



Res Networks

New Ideas for Development

www.iadb.org/res

Latin American Research Network

Child Health, Poverty and the Role of Social Policies

Registration Form

Name of institution: CIESS-ECONOMETRICA BOLIVIA_____

Name of the participants:

Project Director: ROLANDO MORALES_____

Researcher 1: ANA MARIA AGUILAR_____

Researcher 2: ALVARO CALZADILLA_____

Name, title, phone number and e-mail of the person responsible for signing the letter of agreement with the Bank:

Name: ROLANDO MORALES_____

Title: DIRECTOR_____

Phone Number: (5912)-2417437 _____

Fax: (5912)-2411134_____

E-mail: rolando@caoba.entelnet.bo_____

Does the proposal include...? (Please check in the appropriate space):

The specific issues that will be analyzed and the data and methodology that will be applied: YES_

A summary of the existing literature and previous findings: YES___

A list of the researchers that will be involved in the project: YES___

Curriculum vitae of the researchers may appear in a separate annex (3 pags. maximum): YES___

A budget (in a separate annex) indicating items financed by the IDB contribution and those financed by the research center: YES___

PLEASE EMAIL ALL REQUESTED INFORMATION TO RED@IADB.ORG

CONTENTS

Why this topic is relevant for Bolivia	3
Revising the existing literature and previous finding	5
Main Hypothesis	8
The data	9
Methodology	10
Analytic issues	10
Model building	10
Asset index construction	11
Model estimation	12
a) Variable choice and building composite index.....	13
b) Endogeneity and measurement error bias	13
c) Robustness and specification test.....	13
Expected analytical and policy-oriented implications	14
Background of the researchers involved	14
References.....	15
Annex 1. Budget	Error! Bookmark not defined.
Annex 2. Curriculum vitae of the researchers	18
ROLANDO MORALES.....	18
ANA MARIA AGUILAR LIENDO	21
ALVARO LUIS CALZADILLA RIVERA	24
NOTAS	26

Why this topic is relevant for Bolivia

The Bolivian human development is worrisome. Infant and child mortality as well as preschool children malnutrition are among the worst in Latin America, particularly, in the highest and poorest region of the Altiplano.

The relationship between poverty, health and nutrition is well established and supported by many researches¹. Lately scientific evidence highlights the generational and intergenerational links between nutritional status at different stages of the life cycle.

Malnourished children are less able to resist infections, maintain an adequate development and achieve good learning standards, and have more chance of reproducing malnutrition in their own households. And in their later life, they will have low labour productivity and hence more difficulties in generating adequate incomes

Although the challenge to maintain adequate nutrition is present all the time, if presented at early stages has a deleterious and irreversible effect in growth and development. The consequences of being born undernourished or stunted in early life extends into adult life.

During the last decade, Bolivia had experienced a sustained reduction in the levels of stunting (height for age), wasting (weight for height) and underweight (weight for age) of children under 36 months of age. From 1989 to 1998 malnutrition in children less than three years of age have been reduced in the following manner Stunting (height for age) 38.3 % to 25.6 %, underweight (weight for age) 13.5% to 9.5 % and wasting (weight for height) 1.6% to 1.5%. Despite the former, levels are still considerable high and the downward trend ratio of 3.3 is modest compared to countries like Haiti or Brazil which, for a similar period, held a ratio of 6,3 and 6,5 respectively.

More alarming than single national averages are the differences found between and within regions inside the country. For example the department of Potosí has two times more stunted, wasted and underweight children than the country media². Children of mothers who achieved secondary school are four times less stunted than those whose mothers do not have formal instruction. This pattern have not changed since 1994.

Other relevant negative factors are living in rural areas versus urban, belonging to families of the lowest income quintiles versus the highest. In this last point it is noteworthy commenting that stunting in children from families of the two highest quintiles have improved ten times more if compared with children in the lowest quintile. Similar to other Latin-American countries, in Bolivia no significant gender differences were found.

