LA FONDATION MEDECINS SANS FRONTIERES
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CENTRE DE RÉFLEXION SUR L'ACTION ET LES SAVOIRS HUMANITAIRES

Child Undernutrition: advantages and limits of a humanitarian medical approach

Jean-Hervé Bradol, Jean-Hervé Jézéquel

MEDECINS SANS FRONTIERES

Les cahiers du crash

Child Undernutrition: advantages and limits of a humanitarian medical approach

Jean-Hervé BRADOL, Jean-Hervé JÉZÉQUEL

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Fondation Médecins Sans Frontières crash

8, rue Saint-Sabin 75011 PARIS - FRANCE
tél. : 00 33 01 40 21 29 29 - fax : 00 33 01 40 21 29 62
www.msf-crash.org

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Redaction: Jean-Hervé Bradol, Jean-Hervé Jézéquel
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Introduction

Four years after the hunger crisis in Niger, much has changed on the nutrition issue. Some of these changes are internal to MSF. The success of our operation in the Maradi region in 2005 marked both the resolution of one question (the return of humanitarian medicine in treatment of severe acute malnutrition) and the beginning of new tasks for MSF teams, namely the exploration of new operational procedures (such as earlier treatment) and new objectives (dealing with zones of high infant mortality, establishing a longer-term presence in foci of endemic malnutrition instead of mounting operations only during crisis periods).

Other changes are external to the association. New players have entered the nutrition sector, bringing with them fresh funding and new expertise. New protocols and management of malnourished children have been developed in several of the countries where MSF operates. Lastly, rising food prices and the global economic crisis have drawn renewed attention to hunger, and international organisations seem ready to allocate substantial funding to the problem. Some of us are tempted to see all this as an unprecedented opportunity to intensify the fight against malnutrition. Although it is too early to say where these new developments are headed, MSF should now be thinking about the role it wishes to play in this movement.

This "Cahier du CRASH" therefore aims both to assess the recent changes and explore new opportunities for action by MSF: how might the changes observed in the last few years induce MSF to reconsider its objectives and shift the focus of its operations? How do the new knowledge and experience acquired by MSF teams since the Niger crisis give rise to new operational ambitions?

Malnutrition arouses such strong feelings within MSF because it is relatively new ground for us, provoking enthusiasm in some, who see it as an opportunity to renew our militant stance, and concern in others, who see our ambitions as excessive or naive.

The purpose of this volume is not, however, to lay down a policy for MSF to follow. That is certainly not the role of the CRASH. Rather, we wish to identify the various possibilities open to us for fighting malnutrition, so that the association as a whole can debate the issue and make informed choices. Another aim is to demonstrate the impact that nutrition programmes can have on beneficiary populations, and to discuss how these programmes may in turn transform

our association and its intended role. In short, this volume does not express a single viewpoint; rather, it reflects the diversity of the many viewpoints present in our association. Although there are many areas of disagreement, one conviction is common to all of these policy stances: MSF's ambitions in fighting malnutrition must not be determined by technical, scientific and financial considerations alone. These are policy decisions that must be taken today and clearly accepted by members, as they are closely linked with the role that MSF intends to play in the coming years. The aim of this volume is precisely to help the members of MSF teams, and the association in general, to assimilate the terms of the debate so that they can take an active part in these discussions.

This book was also designed to be used in MSF training sessions. It is divided into two main parts. The first is a transcription of the proceedings of a seminar on malnutrition organised by CRASH at MSF France headquarters. We chose to present a written version of the oral presentations made by the seminar speakers, as well as a summary of the ensuing discussion. Recordings of all the proceedings are available on the CRASH website. The second part consists of two papers on current issues in nutrition policy, written by Jean-Hervé Bradol and Jean-Hervé Jézéquel, and is based on an examination of the changes that are affecting both medical research and operational practice today. The papers introduced a number of ideas, often different but not necessarily irreconcilable, on the role that MSF can play in fighting malnutrition.

The volume ends with a bibliography that reviews recent publications (including those of MSF) and makes suggestions for further reading, both in the social sciences and in medical, nutritional and operational research.

PART 1
CRASH seminar: can malnutrition be solved by humanitarian medicine?

11 march 2009

On 11 March 2009, the *Centre de réflexion sur l'action et les savoirs humanitaires* (CRASH) organised a seminar on the role of nutrition in medical humanitarian activity. After three years of increased treatment and lobbying, the response to undernutrition has reached another crossroads and things have changed greatly in recent years with new players, new products and new financing. These changes, which MSF helped instigate, led us to hold this seminar to consider the role that the association could still play in this sector of humanitarian aid. It seemed necessary to take stock of what we have learned from our operational experience and review our choices for the future: on which situations of nutritional insecurity do we wish to focus and with what objectives? How can our knowledge and medical techniques help deal with a problem that has important economic, social and political implications? How should we adjust our objectives and operations in contexts where aid providers and governments now have a more active presence than in the past?

The seminar was organised around the following three topics: situations; the state of knowledge and medical techniques; and the interplay of players and formulation of new policies. The aim was to update the various points of view on nutrition within MSF and to debate the options open to us today. The debate was also intended to lay the groundwork for changes in our operational procedures and policies.

The seminar consisted of three two-hour panel sessions, introduced by two short presentations and followed by an open debate. The following pages transcribe most of the discussions at the seminar of 11 March 2009.

Jean-Hervé Bradol et Jean-Hervé Jézéquel

1ST SESSION: "SITUATIONS"

Millions of undernourished people reappear every year in very different contexts: refugee or displaced person camps, major cities and rural areas, parts of the Sahel or the Indian sub-continent, prisons, orphanages, etc. How should we address this problem? In other words, how should we "screen" patients? On which situations does MSF wish to focus and with what objectives? Should we be looking for fertile ground for operational research, or should we focus on the "rejection fronts" that have not benefited from the major changes seen in recent years? Should we try to tackle malnutrition and infant mortality in shantytowns or in rural areas? Should we give priority to exceptional situations, or establish ourselves in areas where high malnutrition rates are frequent or even the norm? The discussions of the first panel session concern MSF's own knowledge and conceptions of these situations: what we know also determines what we intend to do about them. And what do we know today about these malnutrition hotspots, and more generally about high child mortality in sub-Saharan Africa and Asia? What is the history of these hotspots? What causes the imbalances affecting them? What systems are in place to treat the consequences of food shortages and undernutrition?

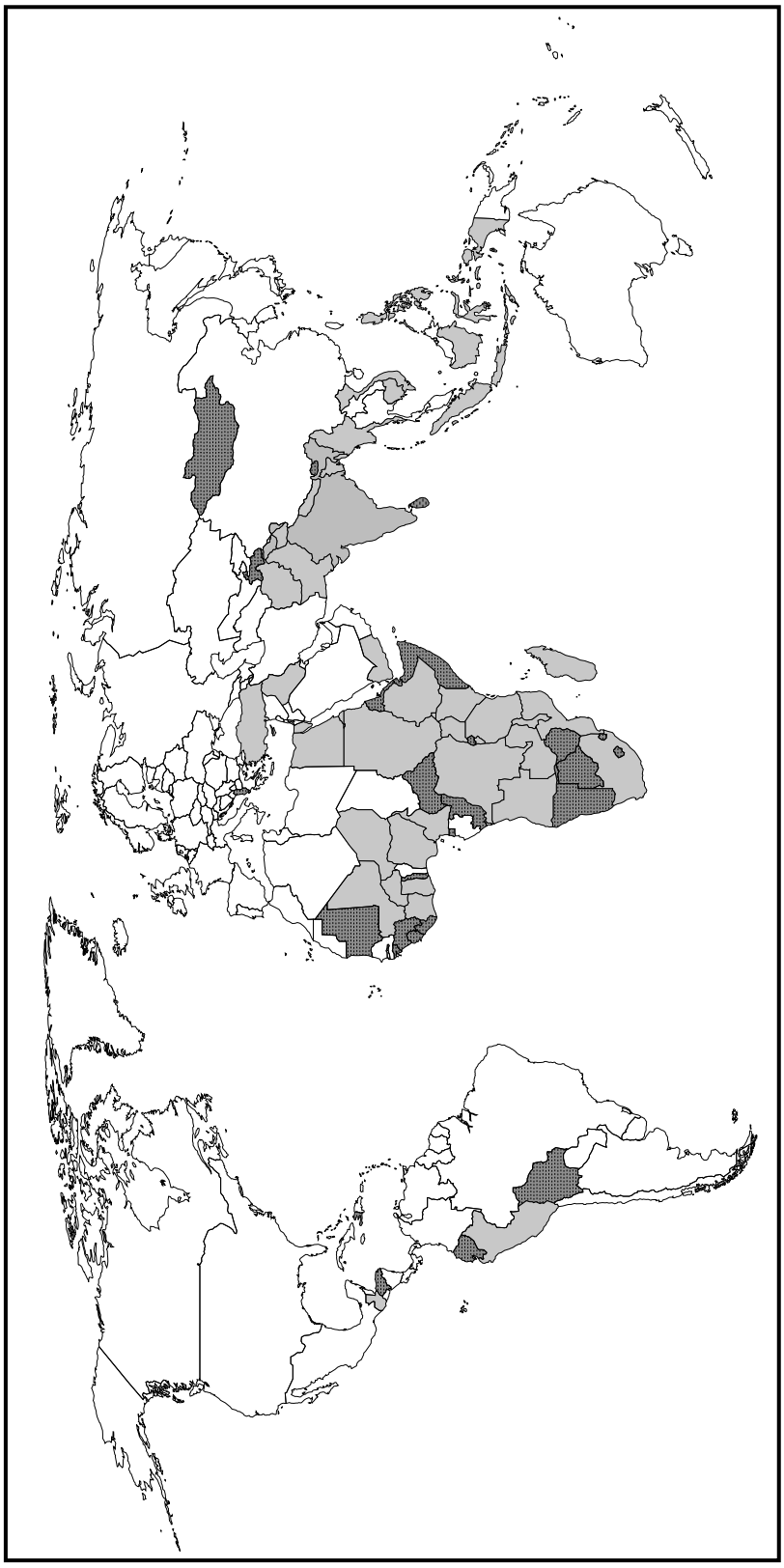
PRESENTATION BY JEAN-HERVÉ JÉZÉQUEL, RESEARCH DIRECTOR, CRASH, PARIS

The first panel session of the seminar explores malnutrition "situations". The aim was to discuss a few issues that MSF wishes to consider in operational terms: what are we facing when we speak of malnutrition? How should we tackle the problem, and to begin with, what should be the geographical entry points?

My starting point is one of the many maps that we use to get an idea of the scale of the nutritional problem worldwide. It is a planisphere showing the prevalence of underweight status round the world (see map below). The map shows high concentrations in the Sahel region of Africa, East Africa, Central Africa and South Asia. The first impression on looking at the map is that of malnutrition on a dramatic scale; all the green spots imply a "pandemic" requiring emergency measures. But where should we start?

I feel that this map raises more questions than it answers. Maps are not a true reflection of reality; they are constructions that direct one's attention in a particular way and shed light on some phenomena and leave others in shadow. This map, for example, makes no distinction between very different situations, putting them all indiscriminately in areas of the same colour. In fact, using the vague concept of "hotspots", this map lumps together arid, desert-like areas of the Sahel with green, fertile regions in southern Ethiopia; areas that are entirely rural or have low population density with the major conurbations and population centres of the South; areas at war or at risk of conflict with countries at peace. Clearly, malnutrition is not

a result of the same conditions in all these areas, although in strictly quantitative terms it affects an identical proportion of the population. This map shows a worrying global situation, a sort of pandemic, but others could very well suggest, on the contrary, that these malnutrition situations are unconnected, that they reflect very different contexts that can hardly be addressed in the same way. So underlying the choice of cartographic representation is a hidden question on the nature of the nutritional problem: are we facing a single problem that calls for a general and relatively standardised response? If so, what role could MSF play in dealing with this problem? Or are we faced with a series of different situations that can more usefully be addressed separately than together? In my view, what is true for cartographers is also true for MSF. The way we are currently striving to grasp the scale of the problem is in itself the result of certain conceptions of the nutritional problem and even of the degree of responsibility we wish to assume for addressing it. This is not in itself a bad thing; it is normal to view "reality" through lenses that we ourselves have chosen. However, I think it important for MSF to be clearly aware of the nature of the "lenses" it is using today and the type of distortions that they may cause.


36 countries which account for 90% of stunted children worldwide
32 countries with rates of child stunting and/or underweight > 20%

How we see the nutritional problem partly determines the operational choices that we are making today. In our recent operational decisions, our ambitions for comprehensive treatment of malnutrition outweigh our assessment of the health status of a given population. The fact is that we are choosing our areas of operation by virtue of their potential for experimentation with new approaches related to early treatment or prevention of malnutrition. If Mali attracts more interest than northern Nigeria, it is not because the health situation is worse there or the absence of aid providers more flagrant, but because there seems to be much more opportunity to collaborate with governments in devising new ways of managing malnutrition. Once again, this is not necessarily a problem, but it is helpful to recognise what really influences our operational decisions. In this case, they are related to a particular view of malnutrition as a global issue: our local operations serve as arguments in a series of negotiations over global food and nutrition policies.

The map I am using as the starting point for this line of thought also says nothing about the players and systems being established in the fight against malnutrition. I think it is very important today to gain a better understanding of what others are doing, in order not only to emerge from our arrogant isolationism but also to grasp what has changed in the nutrition scene in recent years. MSF likes to see itself as the NGO that goes where others do not, which means precisely that we need to know where the others go. If we take seriously what is now merely a slogan for publicity purposes, we have two possibilities. We can go where the others do not in geographical terms, or we can do what the others do not in terms of types of operation, i.e. place ourselves in the forefront of operational research. I would therefore like to substitute for this map another representation that would take account of two types of situations that we face: first, what I call "rejection fronts", that is, countries where very little has changed in terms of malnutrition treatment in recent years – for example, northern Nigeria – and second, "pioneering fronts", namely areas where there have been noteworthy developments in recent years and where new treatment models have been introduced. Here, I am thinking in particular of Ethiopia, which has perhaps the most modern system of malnutrition management today, but also of countries in the Sahel, such as Niger and Burkina Faso, where both aid providers and local institutions are changing. Should we focus our efforts on the "rejection fronts" where fewer humanitarian players are present, where little has changed and the people do not yet have access to curative treatments? Or should we focus on "pioneer fronts" to take the lead in and accelerate the process of change?

There is another reason why we should take an interest in what other humanitarian players are doing in these "malnutrition situations" that we are trying to localise and address. We are not the only organisation taking an interest in the treatment of malnutrition today. We are only one of many groups of experts working on the case of the malnourished child. More specifically, we represent the medical expert, and as such, we do not have the same ability or legitimacy to treat the various forms of malnutrition found in the situations we see today.

It seems to me that our work in Niger in 2005 marked the return of doctors in the management of malnutrition. We made the difference because we were treating a highly specific form of malnutrition, namely severe acute malnutrition, which is associated with a high fatality rate. When death is imminent, doctors are undeniably more effective and seem better equipped than other experts (educators, development experts or economists). But when we look at other forms of malnutrition, which are not severe but moderate, not the malnutrition we see today but that of tomorrow – since we are also speaking of prevention – it seems to me that we lose some of this comparative advantage. Other experts – educators, development specialists, public policy experts – also propose solutions. What is the position of the medical expert with respect to these other experts when the issue is no longer that of treating a form of malnutrition associated with a high rate of fatality and imminent death? These are the questions that I think should be raised in this first panel session.

PRESENTATION BY MICHELO LACHARITÉ, PROGRAMME MANAGER, MSF PARIS

I will try to answer the questions raised by Jean-Hervé Jézéquel, or at least to provide some clarification. How does the effectiveness and legitimacy of MSF actions vary with the contexts in which we operate? What is our relative advantage, our "value added", in each of these contexts? In particular, what about the opposition between the role of medical practitioner and that of an influencer of policy? Lastly, what is MSF's internal decision-making process in choosing the locations for our operations?

Before addressing these questions, I think it important to distinguish between the two main types of context in which we work to address malnutrition-related medical needs. First, there are situations marked by periods of crisis: war, famine, population displacement, and particularly serious hunger gaps, etc. In this case, the indicators that determine the decision to intervene are the crude mortality rates and severe acute malnutrition. In these contexts, there is generally a consensus within MSF to take action, although there may be some debate over how serious the situation is and how we should respond to it. There is no unanimity within MSF about the alert threshold that should determine when we should launch an operation. For example, at Akuem (southern Sudan) in 2005, the teams of the French section of MSF all had the same indicators, but could not agree on how to describe the situation or whether early intervention was appropriate.

Second, there are situations that I would call structural, in which malnutrition is not associated with a sudden crisis that is visible to international players and the local population. Examples include Burkina Faso, Mali, Ethiopia and India (this list is not exhaustive, but merely mentions the countries in which MSF France is currently involved). The indicators used to assess these situations are overall rates of chronic malnutrition and acute malnutrition, infant and child mortality and associated forms of morbidity. In areas characterised by endemic malnutrition, epidemic peaks (malaria, meningitis, measles, etc.) occur over the course of

the year, especially during the hunger gap. These factors of morbidity combine to cause a high mortality rate, reaching levels comparable to those observed in crisis and conflict areas. There is one difference: these cycles of "excess mortality" are seasonal, recurrent and predictable. And yet, in contrast to contexts of crisis or social breakdown, there is no consensus within MSF for intervention in these contexts of endemic malnutrition.

Most of our current debates are concerned with these structural situations. Can we intervene in these contexts with the same effectiveness and legitimacy as in contexts of crisis? The recent development of new operational methods has, in my opinion, opened up new prospects for MSF. An example is the management of severe acute malnutrition patients as outpatients thanks to the use of ready-to-use therapeutic foods. Another is early treatment of malnutrition and associated diseases using ready-to-use food (RUFs) and the associated care packages. These new operational modes enable us today to have a significant impact on hotspots of mortality. Previously, we could not hope to have such an impact, owing to the lack of adequate strategies and operational methods. With recovery rates close to 90% in outpatient management of severe acute cases, we are achieving excellent results that are undeniable proof of effectiveness.

We are wasting a great deal of energy today by trying to evaluate "scientifically" the effectiveness of new products (in this case, RUFs), as if we could put our patients under a bell jar and isolate them from the other parameters of the context. After all, it is the responsibility of the manufacturer or of nutritionists to evaluate the effectiveness of a new product; ours is to assess the impact of our operations relative to the needs identified initially. In my opinion, MSF should focus on the overall impact of an operation, that is, on the care packages provided by our teams. But the fact is that our teams rarely limit their activity to the treatment of malnutrition or distribution of RUFs. For example, outpatient treatment of malnutrition often includes prophylactic care (vaccination, antibiotic treatment and parasite elimination) and treatment of associated pathologies. Similarly, in the case of early treatment using Plumpy'doz, we also try to prevent the main associated pathologies through better vaccination or mass parasite elimination, systematically combined with the detection of diseased children within a cohort and their referral to medical facilities. For example, in Mali, we want to combine distribution of therapeutic foods with prophylactic measures against malaria. We should therefore be speaking in terms of the package of MSF activities in early childhood care, rather than solely of treatment of malnutrition. And it seems to me that, in our most recent operations, MSF has shown an undeniable effectiveness in this respect.

Jean-Hervé Jézéquel raised the question of the legitimacy of our operations: "We represent the medical expert, and I think that the medical expert does not have the same ability or legitimacy to treat all forms of malnutrition depending on the types." Legitimacy is founded in law, but I do not think that Jean-Hervé meant that type of legitimacy. He was probably

referring to the subjective view that one may have when faced with a given situation. Indeed, it is more legitimate for a doctor to treat a wounded person than a plumber. Yet few players outside MSF question the legitimacy of our interest in early treatment of malnutrition. When people within MSF refer to the concept of legitimacy, it seems to me that they are speaking in ontological terms. They define the pseudo-essence of MSF, and if a given activity does not correspond to that essence, it is deemed to be illegitimate. In my view, MSF no more has an essence than it has a specific mandate. Our missions change with the contexts and the tools available to us. We are free to engage in new medical activities and to include them in our social mission, particularly if they are of proven effectiveness.

Let us use UNICEF's causal schema of malnutrition, which defines infectious disease and inadequate diet as the two direct causes of malnutrition and mortality. In all of our operations, we address both the effect (malnutrition) and the two direct causes of malnutrition (infectious disease and inadequate diet). Restricting our activities to diseased persons and cases of several acute malnutrition - i.e. to patients who have reached the stage that precedes death - should be more problematical for us when the incidence of severe acute malnutrition is very high, when there is a high rate of chronic malnutrition and when the mortality rate is also high. Is it not possible to provide early treatment? In some situations, instead of waiting until we need to treat a large number of cases of disease or severe acute malnutrition, we have other solutions available. We can distribute ready-to-use food supplements (RUFs) to improve the quality of the subjects' diet. We can also administer prophylaxis, eliminate parasites and/or supplement vaccination coverage, depending on which forms of morbidity are the most lethal. Let's consider a different pathology: malaria. We let others handle the marsh-draining campaigns, although these are quite effective in checking malaria in endemic areas, so as to concentrate our efforts on screening and treatment based on appropriate products. This should also be true of nutrition. If malnutrition is multi-causal and we leave it up to development specialists, farmers or other experts to tackle the roots of the problem, it seems to me legitimate for MSF to concern itself with the effects and immediate causes.

What then is MSF's comparative advantage? Jean-Hervé Jézéquel seemed to oppose cases of Nigeria and Ethiopia to that of Mali. To oversimplify, this amounts to saying that we take no action in Nigeria out of negligence or laziness, despite a very bad nutritional situation, and that we do intervene in Mali for reasons of facility and opportunism, because there are donors present and the government is friendly. I think that this is a mistaken analysis. The teams in Nigeria had started some nutrition-related activities in Katsina in 2005, and we tried to return there in 2006. However, we met with a categorical refusal on the part of the authorities. Last year, we went back to the area to work on measles, and once again we met with a veto on anything related to nutrition. I do not think that we ignore worrying hotspots or that we refuse to address them. However, I think it might be better to develop other operational modes for use in these "rejection fronts", notably by seeking alliances with Nigerian civil

society organisations, which are more discreet, better integrated and hence better suited to try to break through such fronts. When one child in four does not reach the age of five, and where there is a high rate of severe acute malnutrition, and only 40% of diseased people have access to real health services, has the situation not reached a level that justifies our intervention? This is the situation in Mali, where it seems to me legitimate for MSF to intervene. I think that the experience in Niger demonstrates that there is a role for doctors in the nutrition field, especially when we have the tools needed to address the situation and the right conditions exist – including political opportunities and prospects for funding – for some hope that the operation will have a real impact.

The operations department has chosen to work in the two broad types of context defined above: "classical" nutritional emergencies (where they work mostly independently of governments) and hotspots of "structural" malnutrition and high mortality (where the operations department wants to develop real medical and political partnerships with governments). How then should we decide where to mount operations? It is important not to compare situations on an *a priori* basis, taken out of context, and eliminate some of them from our "legitimate scope of action". I think we should assess our ability to respond to identified needs, our effectiveness and our efficiency with respect to a given context. In 2008, the French section of MSF received 47,000 children for outpatient treatment of malnutrition and 9,000 for inpatient treatment. UNICEF estimates that 150 million children are affected by malnutrition, so clearly much remains to be done. Our goal is not to treat all of them, but neither can we stop where we are because of the efforts already made. In 2009, the funding that the Paris MSF group allocated to nutrition accounted for less than 5% of the "missions" budget[1]. Although nutrition remains a priority for MSF, the resources currently allocated to it do not seem disproportionate. Budgetary reasons should thus not be an insurmountable obstacle to the initiation of new projects. Nonetheless, choices will have to be made between the various possible locations for MSF action in this field. I am not sure that we are specific and explicit enough concerning our objectives to make these choices in a calm, reasoned manner. It is essential to clarify our strategies if we want our projects to complement one another and to broaden the range of possible strategies.

SUMMARY OF THE ENSUING DISCUSSION

Fabrice Weissman (research director, CRASH) called for a critical look at general maps and macro-data on malnutrition. They tend to equate health situations that actually belong to very different social and political contexts. Regarding nutrition, as indeed for everything else, he thinks that our choice of operations should primarily be guided by a political analysis of the conditions under which we could work in the areas concerned.

Stéphane Doyon (CAME) pointed out that humanitarian organisations have acquired the reflex of treating malnutrition in emergency and/or conflict situations, but are more reluctant

1. €5.7 million out of a total budget of €111 million - July 2009.

to conduct operations in countries at peace. Data from surveys conducted in some of these countries show that they have very high malnutrition prevalence rates, and that malnutrition remains a neglected disease. Even recently, malnutrition in these areas was seen more as a development problem than a medical issue. With the new treatments available, we have been able to provide a mass curative approach and make malnutrition a medical issue once again in areas of high endemicity. But we still face the problem of chronicity: treatment operations are certainly effective, but they have to be repeated each year. They also give rise to a form of rationing, because only the children who have reached the most severe stage of malnutrition receive treatment. These observations, derived from our practice, are leading us to consider preventive approaches to the problems we are facing. It is true that this would take us from a purely medical logic to a more "food aid" logic. But in a certain sense, we would simply be carrying out more extensive food handouts, as we have done in war situations. Through our practice, we will show that operations combining new products with new operating procedures are much more effective than the inappropriate strategies used to date by other aid providers.

Rony Brauman (research director, CRASH) voiced the opinion that even if a problem recurs from year to year, this does not make medical intervention any less meaningful. This is as true for MSF as it is for doctors who primarily treat recurrent problems. This point is not trivial, when one sees how the argument that recurrent operations are of no medical use is gaining strength within MSF. Rony Brauman also thinks that the definition of malnutrition and its pathological nature should be clarified. The reason is that the definition of malnutrition does not amount simply to a matter of measurements and norms. Exploring the link between malnutrition episodes and increased mortality could help us to understand the problem better from a medical standpoint.

Concerning the problem of maps, Jean-Hervé Bradol (research director, CRASH) reminded participants that these are mostly politically-oriented maps related to the Millennium Development Goals. It would be naive for MSF to neglect the underlying political context of these maps. Jean-Hervé Bradol also thinks that classifying malnutrition situations by their causes (war, desertification, etc.) is not very helpful. The same holds true when situations are classified by type of malnutrition, because the various types are so intertwined. For MSF, it is ultimately more pertinent to consider the various types of situations in the light of our own know-how and the influence we can have. What is new since 2005 is that we have realised that our interventions have an impact not only on a series of individual cases but also on the epidemiological profile of an entire community. We feel this intuitively, and this intuition needs to be discussed and confirmed. However, we have a problem concerning measurement and evaluation tools. The impact of acute diseases is generally analysed in terms of incidence, whereas our main tool for monitoring acute malnutrition remains the prevalence survey.

On the question of what is measured and by what method, Vincent Brown (epidemiologist, MSF) pointed out to Jean-Hervé Bradol that MSF produces weekly data on incidence before it conducts prevalence surveys. He also thought that the centre of the nutrition debate does not lie in the question of what techniques and indicators are apt to demonstrate the efficiency of MSF nutrition projects. Geza Harczi (nutrition issues officer, MSF medical department) disagreed, saying that the lack of reliable data and a monitoring system is a vital problem, as these would help us to identify the areas where our intervention would be the most useful. So the malnutrition map presented at the beginning of the discussion has a certain value in that it indicates both the prevalence of underweight status and population density.

