Monitoring Services for Municipal Utilities,
c) Consumer complaints surveillance for water safety,
d) Sanitary inspection of service reservoirs for water safety,
e) Focus groups and community connect for water safety,
f) Research collaborations for water safety, and
g) Institutional-Campus Water Quality Monitoring.

A. Accessible Water Testing & Analysis for Public Health (AWTAPH):

Access to safe drinking-water is essential to health. Safe and readily available water is important for public health, whether it is used for drinking, domestic use, food production or recreational purposes. Contaminated water and poor sanitation are linked to transmission of diseases such as cholera, diarrhoea, dysentery, hepatitis A, typhoid and polio. Absent, inadequate, or inappropriately managed water and sanitation services expose individuals to preventable health risks. This is particularly the case in health care facilities where both patients and staff are placed at additional risk of infection and disease when water, sanitation and hygiene services are lacking. Inadequate management of urban, industrial and agricultural wastewater means the drinking-water of hundreds of millions of people is dangerously contaminated or chemically polluted. Natural presence of chemicals, particularly in groundwater, can also be of health significance, including arsenic and fluoride.

The IHS Laboratory seeks to empower people by easily accessible to water quality testing services. Sample collection bottles with guides and appropriate carry bag are made available round-the-clock. Samples are also received 24 hours. Samples received after working hours are stored by watchman in freezers for analysis the next day. People inquire about water quality testing options at IHS through dial-in and online search platforms like JustDial, through the IHS website, and/or personally visiting the IHS. A service matrix showing the scope of various test-packages, their test codes and a guide for selection of test-packages is made available to all visitors to the Front office and through email to people inquiring online. Sample collection services are offered for a modest fee. Reports are being scanned and sent by e-mail, held for pickup or couriered depending on client-options.

Test-packages are designed for water from different sources for various uses. For example; the complete potability tests (CPT) includes a set of common parameters to test municipal water from surface water sources, to assess potability and fitness for domestic use. The groundwater potability tests (GPT) build upon CPT and includes some more parameters relevant for borewell water. The basic potability tests (BPT) includes a minimal subset of CPT/GPT to assess potability, at a lower cost. Clients can use GPT/CPT to benchmark their sources and then follow up with BPT at periodic intervals to ensure that their source continues to remain potable. As of September 2023, the laboratory tests catalogue includes 24 test packages multi-parameter, and 35 single or limited parameter test services. The multi-parameter test-packages include; bottled water potability (BWP), RO product water profile (ROP), surface water basic profile (SBP), basic (municipal water distribution) system vulnerability (BSV), dialysis RO system feed water (DRF), dialysis water basics (DLB), bacterial endotoxin (BET), (swimming) pool side tests (PST), effluent water (EWT), sewage treatment plant effluent (STE) tests, in addition to GPT, CPT and BPT mentioned earlier. The parameters included in various test-packages are tailored to facilitate interpretation with respect to the concerned source, treatment efficacy and intended use. For example; PST includes free, combined and total chlorine, relevant for adequate disinfection of contaminants from bathers in swimming pools. Effluent water tests (EWT and STE) include total suspended solids (TSS), biochemical and chemical oxygen demand (BOD, COD), Oil and grease, etc.

Notes and recommendations attached to test reports in a unique feature of water quality test services from the IHS laboratory. People usually have concern about safety and suitability of water for an intended use. For example; is this water safe to drink? ‘Can I use my borewell water for domestic purposes?’ Is it suitable for gardening? Some clients ask if their water suitable for poultry, fisheries or other animal feed. ‘What to do if my borewell water has a petroleum smell and a neighbourhood petrol pump might be responsible?’ Occasionally, a client may ask if the water suitable for a beauty-saloon, or to wash aircraft engines! A baker would be concerned about suitability of water for their operations and a food processing industry would want to know if the water is suitable for washing and cleaning of raw fruits and vegetables. Sometimes clients bring sample of water collected in their cellar and ask if they can put it to some use. To meet various client concerns, IHS faculty refer applicable standards, fact sheets, public health and/or environmental protection agency advisories, industry guidelines, etc. to offer notes and recommendations regarding suitability of the particular water sample submitted for analysis for their intended purpose.

In addition to fitness for purpose, IHS faculty try to diagnose, hypothesize or at least develop some conjectures about what could have contributed to observed deviations in water quality parameter values, and how to deal with the situation. For example; high turbidity in case of a recently drilled borewell may indicate that either well development was not done or is incomplete and/or mismatch between natural yield of the borewell and capacity of the pumping arrangement. The notes and recommendations would briefly mention about usefulness of well development and direct the client to literature that describes methods for well development. Clear water from a recently drilled borewell showing presence of coliforms may indicate contamination during drilling. In such cases, IHS notes and recommendations would advise about procedure for disinfection of the borewell using easily available household products for chlorination. Output from a water purifier with Ultra violet (UV), showing presence of total coliforms can be used for drinking, but presence of heterotrophic organism in the sample would indicate failing UV unit, and/or contamination from the dispense faucet.