Beyond the nutritional status measured by anthropometry – the silent undernutrition or micronutrient deficiency, a term applied to essential vitamins and trace minerals, is highly prevalent in low and middle income countries. Inadequate intake of them contributes to increase rates of illnesses and death due to infectious diseases. Four essential micronutrients have public health importance: iodine, vitamin A. iron and zinc. Iodine deficiency in pregnant women results in mentally retarded

¹ Many papers were published about the relationship between poverty, health and nutrition. See, for example, the papers published by the World Bank.

² The altitude of Potosi is 4000 meters. Most of its population is quechua and it is one of poorest region of the country.

newborns. Iron deficiency also reduces cognitive development and work performance. Vitamin A deficiency is major cause of blindness, its intake contributes to the prevention of deaths from diarrhoea, measles and malaria. Severe zinc deficiency causes failure to growth and impairs the immune system, its supplementation improves growth in children, lower rates of diarrhoea, malaria and pneumonia hence reducing child mortality.

According to WHO (Black 2003), there are 10.8 million child deaths per year. The death number attributed to zinc, vitamin A, and iron deficiency is 2 millions, or 19% of the total. Malaria causes less than 1 million child deaths per year . It also causes 2,7% of global DALYs compared to 6% caused by iron, vitamin A, zinc deficiencies.

This problem also affects Bolivian children and women. Iodine deficiency was a major cause of stunting and mental retardation, fortunately this deficiency was adequately controlled and its effects were importantly reduced. Data related to vitamin A deficiency goes back to 1991 when it was shown that subclinic deficiency reached nearly 20% of the population. Since then, megadosis of vitamin A have been widely distributed to children in immunization campaigns and also in regular outpatient consultations. The 1998 DHS data included a surveillance of nutritional anaemia, according to it: one in three children under three years of age suffer this deficiency. Interventions to control this deficiency are under way through the administration of ferrous sulphate and fortification of wheat flower with iron. Neither an evaluation nor interventions have been carried out regarding to zinc.

Almost all factors which affect the family well-being can produce malnutrition. An interesting framework divides causes as fundamental, subjacent and immediate (see World Bank 2000). Overall increment of the conditions of living: income, household water and sanitation, food security and access to health services have a positive effect in the control of malnutrition. The more immediate causes depend of the characteristics of families and caretakers. However, these causes are not well studied in Bolivia.

A comprehensive review developed by the World Bankⁱ highlights important gaps on the application of well known protecting factors. National policies do not give enough importance to promote exclusive breast feeding until six months of age, appropriated complementary feeding practices including hygiene, use of clean water and active feeding. The former practices and an adequate care during infections, could alone improve nutritional status and reduce morbidity and mortality.

The weaning period is particularly critical as is emphasized in a survey done in El Altoⁱⁱ where stunting was directly related to the quality of complementary food. Reports of food consumed by young children have showed lack of micronutrients, insufficient provision of fat calories. This pattern of consumption is frequently in many regions of the country.

A considerable amount of resources have been channelled to nutritional programs both at state and private/NGO level. Unfortunately, according to World Bank review, most of them were not carefully targeted neither to key age selected groups nor to specific problems.

There is a pressing need to redirect interventions according to relevant and new nutritional research applied with success in different countries. All literature reviewed points out that major determinants could be classified in four groups: a) Health inputs, b) Child characteristics, c) Household characteristics, d) Environmental factors.

Of all, the first one is likely to be addressed by the Universal Mother and Child Health Insurance (SUMI) launched by Ministry of Health in January 2003. The other aspects deserve attention given the characteristics of the population in Bolivia and the diverse geographical differences. For the design of national programs, it is important, to consider patterns of beliefs, attitudes, practices, culture, altitude, weather among important variables.

Revising the existing literature and previous finding

The most deleterious effects of malnutrition concern to younger ages. However recent researches have suggested that malnutrition have a life cyclical dimension.(ACC/SCN 2000). Any damage could exert its effect long the life of the individual as shown in table No 1.

Malnutrition affects nearly 30% of people in the world and its consequences are: death, disability, stunted, mental and physical deficiency.

In this context, turning the tide of malnutrition (WHO 2000) requires a careful study of the effectiveness of different interventions related to the characteristics where there are applied. A comprehensive review concerning all probed interventions was done in 2001 by Allen and Gillespie (Allen and Gillespie 2000).