Philippe Levaillant (former head of MSF-France's mission in Niger) replied to Rony Brauman saying that measuring malnutrition is not the same thing as defining it. For him, malnutrition is a "quantitative and qualitative diet deficiency in young children that makes them unable to resist the diseases they face as they grow up". Responding to Jean-Hervé Jézéquel's presentation, Philippe Levaillant noted that there is indeed renewed interest in malnutrition, but that few medical organisations are active in the field. He mentioned the classification used by Dr Steve Collins, who draws a distinction not between moderately and severely malnourished people, but between malnourished people with medical complications and those without complications. The point is that, apart from MSF, which has considerably improved its work in this field, few organisations have succeeded in treating malnourished patients with medical complications effectively. This may be where MSF, as a medical organisation, can best play a role in the overall response to malnutrition.

For Yves Martin-Prével (nutritionist and researcher, *Institut de Recherche pour le Développement*), malnutrition is a global issue that affects all countries, including the United States where malnutrition occurs through dietary excess more than dietary deficiency. In developed countries, however, governments have established systems of varying degrees of efficiency to deal with the problem. Elsewhere, there is little or nothing to deal with it. MSF should therefore consider whether it should participate in developing such systems, instead of limiting itself to the question of severe acute malnutrition alone.

Joan Tubau (programme manager, OCBA) recalled the conditions in which OCBA's nutrition project in India was initiated. It was through its activities in India that OCBA discovered the malnutrition problem and decided to address it. Many other organisations were present, but none of them offered medical treatment for severe acute malnutrition. Contrary to what Jean-Hervé Jézéquel said, this project was not driven by a political agenda set by the organisations' head offices. It started at the grassroots and was then discussed at the desk level. We still don't know where it will lead, but we have to accept this element of trial-and-error and uncertainty. The main thing today is to be able to save the lives of these children.

Fred Meylan (emergencies manager, OCG) recalled the conditions in which the Djibouti nutrition project was initiated. He affirmed that MSF has been observing malnutrition problems for fifteen years, yet no section has sought to address this problem, probably because it seemed too structural. MSF-Switzerland finally decided to do so, although in his opinion geopolitical considerations did not play a determining role in the decision. Fred Meylan is favourable to Rony Brauman's argument: resigning ourselves to carrying out repetitive tasks is also part of our job.

End of the first session

2ND SESSION: KNOWLEDGE AND TECHNIQUES

Is the anthropometric norm an objective we should strive to attain? What do we know about the relationship between deviation from the anthropometric norm and mortality? Is there a standard treatment? Should the standard treatment be the one that most often brings patients closer to anthropometric norms? With the new WHO norms, is there still any point in treating moderate acute malnutrition? Can a treatment be evaluated in the same way as a programme? Can there be scientific proof of the effectiveness of a given policy?

PRESENTATION BY GEZA HARCZI, NUTRITION OFFICER, MSF MEDICAL DEPARTMENT, PARIS.

Whom should we treat for undernutrition? The question of how to define malnutrition brings us to the commonly used anthropometric indicators. These indicators are simply one of several tools that serve to assess the nutritional status of an individual. We will review the various anthropometric indicators, in each case noting their correlations with the risk of mortality. Biological tests are ill-suited to our working conditions in the field, as well as being largely non-specific. Clinical examination still has an important role, whether in a routine paediatric consultation or a consultation that is part of a nutrition programme, particularly when the clinician tries to assess the severity of a child's condition, which cannot be done through anthropometric indicators alone. The fact is that the indicator says nothing about the speed at which the child's health is deteriorating, nor about the speed of wasting. A child having an initial weight close to the ideal norm can sustain substantial weight loss, e.g. 10% of body weight, as a result of an episode of diarrhoea, without necessarily crossing the anthropometric threshold below which he/she would receive treatment. Yet the speed and scale of the weight loss increase the child's risk of death. In contrast, a child whose initial weight is already somewhat below the norm but not yet below the anthropometric threshold value will receive nutritional treatment following a minimal loss of weight that puts him/her below the limit, even though the child's risk of dying has changed very little. This highlights the importance of regular monitoring of children's development in order to know precisely when they need nutritional treatment. Mere anthropometric measurement of a deviation from an ideal norm cannot replace clinical monitoring. A complementary examination will be interpreted according to a context, in the light of a clinical process. The aim of nutrition management is not to have all children reach an ideal anthropometric norm. If there is one norm from which we would prefer not to see children deviate much, it is a physiological growth norm. Our aim is not to produce fat children, or tall children, but healthy children. The underlying principle is that dietary deficiencies cause major physiological disruptions, and anthropometrics reflect this very imperfectly. The sensitivity and specificity of anthropometric indicators could be discussed at length. Nevertheless, this tool helps us in

diagnosis, when used as a complementary examination to be incorporated into the clinical approach.

The above remarks also hold true for individual treatment of malnutrition. But the other question concerning anthropometric indicators is exactly when a given situation requires specialised nutritional treatment owing to the severity of the undernutrition of a given population. Anthropometric tools, used for malnutrition prevalence surveys, are also factors in the decision on whether to launch a specialised operation with a group of individuals. The main objective in a situation that is already severe is to help reduce mortality. Some authors, notably David Pelletier[2], who has done extensive work on the relationship between anthropometrics and mortality, have established that a significant reduction in mortality can be expected from a reduction in morbidity (primarily infections) and/or malnutrition. The maximum expected impact would be obtained by working on both aspects: morbidity and malnutrition. The other postulate is that resources are limited and that this must be taken into consideration. MSF's Campaign on Access to Essential Drugs (CAME) has been advocating for years that not enough high-quality foods and food supplements are being produced to cover requirements. And even if enough of these were produced, would health organisations have the capacity to distribute these foods and administer treatment? Resources are limited so we must use them rationally. The decision depends on the expected benefit from an operation targeting an entire population. In a large population, if few treatments are available, they will only be used for the most severe cases. However, Pelletier's work shows that the greatest impact on mortality would be obtained by addressing malnutrition at its various stages (not solely in severe cases), in the locations showing the highest rates of morbidity and malnutrition. This brings us back to the idea of "hotspots", discussed in the first part of this seminar. Hotspots are areas with large, concentrated populations with high malnutrition prevalence rates. By working in such areas, one can hope to have a stronger impact on mortality. This does not, however, mean abandoning the aim of treating malnutrition through individual paediatric care.

Whom should we treat? The main results of 39 prevalence studies based on several indicators (weight/height, height/age and weight/age) show that it is crucial to address the problem between the ages of 6 months and 24-36 months. Degradation of anthropometric indicators often begins before 6 months of age and intensifies at the point when breastfeeding is no longer sufficient to meet all the needs of a growing child. The food supplements needed in this critical period are generally lacking in both quality and quantity in the contexts where we operate. A high density of calories and micro-nutrients is needed to meet the substantial physiological needs at this high-growth period, because an undernourished child has a small stomach and the density of the therapeutic food is crucial. It is usually said that nutritional status degrades at the age of 6 months. In fact, the process certainly begins before that age in most cases, but intervening at an earlier age is problematic as it may interfere with the

2. "Changes in Child Survival Are Strongly Associated with Changes in Malnutrition in Developing Countries", David L. Pelletier and Edward A. Frongillo, 2003, *American Society for Nutritional Sciences*.

principle of exclusive breastfeeding. Nutritional care takes on its full meaning as from 6 months of age.

Several indicators are used to study the relationship between anthropometric status and the risk of death (weight/height, mid-upper-arm circumference [MUAC], height/age), but none is a "gold standard". The prevailing tendency in our professional circles is to give preference to the weight/height ratio, which we have grown accustomed to using for pragmatic reasons. However, this is not a reference to be compared with MUAC as regards sensitivity and specificity. No one indicator is predominant; each has advantages and disadvantages. In March 2007, the WHO and UNICEF called for reconsideration of the relevance of MUAC because, as the UN states, it is easy to use for community-level management of malnutrition. In addition, the threshold values used to define severe acute malnutrition (below -3 for the Z-score, below 70% of the median and below 110 millimetres for brachial circumference) all have limitations for establishing a precise prognosis. But the greater the deviation from the anthropometric norm, the greater the risk of death. When we used the NCHS charts, which were based on data for children living in the United States, two-thirds of all deaths due to acute malnutrition occurred in the group suffering from so-called moderate acute malnutrition. So in Niger in 2006, we wanted to extend the scope of care to include children who were classified as cases of moderate acute malnutrition but who were so numerous that the majority of undernutrition-related deaths occurred in this category. The WHO's new charts, issued in 2007, changed this aspect of the situation, and comparison with the data we collected in Niger in 2006 shows that the United Nations' new weight/height standard is more successful in classifying children with a high risk of dying in the category of severe acute malnutrition. In short, the "severe acute malnutrition" category now includes a larger number of individuals and a higher proportion of children whose lives are at risk.

But we cannot focus solely on children suffering from severe acute malnutrition (wasting), since stunting also carries an increased risk of mortality. A recent example illustrates this point: three or four weeks before our meeting, Andrea Minetti of Epicentre conducted a prevalence survey in the Southern Nations, Nationalities and Peoples Region (SNNPR) of Ethiopia. The survey found a mean Z-score below -2, and found that the distribution of this population was strongly shifted to the left (63% showed stunting, and 37% severe stunting). We can get an idea of the relative risk of death among these children from an observational study conducted by Wafaie W. Fawzi[3] who monitored a group of Sudanese children in the 1980s and 1990s, measuring them every 6 months for a period of 18 months, with no treatment. Fawzi's work suggests that for 37% of the Ethiopian children examined by Andrea Minetti, the relative risk of dying within 18 months is at least 2 to 1. Overall, studies of mortality risk from childhood diseases show that this risk increases with the degree of undernutrition, whether the latter is measured by the weight/height ratio or height/age ratio. The decisions we must take are also influenced by the seasonal nature of food insecurity, which has been

3. "A Prospective Study of Malnutrition in Relation to Child Mortality in the Sudan", Wafaie W. Fawzi, M. Guillerino Herrera, Donna L. Spiegelman, Alawia El Amin, Penelope Nestel and Kainal A. Mohamed. *American Journal of Clinical Nutrition* 1997:65:1062-9.

thoroughly documented by CARE in the northern Bar-El-Ghazal (Sudan), based on survey data from the 1998-2006 period. There is clearly a seasonal degradation during the hunger gap. The results of a nutrition survey should thus be interpreted according to the season during which the data were collected.

In situations that are already very bad, the data show that the entire population is undernourished. In crisis situations, the distribution curve of weight/height ratios within the child population shifts towards the left (undernutrition) and almost all individuals are affected to some extent. The mean is used to estimate the number of individuals lying outside the norm, at the extremities of the curve. Since almost all of the age group is undernourished, why do not all these children receive treatment? What is the rationale for selecting those who should receive food supplements? Such screening takes an enormous amount of energy, staff time and money. This led us to consider treating an entire age group (children from 6 to 36 months in the case of Guidam Roumji, Niger, 2007).

DISCUSSION OF GEZA HARCZI'S PRESENTATION

Rony Brauman, research director, CRASH

– Is the anthropometric norm used truly universal? If so, we need an explanation, because in practice, we see that physical profiles vary, and that the idea of a universal norm does not appear to be valid.

How do we use these norms in consultations to assign a child to one category or another, and decide what treatment to administer?

Susan Sheperd, Coordinator, MSF International Nutrition Working Group

– The new anthropometric norm stems from a study of a group of about 8,000 children in six countries on five continents (The WHO Multicenter Growth Reference Study, 2005). They were all living in families with sufficient purchasing power to feed themselves adequately. The mothers were in good health, did not smoke and carried their pregnancies to term. The children were breast-fed, at least for the first four months. The principal differences with the previous norm (NCHS, based on children in the United States) relate to breast-feeding - which plays a much more important role - and the statistical approach. The previous norm represented the growth of a group of privileged children living in the United States, whereas today, an ideal growth norm is proposed. One of the WHO's answers to questions about the universal nature of the new norm is to say that, in the six countries covered by the study, the variations within groups of children in a single country are greater than those between groups from one country to the next. Some human populations – such as the Dinka in southern Sudan, who have a very elongated body shape – have specific growth profiles. Does a pygmy child have the same weight at birth as a Dinka child, a Nigerian child or a Brazilian child? These new WHO standards are certainly an improvement over the growth charts produced in the United States in the 1970s. They are universal in the sense that they are the reference

that everyone uses. Today, we are seeing the transition from one standard to the other, on an international scale.

Yves Martin Prével, Institut de Recherche pour le Développement (IRD)
– The new standard presents a growth potential that, as has been practically established, is the same for all children, regardless of their origins. Several types of research studies support this point of view. The average size of the Vietnamese who have emigrated to the United States has, in two generations, become identical to that of all Americans. The average size of a population depends on the environment, not on genetics.

Rony Brauman
– You mean that Americans are normal and that the Vietnamese are not normal until they arrive in the United States?

Yves Martin-Prével
– No, I did not say that. I say that, when placed in the same environment, Vietnamese and Americans have identical growth patterns. I did not say it was normal. Should we try to direct the human race towards an ideal weight and height? Is that reasonable? Isn't that discouraging for the countries and populations that are furthest from that ideal? In response to the question about whether these norms are universal, I think that the Dinka (a very tall people in southern Sudan) and pygmies have different morphologies. But if pygmies spent three or four generations in a much more favourable environment for their growth, wouldn't their growth pattern catch up to the current norm? The answer is probably yes, in the current state of our knowledge. The other type of reasoning that leads us to think that different populations have the same growth potential is based on historical comparison. The curve in Andrea Minetti's Ethiopia study corresponds to the curve for poor people in England in 1840. What has changed in England? Presumably, it is not the genetics of the English people but rather their environment.

Rony Brauman
– The normative aspect of nutrition becomes apparent in the denial of normativeness. It is stated that the nutritional status of Ethiopia today is the same as that of England in 1840. This implies that Ethiopia is 160 years behind England. When we speak of the growth potential of the Vietnamese or Japanese who come to live in the United States and "catch up" to American height, it is because we think they were lagging behind.

The scale of intervention is defined in terms of these normative ideals. In other words, we are creating our own market for operations. We should also take into consideration the way some research scientists manufacture their own markets when judging the results of their research. We see numbers in the millions that are specified down to the last digit, when in France we only know the real situation of the French population to within 2 or 3 million.

How can we even know how many people are living in the Sahelian countries? What denominator is used to calculate these proportions? In some cases, the population base on which morbidity and mortality were calculated varied by a factor of three, sometimes a factor of ten, particularly in the Democratic Republic of Congo. All of this is extremely unsound. Not only in philosophical terms (the universalising, normative aspect) but also in practical terms (accuracy of the calculation).

Jean-Hervé Bradol

– Geza Harczi's presentation undeniably implies the promotion of a norm, with all its arbitrary, debatable aspect. This leads in practice to a ranking of populations. Of what practical use is this norm in our health care activities? Do we prescribe treatment with the goal of seeing all the children in a given population reach an ideal weight? No. In practice, what interests us is the size of the deviation from the ideal norm and its consequences, particularly the mortality rate associated with that deviation. In our practice, the norm is not an ideal that we strive to reach, but a guide from which we should not deviate too far. For this reason, analysis of the associated risks, particularly the risk of death, is of fundamental importance in defining our goals and evaluating our results.

Jean-François Etar, directeur scientifique, Epicentre

– I think we must consider the children's individual characteristics, and we have methods that allow us to quantify the deviation from the overall mean. The problem is methodological. We would need to take several measurements per child and have a longitudinal compendium of measurements to capture the deviation from the average growth of the other children. Instead of giving results in the form of percentages of pre-defined norms, we need to have an idea of the individual variations of each child.

Jean-Hervé Jézéquel

– I have a question on the notion of associated risk, on the way in which two elements are associated and isolated: these elements are malnutrition and mortality. We isolate malnutrition on the one hand and mortality on the other, ignoring the rest of the environment. That reminds me of political science studies of confliction in Africa that show that the risk of conflict increases with the proportion of young people in the society. To have fewer wars, have fewer young people! The link established between two isolated factors disregards the context that connects them and that, if it were taken into consideration, could shed light on the meaning of this link. Do we establish the same link between malnutrition and mortality in a context where malaria is widespread and a context where it is less so?

Yves Martin-Prével

– I agree that what interests us is the deviation from the norm rather than trying to attain the norm. A population's mean deviation from this norm has implications for the mortality

rate of that population, for learning lags and for the country's gross domestic product. How valid are the calculations? They have been subject to many debates and criticisms. Today, there are major controversies over the work of Pelletier. The questions have to do with the level of mortality associated with malnutrition: 54% or 35%, as is claimed in the latest series of The Lancet? In both cases, the mortality rate is much too high to be tolerable.

Rony Brauman

– A high rate of malnutrition or of mortality may seem morally untenable, but in order to assess it we must see it within an historical trend. For example, consider the figures that the demographer Alfred Sauvy used to show that the world was not so badly off after all. He showed that if nothing had changed, all other things being equal, the annual number of deaths would be not 50 million, but 120 million. Thus, dividing the theoretical mortality since the 1930s by 2.5 showed that a number of factors had considerably improved life expectancy. But who will say that 50 million deaths is good and 120 million is less good. The issue is obviously not to form a judgement in absolute terms, but to understand the broad trends. I think that the precision and accuracy of numbers are important, so that we can dispute them when they are produced for reasons other than understanding reality as it is. I do not see any conspiracy or ulterior motives here. In epidemiological terms, it can be demonstrated that research is influenced by many things, and in particular by those who sponsor the research.

Jean-Hervé Bradol

– It is interesting to note the internal context in which we are discussing the anthropometric norm. In our recent past, indicators of severe acute malnutrition were the only thing that triggered a field operation. The norm we used to work with was very severe, in every sense of the word. With the old curves, as we say in our jargon, two-thirds of malnutrition-related deaths were not covered in our objectives. It seems to me that we are now in a period when norms are used more flexibly. In practice, we now mount successful operations to help children who used to be excluded from receiving care. The predominant attitude in our professional circles is still not to intervene except in cases of severe acute malnutrition. This prevailing norm is an issue because we find it overly restrictive.

Apart from this question of the norm, another subject that concerns us and that crops up often in our internal discussions is the question of proof. That is, how do we prove something? Should we wait for scientists to provide proof that our field policies are the right ones? On this subject, I leave the floor to Rebecca Grays.

PRESENTATION BY REBECCA GRAYS, EPICENTRE

I will speak in English. We can speak French later on, but in a discussion like this one, words are very important. Jean-Hervé asked me to review these questions, and I will try to do so. The first thing I will talk about is the concept of proof in the scientific method.

And in particular, I will speak of proof, of the reproducibility of results, the role of publications and the reality of the scientific method; lastly, I will speak of the moment when studies should be conducted, how they should be conducted, and the implications for nutrition.

The first subject is proof. The English word "proof" can have different meanings from the French word *preuve*. Proof in English means "something established beyond doubt"; there are several types of such proofs. There is "real world" proof; for example, "she called me an idiot and here's the e-mail that proves it". There is mathematical proof, such as the Pythagorean theorem, made up of a set of rule-based affirmations that lead necessarily and absolutely to a set of conclusions. There is legal proof as well, which depends on the legal system to which one belongs. "Scientific proof" has a very specific definition. In fact, it is not proof at all! Scientific proof considers a set of peer-reviewed experiments, formulae or conclusions; the term "peer-reviewed" is very important here, and we will come back to it. A particular idea has every chance of being true as a result of a proof, and in this case, proof means a piece of information that supports or does not support a theory. In scientific proof, the objective is thus to try to predict as closely as possible what will happen in future situations. In other words, it is the best solution in our current state of knowledge. It is not a quest for truth, since knowledge is constantly changing and truth is relative; rather, it depends on the state of our knowledge.

So how is such proof established? If you remember from your studies, we used the scientific method to obtain a scientific proof. First, we observe what happens; and we formulate a hypothesis to explain it. Next, we evaluate that hypothesis through experiments: this is the second step. Third, we conduct experiments, and fourth, the proof obtained through these experiments should ideally be reproduced by other people. If the hypothesis agrees with the proof, it becomes a theory. If it does not, we go back to step 2, reformulate the hypothesis, and carry out the next steps again. When we obtain a theory, we are in a position to make predictions about the future. Today, I will speak primarily about steps 3 and 4. Many people prefer to deal with steps 1 and 2, and neglect steps 3 and 4!

In step 3, all the proofs are not equal. There are levels of proof, with a hierarchy. You see on this slide the system of levels used by various groups – government health departments, universities and the UN, among others. The randomised control trial (RCT) is the highest level of proof, the ideal being to have several RCTs and then to study their findings. The next level down is the non-randomised comparative trial. Next come group studies or case series, followed by time series, with or without intervention. The lowest level of proof is personal opinions. They are the opinions of experts, but sometimes it's all we have.

Why are RCTs the highest level of proof? Why are they always so important? And why are they always put under the spotlight? RCTs consist in randomly selecting people or groups of people to form other groups, which then receive one or more interventions. They are

comparative: one element is compared to another, or a number of elements may be compared. RCTs are experiments, that is, they are controlled by the person conducting them, and there are enough subjects participating to ensure that the known and unknown confusion factors (I will come back to this) are also divided between the groups. After the trial, if your experimental intervention shows a significantly different effect concerning the control group (the group to which we are comparing the factor studied), it is probable that it had an effect on the disease. That is what can be concluded from an RCT. This is the highest level of proof we have in decision-making.

Why is randomisation considered so important? For two reasons. The first is known as *causalation*, a portmanteau word made of "cause" and "correlation", and the second is the confusion factor. The classic example is the extremely strong correlation between ice cream sales and shark attacks. First of all, we're not going to think that sharks are eating us because we have been eating ice cream. If we arrive at that conclusion, we are guilty of *causalation*. And it is not true, because there is a confusion factor. And this confusion factor is either the heat or the vacation period. The probability that you will go to the beach is higher in the summer, as is the probability that you will swim and be attacked by a shark. And you will probably buy an ice cream when it's hot. But no-one would argue that these factors (ice cream sales and shark attacks) are really connected. Yet this is what many people do all the time in less obvious cases.

Coming back to RCTs, there are several types of these trials; they may or may not be conducted "blind", meaning that either the scientist or the patient, or sometimes a third party, does not know which intervention the subject has received. Trials may employ a number of different interventions, called "arms", and may involve either individuals or groups of individuals. RCTs are difficult to conduct, expensive and sometimes very time-consuming. And even if we reach this highest level of proof and believe in the levels-of proof system, RCTs have their limitations, and their results are not always reproducible. Lastly, they are not always appropriate, and sometimes frankly impossible to carry out. Let us review briefly why one would not conduct an RCT. First, RCTs can be unethical. This is obvious, but not always clearly stated. For example, in the 1950s and 1960s, the Chinese ran studies on what is a vital organ and what is not. They therefore arranged randomised trials in which they removed a person's heart, and oops! Fatal! And in another individual they left the heart. Obviously, random selection of people and extraction of their organs is contrary to our ethical code. RCTs can be inappropriate when it is not possible to isolate the intervention from the factor to which it is being compared, and I will speak of that in a moment. Third, in my personal opinion, when a trial will not provide additional proof, it should not be undertaken. Thus, if an RCT cannot be done or is inappropriate, there remains a whole series of other methods, from collecting the opinions of experts to the well-designed non-randomised trial. Each has its advantages and disadvantages, its pros and cons.

The aim is to secure the soundest possible proof given the constraints. We have spoken only in theoretical terms to this point, and now I will speak of the reality. First, reproducibility. Why is it important? Ideally, it should be possible for the studies to be reproduced by other, independent organisations and in different contexts. One study is not enough, and does not carry as much weight as several studies do. How are these studies reproduced? On the basis of studies published in peer-reviewed journals. The underlying theory of this type of publication is that the research submitted for publication is examined by experts in the field. In theory, peer review is impartial, which means it should be anonymous and independent. You submit an article to a journal, which sends it out for peer review. Now, imagine that I am a peer reviewer and the authors are anonymous. I do not know who did this work, and the author submitting the paper does not know that I am one of the peer reviewers. This also ensures a diversity of opinions. For if only one person at a journal made the decision concerning the article or the research, we would have a dictatorship deciding what was right and wrong Thus, the aim is to ensure that several people give their opinions of the quality or merits of the work. Why is it so important? With these peer reviews, journals become scientists' debating forums. Publications are a form of emulation: people will reproduce the results and challenge them. Publications also serve to document what is happening, because science and scientific progress build on past knowledge. The mere fact of publishing research draws attention to a particular problem, and it is the common currency of our discussions – that is, the "scientific currency", the way scientists assess things.

Now let's speak about the reality: behind this nice theoretical picture, what is really going on and what are the implications for nutrition? At the top of the slide, you can see the scientific method that I showed you in the first slide. At the bottom, you can see what really happens in many cases, and it is very different. The first step in the scientific method consists in observing what happens, but in reality, what often happens is, "I will start up a study on what 'they' told me that 'they' would like to establish as true". In the Epicentre-MSF context, this could mean that the Mali programme manager wants a study to demonstrate the success of the programme and that I am supposed to find a way of doing so. Instead of formulating an hypothesis, scientists and researchers then design the minimum number of experiments needed to show that the theory is true, instead of designing the best experiments. Sometimes, people change the theory to fit the data – or vice versa. Then they publish an article and claim they are using a scientific method. Next, of course, if someone dares to utter a criticism, they defend themselves vehemently. This happens often. I am joking here, but when you think about it, it is not really funny.

Why is it so complicated? Why is it so difficult? You see here a slide from a study on diarrhoea-induced mortality – one could just have well have written "nutrition-induced". I tried to imagine a situation in which someone told me, "I would like you to conduct a study showing that the incidence of diarrhoea was reduced by half in 2009". This cannot be done

in an RCT, because thousands of things happen and it is very difficult to isolate one element among them. This is not impossible and I am not trying to say that you should not do it, I am simply pointing out the problem raised by such a situation.

I have isolated here a dozen problems out of those commonly encountered. The first and main problem is very often that the hypothesis or objective of the study is unclear or incredibly vague. There is also the difficulty connected with multiple interventions, as indicated in the previous slide.

Next, there is the question of individuals in the context of scientific research: if we are good doctors, we put the patient's health first, whether the patient is participating in a study or not – that is, we should, but it doesn't always work that way in the context of a research study. In addition, the context in which the study is conducted must stay the same, must remain comparable, which is a recurrent difficulty. Such studies are expensive. Their results are not immediately available. Sometimes scientific knowledge changes more quickly than the timing of the study itself. We may start on a study that is to last, let us say, two years, but during those two years other things can happen: other research projects are completed and other knowledge is accumulated. Scientists and readers also often make mistakes in interpreting statistics or the meaning of figures and findings. Rony Brauman can speak of this much better than I can. Just because something is quantified does not make it scientific or legitimate.