B. Water Quality Monitoring Services for Municipal Utilities:

Safe water refers to water that is not harmful for human beings, that is not contaminated to the extent of being unhealthy. Safe water also refers to water supply that is of sufficient quantity to meet all domestic needs, is available continuously to all and is affordable. Water that looks clean is not always safe for humans to drink. Sometimes it is hard to see the germs and bacteria that cause diseases as they cannot be seen with naked eyes. Often, these unseen organisms can make us very sick. They are especially dangerous for small children or the elderly and in some cases lead to death. So, one cannot assume that water is safe just because it looks clean. If drinking water comes from a polluted source and is untreated, it may contain germs and bacteria that can cause the spread of waterborne diseases like diarrhoea, typhoid and cholera. Treatment of water is a process of killing and removing harmful microorganisms in the water. Water treatment involves filtering or adding chlorine in order to kill or remove harmful bacteria, as well as to improve the colour, odour and taste of water. Small dose of chlorine in water is safe for humans, but deadly for bacteria.

The water quality monitoring program at IHS has developed in partnership with the Hyderabad Metro Water Supply and Sewerage Board (HMWSSB/MWB). This public-private partnership started in 2005, soon after establishment of the IHS Laboratory, and in the context of a jaundice outbreak in the old city area of Hyderabad[141]. A few slum areas were assigned by the MWB for monitoring of water quality by the IHS. IHS water quality investigators (WQIs) tested for residual chlorine in all public standposts and pit taps in households. In addition, a random sample of house taps were covered. Samples for bacteriological and physicochemical analysis are collected from a smaller number taps tested for residual chlorine. Subsequently samples of stored water in households and drinking water from street vendors were included for a more comprehensive understanding of consumer exposure to drinking water quality.

Residual chlorine (RC) is tested using N,N-diethyl phenylene diamine (DPD) with calibrated colour comparator, as recommended by the World Health Organisation (WHO). Previous methods involved the use of Orthotolidine and starch-potassium iodide. OT is now

[141] Times News Network. 2005. *NGO tries to zero in on the danger zone.* The Times of India. Hyderabad; 2005 Mar 24; Times City.

known to cause cancer and so is not recommended[142]. Water quality investigators are trained to test for residual chlorine using DPD tablets and a laminated colour comparator. The chemical unit of IHS Laboratory (aka ChemLab to IHS personnel) periodically conducts induction training in field testing of residual chlorine (FTRC) for new recruits, proficiency tests and refresher training at regular intervals for continuing staff. WQIs are provided with a specially designed bag to carry residual chlorine test kit, sampling-bottles, ice packs etc. Separate sampling bottles with unique identification (BottleId) labels are provided for physicochemical and bacteriological monitoring[143]. Every WQI carries a smartphone with a specially developed NJS app to capture FTRC test data. The Nagar Jal Suraksha (NJS) app has been developed by the IHS on the Android platform. A dedicated Nagr Jal Suraksha chat group (NJS chat-group) has been created on a social media for real time communication between WQIs, IHS water safety project coordinators (IHS-coordinators) and water utility quality assurance and testing (QAT) officers.

The NJS app helps WQIs record field test results and sampling locations. WQIs can easily identify testing & sampling locations by selecting items from dictionaries of service reservoirs, area names etcetera. Records of a day's work can be exported and emailed to central data processing office for consolidation and analysis. The NJS app allows for recording of data under multiple channels of monitoring. For example; a water utility may have one program of daily monitoring service reservoirs, another program for periodical monitoring of water quality in residential areas, and yet another program for investigation of consumer complaints. Each program can be assigned a channel code. WQIs can select the assigned channel once and continue their work. The app has separate forms for testing and sample collection from Service Reservoirs, Households, and water Tankers. WQIs can work in online mode staying connected with dictionaries from the central data processing office or in offline mode to save on data charges or in areas where mobile data network is not available.

WQIs visit service reservoirs and residential neighbourhoods (identified slums) in their respective zone, for FTRC and collection samples for laboratory tests. Their working hours are synchronized with water supply timings in respective areas, to ensure testing of live municipal supply. Typically, WQIs start their day early. On any particular day a WQI would visit several service reservoirs and slum areas, and rotate daily visits to cover most of the services reservoirs and slum areas in the assigned zone. WQIs their first test result in the chat group to indicate their attendance. In the event of a no-residual-chlorine (No-RC) test result, post a message in the WQM-chat-group and sometimes may upload photos of test result/location etc. This enables QAT officers to initiate real time response through concerned operations personnel. At times, when there is any confusing or implausible posting in the WQM-chat-group, IHS-coordinators and QAT officers confer over telephone to resolve discrepancies, and establish factual position to facilitate appropriate action. In the event of a no-RC result at a service reservoir, WQIs inquire with operations personnel to ascertain reasons and report the same using a set of structured 'RC Note' and a free flowing 'RC

[142] WHO. Chlorine Testing Fact Sheet. Geneva: World Health Organization (WHO); 2016 Jul 18; Fact Sheet. https://www.who.int/water_sanitation_health/sanitation-waste/fs2_31.pdf?ua=1. Accessed Aug 2021.
[143] For bacteriological monitoring clean 250-ml wide-mouth polypropylene bottles containing a few grains of sodium thiosulfate to neutralize residual chlorine, are sterilized, dried, affixed with bottleid labels and packed in polythene bags. For physicochemical monitoring clean and dry 1-litre wide-mouth polypropylene bottles are provided.