WHO and NHD (2001) have provided seven specialized global nutrition data banks to analyse trends and progress. These are on: Child growth and malnutrition, micronutrient deficiency information system, iodine deficiency disorders, vitamin A deficiency, anaemia, breastfeeding, obesity and adult body mass index and national nutrition policies and program's. This, not only shows global concern towards this problem but also offers an important tool to policy makers and researchers dedicated to combat malnutrition.

Effective programs regarding to interventions at each step of the life cycle are scarce in contrast to the progress in the sciences of food and nutrition.

The strategies proposed by UNICEF for the decade 1990 remain largely unchanged (UNICEF 1990: Estrategia para mejorar la nutrición de niños y mujeres en los países en desarrollo).

Most of the scientific debate on child feeding and field interventions was reviewed and edited by the World Health Organisation . (WHO 1998). The document reinforces the need to concentrate in the younger child for developmental biological reasons and provides accurate guides in relation to density, volume, frequency, factors that affect intake, macro an micro nutrient content of the diets and country based experiences with processed foods. The authors regret the absence of rigorous evaluations of the nutrition impact of complementary feeding programs. They point out that factors contributing to success are community involvement in all program steps. Adding that “targeting of resources to specific geographic regions, age groups or physiologic categories can lead to greater cost – effectiveness. .” (WHO 1998 Page 163).

It is also important to mention the experience gained in nutrition education methodologies which have focused on behaviour change. A well known community based program with a well designed education component is the AIN program in Honduras (Integrated Attention to the Child) which comprises community participation, high exposure to program activities a mid term evaluation has

demonstrated an improvement of knowledge, attitudes and practices of child feeding. (BASICS II 20002: BASICS II Midterm evaluation of the AIN Program in Honduras , 2000).

Malnutrition across the life span, by disorder and consequence

Life Stage	Common Nutritional Disorders	Main Consequences
Embryo/fetus	<ul style="list-style-type: none"> • Intrauterine growth retardation • Iodine deficiency disorders (IDD) • Folate deficiency 	<ul style="list-style-type: none"> • Low birth weight • Brain damage • Neural tube defects • Stillbirths
Neonate	<ul style="list-style-type: none"> • Low birth weight • IDD 	<ul style="list-style-type: none"> • Growth retardation • Developmental retardation • Brain damage • Early anemia
Infant and young child	<ul style="list-style-type: none"> • Protein-energy malnutrition (PEM) • IDD • Vitamin A deficiency (VAD) • Iron deficiency anaemia (IDA) 	<ul style="list-style-type: none"> • Continuing malnutrition • Developmental retardation • Increased risk of infection • High risk of death • Goitre • Blindness • Anaemia
Adolescent	<ul style="list-style-type: none"> • PEM, IDD, IDA • Folate deficiency • Calcium deficiency 	<ul style="list-style-type: none"> • Delayed growth spurt • Stunted height • Delayed/retarded intellectual development • Goitre • Increased risk of infection • Blindness • Anaemia • Inadequate bone mineralization
Pregnant and lactating women	<ul style="list-style-type: none"> • PEM, IDD, BAD, IDA • Folate deficiency • Calcium deficiency 	<ul style="list-style-type: none"> • Insufficient weight gain in pregnancy • Maternal anaemia • Maternal mortality • Increased risk of infection • Night blindness • Low birth weight/high-risk death rate for fetus
Adults	<ul style="list-style-type: none"> • PEM, IDA • Obesity • Diet-related diseases 	<ul style="list-style-type: none"> • Thinness • Lethargy • Obesity • Heart disease • Diabetes

		<ul style="list-style-type: none"> • Cancer • Hypertension/stroke • Anaemia
Elderly	<ul style="list-style-type: none"> • PEM, IDA • Obesity • Osteoporosis • Diet-related diseases 	<ul style="list-style-type: none"> • Obesity • Spine and hip fractures, accidents • Heart disease • Diabetes • Cancer

