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**PREVENTION AND CONTROL OF NON-COMMUNICABLE
DISEASES: STATUS AND STRATEGIES**

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Foreword

This paper formed part of a series of background papers prepared for the ICRIER India Health Study, “Changing the Indian Health System: Current Issues, Future Directions” by Rajiv L. Misra, Rachel Chatterjee, and Sujatha Rao. The India Health Study, prepared under the team leadership of Rajiv Misra, former Health Secretary, Government of India, was funded by the Bill and Melinda Gates Foundation.

Among the major health transitions witnessed in the second half of the twentieth century, the most globally pervasive change has been the rising burden of non-communicable diseases (NCDs). This has given rise to new challenges of providing acute and chronic care for NCDs, especially in poor countries such as India with an already existing mismatch between health care needs and resources. This paper examines the socio-economic impact and burden of NCDs and discusses various strategies for the prevention and control of such diseases in India. It recommends that existing health systems will need to be reorganized and reoriented to include the prevention, surveillance, and management of NCDs. The paper also recommends that evidence based clinical practice and appropriate use of technologies should be promoted at all levels of health care, including tertiary services.

The prevention and control of NCDs poses a major public health challenge for the country in the twenty-first century. I am very pleased that ICRIER has had the opportunity to participate in the debate in this area. This contribution by K. Srinath Reddy will help significantly in providing a better focus to the problems and solutions at hand.

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Introduction

The second half of the twentieth century witnessed major health transitions in the world, propelled by socio-economic and technological changes which profoundly altered life expectancy and ways of living while creating an unprecedented human capacity to use science to both prolong and enhance life. Among these health transitions, the most globally pervasive change has been the rising burden of non-communicable diseases (NCDs). Epidemics of non-communicable diseases (NCD) are presently emerging or accelerating in most developing countries (Murray and Lopez 1996). Even as infections and nutritional deficiencies are receding as leading contributors to death and disability, cardiovascular diseases (CVDs), cancers, diabetes, neuropsychiatric ailments, and other chronic diseases are becoming major contributors to the burden of disease. India too illustrates this health transition, which positions NCDs as a major public health challenge of growing magnitude in the twenty-first century.

As India experiences a rapid health transition, the mismatch between health care needs and resources is widened by an expanded list of health conditions that vie for attention from policy-makers and public health action while posting competing claims for clinical care. The complexities are compounded when policy has to prioritise on the basis of disease burdens, cost-effectiveness, and equity while the delivery systems have to simultaneously cope with the transformative pressures of economic restructuring and health care reforms. The challenges of providing acute and chronic care for NCDs in such settings are immense, yet the imperatives of proper planning and performance for delivering such care become increasingly urgent as health transition rapidly rewrites a new agenda for health care in the India.

Existing health systems need to be reorganised, reoriented, and recruited to deliver the expanded mandate of health care involving the prevention, surveillance and management of chronic diseases. The sustained nature of preventive interventions, required over many years, as well as the growing demand for acute and chronic care of NCDs will need to be accommodated into the agenda of primary and secondary health

care. Surveillance of NCDs and their risk factors should also become an integral function of health systems, complementary to the other surveillance functions they are currently performing. Evidence based clinical practice and appropriate use of technologies should be promoted at all levels of health care, including tertiary services.

Determinants of Health Transition

Health transition, whereby NCDs become the dominant contributor to the burden of disease, is principally due to a combination of demographic and lifestyle changes that result from socio-economic development. Demographic transition is characterised by a decline in mortality, followed by a drop in fertility. During this transition, the age structure of the population changes from a pyramidal shape to a more columnar shape, as fertility declines and the population ages. This is then reflected in the profile of the causes of death. As industrialisation and urbanisation occur, there is a decline in the mortality attributable to infectious diseases and nutritional disorders. As more individuals survive to enter the middle ages, the years of exposure to the risk factors of chronic disease increase. Simultaneously, urbanisation, industrialisation, and globalisation are often accompanied by several undesirable lifestyle alterations in the form of a diet rich in saturated fat, salt, and excess calories, decreased physical activity, addictions like tobacco and alcohol, and augmentation of psychosocial stress. Thus the dose and duration of risk factor exposure both increase, resulting in large numbers manifesting lifestyle related diseases and their consequences. Health transition is characterised by a demographic transition in the age profile and an epidemiologic transition marked by the shift in the cause of death profile with the increasing dominance of NCDs (Omran 1971; Olshansky and Ault 1986).

In addition, recent evidence suggests that impaired foetal nutrition, reflected in small birth size, results in programmed susceptibility adult cardiovascular disease, diabetes, and some cancers. Migrant Indians have also been shown to have excess rates of coronary heart disease (CHD) and diabetes in comparison to other ethnic groups, indicating a magnified response to environmental change. These factors will adversely

impact on the future burden of NCDs, as India experiences health transition (Reddy and Yusuf 1998; Reddy 1999).

Socio-economic Impact of NCDs and Equity Issues

Death or disability from NCDs in the productive middle ages results in major economic burdens on the affected individuals, their families, and society as a whole. The management of established NCDs (diagnosis and therapy) is often technology-intensive and expensive. Individual as well as societal resources are already being drained, at a disproportionately high level, by the tertiary care management of NCDs, often drawing scarce resources away from the unfinished agenda of infectious disease and nutritional disorder control.

