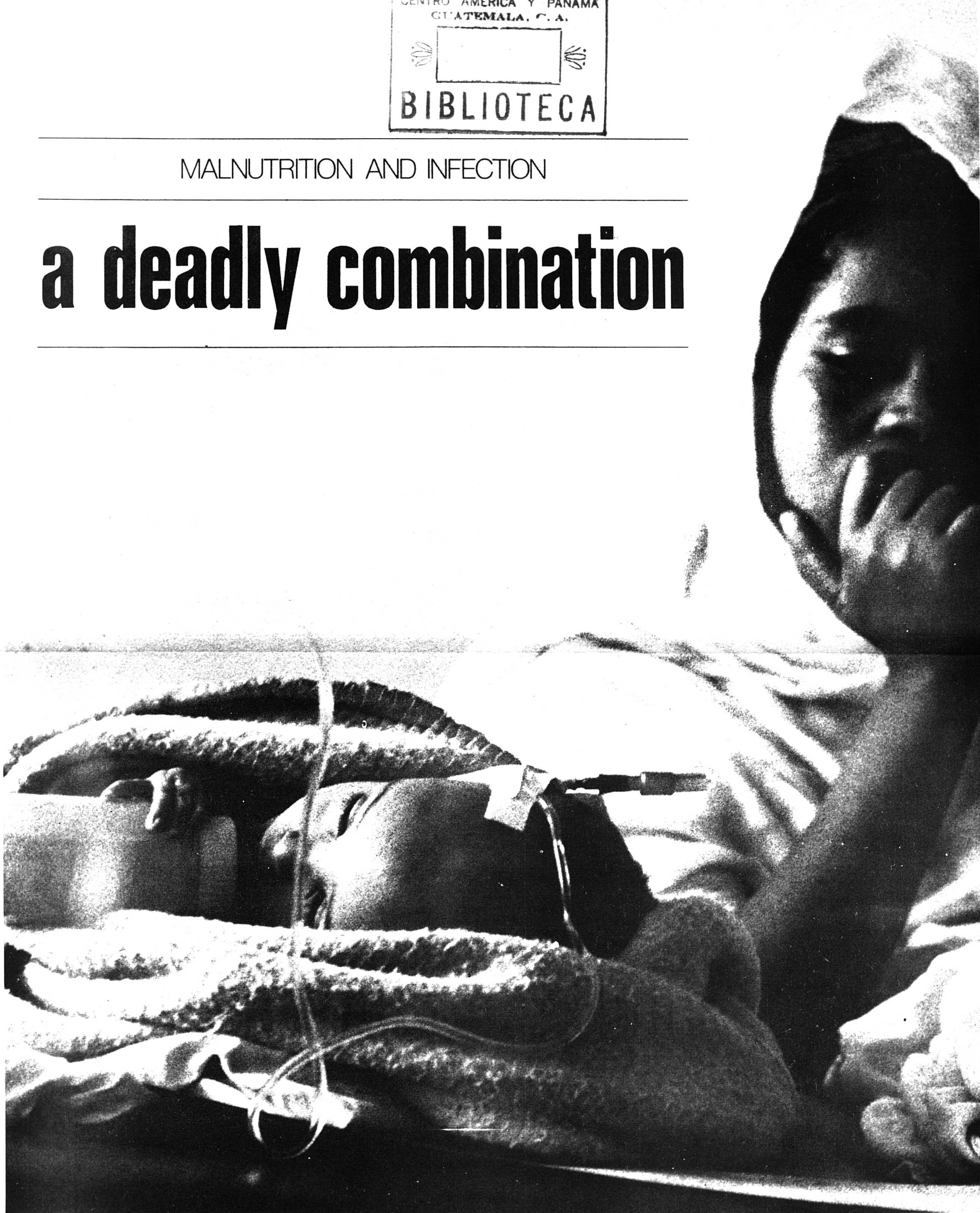


MALNUTRITION AND INFECTION

a deadly combination



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For as long as man has existed, microbes have been his chief enemies and the most important cause of disease and death. Epidemics, often of devastating proportions, have periodically laid waste large population groups or even the whole of mankind, leaving desolation in their wake. Because of their insidious day-to-day action, the endemic infectious diseases constitute the greatest health problem man has to face.

