Challenges for Childhood Health and Nutrition Research in Latin America addressing the 90/10 gap

A Regional Latin American Agenda for Applied Health and Nutrition Research

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Child Health and Nutrition Research Initiative (CHNRI)

Challenges for Childhood Health and Nutrition Research in Latin America: addressing the 90/10 gap
A Regional Latin American agenda for applied health and nutrition research based on current nutritional problems and programs and existing scientific research capacity in the region

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Child Health and Nutrition Research Initiative

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Introduction and Background

Latin America faces a double burden of nutritional disease that affects health throughout the life course. Most countries in the region are at different stages of the demographic/ health/nutrition transition with varying combinations of deficiency diseases and a rapid emergence of diet related chronic disease. The countries need to resolve pending problems related to undernutrition (protein-energy and micronutrient deficiencies, including iron, zinc, vitamin A and folate) and at the same time they must also address the progressive rise in nutrition related chronic disease NRCDs (obesity throughout the life course, diabetes, hypertension and cardiovascular diseases). Countries such as Guatemala, Bolivia and Peru are early in this transition and have high rates of both infant and adult mortality while others like Colombia, Venezuela, Brazil and Mexico have decreased their infant mortality rates substantially but still face some undernutrition problems and NRCD are on the rise. A third group that includes Costa Rica, Cuba and Chile has completed their transition with low childhood mortality and a predominance of NR-CD.

The main nutrition related problems in children in Latin America are:

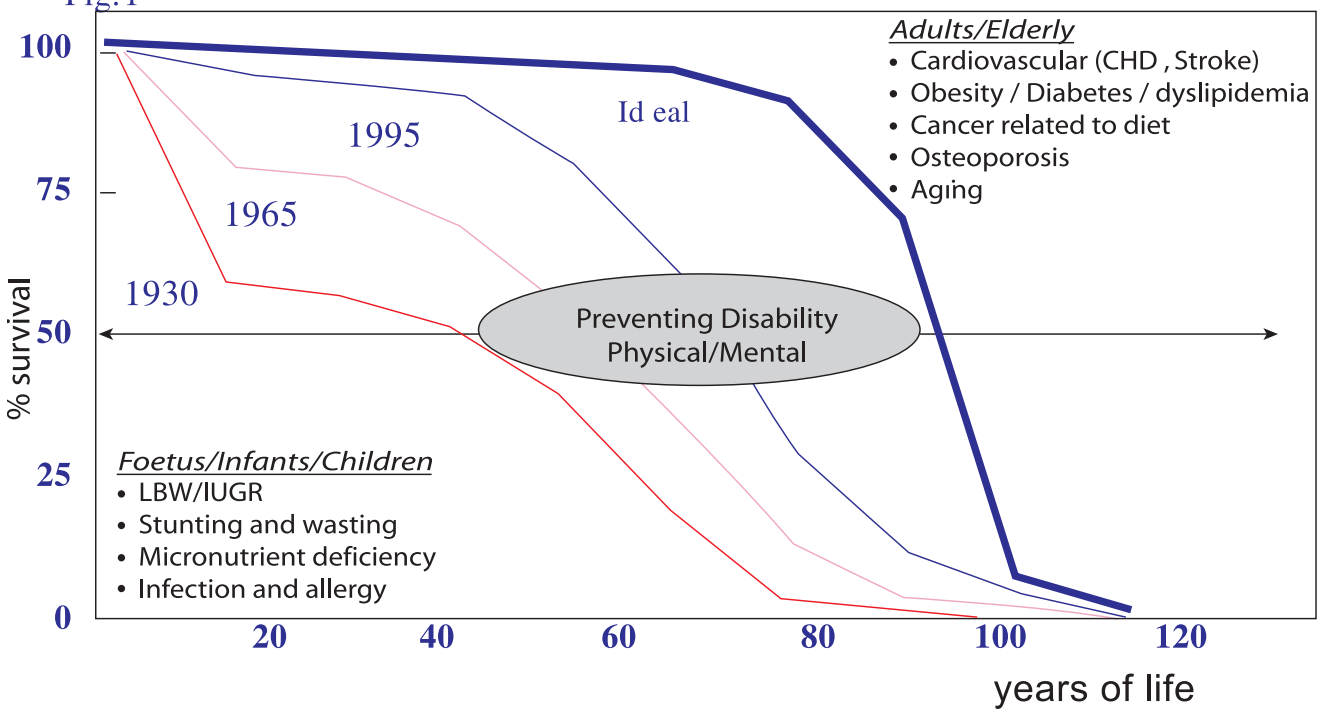
Stunting

One out of every four children is stunted and fails to reach their genetic growth potential and many have restricted growth before they are born. Such nutritional deficiencies have well-documented consequences for intellectual development, school performance and future earnings. Severe wasting due to protein energy malnutrition has re-emerged in some countries, particularly during natural or economic disasters, as a fatal condition because of its effects on the immune response and other host defense systems. Short stature among young girls puts them at future risk of difficult delivery, elevating their risk of significant morbidity and/or mortality during childbirth while conditioning low birth weight, producing an inter-generational vicious cycle of malnutrition which restricts human and social development.