The same is true of publications. Rony Brauman mentioned this a few moments ago, but I will say it a bit more abruptly. Publications have many biases. The first is that if one is conducting a study and wants to do things right, it must be published in a journal so that it becomes part of the body of scientifically proven facts in order, ultimately, to serve in formulating a scientific or medical policy. The problem is that, if the result of a scientific study is nil, the study becomes uninteresting and has little chance of being published, which is a very important bias. Then there is the question of language: I am speaking here in English, and this is a good example. Research topics are biased in themselves: many more studies are published on Viagra than on malnutrition. There are even biases connected with the titles of scientific studies, since people like catchy, hard-hitting titles. There is also the "I owe you one" bias, which is very common: if I am reviewing a paper and, even though in theory I do not know the author, I might know who wrote it and I might say to myself: "the study is poor but I know the guy who wrote it, he's helped me in the past, he's a nice chap. I will not refuse the paper". There is also the "well-known author" bias, which might be called the "Robert Black bias"[4]: scientists who have a big reputation can write what they like, and frankly, I don't think their papers are at risk of being refused. There is also the "belligerent" bias: people reject papers simply because they have the power to do so. And the probability of being published is very low when one has never published before – the "unknown author" bias. This makes things very difficult. More experienced authors can add their name to the paper to help out

4. Professor and President, Bloomsberg School of Public Health, Johns Hopkins University.

a young author, because even if the study has been well conducted it is highly improbable that it will be published.

Why am I telling you all this? Why is it important? This raises the question of why we undertake scientific studies. There are three main reasons for doing so. First, we conduct scientific studies when we do not know something, and it is often basic research. Second, we conduct studies when there is not enough of a consensus on what should be done, on the appropriate treatment. The third reason – which is often Epicentre's area of intervention – is when a consensus exists but is not acted on for one reason or another. For example, why are country protocols different for ACT malaria treatments or HIV treatment? When one knows what may be the right treatment for a given disease, and that treatment is not used, one needs proof to demonstrate it. The reasons why it is not used may have nothing to do with science: they may stem from ignorance, or from a decision not to follow a protocol that is too expensive, or from political or cultural motives. Whatever the case, one may want to demonstrate that a particular protocol can be applied even in contexts where such considerations may arise.

To answer Jean-Hervé's question: can a treatment and a programme be evaluated in the same way? No. If you decide to conduct a scientific study, the plan of the study should depend on the question you are trying to answer, on the constraints encountered and, of course, on the level of proof desired. A quick assessment of a programme and a five-year RCT are very different undertakings: the goals are different, the target audiences are different, and they are conducted for different reasons. But above all, when we evaluate a programme, we are evaluating a whole set of things simultaneously – Michelo used the word "packages" this morning – and not one thing in particular.

Why is this difficult in the case of malnutrition? The decision to formulate a programme or policy can be based on something other than science. It may be based on arguments relating to equity, justice or other factors, which do not depend on a scientific study. Scientific language and the scientific process, though very important in themselves, are also tools available to people, who will decide when to use them and when not to use them, depending on whether there is any point in their doing so. This is true of humanitarian organisations like MSF. When we develop a policy stance, sometimes we will use scientific arguments, and sometimes not. I like to think that this is the primary reason why I do this work, and why CAME exists, and why CRASH exists. There are different ways and means of achieving our objectives, and science is only one of them.

DISCUSSION OF REBECCA GRAYS' PRESENTATION

Jean-Hervé Bradol

– To get the discussion started: should milk be used in the food supplements given to children with moderate acute malnutrition? There is a good deal of scientific information in favour

of using milk, but its price is an obstacle. Reading the report of one of the last meetings of the MSF International Working Group on Nutrition, we note that one of our teams, partnered with a Danish university, the WHO and the WFP, wants to study the composition of the therapeutic food to prescribe for moderate acute malnutrition. A three-arm study is proposed: one group will receive a mixture of cereal paps and milk, another group cereal paps only, and a third group no food supplements at all. Does this research proposal correspond to the state of scientific knowledge? Do we still need to verify that milk is useful in treating child malnutrition? Is it quite ethical to plan such a trial? In my opinion, such research is neither scientific nor ethical.

Jean Rigal, medical director, MSF, Paris
– There is no valid reason to question the role of milk in the diet of young children. The European experience on this point is instructive.

Susan Sheperd
– RCTs were developed in a special context, in response to the introduction of new drugs that had severe secondary effects, and whose effectiveness had not been scientifically established in comparison to the previous treatment, which was the standard. This methodology may not be applicable to other questions.

Rebecca Grays
– Must the scientific studies conducted in the areas where we operate meet the same standards as those which prevail in Paris? It is possible to carry out RCTs in very different environments. But is this a good idea? No, unless the aim is to isolate the effect of one intervention or treatment from the effects of others. More generally, the main question is not always scientific; there are other arguments that at times are more appropriate to the problem being studied.

Rony Brauman
– One remark: your description of the ideal scientific method is still much too idealised. The starting point is not an observation but a theory that governs the objects that you will observe; thus, we do not move from observation to theory, but from theory to theory, and this is also true of scientists. This is important because it lead us to question the presuppositions, which are "scientific" to varying degrees, that govern the measurement of such or such an object, comparison of such and such a group or parameter, etc. Can the impact of an acute malnutrition prevention programme be measured? Ultimately, if we want to sum up the main issue of this seminar, this is where it lies.

Rebecca Grays
– What do you mean by the impact of the programme?

Rony Brauman
– Can we say that distributing Plumpy'doz reduces the number of children who become subject to acute malnutrition?

Rebecca Grays
– Yes, but that is an evaluation of the impact of all the project components, not of Plumpy'doz alone. That would be different from an RCT comparing Plumpy'doz to other products.

Jean-Hervé Jézéquel
– Rebecca's presentation shows the limitations of the scientific method. It also shows the mismatch or misalignment between the time constraints and rationales of humanitarian and scientific stakeholders. If they are to work together, humanitarian and scientific stakeholders must take this problem of alignment into consideration. I would like to know what our colleagues in Operations, concerned as they are with the need to provide scientific proof, thought of Rebecca's presentation. In Niger in 2005, we did not do an RCT to prove what we were convinced of at the time, namely that mass treatment of children in the southern Maradi region was needed.

Susan Sheperd
– There was at least one RCT before that.

Vincent Brown, epidemiologist, MSF general management
– Plumpy'nut has been widely used by operational staff without scientific studies since the late 1990s. Since then, we have been asked to prove not that the children put on weight but that Plumpy'nut is a good product. This is absolutely absurd.

Marc Poncin, Niger desk, MSF, Geneva
– We cannot say today whether Plumpy'doz works. The study in Zinder province was interrupted owing to tensions with the government of Niger. The point of conducting these studies is to provide quasi-scientific evidence so that we can convince other players to use the same protocol. Once we are convinced that a protocol yields good results, we try to simplify it as much as possible so that it can be employed in less privileged environments than those of MSF projects. One of the perverse effects of using anthropometric norms in the project in Niger's Zinder province was to make us forget that there is more to children's health than nutrition. We missed the importance of malaria in child mortality, because we were too focused on nutrition.

Laurent Gadot, health economist , MSF Campaign on Access to Essential Drugs
– On the question raised by Rony Brauman: how many cases of severe acute malnutrition were avoided through the distribution of Plumpy'doz? This is the key to the World Bank's approach to assess how much money is needed to fight malnutrition around the world. To

estimate this, the Bank would like to have scientific studies as a basis. But the debate is not limited to its scientific aspect. It is obvious that feeding individuals prevents them from suffering from malnutrition.

Jean Rigal

– In the history of medicine, the classification of mental illnesses was greatly changed by the introduction of medication. Diagnosis and therapy were changed by the discovery that certain molecules act in certain ways. The introduction of ready-to-use therapeutic foods has changed not only the way we look at malnutrition but also our mode of operation. Geza Harczi and Isabelle Defourny's 2006 paper on the treatment of moderate acute malnutrition with Plumpy'nut has had a considerable impact, though it was not a randomised trial. Scientific studies are necessary, but we must remember that the way they were conducted was long based on empiricism. We should also note that randomised trials have taken some of the steam out of drug research.

End of the second session

3RD SESSION: STAKEHOLDERS AND THEIR POLICIES

Is the fight against malnutrition a matter for political action, education, agricultural and economic development, or for medicine? Are all these spheres of action opposed to one another or complementary? Are the Millennium Development Goals on hunger, poverty and infant mortality realistic? Is the reluctance of some countries to treat acute malnutrition legitimate? Is the intention of providing care, here and now, reconcilable in practice with that of influencing public policies for a better future? Ultimately, what are MSF's ambitions in the field of nutrition?

PRESENTATION BY STÉPHANE DOYON, CAME

My presentation will try to describe, in necessarily summary fashion, the recent changes and differences in the way the major international organisations view the problem of malnutrition and how to respond to it. I will conclude by giving my view of what ambitions MSF might have for the fight against malnutrition and what goals we might set in this respect.

There is a relative consensus today for the UNICEF multi-causal explanatory model (see diagram below), although this model still raises a number of questions. The model identifies all the factors that may influence the nutritional status of a population, that is, the structural and indirect determinants of malnutrition (the economy, education, level of development, etc.) as well as the more immediate factors (disease, diet, etc.). These are all factors that affect the living conditions of a given population, and hence its nutritional status.

Conflict situations generally destabilise these structural factors (through massive population displacement, destruction of the economic and social fabric, etc.) and frequently lead to situations of severe nutritional imbalance. I will not analyse nutritional interventions in this type of context, since to my mind there is a broad consensus on the subject, particularly within MSF.

Operations raise more questions when we are faced with situations where there is not a clear acute situation, a crisis or declared emergency with a well-identified trigger that explains a high level of malnutrition. Examples from the contexts where MSF operates would include the situations of Niger and Burkina Faso. People often ask what the point is of treating malnutrition in these contexts where malnutrition is classified as chronic. It is therefore worthwhile to consider the positioning of the various stakeholders, as well as the various obstacles they evoke to oppose treatment of malnutrition.

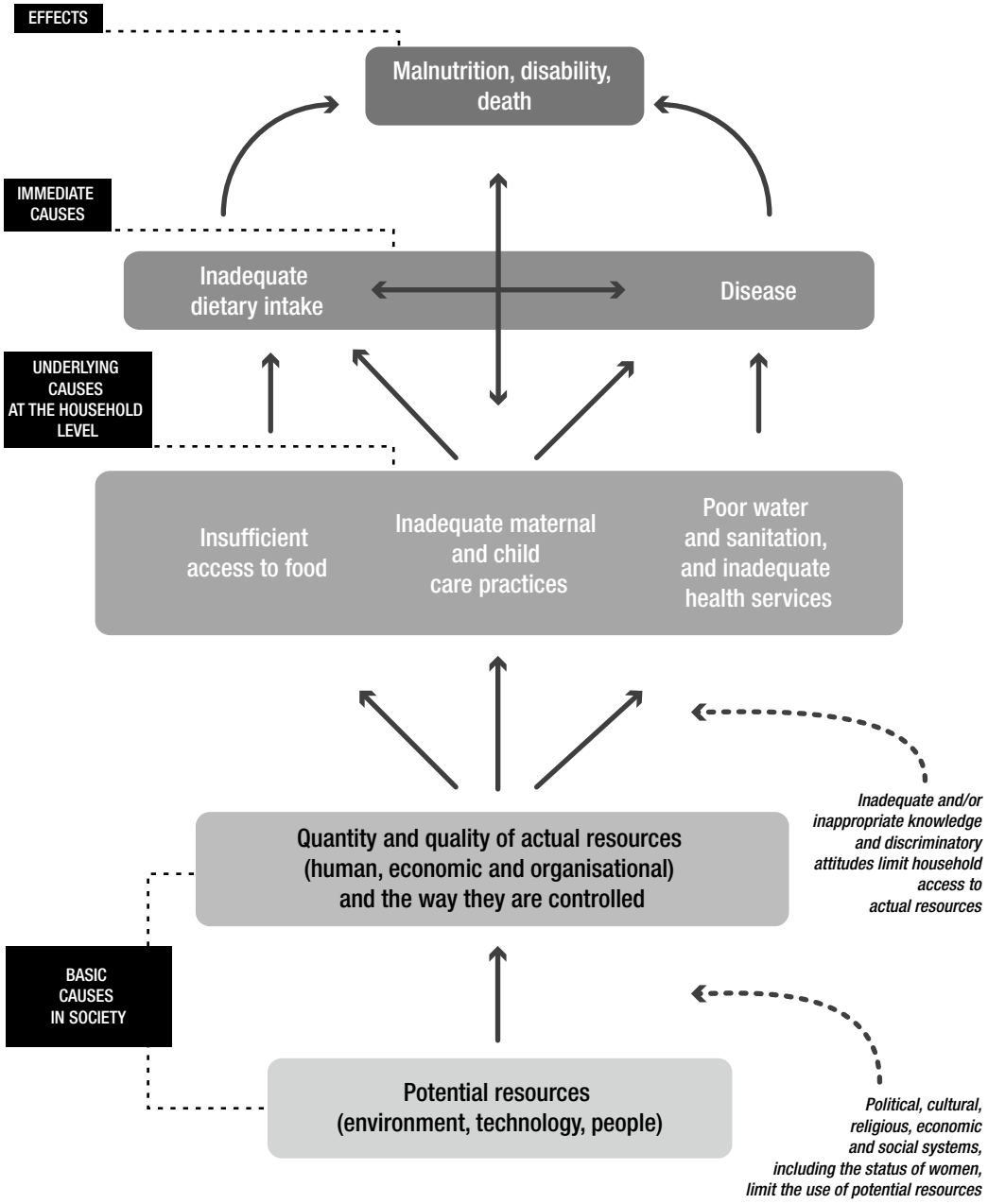


Diagram: the causes of malnutrition in children (source : unicef.org)

In some countries where malnutrition is structural, governments tend to start by denying the problem. In Niger, for example, the health ministry accused MSF of maintaining a situation of endemic malnutrition with the complicity of mothers. Some NGOs are accused of maintaining or indeed creating a problem because, it is claimed, it is their "stock in trade": it enables them to justify their activities and, most importantly, to gain access to resources through financing or collection of donations. Nigeria is another of these "rejection fronts" that Jean-Hervé Jézéquel spoke of this morning. The doors are not entirely closed to us, admittedly, but during our last operation in the northern state of Katsina, the Nigerian authorities were very clear: they did not try to deny to our faces that a nutritional problem existed, but they said they did not want pictures of emaciated children in northern Nigeria to be disseminated, as we saw in the media in 2005. The authorities prefer to hush things up and ban humanitarian operations rather than see such damning pictures used again.

Another group of stakeholders sees malnutrition as a development problem. The World Bank, for example, as well as eminent associates of the medical journal *The Lancet* such as Robert Black, have more explicitly associated malnutrition with a lack of education among the populations concerned. They believe that in countries affected by malnutrition, there is enough food available to meet the needs of all. According to these experts, the problem is not access to food, but rather the fact that parents, particularly mothers, lack the knowledge to make proper use of the resources they have to feed their children. Thus, to deal with malnutrition, which is thought to be the result of poor feeding practices by mothers, a few sessions of nutritional education is considered enough. This type of argument seems rather weak to me, in view of the seasonal nature of hunger observed in most of the areas concerned. How can we explain the seasonal variations in malnutrition levels when we know that mothers' knowledge of the matter does not vary according to the season of the year? The problem of access to food is still, in my view, the main determinant of malnutrition in the largest hotspots. Even the World Bank is recognising this in its latest declarations. More generally, these situations of chronic malnutrition are interpreted differently depending on the experts: doctors will generally see it as resulting from deficient health systems, educators point to the mothers' lack of education and agronomists deplore low levels of agricultural output. There is competition among the experts and the policies that might be used to address the problem of malnutrition. Would it be best to stimulate agriculture? To distribute food handouts? To develop economic infrastructure? There is a whole series of choices to be made between the various policies proposed.

For example, should priority be given to short-term actions or to preparing for a better future? For many years, any "development aid" action on nutrition was considered as current expenditure and not as an investment. In other words, the money used in these aid programmes was considered as badly spent, because it served to meet the immediate needs of the current population and not the long-term needs of future generations. It was considered preferable to put the effort into infrastructure investment or into actions that could help to build a better future. A series of recent events, including the Niger emergency in 2005, have reopened

the debate on this issue. It is now generally accepted that where malnutrition is concerned, development actions and treatment of malnutrition should be combined rather than opposed.

To take another example, there exists today a high degree of inequality, if not competition, between the various aid sectors: the international funds allocated to funding nutrition-oriented programmes amount to about US$300 million, whereas the funding devoted to fighting AIDS amounts to US$6 billion. I am not calling for a transfer of funds from one sector to another, I simply want to point out the mismatch in the resources allocated to these two health problems and thus to illustrate the extent to which the international aid community has neglected the fight against malnutrition.

The treatment of malnutrition raises many questions. Until now, we were in agreement on limited or "exceptional" actions in time of war, but were generally reluctant to tackle the much larger problem of regions that suffer chronic malnutrition. But this has changed in recent years with the emergence of new treatments, namely ready-to-use therapeutic foods. These have made it possible to decentralise treatment, to work with fewer resources and therefore carry out more massive operations to treat the affected population. Previously, MSF was often overwhelmed by the number of patients and had to refuse patients during certain operations. This was the case in Sudan, where our teams had to screen the patients they decided to treat from a large number of severely malnourished children, because they could not provide care for all of them. Systematically hospitalising children suffering from severe acute malnutrition will not provide care for a large number of patients. Today, this is no longer the case, and it is now possible to organise large-scale treatment operations. Moreover, MSF is not the only organisation concerned, because these new treatments are now recommended at international level by the WHO. About 34 countries have incorporated these recommendations into their protocols. We are beginning to see changes in malnutrition management practices, or at least a generalisation of community management of severely malnourished cases, including in situations of endemic malnutrition.

These new treatments have also led to a more general questioning of the approach taken to malnutrition. The possibility of mass treatment of malnourished children has suddenly enabled providers to realise the scale of the phenomenon. In situations where malnutrition is recurrent and seasonal, it seems absurd to organise exclusively curative operations each year to treat the outbreak of malnutrition observed during the hunger gap. We know this phenomenon is predictable, we know when and where it will appear, we even know which populations it will strike. This strategy is based rationing: wait until children's health is strongly affected before providing nutritional support. Some organisations are questioning these approaches today, and are considering the possibility of earlier prevention or of tackling other types of malnutrition than the severe acute form. This is a public health principle that is not far from what MSF follows on issues other than malnutrition: if we see one case, we treat it; if we see a thousand, we consider vaccination. We have always adopted this type of strategy in nutritional emergencies and we distribute food when we see many cases of malnutrition. It is just a matter of making a similar response in areas of chronic malnutrition. From an

operational standpoint, it is easier to distribute food to young children each month than to run large-scale medical operations each year to treat tens of thousands of malnourished patients.

The recent advances in treatment have also led to criticism of food distribution programmes as practised in the early 1950s. The approach was basically quantitative: the food surpluses of countries in the North should be transferred to Southern populations hit by food shortages. The problem is that these populations also need nutritionally appropriate food. We are rediscovering today - and MSF has had some role in this movement - that food aid policies are based on products that are often a poor match for the needs of beneficiaries, particularly children. Recent WFP publications point out that "the current composition of enriched paps is not ideal for children under two years and for moderately malnourished children" and that "there is an urgent need to develop new, effective and affordable products to address malnutrition in that age group"[5]. Another step forward, in my view, is that these publications also recognise the role of milk in the diet of children under the age of two. But there is still much to be done: it is significant that the operations of the WFP, the biggest distributor of food aid in the world, still do not include nutritional indicators in the monitoring of their activities. It is also unfortunate that the food distribution operations used no products designed for young children, who constitute the population that is most affected by malnutrition.

In this context, where things are starting to change but much remains to be done, I would like to conclude by addressing the question of MSF's ambitions.

Apart from areas hit by conflict, there are two types of objectives that we should consider. We could target stable areas where there is neither any treatment of malnutrition nor even any recognition of the problem posed by high malnutrition rates. In some of these countries, such as India, discussions on this problem are under way, and there have even been some requests that MSF get involved. We should set up pilot programmes in these areas to demonstrate both the possibility of treating severe acute malnutrition and the effectiveness of the treatment. We should also be aiming, and I say this loud and clear, to "tip the scale", that is, help to spread the use of this treatment in the country concerned, by inducing civil society, intellectuals and political forces to adopt it.

The second objective, in my view, would be to make a more comprehensive contribution to the reform of food aid. To cope with the sharp seasonal peaks in countries of chronic malnutrition, we need larger distribution models with products that meet the specific nutritional needs of early childhood. So the reform of food aid involves moving in two directions: on one hand, we need to shift from a "purely quantitative paradigm" to a "qualitative paradigm"; on the other, in malnutrition hotspots we need to abandon the rationing strategy that targets only those children whose nutritional status has severely deteriorated for a strategy of enlargement aimed at covering all those affected or at risk. What we need to do now is demonstrate the effectiveness of these strategies through practice, without necessarily trying to provide scientific proof. For this, we need to work in stable areas, and particularly in the largest malnutrition hotspots, so that we can adapt and improve our own practice. We may reap the benefits of this experience when working in emergencies or in our other activities.

5. WFP, "Ten minutes to learn about… Improving the Nutritional Quality of WPF's Food Basket", *Sight and life magazine* 2008;3(S):4–14

In addition to our own practice, we want to influence the operational practices of other aid providers in these stable countries. In the long run, the aim would be to see these strategies grow and spread without us. For this, it is also necessary to work for an increase in the international funds allocated to nutrition.

PRESENTATION BY RONY BRAUMAN, RESEARCH DIRECTOR, CRASH, PARIS

After Stéphane Doyon's presentation, I will focus my own presentation on two main points. First, I will examine the transition from curative to preventive treatment of malnutrition, and then I will address the issue of MSF's choice of pathologies.

1. The transition from curative to preventive treatment is often presented as a logical, natural extension of therapeutic activity, and not only at MSF. To me, it looks much more like a break with therapeutic activity. It may seem like a smooth continuity, but this is a revolution in both our conceptions and our practices. Instead of having malnourished children come to the therapeutic centres of a medical organisation, the medical organisation treats a population for infant malnutrition. A shift on this scale may be justified, but it should not be ignored.

There are other ways of changing our nutritional programmes. In particular, when we discuss this at MSF, we could abandon the "top-down" approach of nutritional programmes and instead incorporate them into mother and child protection programmes. Instead of focussing on nutrition, we could reinforce the medical component of our programmes, broadening the range of healthcare provided and improving its quality. I believe that this corresponds more closely to the expectations of those we want to help, as well as to the reason for MSF's existence.

How to respond to malnutrition is a issue that always leads us to question the limits of our operations. Metaphorically, I believe that we are wavering between two models: that of a global ministry of health, and that of a UNICEF remake. The fact is that, when we cite macro-data on morbidity and mortality, where the basic unit is the million, we speak of malnutrition as if MSF had global responsibilities for population management, preservation of life and collective security. But this is central to the prerogatives of the modern state. By approaching the nutrition debate in these terms, we are at risk of leaving the proper terrain of non-state players, i.e. humanitarian NGOs, to play the role of a sort of state institution with global responsibilities. On the other hand, by systematically putting women and children first, we are playing a role similar to that of UNICEF in our public statements, which seems to me no better. First, UNICEF already exists, and I do not see the point in reproducing it in NGO form; second, its positioning is clearly that of a good works organisation, and I think that MSF should avoid that missionary temptation. And such a broad framework could only strengthen that temptation.

Remember the oral rehydration salts (ORS) campaign in the 1980s. *The Lancet* was heavily involved in the campaign, alongside UNICEF and the WHO. In their public statements, distribution of ORS was deemed necessary for saving the lives of millions of children. This campaign with a prophetic flavour was based on undeniable progress in scientific knowledge:

no-one can deny that oral rehydration salts are useful in the treatment of diarrhoea and acute dehydration. However, the transition from individual treatment of acute dehydration to prevention of dehydration proved to be much more complicated than a mere shift of objective. The advocates of this type of care are to some extent collectively responsible for a health disaster. Their support for the so-called primary health care policy implemented by "village health agents", who constituted the new backbone of public health systems, provided a splendid alibi for governments that were reluctant to finance public health infrastructure. This policy also found favour with the accounting logic of the IMF and its "structural adjustment plans".

I do not want to push the comparison too far, but I do see analogies between UNICEF's ORS campaign and MSF's campaign for RUTFs: first, both of them pursue the goal of using a therapeutic product more widely than in acute pathological episodes; second, both seek legitimacy by combining a scientific discourse on the product's effectiveness with a moral position on saving children's lives. It can be helpful to note elements of past failures as this will make us reflect on our current ambitions.

2. My second point concerns MSF's operational choices. In a context of necessarily limited financial and human resources, we cannot be constantly adding new programmes and new objectives to our association's activity. Choices have to be made (for example, MSF decided not to treat metabolic and degenerative diseases). The risk is that the development of nutritional programmes on such a large scale and with such vague goals as the reduction of morbidity and mortality hotspots would mean devoting a very large share of our resources to this area. It seems to me that we should consider the alternatives and in particular refocus our actions on more general medical practice and know-how, as I have already suggested. For example, we could choose to work in major cities, conurbations that are submerged by population movements as a result of war, climate change or socio-economic upheavals. It seems to me that we would be providing very important services by setting up health units in these areas, which would of course deal with nutrition, but also with other pathologies that plague urban environments.

In passing, I also note that the broad trends of world mortality are converging: cardio-vascular diseases, metabolic diseases and cancer, road accidents and alcoholism are the main causes of mortality around the world. That being the case, if we try to attack the main foci of mortality, there are a number of medical causes that could draw the attention of MSF. Nutrition is one of them, but making it a priority is not obvious. If we choose to take that direction, we must do so in full knowledge of the operational, financial and organisational consequences.

I will conclude by stressing that one of the main problems facing us today is the increasing distance between the practice of medicine in individual cases (the care provider's position) and medical prescription for collective cases (the expert's position). We noted this morning that, in a given social situation, medical care is only one of the possible forms of intervention.

Health care undeniably confers a certain legitimacy, a way of describing and understanding the problem – but it is one of several possible ways, not the only way. When a doctor begins to focus on society rather than on individual patients, he joins the ranks of the experts, and has neither more nor less legitimacy than they. Public health problems are rarely monocausal, like saturnism and asbestosis. There is a degree of competition among the experts working on a particular collective problem; each of them describes a part of the reality without being able to encompass it entirely. In the case of nutrition, the doctor is placed alongside educators, development specialists, economists and agronomists. Lastly, from the standpoint of both MSF and governments, there is an overriding question of resource allocation: for governments, the question is how to choose among the various expert opinions on how to resolve the problem of malnutrition (educating the public, increasing incomes, family planning, agrarian reform, etc.); for MSF, it is a choice between different forms of action, which requires us to think about the role of top-down programmes (AIDS, nutrition, vaccination, psychology) in comparison to other programmes. I would like to emphasise the importance of being wary not to let these vertical programmes proliferate, without denying their value in certain circumstances, as well as of keeping in mind the difference (without making it an opposition) between care and prevention.