Remarks' field in their mobile app. The structured 'RC Note' can be grouped into (a) Machine malfunction, (b) Operator error or no operator, (c) No chlorine gas, (d) No power, (e) Low level or no distribution etc. The WQI may record additional information in 'RC Remarks' to reconfirm or further explain the No-RC event. For example; when booster chlorination could not be done as there was no chlorine gas, the WQI would select 'No chlorine gas' in the 'RC Note' field and enter information about availability of spare cylinder in the 'RC Remarks' field. In case, a sample is collected for laboratory analysis the identification number captured in the mobile app for reference. WQIs collect samples for physicochemical testing and bacteriological analysis in accordance with a sampling plan, which allocates samples to various sources, namely; service reservoirs, water tankers, public standposts, pit taps, house taps, stored water etc. WQIs end their work shift by visiting the IHS Laboratory to deliver samples for laboratory testing and to synchronize FTRC data from mobile app with data processing unit. Occasionally, when there is no sample to deliver for lab testing, a WQI may send FTRC synchronization file by email, and retire for the day.

The ChemLab and microbiology unit of IHS Laboratory (aka BioLab to IHS personnel) process samples received from the field. The physicochemical monitoring (PCM) monitoring test package includes a core set of parameters to assess quality of municipal water. These include, (a) physical and sensory characteristics such as colour, odour, turbidity, total dissolved solids (TDS) and pH, and (b) chemical parameters such as alkalinity, hardness, ammonia, nitrites, nitrates, and chlorides. Colour, odour, turbidity and TDS indicate aesthetic quality of municipal supply. pH and alkalinity are operational parameters for safe passage in distribution system. Ammonia, nitrite, nitrates and chlorides would indicate intrusion of sewage or organic leachates into the distribution system. Hardness, would indicate domestic usability and implications for maintenance of household appliances. In addition, fluorides are included in the PCM test-package for Hyderabad Metro Water, because fluorosis is a regional concern.

Bacteriological contamination monitoring (BCM) test-package for municipal water includes estimation of most probably number of total coliforms [MPN(TC)/MPN], thermotolerant coliforms (TTC), and E. coli. Most total coliform bacteria (excluding Thermotolerant coliforms & E. coli) are normal inhabitants of soil and water environments. Total coliforms can also survive and grow in water distribution systems, particularly in the presence of biofilms. Hence, Total coliforms are useful as an indicator to assess the treatment effectiveness, cleanliness and integrity of distribution systems and the potential presence of biofilms. Plenty of total coliforms in distribution systems, despite booster chlorination, may be due to biofilms, inadequate booster chlorination, and/or excessive ambient temperature. Hence, QAT officers are advised to investigate locations showing plenty of total coliforms, to rule out operational deficiencies, if any.

Thermotolerant coliforms, other than E. coli may originate from organically enriched water such as industrial effluents or from decaying plant materials and soils, as well as animal and human faeces. In temperate climate, surface water concentrations of thermotolerant coliforms are directly related to E. coli concentrations. But in tropical and subtropical surface waters, such as in Hyderabad, thermotolerant coliform bacteria may occur without any obvious relation to human faecal pollution. Hence TTC alone do not indicate faecal contamination. However, presence of TTC in treated water should not be ignored, as the basic assumptions that pathogens may be present, and that treatment has been inadequate still

holds good. Hence, QAT officers are advised to view TTC as an operational indicator of system integrity. Presence of E. coli is a definitive indicator of faecal contamination.

These core set of parameters mentioned above have been chosen for cost-effective and sustainable routine monitoring of municipal water quality. These parameters would not detect contamination with industrial effluents, heavy metal or pesticide intrusion etc. Special tests will have to be done when and where such contamination is suspected. Both units of the laboratory share test results in a spreadsheet to the data processing unit and IHS coordinators on the same day when results are available.

The data processing officer(s) gather FTRC data files from all WQIs, laboratory test results from BioLab and ChemLab and prepare a daily report to the Water Utility's QAT officer concerned. The daily report provides a summary of BCM activities, identifies BCM test results that may be of some concern, BCM sample-wise statement, a summary of FTRC activities, statement of No-RC cases, and statement of PCM test results. A structured algorithm is followed to report about quality of water based on BCM test results, indicating cases of operational concern and unsatisfactory test results if any.

QAT officers inform operations personnel about cases of concern and unsatisfactory BCM test results are, so as to identify contamination vulnerabilities and for appropriate remedial action. Strict adherence to booster chlorination protocol often resolves many contamination concerns. Sometimes SR cleaning, protection & proper maintenance would help. Occasionally, repair or replacement of distribution lines may be required. The net result of all such interventions would be clearance of bacteriological contamination in follow-up samples.

