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Health, development and infrastructure

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INTRODUCTION

As communities and nations develop so does the level of organization and infrastructure necessary to support it. Among the factors driving development are improvements in health and well-being and, hence, survival.

In this paper the interrelationships of engineering infrastructure and health with development are considered, with particular emphasis being given to urban environments, and slums 'a dirty overcrowded district inhabited by very poor people' (ref. 1)

HEALTH

There is a need to shift away from economic development with a dependency on curative health measures towards sustainable development, embodying promotive and preventive health measures supported by curative systems.

Curative health is essentially a technology-oriented and hospital-based system that concentrates on treating those who are already sick. This requires inputs by trained doctors and nursing staff, expensive and often rare and sparsely distributed cadre, especially in rural areas and slum communities.

Promotive health is directed at changing people's behaviour patterns, through health education and example, to prevent them becoming sick. Awareness of the transmission cycles for diseases and actions that can interrupt the cycle, if adopted, can markedly reduce disease incidence. It is, therefore, closely linked to prevention.

Preventive health is, as the name suggests, aimed at preventing people becoming sick. It embodies a variety of approaches which are outlined in figure 1. It is closely allied with promotive health and health education.

Malaria is one example of a disease for which all the methods can and may need to be used to reduce disease morbidity. For example, chemicals can be used to kill larval or adult mosquitoes or as prophylactics to prevent susceptible hosts becoming infected; biological control using fish that eat mosquito larvae can be used in open wells, swampy areas and flooded basements; engineering methods such as filling borrow pits, design of standposts and drainage

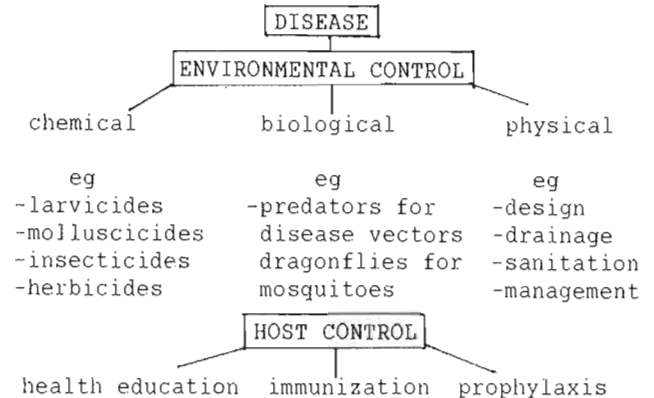


FIGURE 1. Preventive measures to interrupt disease transmission cycles.

channels (especially stormwater ones) and provision for disposal of sullage all reduce ponding and hence potential breeding sites for malaria-carrying mosquitoes.

Dracontiasis (Guinea worm infection), in contrast, is unique in that improving the quality of drinking water alone could eradicate the disease. India is one of the countries that is currently implementing a successful Guinea worm eradication programme. Using a mixture of measures, e.g. chemicals to attack the vector (*Cyclops* species), fine mesh cloth for straining drinking water, health education and provision of protected water supplies, Guinea worm in India could be eliminated by the end of 1990.

HEALTH, DEVELOPMENT AND THE ENVIRONMENT.

Health and the environment.

Mismanagement or lack of management of the earth's resources and of human domestic, agricultural and industrial wastes, together with socio-cultural determinants, affect not only human health but also cause damage, possibly irreparable, to geophysical and ecological systems in the biosphere. This paper will however concentrate on the impacts on human health; for fuller discussions of the wider issues the reader is referred to the literature (refs 2-7).

Human health - a state of complete mental, physical and social well-being, rather than solely the absence of disease - is affected by

many components in the environment. Climate and natural catastrophes, such as earthquakes, floods and hurricanes, can have dramatic effects in localized areas but it is environmental management or manipulation by humans themselves that has the greatest effect on morbidity and mortality. Water, food and shelter are essential for survival and humans have developed ways to adapt their environment to satisfy these needs. Developments have, however, been costly in human, economic and environmental terms. They have resulted in an unequal health status, most notable between the more industrialized, developed countries and the developing countries: difference also occur within countries, between the rural and urban communities.

Health and development

Global awareness of the contribution of economic development to effects such as damage to the ozone layer; greenhouse warming and the depletion of forest cover and non-renewable energy resources and their implications for human (and environmental) health is increasing. The need is to achieve a balance of economic development and engineering infrastructure against long-term health of humans and the environment.

Development plans emphasizing sustainability, particularly through community involvement, have arisen out of the need to optimize development expenditure so that it reaches an increasing percentage of the growing world population. Participation of communities necessitates changes in programme planning to accommodate consultations and, where necessary, the strengthening or establishment of institutional infrastructure to support the current and future developments.

Experience has also shown that, for positive results on health, good planning, design and operation and maintenance are essential for any development programme. Failure to assess fully the health and socio-cultural aspects of interventions can have disastrous consequences, from the high incidences in schistosomiasis following impoundment for irrigation (ref. 8) to the non-use of a borehole sited on 'holy' ground because of failure to consult the villagers.