Micronutrient Deficiencies

More than 50% of all infants and young children suffer from anemia, which compromises their cognitive development and educational performance. Anemia in adolescent girls of reproductive age increases their risk of severe and/or fatal hemorrhage during childbirth. Among the workforce, it limits productivity and remuneration. Although, anemia is a result of several factors, the principal causes of anemia are micronutrient deficiencies, particularly iron deficiency. The prevalence of iron deficiency in the region are even higher (at least double) than anemia prevalence. Zinc deficiency com-

Fig. 1



promises linear growth and increases the incidence and severity of common childhood illnesses. Marginal vitamin A deficiency in young children is common in the region and may be responsible for the high mortality rates in some countries. Folate deficiency during pregnancy causes neural tube defects, the leading cause of preventable birth defects.

Child Obesity

The prevalence of obesity in children is increasing considerably, particularly in urban low income groups. Obesity in children increases the risk of several non communicable chronic diseases during adulthood, including high blood pressure, diabetes, heart disease, and stroke, which are the leading causes of morbidity and mortality in the Region. Unlike the acute infectious diseases of the past century, these conditions are not easily prevented and controlled through health service delivery but require significant environmental changes to facilitate healthy choices in diet and physical activity.

The concept of how early nutrition may affect the prevalence of nutrition related chronic disease has not been incorporated to the thinking of conditioning factors for health or to the programmatic action in maternal and child health. The importance of abnormal fetal growth as a significant determinant of the metabolic syndrome (abdominal obesity, glucose intolerance, hypertension, dyslipidemia, leading to diabetes and cardiovascular disease) is largely ignored in the LA region. This is an important omission since this approach permits the integration of both contrasting sides of nutrition problem in the region. This integrated lifecycle approach indicates that by improving birth weight distributions, avoiding both fetal growth restriction as well as macrosomia, we can contribute to the prevention of nutrition related chronic disease. Likewise enhancing linear growth by exclusive breast feeding and appropriate complementary feeding will prevent stunting and contribute to avoid obesity. These interventions in early life serve to prevent the consequences of the metabolic syndrome in adult life as well as the consequences of undernutrition during early life and its effects on human capital. Healthy diets and active living during childhood serve to prevent obesity and undernutrition and to avoid their life long consequences.

The region of Latin America has a respectable tradition in child health and nutrition research and program implementation. Unfortunately most research centers in the region have not updated their tools and most programs are outdated relative to the changing scenario. Underweight is no longer the main problem; protein energy malnutrition is no longer the most prevalent nutrition related condition that affects health, yet a substantial amount of activities are still focused on malnutrition control and prevention. Linear growth restriction is presently the most prevalent problem; in fact many stunted children are of normal weight for stature or even overweight for their stature. Moreover, obesity is currently more prevalent than underweight in most countries. Finally, micronutrient deficiencies are highly prevalent and have been resilient to poorly implemented fortification or supplementation programs.

Overall and specific objectives.

The aim of the project was to contribute to regional efforts for accelerating human and social development in the Latin-American Region by improving the nutrition and health of children.

The overall objective of the program was to define a regional agenda for applied health and nutrition research based on the current epidemiological profile, the set of programs and policies available for the prevention and control of malnutrition, and the existing capacity for scientific research

In order to reach this overall objective, the following specific objectives were proposed:

- Identify the key nutrition problems of children in Latin America during childhood and throughout the life cycle.
- Propose health and nutrition research priorities integrat ing the epidemiological evidence and the science base available in the region.
- Define a geographic/physical map of the individual researchers, organizations, universities, NGOs and other organizations that play a role in the field of child health and nutrition research in the region.
- Generate a discussion of the 'regional profile' and research agenda among research institutions, national governments and potential donors.
- Develop self-training modules that address the priority setting process for short-term training activities.
- Edit a set of final documents and disseminate results widely after receiving input from the applied research community, national and regional organizations, and potential donors.

Methodology/Study focus and Approach

The project activities were conducted from March 2002 through April 2003.

Partners

The project development was accomplished by a coordinated effort between two partner institutions; the Institute of Nutrition and Food Technology (INTA Chile) and the National Institute of Public Health (INSP Mexico). These institutions were responsible for the project, working as core centers of the network, coordinating the collaboration of researchers in seven other countries. INSP (Mexico) supervised data collection in Costa Rica, Guatemala and Venezuela and INTA (Chile) supervised data collection in Peru, Brazil, Colombia and Cuba.

Research strategies

The main communication tool through the process of this project has been electronic mail. Additionally, two planning meetings took place during 2002. Conducting these activities in parallel to other research meetings minimized the costs. The meetings enabled the two principal investigators of the project to interact and review progress assuring coordinated actions.

The first meeting took place in Sao Paulo, Brazil in April 2002. In addition to planning the detailed implementation of the project, the meeting served the objective of exploring the Brazilian participation in the project from University of Pelotas in Brazil. The second meeting took place in Cuernavaca, Mexico in August 2002 with the objective of reviewing the ongoing project activities.