Against this "Public Enemy No. 1" scientific medicine achieved its greatest advances during the past century. First Pasteur, Koch and others unmasked the enemy and established its responsibility for infectious diseases. Then Lister, Pasteur and other research workers established the main principles of asepsis and environmental health, laying the foundations of hygiene as an effective means of prevention.

Pasteur later managed to "tame" microbes and, through vaccines, to convert them into one of the most efficient weapons for fighting disease. Jenner had already taken the lead by discovering the anti-smallpox vaccine, but it was Pasteur who established the scientific bases enabling the principle to be extended to other diseases as well. Finally, with the advent of microbe-killing drugs—first the sulphonamides and then the antibiotics, based on Fleming's observations—an effective arsenal was built up.

These advances, coupled with an improvement in living conditions, have in many countries brought about a prolongation of life expectancy and an improvement in general well-being. Unfortunately, however, infectious diseases are still the main cause of illness and death among the two-thirds of the world's population who live in the pre-industrial or developing countries.

International co-operation in health began in the last century with efforts to control the major plagues, and since then considerable advances have been made against certain epidemic and widely endemic diseases, such as smallpox, yellow fever, bubonic plague, cholera and malaria. Nevertheless, infectious diseases are still the principal health problem in the

poorer countries and against many of them there are no specific means of control, though improvements in general living conditions, housing and environmental hygiene could work wonders. The diarrhoeal diseases (dysentery, enterocolitis, etc.) and the respiratory infections are the worst. Measles and whooping cough—against which effective vaccines have only recently been developed—are also still a major cause of illness and death.

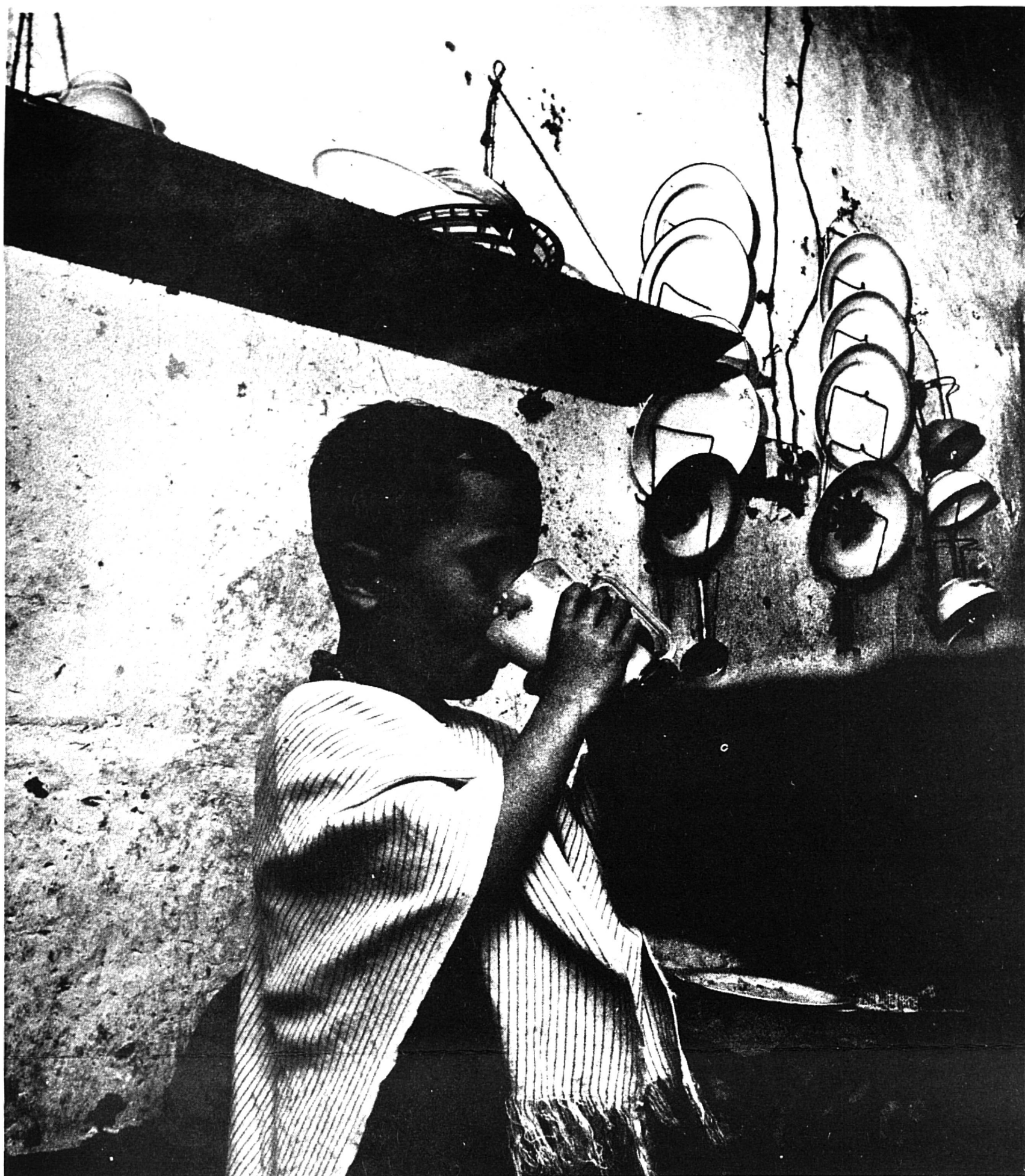
These infections are particularly serious in early infancy, when the child has not yet developed its own natural defence mechanisms. A high proportion of children die during their first months or years of life, leaving a population which, although more resistant and better adapted to its unhealthy environment, has suffered damage. In the rural areas of Guatemala, for instance, the mortality among infants less than one month old is roughly double the rate observed in the United States of America for the same age-group; it is eight times higher during the remainder of the first year of life, and 25 times higher for children aged two, three and four. If deaths due to infectious diseases are subtracted from the mortality figures for the rural population of Guatemala, the death rate becomes almost the same as that of the United States for the first year of life, and only three to five times higher for the next three years.