Health and infrastructure

The International Drinking Water Supply and Sanitation Decade has further raised public consciousness of relationships between health and infrastructure development, especially as regards infectious disease.

Water-related illnesses cause the deaths of approximately 25 million people per year, i.e. one death every 1.2 seconds, and the deaths of >15 children every minute from diarrhoeal

disease alone. In addition, millions more are debilitated by schistosomiasis (250 millions), malaria (350 millions), trachoma (500 millions) and Bancroftian filariasis (250 millions) each year. In India alone the cost of a loss of 73 million days of production each year and the medical care involved is over US\$ 1 billion. Most of these cases could be prevented by development of appropriate infrastructure.

Infrastructure development provides the opportunity, therefore, for improvement in health status through reduction in infectious disease. It also has effects on the mental and physical health status by, for instance, removing the stresses of collecting water or of living in substandard housing. It should, however be achieved by methods that conserve the environment for future generations.

A three-legged stool has been used to represent the infrastructure necessary for health and development: Sanitation, Education and Water act as the three legs, supporting health and development, the seat. The acronym for this imagery is, therefore, SEW.

Of acronyms developed at WEDC to represent more complex relationships of infrastructure to health and development, a preferred one is 'FISTE for HAND' (with apologies for the spelling). The clenched fist with its five digits represents - Financial and economic
- Institutional
- Socio-cultural
- Technical and
- Educational and environmental
infrastructure, with the hand representing
- Health
and
- Development.

Development and Infrastructure

Sustainable development with improvements in health, can be realized through programmes that are: economically sound and capable of being supported financially by the community or government; taking into consideration both the social and cultural preferences of those being served; aware of institutional and educational potential and select technologies appropriate to these needs, capabilities and potentials in a specific environment.

One approach commonly adopted is introducing development in stages or starting with a technology that can be readily upgraded when funds or materials become available. Pilot projects are useful tools to help communities choose from a number of possible technologies. This has proved useful in sanitation projects where the choice may be between different latrines or possibly septic tanks and shallow sewers. Such pilot projects may also demonstrate that the alternative technology is

not only at least as efficient as conventional systems but, for the particular location, is actually a better option.

Educational infrastructure and provision of training for local in-country personnel at all levels is invaluable for project sustainability. This can range from informal health education using the media or mother and child clinics, through training on-the-job of pump attendants or community-based health workers, to formal education at national or international institutions for the implementing engineers, the medical staff or managers and administrators.

This education helps to ensure successful project implementation and subsequent operation and maintenance. It also discourages dependency on external 'experts', thus fostering the concept of self-determination and reliance.

The ethos of affordability, self-determination and sustainability parallel those of Primary Health Care (refs 9 and 10).

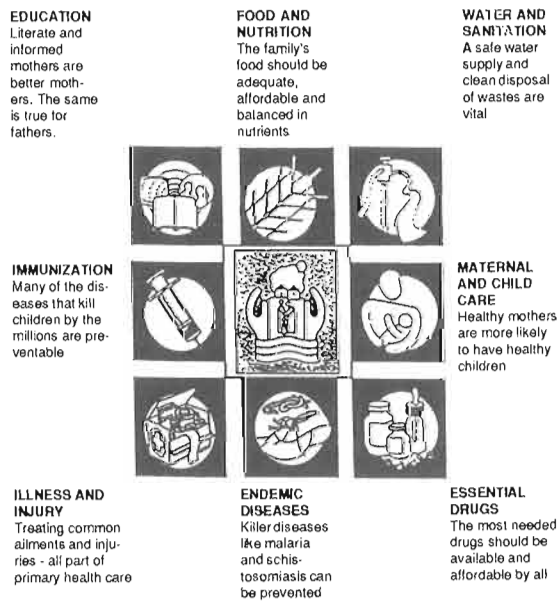


FIGURE 2. Primary Health Care.

The family unit at the centre of the figure is surrounded and protected by the components and the 'hands' of Primary Health Care. Source:- adapted from Bryant (ref. 10).

To provide the necessary promotive, preventive, curative and rehabilitative services it should include the eight components illustrated in figure 2. To provide these services requires a multi-disciplinary and co-ordinated approach. This is facilitated by cross-discipline components in all training programmes, which is why WEDC courses for engineers include, among the many subjects studied, health and social science components and, correspondingly, health sector workers study technology and economics.

Primary Health Care (PHC) is a vital component of the campaign for Health For All by the Year 2000, both of which are well documented in ref. 10. It is also essential if the health status of the rapidly growing urban populations is to be improved.