Methods for data collection and data analysis

Data collection focused on the following information obtained from the countries studied: a) the epidemiological profiles in relation to the nutritional status of the population, b) institutions conducting research in the area of nutrition and their capacity and c) nutrition intervention programs in operation.

Information on each of the three areas reported in this monograph was obtained in a standardized way in all countries using the methodology described below.

Epidemiological Profiles

An epidemiological profile questionnaire was developed. The questionnaire contains 7 sections with 64 indicators regarding demographic, socioeconomic, mortality, morbidity, and nutritional status indicators, as well as risk factors and resources, and access and coverage indicators (for questionnaire visit: **http://latinut.net**)

The information was collected using published data available online from the 9 countries studied. The main web pages consulted were WHO/PAHO, UNICEF, FAO, UNDP, and World Bank. The completed questionnaires were sent to collaborators in each country for reviewing collected information, updating figures when local reliable information was available, and completing missing data using national sources.

Once the epidemiological profiles were reviewed and completed by the country collaborators, the information was sent to experts for its analysis according to five relevant public health nutritional problems: low birth weight (LWB), micronutrient and stunting, undernutrition and severe protein energy malnutrition (PEM), selected micronutrient deficiencies (iron, folic acid), and child obesity. The researchers invited to participate in this process are experts in each of the selected nutritional problems at the following institutions: INTA/Chile, INSP/México, UFPel/Brazil, IIN/Peru, and Universidad de la Plata/Argentina.

Profile of Institutional capacity on nutrition research

Collaborators in each of the studied countries were asked to prepare an inventory of institutions working in nutrition research in their country. The requested information included the name of the institution, director's name and e-mail, and name and e-mail of a contact person.

A questionnaire was developed and applied at the institutions working in nutrition research identified by our collaborators. The questionnaire inquired about the areas of research, source of funding, institutional objectives and/or strategic plan, main research priorities, funded research projects, networking activities, outreach programs, research productivity, and publications. The questionnaire, designed in a word format, was divided in three sections with a total of 25 questions, most of them designed for short answers and to be completed in about 20 minutes.. The Institutions were also asked to send a list of their publications between 1999 and 2003.

The questionnaire was sent as an attached document to the institutions directors or contact person (when the first was not available). The e-mail message was standard, consisted of an introduction letter signed by the project investigators

After sending the questionnaires, each country collaborator was asked to follow up by telephone calls. The collection data period was from July 2002 through March 2003 (for questionnaire visit: **http://latinut.net)**

Food and Nutrition Intervention Programs Profile

A questionnaire was developed to collect information regarding food and nutrition programs with high coverage in the countries studied. The questionnaire had five sections (See questionnaire in Appendix I or visit: www.latinut.net):

a) Program's general information: main objectives, target population and goals.

b) Nutritional content of foods distributed by pro grams.

c) Nutritional content of micronutrient supplements and fortified foods distributed by programs.

d) Nutrition education, community participation and monitoring and evaluation components.

e) Norms and cost.

The instrument was designed for completion by country collaborators who identified the main Food and Nutrition Intervention Programs in their countries and conducted the interview with program managers.

A total of 57 questionnaires were filled out in eight out of the nine countries: six from Colombia, four from Costa Rica, six from Cuba, seven from Chile, twelve form Guatemala, eight form Mexico, seven from Peru and seven from Venezuela.

National and Institutional research priorities

Information about national and institutional research priorities was obtained through the survey conducted in the research institutions in the countries studied.
The survey was conducted using a pre-tested questionnaire and was sent to identified nutrition and health research institutions in the nine Latin-American countries studied.
For these purposes, we compared the institutional research priorities in each country with their main nutritional problems identified by the epidemiological profile developed as part of this project. We used the prevalence categories described in that report for each priority problem to establish severe, moderate and mild intensity of nutritional problems and to identify the principal nutrition problems in each country and for the summary of countries studied.

The National Priorities were based on information provided by institutions and not official government documents, since very few countries have clearly defined national priorities. The number of responses for national and institutional priorities, from the total potential responses (based on maximum of three per institution), allowed us to define a rate for each priority class based on the frequency with which it was quoted over the total number of priorities mentioned by all respondents

We compared the national and institutional research priorities in each country with their main nutritional problems identified by the epidemiological profile and with publications produced by these institutions in order to assess congruency.

Analyze the publications of the identified institutions to determine how well these publications respond to the problems found in the region and to the stated priorities.

The following is the description of the criteria used for the classification of the list of publications sent by the research institutions.

The classification was conducted on the basis of the manuscript title, which was assessed independently by two investigators using the following criteria:

a) Only publications for 1999-2003 were considered

b) Articles for which the titles suggested a literature review as well as book chapters were not considered for this classification and analysis

c) Studies with a very similar title accepted for publica tion at different sites, were considered

d) Publications that appear simultaneously for two insti tutions (ie. INCAP and INSP) were considered for both institutions

Whenever the title indicated that the study was not related to one of the nutritional problems of reference, it was categorized as not applicable (N/A).