Though NCD epidemics usually originate in the upper socio-economic strata, they diffuse across the social spectrum, with the social gradient ultimately reversing and the poor becoming predominantly afflicted. Indeed, in the more mature stages of these epidemics, the poor are the often worst afflicted in terms of disease and usually the most marginalised in terms of care. This historical experience of the developed countries, where the NCD epidemics matured over the past half-century, is likely to be replicated in the developing countries in the coming half-century. There is recent evidence from some Indian studies that the social gradient for CVDs has already begun to reverse in some population groups in India, especially in large urban settings (World Bank 1999). Tobacco consumption is also higher in rural as compared to urban populations and in the poor as compared to the rich population groups. The future risk of tobacco-related NCDs is, therefore, likely to be higher in these groups (Chadha et al. 1997; Reddy 1993). A comparison of per capita income profile and death rates in Punjab, Maharashtra, Andhra Pradesh, and Orissa in 1988 reveals that as per capita income profile progressively declines from Punjab to Orissa, the probability of death between the ages of 15 and 60 years progressively rises (19 per cent, 27 per cent, 34 per cent, and 38 per cent respectively). NCDs are a major contributor to deaths in this age group.

These post-transitional diseases also have macro and micro economic impacts which may prolong the high burden of pre-transitional diseases in developing country settings. The loss, due to death and disability, of productive persons in mid-life, cripples development and perpetuates social conditions which foster communicable and nutritional disorders. The loss of a wage earner in the family has devastating effects on the nutrition, education, and health care access of other family members, especially young dependents. The twin agendas of health care, mandated by pre-and post-transitional diseases, are not competitively exclusive but are synergistically complementary. The goal of extending health care benefits across an expanding lifespan requires that these two agendas be harmonised in India, as we brace up to meet the challenges of health transition.

Much of these economic and health burdens could be obviated

- (a) *in the short term* by strategies which involve low-cost screening for early detection of NCDs in whom early interventions effectively alter the natural history of disease and the use of the several low cost, high impact interventions for secondary prevention and clinical care which are now readily available and
- (b) *in the long term* by investment in population based prevention strategies for preventing the acquisition or augmentation of risk in hitherto low-risk populations and reduction of risk in populations already affected by health transition.

Burden of NCDs (Present and Projected)

Even at the present stage of health transition, India contributes substantially to the global burden of NCDs. In 1990, India accounted for 19 per cent of all deaths, 16 per cent of all NCD deaths, and 17 per cent of all CVD deaths in the world. CVDs in India alone accounted for around 2.4 million deaths, in contrast to nearly 3.2 million deaths due to that cause in all the industrialised countries together (Murray and Lopez 1996).

While the present high burden of NCD deaths is itself an adequate reason for public health attention, a greater cause for concern is the early age of these deaths in India compared to the developed countries. More NCD deaths in India occur in middle-age (35–69 years) than in industrialised countries, where they occur largely in old age (>70 years). Even as the overall NCD burdens will rise sharply by 2020 (Tables I and II), disproportionate loss of lives in mid-life will continue to constitute a major burden (Table III). Table IV provides a comparison between India and established market economies (EME). In India, 52.2 per cent of all CVD deaths in 1990 occurred before the age of 70 years, in contrast to 22.8 per cent in the EME countries (Murray and Lopez 1996; Reddy and Yusuf 1998).

Table I
GBOD Estimates for India (1990, 2020)

	India (1990) Population = 850 million		India (2020) Population = 1267 million	
	Group I	Group II	Group III	Total
Deaths 1990 (thousands)	4775 (51.0%)	3788 (40.4%)	808 (8.6%)	9371
Deaths 2020 (thousands)	2461 (21.6%)	7627 (66.7%)	1342 (11.7%)	11,430
DALYs 1990 (thousands)	162,354 (56.4%)	83,437 (29.0%)	41,947 (14.6%)	287,739
DALYs 2020 (thousands)	57,756 (24.4%)	133,770 (56.5%)	45,285 (19.1%)	236,741

Group I = Communicable, maternal, perinatal, and nutritional conditions

Group II = Non-communicable Disease

Group III = Injuries

DALY = Disability Adjusted Life Year

GBOD = Global Burden of Disease

Source: Murray and Lopez (1996).

Table II
Contribution of NCDs and Injuries to Mortality in India (1990, 2020)

Cause of Death	Cause-specific Proportionate Mortality (as % of total mortality)	
	1990	2020
Total NCD	40.4	66.7
Cardiovascular	24.2	41.8
Malignant neoplasm	5.4	11.4
Neuropsychiatric	1.1	0.9
Total Injuries	8.6	11.7
Unintentional	6.9	9.5
Intentional	1.6	2.2

Source: Murray and Lopez (1996).

Table III
Mid-life Mortality due to NCDs in India (1990, 2020)

Cause of Death	Percentage of cause-specific mortality occurring in the age group of 30–69 yrs	
	1990	2020
Total NCD	48.9	51.3
Cardiovascular	48.2	47.7
Malignant neoplasm	64.6	69.2
Neuropsychiatric	40.6	39.6
Total Injuries	36.3	52.8
Unintentional	34	52
Intentional	45	56.4

Source: Murray and Lopez (1996).