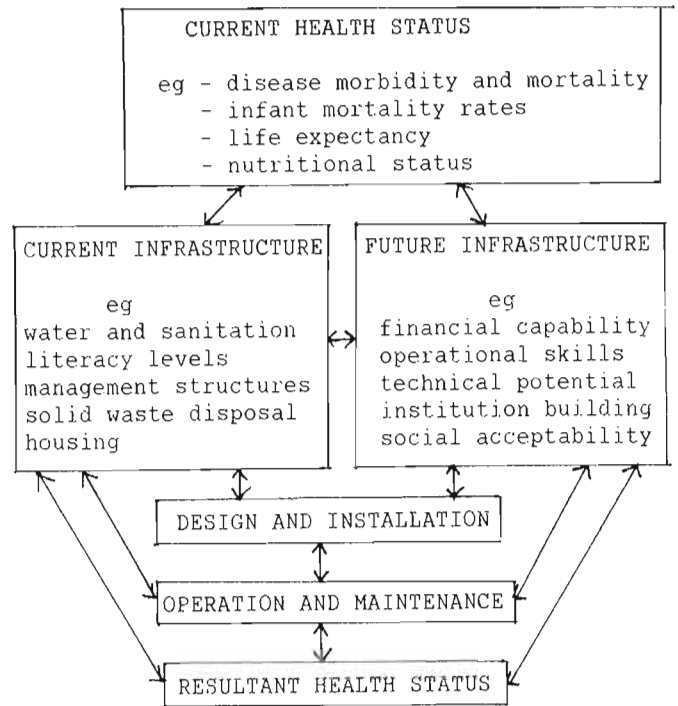


FIGURE 3. Health status: factors affecting the impact of development projects.

Figure 3 shows a simplified interaction chart or health cycle for assessing a path for improving health status. The infrastructure and additional factors indicated reflect the aims of PHC and sustainable development. The chart is akin to the project cycle.

This cycle approach can be used in rural as well as in the urban developments, including slum communities, in developing and developed countries. In developing countries, however, infectious diseases are still prevalent and a major cause of morbidity, so the impact of infrastructure development on health status is high. The health conditions in towns and cities are in the following overview of urbanization.

HEALTH IN URBAN ENVIRONMENTS

Health and urban settlements

Human contact with most positive and negative factors affecting their well-being occur in settlements. Despite the higher population and housing density than that found in rural communities, provision and access to services and amenities is, generally, greater. This is

especially true for health care facilities. In addition the movement of people in to and out of the city, as well as within it, facilitates the spread of disease to all inhabitants. With improved communications, including international travel, the spread can be rapid.

In new housing schemes, sites and services planning can incorporate the physical infrastructure to optimize health benefits (within budgetary constraints). The best schemes will also consider at the planning stages the socio-cultural patterns of future residents. In the 'old' areas of cities narrow streets and house design can make upgrading measures difficult and alternative technologies may need to be developed. The greatest problems are, however, usually associated with newer, spontaneous or unplanned settlements.

Population pressures on non-renewable resources by subsistence farmers lead to debt and the poverty trap; this forces more people out of rural areas and into towns and cities. Here, failure to keep pace with the infrastructure demands of rapid urbanization and urban growth result in population overspill from existing housing and in the establishment of slums.

The quality of housing, overcrowded conditions and lack of amenities are among factors that contribute to higher incidences and different patterns of disease in slum communities relative to other communities in the same city. Air pollution from hazardous industries and from traffic together with the social inadequacies of in-migrants in urban environments can exacerbate these effects. In addition, this illness and poverty can act as barriers to development - of the community and physical infrastructure.

Health status - urban slums

As indicated above, the current health status in slums is usually below that of other urban dwellers. Malnutrition, infectious disease (especially water-related and respiratory diseases) and psychological disorders are compounded by the physical conditions, the low employment levels and opportunities, stress over security of tenure (or rather lack of it) and cultural changes.

Many of the inhabitants are in-migrants who tend to be young. The birth rate and both the infant and general mortality rates are higher than in non-slum areas in the same city. Incidence of gastro-intestinal disease and respiratory diseases such as tuberculosis are high. For instance, in one Calcutta slum the incidence of TB has been as high as 10 times that in other areas; in Allahabad (1984) one of the slum communities had morbidity levels of 60 and 45-55%, respectively for scabies and intestinal worms.

Implementation of water supply and sanitation programmes alone have the potential to reduce these morbidities considerably:- 80-100% for scabies (and Guinea worm); 40-50% for round-worms (Ascariasis). The full potential will only be reached if approaches such as that outlined in figure 3 are employed. Detailed treatment of these approaches is beyond the scope of this paper but they are summarized by the acronym 'FISTE for HAND'.

CONCLUSION

Health is dependent on many factors, mainly within the control of humans themselves. To achieve 'Health for all' requires not only an integrated, multidisciplinary approach but also action by many people at many levels - from the individual and family through the local and national communities to international organizations. The scope of the task may seem daunting but if the slogan for World Health Day 1990 is adopted much will be achieved.

THINK GLOBALLY - ACT LOCALLY

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