Publications were grouped into each nutritional problem and discipline described below:

Nutritional problems; Low Birth Weight (LBW); Micronutrients and anemia (Micronutr); Nutrition related chronic diseases (NRCD) including Obesity-NRCD (O-NRCD); Stunting (Stunt); Undernutrition (Wasting): including all studies related to PEM and undernourished children, including breastfeeding.

Finally, the publications were grouped according to whether they were indexed in Medline, Lilacs or not indexed. The classification into Medline and Lilacs indices was not mutually exclusive; therefore, the total numbers of publications classified into the three categories was more than the number of publications.

Results and discussion

The countries in Latin America are experiencing the same demographical and epidemiological changes of societies in transition: lower fertility rates, rapid aging and increasing urbanization (PAHO/Health Situation Analysis of the Americas.1998). Latin American countries are characterized by the young age structure of its population and by a high percentage of the population living in urban areas; with different levels of urbanization among the countries.

Two types of information were collected: (1) Information collected by electronic searching in web pages of international organizations and (2) Information collected from national sources by each country collaborator when available and founded. The information available was not always national statistics; however it was used as the country estimation when the national values did not exist or were not founded.

Epidemiological Profile

Nutrition related Indicators: The United Nations ACC/SCN commission for nutrition challenges in the XXI century defined a new paradigm to explore nutritional problems in developing countries: the double burden of nutrition related disease (undernutrition and micronutrients related disease co-existing with diet-related non-communicable chronic diseases). In this report available data is presented from Latin American countries related to this double burden with a life course perspective. Table 1 presents the principal nutrition related problems found in the Latin American countries studied.

The most prevalent nutritional problems are the micronutrient deficiencies and anemia in children, in addition, the vitamin A deficiency in children younger than 3 years of age is also prevalent in the countries of the region. Low height or stunting as well as low birth weight are moderately prevalent in the countries, while wasting is no longer a problem of public health dimensions in the region.

Table 2 shows the criteria used to identify the severity of the prevalence of nutritional problems in the countries of the region in order to compare prevalence with research priorities.Table 3 shows the number of countries at each

Table 1: The principal nutritional problems in children among the countries that responded in the study include Anemia, Vitamin A deficiency, Low birth weight, Wasting and Stunting.

Country	Micronutrient deficiencies & Anemia [2] Children under 5 yrs	Vitamin A deficiency [3] in children < 3 yrs	LBW infants (< 2500 grams)	Wasting [5] in children <5 yrs	Stunting [6] in children < 5 yrs
Brazil	48.0	-	10.0	2.3	10.5
Colombia	-	23.3	9.0	0.8	13.5
Costa Rica	21.6	8.7 (<6yrs)	7.0	2.3	6.1
Cuba	46.0 (0.5-3 yrs)	3.6 (0.5-2 yrs)	6.0	2.0	4.6
Chile	19.0	-	5.0	0.3	1.5
Guatemala	26	15.8	13.0	2.5	46.4
Mexico	27.2	27.2 (<2 yrs)	9.0	2.0	17.7
Peru	27.8	13.1	11.0	0.9	25.4
Venezuela	52 (<3 yrs)	30.5	7.0	3.0	12.8

Source: 5th Report on the World Nutrition Situation, Pan American Health Organization (Country Health Profiles), World Health Organization (WHO) and National Nutrition Survey (only in Costa Rica, Cuba, Mexico).

[2] Hemoglobin <11g/dl adjusted by altitude
[3] Serum retinol <20 mg/dl
[4] Defined as Body Mass Index (BMI) in kg/square height in meters
[5] Underweight is defined as <-2 standard deviations of the weight-for-height median value of the NCHS/WHO international reference data.
[6] Stunting is defined as <-2 standard deviations of the height-for-age median value of the NCHS/WHO international reference data.

Table 2: Severity criteria for each nutritional indicator

Level of severity *	Prev. of anemia[1]		Prev. of Vitamin A[2] deficiency in children under 3 yrs	% of infants with low birth weight (< 2500 grams)	Prev. of underweight[5] in children under 5 yrs	Prev. of stunting[6] in children under 5 yrs
	Children under 5	Pregnant women				
Severe	> 40	>25	>20	>10	> 5	>25
Moderate	12-40	12-25	10-20	5 -10	4	5-25
Mild	<12	<12	<10	<5	2-3	<5

* Based on severity categories given by Working Groups (see Report 2003) (Definitions are in table 1)

Table 3: Number of countries per level of severity for each nutritional indicator (based on Table 2 values)

Level of severity *	Prev. of anemia[1]	Prev. of Vitamin A[2] deficiency in children under 3 yrs	% of infants with low birth weight (< 2500 grams)	Prev. of wasting in children under 5 yrs	Prev. of stunting[6] in children under 5 yrs
	Children under 5 yrs				
Severe	3	3	2	-	2
Moderate	5	2	7	-	5
Mild	-	2	-	6	2
Number of Countries	8/9	7/9	9/9	9/9(*)	9/9

(*) 3 countries fall in the level of "no problems exist" (Definitions are in Table 1)

level of severity for the nutritional problems identified. The top three most prevalent nutritional problems are stunting, low birth weight, and anemia and micronutrient deficiencies. Wasting ranks last, since the problem is classified as mild or non existing in all countries.