Table IV
Early Mortality due to NCDs in India (1990, 2020)

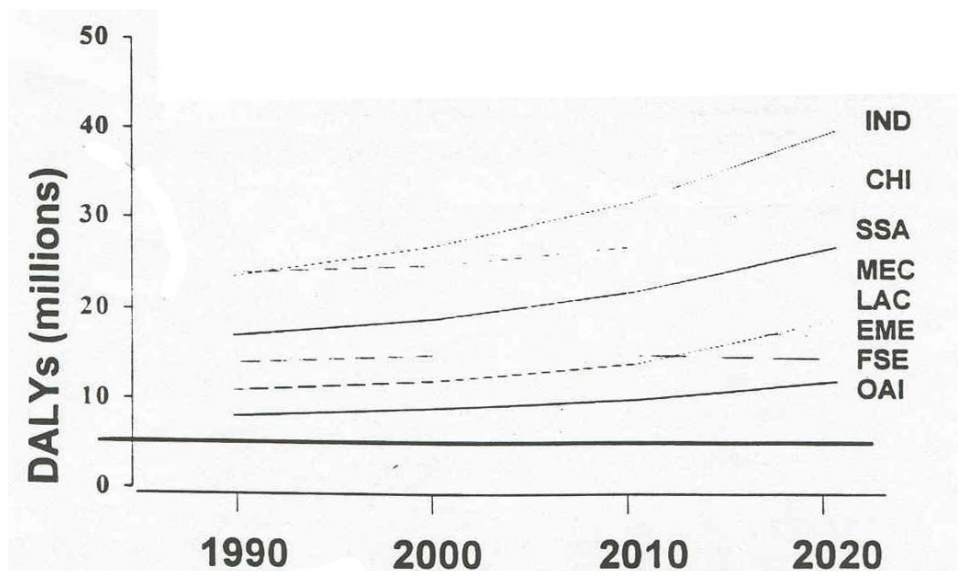
Age profile of NCD deaths (% of NCD deaths in each range)				
Age at Death	India 1990	EME 1999	India 2020	EME 2020
<30 yrs	12.2	3	4.1	0.6
30-69 yrs	48.9	23	51.3	24.8
>70 yrs	38.9	74	44.6	74.5

Source: Murray and Lopez (1996).

The high prevalence of diabetes in urban and migrant Indians is also a cause for concern. Urban estimates of diabetes in adults aged over 35 years are in the range of 16–20 per cent, while the corresponding rural estimates are around 4 per cent. With such rates, it has been estimated that India has the largest number of diabetics in the world. As dietary habits worsen and physical activity decreases with resultant obesity, diabetes will become an increasingly frequent contributor to NCD. It has been estimated that the number of persons with diabetes will rise from 19.4 million in 1995 to 57.2 million in the world, even as India leads the global table for the number of diabetes (King et al. 1998). Since these estimates are based on older and higher cut-off values for the diagnosis of diabetes and also do not take into account the category of impaired glucose tolerance, the overall burdens of disease attributable to diabetic and pre-diabetics may be even higher than those projected.

There will also be a sharp rise in disability adjusted life years (DALYs) lost due to NCDs between 1990 and 2020. This is illustrated by the rise in the DALY loss attributable to CVDs where India will be the global leader (Fig. 1).

Figure 1
Burden of CVDS, 1990–2020



IND=India; CHI=China; SSA=Sub Saharan Africa; MEC=Middle Eastern Crescent; LAC=Latin American Countries; EME=Established Market Economies; FSE=Former Socialist Economies; OAI=Other Asia and Islands.

Source: Murray and Lopez (1996).

While these estimates (present and projected) are based on a variety of data sources of limited coverage and uncertain validity, they are the best available estimates from a globally acknowledged data source [the Global Burden of Disease (GBOD) study by Murray and Lopez in 1996]. Some Indian investigators have questioned the estimates for 1990, based on independent secondary analysis and modelling (Anand 2000). The differences are not substantially large. While the precise dimensions of the epidemic may be difficult to gauge at present, the directions of its growth are indisputable.

The prevalence/incidence of various NCDs for 1998 has also been estimated, for India, based on various published studies from different regions (Anand 2000). These are profiled in Table V. These estimates may be relatively conservative, as suggested by the comparison with the diabetes prevalence estimates of the World Health Organization. Even then, it is estimated that about one-fifth of the population would have at least one of these selected NCDs.

Table V
Estimated Number of Cases of Selected NCDs in India, 1998

Disease	Prevalence / incidence	Number of cases	% of total population
All Cancers	Prevalence	2 million	0.2
Heart diseases (IHD, HT, Stroke, RHD)	Prevalence	65 million	6.6
Respiratory diseases	Prevalence	65 million	6.6
Diabetes mellitus	Prevalence	13 million	1.3
Injuries	Incidence	7 million	0.70

Source: Anand (2000).

The lag period between exposure to risk factors of NCDs and their clinical manifestations make current mortality rates unsuitable for prospective public health planning, since they only represent past exposures over some decades. The present levels of risk factor exposure would be more meaningful in predicting future risk and driving public health policy. The rising levels of hypertension, diabetes, obesity, tobacco consumption, and blood lipids in Indian population groups have been well documented in

recent years (Chadha et al. 1997; Reddy 1993; King et al. 1998; Anand 2000; Gupta et al. 1996). These too portend a major rise in future NCD burdens in India.

Strategies

The principles of prevention which underline the strategies for NCD control are as follows.

- Principle 1: Risk operates in a continuum—not across arbitrary thresholds; Risk reduction benefits across the range.
- Principle 2: Majority of NCD events arise in a population from the middle of the distribution (of a risk factor) than from its high end.
- Principle 3: Co-existence of risk factors leads to interactive risk which is multiplicative.
- Principle 4: The absolute risk of a major NCD event (e.g. CHD/stroke) is dependent on the overall risk profile contributed by co-existent risk factors operating in a continuum.