One important research line about the causes of malnutrition has focused in poverty measured by personal income or by household expenditures³. In a recent paper, Haddad et al. (2002), express their concern about how rapidly will child under nutrition respond to income growth. Their empirical study suggests that the response of under nutrition to income variation is slow. Therefore they suggest to adopt intervention policies in order to improve nutrition faster. In addition, they have observed that “the majority of studies address in the causal link between growth and malnutrition have focused on the response of nutrient consumption to changes in income and not in the causal relationship between income and under nutrition”. We can add that this a very common problem in most of the studies about the causes of malnutrition. For example, many studies have focused in the relationship between mother’s education and nutrition and not in the causal relationship between mother’s or other family’s behavior and under nutrition. This is done because behavior is not observable and the researchers assume implicitly that there is a strong relation between mother education and her behavior relating to the child care⁴.

Nevertheless, there are some other important studies taking “child care” directly as an explanatory variable of nutrition. This is the case of the study of Ruel M. et. al. (1999). Their study examines how good care practices affect child nutrition in a sample of 475 households in Accra. The caregiving behaviors surveyed were child feeding practices and the use of health services for preventive care (immunization and growth monitoring). Their main research objectives were: (1) determining whether a meaningful care index (a measure of the extent of child care) can be derived from a simple recall questionnaire about child feeding and the use of preventive health services in a cross-sectional survey; (2) investigating whether care practices (as proxied by the care index) are associated with children's nutritional status; and (3) identifying subgroups of children that may benefit more than others from good maternal care. The study shows that care practices are strong determinants of children's nutritional status, particularly for children from poorer households and children with mothers having less than a secondary school education

In a more recent study, Webb P. and Block S. (2003), applying parametric and non parametric techniques, found that: 1) Mothers’ nutrition knowledge has a strong, positive impact on child nutrition in the short term (weight for height), controlling for mother’s education an income, 2) by contrast, formal schooling dominates nutrition knowledge in determining child anthropometrical outcomes in the longer run (height for age), 3) to the extent that maternal education contributes to shorter-run child outcomes its effects are mediated through nutrition knowledge, and 4) paternal education contributes independently to long run (but not short run) child nutrition.

³ See, for example, Strauss and Thomas, 1998

⁴ There is a long list of papers centered in the relationship between mother education and nutrition. See, for example, the interesting papers of Barrera A.(1990), Behrman J. (2000), Thomas D.(1994)

Many researches were also made about the impact on health and nutrition of public policies. Lavi et al. (1995) have analyzed the effect of quality and accessibility of health services and other public infrastructure on the health of children and adults in Ghana. Their finding suggests that increasing the provision of basic health services, such as adequate supplies of basic drugs, will yield high social returns in terms of improved child health and survival probabilities.

Behrman, Jere R. and Anil B. Deolalikar.(1990).have studied the intrahousehold demand for nutrients in Rural South India. They found that: (1) Nutrient intakes for females systematically have algebraically lower price elasticities than do those for males, (2) Unobserved fixed effects may bias the estimates of responses to observed variables. They also observe that most previous studies use current instead of permanent income, which a priori may account for the low estimated income elasticities. We note that in the Bolivian case there are not significant difference in the rate of malnutrition between boys and girls. This could suggest that there are not important problems in the intrahousehold food distribution. Any way, this point needs more investigation.

Some seminal papers about the high prevalence of malnutrition in Bolivia have proposed the hypothesis that factors, such as high altitude hypoxia and/or genetics are influential in the slow and prolonged growth of children⁵. This hypothesis was based in observed anthropometrical measures and show that in high altitude the population was growing more slowly compared to international growth standards, yet dietary surveys indicated that they were sufficiently well-nourished. In present days, it is not commonly accepted that high altitude or genetics are causal factors in itself to explain malnutrition. However, population who lives in high altitude very often are poor, have problems to access to markets, to access to good quality water, etc. In the same way, today it is demonstrated that all babies if they receive the same care they can achieve the same development pattern. Given that in the high altitude places, most people are natives, influential aspects of “genetics” should be interpreted as different cultural child care practices.

The general consensus of the anthropological literature that emerged the past two decades is that problems related to child take care rather than high-altitude hypoxia or genetic adaptation are responsables for the observed growth retardation. However, these problems are very often associated to environmental factors.