Institutional Resources for Research in nutrition

A descriptive analysis of institutions that work in nutrition and health related research in the Latin-American studied countries (Brazil, Chile, Colombia, Costa Rica, Cuba, Guatemala, Mexico, Peru, and Venezuela) is presented in this section. Questionnaires were voluntarily responded and send by e-mail to project coordinators of the research institutions; therefore the data represent an approximation to the total number of research institutions in the studied countries.

The number of research institutions in most of the nine studied countries is fairly low, only two in Venezuela and as much as 7 in Mexico. The only country that shows a significant higher number is Brazil, with nineteen research institutions. Out of the 54 institutions studied 80% of those are from the public sector and 20% form the private sector.
Research institutions are mainly academic (63%) or research centers (25%), and they usually do both research and dissemination of information, through nutrition and health related careers. All of the institutions perform research and additional activities including teaching (87%), health promotion (57%), and technical (41%) and clinical assistance (35%).

The number of researchers in LA research institutions is fairly low, with 81% of the responded institutions having less than 25 professionals.

Limitations across all the institutions are mentioned frequently. Existing limitations most often identified were economic resources (90%) and equipment (85%), followed by laboratory infrastructure (80%), trained human resources and external advisers (80%). Ninety six percent of the institutions were interested in working in Latin American networks. The top two interests for networking were Nutrition Related Non Communicable Diseases and Micronutrient deficiencies.

Food and Nutrition Intervention Programs.

The summary of the main nutrition intervention programs, as well as the questionnaires available, were placed on the Latinut web page **(http://latinut.net).**

Each intervention program was classified into one or more of the following categories: food distribution, micronutrient fortification, micronutrient supplementation, food subsidy, money transference, nutrition education and promotion of physical activity..

A list was generated of nutrition intervention programs with available information, organized per country, and a total of 59 programs were identified. From the total number of programs reported by the country 29 were food distribution and 20 were micronutrient fortification. The countries also reported 5 micronutrient supplementation, 5 money transfer and 2 food subsidy and physical education programs respectively. The final program was related to nutrition education.

Programs that provided take home rations were included in the category of food distribution as well as in site feeding programs such as school feeding programs and centers for nutrition recovery. All the countries, except for Cuba, targeted the programs to high risk population groups in terms of socioeconomic conditions and vulnerable groups.

The information collected was based on reports which showed that all countries, except Venezuela, have at least one food distribution program oriented towards the more vulnerable groups: young children and pregnant and lactating women. Regarding the age of children, Colombia and Mexico targeted children less than two years of age and Cuba and Peru to the less-than three years of age. The remaining countries targeted children <7 and <5 years of age.

All of the studied countries have implemented school-feeding programs though they aim at different age groups: Guatemala targets school age children; Venezuela and Colombia target school age children and adolescents, and the remaining countries target preschool, school and adolescents children. Chile, Guatemala, Mexico and Venezuela include within the vulnerable groups the elderly and have an additional intervention program for that population.

Concerning food subsidy programs, information was reported for Mexico and Venezuela. In both countries poor families can buy a food item or a package of the basic commonly consumed foods at low cost. Only Mexico has a conditional cash transfer program that includes direct money transfers conditioned upon family investment in health, nutrition and education of children. In addition, fortified food supplements are distributed to children and to pregnant and lactating women.

Table 4: National and Institutional research priorities by category and country.

Country (Number of Institutions analyzed)	Priorities	Nutritional Problems**						Priorities Specified/ Possible #
		Wasting	Stunt	LBW	MicroNutr & Anemia	NRCD	FdSec	
Brazil (20)	National	0.	0.02	0.05	0.19	0.14	0.07	25/63
	Institutional	0.14	0.05	0.07	0.21	0.07	0.07	30/63
Colombia (5)	National	0.11				0.22	0.33	6/15
	Institutional	0.14		0.07	0.07	0.14	0.22	12/15
Costa Rica (4)	National				0.10	0.10	0.20	5/12
	Institutional				0.33	0.33		4/12
Cuba (3)	National				0.14	0.43	0.14	5/9
	Institutional				0.14	0.43	0.14	5/9
Chile (6)	National					0.43		3/18
	Institutional					0.15	0.08	5/18
Guatemala (4)	National							0/12
	Institutional			0.14	0.43	0.14		5/12
Mexico (9)	National	0.12		0.04	0.20	0.16	0.08	15/27
	Institutional	0.05	0.10	0.10	0.15	0.10		10/27
Peru (4)	National	0.08	0.08	0.25	0.17	0.08		8/12
	Institutional			0.17	0.17			2/12
Venezuela (3)	National			0.17	0.33			3/9
	Institutional				0.12			1/9
Priorities Summary	**National**	**0.43**	**0.10**	**0.51**	**1.13**	**1.76**	**0.82**	**70/177**
	Institutional	**0.33**	**0.15**	**0.55**	**1.62**	**1.36**	**0.51**	**74/177**