In addition, IHS coordinators watch for BCM test results to focus on cases indicating faecal contamination and inquire about concerned sampling points. WQIs revisit the concerned household or service reservoir as the case may to gather circumstantial evidence and contextual information that may provide some clue regarding source of contamination. For example; WQIs would ask the concerned household and in the neighbourhood, if they have noticed any discoloration, foul smell, or turbidity in municipal supply, if they have experienced sewerage overflows in the area or if there is any recent damage or repair to water pipeline in the neighbourhood etc. A brief summary of the follow-up inquiry is incorporated in the 'BCM Remarks' column of the concerned daily report. The revised daily report is forwarded to QAT officers drawing their attention to specific changes in the revised daily report. The PCM test results are watched by IHS coordinators looking for signs of sewage contamination if any. For example, very high TDS, coupled with high levels of chlorides, presence of ammonia and nitrites would indicate some intrusion. In our experience such deviations in chemical profile are very rare. None the less, IHS coordinators actively watch for such events, so that follow-up samples can be tested to reconfirm altered chemical profile and sources of contamination, if any, can be investigate. The data processing unit consolidates the daily report once in a week and at the end of every month. The weekly and monthly reports are forwarded to water utility QAT department for managerial review and future planning purposes.

The annual report of water quality monitoring activities summarises FTRC, PCM and BCM data for the year, analyses trends with respect to previous year, documents insights gained from WQM activities during the year, identifies areas of concern, and suggests

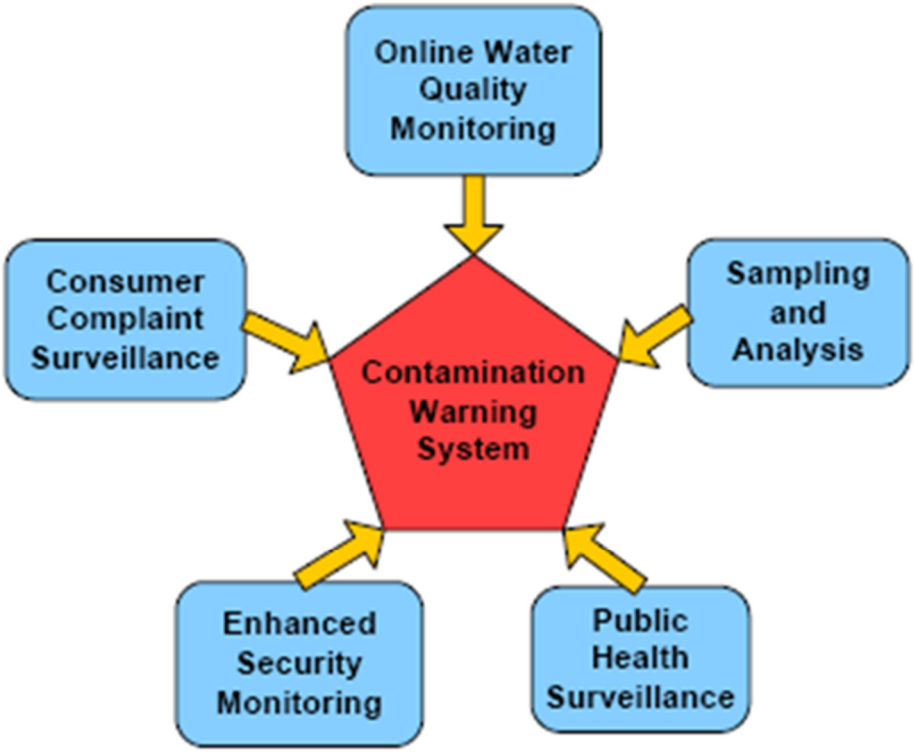
operational improvements for consideration of senior management. This report also provides descriptive summary statistics of physicochemical profile and microbial purity of water supplied to consumers in monitored areas, during the year.

The IHS Laboratory supported the Hyderabad Metro Water Supply and Sewerage Board (HMWSSB) as an independent (third party) water quality monitoring agency for period of 16 years from 2005 to 2021. From March 2023, the IHS Laboratory is providing third party water quality monitoring for Hyderabad including the Outer Ring Road (ORR) areas.

C. Consumer complaints surveillance for water safety

Consumers may become aware of potential problems with the safety of their drinking-water because of their own senses or informal networks. To a large extent, consumers have no means of judging the safety of their drinking-water themselves, but their attitude towards their drinking-water supply and their drinking-water suppliers will be affected to a considerable extent by the aspects of water quality that they are able to perceive with their own senses. It is natural for consumers to regard with suspicion water that appears dirty or discoloured or that has an unpleasant taste or smell, even though these characteristics may not in themselves be of direct consequence to health. Trust and goodwill from consumers are extremely important in both the short and long term. Consumers have an important role to play in assisting the authorities in an incident by their own actions and by carrying out the necessary measures at the household level.

Figure 2: Components of a Contamination Warning System for Water Utilities.



Source: Fig-F2 in USEPA, Water Security Initiative: Interim Guidance on Developing an Operational Strategy for Contamination Warning Systems. Washington DC, USA: United States Envi. Protection Agency ; 2008 Oct.