Traditionally, public health approaches to NCD control have been (a) a high risk strategy, targeting persons with high levels of risk factors and employing interventions to reduce them, usually with drugs and (b) a population strategy which attempts to reduce risk factor levels in the whole community, usually through lifestyle related measures (Rose 1985; Rose and Day 1990). The former provides higher benefits to individuals at maximum risk. However, since such individuals are a small segment of the society, there is no major impact on national morbidity or mortality on the country. The population approach aims at relatively modest reductions in the risk for each individual, but the cumulative benefits to the community are large since there are many more persons in the mild or moderate range of risk factor elevation than there are in the highest range. The two strategies are not mutually exclusive but are synergistically complementary. However, population-based and lifestyle linked strategies are likely to prevent the acquisition or augmentation of NCD risk factors in transitional societies like India, while avoiding the economic and biological costs of pharmacological risk reduction strategies practised in the developed countries.

Simultaneously effective low-cost case-management strategies are required for persons who manifest disease. Such technologies are available but await widespread dissemination and application. For example, oral aspirin administration in cases of suspected heart attack saves as many lives as the intravenously administered clot dissolving drug streptokinase (Antiplatelet Trialists Collaboration 1994). The community needs to be empowered, through information, to avail of such technologies, which are both feasible for wide application and are cost-effective (Table VI).

Table VI
Effect of Treatment of 1000 Patients with AMI

	Premature deaths avoided	Cerebral haemorrhages caused	Cost per life saved
Aspirin	23	0	Rs. 152
Streptokinase	25	2–3	Rs. 123,560

Source: Murray and Lopez (1996).

At the population level, programmes for promotion of (a) a health promoting diet (calories appropriate to the level of physical activity; moderation in the intake of saturated fat, salt, and refined sugar; high intake of fresh fruit and vegetables; fish in preference to red meat in non-vegetarian diets) and (b) adequate physical activity and regular exercise are required. These are likely to have benefits for a wide range of NCDs, especially CVD, diabetes, hypertension, and some cancers which are related to saturated fat intake.

Tobacco control is a major public health imperative which will provide the largest benefit, for NCD prevention. Tobacco-related cancers, CVD, and chronic obstructive airway disease are amongst the diseases which can be effectively prevented if abstinence from tobacco and cessation of the tobacco habit are encouraged in the population. It has been estimated that of all the teenagers who are currently smoking, half will eventually die of tobacco related diseases (a quarter in the middle age and a quarter at an older age).

For those who die of tobacco related illnesses in the middle age, the average loss of life-expectancy compared to non-smokers is 20–26 years. Tobacco and AIDS represent the most rapidly growing causes of death, the former being the foremost preventable cause of death in the modern world (World Bank 1999). Population based control strategies are clearly a high priority.

The success of population based interventions, addressing multiple risk factors common to most NCDs, through lifestyle linked community programmes has been demonstrated both in developed and developing countries (Puska et al. 1995; Dowsen et al. 1995). Such population strategies require both ‘bottom-up’ (community health education and empowerment) and ‘top-down’ (legislation and regulation) approaches. Whether it is food (production, pricing, labelling) or tobacco (production, sale, advertising) or physical activity (a conducive transport policy which favours urban cycle lanes and curbs vehicular transport as well as provides facilities for leisure time exercise in community playgrounds), active health policy measures are required alongside public health education. An enlightened policy and an empowered community can together stall the advance of the emerging epidemics of NCDs in India.

Presently, programmes for NCD control are non-existent or functioning at a low level in India. The National Cancer Control Programme involves cancer registries at selected sites and strengthening of facilities for clinical care (e.g. radiotherapy). Pilot studies for control of CVD and diabetes have been initiated but have not impacted on policy and programme development. Tobacco control is being accorded greater importance but awaits early passage of proposed legislation and a vigorous public education campaign.

Implementation

Programmes for the prevention and control of NCDs need to adopt a ‘life span’ approach, attempt to reduce risk at stage of life through appropriate public health interventions. They also need to be variably integrated into different levels of health care

(primary, secondary, and tertiary). The principal functions of such a programme would be: (a) to provide information and an enabling environment for increasing awareness and adoption of health living habits by the community; (b) early detection of persons with risk factors and cost-effective interventions for reducing risk; (c) early detection of persons with clinical disease and cost-effective care to prevent complications; (d) acute care, utilising low cost, high yield technologies; (e) secondary prevention to reduce, risk of the recurrent events; and (f) rehabilitation and palliative care, in cases where disease has resulted in complications or is incurable.

Many of these activities can be performed in primary care settings (e.g. health education, blood pressure checks, tobacco cessation, chest pain algorithms, oral cancer screening). Some would need to be strengthened in secondary care (e.g. management of some cancers, treatment of left ventricular dysfunction). In settings of tertiary care, technology needs to be utilised cost-effectively to provide advanced care as per clearly defined guidelines.

The operational components are listed in Table VII.

Table VII
Implementation: Operational Components

Area	Essential package (core components)	Optimal package (other components)
Prevention	<p>Tobacco control (Taxation, Regulation, Education)</p> <p>Promotion of healthy diets (production, pricing, consumer empowerment) including the preparation and dissemination of national food based dietary guidelines</p> <p>Promotion of physical activity (planning of cities and work-sites, community education)</p> <p>Mass media campaigns – targeted special group programmes for community health education</p> <p>School based programmes for ‘Learning to Live Healthy’</p>	<p>Phasing out tobacco agriculture and industry (alternate crops and occupations)</p> <p>National Nutrition Policy (involving agriculture and industry)</p> <p>National Transport Policy (pollution control and promotion of physical activity)</p>
Surveillance	<p>Tobacco consumption habits</p> <p>H/o Diabetes, Hypertension</p> <p>Blood Pressure</p> <p>Body Mass Index</p> <p>Waist circumference</p> <p>NCD mortality (by cause, age and sex)</p> <p>National aggregate indicators (e.g., production and consumption of tobacco, fruit and vegetables)</p>	<p>Blood lipids (total cholesterol, HDL cholesterol)</p> <p>Diabetes (by blood chemistry)</p> <p>Health beliefs</p> <p>Dietary consumption patterns</p> <p>Physical activity patterns</p> <p>NCD morbidity (disability)</p>
Screening	<p>‘Opportunistic’ screening for:</p> <ul style="list-style-type: none"> ⇓ Tobacco consumption ⇓ High Blood Pressure ⇓ Overweight ⇓ Central obesity ⇓ COPD ⇓ Cervical cancer ⇓ Oral cancer 	<p>‘Targeted’ screening for:</p> <ul style="list-style-type: none"> ⇓ Diabetes ⇓ Dyslipidemia ⇓ Other cancers ⇓ Transient ischaemic attacks

(Contd....)