Main Hypothesis

As it was explained before, there is a wide literature about the determinants of child malnutrition. The determinants can be classified in 4 groups: a) Health inputs, b) Child characteristics, c) Household characteristics, d) Environmental factors.

The main hypothesis that we will try to test is that some variables in these 4 groups have an impact on nutrition. Besides that, we are particularly interested to test the following hypothesis: Controlling all well known effects on nutrition (mother education, nutrient intake, etc.), there are specific effects on nutrition of: (1) geographical features (both natural and created) and (2) cultural differences between groups⁶.

⁵ Frisancho and Beker (1970), Greksa (1984, 1986); See also Miller T.(2001)

⁶ Many authors prefer the expression “ethnic group” to cultural groups.

Natural geographical features refer to altitude, temperature, humidity, etc. Created geographical features refer to existing infrastructure, particularly, roads. The geographical features are inside of the group of environmental factors. The probable incidence of geography on nutrition could be explained in three ways: a) The food access may be affected by adverse climatic conditions on agriculture or/and by transport problems to access to markets, b) The entangled effect of altitude (an other variables) in the development of feeding practices, c) The natural land endowment in some micronutrients , such as iodine, is poor in the Andean region.

Concerning cultural groups, we remind that 50 percent of the Bolivian population conceive themselves as pertaining to an ancestral culture (quechua, aymara and guarani) and the other 50 percent to “occidental” culture. Many studies suggest that controlling other related factors, there is a cultural specific effect of culture on nutrition. Culture appertain to Household variables related to nutrition. Culture may have impact on nutrition by specific ways of child care (feeding and disease care practices, etc.)

The data

The main source of data for this research is the Demographic and Health Survey, ENDSA. The ENDSA survey was applied in years: 1988, 1994 and 1998. We will explore the data of these 3 years, particularly, of the last one.

The ENDSA does not have information about income. Therefore, we will use, in our model, the Asset Index suggested by Filmer D. and Pritchett L.(2001). We will test the performance of this index using the Mecovi surveys data (Mecovi survey is a LSMS survey) for 1999 and 2000 with the similar criteria suggested by these authors.

We will add to the ENDSA data, geographical information concerning altitude, temperature, etc. coming from Ciess-Econometrica data base. This information is aggregated at province level. In a similar way, we will add information on health, education and other community infrastructure at municipality level elaborated by UDAPE (“Municipios. Demandas Municipales 2000”)

The following table summarizes the data that we are planning to use for this research:

Surveys	Other data sources
ENDSA (DHS) 1988, 1994, 1998	Geographical information
MECOVI (LSMS) 1999, 2000	Social infrastructure information

The most important limitation on available data is the lack of information about price vector of consumption goods, leisure and health at local level. Most of socio-economic surveys lack these details. Therefore, our approach will focus on the reduced-form demand for child health (see Gibson 2001).

Methodology

Analytic issues

This research is focused in modeling health related to a set of exogenous variables. Nevertheless, we note that statistical exercise looking to build a model can not replace the necessary qualitative assessment about the cause of disorders in nutrition. Therefore, a first part of our research will be dedicated to elaborate a good situation analysis, with a strong description of issues. This analysis should oriented the model building.

Interesting papers in the literature show the importance to have a good analytical description before beginning the numerical exploration exercise in order to build an econometric model⁷. The following explanation underlines the importance of the analytical description.

Traditionally, the basic framework to explain malnutrition is as follows⁸: Nutrition depends on: a) Food intake (quantity, quality, frequency), b) Diseases (frequency, gravity, care, post-care). Food Intake and Disease depend directly on the pattern of child care which depends on the behavior of the child's family (particularly caretakers)⁹. What we want to point out with this observation is the statistical difference between observed and unobserved variables. Note that in the basic framework explanation, most of the variables are non observable. Facing this difficulty, most econometric studies of child health include in the model some observable variables related to non observable variables. For example, is generally accepted that education of the mother can replace the unobservable variable called the behavior of the mother. However, it is important to observe that there is not a "one-to-one" relation between both variables, therefore, there is a part of mother behavior related to child care that can not be explained by mother education. On the other hand, some unobservable variable related to child nutrition, for example, the choice of the home place, could be correlated to mother education. Gibson (2001) has showed that not having into account all these problems can over or under evaluate the importance of some of independent variables of the model¹⁰.