* Proportion for each category based on total potential responses; # Number of responses per category of total potential responses (max 3 per institution); **

Mandatory micronutrient fortification is the most common intervention being implemented to prevent and control micronutrient deficiencies in Latin America. Salt and wheat flour are the universal vehicles used for iodine and iron fortification respectively. Some countries have national fortification programs using maize flour such as Costa Rica, Mexico and Venezuela; this last uses precooked maize flour as the universal vehicle for vitamin A in addition to iron. Other foods used less commonly for micronutrient fortification among the region are milk with iron and other micronutrients in Costa Rica, Chile and Mexico and sugar with Vitamin A in Guatemala.

Nutrition Education Programs are not commonly implemented in the region and when included as a component of other programs they are weakly designed. Thirty one programs stated having a nutrition education component, however only Guatemala reported having a program completely devoted to this matter, however it has not established goals and indicators for evaluating its performance. Of the remaining countries, thirteen have defined specifics goals and only four adequate indicators for nutrition education. Only Guatemala and Venezuela reported having individual programs for the promotion of breast-feeding.

No country reported having national programs for the prevention of NCRD related to diet and only Chile has implemented a program for the promotion of physical activity. The lack of programs in this area is remarkably important considering the rapid increase of the obesity and other NCRDs in the region, and the important roles that physical activity and adequate diets play in the prevention of these diseases.

Analysis of national and institutional priorities and publications.

The information for national and institutional priorities was summarized based on the nutritional/health problems being addressed.

Table 5: Publications per Nutritional Priorities per country

Country	Priority Nutritional Problems								
	Fd Safety N(%)	Wasting N(%)	Stunt N(%)	LBW N(%)	Micronutr & Anemia N(%)	NRCD N(%)	O-NRCD N(%)	N/A*	Total
Brazil	5(2)	45(18)	5(2)	15(6)	38(15)	70(28)	NA	75(30)	250(100)
Chile	1 (0)	17 (4)	16 (3)	18 (4)	87 (19)	106 (23)	30 (6)	191 (41)	466 (100)
Colombia	7(14)	2 (4)	1 (2)	2 (4)	7 (14)	9 (18)	2 (4)	19 (39)	49 (100)
Costa Rica	7(10)	0 (0)	0 (0)	1 (1)	17 (24)	28 (39)	4 (6)	14 (20)	71 (100)
Cuba	0 (0)	1 (8)	0 (0)	0 (0)	3 (25)	2 (17)	6 (50)	0 (0)	12 (100)
Guatemala	0 (0)	7 (15)	1 (2)	2 (4)	9 (19)	8 (17)	0 (0)	21 (44)	48 (100)
Mexico	0 (0)	36 (30)	3 (3)	3 (3)	24 (20)	8 (7)	6 (5)	40 (33)	120(100)
Peru	4 (8)	13 (25)	1 (2)	3 (6)	20 (40)	2 (4)	2 (4)	6 (12)	51 (100)
Venezuela	0 (0)	9 (56)	1 (6)	2 (13)	2 (13)	0 (0)	0 (0)	2 (13)	16 (100)
Total 9 countries	**24 (2.2%)**	**130 (12.0%)**	**28 (2.6%)**	**46 (4.2%)**	**207 (19.1%)**	**233 (21.5%)**	**50 (4.6%)**	**368 (35.0%)**	**1083 (100%)**

N/A*: Not Applicable or Nutritional Problems not classified within priorities

National and Institutional Priorities are based on information provided by institutions and not by official government documents; since very few countries have clearly defined national priorities. The number of responses for national priorities, from the total potential responses (based on maximum of three per institution), allowed us to define a rate for each priority class based on the frequency with which it was quoted over the total number of priorities mentioned by all respondents.

Table 3 shows the national and institutional priorities by nutritional problem per country. Many countries included as national or institutional priorities disciplinary areas (i.e., clinical nutrition, basic sciences, policy and programs), rather than nutrition problems. However, for the purposes of this analysis, only the responses regarding national and institutional priorities related to nutritional problems were considered (Table 3); therefore, the sum of the fractions for each nutrition problem do not add up to 1, since priorities related to disciplinary areas were not included in the Table. However, the fractions allow identifying the order of priorities assigned to each problem.

Table 4 shows that the leading nutrition related research priority in the region is micronutrient deficiencies and anemia (score 1,76 and 1.36, for national and institutional, respectively). The second research priority is nutrition related chronic diseases (1.13 and 1.62, respectively) even though this is not a child related category as are the others. The third research priority is low birth weight followed by wasting and surprisingly stunting lags behind. Though the table only includes research priorities related to nutritional problems, many countries also place high priority on research in discipline areas such as policy and programs and clinical nutrition. In general, there is agreement between stated research priorities and the principal nutrition problems, with the exception of wasting and stunting. Although wasting is no longer a public health concern in the region, it still ranks high in terms of research priorities; the opposite is true for stunting which is one of the principal research priorities but ranks low in terms of stated research priorities.