DISCUSSION OF THE TWO PRESENTATIONS

The presentations in the third session debated MSF's role and ambitions regarding nutrition. Following the presentations of Rony Brauman and Stéphane Doyon, the discussions focused mainly on two broad themes. First, the possibilities of linkages between the curative approach and the preventive approach to malnutrition. Some saw these two approaches as necessarily complementary, while others warned against a worrying shift in MSF's ambitions. The discussion then turned to the role that MSF could play with respect to food aid policies in general: should we help to change these policies? Should we go so far as to propose a new "model"? Ultimately, these questions have to do with the place occupied by MSF, either within or on the margins of the system of policies and stakeholders engaged in fighting malnutrition or hunger. Apart from these two main topics, the discussion also addressed other themes such as competition among experts in the fight against malnutrition, the issue of a transition in health care and the difference between feeding and nutrition.

Curative and/or preventive care

Jean-Hervé Bradol said that Rony Brauman's presentation raises important theoretical issues on the risks associated with preventive approaches but the reality of MSF operations does not bear out what he says. For example, it cannot be said that in Niger MSF moved from treatment to prevention since we know that, in the Maradi areas, the great majority of children in one age group suffer from malnutrition in one form or another. Nor can it be said that our interest in treating malnutrition, any more than our interest in treating AIDS, takes too much of our energy and distracts us from treating other categories of disease. To back

up these affirmations, he mentioned the programmes against multi-resistant tuberculosis and reparative surgery conducted by MSF in recent years. More broadly, Jean-Hervé Bradol thought that MSF has always been and should remain sensitive to techniques that "make it easy to save lives".

Rony Brauman answered that his concern is not with past experiences but with the current debate over MSF's new ambitions in the nutrition field. He pointed out again that the transition from treatment to prevention is less a natural extension of medical action than a clear break in the association's ambitions. He warned against the repeated failures of huge social engineering projects, which generally come up against a human reality that is more resistant to change than it may appear. He cited the example of the camps in Darfur, which are closed environments that live on humanitarian aid all year round and are nevertheless affected by seasonal peaks of malnutrition. Philippe Levaillant, former head of mission in Niger, took the floor to say that the seasonal character of malnutrition in Sudan is due to many factors (e.g. the onset of respiratory infections during the rainy season and the fact that mothers working in the fields pay less attention to their children's feeding). Rony Brauman remarked that this is precisely why he used this example: human economies are complex and the factors that need to be considered are so numerous that the "scientific" effectiveness of a medical product does not guarantee that it will be taken up by society. In the same vein, François Enten (anthropologist and member of the MSF-France board) reminded participants that local populations always take over aid programmes, changing their direction and impact. This is true regardless of the product used, be it seeds from the FAO or Plumpy'doz from MSF. If a product is to be "socially" and not merely "scientifically" effective, we would need to control the impact of our activities on the ground. But we do not: the local population assume ownership of these products. This is not necessarily negative from their point of view, but it should lead us to greater modesty concerning the goals we can reach. In support of these comments, Claire (an MSF volunteer who had been in Darfur) mentioned the difficulties she had experienced in Darfur in a nutrition programme conducted outside the camps of displaced persons: "we found ourselves involved in social and political questions that we had not dealt with before".

Susan Sheperd (MSF Nutritional Working Group) thought instead that the new products could make it possible to design health systems that are more accessible to the populations of the countries where we work. Thus, she does not understand Rony Brauman's criticism of ORS in his presentation. Shouldn't our goal be to put a simple, effective treatment in the hands of families? Shouldn't we be moving towards health systems that are truly accessible to the people?

Marc Poncin (programme manager, MSF Switzerland) expressed his surprise at the opposition that some were seeing between preventive and curative approaches. In the history of MSF, these two activities have always been conducted in complement. An example is vaccination in conjunction with treatment or as a preventive measure. Stéphane Doyon agreed, noting that prevention where malnutrition is concerned is indeed in keeping with a medical

approach and that it can be compared with vaccination campaigns: it is an extension of treatment activities, not a break with them, with the aim of being more operationally oriented and more relevant.

In response, Rony Brauman explained that he was not questioning the public health role of MSF, a role that the organisation has long been playing in refugee camps, for example. What he does question is "the exaggerated continuity between care and prevention". For him, the vaccination or infectious disease paradigms that we use to justify our new ambitions on nutrition are deceiving. There is a false analogy at work here. The vaccination paradigm is indeed within the medical domain, whereas Plumpy'doz involves very different social mechanisms; it takes us into the area of feeding programmes and of trying to change the behaviour of individuals. Does MSF want to change food aid policies or the feeding habits of populations? Will we focus on food aid systems or the major hotspots of endemic malnutrition? Rony Brauman thinks that MSF has still not clarified these issues.

Should we change the system or help those ignored by the system?

Responding to Stéphane Doyon's presentation, Ondine Ripka (MSF France Legal Department) said we were mistaken regarding what MSF has succeeded in demonstrating to date: the effectiveness of a product, certainly, but not the effectiveness of large-scale treatment. In countries like Ethiopia, where the approach of early and large-scale intervention has been taken furthest, there are still enormous problems when the annual malnutrition peaks arrive or in certain categories of patients, such as malnourished people with medical complications. The latter receive very poor treatment in the decentralised systems developed in recent years. MSF should thus not focus on treatments alone but also on mechanisms for introducing them and scaling them up. This comment led to a series of exchanges on MSF's role in national and international systems for managing malnutrition.

Jean-Clément Cabrol (International Office) expressed reservations concerning certain recent changes in nutrition programmes. In addition to the problems raised by the transition from treating individuals to treating an entire population through top-down programmes, he noted the risks entailed by MSF's new ambitions. According to him, the association plans to propose new nutritional treatment systems despite the fact that MSF has had some bitter experiences of this type of large-scale ambition (supporting the ICC, the Bamako initiative). Our role is less to propose alternative systems than to show that such systems are adaptable. Jean-Hervé Jézéquel continued on this point by asking whether MSF has not indeed played its role as a goad or a start-up. For him, the Niger crisis made the global aid community throw off its inertia in nutritional matters and begin the transformation of systems that is still going on today. This does not mean that MSF should abandon a changing field, but it should redirect its attention to geographical areas or population groups that are still neglected by the systems undergoing reform. Similarly, Philippe Levaillant said that MSF should concentrate on malnutrition cases with medical complications, where MSF has a real comparative advantage. He also called for the broadening of an issue that we tend to consider

in an overly top-down manner. For example, he thinks that malnutrition could be a gateway to better management of maternal and infant health. Rony Brauman responded that he agreed with calls for including more nutrition in a medical activity.

On the discussion on the change in overall policies, Laurent Gadot (economist, CAME) spoke of CAME's discussions with the World Bank on the subject of malnutrition treatment. He noted that the Bank used the issue of *The Lancet* devoted to nutrition to defend treatment policies that pass over a large part of the problem. He therefore thinks there is an obligation to change this system and demonstrate the value of prevention strategies. To this end, we must not simply produce reports but also conduct operations supporting our recommendations. In response, Rony Brauman said that these comments illustrate his fears concerning the disproportionate ambitions held by some members of MSF: "to me, holding discussions with the World Bank is to wander into limbo, into the clouds".

Stéphane Doyon explained that it is more a matter of contesting current practices that we consider ineffective than of replacing one care system with another. For example, MSF has no pretension to create new nutritional products, but seeks to mobilise nutrition experts to design products that are appropriate for the contexts in which we work.

Jean-Marie Kindermans (president, MSF-Belgium) said it was not a matter of changing the system but simply of proposing new strategies for treating malnutrition. In this respect, he was gratified to see MSF-France rejoin the Belgian section in recognising that the association has a role to play as a "global public health organisation". However, he expressed reservations on mass distribution operations and on the ambition of large-scale prevention, which are not in keeping with the practice of the Belgian section. He also mentioned vaccination practices, but for the purpose of reminding the participants that MSF has stopped participating in mass vaccination campaigns that are integrated into national health systems. He considers that the association does not have a particular comparative advantage to contribute to such campaigns.

Jean-Hervé Bradol thought that wanting to change the prevailing policies can indeed prove dangerous for MSF, but he recalled the origin of these ambitions. Neither in the case of malaria nor in that of malnutrition was it MSF's initial intention to change the health care system in its entirety. It is rather a matter of being able to take action where we are, with the tools we consider best suited to the task. It is political authorities, particularly health authorities, that lead us to make more general proposals by requiring us to prove the effectiveness of what MSF proposes before they allow us to use it. In other words, in order to treat malnourished children with enriched milk, they ask us to demonstrate the effectiveness of this. The aim is not to change the system, it is to claim the right to use enriched milk to treat young children whom we consider malnourished. There has been progress in this direction, particularly among the WFP's experts, but the fight is not over yet: we have encouraging recommendations from the WFP and the WHO, but this does not mean we are free to put them into action in the countries where we work.

Competition among experts: whose business is nutrition?

Yves Martin-Prével recalled that UNICEF's explanatory diagram on malnutrition, which was criticised in the presentations, had nonetheless made it possible to obtain progress in nutrition policies and to build a consensus among the various players. For him, malnutrition is not merely a medical problem, it is first and foremost a social and political problem, a "development matter". He expressed satisfaction over the recent advances made by the curative approach, which saves lives and which we should continue to defend. However, he feels that we must not forget that this medical approach treats only the tip of the iceberg. To address the roots of the problem, it will be necessary to bring together a variety of forms of expertise and skills, to run long-term and short-term actions in tandem. We have just gotten beyond the simplistic idea that increased agricultural output alone could eradicate malnutrition; we must not fall today into an equally reductive paradigm by thinking that little packets of enriched foods will resolve the problem of world malnutrition. This is where the multi-causal diagram retains its usefulness, because it allows us to combine the different approaches. In humanitarian medicine, we should thus be asking to what extent actions by physicians are "soluble" in these schemes, in order words, to what extent can they be integrated into the national systems for treating malnutrition that are being established in the countries concerned.

Fabrice Weissman took this line of discussion on the competition among experts a step further by pointing out that this question applies not only to nutrition but also to areas in conflict. In both cases, some experts (development experts on one side, those interested in defending international justice or rebuilding states on the other) consider that it is more important to address the root causes of these crises than to treat the symptoms. And yet, while those who wish to work on the root causes have not demonstrated the effectiveness of what they propose, we must continue to work with our own tools. Where nutrition is concerned, while some experts try to deal with long-term economic insecurity, our medical interventions have the merit of decoupling, for the moment, economic insecurity from excess mortality.

Rony Brauman refocused the discussion by observing that MSF has legitimacy primarily in situations where we provide care to patients who come to our health centres. In the nutrition field, however, MSF intends less to receive patients than to "go against a society" to resolve a general nutritional problem. In so doing, we rejoin the legion of experts who want to resolve this macro-problem, we are no more and no less legitimate than they are, we simply join them in this desire to change collective behaviours, a goal that is not in continuity with providing health care, but rather represents a break from it.

The health transition?

Jean Rigal contested Rony Brauman's contention that the countries of the South and the North display increasingly similarly profiles of mortality and morbidity. Rony Brauman thought nonetheless that this is the general trend, though indeed it needs to be qualified depending on the region considered. Jean-Hervé Bradol pointed out that it is probably the regions where

such a convergence has not yet appeared that should interest us, and, moreover, that these are the places where we send our medical teams.

The difference between nutrition and feeding?

Susan Sheperd asked Rony Brauman what distinction he draws between nutrition and feeding. Rony admitted that this is a difficult question. For his part, he thinks that the field of nutrition starts where dietary practice becomes a body of knowledge informed by science. Although dietary practices change, Rony Brauman doubts that they will do so at the behest of a group of nutritionists or an NGO that comes in and explains to people what is the best food ration.

End of the third session.

PART 2
Foods for young children: from rationing to abundance?

Jean-Hervé Bradol

Undernutrition, which can range from individual cases to nutritional crises affecting an entire population, is one of the most frequently encountered pathologies in humanitarian medicine. Doctors have many patients in clinics and are pressed for time. Clinical skills are scarce and follow-up examinations rare. Diagnosis is performed chiefly through anthropometrics, in other words, when a patient's body measurements (weight, height, upper arm circumference) and age are known, they can be compared with reference tables to assess the extent to which the patient deviates from an ideal growth norm. The use of such a norm does not mean that the aim is to have each individual attain an ideal stature at a given age. Georges Canguilhem, in his book *The Normal and the Pathological*, explains the meaning to be attributed to a norm: "Strictly speaking a norm does not exist, it plays its role which is to devalue existence by allowing its correction. To say that perfect health does not exist is clearly to say that the concept of health is not one of an existence, but of a norm whose function and value is to be brought into contact with existence in order to stimulate modification. This does not mean that health is an empty concept."[6] In the case of undernutrition, the desired modification or correction of existence is to prolong the life of the individual, and it has in fact been firmly established that serious deviations from the anthropometric norm are associated with high mortality rates among young children. The norm currently in use was revised by the World Health Organisation in 2006. Without dwelling on this point, we should note that the new anthropometric charts make it easier to identify children whose lives are at risk. Specifically, what we need to do is reduce the mortality rates in populations in which 10%, 15% and sometimes up to 20% of children do not reach the age of five. The weak response of national governments and international organisations makes such an action all the more important for a humanitarian medical organisation. To take just one example, available estimates show that 90% of children suffering from the most lethal form of undernutrition (severe acute malnutrition) receive no treatment whatsoever.

More than 90% of all cases of infant and young child malnutrition occur in 36 countries. The countries most affected are those where MSF is already present for other reasons. There are certain justified reservations concerning the aggregation of the data and the analyses based on these data, but where undernutrition is concerned, epidemiological data at least

6. G. Canguilhem, *The Normal and the Pathological*, trans. C. Fawcett, Zone Books, New York, 1991, p. 77.

are based on national surveys using common case definitions and methodology. The continents most affected are Asia, particularly the Indian sub-continent, and Africa, particularly sub-Saharan Africa. Available estimates show that two-thirds of all cases are found in rural areas. In the current state of knowledge, action is recommended before the age of 2 or 3. The majority of deaths occur at this age, while at a later stage in life, unaddressed dietary deficiencies have permanent effects on the individual, including diminished learning capability and higher frequency of degenerative diseases in adulthood (cardiovascular pathologies, diabetes). Moreover, rapid but late (after early childhood) correction of underweight status is thought to increase the risk of chronic disease in adulthood. So if medical intervention is to be effective rather than harmful, it must be undertaken during early childhood. When a medical visit reveals wasting or stunting, in most cases neither the family nor the medical practitioner can provide the foods needed for the child's nutritional recovery, despite the lethal consequences. These foods are either not commercially available or too expensive for the great majority of households. When an entire region suffers from malnutrition, the situation will inevitably worsen in almost exactly the same way each year at the same time during the period just before the harvest, known as the hunger gap or hunger season, when families have exhausted their economic reserves and must wait for the income from the coming harvest. Undernutrition then gives rise to a seasonal epidemic outbreak that accentuates the already considerable dietary deficiencies of the population, to the point where this causes a peak of mortality. This is a critical season, as it also sees an increase in infectious diseases such as malaria, diarrhoeal diseases and respiratory infections. Undernutrition weakens the child's immune defences and thus leads to infections, which in turn further degrade the child's nutritional situation. The two pathologies together produce a surge in infant and child mortality. However, whereas it is accepted that infections should be treated, this is less true where dietary deficiencies are concerned. No healthcare team would let an infant go without treatment in the case of a malaria episode, serious respiratory infection or diarrhoea, but the vast majority of undernourished infants leave the consultation without a prescription to treat their dietary deficiencies, despite the fact that the medical literature, depending on the source, considers undernutrition to be the cause of 35% to 53% of all deaths of under 5-year-olds. In contrast to the chronic situations discussed above, food relief and nutritional care have made the most progress in recent decades in the most extreme circumstances: war and natural disaster. The problem is that the majority of undernutrition-related deaths occur not in these exceptional situations, but in the everyday circumstances of regions where three factors combine to produce these chronic disasters: food shortages in many families; ignorance of the feeding practices suited to the physiological needs of infants; and the strong effect of infectious disease. To help reduce mortality, the treatment of malnutrition should be included in paediatric procedures which are particularly aimed at preventing and treating infections.

SCIENTIFIC AND TECHNOLOGICAL PROGRESS THROUGH TRIAL AND ERROR IN THEIR IMPLEMENTATION IN THE FIELD

The development of medical knowledge has given us a better understanding of whom to treat in priority (pregnant women and very young children), why they should be treated (to reduce the mortality rate), and also how they should be treated. The links between a number of daily ration ingredients (vitamins, minerals, amino acids, etc.) and certain pathological conditions are better understood today. The new generation of nutrition products is more effective because it covers not only the individual's calorie and protein requirements but also includes some 40 micronutrients. Ready-to-use therapeutic foods have also proven to be essential for outpatient treatment in cases of severe acute malnutrition. In Angola in 2002, MSF was able to treat about 8,000 cases of severe acute malnutrition in just a few months. It is now possible to provide care for tens of thousands of children, with unprecedented cure percentages, often above 80% (Niger, 2005). These new interventions are successful not only because of the improved composition of therapeutic foods but also, and especially, because such products at last respond to mothers' requests to treat children at home in the simplest manner possible. The increase in the number of children treated and in the proportion of cures is largely due to the fact that the treatment is not administered in medical facilities. Doctors have made an about-face in their views on the role of mothers, and of the family in general. Previously, it was believed that mothers were failing to feed their children properly and resisting the constraints of the old treatment protocol. When the child's condition became critical, they often refused to spend more than one month with him/her in hospital. Mothers gave legitimate reasons for refusing hospitalisation, such as the need to look after their other children and the costs to the family of a hospital stay – including direct costs (payment of at best a portion of the hospital costs) and indirect costs (income lost because the mother is looking after the child full-time). Today, they can treat children successfully at home, on condition that medical institutions make therapeutic foods available to them. These products not only meet the specific needs of a rapidly growing organism, they are also suited to family circumstances, i.e. to the time and resources available to families to feed the youngest children. They require no particular preparation, and their doughy consistency makes them easy for the youngest family members to eat. At the same time, the means of fighting infections have improved, with new vaccines and drugs. All these advances in nutrition and infectiology could bring a quantum leap in the effectiveness of paediatric care, on condition that the children in the most vulnerable situations benefit from them.

Although the scientific and technical advances are real including new norms allowing more accurate selection of the children at greatest risk, more effective treatments and

opportunities for earlier intervention, they are used only to a limited extent in the field. Nutrition specialists today agree to the promotion of breastfeeding, the dissemination of information on the specific nutritional requirements of the mother and infant, the enrichment of certain industrial food products (e.g. iodine in table salt), the massive distribution of certain micro-nutrients (e.g. vitamin A) and the treatment of severe acute malnutrition. Restricting the distribution of a therapeutic food to serious cases of wasting has several disadvantages in areas where endemic undernutrition is compounded by a sharp seasonal peak each year. There are too many severe cases for public health institutions to treat, and they are too dispersed within the population to be easily identified, since this requires a complex, costly and permanent screening process covering all children. Outpatient treatment is preferable, but about a quarter of all cases display complications that require hospitalisation. When the rate of incidence is high - during the annual peak - the number of hospitalisations soon becomes unmanageable for health centres and hospitals. If therapeutic food is also distributed in cases of moderate acute malnutrition to prevent the occurrence of too many severe cases thus reducing the number of hospitalisations (as was done at Guidam Roumji, Niger, in 2006), the screening needed to identify the cases requiring treatment involves so much work that the process alone swallows up a high proportion of the available resources, leaving only one-third of the budget for the purchase of therapeutic foods. In 2007, the option of treating all children in the age group at greatest risk (6-36 months), without screening, was tried out in the Guidam Roumji region. This allows a more balanced share of financial resources, since two-thirds of the budget is used to buy food for the children. These two approaches, implemented in successive years in the Guidam Roumji region of Niger (2006 and 2007), had the same impact in terms of reducing the number of severe cases. Treating the entire age group is consistent with the epidemiological data: high prevalence of acute malnutrition cases within a given population of children indicates that nearly the entire population is affected by dietary deficiencies, in one form or another. The problem is that distributing a nutritional supplement to all children from 6 months to 3 years old during the critical period of the year entails a total expenditure on specialised foods that no public health budget can afford. Ready-to-use specialised foods cost about €2.5 a kilo, and half is spent on the raw materials: milk, sugar, groundnuts and oil. Whether the treatment is administered early and spread over several months, or late and concentrated in a period of about a month during an outbreak of severe acute malnutrition, it requires about 10 kilos, or €25. These foods are too expensive for large segments of the population, and the price is incompatible with both national health budgets and international aid budgets.

Apart from cases of severe malnutrition, the standard practice until now has been to give children cereal paps. But these paps do not meet international nutritional recommendations for infants because they lack protein of animal origin which is essential for growth. A new generation of paps enriched with milk and micronutrients has recently been developed, but when all the parameters involved in their use are taken into account, these new paps do not offer a less expensive alternative to ready-to-use nutritive pastes. In 2006, the United Nations'

World Food Programme distributed 6.7 million tonnes of food aid, of which infant paps accounted for only 7% and products containing milk only 0.3%. Such paps are in fact mainly used for schoolchildren rather than infants. Even though the latter account for the great majority of deaths due to underfeeding, they are poorly served by international food aid.

THE POLICY OF RATIONING AND INVISIBILITY

While it is now accepted that the previous generation of paps does not meet the needs of the youngest children, there is still debate over the proposal to treat infants with the new generation of foods before they are diagnosed with the most severe form of malnutrition. Apart from war and natural disaster situations, this proposal faces the usual hostility to food distribution and the lack of agreement among experts on the ideal composition of foods to treat non-severe forms of acute malnutrition. Donors are providing tens of millions of dollars in new funding to support research aimed at developing a new family of food supplements.

Is the available scientific information insufficient to enable carers to take the decision to treat malnutrition before it becomes severe? Although the nutrition situation is still bad in one in five countries, we should not forget that the other four have resolved a problem that, less than two centuries ago, affected the entire world. Apart from Europe and North America, there are many success stories in Asia and Latin America (e.g. Mexico and Thailand). Research projects in progress should not be a prerequisite for taking action. In fact, the purpose of scheduled clinical trials[7] is not to find the food that would best meet the physiological needs of children but to "assess the effectiveness of low-cost formulations of lipid-based nutrient supplements[8] (LNS) for infants and young children". The clinical trial protocol mentioned above divides children randomly into six groups. The goal is to compare the impact of six different treatments for nutritional recovery, and in particular to compare their cost. Two of the six groups will receive no milk and one will receive no food supplements for one year, even though the available data on the nutritional deficiency of the Malawian children taking part in the clinical trial and prior studies conducted in the same country indicate that depriving certain groups of milk is unadvisable. The main purpose of such research protocols, in which MSF sometimes participates, is not to specify the ideal composition of food supplements for children's growth; rather, it is to cut expenditure while hoping to retain some effectiveness. The protocols study the effects of reducing the number of beneficiary children, reducing daily amounts (by steps of 10 grams in this example) and lowering quality by reducing the proportion of milk or eliminating it entirely. The drafting of such clinical trial protocols is governed by economics - namely a policy of rationing - rather than by the need to consider

7. International Lipid-Based Nutrient Supplements (iLiNS) Project Overview, 12 April 2009. The iLiNS Project is supported in part by a grant from the Bill and Melinda Gates Foundation to the University of California, Davis. The University of Malawi, the University of Tampere (Finland), the University of Ghana, the Institut de Recherche en Sciences de la Santé (Burkina Faso), Nutriset (France), Project Peanut Butter (Malawi) and Helen Keller International are also participating in the iLiNS Project.
8. The terms "lipid nutrient supplements" and "ready- to-use food supplements" designate the same category of products.

established scientific fact. This approach would be more understandable if the food supplements included raw materials that were in short supply instead of merely milk, sugar and oil.

Could malnutrition be treated without industrial food supplements? Experiments in which aid is distributed in the form of money rather than food products indicate that families' food consumption improves, but that no significant improvement occurs in the anthropometric indicators for young children. The dietary deficiencies that cause undernutrition are so diverse and so pronounced that it is often impossible to compensate for them through the foods available in the family's immediate environment. There is intense controversy among experts on the degree of responsibility attributable to each of the factors that contribute to undernutrition. The debate is clearer, however, when it concerns the choice of solutions rather than the search for causes, and in the countries which still have a high incidence of early childhood undernutrition, programmes to fight this problem are therefore primarily governed by economic considerations. The main concern is therefore to distribute as little food as possible to infants while retaining some degree of effectiveness. The clinical trial projects described above clearly indicate that the supply of nutritional supplements is limited primarily by the cost of the ingredients. In current market conditions, neither families nor public health institutions can afford to procure foods that can offset all dietary deficiencies. As a result, the annual cycle of nutritional disasters in regions with high rates of infant and child undernutrition cannot be broken without a change in the cost of specific foods for young children. Today, the United States Department of Agriculture[9] affirms: "We help more than 35 million people to put healthy food on the table each month." Food autonomy for the poorest is thus not guaranteed in any country, but the solution adopted in the United States (public food aid for over 10% of the population) is harder to apply in parts of the world where 50% of households do not have enough income to feed themselves properly. Instead of being offered food aid, poor families in the South are advised to improve their eating habits and to increase their incomes by taking part in economic development.

Experts and donor countries currently agree that the distribution of foods suitable for the nutritional recovery of young children should be restricted to cases of severe acute malnutrition. From a medical standpoint, withholding treatment until a patient reaches the worst stage of undernutrition is not advisable. From the standpoint of public health, this leads to restrictions on the share of spending allocated to purchasing food for children, in favour of the budget used to pay the wages of staff members who constantly screen the child population to identify severe cases. Lastly, analysis of the political aspect of the experiment shows that, in the eyes of political leaders (in Nigeria, Niger and Ethiopia, among others), treatment of severe acute malnutrition has the disadvantage of having large groups of emaciated children arriving at health centres. The resulting media attention causes strong tension between the authorities, the press and the organisations providing nutritional care. Dissemination of information on a country's inability to feed its people undoubtedly damages its reputation and discourages investors. From the standpoint of domestic politics, images of emaciated children call into question the leaders' ability to ensure the survival of part of the population. The memory of

9. http://www.fns.usda.gov/fsp/

governments overthrown as a result of food crises remains sharp and clear in the minds of the political leaders of the countries affected. For this reason, political elites often give in to the temptation to forbid (as in the northern states of Nigeria) or limit (as in Niger and Ethiopia) the treatment of malnutrition. In truth, the public health recommendation to treat cases of severe acute malnutrition is both a step forward and a medical and political aberration. Never, in recent times, have so many children been successfully treated. But although these children account for under 10% of the total number of severe acute malnutrition cases worldwide, they are still numerous enough to attract media attention that is worrying for governments and too numerous to be sustainably covered by the public health institutions of the countries that are making an effort to treat them.

Many of the countries concerned by this problem do not make it a national priority to treat infant and child malnutrition. In contrast, the international community placed the fight against world hunger first in the Millennium Development Goals adopted by the United Nations. The goal of improving access to food for a billion individuals is part of the effort to reduce severe forms of poverty. To catch the attention of countries and international organisations, any health policy proposal must affirm that a limited initial effort will, in the long term, eliminate the problem and thus ensure a maximum return on investment. From a rhetorical point of view, the Millennium Development Goals meet this criterion. In the case of world hunger, economic development is presented as the sole means of eliminating food shortages, whereas food aid is accused of helping to prolong under-development. Despite a great deal of research proving the contrary, political discourse often persists in describing food shortages as crises of under-production. In terms of solutions, the emphasis is placed on economic growth - particularly increased production through scientific and technical progress - and on the promotion of healthy eating. On 13 September 2006, the director-general of the United Nations Food and Agriculture Organisation (FAO), Jacques Diouf, issued an appeal for a "second Green Revolution" in the hope of "helping to build a world without hunger". In this productivist reasoning, mere treatment of malnourished individuals is not perceived as an end in itself. On the contrary, it is viewed as a bottomless pit swallowing up ever-increasing amounts of funding that do not help to eliminate the cause of the problem.