This suggests that a high percentage of deaths among the very young in the developed countries should never occur. The Pan American Sanitary Bureau (PASB) has estimated that 77 per cent of deaths of children under five in Latin America are ascribable to theoretically avoidable causes; this amounts to roughly 2,000 unnecessary deaths every day.

Overcrowding, promiscuity, the lack of personal and environmental hygiene, inadequacy of water supplies, poor systems of sewage and rubbish disposal, and inadequate working conditions and recreational facilities are the main factors that maintain high sickness and death rates from infectious diseases, including tuberculosis. The incidence and severity of these infections are in inverse proportion to the socio-economic level of the family.

Children weakened by malnutrition are especially susceptible to infections and suffer their effects more severely. This Ethiopian child, watched by its anxious mother, is receiving rehydration treatment for diarrhoeal disease. (Photo WHO/N. Wheeler)

a deadly combination



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This Colombian boy is drinking a milk mixture provided as part of a supplementary feeding programme for mothers and pre-school children by the World Food Programme. Over a quarter of the world's population live in a state of malnutrition. (Photo WFP/J. de J. Fonseca)

The apathy and sadness of malnutrition. This girl in a hospital in Jordan is suffering from a severe protein-calorie deficiency. (Photo WHO/Koundakjian)

In the now developed countries, mortality due to tuberculosis, measles, whooping cough, typhoid fever, diarrhoeal diseases and many other infections began to fall long before the responsible microbial agents had been identified and before specific measures of control or treatment were known. This decline—much greater than anything achieved since through the use of vaccination and antimicrobial drugs—paralleled the improvement in general living conditions. Microbes and the diseases caused by them prosper, therefore, only in environmental conditions favourable to them.

The other determining factor is the degree of microbe-resistance of the individuals who make up a population, which is determined largely by their nutritional status. Malnourished populations are more susceptible to infectious diseases and suffer their effects more intensely.