In addition, the publications of the identified institutions were analyzed to determine how well these publications respond to the problems found in the region and to the stated priorities. The analysis of peer-reviewed publications can provide an indication of actual research priorities as

Table 6: Research priorities according to prevalence (epidemiological data), stated Institutional priorities and publications.

Priorities	Wasting	Stunting	LBW	Miconutrients and anemia	NRCD	Food Safety
Epidemiology	5	3	4	1	2	-
Institutional	5	6	3	1	2	4
Publications	3	5	4	1-2	1-2	6

opposed to declared priorities by the institutions. The analysis of the publication lists is a way to describe the research topics and disciplines by the Latin American institutions working in the area of nutrition and how those topics and disciplines relate to stated national and institutional priorities by those institutions.

Table 5 describes the publications per nutritional priorities per country. Over a third (35%) of published research does not deal with any of the principal nutrition problems, which indicates that research topics do not follow the principal public nutrition problems in the countries studied. Among publications related to the principal problems NCCD and obesity rank first, followed by anemia and micronutrient deficiencies and wasting, while stunting lags behind. Again, there is general agreement with the exception of wasting and stunting. While wasting ranks high in terms of publication it is no longer a public health concern. In contrast, stunting, which ranks low in research is an important public nutrition problem.

Finally table 6 summarizes the congruency between the prevalence of the problems, the started research priorities and the publications. In general there is congruency, except for stunting and to some degree wasting.

Recommendations and Policy Implications

The findings of this project supported by CHNRI reveal a gross mismatch between the epidemiological profile and the present programmatic activities in most countries of the region. There is a definite need to update the child health and nutrition research agenda in the region. Most programmatic action in the region is still centered in the traditional malnutrition model, some progress is being made in addressing micronutrient deficiency. National and regional institutions should undertake periodic review of changing epidemiological profiles and prevalence of corresponding risk factors. The applied research agenda for countries and the regional priorities should be analyzed considering the changes in prevalent causes of death and disability as well as the need to reduce the related risk factors.

The LA region needs to take research beyond the descriptive phase and conduct the required controlled evaluations of cost effective interventions to prevent and control the prevalent problems that condition disability and loss of life.

Resource allocation for applied research should be based on priorities defined by the need for risk reduction related to prevalent problems and attributable population risk burden related to specific modifiable risk factors.

Funding agencies at national and regional levels should provide appropriate individual and group incentives to research productivity considering not only the quality of the research, but the impact it may have on the health and well being of the population in the LA region.

Research funding opportunities for collaboration between centers in advancing cost effective solutions to prevalent nutrition and health problems of children in the region should be promoted, expanded and facilitated.

Resource allocation of bilateral, multilateral and international donors in the region should address the need to strengthen local capacity and the need to train young scientists to secure a future for research centers in the region. Specific opportunities to support young researchers as they get established should be provided.

A regional forum for nutrition and health stakeholders in LA should be established with yearly meetings to serve as a clearing house/program review and harmonization/dissemination of new knowledge and its application to advance solutions to the prevalent problems. The GFHR/CHNRI is in a unique position to lead the way in this process inviting National Governments, bilateral and international donors, UN agencies, and NGOs (humanitarian, development and academic) to join in this effort.

Research productivity is low and publications in competitive

international journals are few. The region as a whole is very much underrepresented in terms of quantity and quality of publications. Priorities for child health and nutrition research within the region are often driven by international collaborations which although of great academic value in advancing knowledge, may not be the best way to acquire the knowledge needed to serve children in the region.

The linkages and research cooperation within countries and between countries in the region is extremely poor and in practice ineffective. Most links and flow of knowledge is unidirectional from north to south, the former being the proponent while the latter is the recipient of research methods and technology. There are scant or no resources allocated to south/south cooperation. The usual model is that groups from the south compete for limited research resources. Few if any networks for operational research are in existence

Political and economic instability are key factors in defining the prospects of research institutions in the LA region. Most centers have difficulties in keeping the best-trained researchers; many migrate to the north or abandon research and training careers in the public sector for more lucrative positions in the private sector.

Dissemination and Implementation plans.

The Information about the regional activities carried out as a result of this project is available at http://latinut.net Website The information generated by the project is also available in a CD for dissemination (800 copies have been distributed at regional meetings). The CD includes the epidemiological profiles, summary and detailed information on health and nutrition related research institutions in the 9 countries, summary and details of nutrition intervention programs active in the 9 countries studied, documents on each of the five key priority areas for action establishing determinants and strategies to address these problems by Working Groups and abstracts of published work in these areas conducted in the region over the past 5 years.