Consumer feedback and complaints provide utilities with useful data about consumer perceptions of aesthetic water quality in the distribution system. Consumers as real-time sensors are uniquely positioned to provide feedback. These feedbacks may be specific such as chlorine smell or general such as "polluted water", "bad smell", etc. A responsive consumer-complaints handling system is an essential aid to development and implementation of water safety plans. The idea of such a surveillance system emerged out of a pilot study of selected consumers who had registered repeated complaints with the Metro Consumer Complaints (MCC) system of the Hyderabad Metro Water Supply and Sewerage Board (HMWSSB).

The sample size for consumer complaints surveillance system would depend on availability of funds and the granularity of desired estimates. A minimum sample size of about 1200 consumer complaints per year was considered appropriate for robust organisation-wide estimates annual estimates and to build-up more granular estimates by cumulating date for several years, as the system gets established. The sample size is distributed month-wise, for concurrent operation of the CC surveillance system and balance estimate based on consumer experiences throughout the year. At first, each sampled consumer is approached to obtain informed consent for the survey. Sometimes a consumer may refuse consent to proceed with the survey, after the informed consent process. Rarely a consumer would consent, and the survey would progress to some extent but remain incomplete on account of unexpected circumstances. All such cases are reported to the project coordinator, who would either find a solution to proceed with the survey, and where this is not feasible, would authorise replacement samples.

A basic system vulnerability (BSV) test-package has been designed to help identify distribution system vulnerabilities for environmental and sewage contamination.

Table 1: Basic Vulnerability Test Parameters to help identify vulnerabilities in distribution system to environmental and/or sewage contamination.

Parameters		Rationale for inclusion of the parameter.
1 General	Color, Odour, Turbidity, pH & TDS	Backsiphonage is sometimes associated with disagreeable odor (drainage or sewage smell), increased turbidity, and TDS.
2 Chemical	Ammonia, Nitrites & Nitrates; Chlorides.	Excess of ammonia; (a) is an important indicator of faecal pollution, (b) affect taste & smell, and (c) reduce efficiency of chlorination, as up to 68% of the chlorine may react with the ammonia and become unavailable for disinfection. High level nitrites and nitrate indicate probable environmental and sewage contamination. Nitrites indicate recent contamination. Nitrates indicate older contamination. Presence of both may be due to a continuing source of contamination. Chloride in drinking-water originates from natural sources, sewage and industrial effluents.
3 Microbial	MPN (Total Coliforms), Thermotolerant & *E. coli*.	Plenty of total coliforms indicates that there may be some issues regarding cleanliness and integrity of the distribution system. Presence of thermotolerant coliforms suggests environmental pollution including the possibility of sewage contamination. Presence of *E. coli* is a definitive sign of sewage (fecal) contamination.

The survey instrument has been designed to help with a structured and detailed conversation about consumers' experience of the complaints-resolution process. In addition, this survey provides a cost-effective opportunity to gather primary data regarding domestic water storage infrastructure, water handling practices and domestic sewage systems, and the state of street sewers nearby the sampled consumer premises. The Survey Instrument includes, (a) questions to gather information from the consumer/informant, (b) rating scales to measure informant's assessment of water utility response to their complaints, and (c) items for recording surveyor's observation of domestic water supply and sewage system. The instrument was fine-tuned during the course of survey, based on field experiences and additional information needs.

Before embarking on the survey, the Water Quality Investigator (surveyor) visits the concerned MWB - Section Office to, inform about the survey, identify the service reservoir that supplies to the sampled consumer, gather information about the distribution line to the sampled consumer. Sometimes, people at Sections Office may also help with directions to locate the consumer premises. Surveyors visit the concerned consumer premises, twice. First, to locate the consumer premises, identify an appropriate respondent, gather detailed information regarding the water quality complaint and fill in the consumer survey instrument. Information regarding water supply timing is gathered at this time. If, by chance, there is live metro water supply at the time of first visit to sampled consumer's premises, the surveyor would test for residual chlorine and collect a sample for laboratory analysis. Mostly, however, the surveyor makes a follow-up visit, during the water supply timings, to test for residual chlorine and collect a sample of metro water supplied to the consumer (live supply) for laboratory testing. Occasionally, particularly if the supply times are from midnight to early morning, the surveyor would give a presterilised sample collection bottle to the informant/consumer, explain the procedure and request him/her to collection a sample of metro water during live supply. In such cases the surveyor visits the household the next day morning to collect the water sample and deliver it to the IHS laboratory for testing. On the spot testing for residual chlorine would not be feasible for these cases. The surveyor also visits the concerned service reservoir, preferably within the scheduled supply time for the sampled household, tests for residual chlorine and collects a sample for laboratory analysis.

The study started in 2017-18 and five annual study reports have been completed, covering complaints in financial years 2017-18 to 2021-22. These studies show that most of the water supply related complaints fall into four categories, namely; no-water (23% to 36%), water leakage (21% to 41%), distribution issues (12% to 25%), and polluted water (12% to 21%). About 85% to 95% of complainants evaluated MWB response as 'satisfactory' or better (good, very good and excellent). More than 95-98% complaints were attended to within the maximum of 15 days specified in the citizen's charter. About 74 to 85% complaints were attended to within 5 days. However, persistence and recurrence of problems is a major concern. About 86% households have sumps and/or overhead tanks for bulk storage, mostly of metro water. Overall, sanitary conditions of most sumps & OHTs are reasonably good.