Instead of being an integral part of the effort to eradicate a cause of morbidity, curative care in the public health policies of low-income countries is in most cases restricted to the treatment of a small number of cases (in our example, the severe forms of acute malnutrition). According to the time-honoured argument, priority should be given to treating the causes (lack of schooling and economic underdevelopment) rather than the consequences (undernourished children). To keep the fight against infant and child malnutrition from falling into a rut, it must be given a more modest objective than the disappearance of world poverty and hunger, namely, reducing the number of deaths due to undernutrition. The fight against child malnutrition involves more than mere distribution of specialised food aid to families lacking the purchasing power to buy specific nutritional supplements for young children. History indicates that other factors – such as education, social mobilisation,

economic development and scientific progress – probably play a more decisive role. It is necessary to understand, however, that when wasting and stunting are already established, a number of biological constraints make it essential to have industrial foods suitable for young children. When undernutrition is not yet present, the feeding of young children can still be based on an intelligent combination of the foodstuffs available in the family's immediate environment, on condition that the family has the required purchasing power. But the massive use of industrial foods for infants in rich countries suggests that the image of a mother wholly devoted to the child's welfare and perfectly capable of managing food issues in a given environment does not correspond to social reality. This observation in no way calls into question the importance of breastfeeding, which is one of the keys to healthy growth, but breastfeeding alone cannot meet the need for foods of animal origin up to the age of 2 to 3.

The industrial aspect of the solution considered often encounters hostility from activists (the Right to Food movement in India, for example), who see it as the Trojan horse of agri-food multinationals. Yet experience shows that the increased consumption of the new generation of therapeutic foods has instead spurred the growth of small and medium-sized firms using local raw materials (in the Dominican Republic, Malawi, Niger, Ethiopia, Democratic Republic of Congo, etc.). Large multinational corporations have taken no initiatives in this field. For this productive sector to develop, demand has to increase, but demand is stifled today by the high cost of the raw materials and the low purchasing power of many families. The most difficult step in stopping the rationing of these specialised foods, and making them abundant in the 30 countries that account for 90% of cases of infant and child malnutrition, is to persuade the countries concerned and international donors to provide several billion dollars per year on an international scale, mainly to cover the cost of raw materials. This would be a public health action requiring as much political will as the launch of the expanded immunisation programmes in the early 1980s when the prices of vaccines were reduced by a factor of 20. Lacking a new economic model for the production and distribution of foods for young children, doctors will have to resign themselves to diagnosing wasting and stunting, without, in the great majority of cases, being able to do anything about it. A high proportion of the world's children will continue to be denied access to the foods that are indispensable to their survival.

PART 3
The Plumpy'nut revolution: an uncertain future?

Jean-Hervé Jézéquel

The crisis in Niger in 2005 was a turning point in child malnutrition policy. It was clear in the early 2000s that change was already underway, under the combined influence of new nutritional knowledge and renewed interest in bringing down infant mortality rates, in the wake of the Millennium Development Goals. However the crisis in the summer of 2005, in which MSF played a key role (Crombé & Jézéquel, 2007), without doubt helped speed up medicalised infant care policies, first of all in the Sahel and then globally. Since 2005, we have seen a series of changes in the measures implemented worldwide (new recommendations issued by the WHO, UNICEF and the WFP, increased production and use of RUTF, etc.) and in national public policies (new national protocols for dealing with malnutrition, setting up community re-nutrition centres in the affected countries, and so on).

MSF has every reason to welcome these changes, for which it was in part responsible. National and international steps to combat malnutrition have confirmed a large number of measures recommended by MSF and other players, in particular those concerning the use of RUTF in outpatient treatment of severe acute malnutrition. Paradoxically, the changes witnessed in the field of nutrition place MSF in an uncertain, even embarrassing situation. Now that its use is being recognised by global stakeholders, how far should the medicalised treatment of malnutrition be taken and how should it be handled? What resources and what efforts should MSF devote to malnutrition now that governments and other NGOs are moving into this sector? Does MSF have a role in this field given the arrival of new players, particularly sovereign states? If the Plumpy'nut revolution was a source of great excitement for the association, the future is now more uncertain. There is hesitation over which path to follow and questions concerning the scope of our commitment.

This text does not claim to plot the right course for MSF to follow, not only because this is not the role of CRASH, but also because the author would be hard pressed to say what "the" right course is. This text aims more to present a number of ideas: the first are reviews of the changes affecting the nutritional issue in recent years; the second propose a critical analysis of the choices available to MSF for combating malnutrition in the future.

CHANGES IN NUTRITIONAL PRACTICES AND POLICIES: WHAT'S NEW SINCE 2005?

MSF is conducting an in-house review of the HIV situation and, in particular, the results of the mass treatment programme it recommends, so it would seem appropriate to prepare a similar review of large-scale malnutrition. To do this, we must first of all understand how the practices and policies of the various stakeholders in dealing with malnutrition have changed in recent year

It is still hard to draw any real conclusions from these changes. It is especially difficult to measure the true impact of the new international recommendations and national protocols concerning treatment. In the Sahel, where a series of international players - including MSF, ECHO and UNICEF - were particularly determined in asking for change, only Niger can today accurately state the number of children treated per year by all the players concerned, from the national health structures to the NGOs. In 2008, a confidential EU report expressed concern about the blatant operational problems in the treatment structures set up by certain NGOs in the Sahel. In the general confusion, the matrons sometimes mixed the new RUTF products with millet paste during the educational programmes aimed at the mothers. Some even used the term 'death-traps' when talking about the malnutrition treatment programmes where the terms "community" or "out-patient" were used as a pretext for complete de-medicalisation with its disastrous effects. Are these examples simply marginal cases which will inevitably disappear as and when the programmes become established and the personnel gain experience? Or are they a clear illustration of more deep-rooted structural problems?

Conducting a detailed review of advances in nutritional practices and policies is beyond the remit of this text. Here, I would prefer to discuss two points: the (re)-medicalisation of hunger, and what could be called the "geopolitics" of Plumpy'nut.

IS HUNGER A MEDICAL PROBLEM?

The crisis in Niger in 2005 marked the "official" return of the doctor to the malnourished child's bedside. For several decades, this position had been taken over by other experts, whether developers, agronomists or educators. Doctors occupied a marginal role in hospital structures that were too small to have any significant impact, given the scale of the problem. RUTF combined with outpatient treatment opened the door to large-scale treatment of malnourished children and offered doctors a new role on the "hunger" specialists' stage[10]. Even if the doctor focuses on the problem of child nutrition, his actions inevitably place him within the greater context of the politics of 'hunger' management.

MSF played a key role in returning doctors to the forefront of the nutritional problem: this showed that doctors could propose large-scale, effective treatment of severe, acute

10. As far as the doctor is concerned, he is not treating 'hunger', but malnutrition. The concept of 'hunger' is felt to be far too vague and malleable. This does not change the fact that the medical response to malnutrition is now one of the strategies used in combating the effects of 'hunger' by the political authorities (both local and international). Thus in Niger, we talk not only of food security, but also of food and nutritional security policies.

malnutrition, based on the know-how of the nutritionist – another expert that made a strong comeback during the Niger crisis. In 2005, the doctors demonstrated that in practice they could save lives far more quickly and effectively than the other parties involved. The new medicalised responses to malnutrition thus joined the arsenal of techniques deployed to combat the effects of "hunger" in the broadest sense.

This comeback of the doctor is however ambiguous in more than one respect. The success of the new curative techniques is therefore the paradoxical counterpart of demedicalisation of those involved. The new therapeutic products (RUTF) enable patients to be treated outside the hospital, at home or as an out-patient. To quote a phrase from during the debates held at MSF in 2009, '*Treatment is placed in the hands of the patients*'. As therapy became disassociated with medical structures, carers also became more diversified: community health workers, parents and non-medical NGOs all leapt at the opportunities offered by RUTF. Those who previously were rarely involved in severe acute malnutrition treatment, such as emergency food-aid or development NGOs - because before RUTF became available hospitalisation was unavoidable - are today developing curative activities which were once the exclusive preserve of doctors. This is obviously a positive development, but cannot fail to raise new questions. Special problems in particular arise for the 10% to 20% of malnourished children also suffering from medical complications, which are either incorrectly referred or poorly treated by these NGOs which lack the medical know-how necessary when distribution of RUTF alone is not enough to treat the malnutrition. The aim here is not to exclude non-medical players because they lack the specialised expertise, but rather to examine the extent to which their presence in the curative sector affects the nutrition-related ambitions of a medical organisation such as MSF. This explains why during the debates some participants urged the association to focus on the more medical aspect of the problem, i.e. severely malnourished children suffering from other serious pathologies.

'THE GEOPOLITICS OF PLUMPY'NUT'

Apart from the technical progress achieved, the most significant advance since the 2005 crisis is the return of the nutritional issue to the political agendas of both Southern States and international bodies. In the countries of the Sahel for example, food safety policies are no longer concentrating simply on cereal volumes (quantitative paradigm) but are also including nutritional safety and the concept of aid tailored to very young children ("qualitative paradigm"). Here again, moves were afoot prior to the Niger crisis, but MSF's action in this area considerably hastened matters. Another example is Ethiopia which, even a short time ago, rejected the idea of opening therapeutic re-nutrition centres and is today pioneering the treatment of child malnutrition. There is admittedly much still to be done, but the Ethiopian government is now proactive: it has adopted new protocols, supported the local production of RUTF and set up a National Nutrition Plan which combines prevention and treatment. These changes are not restricted to just a few countries in Africa. International organisations

such as the World Bank and UN agencies such as the WFP, UNICEF and the WHO are (re)addressing the malnutrition issue, including taking account of the opportunities made possible by the recent therapeutic developments. Even if the volume of funding devoted to malnutrition remains relatively modest when compared with other pathologies such as AIDS, the mobilisation seen today is in sharp contrast to the relative neglect of recent decades.

The mobilisation however remains fragile. It was mentioned in the book on the 2005 Niger crisis, which drew the attention of the government, international funding agencies and other NGOs to malnutrition. This scenario has since been confirmed; in 2009, four years after the crisis, MSF was still treating most of the cases in Niger. Despite the departure of the French section, the MSF movement was directly or indirectly involved in treating more than 50% of all cases identified (UNICEF). So, was the glass half-full or half-empty? In any case, the cause has not yet really been taken up by the other stakeholders, starting with the governments themselves.

Still more worrying is the fact that there has been very little change in some of the countries with the highest concentration of malnourished children. In the north of Nigeria (probably the largest area affected in Africa, along with Ethiopia), the authorities refuse to recognise the problem publicly. They have adopted neither the new therapeutic products nor the new treatment protocols. We are not looking to cast stones at governments and accuse them of sacrificing their populations. It would be more productive to try to gain a clearer understanding of the political motives of these governments, obtain a better grasp of the particularly sensitive nature of the nutrition issue, and a clearer idea of the de-facto rivalry that arises between governing bodies and humanitarian organisations when a crisis situation is declared. The case of India is in this respect particularly interesting. The political authorities there cannot be accused of indifference to the fate of poorer populations and considerable energy is spent on combating malnutrition, but the political and economic issues linked to the national food aid system have paralysed the introduction of new therapeutic products such as Plumpy'nut. The treatment of severe acute malnutrition in India remains a subject that is as sensitive as it is crucial. In this type of context, the model of the "medical coup d'état" used in Niger in 2005 is clearly not fully applicable and other forms of negotiation will no doubt have to be introduced.

So, what we are seeing today is a pioneering front committed to proactive policies coexisting alongside "denial fronts" where nothing really moves. Where should MSF intervene? Should it primarily go where malnourished children are being refused help? Or should it prefer to opt for more welcoming places and experiment with more effective treatment models, more able to overcome the reticence of the political decision-makers? Ideally, both directions should be followed, but at a time of limited resources, choices may have to be made. In any case, it would appear important for MSF to better understand the dynamics of the various

local arenas, so that the organisation can intervene in the areas not benefiting from the nutritional policies being set up.

The fragility of the mobilisation effort is not due simply to the resistance from the "denial fronts". More generally, the international situation is one of indecision. The Millennium Development Goals (MDG) no doubt drew attention to the high level of mortality associated with child malnutrition. The funds associated with these MDG raised the possibility of significant political and financial mobilisation around the issue of malnutrition. With the MDG, child malnutrition is becoming a global issue involving governments in the South as well as those in the North. The situation is, however, a delicate one and everything could still change in the wake of the new "global crises" affecting the planet. As the financial crisis leads to fears for cuts in aid budgets, the world food crisis is triggering renewed interest in productivist agricultural strategies. But the crisis in Niger in 2005 highlighted the limits of the agricultural and productivist paradigm in treating child malnutrition. We do not aim to dispute the benefits of revitalising agriculture in the Southern hemisphere, but to underline the limitations of this policy in combating malnutrition effectively. At the last G20 summit, the funds promised by the Northern states focused mainly on the revitalisation of the agricultural sector. As it turned out, the "world food crisis" was not an opportunity to train the spotlight on malnutrition, no doubt because there were few players who could draw the parallels between the two phenomena. Neither MSF nor the other players involved in combating malnutrition really managed to make their voices heard at the last G20 meeting, even though food issues were debated. It is vital that other opportunities not be missed, but this presupposes that MSF has clearly defined its ambitions and the role it intends to play in this field. For example, does the association want to militate in favour of policies that free milk from the conventional rules of the market economy, in the same way as essential drugs? It is in this particular context, where true progress rubs shoulders with recurring uncertainties, that MSF has to ask itself again what it wants to do in the fight against malnutrition.

WHAT NUTRITIONAL POLICIES FOR THE FUTURE?

The progress achieved in malnutrition treatment techniques is opening up new operational prospects for aid players. Some believe that effectively and sustainably tackling the main centres of malnutrition is not an unrealistic objective. They claim that the final hurdles are not technical and not even financial[11] but stem more from the political will of the main aid players and the governments concerned. It would then be tempting to believe that we are on

11. Given the colossal sums invested this year in bailing out the international financial system.

the brink of a major turning point in the world's demographic history. In conditions such as these, can MSF go beyond simply combating malnutrition at a given place and time? Can it set itself the goal of sustainably reducing malnutrition and even, more generally, child mortality among the population at large? This question in fact leads to two further major considerations. First of all, a historical consideration of the driving forces behind human demographics and, more precisely, the role of medicine in reducing mortality. Secondly, consideration of the link between scientific and technical progress on the one hand, and the operational ambitions of a humanitarian organisation such as MSF on the other: do the new opportunities offered by medical and technical progress mean that we have to broaden our goals automatically?

TACKLING THE MAIN CENTRES OF CHILD MORTALITY?

Could the new technical and medical knowledge lead to a historical drop in child mortality in the Southern hemisphere, a century after the same thing happened in the North? A quick look at history could be useful in examining similar pivotal moments in demographic change and/or attitudes that linked advances in scientific knowledge to the progress of humanity. In many areas of the world, child mortality has fallen significantly since the end of the 19th century. These regions are also areas in which the war against undernutrition was waged successfully. Common sense would seem to indicate that progress in medical knowledge and techniques were at the core of the main contemporary demographic changes in Europe, North America, but also China, Latin America, and elsewhere. Demographic historians however have trouble agreeing on the true origins of these global dynamic movements.

For some demographers, the fall in child mortality is the direct result of health policies based on medical innovation that began to be implemented by governments in the 19th century. This idea was disputed by Thomas McKeown, for whom socio-economic changes were key factors in major demographic changes. In his opinion, improved economic conditions led to better nutrition for the populations, itself leading to a fall in mortality[12]. In so claiming, McKeown minimises the impact of health policies and thus the role played in demographic change by medicine and more broadly by the public powers[13]. McKeown's theory has enjoyed considerable success in the historian community. Following on from his work, Kwang-Sun Lee also defends the idea that the marketing of pasteurised milk is the main factor in the reduction of child mortality in general, and more particularly of mortality associated with diarrheal diseases. He claims that its impact is even greater than family income, health measures or medical progress. McKeown's theories however have also sparked strong controversy. The Italian demographer Massimo Livi-Bacci in particular questioned the links between nutrition and mortality over the long term. He stresses the fight against infection and thus puts health policy back at the centre of the issue. The demographer community is therefore divided and the debate is far from over. In an article published in the *American Journal of Public Health* in 2002, James Colgrove summarised the main bone of contention as follows: "*Are public health ends better served by targeted interventions or by broad-based efforts to redistribute the social, political, and*

12. T. McKeown, The Modern Rise of Population, 1976.
13. T. McKeown, *The Role of Medicine*: Dream, Mirage, or Nemesis?, 1976.

economic resources that determine the health of populations?"[14]. In some ways, this debate is echoed in the humanitarian community by the discussions between those who stress *cash transfer* programmes and those who underline the immediate impact of more closely targeted health policies, as is the case with the treatment of malnutrition via RUTF and RUSF.

The most interesting historical approaches are perhaps those which recognise the considerable uncertainty surrounding the major demographic changes of the contemporary period. These works show that demographic progress has not followed a single straight line and that many factors differ from one country to another. It then becomes impossible to compare these changes with a single straight-line model: the reasons behind the fall in mortality in England or in France, in rural or urban areas, were different. The historian Catherine Rollet links the fall in child mortality due to medicalisation of infants to far broader social, political and cultural transformations: a new collective concept of childhood and children, the rise of nationalism in European states in the 19th century, etc.

In the end, it has to be accepted that the reduction in child mortality followed different paths in different parts of the world, at different times in history. Scientific and medical innovation often play a role, but its impact cannot be isolated from a host of other factors with which it is interconnected. Similarly, if proactive politics – for example implementing public policies in favour of infants – were also a factor, they must be linked to the far broader dynamic over which politicians have little control.

History then shows us that the provision of suitable food to small children is a necessity but not in itself sufficient to ensure a significant and sustainable reduction in child mortality in the countries still affected. It also shows that we must be circumspect regarding the role played by public health policies based on scientific and medical innovation.

TESTING REPRODUCIBLE MODELS?

The desire to build sustainable and reproducible models for reducing malnutrition, if not mortality, is driving MSF to organise operations which are in part designed to demonstrate their effectiveness "scientifically". The question of the role of science and technology was first tackled during the debates and we can read the highly instructive presentation from Rebecca Grays (Epicentre) on this subject presented later in this paper. I would like to add a few considerations, recalling how technical and scientific methods are often appropriated and transformed by the various players.

RUTF have constantly changed hands in recent years: initially developed and tested by nutrition researchers, they then found themselves in humanitarian aid packages before attracting the interest of large institutions in charge of health or international aid. In changing hands in this way, the products are also used differently and their effectiveness is transformed.

14. James Colgrove, "The McKeown Thesis: A Historical Controversy and its Enduring Influence", *American Journal of Public Health*, May 2002, Vol. 92(5), p.725.

Plumpy'nut has been widespread, even commonplace in certain regions of Africa, but its multiple uses are as yet poorly understood: a sexual stimulant in northern Nigeria, breakfast for children before they go to school in Monrovia, a worker's snack before heading out into the fields in Ethiopia, a beauty product used to fatten up young women and give them a shiny skin, and so on. Some time ago, experts wondered whether Plumpy'nut should be considered a treatment or a food. The debate was not purely a technical or scientific one and was also at the heart of competition for resources and between those competent to use these products. Without waiting for the opinion of the experts, the populations themselves settled the issue. The beneficiary populations have made Plumpy'nut their own and, more broadly, taken over nutritional aid programmes.

There is a tendency to consider this takeover as marginal, or to analyse it from the conventional standpoint of aid misappropriation. It is however indicative of far more than that. It first of all shows that the effectiveness of science and technology is altered when taken over by a population, especially when it involves a product linked to an issue a fundamental as food. It also shows that the populations take charge of the aid machine in order to redefine their own problems and needs (see box on Ethiopia).

Cheating in Ethiopia?

During the crisis in southern Ethiopia in 2008, the MSF teams complained about the many cases of cheating and fraud (for example, hiring out of malnourished children, trafficking in empty PPN bags, etc.). In the eyes of the volunteers, these events were all the more shocking because they were not the acts of greedy traders or corrupt civil servants, but of the "suffering population" itself. Some wanted to consider this behaviour a result of operational malfunctions (lack of logistical rigour) or proof of the despair of the families obliged to take extreme measures to gain access to aid (rumoured cases of children whose feet had been dipped in boiling water to simulate œdemas).

This "cheating" can also be interpreted differently: faced with a food crisis which affected the entire population in 2008, it was a way of protesting at how the aid players – and not the populations – defined the nature of the problem and ranked priorities. Faced with those who focused their attention and their actions on nutritional aid for infants, the populations used this "cheating" to show that the problem was a food problem and affected all age groups.

The beneficiary populations are not the only ones giving a new meaning to nutritional intervention by taking over. The same is true for governments who, for a number of years now, have been defining new malnutrition management policies. The technical arrangements

allowing effective handling of cases of malnutrition (new products, outpatient approach) are being reviewed and transformed by political issues. This is the case when the outpatient approach is transformed into a community-based approach by the governments, on the advice of international institutions. The community-based approach no doubt has its virtues, but it can also be an opportunity for reducing the media visibility of malnutrition (see box below). Presented as a tool that gives power back to village communities, it can also be seen as a mechanism whereby the government unburdens itself of its responsibilities by passing them onto the poorest communities.

From out-patient to community: the political uses of a technical tool in Ethiopia

Community Management of Acute Malnutrition (CMAM) enables the Ethiopian administration to regain control of malnutrition and the sensitive issue of its media visibility. CMAM in fact stresses the decentralisation of acute malnutrition treatment structures, moving them as close as possible to the populations concerned. Behind the promises of efficiency and the proximity of medical structures, decentralisation of the feeding units can also become an instrument of political control. By transferring cases of malnutrition from a small number of large feeding centres to a host of small structures, it becomes possible to "dilute" malnutrition or at least minimise its visibility. It is interesting to note that during the 2008 crisis, the administration were more than happy to let foreign journalists visit the small OTPs – where the children in fact only stayed for a few minutes – rather than the SCs (Stabilization Centres) – where the more serious cases could be seen. Out-patient or community-based treatment is without doubt effective from the medical standpoint, but also offers advantages in terms of political control of a sensitive issue such as malnutrition.

As they pass from the hands of the scientists, to those of the humanitarian agencies, then to the governments and finally to the "vulnerable populations", community-based malnutrition treatment systems constantly change. It is difficult to asses these changes, but there are two questions that need to be discussed at MSF.

Because it recommends the distribution of new therapeutic products and community treatment solutions, MSF should examine more closely the impact of these systems and in particular how they are received both socially and politically. What is the effect of these protocols, which we recommend distributing beyond our own operations? How do they modify actual practices by those working in the nutrition field?

The 'takeover' mechanisms described above raise the question of the validity of 'scientific proof' in the distribution of RUTF. It would be near impossible to demonstrate scientifically the effectiveness of a product whose social, economic and political parameters, which determine how it is received and used locally, are totally beyond our control. We are not arrogantly claiming that, once therapeutic products leave humanitarian hands, they do not work as well. The aim is more to recognise that they work differently and can be put to a multitude of uses. So our discussions about new methods of treatment must also take account of these political and social dimensions.

PREVENTION OR CURE?

During the debate on nutrition, held in 2009 at MSF headquarters, several participants restated that the large-scale severe acute malnutrition treatment operations had proven to be effective in Niger in 2005 but that they were today showing their limitations. These vast operations are sometimes felt to be an aberration. On the one hand they have to be repeated year after year in areas where malnutrition is endemic, and on the other, they are based on a principle of food aid rationing, whereby the children only receive treatment once they have reached the serious stage of illness. These criticisms encouraged MSF to gradually develop an earlier and broader treatment: a preventive model based on widespread distribution of food supplements appropriate to infants in the areas most severely affected by chronic malnutrition. This is without doubt an interesting area that needs to be explored further, even if the actual effectiveness of such a system, once it has been reabsorbed by politics, is questionable.

Justifying the creation of preventive models by criticising remedial models can however prove problematical. There was a bizarre turnaround of the stance adopted by MSF France during the Niger crisis. In 2005, MSF developed its treatment operations despite the considerable reticence of development experts and the political authority, which criticised us for not making our actions part of a longer-term sustainable framework. Indeed, our actions were considered to be counter-productive, because they were costly and failed to provide any long-term solution to a problem that would inevitably recur every year. We rejected this imposed sustainability and claimed our right to act, guided by the aim of "savings lives here and now". We refused to align ourselves with a political order which sacrificed current generations for a better tomorrow for the future generations in Niger. In justifying the creation of a preventive model by claiming that large-scale treatment activities are an aberration, are we not contradicting our former position?

But these operations are indeed aberrant from a number of standpoints. Firstly, for the financial expert or economist, they concentrate enormous amounts of resources for an impact, albeit immediate, but of extremely limited duration, and with no chance of being able to make such a costly system either sustainable, or able to reach all the areas affected. Secondly,

for the public health expert, they require far more human and financial resources than current health systems can actually deploy in most areas affected, nor do they take sufficient account of the principles of prevention which underlie most public health policies in force today. Finally, for the government (and indeed some of the large international development organisations), large-scale treatment operations suddenly expose the fact that the authorities are unable to "feed" their populations correctly; they create potential flashpoints for the political leaders of the countries concerned, which can compromise the long-term development policies implemented by the large international institutions.

It is precisely because they are aberrant in the eyes of these other players that they make sense to the humanitarian doctor. Surely promoting humanitarian medicine means precisely that: accepting an abnormal situation and organising massive safeguard operations which do not have to promise a better tomorrow. It is a refusal to make the safeguarding of human life dependent on the construction of models obeying the dominant economic, political and health-care concepts. As Jean-Hervé Bradol wrote, "*humanitarian action can turn this rejection of the elimination of a part of humanity into a way of life based on the satisfaction of* ***unconditionally*** *offering someone in mortal peril the help he or she needs to survive*"[15].

We are not saying that a medical organisation such as MSF has nothing to say or do in situations of chronic suffering, in this particular case areas afflicted by extremely high child mortality rates – quite the opposite. We should intervene in these areas as humanitarian workers, as we do elsewhere. We should enter these areas officially at peace, just as we would a conflict zone. When we go into Congo or Liberia, we do not ask whether we will have to repeat the same operations one, two, ten or fifteen years in a row. It's not because our operations are being prolonged in "endemic" conflict zones such as Kivu that we should submit to the current logic put forward by those wishing to rebuild the health system or by the peacemakers. We must approach poverty and chronic suffering in the same way, as a player "*freed from the illusion of humanity inexorably marching towards an ideal society*"[16], a player whose primary concern is to identify the current cost of the sacrifice imposed by the (local and international) population management policies and to intervene accordingly.