(Table VII Contd.)

<p>Management</p>	<p>Clinical algorithms for:</p> <ul style="list-style-type: none"> ⇓ Acute myocardial infarction ⇓ High blood pressure ⇓ Congestive heart failure ⇓ Diabetes ⇓ Transient ischaemic attacks ⇓ Childhood leukaemias ⇓ Other cancers (e.g., oral, breast, cervical) ⇓ COPD 	<p>Clinical Algorithms for:</p> <ul style="list-style-type: none"> ⇓ Angina ⇓ Dyslipidemia ⇓ Stroke ⇓ Other cancers ⇓ Obesity
<p>Health Systems</p>	<p>Integrate core components of prevention, surveillance, screening, and management into primary and secondary health care</p> <p>Strengthen health provider education (learning and skills relevant to NCD control)</p> <p>Enhance the knowledge and decision making ability of health care managers in the elements of NCD control</p> <p>Implement essential drugs policy for provision of NCD related drugs</p>	<p>Strengthen quality assurance in NCD related health care delivery</p> <p>Perform technology audits to identify and correct inappropriate use of expensive technologies</p> <p>Strengthen the production and distribution of cost-effective drugs and devices for NCD care in collaboration with industry</p>
<p>Research</p>	<p>Strengthen capacity for research relevant to NCD control through national and international partnerships (Implementation research, to effectively apply available knowledge)</p>	<p>Support innovation research in the aetiology of NCDs (as relevant to Indian population groups) and for the identification of new technologies which are contextually cost-effective</p>

Issues in the Delivery of Chronic Care

Chronic Care and Optimisation of Available Resources

Since the demands of chronic care are many and the available resources and restricted, efforts to optimise the use of those resources should include the following elements.

Identifying a Menu of Core Components for Providing an 'Essential Package' of Chronic Care with Possible Extension to an 'Optimal Package'.

A list of core (essential) and other (optional) components of chronic care needs to be prepared, as appropriate to the context of each state or (where feasible) of each district. The delivery of the 'essential' package must be the immediate objective of the health care system, while the extent to which the 'optimal' package can be delivered is subject to the availability of resources.

Since resource constraints are especially severe in the developing countries like India and programmes for delivery of chronic care at an inception, it is essential to identify a set of core or 'essential' components that constitute the minimal agenda of chronic care. These will have to be chosen based on cost-effectiveness and impact on population attributable risk, so as to optimise the use of available resources. In addition a set of other 'optimal' components may also be identified for extending this agenda if adequate resources become available. A suggested list is provided in Table VII. This list has to be customised, as appropriate to each regional context. For example, in regions where stroke is the predominant contributor to cardiovascular mortality, algorithms for the management of stroke may need to be included in the 'essential' package of chronic care.

Integration of these Services into Various Levels of Health Care

The 'essential' package of services must be integrated into the existing health care infrastructure, by involving care providers, of all categories at various levels of care.

The health care systems of most states in India have not yet geared up to meet the demands of delivering chronic care. The expanded mandate of health care, which involves the addition of chronic care to pre-existing services (such as maternal and child, health, population control, and control of infectious diseases), can be delivered only when health care providers of all categories are adequately mobilised and involved at each level of health care. The involvement of the public sector, which provides a large part of the care in the India, is possible only when the governments decide to adopt a programme for integrated control of chronic diseases. The resistance of governments to commit scarce financial and human resources to chronic care must be overcome by informed advocacy by health professionals and community representatives. The private sector is usually responsive to the needs of chronic care, since such services are considered financially remunerative. However, the imbalances in the type of care provided (arising from frequent use of high cost, low yield technologies) must be corrected. Thus, the public sector needs to become more responsive (to the needs of chronic care) and the private sector should become more responsible (in the use of resources).

Clinical Practice Guidelines

The development of clinical practice guidelines (which are evidence-based, context-specific, and resource-sensitive) and their integration into various levels of health care will facilitate greater use of low cost-high impact interventions.

Clinical care, utilising cost-effective interventions demonstrated to have high impact, would be a cardinal element of the global strategy for chronic care. There are several areas of chronic care, where interventions for clinical care and secondary prevention have been demonstrated to have high impact at relatively low costs (e.g., aspirin in the treatment of heart attacks and prevention of strokes, the treatment of childhood leukaemias, foot care, and blood pressure control in diabetics). Appropriate use of such cost-effective clinical interventions with a potential for high impact on chronic disease burdens should be promoted through the development, dissemination, adoption, and implementation of clinical practice guidelines which are simple, evidence-based,

context-specific, and resource-sensitive. Operational research would be required to evaluate the effectiveness of educational interventions to promote guidelines-based clinical practice at each level of health care.

Provider Training

Education and training of health care providers, of diverse categories, would need to be modified in order to enhance the levels of their learning and skills as relevant to chronic disease prevention, surveillance, and management. A review of present training programmes should be undertaken to identify areas which need to be added or strengthened.