Model building

As suggested by the "Call for Research Proposal", an important instrument of analyze in this research will be the following model:

$$H_i = a + X_i' \beta_1 + X_h' \beta_2 + Z_h' \beta_3 + X_c' \beta_4 + [\text{Interactions}]d + \epsilon_i$$

Subscript i indexes children, subscript h indexes households and subscript c indexes municipality.

H_i is the health indicator. As suggested by the TOR, we will define H_i as z-score of weight/age.

⁷ See, for example, Barrera A.(1990), Behrman J. Wolfe (1984), Behrman J.(1987), Skoufias E.(1999, 2001), Henriques M. et al.(1991)

⁸ See, for example, the World Bank study for Bolivia 2001.

⁹ Besides that, there are some important underlying causes of malnutrition (such as economic resources, ecological conditions, etc.).

¹⁰ See also Barrera A.(1990)

In this notation, all the X variables are column vectors; therefore X' are line vector. The Greek letters identify parameter vectors. The variables in this equation are define as fellows:

- X_i = Child characteristics
- X_h = Household characteristics (include culture)
- Z_h = Asset index
- X_c = Environmental factors (Social infrastructure and geographic features)
- [Interactions] = Interactions between two categorical variables or one categorical variable and a numeric variable. As it is recommended in the TOR, we will analyze particularly the interaction between household socioeconomic characteristics and environmental factors (possible, several terms)
- ?i = (scalar) summarize all unobservable variables that affect child health

The following table contents some of the variables that our sources of information provide for each one of these variables group:

Table 1. Example-variables of each one of variable groups associated with nutrition

Variable group	Example variables
Child characteristics	Gender; age; weight at birth; exclusive breastfeeding; twins; birth order, interval between births; immunization; Health card
Household characteristics	Parental human capital: Language/culture; number of members; mother characteristics (age, education, reading practices, Tv watching, radio listening; disability; domicile; health knowledge; work; maternity situation, etc). Height and weight of the mother. And, some similar father characteristics. Dwelling characteristics such as room number, quality of the roof, of the floor, of the walls. Access to pipe water, sanitation, electricity, etc. Iodized salt consumption Land owner.
Asset index	See variables retained by Filmer and Pritchett (2001) and the explanation below.
Environmental factors	Urban vs rural. Geographical variables at province level; social infrastructure at municipal level; income average at province level; poverty indicators at province level.

Asset index construction

The Filmer D. and Pritchett L.(2001) methodology define the Asset Index based in the principal component analyze. The general idea of this methodology can be explained in the following way:

Let be {w₁, w₂,...w_q} a set of long-run household wealth indicators (such as durable consumption goods). We are looking for an aggregate linear indicator such as:

$$Z = ?_1w_1 + ?_2w_2 + \dots + ?_qw_q$$

The problem is to find a set of weights β . A natural criteria to choose the weights β is to select those that let a maximum differentiation of household concerning the wealth indicators. In order to have a unique solution to this problem, it is necessary to restrain the length of the vector $\beta = (\beta_1, \beta_2 \dots \beta_q)$.

As we now, a measure of differentiation is the variance. Therefore, the β vector can be defined as the solution of the following problem:

$$\begin{aligned} & \text{Max } \text{Var}(Z) \\ & \beta \\ & \text{With the restriction of } \beta' \beta = 1 \end{aligned}$$

Let W be a $n \times q$ matrix with the standardized values of observations of the q wealth indicators w_i for the n -household. Let be $S = W'W$ the variance matrix.

$$\begin{aligned} & \text{Max } \beta' S \beta \\ & \beta \\ & \text{With the restriction of } \beta' \beta = 1 \end{aligned}$$

As it is well known, the solution to this problem is as follow: a) the optimal vector β is equal to eigenvector of S associated to its biggest eigenvalue β_{\max}

After solving this problem, we can normalize the β vector in others ways. For example, imposing that the sum of its components be equal 1.