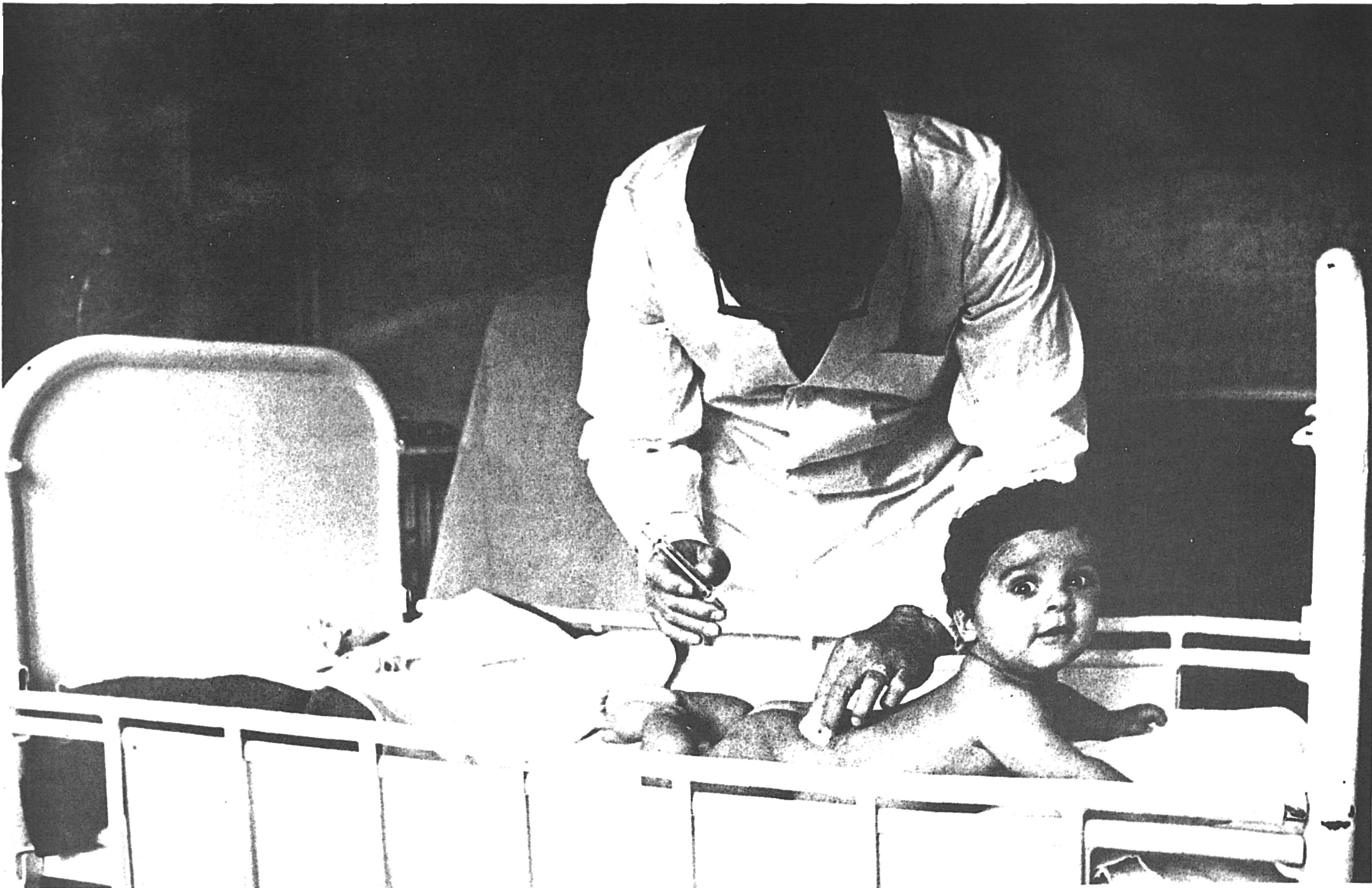
Conversely, infectious diseases have an unfavourable influence on the nutritional status of the patient. This creates one of the many vicious circles of underdevelopment.

Malnutrition can be of two kinds, acute and chronic. The acute kind is due to nutritional diseases or deficiencies which bring about anatomical and functional changes. Examples are rickets, beriberi, pellagra, and the severe protein-calorie deficiency syndromes, kwashiorkor and marasmus. Far more people, however, suffer from the chronic form of malnutrition, a condition without specific manifestations which therefore may be imperceptible even to doctors. Roughly two-thirds of the population of the developing countries live in this state of "chronic hunger".