Current training programmes for health care providers do not equip them adequately to deliver appropriate chronic care. The training of paramedics and primary care nurses is especially deficient, as their traditional role deals mostly with 'pre-transitional' disorders and population control. Even physicians are not trained to follow an evidence-based, guideline directed, algorithmic approach that is contextually appropriate and cost-effective. The concept of a team approach, involving shared responsibilities between the health workers, nurses, and physicians is not practically ingrained during the training process. These deficiencies need to be addressed, through an in-depth review of the curriculum as well as the training methodology, so as to appropriately strengthen the learning process in terms of chronic care delivery.

Referral Linkages and Follow-Up Systems

Efficient systems for referred care, linking primary care to other levels of provider services (secondary and tertiary) and effective systems for subsequent follow-up care (by primary and secondary care providers) need to be established to ensure cost-effective bi-directional movement of patients across the health care chain.

The systems for referral of patients from primary care for advanced forms of chronic care must be established and guidelines for such referral clearly delineated, to ensure that referrals are both timely and necessary. Similarly, systems for reliable follow-

up of such patients at primary/secondary levels of care (on return from secondary/tertiary care) must be ensured, based on user friendly guidelines and algorithms developed to facilitate such follow-up care.

Providing Patient Education and Promoting Self-Care

The constraints of limited health care provider resources may be overcome by investing in patient education and encouraging self-care which will reduce the demands of follow-up care.

The need for promoting participatory care through patient education and the value of promoting self-monitoring and self-care in improving outcomes have been recently acknowledged in the developed countries. From the introduction of patient education packages for hypertension and congestive heart failure to the outstanding success of diabetes self-care, these practices have served to alter the provider dominated paternalistic model of care in favour of a partnership model of patient participation.

In developing country settings, the scarcity of trained health care personnel to provide regular follow-up services for care of chronic diseases makes this virtue of patient education and self-care a necessity. While the initial diagnosis and periodic reviews may involve provider–patient interaction, much of the regular care may be undertaken by the patient (and/or family members). This will reduce the periodicity of the required follow-up visits. While this requires investment in educational programmes, it will prove cost-effective in the long term management of chronic diseases.

Essential Drugs and Technology Needs

Any programme for providing chronic care must ensure the availability of essential drugs at affordable prices and meet the technology needs of managing a variety of chronic diseases.

The agenda of chronic care would become infructuous, if essential drugs are not available to needy consumers at affordable prices. The advent of compulsory 'product patenting' under the WTO regime will restrict the scope of local production. However, countries like India and Brazil have used the practice of 'process patenting' to build self-sufficiency in the production of many drugs, including most of the essential drugs. These are available, as generic drugs, at relatively low cost. The Indian pharmaceutical industry needs to be encouraged to invest more in research and development to produce new drugs for the local market.

Non-availability of technology, for deployment at various levels of health care, may be a major threat to the delivery of chronic care. Technology required for providing the 'essential' package of care at primary level would be easier to provide than more advanced technologies for secondary and tertiary care. South-South cooperation for technology exchange, international assistance for subsidising essential technology acquisition, and guideline based use of available technology will help developing countries like India to overcome the technology barrier. Well-conducted research involving the economic evaluation of various health care technologies will aid decisions regarding the nature of technologies that are most cost-effective at each level of health care and the extent to which they should be deployed. Capacity for such research in health economics must be quickly established and integrated into the planning process in Health Ministries and other health care financing agencies.

Situational Analysis

Estimates of existing and required capacity for delivering chronic care to communities must guide the process of planning. Qualitative and quantitative research methods will help to identify key indicators for such a situational analysis.

While planning for the delivery of chronic care to a community in any region, it would be essential to be cognisant of the capacity which exists within that community to meet current chronic care needs, in terms of policy, programmes, and infrastructure. The

anticipated growth in ‘capacity’ (defined as a composite whole, comprising of these components), *vis-à-vis* the projected rise in the burden of chronic diseases, would also need to be appraised. The suggested components of such a ‘situational analysis’ study are listed in Table VIII.

Such an assessment would involve a mixture of qualitative and quantitative research methods to tap a variety of stakeholder perspectives and map the status of diverse indicators of capacity (from health beliefs of the community to the availability of essential drugs at affordable prices). Any planning process for providing chronic care must be based on such a situational analysis of the required and available capacity.

Table VIII

Assessment of National Capacity: Questions for Situational Analysis

1. What is the current capacity, within a defined community setting, for community participation in programmes related to the prevention and control of NCDs?
(health beliefs; access to information; networking within the community; partnerships with external agencies; availability, affordability. Acceptability of, and access to promotive preventive, and therapeutic health care)
2. What is the current capacity, within the provincial/regional health care delivery system, to provide promotive, preventive, and therapeutic health care, as relevant to prevention and control of NCDs in that community?
(currently operational programmes: content, resources, outreach; health care providers: numbers, training, skills, motivation, time; resources for essential care: community health education, essential drugs, equipment, guidelines, patient education; referral linkages and follow-up services; surveillance systems)
3. What is the current capacity, within the provincial and national policy framework (regulation, legislation, taxation), to provide a supportive environment for people, patients, and providers to adopt practices conducive to the prevention and control of NCDs in the community?
(tobacco control; food and nutrition; education; drug production, pricing and supply; resource allocation; urban planning; health care financing; media)
4. What are the critical deficiencies in the capacity for and major barriers to the prevention and control of NCDs, in the perception of (a) community representatives, (b) health care providers (c) health administrators and (d) policymakers? What are the prioritised solutions recommended by each of these groups?
5. What is the required augmentation of capacity that is considered (a) desirable and (b) feasible, by policymakers, to meet the projected rise in needs for the prevention and control of NCDs over the next twenty years?