This does not mean that we cannot improve our treatment methods, particularly by exploring ways of broadening them and implementing them earlier. But the search for a recipe that is acceptable to other players' logic must distract us too far from that which sets us apart: our willing acceptance of the aberrances characteristic of our interventions.

SO WHAT NEXT?

This text aims to urge caution in intervening in nutritional issues based on a progressist, linear and simplified notion of the potential role of medicine in malnutrition and, more generally, child mortality.

15. F. Weissman, *A l'ombre des guerres justes*, Flammarion, 2003, p.32.
16. *op. cit.*, p.31.

This criticism does not however aim to kill off initiative or recommend a cautious fall-back on a necessarily conservative view of the role of an organisation such as MSF. Returning to the more modest historical role of medicine and nutrition does not mean denying the potentially important impact of an organisation such as MSF. The aim is more to define a clearer approach to the various possibilities for humanitarian medicine in combating malnutrition.

Even if in this text it is clear that we feel some directions are more interesting than others, it does not aim to support one solution while ruling out others. There is no right way or wrong way, but simply different options for determining where MSF is today and will be going tomorrow, because even if our association influenced nutritional policies with the 2005 Niger crisis, it has to be accepted that malnutrition in return affects how MSF sees its role and its goals. In Niger in 2005, medical intervention by MSF completely disrupted the balance between emergency aid and development in the food safety and nutrition sector. Today the desire (and technical capability) to provide a sustainable and global response to malnutrition issues calls into question the tacit relationship established between two facets of MSF activity, that of the policy-shaper and that of the practitioner, that of the public health physician and that of the emergency doctor. Our future actions will also depend on our ability today to make clear political choices concerning our ambitions.

MEDICAL BIBLIOGRAPHY

The selection of articles below is biased. It is intended to draw attention to a sample (27) of publications that encouraged us to think that it was possible to go beyond existing responses to nutritional crises. We have also included articles published by Epicentre and MSF (marked *).

Articles are divided in 4 sections:

I. Foods
II. Diagnosis
III. Epidemiology
IV. Treatment

I. Foods

I.1. ***Presented in the workshop "History of Food and Nutrition in Emergency Relief" given at the Experimental Biology 2001 Meeting, in Orlando, Florida on April 3, 2001, sponsored by the American Society for Nutritional Sciences.***
'The development of concepts of malnutrition'

MICHAEL H. N. GOLDEN
Department of Medicine and Therapeutics, University of Aberdeen, Aberdeen, United Kingdom
Pr. M. Golden gives an overview of key evolutions of concepts in nutrition, over a century.

I.2. ***Presentation to an internal meeting at MSF Paris. 2008.***
'The response to nutrient deficiency / Type 1 and type 2 responses'

MICHAEL H. N. GOLDEN
Department of Medicine and Therapeutics, University of Aberdeen, Aberdeen, United Kingdom
A child responds to a deficiency of an essential nutrient in one of two quite different ways. First, he can continue growing, consume the body stores and then have a reduction in the specific bodily functions that depend upon the deficient nutrient. Or, second, he can stop growing, avidly conserve the nutrient in the body and, if necessary, loose weight to make the nutrient internally available and thus maintain the concentration of the nutrient in the tissues. The difference between these two responses is fundamental and can be seen in experimental and farm animals, bacteria and even in plants grown on soils that have the same nutrient deficiencies.

I.3. ***Journal of Nutrition.*** 133: 3932S–3935S, 2003.
'Animal Source Foods to Improve Micronutrient Nutrition and Human Function in Developing Countries. Nutritional Importance of Animal Source Foods'

SUZANNE P. MURPHY AND LINDSAY H. ALLEN
Cancer Research Center of Hawaii, University of Hawaii, Honolulu, HI 96813 and Department of Nutrition, University of California, Davis, CA 95616

ABSTRACT. Animal source foods can provide a variety of micronutrients that are difficult to obtain in adequate quantities from plant source foods alone. In the 1980s, the Nutrition Collaborative Research Support Program identified six micronutrients that were particularly low in the primarily vegetarian diets of schoolchildren in rural Egypt, Kenya and Mexico: vitamin A, vitamin B-12, riboflavin, calcium, iron and zinc. Negative health outcomes associated with inadequate intake of these nutrients include anemia, poor growth, rickets, impaired cognitive performance, blindness, neuromuscular deficits and eventually, death. Animal source foods are particularly rich sources of all six of these nutrients, and relatively small amounts of these foods, added to a vegetarian diet, can substantially increase nutrient adequacy. Snacks designed for Kenyan schoolchildren provided more nutrients when animal and plant foods were combined. A snack that provided only 20% of a child's energy requirement could provide 38% of the calcium, 83% of the vitamin B-12 and 82% of the riboflavin requirements if milk was included. A similar snack that included ground beef rather than milk provided 86% of the zinc and 106% of the vitamin B-12 requirements, as well as 26% of the iron requirement. Food guides usually recommend several daily servings from animal source food groups (dairy products and meat or meat alternatives). An index that estimates nutrient adequacy based on adherence to such food guide recommendations may provide a useful method of quickly evaluating dietary quality in both developing and developed countries.

I.4. ***Journal of Pediatric Gastroenterology and Nutrition: 36:***12–22. January, 2003, Philadelphia.

'Linear Programming: A Mathematical Tool for Analyzing and Optimizing Children's Diets During the Complementary Feeding Period'

ANDRÉ BRIEND, NICOLE DARMON, ELAINE FERGUSON, JUERGEN G. ERHARDT
Institut de Recherche pour le Développement, Paris, France; †Unité INSERM 557, Conservatoire National des Arts et Métiers, ISTNA, Paris, France; Department of Human Nutrition, Otago University, Dunedin, New Zealand; University of Hohenheim, Institute of Biological Chemistry and Nutrition, Stuttgart, Germany

ABSTRACT. During the complementary feeding period, children require a nutrient-dense diet to meet their high nutritional requirements. International interest exists in the promotion of affordable, nutritionally adequate complementary feeding diets based on locally available foods. In this context, two questions are often asked: 1) is it possible to design a diet suitable for the complementary feeding period using locally available food? and 2) if this is possible, what is the lowest-cost, nutritionally adequate diet available? These questions are usually answered using a "trial and error" approach. However, a more efficient and rigorous technique, based on linear programming, is also available. It has become more readily accessible with the advent of powerful personal computers. The purpose of this review, therefore, is to inform paediatricians and public health professionals about this tool. In this review, the basic principles of linear programming are briefly examined and some practical applications for formulating sound food-based nutritional recommendations in different contexts are explained. This review should facilitate the adoption of this technique by international health professionals.

II. Diagnosis

II.5. ***Journal of Nutrition***. 129: 529S–530S, 1999.
'Symposium: Causes and Etiology of Stunting. Introduction'

EDWARD A. FRONGILLO, JR.
Division of Nutritional Sciences, Cornell University, Ithaca, NY 14853–6301
Introduction: This symposium considered why and how stunting of children occurs. As described in the comprehensive examination made by WHO of the use and interpretation of anthropometry (1995), stunting (i.e., short stature due to poor living environments) is one of the two most important indices of child well-being in use throughout the world. The assessment of stunting is integral to public health, clinical and research workers in many fields concerned with the well-being of children and with the biology of growth and development. In developing countries, 40% of children, 5 y of age are stunted [de Onis and Blössner 1997, WHO Subcommittee on Nutrition (SCN) 1997]. This means that 200 million young children are stunted. The timing of stunting is reasonably understood in that most stunting occurs before the age of 3 y, and stunted children usually become stunted adults. The consequences of becoming and remaining stunted are increased risk of morbidity, mortality, delays in motor and mental development, and decreased work capacity (SCN 1997, Waterlow and Schürch 1994). The causes and etiology of stunting are much less understood than are its timing and consequences. In particular, there is little understanding of why and how stunting occurs extensively in environments that are poor, but not desperately so, and in environments that seem to be improving. In a population, an individual child can become stunted or not. In addition, some populations are much more stunted than others (WHO 1995). This means that an understanding of why and how children become stunted is needed at both the individual and ecological levels…

II.6. ***Pediatrics***. Vol. 107 No. 5 May 2001, www.pediatrics.org
'Worldwide Timing of Growth Faltering: Implications for Nutritional interventions'

ROGER SHRIMPTON, CESAR G. VICTORA, MERCEDES DE ONIS, ROSA ANGELA COSTA LIMA, MONIKA BLÖSSNER AND GRAEME CLUGSTON.
Nutrition Unit, UNICEF, New York, New York; Postgraduate Program in Epidemiology, Universidade Federal de Pelotas, Pelotas, RS, Brazil; and the Department of Nutrition for Health and Development, World Health Organization, Geneva, Switzerland. Centre of International Child Health, Institute of Child Health, University College London, London, United Kingdom
ABSTRACT. Objective: It is widely assumed that growth faltering starts at around 3 months of age, but there has been no systematic assessment of its timing using representative national datasets from a variety of countries.
Methodology: The World Health Organization Global Database on Child Growth and Malnutrition includes the results of 39 nationally representative datasets from recent surveys in developing countries. Based on these data, mean z scores of weight for age, length/height for age, and weight for length/height were compared with the National Center for Health Statistics and Cambridge growth references, for children younger than 60 months.
Results: Mean weights start to falter at about 3 months of age and decline rapidly until about 12 months, with a markedly slower decline until about 18 to 19 months and a catch-up pattern after that. Growth faltering in weight for length/height is restricted to the first 15 months of life, followed by rapid improvement. For length/height for age, the global mean is surprisingly close to National Center for Health Statistics and Cambridge references at birth, but faltering starts immediately afterward, lasting well into the third year.
Conclusions: These findings highlight the need for prenatal and early life interventions to prevent growth failure.

*II.7. ***Archives of Pediatrics & Adolescent Medicine.*** 2009; 163(2):126-130.
'Comparison of the New World Health Organization Growth Standards and the National Center for Health Statistics Growth Reference Regarding Mortality of Malnourished Children Treated in a 2006 Nutrition Program in Niger'

Nancy M. Dale, Rebecca F. Grais, Andrea Minetti, Juhani Miettola, Noel C. Barengo.
Department of Public Health and Clinical Nutrition University of Kuopio, Finland; Epicentre and Médecins Sans Frontières, Paris, France; Department of Public Health, University of Helsinki, Finland

Objective: To compare the National Centre for Health Statistics (NCHS) international growth reference with the new World Health Organization (WHO) growth standards for identification of the malnourished (wasted) children most at risk of death.
Design: Retrospective data analysis.
Setting: A Médecins Sans Frontières (Doctors Without Borders) nutrition program in Maradi, Niger, in 2006 that treated moderately and severely malnourished children.
Participants: A total of 53 661 wasted children aged 6 months to 5 years (272 of whom died) in the program were included.
Interventions: EpiNut (Epi Info 6.0; Centers for Disease Control and Prevention, Atlanta, Georgia) software was used to calculate the percentage of the median for the NCHS reference group, and the WHO (igrowup macro; Geneva, Switzerland) software was used to calculate *z* scores for the WHO standards group of the 53 661 wasted children.
Outcome Measures: The main outcome measures are the difference in classification of children as either moderate or severely malnourished according to the NCHS growth reference and the new WHO growth standards, specifically focusing on children who died during the program.
Results: Of the children classified as moderately wasted using the NCHS reference, 37% would have been classified as severely wasted according to the new WHO growth standards. These children were almost 3 times more likely to die than those classified as moderately wasted by both references, and deaths in this group constituted 47% of all deaths in the program.
Conclusions: The new WHO growth standards identifies more children as severely wasted compared with the NCHS growth reference, including children at high mortality risk who would potentially otherwise be excluded from some therapeutic feeding programs.

*II.8. ***PloS medicine.*** March 2009, Volume 6, Issue 3, www.plosmedicine.org.
'Prognostic Accuracy of WHO Growth Standards to Predict Mortality in a Large-Scale Nutritional Program in Niger'

Nathanael Lapidus, Francisco J. Luquero, Valérie Gaboulaud, Susan Shepherd, Rebecca F. Grais
Epicentre, Paris, France, European Programme for Intervention Epidemiology Training (EPIET), European Centre for Disease Prevention and Control (ECDC), Stockholm, Sweden, Médecins Sans Frontières, Paris, France

ABSTRACT. Background: Important differences exist in the diagnosis of malnutrition when comparing the 2006 World Health Organization (WHO) Child Growth Standards and the 1977 National Center for Health Statistics (NCHS) reference. However, their relationship with mortality has not been studied. Here, we assessed the accuracy of the WHO standards and the NCHS reference in predicting death in a population of malnourished children in a large nutritional program in Niger.
Methods and Findings: We analyzed data from 64,484 children aged 6–59 mo admitted with malnutrition (80% weight-for-height percentage of the median [WH]% [NCHS] and/or mid-upper arm circumference [MUAC] < 110 mm and/or presence of edema) in 2006 into the Médecins Sans Frontières (MSF) nutritional program in Maradi, Niger. Sensitivity and specificity of weight-for height in terms of Z score (WHZ) and WH% for

both WHO standards and NCHS reference were calculated using mortality as the gold standard. Sensitivity and specificity of MUAC were also calculated. The receiver operating characteristic (ROC) curve was traced for these cut-offs and its area under curve (AUC) estimated. In predicting mortality, WHZ (NCHS) and WH% (NCHS) showed AUC values of 0.63 (95% confidence interval [CI] 0.60–0.66) and 0.71 (CI 0.68–0.74), respectively. WHZ (WHO) and WH% (WHO) appeared to provide higher accuracy with AUC values of 0.76 (CI 0.75–0.80) and 0.77 (CI 0.75–0.80), respectively. The relationship between MUAC and mortality risk appeared to be relatively weak, with AUC ¼ 0.63 (CI 0.60–0.67). Analyses stratified by sex and age yielded similar results.
Conclusions: These results suggest that in this population of children being treated for malnutrition, WH indicators calculated using WHO standards were more accurate for predicting mortality risk than those calculated using the NCHS reference. The findings are valid for a population of already malnourished children and are not necessarily generalizable to a population of children being screened for malnutrition. Future work is needed to assess which criteria are best for admission purposes to identify children most likely to benefit from therapeutic or supplementary feeding programs.

II.9. ***World Health Organization, Unicef.*** 2009.
'WHO child growth standards and the identification of severe Acute malnutrition in infants and children. A Joint Statement by the World Health Organization and the United Nations Children's Fund'
This statement presents the recommended cut-offs, summarizes the rationale for their adoption and advocates for their harmonized application in the identification of 6–60 month old infants and children for the management of severe acute malnutrition (SAM). It also reviews the implications on patient load, on discharge criteria and on programme planning and monitoring.

*II.10. ***A poster shown by MSF at the 10th World Commonwealth Association of Pediatric Gastroenterologists and Nutritionists (CAPGAN) Conference on Diarrhea and Malnutrition,*** Blantyre (Malawi), 12-16 August 2009
'Activity report of a community-based therapeutic feeding program with mid-upper arm circumference (MUAC) as exclusive admission criteria'

Geza Harczi, Yodit Bekele, Sylvie Goossens, Andrea Minetti, Marie Ouannes, Loretxu Pinoges
Background and objective: Despite the objective of extending treatment to a larger number of children with community-based nutritional programs, mid-upper arm circumference (MUAC) <110 mm often remains the least sensitive anthropometric criteria among those currently in use, thus excluding a greater number of children in need from treatment.
In September 2007, MSF-France implemented a large-scale therapeutic feeding program (TFP) for the treatment of severe acute malnutrition (SAM) in Burkina Faso. The objectives of the program were to:
- Treat cases of SAM through a community-based approach
- Admit children to treatment through an exclusive MUAC criteria and/or edema
- Validate the admission criteria and develop an adapted criteria for discharge

Methods: Individual patient charts were entered into a database used for program monitoring and in-depth analysis.
Admission criteria to treatment was MUAC <120 mm and/or edema. From September 2007 through March 2009, children were considered as recovered when clinically well, with good appetite and weight >15% of admission weight. As of April 2009, children were discharged by the same clinical criteria, but instead of weight gain >15%, MUAC >=124 mm is now used.

Results: Baseline patient characteristics (Sep 2007-Dec 2008, N=23,108): 94.4% of children admitted with MUAC had mean weight-for-height Z-score (WHZ) <-3 (WHO standard). Female-to-male ratio was 1:1, and median age was 14 months, for children admitted by MUAC. 92.2% of children admitted by MUAC went directly to outpatient units; 82.2% were treated exclusively at home. 3.8% had edema, with median age 24 months.

*II.11. ***Tropical Medicine and International Health.*** Volume 14 no 10 p 1210–1214 October 2009

'Impact of the shift from NCHS growth reference to WHO2006 growth standards in a therapeutic feeding programme in Niger'

A. Minetti, M. Shams Eldin, I. Defourny and G. Harczi
Epicentre and Médecins Sans Frontières, Paris, France

SUMMARY. Objectives: To describe the implementation of the WHO2006 growth standards in a therapeutic feeding programme.
Methods: Using programme monitoring data from 21 769 children 6–59 months admitted to the Médecins Sans Frontières therapeutic feeding programme during 2007, we compared characteristics at admission, type of care and outcomes for children admitted before and after the shift to the WHO 2006 standards. Admission criteria were bipedal oedema, MUAC <110 mm, or weight-for-height (WFH) of <-70% of the median (NCHS) before mid-May 2007, and WFH <-3 z score (WHO2006) after mid-May 2007.
Results: Children admitted with the WHO2006 standards were more likely to be younger, with a
higher proportion of males, and less malnourished (mean WFH -3.6 z score vs. mean WFH -4.6 z score). They were less likely to require hospitalization or intensive care (28.4% vs. 77%; 2.8% vs. 36.5%) and more likely to be treated exclusively on an outpatient basis (71.6% vs. 23%). Finally, they experienced better outcomes (cure rate: 89% vs. 71.7%, death rate: 2.7% vs. 6.4%, default rate: 6.7% vs. 12.3%).
Conclusions: In this programme, the WHO2006 standards identify a larger number of malnourished children at an earlier stage of disease facilitating their treatment success.

III. Epidemiology

III.12. ***International Journal of Epidemiology.*** 1985;14:32–38.
'Sick individuals and sick populations'

Geoffrey Rose
Department of Epidemiology, London School of Hygiene and Tropical Medicine, London, U.K
ABSTRACT. Aetiology confronts two distinct issues: the determinants of individual cases, and the determinants of incidence rate. If exposure to a necessary agent is homogeneous within a population, then case/control and cohort methods will fail to detect it: they will only identify markers of susceptibility. The corresponding strategies in control are the 'high-risk' approach, which seeks to protect susceptible individuals, and the population approach, which seeks to control the causes of incidence. The two approaches are not usually in competition, but the prior concern should always be to discover and control the causes of incidence.

III.13. ***British Medical Journal.*** Volume 301. 3 November 1990.
'The population mean predicts the number of deviant individuals'

Geoffrey Rose, Simon Day
Department of Epidemiology, London School of Hygiene and Tropical Medicine, London, U.K
ABSTRACT. Objective – To examine the relation between the prevalence of deviation and the mean for the whole population in characteristics such as blood pressure and consumption of alcohol. Design – Re-examination of standardised data from the Intersalt study, an international, multicentre study on the determinants of blood pressure. Setting and subjects – Samples of adults representing 52 populations in 32 countries. Main outcome measures – The relations, expressed as correlation coefficients, between the mean population values for blood pressure, body mass index, alcohol consumption, and sodium intake and the prevalence of, respectively, hypertension (e140 mm Hg), obesity (body mass index 30 kg/M2), high alcohol intake (¢300 ml/week), and high sodium intake (¢e250 mmol/day). Results – There were close and independent associations between the population mean and the prevalence of deviance for each of the variables examined: correlation coefficients were 0-85 for blood pressure, 0-94 for body mass index, 0 97 for alcohol intake, and 0-78 for sodium intake. Conclusions – These findings imply that distributions of health related characteristics move up and down as a whole: the frequency of «cases» can be understood only in the context of a population's characteristics. The population thus carries a collective responsibility for its own health and well being, including that of its deviants.

III.14. ***Bulletin of the World Health organization.*** 1995, 73 (4): 443-448.
'The effects of malnutrition on child mortality in developing countries'

D.L Pelletier, E.A. Frongillo, Jr, D.G. Schroeder, J.P. Habicht
Division of Nutritional Sciences, Cornell University, Ithacca. New York, USA.
Conventional methods of classifying causes of death suggest that about 70% of the deaths of children (aged 0-4 years) worldwide are due to diarrhoeal illness, acute respiratory infection, malaria, and immunizable diseases. The role of malnutrition in child mortality is not revealed by these conventional methods, despite the long-standing recognition of the synergism between malnutrition and infectious diseases. This paper describes a recently-developed epidemiological method to estimate the percentage of child deaths (aged 6-59 months) which could be attributed to the potentiating effects of malnutrition in infectious disease. The result from 53 developing countries with nationally representative data on

child weight-for-age indicate that 56% of child deaths were attributable to malnutrition's potentiating effects, and 83% of these were attributable to mild-to-moderate as opposed to severe malnutrition. For individual countries, malnutrition's total potentiating effects on mortality ranged from 13% to 66%, with at least three-quarters of this arising from mild-to-moderate malnutrition in each case.
These results show that malnutrition has a far more powerful impact on child mortality than is generally appreciated, and suggest that strategies involving only the screening and treatment of the severely malnourished will do little to address this impact. The methodology provided in this paper makes it possible to estimate the effects of malnutrition on child mortality in any population for which prevalence data exist.

III.15. ***American Journal of Clinical Nutrition:*** 1997:65:1062-9. USA. 1997
'A prospective study of malnutrition in relation to child mortality in the Sudan'

Wafaie W Fawzi, M Guillerino Herrera, Donna L Spiegelman, Alawia El Amin, Penelope Nestel, and Kamal A Mohamed
Departments of Nutrition and Epidemiology and Biostatistics, Harvard School of Public Health, Boston; the Harvard Institute for International Development, Boston: the Department of International Health, Iohns Hopkins School of Hygiene and Public Health, Baltimore; and the Ministry of Health, Sudan.
ABSTRACT: We examined prospectively the relation between malnutrition and mortality among Sudanese children. A cohort of 28 753 children between the ages of 6 mo and 6 y was examined every 6 mo for 18 mo. Two hundred thirty-two children died during 18 mo of follow-up (480 624 child-months). Low weight-for-height was associated with an increased risk of mortality ($P < 0.0001$). Even children with Z scores between -1 and -2 were 50% more likely to die in the following 6 mo than were children with Z scores > - 1 (multivariate relative mortality: 1.5; 95% CI: 1.1, 2.2). There was also an inverse relation between height-for-age and mortality ($P < 0.0001$). Among breast-fed children, the relative mortality associated with a Z score for weight-for-height of < -3 compared with > -2 was 7.3 (95% CI: 3.3, 15.9); among children not breast-fed, it was 26.0 (95% CI: 12.8, 53.0: P for interaction = 0.001). A strong and significant synergy was also found between infection and wasting or stunting as predictors of child mortality (P for interaction = 0.001 and 0.02, respectively). In developing countries, children who are below the customary cut-off point of -2 Z for weight-for-height may be at higher risk of death. Breast-feeding and reduction of morbidity should be advocated in programs designed to reduce malnutrition and mortality among children.

III.16. ***Journal of Nutrition.*** 133: 316S–321S, 2003, American Society for Nutritional Sciences.
"Symposium: Nutrition and Infection, Prologue and Progress Since 1968.
Historical Concepts of Interactions, Synergism and Antagonism between Nutrition and Infection"

Nevin S. Scrimshaw
Massachusetts Institute of Technology, Cambridge, MA and Food and Nutrition Programme, United Nations University, Tokyo, Japan
ABSTRACT. In the 1950s textbooks of nutrition made little or no mention of a relation to infection. The same was true for treatises on infectious disease. Relevant studies in experimental animals and a number of classical clinical observations were available pointing out the role of infection in precipitating nutritional disorders. However, clinicians and nutritionists did not recognize the importance of the relationship. The field and metabolic studies of the Institute of Nutrition of Central America and Panama (INCAP) in the 1950s demonstrated that malnutrition and infection in humans are generally synergistic. These

studies stimulated the review of available evidence that resulted in the 1968 WHO monograph on "Interactions of Nutrition and Infection." It provided extensive evidence for the role of infections in precipitating clinical malnutrition and for the impact of malnutrition on morbidity and mortality from infection. The high frequency of diarrhea in underprivileged young children led to intensive studies in many countries of its effect on nutritional status and to recognition of the high prevalence of "weanling diarrhea." The effects of infection on nutritional status were then extensively and elegantly investigated at Fort Detrick, MD, and hormonal and cytokine mechanisms identified. The subsequent explosion in knowledge of cell-mediated immune mechanisms has led to an understanding of how malnutrition lowers this resistance. Today, recognition of the synergistic relationship between nutrition and infection influences most public health interventions to prevent malnutrition.

III.17. ***www.thelancet.com,*** published Online, January 17, 2008.
'Maternal and Child Undernutrition 1. Maternal and child undernutrition: global and regional exposures and health consequences'

Robert E Black, Lindsay H Allen, Zulfiqar A Bhutta, Laura E Caulfield, Mercedes de Onis, Majid Ezzati, Colin Mathers, Juan Rivera.
Johns Hopkins Bloomberg School of Public Health, Baltimore, USA; USDA, ARS Western Human Nutrition Research Center, Davis, CA, USA; Aga Khan University, Karachi, Pakistan; World Health Organization, Geneva, Switzerland; Harvard School of Public Health, Boston, MA, USA; and Mexico National Institute of Public Health, Cuernavaca, Mexico
Maternal and child undernutrition is highly prevalent in low-income and middle-income countries, resulting in substantial increases in mortality and overall disease burden. In this paper, we present new analyses to estimate the effects of the risks related to measures of undernutrition, as well as to suboptimum breastfeeding practices on mortality and disease. We estimated that stunting, severe wasting, and intrauterine growth restriction together were responsible for 2.2 million deaths and 21% of disability-adjusted life-years (DALYs) for children younger than 5 years. Deficiencies of vitamin A and zinc were estimated to be responsible for 0.6 million and 0.4 million deaths, respectively, and a combined 9% of global childhood DALYs. Iron and iodine deficiencies resulted in few child deaths, and combined were responsible for about 0.2% of global childhood DALYs. Iron deficiency as a risk factor for maternal mortality added 115 000 deaths and 0.4% of global total DALYs. Suboptimum breastfeeding was estimated to be responsible for 1.4 million child deaths and 44 million DALYs (10% of DALYs in children younger than 5 years). In an analysis that accounted for co-exposure of these nutrition-related factors, they were together responsible for about 35% of child deaths and 11% of the total global disease burden. The high mortality and disease burden resulting from these nutrition-related factors make a compelling case for the urgent implementation of interventions to reduce their occurrence or ameliorate their consequences.