Most importantly, the surveys show that, consumer confidence on potability of metro water is quite high. The proportion of households relying on metro water as their primary source for drinking increased from about 86% during for the first three study periods (2017-20) to 92% for 2021-22. Proportion of households relying on bottled water decreased, from about 13% for the 2017-20 study periods, down to 7.5% for 2021-22. Aesthetic quality of

metro water supplied to consumers in Hyderabad has generally been quite good. About 99% of samples from both SR & households satisfy the acceptable criteria for colour and odour. About 99% of metro water supplied to households in Hyderabad tested during the 5-year study period was found to be very palatable (TDS<=500mg/L). About 90% of service reservoir and consumer-end samples did not grow any coliforms at all. The 5-year pooled estimate of faecal coliform events in service reservoir and consumer-end samples was about 0.78%.

Overall, the HMWSSB is supplying excellently palatable, aesthetically acceptable, contamination free potable water in 99% cases. Most of the contamination is attributable to issues with distribution pipeline or consumer connection pipe line.

D. Sanitary Inspection of Service Reservoirs (SISR) for Water Safety:

Water utilities usually source raw water from surface water bodies such as dams & reservoirs or by directly pumping from rivers. Sometimes groundwater may also be used. In any case, raw water has to be processed and treated before it is ready for distribution to consumers. Adequate volume of treated water has to be safely stored for distribution to consumers. The storage facility for distribution of treated water, called distribution reservoirs are also known as service reservoirs, finished or treated water storage etc. Service reservoirs are located close to consumer areas to maintain effective pressure in distribution lines.

The purpose of sanitary inspection is to check all aspects of a service reservoir (SR) to rule out vulnerabilities and pathways of contamination, if any. The inspections are designed to identify structural and/or operational deficiencies, if any and recommend measures to improve sanitary integrity, and minimise risk of contamination of water stored and distributed from the SR. For example; SRs with unprotected air vents and/or open manholes would be vulnerable to bird droppings. Unprotected side-wall air vents and walk-in access ways may allow birds to nest, which in turn increases vulnerability for bird droppings. Leaks and gaps around inlet, outlet, overflow arrangements can create vulnerabilities for entry of contamination to the distribution system. Defunct inlet/outlet pipes and cul-de-sacs can provide niches for growth biofilms. Close examination of the SR exterior may give clues regarding vulnerabilities for contamination. For example; inadequately drained roofs allowing for accumulation of storm water that pickup contamination from bird the roof surface into the SR interior through cracks, gaps etc. around air vent pipes, manholes, entry/exit of various pipes etc. Cracks, crevices and/or water marks on the SR walls may indicate junctional voids that may eventually allow for entry of contamination. Condition of the surrounding land may indicate some vulnerability. For example, if the surrounding land is not sloping towards the SR instead of sloping outward, storm water would accumulate around the SR structure, which in turn would affect structural and functional integrity of the SR. Similarly, information about the latest and previous cleaning operations, booster chlorination, and time trend analysis of water quality monitoring results for the concerned SR may give some clue about operational vulnerabilities, if any. Water safety surveyors are trained to inspect and gather information about air vents, manholes, inlet-outlet arrangements, state of roof & walls, surroundings, history of cleaning, and chlorination arrangements. Reports are prepared based on their initial inputs and follow-up visits for further clarifications. Each report provides actionable recommendations to address sanitary deficiencies, if any and improve operational integrity of the SR. Sanitary inspection reports should clearly identify and provide feasible and actionable recommendations that can be taken up by operations and

maintenance (O&M) personnel without. The protocol for sanitary inspection, and preparation of reports IHS was developed by pilot testing followed by fine tuning of designed forms and guidelines based on experiences from inspection of 73 services reservoirs during September 2018 to June 2021. Thereafter, 92 SISRs have been conducted during March to November 2023.

E. Focus Group Discussion (FGD) and Community Connect for Water Safety:

The objective of the community mobilisation is to develop strategies for water safety in slum areas of Hyderabad and build community awareness among the slum residents. Focus group discussions (FGDs) are conducted regularly in identified slum areas to gather information about consumer perceptions of metro water supply through domestic connections, public stand posts and tankers and to understand consumer concerns on water availability, regularity, and quantity of supply. FGDs also help to understand community knowledge, attitudes and practices about water quality and related issues, usage, storage, handling, hygiene, sanitation, and health status. In addition, the FGDs are used to inform & educate the target group on good hygiene practices and measures to prevent waterborne diseases. Water safety surveyors, fellows/interns, research assistants, associates, faculties, and other personnel drawn from various sections of the Institute are trained in focus group methodology (Scrimshaw and Hurtado, 1987) and water sanitation and hygiene concepts (CAWST, 2017; WHO, 2015; UNICEF, 2011) to act as FGD resource persons. Two resource persons are drawn for each focus group, one to act as a facilitator and the other as recorder. Monthly about five FGDs are being conducted in different slum areas of Hyderabad. and reports are submitted to HMWSSB for follow up action.