Note: Adapted from the project protocol of Initiative for Cardiovascular Health in the Developing Countries (www.ichealth.org)

Customization

Different geographical regions have a differing mix of chronic diseases. Even within a country, the magnitude of different chronic diseases will vary across social classes, gender and age groups. Within the broad framework of integrated chronic care, these varied needs have to be addressed through an appropriate mix of interventions, which are most relevant and cost-effective.

While the general needs of chronic care are likely to be similar for most regions in India, the specific mix of prioritised services would differ from region to region. These variations would be determined by the current state of health transition, projected pace of the chronic disease epidemics, geographic epidemiology of disease patterns, status of health services, resource scenario, and prioritisation within the health sector. Since there are also likely to be disparities related to socio-economic status, gender, and age resulting in a diversity of health states as well as variable access to health care, provisions for chronic care would also need to be customised within a country. This applies, for example, to guidelines and algorithms for detection and management of risk factors and disease states.

The interventions proposed for the prevention and management of chronic diseases should be based on demonstrated efficacy as well as likely financial and operational feasibility of integration into various levels of health care. Cost-effectiveness of specific interventions will, however, need to be estimated or modelled for each country, based on country-specific estimates of costs and impact. Ideally, such a cost-effectiveness analysis should be generalised, employing a sectoral approach, and seek to evaluate a wide range of interventions and resource allocation options.

Influencing Policymakers and Health System Managers

Concerted efforts must be made to enhance the knowledge of policy-makers and health system managers, at various levels, about the potential impact of cost-effective

chronic care interventions and the high costs of 'missed opportunities' so that they become motivated agents for improving the delivery of chronic care.

There are many 'missed opportunities' in clinical practice which cumulatively contribute to high burdens of chronic disease through errors of omission. The failure to administer aspirin to a case of suspected acute myocardial infarction results in loss of an opportunity to reduce early mortality by 23 per cent. Similarly, the neglect to offer advice regarding smoking cessation to diabetic or hypertensive patients results in a high burden of avoidable vascular deaths. Sensitising the policy-makers and health care managers to the health costs of such missed opportunities will ensure that adequate attention is paid to such aspects while planning and monitoring the delivery of chronic care.

Overcoming the Barriers

The operational priorities listed above face several barriers for effective implementation, in the context of the developing countries. These include: short supply and maldistribution of trained health care providers (with a disproportionately large selective urban clustering of physicians and massive shortage of trained paramedics); inadequate knowledge and skills for providing chronic care, in the currently deployed primary care providers; ill-defined roles of the public, private, and voluntary sectors in providing chronic care and inadequate purchasing power among consumers for accessing chronic care. The following strategies are suggested as potential methods of overcoming those barriers.

Community Participation

Empowerment of the community, through effectively communicated health information and support of enabling social environments will allow individuals to perform many tasks related to chronic care, ranging from self-care to assisted care of others.

The needs of integrating promotive and preventive care, early detection of risk factors, and disease, as well as certain types of emergency care into the ambit of primary health care can only be addressed effectively when the community is adequately mobilised to participate in these activities. This will be in consonance with the currently recommended models of development which emphasise devolution of decision making power to communities, with decentralisation of programme planning and implementation. By empowering communities with information and skills, a large mass of individuals can be energised to take on functions traditionally assigned to health care providers in a public health system. While a reasonable level of financial and technical resources and referral support would have to be provided by the public health system, the outreach of services would be greatly enhanced for the level of resources invested. From self-examination for oral and breast cancer to emergency care of acute cardiac events, an informed individual can perform several functions related to chronic care. Appropriate self-referrals (e.g. for blood pressure, diabetes, or cancer screening) are also promoted by such an approach. Health education would also facilitate awareness and adoption of health promoting behaviours which would prevent disease and reduce disability. While low levels of literacy are often perceived to be a barrier, the wide outreach of the audio-visual mass media will help effective communication with the community.

The large population size of India has traditionally been viewed as the major constraints to the delivery of adequate health care. By facilitating community participation, these very numbers could be converted into abundant resources for the delivery of essential services related to chronic care. The preservation, to a large extent, of an extended family structure and strong social support systems within the community, should substantially enable assistance of self-care or delivery of chronic care through the families as well as other social networks. This resource must be adequately utilised to reduce dependence on health care providers in the public or private delivery systems. From the management of diabetes and high blood pressure to community based management of mental illnesses, this would reduce the demands on follow-up services and institutional care.

Broadening the Base of Care Providers in Primary Health Care

The use of trained public health nurses, community health workers, and practitioners of complementary systems of medicine to deliver some of the services currently assigned to physician care providers in primary health care will extend outreach at a lower cost.

Since the existing strength of physician care providers is low or grossly maldistributed with selective urban clustering, there is a need to provide essential chronic health care to underserved populations, especially those in rural areas. This may be done through the development of a cadre of Community Health Workers (CHWs) who are recruited from within the communities to be served and trained to deliver those essential services. Since they are selected by the community from its members and the training period is shorter than for physician care providers, the services provided by them are likely to be sustainable and less expensive. While existing public health care systems do employ multipurpose health workers (MPWs), their current numbers and workload do not make them easily available for delivering services related to chronic care. The recruitment, training, and deployment of CHWs will help in providing chronic care by enhancing the number of trained paramedics with a clear mandate for chronic care. While CHWs may need to perform other duties as well, their work schedule should be framed to facilitate delivery of chronic care as an essential element. The feasibility of training such health care auxiliaries in the prevention and early detection of oral cancer and pre-cancerous lesions has been demonstrated by studies conducted in parts of India and Sri Lanka (Shankaranarayanan 1997).