Where there is nutritional deficiency, infection is often the final episode that leads to the death of the patient. But even more important from the public health

standpoint is the fact that the same is true of chronic malnutrition. A debilitated organism is far less resistant to attacks by invading micro-organisms. Ordinary measles or diarrhoea—harmless and short-lived diseases among well-fed children—are usually serious and often fatal to the chronically malnourished. Before vaccines existed, practically every child in all countries caught measles, but 300 times more deaths occurred in the poorer countries than in the richer ones. The reason was not that the virus was more virulent, nor that there were fewer medical services; but that in poorly nourished communities the microbes attack a host which, because of chronic malnutrition, is less able to resist. The same happens with diarrhoea, respiratory infections, tuberculosis and many other common infections to which malnourished populations pay a heavy and unnecessary toll.





A recent study of the causes of infant mortality carried out by PASB has confirmed the situation. It covered sample populations—urban and rural—in 13 areas of Latin America, and revealed that, even when malnutrition was not given as the major cause of death in official statistics, it was in fact an associated factor in 57 per cent of all deaths among children under five, and in some regions in two-thirds of these deaths. Diarrhoeal infections accounted for most of the deaths, with malnutrition as an associated cause in 50-80 per cent of cases. Malnutrition was also a concomitant factor in 60 per cent of the deaths attributable to measles.

On the basis of this and other analyses, the authors of the study concluded that malnutrition was the most serious health problem among the populations studied. The situation is probably the same in other parts of the world and indeed may be even worse. It should also be remembered that, apart from its impact on mortality rates, the association between infection and nutrition seriously affects growth and development in those children who sur-

vive, as well as the working capacity and general well-being of the adult population.

Children under one are particularly at risk. It has been known for many years—from empirical observations confirmed by recent WHO-supported studies in different parts of the world—that breast-fed infants have fewer and more benign infections. Besides the immunological processes and other defence mechanisms fostered by breast-feeding, infants fed with human milk benefit from a better nutritional state. Where families live in a healthier environment, possess the necessary means and have some notion of hygiene, the artificial feeding of babies may be more or less safe, although it may also give rise to other problems which fall outside the scope of this discussion. But when it comes to poor populations living in an unhealthy environment and having no basic education in hygiene, artificial feeding is often a short-cut to malnutrition, infection and the death or organic deterioration of the child.

The other side of the coin is the aggravating effect of infection on the nutritional state. Many studies carried out with WHO

support reveal that, through their metabolic action and because of the usually unjustified dietetic restrictions imposed upon the sick, even the most benign infections have an unfavourable effect on the patient's nutritional condition. This effect is not paramount in a child who can restore the loss by proper feeding during convalescence; but it may be serious among those who eat barely enough to survive, particularly if the infection is of long duration or recurs frequently, as is common among malnourished populations. The result is a synergism in which the sum of the effects is greater than the independent action of each. A bad diet leads to a state of malnutrition that boosts the impact of the infection which, in turn, aggravates the state of malnutrition.

The control of infectious diseases by specific measures such as vaccination, or general action such as environmental improvement, has a favourable impact on a community's nutritional status. On the other hand, adequate food offers good protection against the more serious effects of communicable diseases, including even

Is it worth vaccinating malnourished children? As part of a WHO cooperative study in which 15 institutions throughout the world are taking part, investigations are under way in Lebanon to see whether malnourished children are able or not to build up the appropriate antibodies after triple vaccination against diphtheria, pertussis and tetanus. The question is of special concern in the Eastern Mediterranean Region where millions of children are estimated to be malnourished and therefore have reduced resistance to infectious diseases. Two groups of children, malnourished and healthy, are given the same triple vaccine and then tested at monthly intervals for antibody production. Left, a healthy baby is vaccinated. Right, a malnourished baby undergoes a general examination. (Photos UNRWA)

those against which we still have no accurate or easily usable weapons. For the time being, an adequate diet is the most effective "vaccine" against most of the diarrhoeal, respiratory and other common infections. The slogan "Better Food for a Healthier World", chosen by WHO for World Health Day 1974, is more than apt so far as infectious diseases and many other conditions are concerned, since adequate food is necessary to enable man not only to bolster his defences against infection but also to achieve a satisfactory biological, psychological, social and economic life.

We have made spectacular progress in the struggle against infectious diseases; it may be, however, that we have given too much thought to the enemy and have to some extent overlooked our own defences.

Let us by all means make the fullest use of the weapons we have acquired, but let us not abandon our bastions or leave our rearguard weak and disorganized. Only with proper food and using the rich legacies of Pasteur, Koch, Lister and Fleming shall we be able to improve the general well-being of mankind. ■