F. Research collaborations for water safety

Often the IHS Laboratory collaborates with other organisations taking up mostly action research projects that require water quality testing. Following are some examples of collaborative project in which the IHS Laboratory has participated.

Institute of Perception Studies and IHS: Water quality in and around Hyderabad

Institute of perception studies Institute of Perception Studies (IPS) is a Delhi based non-profit organisation and works for poverty alleviation and rural and urban distress reforms. IPS undertakes research on rural and urban distress. As part of research, IPS took up the study to know the water quality in the borewells and in direct supply of municipal water in and around Hyderabad. IPS has approached IHS to test the water including interpretation for their assessment. The study has been started in Aug 2021.

EPTRI and IHS: Status Report on State Specific Action Plan for Water Sector: Telangana State

The Environment Protection and Training Institute (EPTRI) was commissioned by the Government of Telangana to prepare the state specific action plan for water sector as in accordance with the terms of reference (ToR) issued by Government of India, Ministry of Water Resources, River Development & Ganga Rejuvenation. As a part of this activity, EPTRI had to prepare a status-, interim- and final-reports in three phases. By May 2017, EPTRI had prepared draft of the first phase stratus report. The Institute of Health System

contributed towards finalisation of this stage by taking up a detailed review of the draft status report with specific inputs for finalisation of the report.

Fresh Water Action Network, South Asia and IHS: Study on Sanitation, Wastewater and Septage Management

Fresh Water Action Network (FWAN), South Asia in collaboration with National Institute of Urban Affairs (NIU), GoI has initiated a study on Sanitation, Wastewater and Septage Management systems on a pilot basis across 5 States in the country including Telangana to strengthen its SCBP (Sanitation Capacity Building Platform) initiative. Siddipet town has been selected for the project in Telangana for the assessment. As part of the assessment, the study team requested IHS in 2018 to undertake water quality testing in various locations of Siddipet town for; (1) Ground Water Potability (GPT)Test for the water from Borewells, (2) COD and BOD for the water from Lakes or rivers. IHS has collected 9 samples for GPT and 5 for COD and BOD and furnished the reports for the assessment by FWAN.

Center For People's Forestry and IHS: Drinking water quality in rural area

Center For People's Forestry (CPF) working for Promoting capacities, diversifying skills, and enhancing livelihood security of the marginalised sections among the forest and rural communities. Before planning an intervention, CPF carries out action research to understand the situation at all levels, identify gaps and define the role to be played by CPF and other stakeholders in it. As part of the action research, CPF commissioned IHS in 2017 to test the water samples in rural areas to know the water quality for drinking. IHS has tested 55 water samples for Ground water potability collected from borewells in Achampet and Adilabad areas of Telangana and gave the interpretation on the suitability of water for drinking.

Gurunanak Institutions - Civil Engineering Dept. and IHS: Water quality in a watershed area

Civil Engineering Department of Gurunanak Institutions, Ibrahimpatnam of Ranga Reddy district took up the study under UGC Minor Research Project to know the water quality in Eliminetivagu watershed area. The institute has commissioned IHS in 2016 to collect the samples from borewells in the villages falling in water shed area for ground water quality test. IHS has collected 30 water samples, tested for GQT and furnished the reports to include in their study report.

Center for World Solidarity and IHS: Potability of Groundwater in Anantapur and Warangal Districts

In 2014, the Center for World Solidarity (CWS) wanted to test for potability of groundwater (GPT) in various gram panchayats of Anantapur and Warangal districts. This was an action research project on sustainable groundwater management (SuGWM). Their team was trained by IHS, in water sample collection, storage and transportation to laboratory. After training they were provided with sample collection bottles, along with written guides for reference, samples to laboratory within 24 hours. All 47 samples were received from them were tested reports furnished to CWS for appropriate intervention.

World Vision India and IHS: Safe drinking water in remote areas using locally sourced groundwater and reverse osmosis (RO) technology

In 2014, the World Vision India (WVI), had a project to deliver safe drinking water in remote areas using locally sourced groundwater and reverse osmosis (RO) technology. The IHS laboratory deployed water quality investigators to collect sample from the field, transport them to laboratory in appropriate packing, analyse and furnish test results to WEVI. Samples were collected from 35 villages in Bhokpur block of Nanded district of Maharashtra, and 12 villages in Korukonda Mandal of East Godavari district. More samples were collected in 2016 to 2017, from Kandukur in Prakasam District, Vijayanagaram, Achampet/Shadnagar area of Mahbubnagar district and a few from Hyderabad city. The main idea of this project is to plan for establishing RO Plants where the ground water was not safe to use, so that the individuals can have access to safe water for drinking and other domestic purposes.