Similarly, the development of a cadre of public health nurses will help to increase the number of primary health care providers equipped with the skills for delivering essential chronic care (such as counselling on health behaviours, detection and management of high blood pressure and diabetes, screening for common cancers, initial management of chest pain syndromes suggestive of acute coronary events, management of acute asthmatic attacks, etc.)

The large number of care providers who serve as practitioners of alternate (complementary) systems of medicine also need to be recruited into the delivery of chronic care on a country specific context. Their ready availability and widespread appeal to many underserved communities will make them valuable resources, provided they are equipped with the information and skills relevant to chronic care.

Training and Reorientation of Existing Primary Health Care Providers for Delivering Chronic Care Services

Currently deployed primary health care providers, of different categories, need to be retrained, along with restructuring of their work schedules, and supported by guidelines to deliver essential chronic care at that level.

The existing personnel in primary health care service (physicians, nurses, paramedics) need to be retrained, to equip them with the knowledge and skills required for delivering the essential elements of chronic care. At the same time, time-motion studies need to be conducted to examine how their current work schedules can be modified to accept this expanded mandate of health care, through redefinition of their assigned work.

Preparation of guidelines and management algorithms is essential to assist such retraining and future work. These need to be developed for each category of health care providers and integrated effectively into primary care practice. Professional associations must be extensively engaged in this effort, so that the private care providers are adequately addressed, in addition to government employees. Health non-governmental organisations (NGOs) too can play a valuable role in creating educational resources as well as facilitating the training of various categories of care providers.

Promoting Public, Private, and Voluntary Sector Mix and Quality of Care

Delivery of chronic care in primary and secondary health care settings requires a partnership of public, private, and voluntary sectors, with definition of standards, adoption of guidelines, and monitoring of practice patterns to ensure quality of care.

While India has traditionally depended on public health systems for provision of primary care, private care providers have become increasingly important contributors to the delivery of such services. The role of the private sector has also rapidly grown in secondary and tertiary health care services. In a number of states, the voluntary sector (represented by health NGOs) has also been contributing to primary and secondary care through direct services, apart from playing the watchdog role. In the state of Karnataka, for example, a number of 'sick' primary health care centres have been handed over by the government to a health NGO for operation.

Ensuring the quality of care and the definition of standards are issues relevant to all three sectors. In many countries the poor quality of care of public services leads to the reluctance of the population to use those services, inducing underutilisation of costly resources. The inability to deliver cost-effective care of acceptable quality may arise due to a variety of constraints (financial, motivational, and organisational). These need to be addressed, as relevant to each sector, so that the desired levels of quality can be attained. Standards need to be defined, based on expert consensus, and adopted through a process involving wide-ranging consultations among different categories of stakeholders. The development and adoption of guidelines as well as periodic profiling of practice patterns along with technology audits would help to ensure reliable delivery of rational health care.

Health Care Financing

A mix of public sector provision of free health care, social insurance, and private insurance would have to be evolved to enable universal access to essential chronic care.

The 'user pays' principle is frequently advocated as a component of health care reforms. The services related to chronic care are often excluded from the package of 'essential services' which are deemed the responsibility of the public sector. This frequently imposes great burdens on the consumer, especially in developing country settings. Some of the services (like 'opportunistic' screening for oral and cervical cancers and hypertension and 'targeted' screening for diabetes) may have to be provided as part of the public health sector's 'essential' package of services. Group insurance schemes may be employed in the organised sector. Differentiated services may be offered, so that those willing to pay can avail of a higher category of services or better facilities, beyond a basic minimum of essential services which should be available to all.

The public sector should not disengage completely from chronic care. Apart from the fact that public sector supply of good medical services can exert a pressure on the high costs of private sector medical services to scale down, the public sector also fulfills a training and research mandate far beyond the capacity or the aptitude of the private sector in the developing countries. A system of social insurance for the economically disadvantaged sections would have to be provided, with private insurance for the more affluent sections. This mix would have to be customised for each national context.

Innovative methods for financing health care need evaluation. With decentralised health care, local taxes may be levied by community organisations responsible for health care (with matching grants from the state, as an incentive). Rural micro-credits also may help enhance purchasing power, without imposing severe financial burdens.

Prioritisation of Interventions

Of the several operational components of chronic care outlined above, a process of prioritisation must sequentially select 'essential' elements for early implementation and 'optimal' elements for later implementation (Table VII). Prevention and control of high blood pressure and tobacco consumption are high priorities, because of their high contribution to the global burden of disease as well as their relationship to multiple

chronic diseases. High blood pressure, for example, is a major risk factor for CHD and stroke and its control has been shown to be a major determinant of improved survival in diabetics. Tobacco is a prime contributor to global mortality, through the causation of CHD, many cancers, and chronic obstructive pulmonary disease. Similarly, clinical conditions such as acute myocardial infarction, congestive heart failure, and childhood leukaemias are associated with high mortality but also have available interventions of high impact for improving survival. These need to be preferentially promoted to substantially reduce the burden of chronic disease.

While planning the organisation of health services, the goal should be to shift the centre of gravity of chronic care delivery progressively towards the base of the health care pyramid. By strengthening the capacity for care by self, family, community, paramedic, or traditional healer and by encouraging guidelines based practice and a rational referral-follow-up pattern which obviates the need for frequent revisits to secondary and tertiary care providers, the responsibility for delivering chronic care devolves downwards closer to the community and away from the more expensive and less accessible higher health care stations. Only such a shift can ensure a sustainable system of chronic care in India, with the promise of extended coverage and containment of costs.

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