We expect that β_i weights are non negative, however, this conditions can not be assured if the S matrix is a variance matrix. A way to ensure to have non negative weights is to define $S = W'W$ with non centered non negative column vectors of the W matrix. This is a sufficient condition to have a non negative β vector. Given that the wealth indicators can have values 0 or 1, this way to define W make easy the interpretation of β .

The choice of the w_i wealth indicator face some problems. As it was pointed by Filmer D. and Pritchett (2001), it is important to choose goods or services that are associated to welfare but that don't have direct effects on nutrition. Beside that it is a logical criteria, if it is not respected, it can introduce colinearity problems in the estimation of the model and/or simultaneity between the asset index and other household unobservable variables summarized by the error term in the regression.

Given the above explanation, we will select the w_i wealth indicator conditioned to: a) They are observed both in the Mecovi and in the Endsa Surveys, b) They must be related to wealth, c) They don't have direct effects in nutrition.

Before to introduce the Asset Index defined in this way in our model, we will make similar analysis of its reliability than that made by Filmer and Pritchett (2001).

Model estimation

The estimation of models of this kind faces many problems. Among them, are: a) variables choice, b) selection problems, c) lack of robustness

a) Variable choice and building composite index

In social science it is well known that there are a lot of variables highly correlated. Therefore, we can expect that not all the possible variables listed in each one of the 4 groups related to nutrition should be in the model. This is not worrisome. However, there is a problem related with this association. Let be $Y=f(X)$ a lineal model and let $\{X_1, X_2, \dots, X_p\}$ be a set of variable highly correlated with X . From the statistical point of view, any lineal model of the kind $Y=f_i(X_i)$ could be substitute of the first model. Nevertheless, the interpretation and the policy implication of each model could be different¹¹. This is an identification problem that can not be solved with statistics or econometric tools. In this case, the problem could be solved using medical knowledge on the order of importance of nutrition's determinants.

We will study and explore the possibility to create an aggregate variable for each one of the 4 variable groups or for some of their subgroups using principal component analysis or another methodology¹² in order to have a parsimonious model. The advantages and disadvantages of the utilization of composite index need to be demonstrated.

b) Endogeneity and measurement error bias

Frequently, a second problem in social sciences, is the existing correlation between the exogenous variables and the error term summarizing all variables not explicitly included in the model that affect child health. This point was explained before. The violation of the assumption of independence of the exogenous variables and the error term invalidate the possibility of OLS estimation. Considering this possibility, depending of the variable choice, if it is needed, we will use the instrumental variable approach¹³. The suggestion of the TOR is to use the Asset index as one instrument. Concerning the impact on nutrition of community factors, the TOR also warns on the possibility that program placement and health facilities placements are non-randomly determined but instead based on location-specific unobserved attributes.

In relation to measurement error bias, Gibson (2001) wrote: "The problem of measurement error occurs because stunting depends on the history of nutrient intakes and sicknesses but variables available to simulate the risk of stunting may refer only to recent periods".

c) Robustness and specification test

The key assumption in least squares is that the "errors" are independent of the explanatory variables, and uncorrelation is needed, and have a finite variance. The key assumption of most of the so-called robust methods is that the errors are symmetric, and independent. As we have always explained, this assumption can be violated if we don't pay attention to correlation between the error and explanatory variables.

¹¹ It is possible to find a rich discussion about the Identification problems in the social sciences in Manski C.F. 1995

¹² For example, Ruel M. and Purnima M. (2001) suggest the utilization of an Child Feeding Index as a composite index of feeding practice. They use successfully this index to explain differences in nutrition in Colombia, Guatemala, Nicaragua and Peru. However, they did not have achieved acceptable results for Bolivia.

¹³ There are good reference texts about the instrumental estimation approach. See, for example, Mukherjee C. et al. 1998, Greene W.H. 2000 and Maddala G.S. 1983

Various definitions of greater or lesser mathematical rigor are possible for the term robust, but in general, referring to a statistical estimator, it means :”insensitive to small departures from the idealized assumptions for which the estimator is optimized”¹⁴. Rubin (1995) have suggested a definition of robustness, modified from the original one of Box to allow risk function considerations, He has proposed the following definition: The robustness of a procedure is the degree to which its properties do not depend on assumptions which you do not wish to make.