Definition of a Regional Agenda. Collaborative work of leading groups in the region was formulated based on the conclusions of the project. The purpose is to advance the objective of generationg relevant rsearch and actions aimed at improving nutrition and health of children to accelerate human and social development in the LA Region.

The regional agenda for applied health and nutrition research was presented at different forum in the LA region from 2003-2005:. At the Latin American Pediatric Society SLAIP/Chile, the Latin American Nutritional Society SLAN/Mexico, and the Federation of Pediatrics Society/Panama. It was also presented to donors, bilateral and UN agencies working on health and nutrition in the region to build consensus based on working groups which have been established as a strategy to focus on nutrition priority regional problems. These groups are composed of researchers from participating centers in the network of research institutions; they have been invited to address key health and nutrition problems of children in the region with a life course perspective. The final products are policy documents that integrate epidemiological evidence and the science base available in the region to propose recommendations for policy makers and program planners to address health and nutrition research priorities.

There are five Nutrition Working Groups: Acute Malnutrition, Stunting, Micronutrient Deficiencies, Nutrition Related Chronic Diseases (NRCD), and Food Security. Each one of these WGs is, at different stages, working on multicenter proposals. In November 2005 the Acute Malnutrition WG held a workshop and, as a result, there were 2 proposals of research projects which were funded and are under way currently and three publications in process. The Micronutrient Deficiency WG's conducted training at INTA of professionals from Bolivia and the Dominican Republic in the analytic technique to monitor folic acid fortification. The Food Security WG is in the phase of consolidation, and the other two WGs are looking for funding to implement multicenter projects, since their proposals are complete. A two day workshop of the Nutrition Related Chronic Diseases (NRCD) WG took place on April 20-21 in Argentina to discuss alternative strategies to carry out the NCRD project already written and to establish a complementary WG dedicated to Infant Obesity. During the (SLAN) Congress in November, 2006, all WG coordinators will participate as speakers at specific Symposiums. Presentations of the results of the Network projects will also be made. Finally, a third Steering Committee (SC) Meeting is planned as a parallel activity at SLAN. WG coordinators will be asked to present their yearly report and coming year (2007) activities to the SC

A sustainable organization to coordinate regional activities was created at the UNU sponsored meeting in November of 2004 in Santiago Chile. The steering committee as of this date is composed by the director of INSP-Nutrition Centre (Dr. Juan Rivera), the Director of INTA (Dr. Fernando Vio), the President of SLAN for the corresponding biennium (Dr. Helio Vannucci from Brazil) and Dr. Wilma Freire former regional director of the nutrition program at WHO/PAHO, currently at the Universidad de San Francisco in Quito, Ecuador.. The first meeting of the SC discussed potential activities from proposals received from the working groups and prepared the action plan for the following 2 years. The steering committee is providing guidance, the sustainability of the work is based on small core support from UNU/IUNS regional networking efforts and has been able to leverage modest support from UN and multilateral and bilateral agencies on behalf of capacity strengthening in the Latin American region.

Additional activities during 2005 included the creation of an in-progress informational database Health Virtual Library in Nutrition and LATINUT Project. The virtual library is presented in the webpage http://www.bireme.br. To date the SC approved the initiative of developing a Health Virtual Library in Nutrition (BVS-N, according to its Spanish acronym). It represents a useful technological tool to make possible functioning of the Latin-American Network, a support for the dissemination of a Regional Research Agenda, and a virtual space to interact and to develop specific web pages by each working group. Additionally, Latinut Project is compatible with the BVS-N and its integration will be supported. The BVS-N has also PAHO support. Currently Mexico, Chile and Brazil have set the regulations for database management and dissemination.
This work will facilitate accessing and retrieving information of geographic/physical map of the individual researchers, organizations, universities, NGOs and other organizations that play a role in the field of child health and nutrition research in the region. The final product will permit accessing the information using the bireme information platform for virtual libraries.

Other UNU-LA-FNP activities include the development of the Regional Nutrition Research Network and the Leadership Training Workshops with selected young professionals, held every three years as a complement activity of the Latin-American Nutrition Society (SLAN) Congress. A leadership workshop for the future leaders of Latin American has been developed and will take place at SLAN 2006. This workshop was organized by previous participants of this Leadership Workshop in coordination with the members of the UNU-LA-FNP.

The other important project currently in progress is the creation of an informational database of Nutrition Masters and PhD programs in Latin American countries. This database is expected to be completed by the end 2006 and will serve as establishment of quality standards and program accreditation in the region.

Finally, UNU activities have included the development of Regional Growth Standards, which serve as the new growth reference standards produced by the joint WHO/UNU Multi-country Growth Reference Standard MGRS is now in the implementation phase; a regional workshop was held at INSP Mexico with the participation of most countries in the region. The LA UNU program, jointly with PAHO/WHO, will play a key role in the implementation process in the region. UNU LA will disseminate the MGRS and explore ways to facilitate its implementation in the region through training activities and the existing working group activities. The MGRS has clear implications for the definition of undernutrition, stunting, and obesity, all key nutritional problems based on the epidemiology of the region's nutritional problems.

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