III.18. ***www.thelancet.com,*** published Online, January 17, 2008.
"Maternal and Child Undernutrition 2. Maternal and child undernutrition: consequences for adult health and human capital"

Cesar G Victora, Linda Adair, Caroline Fall, Pedro C Hallal, Reynaldo Martorell, Linda Richter, Harshpal Singh Sachdev.
Universidade Federal de Pelotas, Pelotas, Brazil; MRC Epidemiology Resource Centre, University of Southampton, Southampton, UK; Sitaram Bhartia Institute of Science and Research, New Delhi, India; Hubert Department of Global Health, Emory University, Atlanta, USA; University of North Carolina at Chapel Hill, Chapel Hill, USA; and Human Sciences Research Council, Durban, South Africa

In this paper we review the associations between maternal and child undernutrition with human capital and risk of adult diseases in low-income and middle-income countries. We analysed data from five long-standing prospective cohort studies from Brazil, Guatemala, India, the Philippines, and South Africa and noted that indices of maternal and child undernutrition (maternal height, birthweight, intrauterine growth restriction, and weight, height, and body-mass index at 2 years according to the new WHO growth standards) were related to adult outcomes (height, schooling, income or assets, offspring birthweight, body-mass index, glucose concentrations, blood pressure). We undertook systematic reviews of studies from low-income and middle-income countries for these outcomes and for indicators related to blood lipids, cardiovascular disease, lung and immune function, cancers, osteoporosis, and mental illness. Undernutrition was strongly associated, both in the review of published work and in new analyses, with shorter adult height, less schooling, reduced economic productivity, and – for women – lower offspring birthweight. Associations with adult disease indicators were not so clear-cut. Increased size at birth and in childhood were positively associated with adult body-mass index and to a lesser extent with blood pressure values, but not with blood glucose concentrations. In our new analyses and in published work, lower birthweight and undernutrition in childhood were risk factors for high glucose concentrations, blood pressure, and harmful lipid profiles once adult body-mass index and height were adjusted for, suggesting that rapid postnatal weight gain – especially after infancy – is linked to these conditions. The review of published works indicates that there is insufficient information about long-term changes in immune function, blood lipids, or osteoporosis indicators. Birthweight is positively associated with lung function and with the incidence of some cancers, and undernutrition could be associated with mental illness. We noted that height-for-age at 2 years was the best predictor of human capital and that undernutrition is associated with lower human capital. We conclude that damage suffered in early life leads to permanent impairment, and might also affect future generations. Its prevention will probably bring about important health, educational, and economic benefits. Chronic diseases are especially common in undernourished children who experience rapid weight gain after infancy.

III.19. ***The Journal of Clinical Investigation.*** **V**olume 118 Number 4 April 2008.
www.jci.org
'New challenges in studying nutrition-disease interactions in the developing world'

Andrew M. Prentice, M. Eric Gershwin, Ulrich E. Schaible, Gerald T. Keusch, Cesar G. Victora, and Jeffrey I. Gordon.
MRC International Nutrition Group, London School of Hygiene and Tropical Medicine, London, United Kingdom. MRC Keneba, Keneba, The Gambia. Division of Rheumatology, Allergy and Clinical Immunology, Genome and Biomedical Sciences Facility, University of California, Davis, Davis, California, USA. Department of Infectious and Tropical Diseases, Immunology Unit, London School of Hygiene and Tropical Medicine, London, United Kingdom. Boston University Medical Campus and School of Public Health, Boston, Massachusetts, USA. Universidade Federal de Pelotas, Pelotas, Brazil. Center for Genome Sciences, Washington University School of Medicine, St. Louis, Missouri, USA.
ABSTRACT. Latest estimates indicate that nutritional deficiencies account for 3 million child deaths each year in less-developed countries. Targeted nutritional interventions could therefore save millions of lives. However, such interventions require careful optimization to maximize benefit and avoid harm. Progress toward designing effective life-saving interventions is currently hampered by some serious gaps in our understanding of nutrient metabolism in humans. We highlight some of these gaps and make some proposals as to how improved research methods and technologies can be brought to bear on the problems of undernourished children in the developing world.

III.20. ***Public Health Nutrition.*** March 2009. journals.cambridge.org
'Incidence and duration of severe wasting in two African populations'

Michel Garenne, Douladel Willie, Bernard Maire, Olivier Fontaine, Roger Eeckels, André Briend and Jan Van den Broeck
Institut Pasteur, Epidemiologie des Maladies Emergentes,, Paris, France. Epidemiology Research Unit, Tropical Medicine Research Institute, University of West Indies, Kingston, Jamaica. IRD, Montpellier, France. World Health Organization, Geneva, Switzerland. Department ofPaediatrics, Catholic University of Leuven, Leuven, Belgium
ABSTRACT. Objective: The present study aimed to compare two situations of endemic malnutrition among < 5-year-old African children and to estimate the incidence, the duration and the case fatality of severe wasting episodes. Design: Secondary analysis of longitudinal studies, conducted several years ago, which allowed incidence and duration to be calculated from transition rates. The first site was Niakhar in Senegal, an area under demographic surveillance, where we followed a cohort of children in 1983–5. The second site was Bwamanda in the Democratic Republic of Congo, where we followed a cohort of children in 1989–92. Both studies enrolled about 5000 children, who were followed by routine visits and systematic anthropometric assessment, every 6 months in the first case and every 3 months in the second case. Results: Niakhar had less stunting, more wasting and higher death rates than Bwamanda. Differences in cause-specific mortality included more diarrhoeal diseases, more marasmus, but less malaria and severe anaemia in Niakhar. Severe wasting had a higher incidence, a higher prevalence and a more marked age profile in Niakhar. However, despite the differences, the estimated mean durations of episodes of severe wasting, calculated by multi-state life table, were similar in the two studies (7.5 months). Noteworthy were the differences in the prevalence and incidence of severe wasting depending on the anthropometric indicator (weight for-height Z-score ≤–3.0 or mid upper-arm circumference < 110mm) and the reference system (National Center for Health Statistics 1977, Centers for Disease Control and Prevention 2000 or Multicentre Growth Reference Study 2006). Conclusions: Severe wasting appeared as one of the leading cause of death among under-fives: it had a high incidence (about 2% per child-semester), long duration of episodes and high case fatality rates (6 to 12%).

III.21. ***PloS Medicine.*** June 2009, Volume 6, Issue 6, e1000101. ***www.plosmedicine.org***
'Seasonal Hunger: A Neglected Problem with Proven Solutions'

Bapu Vaitla, Stephen Devereux, Samuel Hauenstein Swan
Fletcher School, Tufts University, Medford, Massachusetts, United States of America, Institute of Development Studies, University of Sussex, Brighton, United Kingdom, Action Against Hunger–UK, London, United Kingdom
Summary Points: Most of the world's acute hunger and undernutrition occurs not in conflicts and natural disasters but in the annual "hunger season", the time of year when the previous year's harvest stocks have dwindled, food prices are high, and jobs are scarce. We know what works in fighting seasonal hunger and undernutrition: there are identifiable policy and program successes in contexts around the world, but they often operate on a small scale and in isolation. Community-based interventions to treat acute undernutrition and promote growth of preschool children are examples of successful interventions that should be scaled up. Global scale-up of a basic "minimum essential" intervention package against seasonal hunger would cost around 0.1% of global GDP and save millions of lives, while protecting millions more from severe illness. Focusing on seasonal hunger would be an effective way to leverage resources for the attainment of the hunger-related Millennium Development Goal.

IV. Treatment

IV.22. ***British Journal of Nutrition.*** (2001), 85, Suppl. 2, S175–S179
'Highly nutrient-dense spreads: a new approach to delivering multiple micronutrients to high-risk groups'

ANDRÉ BRIEND
Institut de Recherche pour le Développement, ISTNA-CNAM, Paris, France
ABSTRACT. Using a highly fortified food is the most attractive option to bringing missing nutrients to vulnerable groups. The recent development of a highly nutrient-dense spread (HNDS) for the treatment of malnourished children may have some relevance for other high-risk groups. Traditionally, severely malnourished children are fed for 3-4 weeks during their recovery with adapted milk feeds prepared by mixing dried skimmed milk, oil and sugar with a vitamin and mineral complex. This approach, however, is difficult to implement, since these feeds are excellent growth media for bacteria, and they must be prepared and fed under close supervision. This constraint led to the development of a HNDS, which is obtained by replacing part of the dried skimmed milk with a mixture of groundnut butter and powdered lactoserum. This spread can be eaten without dilution with water and preliminary trials showed that children preferred this HNDS to traditional liquid diets. In HNDS all powdered ingredients are embedded in fat which protects vitamins against oxidation and increases the shelf life of this product. Spreads also have a very low humidity and bacteria do not grow in it. Attempts to use spreads to supplement other vulnerable groups such as moderately malnourished children and pregnant women are discussed.

IV.23. ***The Lancet.*** Vol 358, August 11, 2001.
'Viewpoint. Changing the way we address severe malnutrition during famine'

STEVE COLLINS
Valid International, Oleuffynon, Old Hall, Llanidloes, Powys and Centre for International Child Health,Institute of Child Health, London
This year, yet again, saw widespread food insecurity and famine across the horn of Africa. Again, humanitarian agencies set up operations to implement various relief programmes. Nutritional interventions included general ration distribution to the whole of an affected population; blanket supplementary feeding to all members of an identified risk group; and targeted dry supplementary feeding centres for moderately malnourished and therapeutic feeding centres for the severely malnourished. As is usual in emergencies, many of the therapeutic feeding centres were hard to set up and did not achieve an adequate coverage of all the severely malnourished. This combination of delays and low coverage meant that many therapeutic feeding centres achieved little overall impact on mortality. I believe that the present focus on therapeutic feeding centres as the sole mode of treating severely malnourished people during famine is inappropriate and often counter-productive. A new concept of community-based therapeutic care is necessary to complement therapeutic feeding centres' interventions if famine relief programmes are to address the plight of the severely malnourished in an efficient and effective manner. During an emergency, the community-based therapeutic care approach could quickly provide good coverage and appropriate treatment for large numbers of severely malnourished people. The principles behind community-based therapeutic care are, however, developmental, empowering communities to cope more effectively with crisis and with transition back to normality. This is very different to the therapeutic feeding centres' approach that disempowers communities, requires very large amounts of external staff and resources, and undermines the infrastructure. Although emergency community-based therapeutic care programmes could be large-scale and implemented quickly, they could also evolve into developmental Hearth model nutritional programmes without changing their conceptual basis. Conversely, Hearth programmes, although largely sustainable, could in times of crisis quickly scale-up into rapid effective emergency interventions. Creating such a

continuum between emergency and developmental approaches has long been a holy grail of humanitarianism.

IV.24. ***Journal of American Medical Association.*** June 2, 2004 – Vol 291, No. 21 2563
'Impact of the Mexican Program for Education, Health, and Nutrition (Progresa) on Rates of Growth and Anemia in Infants and Young Children
A Randomized Effectiveness Study'

Juan A. Rivera, Daniela Sotres-Alvarez, Jean-Pierre Habicht, Teresa Shamah, Salvador Villalpando.
Instituto Nacional de Salud Publica, Centro de Investigacion en Nutricion y Salud, Cuernavaca,Mexico; and Division of Nutritional Sciences, Cornell University, New York, NY
Context: Malnutrition causes death and impaired health in millions of children. Existing interventions are effective under controlled conditions; however, little information is available on their effectiveness in large-scale programs.
Objective: To document the short-term nutritional impact of a large-scale, incentive based development program in Mexico (Progresa), which included a nutritional component.
Design, Setting, and Participants: A randomized effectiveness study of 347 communities randomly assigned to immediate incorporation to the program in 1998 (intervention group; n=205) or to incorporation in 1999 (crossover intervention group; n=142). A random sample of children in those communities was surveyed at baseline and at 1 and 2 years afterward. Participants were from low-income households in poor rural communities in 6 central Mexican states. Children (N=650) 12 months of age or younger (n=373 intervention group; n=277 crossover intervention group) were included in the analyses.
Intervention: Children and pregnant and lactating women in participating households received fortified nutrition supplements, and the families received nutrition education, health care, and cash transfers. Main Outcome Measures: Two-year height increments and anemia rates as measured by blood hemoglobin levels in participating children.
Results: Progresa was associated with better growth in height among the poorest and younger infants. Age- and length-adjusted height was greater by 1.1 cm (26.4 cm in the intervention group vs 25.3 cm in the crossover intervention group) among infants younger than 6 months at baseline and who lived in the poorest households. After 1 year, mean hemoglobin values were higher in the intervention group (11.12 g/dL; 95% confidence interval [CI], 10.9-11.3 g/dL) than in the crossover intervention group (10.75 g/dL; 95% CI, 10.5-11.0 g/dL) who had not yet received the benefits of the intervention (*P*=.01). There were no differences in hemoglobin levels between the 2 groups at year 2 after both groups were receiving the intervention. The age-adjusted rate of anemia (hemoglobin level<11 g/dL) in 1999 was higher in the crossover intervention group than in the intervention group (54.9% vs 44.3%; *P*=.03), whereas in 2000 the difference was not significant (23.0% vs 25.8%, respectively; *P*=.40).
Conclusion: Progresa, a large-scale, incentive-based development program with a nutritional intervention, is associated with better growth and lower rates of anemia in low-income, rural infants and children in Mexico.

IV.25. ***Journal of Health, Population and Nutrition.*** 2005 Dec;23(4):351-357
'Supplemental Feeding with Ready-to-Use Therapeutic Food in Malawian Children at Risk of Malnutrition'

Monica P. Patel, Heidi L. Sandige, MacDonald J. Ndekha, André Briend, Per Ashorn, and Mark J. Manary.
Department of Pediatrics, University of Texas Southwestern Medical Center, Dallas, TX, USA, Department of Pediatrics, Washington University School of Medicine, St. Louis, MO, College of

Medicine, University of Malawi, Blantyre, Malawi, Institut de Recherche pour le Développement, Paris, France, and Paediatric Research Centre, Tampere University Hospital, Tampere, Finland
ABSTRACT. The study was a controlled, comparative clinical effectiveness trial of two supplementary feeding regimens in children at risk of malnutrition from seven centres in rural Malawi. Being at risk of malnutrition was defined as weight-for-height <85%, but >80% of the international standard. Astepped-wedge design with systematic allocation was used for assigning children to receive either ready-to-use therapeutic food (RUTF) (n=331) or micronutrient-fortified corn/soy-blend (n=41) for up to eight weeks. The primary outcomes were recovery, defined as weight-for-height >90%, and the rate of weight gain. Children receiving RUTF were more likely to recover (58% vs 22%; difference 36%; 95% confidence interval [CI] 20-52) and had greater rates of weight gain (3.1 g/kg/day vs 1.4 g/kg/day; difference 1.7; 95% CI 0.8-2.6) than children receiving corn/soy-blend. The results of this preliminary work suggest that supplementary feeding with RUTF promotes better growth in children at risk of malnutrition than the standard fortified cereal/legume-blended food.

IV.26. ***American Journal of Clinical Nutrition.*** 2005;81:864 –70.
'Comparison of home-based therapy with ready-to-use therapeutic food with standard therapy in the treatment of malnourished Malawian children: a controlled, clinical effectiveness trial 1–4'

Michael A Ciliberto, Heidi Sandige, MacDonald J Ndekha, Per Ashorn, André Briend, Heather M Ciliberto, and Mark J Manary
Department of Pediatrics, Washington University School of Medicine, St Louis, MO; the College of Medicine, University of Malawi, Blantyre, Malawi; the Institut de Recherche pour le Développement, Paris, France; and the Paediatric Research Centre, Tampere University Hospital, Tampere, Finland.
ABSTRACT. Background: Childhood malnutrition is common in Malawi, and the standard treatment, which follows international guidelines, results in poor recovery rates. Higher recovery rates have been seen in pilot studies of home-based therapy with ready-to-use therapeutic food (RUTF).
Objective: The objective was to compare the recovery rates among children with moderate and severe wasting, kwashiorkor, or both receiving either home-based therapy with RUTF or standard inpatient therapy.
Design: A controlled, comparative, clinical effectiveness trial was conducted in southern Malawi with 1178 malnourished children. Children were systematically allocated to either standard therapy (186 children) or home-based therapy with RUTF (992 children) according to a stepped wedge design to control for bias introduced by the season of the year. Recovery, defined as reaching a weight-for height z score > - 2, and relapse or death were the primary outcomes. The rate of weight gain and the prevalence of fever, cough, and diarrhea were the secondary outcomes.
Results: Children who received home-based therapy with RUTF were more likely to achieve a weight-for-height z score > - 2 than were those who received standard therapy (79% compared with 46%; $P < 0.001$) and were less likely to relapse or die (8.7% compared with 16.7%; $P < 0.001$). Children who received home-based therapy with RUTF had greater rates of weight gain (3.5 compared with 2.0 $g \cdot kg^{-1} \cdot d^{-1}$; difference: 1.5; 95% CI: 1.0, 2.0 $g \cdot kg^{-1} d^{-1}$) and a lower prevalence of fever, cough, and diarrhea than did children who received standard therapy. Conclusion: Home-based therapy with RUTF is associated with better outcomes for childhood malnutrition than is standard therapy.

IV.27. ***www.thelancet.com.*** Published Online, September 26, 2006.
'Management of severe acute malnutrition in children'

Steve Collins, Nicky Dent, Paul Binns, Paluku Bahwere, Kate Sadler, Alistair allam

Valid International Ltd, Oxford, UK; and Centre for International Child Health, Institute of Child Health, Guilford Street, London, UK
Severe acute malnutrition (SAM) is defined as a weight-for-height measurement of 70% or less below the median, or three SD or more below the mean National Centre for Health Statistics reference values, the presence of bilateral pitting oedema of nutritional origin, or a mid-upper-arm circumference of less than 110 mm in children age 1–5 years. 13 million children under age 5 years have SAM, and the disorder is associated with 1 million to 2 million preventable child deaths each year. Despite this global importance, child-survival programmes have ignored SAM, and WHO does not recognise the term "acute malnutrition". Inpatient treatment is resource intensive and requires many skilled and motivated staff. Where SAM is common, the number of cases exceeds available inpatient capacity, which limits the effect of treatment; case-fatality rates are 20–30% and coverage is commonly under 10%. Programmes of community-based therapeutic care substantially reduce case-fatality rates and increase coverage rates. These programmes use new, ready-to-use, therapeutic foods and are designed to increase access to services, reduce opportunity costs, encourage early presentation and compliance, and thereby increase coverage and recovery rates. In community-based therapeutic care, all patients with SAM without complications are treated as outpatients. This approach promises to be a successful and cost-effective treatment strategy.

* IV. ***28 New England Journal of Medicine:*** 354;3. January 19, 2006.
'Crisis in Niger — Outpatient Care for Severe Acute Malnutrition'

MILTON TECTONIDIS
Médecins Sans Frontières, Paris, France.
A report about an intervention addressing the needs of several tens of thousands cases of severe acute malnutrition, in a single operation (Niger, 2005) and in an outpatient care network for most of the patients.

IV.29. ***The World Health Organization, the World Food Programme, the United Nations System Standing Committee on Nutrition and the United Nations Children's Fund.*** May 2007.
'Community-based management of severe acute malnutrition'
Severe acute malnutrition remains a major killer of children under five years of age. Until recently, treatment has been restricted to facility-based approaches, greatly limiting its coverage and impact. New evidence suggests, however, that large numbers of children with severe acute malnutrition can be treated in their communities without being admitted to a health facility or a therapeutic feeding centre. The community-based approach involves timely detection of severe acute malnutrition in the community and provision of treatment for those without medical complications with ready-to-use therapeutic foods or other nutrient-dense foods at home. If properly combined with a facility-based approach for those malnourished children with medical complications and implemented on a large scale, community-based management of severe acute malnutrition could prevent the deaths of hundreds of thousands of children.

* IV.30. ***Field Exchange. Emergency Nutrition network.*** September 2007 Issue 31
'Management of moderate acute malnutrition with RUTF in Niger'

ISABELLE DEFOURNY, GWENOLA SEROUX, ISSALEY ABDELKADER, AND GÉZA HARCZI
Médecins Sans Frontières, Maradi, Niger and Paris, France
In 2006, MSF operated 11 outpatient feeding centres attached to integrated health centres

(Centres de Santé Intégrés), along with two inpatient referral feeding units, in two districts of Maradi region with an estimated population of 900,000 people. Moderately malnourished children were admitted to these units and treated with the same medical and dietary protocols used for severe acutely malnourished patients (with the exception of no systematic antibiotic treatment at admission). Within the programme, the distinction between moderate and severe acute malnutrition was abandoned in favour of a distinction between complicated and non-complicated acute malnutrition. Children were admitted according to standard criteria for acute malnutrition: weight-for-height (W/H) ratio < 80% of the NCHS median, and/or mid-upper arm circumference (MUAC) < 110 mm and/or bilateral pitting oedema. Complicated acute malnutrition was defined as acute malnutrition accompanied by anorexia and/or severe pathology. Complicated cases were admitted to one of the two inpatient units for stabilisation. All non-complicated cases were admitted directly to weekly follow-up care in one of the 11 outpatient feeding units, and were referred to inpatient units only if they developed complications during the course of their treatment. As in 2005, Plumpy'nut® (1,000 kcal/day) was used as the RUTF offered to all outpatients. Although the protocol did not distinguish between severe and moderate malnutrition (using complicated and non-complicated acute malnutrition classifications instead), data were collected and are presented here in terms of moderate and severe, to facilitate analysis and for the sake of clarity. An admitted child was considered cured after maintaining a W/H ratio > 80% (NCHS reference) on two consecutive visits. Upon discharge, patients were given an additional week of RUTF treatment as well as a 25-kg ration of fortified blended flour (Unimix) and 5 litres of cooking oil.
Results were analysed by using individual based data from MSF programme monitoring, by means of a database comprised of information from individual treatment cards. A total of 64,733 children were admitted for acute malnutrition in the MSF nutritional programme in 2006. Of these, 92.5% (59,880) were children with moderate malnutrition, and 7.5% (4,853) were children with severe malnutrition. Of the children admitted, 93.1% were less than 36 months of age, a trend consistent with past years. Readmission rates were 8.9% for moderate and 4.2% for severe cases. Of the children, 89.6% of moderate and 58.2% of severe cases were admitted directly into outpatient care. A total of 10,651 children (8,389 moderate and 2,262 severe) spent at least part of their treatment in an inpatient centre. Analysis of results for 59,698 moderate malnourished children showed a cure rate of 95.5%, death rate of 0.4%, and default rate of 3.4%. Average length of stay was 31.4 days, and average daily weight gain was 5.28g/kg body weight/day. Approximately 75% of children had a W/H ratio > 85% of the NCHS reference median on discharge. For the 4,796 severe cases discharged, the cure rate was 81.3%, death rate 3.0%, and default rate 10.3%. Average length of stay was 42.6 days, and average daily weight gain 8g/kg body weight/day.

IV.31. ***www.thelancet.com.*** **Published Online**, January 17, 2008.

'Maternal and Child Undernutrition 3. What works? Interventions for maternal and child undernutrition and survival'

Zulfiqar A Bhutta, Tahmeed Ahmed, Robert E Black, Simon Cousens, Kathryn Dewey, Elsa Giugliani, Batool A Haider, Betty Kirkwood, Saul S Morris, H P S Sachdev, Meera Shekar.

Aga Khan University, Karachi, Pakistan; Center for Health and Population Research, Dhaka, Bangladesh; Johns Hopkins Bloomberg School of Public Health, Baltimore; London School of Hygiene and Tropical Medicine, London, UK; University of California, Davis, CA, USA; Federal University of Rio Grande de Sul, Porto Alegre, Brazil; Sitaram Bhartia Institute of Science and Research, New Delhi, India; and World Bank, Washington DC, USA

We reviewed interventions that affect maternal and child undernutrition and nutrition-related outcomes. These interventions included promotion of breastfeeding; strategies to promote complementary feeding, with or without provision of food supplements; micronutrient interventions; general supportive strategies to improve family and community

nutrition; and reduction of disease burden (promotion of handwashing and strategies to reduce the burden of malaria in pregnancy). We showed that although strategies for breastfeeding promotion have a large effect on survival, their effect on stunting is small. In populations with sufficient food, education about complementary feeding increased height-for-age Z score by 0·25 (95% CI 0.01–0.49), whereas provision of food supplements (with or without education) in populations with insufficient food increased the height-for-age Z score by 0.41 (0.05–0.76). Management of severe acute malnutrition according to WHO guidelines reduced the case-fatality rate by 55% (risk ratio 0.45, 0.32–0.62), and recent studies suggest that newer commodities, such as ready-to-use therapeutic foods, can be used to manage severe acute malnutrition in community settings. Effective micronutrient interventions for pregnant women included supplementation with iron-folate (which increased haemoglobin at term by 12 g/L, 2.93–21.07) and micronutrients (which reduced the risk of low birth-weight at term by 16% (relative risk 0.84, 0.74–0.95). Recommended micronutrient interventions for children included strategies for supplementation of vitamin A (in the neonatal period and late infancy), preventive zinc supplements, iron supplements for children in areas where malaria is not endemic, and universal promotion of iodised salt. We used a cohort model to assess the potential effect of these interventions on mothers and children in the 36 countries that have 90% of children with stunted linear growth. The model showed that existing interventions that were designed to improve nutrition and prevent related disease could reduce stunting at 36 months by 36%; mortality between birth and 36 months by about 25%; and disability-adjusted life-years associated with stunting, severe wasting, intrauterine growth restriction, and micronutrient deficiencies by about 25%. To eliminate stunting in the longer term, these interventions should be supplemented by improvements in the underlying determinants of undernutrition, such as poverty, poor education, disease burden, and lack of women's empowerment.

*IV.32. ***PLoS ONE. www.plosone.org.*** 1 May 2009, Volume 4, Issue 5, e5455

'A Large-Scale Distribution of Milk-Based Fortified Spreads: Evidence for a New Approach in Regions with High Burden of Acute Malnutrition'

Isabelle Defourny, Andrea Minetti, Geza Harczi, Stéphane Doyon, Susan Shepherd, Milton Tectonidis, Jean-Hervé Bradol, Michael Golden

Médecins sans Frontières, Paris, France, University of Aberdeen, Aberdeen, Scotland

ABSTRACT. Background: There are 146 million underweight children in the developing world, which contribute to up to half of the world's child deaths. In high burden regions for malnutrition, the treatment of individual children is limited by available resources. Here, we evaluate a large-scale distribution of a nutritional supplement on the prevention of wasting. Methods and Findings: A new ready-to-use food (RUF) was developed as a diet supplement for children under three. The intervention consisted of six monthly distributions of RUF during the 2007 hunger gap in a district of Maradi region, Niger, for approximately 60,000 children (length: 60–85 cm). At each distribution, all children over 65 cm had their Mid-Upper Arm Circumference (MUAC) recorded. Admission trends for severe wasting (WFH < 70% NCHS) in Maradi, 2002–2005 show an increase every year during the hunger gap. In contrast, in 2007, throughout the period of the distribution, the incidence of severe acute malnutrition (MUAC < 110 mm) remained at extremely low levels. Comparison of year-over-year admissions to the therapeutic feeding program shows that the 2007 blanket distribution had essentially the same flattening effect on the seasonal rise in admissions as the 2006 individualized treatment of almost 60,000 children moderately wasted. Conclusions: These results demonstrate the potential for distribution of fortified spreads to reduce the incidence of severe wasting in large population of children 6–36 months of age. Although further information is needed on the cost-effectiveness of such distributions, these results highlight the importance of re-evaluating current nutritional strategies and international recommendations for high burden areas of childhood malnutrition.