RWTH Aachen University, Germany and IHS: Scenario Analysis for Protection of Water Resources with Regard to Urban Development in Varanasi and Hyderabad

Ms. Nina Engels, was a student of RWTH Aachen University, Germany who was pursuing post-graduation in Geo-resources Management took up the research topic, “Scenario Analysis for Protection of Water Resources with Regard to Urban Development in Varanasi and Hyderabad”. For her research topic, she focused on urban development, in particular water quality and water supply. She designed the study which includes taking water samples from different study areas all around the cities from public hand pumps, taps, rivers, lakes and private bore wells, so as to cover nearly all sources where people in India get their water from. On request from Ms.Nina Engels, IHS has accepted the job and deputed the water quality investigators for collection of samples at the sources which were identified by Ms. Nina Engels. She impressed about the standard procedure of preparation of sample collection kit, skills in collection of water samples by the water quality investigators during accompanying the investigators. The sampled water bottles were transported within six hours and deposited at the IHS laboratory for testing. The test reports were prepared and furnished for each sample to Ms. Nina Engels for including the thesis.

IIT Delhi, ICRISAT and IHS: Study on Manjira River Watershed

The Indian Institute of Technology (IIT) Delhi selected Manjira sub-basin for a pilot study to develop environmental scenarios and assess impact of climate change Godavari river-basin. The study was conducted by IIT-Delhi in collaboration with the ICRISAT at Hyderabad. The IHS Laboratory supported the study by sampling of water in the Manjira river-basin and laboratory testing.

G. Institutional-Campus Water Quality Monitoring

Institutions and their campuses face a special challenge in ensuring water safety for their residents and visitors. Hospitals, for example, have to maintain elaborate water storage and distribution system with various point-of-use and/or point-of-entry water treatment facilities to supply drinking water to patients and attendants and meet for other medical uses such as for dialysis, sterilization units, operation theatres and general use in wards and outpatient departments. Acceptable chemical profile and bacteriological purity is important for hand wash and many other uses in hospitals. Similarly, in case training, research and educational institutions, potability of water supplied in campus is critical for health of the trainees, guests and in-campus residents. These moderately complex water storage,

distribution and point-of-use treatment systems need regular monitoring to identify developing vulnerabilities, if any, for timely preventive measures.

To establish a tailormade water quality monitoring system for an institution, the IHS first takes up a sanitary survey of their water supply system to identify and map various components including sources (municipal supply and/or groundwater), sumps, overhead tanks, distribution system, point-of-use (POU) water treatment units, drinking water dispensing points, etc. Critical components of water sourcing, storage and distribution system are inspected. Based on a risk analysis of the system, and criticality of institutional operations, a water quality monitoring plan, including testing cycle, sampling plan, and periodical sanitary survey of the sumps, rooftop tanks, and borewell heads, etc. is proposed.

For example; the following table shows sample of a water quality monitoring plan for a 100-bedded nonprofit general hospital with dialysis services. This hospital sources municipal water through a 40 mm diameter pipe, supplemented by four borewells. There are five sumps. A RO plant delivers water for dialysis. About six POU units, located in various floors, deliver drinking water to patients and attendants.

Table 2: Monthly Water Quality Monitoring Plan for a Hospital Campus

Sl	Designated Use / Source	Source / Sampling	Bi-annual benchmark		Monthly monitoring	
			Test Code	Qty	Test Code	Qty
1	Dialysis Water	Feeder borewell / Sump / OHT	GPT	1	DRF	1
		RO plant output, Dialysis room	ROP	1	DLB	1
		Dialysis room taps.	BET	1	BET	1
2	Municipal Supply for Drinking & General Use	Sump, OHT & General taps	CPT	4	BPT	3
		POU treatment unit for drinking water	CPT	1	BPT	1
3	Borewells for General Use	Borewell, Sump, OHT & General taps	GPT, CPT, CPT, BPT	4	CPT / BPT	3
4	Sample Collection Service			10		8

Notes:
BPT: Basic potability test: designed to test for general characteristics, and a few chemical parameters (hardness, which is an indicator of mineral content) and microbial quality
CPT: Complete potability tests designed to test for general characteristics, and more chemical parameters (Alkalinity, chloride and sulphates and microbial quality.
GPT: Groundwater potability tests designed to test for a larger set of chemical parameters, in addition to general and microbial characteristics for testing.
ROP: Reverse Osmosis water Profile.
DRF: Dialysis RO Feed water. DLB: Dialysis water Basics. BET: Bacterial Endotoxin Test for dialysis water.
Biannual benchmark tests should be done in April & October.
Monthly monitoring tests in other months. Samples from POU units should be rotated to cover each unit at least once during a semester. Samples from General Use Taps shall be rotated to cover at least one tap from each sump, OHT, floor and service area during a semester.

Similarly, a periodical sanitary survey plan shows for various types of campuses may look like the following:

Table 3: Illustrative Annual Sanitary Survey Plan for a Hospital Campus

Sl	Description	Scope
1	Annual Sanitary Survey	Inspect sumps, rooftop tanks, borewells, water dispensers and usage areas. Identify actionable issues to protect water quality and improve sanitary conditions.
2	Annual Follow-up Sanitary Survey	Check for rectifications and follow-up action on Annual Sanitation Survey. Report extent of compliance and persistent actionable issues needing attention.

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