IV.33. *American Journal of Clinical Nutrition.* 2009;89:382–90.
'Post intervention growth of Malawian children who received 12-months of dietary complementation with a lipid-based nutrient supplement or maize-soy flour'

John C Phuka, Kenneth Maleta, Chrissie Thakwalakwa, Yin Bun Cheung, André Briend, Mark J Manary, and Per Ashorn
College of Medicine, University of Malawi, Blantyre, Malawi; the Department of International Health, University of Tampere Medical School, Finland; the Clinical Trials and Epidemiology Research Unit, Singapore, the Department of Child Health and Development, World Health Organization, Geneva, Switzerland, and IRD, Départements Sociétés et Santé, Paris, France; WashingtonUniversity School of Medicine, St Louis, MO; and the Department of Paediatrics, Tampere University Hospital, Tampere, Finland..
ABSTRACT. Background: Therapeutic feeding with micronutrient-fortified lipid-based nutrient supplements (LNSs) has proven useful in the rehabilitation of severely malnourished children. We recently reported that complementary feeding of 6–18-mo-old infants with an LNS known as FS50 was associated with improved linear growth and a reduction in the incidence of severe stunting during the supplementation period.
Objective: Our objective was to assess whether a reduction in stunting seen with 12-mo LNS supplementation was sustained over a subsequent 2-y non-intervention period.
Design: One hundred eighty-two 6-mo-old healthy rural Malawian infants were randomly assigned to receive daily supplementation for 12 mo with 71 g of maize-soy flour [likuni phala (LP); control group, 282 kcal] or either 50 g of FS50 (264 kcal; main intervention group), or 25 g of FS25 (130 kcal). Main outcome measures were incidence of severe stunting and mean z score changes in weight-for-age, length-for-age, and weight-for-length during a 36-mo follow-up period.
Results: The cumulative 36-mo incidence of severe stunting was 19.6% in LP, 3.6% in FS50, and 10.3% in FS25 groups ($P = 0.03$). Mean weight-for-age changes were –1.09, –0.76, and –1.22 ($P = 0.04$); mean length-for-age changes were –0.47, –0.37, and –0.71 (P =0.10); and mean weight-for-length changes were –1.52, –1.18, and –1.48 (P = 0.27). All differences were more marked among individuals with baseline length-for-age below the median. Differences in length developed during the intervention at age 10–18 mo, whereas weight differences continued to increase after the intervention.
Conclusions: Twelve-month-long complementary feeding with 50 g/d FS50 is likely to have a positive and sustained impact on the incidence of severe stunting in rural Malawi. Half-dose intervention may not have the same effect. This trial was registered at clinical-trials.gov as NCT00131209.

*IV.34. *Journal of American Medical Association.* 2009;301(3):277-285
'Effect of Preventive Supplementation with Ready-to-Use Therapeutic Food on the Nutritional Status, Mortality, and Morbidity of Children Aged 6 to 60 Months in Niger. A Cluster Randomized Trial'

Sheila Isanaka, Nohelly Nombela, Ali Djibo, Marie Poupard, Dominique Van Beckhoven, Valérie Gaboulaud, Philippe J. Guerin, Rebecca F. Grais.
Departments of Epidemiology and Nutrition, Harvard School of Public Health, Boston, Massachusetts; Control of Neglected Tropical Diseases, World Health Organization, Geneva, Switzerland; Ministry of Health, Niamey, Niger; Infectious and Tropical Disease Service, Hospital Delafontaine, Saint Denis, France; Epidemiology Section, Scientific Institute of Public Health, Brussels, Belgium; Department of Psychiatry, Hôpital Avicenne, Bobigny, France; Epicentre, Paris, France (Drs Guerin and Grais); and Harvard Humanitarian Initiative, Cambridge, Massachusetts
Context: Ready-to-use therapeutic foods (RUTFs) are an important component of effective outpatient treatment of severe wasting. However, their effectiveness in the population-based prevention of moderate and severe wasting has not been evaluated.

Objective: To evaluate the effect of a 3-month distribution of RUTF on the nutritional status, mortality, and morbidity of children aged 6 to 60 months in Niger.
Design, Setting, and Participants: A cluster randomized trial of 12 villages in Maradi, Niger. Six villages were randomized to intervention and 6 to no intervention. All children in the study villages aged 6 to 60 months were eligible for recruitment.
Intervention: Children with weight-for-height 80% or more of the National Center for Health Statistics reference median in the 6 intervention villages received a monthly distribution of 1 packet per day of RUTF (92 g [500 kcal/d]) from August to October 2006. Children in the 6 non-intervention villages received no preventive supplementation. Active surveillance for conditions requiring medical or nutritional treatment was conducted monthly in all 12 study villages from August 2006 to March 2007.
Main Outcome Measures: Changes in weight-for-height *z* score (WHZ) according to the World Health Organization Child Growth Standards and incidence of wasting (WHZ <–2) over 8 months of follow-up.
Results: The number of children with height and weight measurements in August, October, December, and February was 3166, 3110, 2936, and 3026, respectively. The WHZ difference between the intervention and non-intervention groups was –0.10 *z* (95% confidence interval [CI], –0.23 to 0.03) at baseline and 0.12 *z* (95% CI, 0.02 to 0.21) after 8 months of follow-up. The adjusted effect of the intervention on WHZ from baseline to the end of follow-up was thus 0.22 *z* (95% CI, 0.13 to 0.30). The absolute rate of wasting and severe wasting, respectively, was 0.17 events per child-year (140 events/841 child-years) and 0.03 events per child-year (29 events/943 child-years) in the intervention villages, compared with 0.26 events per child-year (233 events/895 child-years) and 0.07 events per child-year (71 events/1029 child-years) in the non-intervention villages. The intervention thus resulted in a 36% (95% CI, 17% to 50%; $P < .001$) reduction in the incidence of wasting and a 58% (95% CI, 43% to 68%; $P < .001$) reduction in the incidence of severe wasting. There was no reduction in mortality, with a mortality rate of 0.007 deaths per child-year (7 deaths/986 child-years) in the intervention villages and 0.016 deaths per child-year (18 deaths/1099 child-years) in the non-intervention villages (adjusted hazard ratio, 0.51; 95% CI, 0.25 to 1.05).
Conclusion: Short-term supplementation of non-malnourished children with RUTF reduced the decline in WHZ and the incidence of wasting and severe wasting over 8 months.

IV.35. ***WHO, UNICEF, WFP and UNHCR Consultation on the Dietary Management of Moderate Malnutrition in Under-5 Children by the Health Sector.*** September 30th October 3rd, 2008.

'Background paper. Current and potential role of specially formulated foods and food supplements for preventing malnutrition among 6-23 months old and treating moderate malnutrition among 6-59 months old children'

Saskia de Pee, Martin W. Bloem
World Food Programme, Rome, Italy; Friedman School of Nutrition Science and Policy, Tufts University, Boston; Bloomberg School of Public Health, Johns Hopkins University, Baltimore
ABSTRACT. Reducing child malnutrition requires nutritious food, breastfeeding, improved hygiene, health services, and (prenatal) care. Poverty and food insecurity seriously constrain accessibility of nutritious diets, including high protein quality, adequate micronutrient content and bioavailability, macro-minerals and essential fatty acids, low anti-nutrient content, and high nutrient density. Largely plant-source-based diets with few animal source and fortified foods do not meet these requirements and need to be improved by processing (dehulling, germinating, fermenting), fortification, and adding animal source foods, e.g. milk, or other specific nutrients. Options include using specially formulated foods: fortified

blended foods (FBFs), commercial infant cereals, ready-to-use foods i.e. pastes/compressed bars/biscuits, or complementary food supplements (CFS): micronutrient powders (MNP); powdered CFS containing (micro)nutrients, protein, amino acids and/or enzymes; or lipid-based nutrient supplements (LNS), 120-500 kcal/d, typically containing milk powder, high-quality vegetable oil, peanut-paste, sugar, (micro)nutrients. Most supplementary feeding programs for moderately malnourished children supply FBFs, such as corn soy blend, with oil and sugar, which has shortcomings: too many anti-nutrients, no milk (important for growth), suboptimal micronutrient content, high bulk and viscosity. Thus, for feeding young or malnourished children, FBFs need to be improved or replaced. Based on success with ready-to-use therapeutic foods (RUTF) for treating severe acute malnutrition, modifying that recipe is also considered. Commodities for reducing child malnutrition should be chosen based on nutritional needs, program circumstances, availability of commodities, and likelihood of impact. Data are urgently required to compare impact of new or modified commodities to current (FBFs) and to RUTF developed for treating severe acute malnutrition.

Social science bibliography

There is a plethora of social science literature on hunger and malnutrition. The list provided below is both partial and discriminating. Only the main reading material used for drafting this Cahier is included.

Atkins P. J. (1992), **'White Poison?: The social consequences of milk consumption, 1850-1930'**, ***Society for the Social History of Medicine,*** pp.207-27.
This paper seeks to adduce evidence on the social consequences of milk consumption in the period 1850–1930. It is shown that the poor quality of supply partly resulted from the nature of the marketing system, with adulteration and the use of chemical preservatives as other factors. Local authority regulation and central government legislation were very slow in controlling the cleanliness of production and sale. Milk was heavily contaminated with bacteria and was responsible for spreading a variety of diseases such as scarlet fever and tuberculosis. Infants not wholly breastfed were particularly vulnerable to diarrhoeal infections. Improvements such as pasteurization and bottling were slow to spread and are unlikely to have had much impact before the 1920s. Overall it is argued that ill-health caused by dirty milk was more serious, and its amelioration much later than previously documented.

Bado J.P. (1996), ***Médecine coloniale et grandes endémies,*** Paris, Karthala.
No abstract available.

Banister J. & Hill K. (2004), **'Mortality in China 1964-2000'**, ***Population Studies,*** Vol. 58, no. 1, pp. 55-75.
This paper uses data from censuses and surveys to re-estimate mortality levels and trends in China from the 1960s to 2000. We use the General Growth Balance method to evaluate the completeness of death reporting above the youngest ages in three censuses of the People's Republic of China from 1982 to 2000, concluding that reporting quality is quite high, and revisit the completeness of death recording in the 1973-75 Cancer Epidemiology Survey. Estimates of child mortality from a variety of direct and indirect sources are reviewed, and best estimates arrived at. Our estimates show a spectacular improvement in life expectancy in China: from about 60 years in the period 1964-82 to nearly 70 years in the period 1990-2000, with a further improvement to over 71 years by 2000. We discuss why survival rates continue improving in China despite reduced government involvement in and increasing privatization of health services, with little insurance coverage.

Bell F. & Millward R. (1998), **'Public Health Expenditures and Mortality in England and Wales 1870-1914'**, ***Continuity and Change,*** 13(2).
Attempts to account for the pattern and progress of mortality decline in England and Wales in the nineteenth century have produced a literature in which something of a general accord exists over key factors involved. Historians acknowledge the influence of two broad trends of change: environmental improvements as a result of sanitary reform initiatives and nutritional improvements as a consequence of a rise in the general standard of living. Where discord has arisen is in the degree of attachment of individual historians to one or

other of these trends as primary contributor. The study of mortality decline, which was the product of a complex amalgam of factors, has proved a complicated task. It is one whose outcome ultimately depends upon efforts to disaggregate and measure the influences of different factors involved. To date, attempts at the systematic measurement of certain key factors associated with mortality decline have lagged considerably behind acceptance of the importance of their measurement. An important omission has been a measure of the timing and dimensions of sanitary reform programmes which, via infrastructure development and environmental controls, had the potential to decrease the rate at which infectious diseases were transmitted. This article examines the trends which emerge from a quantification of local government expenditures on sanitary infrastructure and from attention to its phasing over time. We are concerned with two main issues: to what extent do public health expenditure data describe the public health effort, and how do trends in public health expenditure relate to the decline of mortality? Our subject is local authority sanitary reform as a factor in mortality decline and our focus is on the impact of the timing of public health expenditure rather than the reasons for that timing. We do not examine inter-relationships between sanitary reform and other factors contributing to mortality decline such as income levels and density factors. A call for a more comprehensive study of the sanitary undertakings of local government has been common amongst historians of nineteenth-century mortality decline. It has been acknowledged on both sides of the "nutrition versus sanitation" debate that a probable causal relationship exists between sanitary reforms and declining mortality levels. What has been lacking is a study of sufficient scale and detail to enable comprehensive evaluation.

Bell F. & Millward R. (1999), '**Infant mortality in Victorian Britain: an Economic and Social Analysis**', ***Working Papers in Economic and Social History,*** n°41, 46p.
The objective of this paper has been to draw out the central role played by mothers in the pattern of infant mortality in the Victorian period. The mother was a medium in the sense that her health crucially affected the three issues which determined the infant's life chances: the condition of the foetus, the quality of the immune system, the quality and quantity of breast feeding. Because the latter cannot be readily measured, we have proxied their variations across regions and over time by a measure of female mortality. The research reported here reveals the range and quantifiable impact of mothers' health alongside the many other factors affecting infant mortality.
The differences in infant mortality across the sample of towns did narrow in the 1870-1914 period but they remained a dominant characteristic even at the very end in the early 1900s..
The results from our research suggest that, looking at the sample as a cross section, infant mortality was lower the smaller were house occupancy rates and population densities and the bigger was the purchasing power over food. Mothers' health had a powerful influence and this was itself strongly affected by real income levels as well as , in a small way, by environmental factors. Lower fertility levels had beneficial direct effects on infant mortality and sizeable indirect ones through mothers' health. These relationships hold for all comparisons across towns . Over and above that, high levels of female employment were associated with high infant mortality, and reinforcing that, poor mothers' health, The aspiring middle class in towns like Kingston-on- Thames, Tottenham and Oxford exhibited quite separate education and cultural influences on female mortality and fertility. In contrast the male mining culture as well as towns like catholic Liverpool had levels of fertility well above the average.
The conclusion about the pervasive average long term decline of infant mortality from the 1870s to the early 1900s is clear. There were some factors like rising population densities working against the decline in mortality. Opposed to that were a number of factors, the most powerful of which was the improvement in the health of females in the child bearing age range. This itself was most strongly affected by rising real incomes in terms of food which allowed better nutrition and by falling fertility rates. These factors are enough to

explain much of the pattern of decline in infant mortality. No new factors are need be invoked, that is, to account for the very large fall in infant mortality in the textile areas and in suburbia nor the very small change in the mining areas. Real incomes rose strongly and fertility fell dramatically in the textile areas and in suburbia but by only small amounts in mining. In the middle range were the rural areas - typical, it turns out, of the average decline in infant mortality in the country as a whole and triggered by an average improvement in real incomes and fertility levels. Rising child survival rates were one of the factors which was pushing down the fertility levels but which came first cannot be decided by the present model though the results reported here provide some clues for further research on this process.

Bideau B., Desjardins B. & Pérez Brignoli H. (1998), ***Infant and Child Mortality in the Past,*** Oxford University Press.
This volume examines the trends of early-age mortality across time and space and the methodological and theoretical problems inherent in such studies. The approach is interdisciplinary, with contributions from demography, biology, medicine, and economic and social history. The geographical range encompasses Europe, North America, Japan, and India

Bideau B., Schofield R. & Reher D.S. (1991), ***The Decline of mortality in Europe,*** Oxford University Press.
This book examines the remarkable decline of mortality in Europe which began in the 19th century and continued in an uninterrupted fashion, into the early 20th century. During this period there was almost a simultaneous decline in both fertility and mortality in Europe which has long since fascinated historians and demographers. Though transition of fertility is now understood, the same cannot be said for mortality, despite its importance. The transition of mortality between 1870 and 1920 had profound effects for European and American societies. This volume brings to light the different positions held by scholars on such strategic issues as nutrition, income levels and living standards, public health, social organization, and scientific advances. This study will be of particular interest to demographers, social and economic historians, epidemiologists, and postgraduate and advanced undergraduate students of these subjects.

Corsini C.A. & Viazzo P.P. (1997), ***The decline of infant and child mortality,*** UNICEF, Martinus Nijhoff Publishers, 258p.
Of the many changes that have taken place in Western society during the past two centuries, few have been more significant than the steep fall in infant and child mortality. However, the timing and causes of the decline are still poorly understood. While some scholars attribute it to general improvements in living standards, others emphasize the role of social intervention and public health reforms. Written by specialists from several disciplinary fields, the twelve essays in this book break entirely new ground by providing a long-term perspective that challenges some deep-rooted ideas about the European experience of mortality decline and may help explain the forces and causal relationships behind the still tragic incidence of preventable infant and child deaths in many parts of the world today. This book will become a standard work for students and researchers in demography, social and economic history, population geography, and the history of medicine, and it will be of interest to anyone concerned with current debates on the policies to be adopted to curb infant and child mortality in both developed and developing countries.

Devereux S. (2000), ***Famine in the Twentieth century,*** IDS Working Paper, n°105, 40p.
More than 70 million people died in famines in the twentieth century. Stephen Devereux has compiled data from over 30 major famines and has assessed the success of some parts of the world, notably China, the Soviet Union, India and Bangladesh in apparently eradicating mass

mortality food crises. He contrasts this with the experience of sub-Saharan Africa, where famines triggered by the relationship between drought and civil war have become endemic since the late 1960s. Devereux argues that if famine is to be eradicated during the twenty-first century, it requires not only technical capacity in terms of food production and distribution, but also substantially more political will, at national and international levels, than has been seen to date.

FETTER B. (2001), '**Human Initiative in Mortality Reduction Toward a Redefinition of Historical Mortality**', ***Annales de démographie historique,*** n°1.
No abstract available.

FOGEL R.W. (2004), ***The Escape from Hunger and Premature Death, 1700–2100, Europe, America, and the Third World,*** Cambridge Studies in Population, Economy and Society in Past Time, no. 38.
Nobel laureate Robert Fogel's compelling new study examines health, nutrition and technology over the last three centuries and beyond. Throughout most of human history, chronic malnutrition has been the norm. During the past three centuries, however, a synergy between improvements in productive technology and in human physiology has enabled humans to more than double their average longevity and to increase their average body size by over 50 per cent. Larger, healthier humans have contributed to the acceleration of economic growth and technological change, resulting in reduced economic inequality, declining hours of work and a corresponding increase in leisure time. Increased longevity has also brought increased demand for health care. Professor Fogel argues that health care should be viewed as the growth industry of the twenty-first century and systems of financing it should be reformed. His book will be essential reading for all those interested in economics, demography, history and health care policy.

HARRIS B. (2004), '**Public Health, Nutrition, and the Decline of Mortality: The McKeown Thesis Revisited**', ***Social History of Medicine,*** 17(3), pp. 379-407.
The medical writer, Thomas McKeown, can justifiably claim to have been one of the most influential figures in the development of the social history of medicine during the third quarter of the twentieth century. Between 1955 and his death in 1988, he published a stream of articles and books in which he outlined his ideas about the reasons for the decline of mortality and the "modern rise of population" in Britain and other countries from the early eighteenth century onwards. Although McKeown's main aim was to deflate the claims made by the proponents of therapeutic medicine, his publications have sparked a long and protracted debate about the respective roles of improvements in sanitation and nutrition in the process of mortality decline, with particular emphasis in recent years on the impact of sanitary reform in the second half of the nineteenth century. This article attempts to place the debate over the "McKeown thesis" in a more long-term context, by looking at the determinants of mortality change in England and Wales throughout the whole of the period between *c.* 1750 and 1914, and pays particular attention to the role of nutrition. It offers a qualified defence of the McKeown hypothesis, and argues that nutrition needs to be regarded as one of a battery of factors, often interacting, which played a key role in Britain's mortality transition.

LEE K.-S. (2007), '**Infant Mortality Decline in the Late 19th Century and Early 20th Century: Role of Market Milk**', ***Perspectives in Biology and Medicine,*** Vol 50(4).
Starting in the late and early 20th centuries, an unprecedented decline in infant mortality was observed in the U. S. and Western Europe. Economic growth, improved nutrition, new sanitary measures, and an advance in knowledge for the infant care were implicated to this decline in infant mortality. Only a few investigated how these individual factors affected disease-specific components of infant mortality over time. The thematic investigative review on historical

data suggests that cleaning the market milk supply was the single most important contributor to this decline in both diarrheal and overall infant mortality and took a far more important role than family income, other sanitary measures, or a medical intervention.

Le Luyer B. & Sautereau M. (1992), '**Du lait qui tue au lait qui sauve : histoire d'une révolution médicale et culturelle, 1870-1930**', ***Cahiers d'Histoire,*** vol. 37, no3-4, pp. 279-308.
Milk is always the first source food in the life of newborn infants. However, with the industrial revolution, many women worked, and breast-feeding was substituted with bottle-feeding. Despite the work by Pasteur which contributed to producing sterilised milk, bottle-feeding was carried out under appalling hygiene conditions and infant mortality was high until laws and milk production and distribution regulations were imposed between 1870 and 1930.

Livi-Bacci M. (1983), "**The Nutrition-Mortality Link in past Times: A Comment**", ***Journal of Interdisciplinary History,*** Vol. 14(2), n° special "Hunger and History: The Impact of Changing Food Production and Consumption Patterns on Society", pp. 293- 298.
No abstract available.

McKeown T. (1976), ***The Modern Rise of Population,*** E. Arnold, 168p.
No abstract available.

Rollet-Echalier C. (1978), '**Allaitement, mise en nourrice et mortalité infantile en France à la fin du XIX^e^ siècle**', ***Population,*** Volume 33, Numéro 6, pp. 1189-1203.
Through administrative sources, we know the number of babies placed with a wet nurse between 1890-1910 in France and the number that died before they were a year old. This enables to draw up a map of feeding methods in France at that time: north of the Loire the most frequently used method was animal milk, whereas in the Mediterranean regions breast feeding was more frequent. The reasons for these considerable regional differences are to be found on the one hand in the industrial locations and women's jobs which resulted from it, and on the other the location of livestock farming areas. This had significant consequences on infant mortality, which was high before Pasteur in the bottle-feeding regions but also high in those infants weaned late.

Rollet-Echalier C. (2001), '**La santé et la protection de l'enfant vues à travers les Congrès internationaux (1880-1920)**', ***Annales de démographie historique.***
Although each industrialised country has a unique history of infancy, it is also true that a common culture emerged from the end of the XIX^th^ century, at the time when international congresses became interested in infancy, sometimes exclusively dedicated to this topic. The stages of this construction are analysed from a sample of conferences devoted to the protection of infants and Gouttes de Lait. The first approach, strongly marked by the French experience, can be qualified as a legal-administrative approach: it involves the protection of infants at risk. The influence of the Latin countries and particularly France prevails. The second approach is medical: it involves fighting against infant mortality through appropriate means. This approach is empirical and technical and is also marked by French and European influences. The third approach is orientated towards the link between mother and child, education and the role of women as professionals and bears the sign of change in the power struggle during the First World War. The influence of the United States and the Anglo-Saxon example of the family came to the fore..

Rollet-Echalier C. (1991), ***La politique à l'égard de la petite enfance sous la III^e^ République,*** Paris, INED.
No abstract available.

ROLLET-ECHALIER C., **'The fight against infant mortality in the past: an international comparison', in BIDEAU B., DESJARDINS B. & PÉREZ BRIGNOLI H.** (1998), ***Infant and Child Mortality in the Past,*** Oxford University Press, pp. 38-60.
This article critically examines the role of medicine, government, and people in reducing infant mortality (IM) in industrialized countries and in reaching demographic transition. IM decline tends not to be a linear process. Meckel (1990) and Rollet (1990s) indicate 3-4 stages in the awareness of IM. By the mid-1860s, IM was acknowledged as a social, demographic, and political problem. The 2nd stage, around 1880-90, focused on doctors and the technology. The 3rd stage focused at the turn of the century on the role of mothers. The 4th stage, after World War I, views children in a family context and according to financial needs. Countries have different public and private sector roles to protect children. Some countries were organized around a strong central authority, while the US had a decentralized structure with less continuity. The state and private sectors emphasized social needs and lower class responses to social controls. Medical intervention styles varied between countries. The French model linked medical visits with milk distribution and education of new mothers. The US offered milk distribution centers, but without consultations. French consultation systems did not agree with the British value system. Women in the US always played a strong role in child welfare. The UN passed the Declaration of the Rights of the Child. Child welfare was first viewed as key to a nation's well-being and then as the object of specific policies. Now the principles of milk and medicine plus tenderness and personalized care are widely accepted. All societies had a continuous, dynamic demographic process. Many unanswered questions remain.

SRETZER S. (1988), **'The Importance of Social Intervention in Britain's Mortality Decline c.1850-1914: a Re-interpretation of The Role of Public Health'**, ***Social History of Medicine,*** 1(1):1-38.
It continues to be generally accepted that the iconoclastic research work of Professor Thomas McKeown and associates conclusively demonstrated that the medical establishment including all the efforts of the public health movement-played only a minor role in the grand historical and demographic drama of the period, the secular decline in national mortality levels. According to McKeown's apparently authoritative analysis and interpretation of the available epidemiological statistics, the mortality decline in England and Wales can be primarily accounted for by the benevolent "invisible hand" of gradually rising living standards, particularly in the form of increases in per capita nutritional consumption. The coherence of this view is brought into question by a critical re-examination of the supporting evidence and arguments presented by McKeown *et al*. It is anticipated that for many of those not closely acquainted with the "McKeown thesis", the fragility of the case may come as something of a surprise. An alternative interpretation of the same epidemiological evidence then forms the basis for a revisionist account which directs attention to the leading role played by the public health movement and its locally administered preventive health measures in combating the urban congestion created by industrialization.

WILLIAMS, N.J. AND GALLEY, C. (1995) **"Urban-rural differentials in infant mortality in Victorian England"**, ***Population Studies,*** vol. 49, pp. 401-20.
This paper examines the magnitude of urban-rural differentials in infant mortality in England during the nineteenth and early twentieth centuries and also compares the timing of decline for a selection of towns of varying size, and their immediate rural hinterlands. Most towns continued to experience short-term fluctuations in infant mortality until the very end of the nineteenth century; however, in some of the adjacent rural communities – where levels of infant mortality were much lower – conditions were sufficiently favourable to allow a continuous decline in infant mortality from at least the 1860s, if not before. The final part of the paper considers the causes of these patterns and their implications for explanations of infant mortality decline.

Williams, N. J. and Mooney, G. (1994) '**Infant mortality in the age of great cities: London and the English provincial cities compared c.1840-1910**', ***Continuity and Change,*** 9, pp.185-212.
This study uses published vital registration data to construct annual infant mortality rates for 21 large English towns and 25 districts in London between 1840 and 1910. Using a comparative geographical approach, differentials in levels of infant mortality and short-run cyclical movements are examined. While local factors (urban growth, prevailing sanitary conditions, methods of feeding and the quality of the milk supply) all affected levels of infant mortality, the close correspondence in the timing of movements of infant mortality suggest that a more general set of factors operated throughout the entire urban system at the same time. Of these, the interaction of climate and poor sanitary conditions is given particular emphasis.

Woods R. I., Watterson P. A. & Woodward, J.H. (1988 & 1989) '**The causes of rapid infant mortality decline in England and Wales, 1861-1921**' Part I, 1988, ***Population Studies*** 42, pp.343-68, and Part II, 1989, ***Population Studies,*** 34, pp.113-32.
No abstract available.

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