Describing the outliers behavior is one of the most common procedures attached to study the robustness of estimators. But this is not the only point. There are a lot of situations that small departures from assumption can introduce important variations in the outcome estimation procedure. For example, in addition to always mentioned cases, we can mention the colinearity that introduce numerical problems resolving the normal equation, to much or to little explanatory variables, errors with to large variance, deviations from normality, etc.

To achieve a good estimation of the parameter of our main model, we will explore the behavior of the error in order to identify outliers and normality. We will also apply the specification tests that are available in the most common statistical software¹⁵.

Expected analytical and policy-oriented implications

Child oriented policies in Bolivia have evolved continuously from the application of vertical programs like control of diarrhoeal diseases, acute respiratory infection, growth monitoring to a more integrated view of the child and the family. However, the accomplishment of an adequate care, specially in young children needs specific measures to include mothers and families.

Although there are many nutrition studies in Bolivia confirming the general hypothesis about malnutrition, the knowledge about the impact of geographical and cultural variable is weak. Therefore, we expect that our study will contribute to design of policies providing new knowledge about these factors, particularly, concerning the local policies that it should be applied in different geographical and cultural context. This could complement the efforts of Bolivian Government who provides free access of care to all under fives supplements like vitamin A and iron.

Background of the researchers involved

Rolando Morales will conduct this research. He is economist, with a Doctor degree in Econometrics and Applied Statistics from Geneva University. He was the first professor to teach Health Economics in Bolivian universities. He is former President of Bolivian Health Economics Association. He has a wide work experience in economic and social research. He works as consultant of several national and international organization and he is professor of several university courses (macroeconomics, econometrics, statistics, economic growth, Health Economics, Education economics and others).

Ana María Aguilar will contribute to this research. She is a MD with specialization is pediatrics and Msc in Human Nutrition. She has studied in Chile and in the United Kingdom. For the last twenty years Dr. Aguilar contributed to the implementation of child survival programs in Bolivia

¹⁴ Numerical recipes in C: The art of scientific computing, 1988-1992

¹⁵ Such as Stata software

and served as consultant in other neighboring countries. As a nutrition specialist is responsible of the hospital's ambulatory clinic which addresses feeding and failure to thrive problems.. Dr. Aguilar teaches post graduate students of the Residency system in La Paz. Currently she is part of a combined multinational team composed by INTA (Instituto de Nutricion y Tecnologia Alimentaria de Chile), WHO/PAHO and hospitals of La Paz and Cochabamba working to address the management of children malnutrition inside the health system.

Alvaro Calzadilla will participate in this research as assistant. He is a young economist. He is concluding a Ma in economics.

References

- Allen LH, Gillespie SR. 2001, What Works? A review of the efficacy and effectiveness of nutrition interventions. CC/SCN Nutrition policy paper No 19 and ADB Nutrition and development series No 5. September 2001
- Anderson, M.A. 1981, Health and nutrition Impact of Potable water in Rural Bolivia. *J. Trop. Ped* 27, 39-46.
- Antezana M.2001, Seguridad Alimentaria en Pando CIPA PIEB La Paz 2001
- Barrera A.(1990), The role of maternal schooling and its interaction with public health programs in child health production, in *Journal of Development Economics*, 32
- Behrman, Jere R. and Anil B. Deolalikar. 1990. "The Intrahousehold Demand for Nutrients in Rural South India: Individual Estimates, Fixed Effects, and Permanent Income." *Journal of Human Resources* 25(4):665-696.
- Behrman J. Wolfe 1984, More evidence on nutrition demand: income seems overrated and women's schooling underemphasized, *Journal of Development Economics*, 14
- Behrman J. Wolfe 1987, "How does mother's schooling affect the family's health, nutrition, medical care usage and household sanitation", *Journal of Econometrics* 36
- Behrman, J.B., and B.L. Wolfe. 1984. More evidence on nutrition demand: income seems overrated and women's schooling underemphasized. *J. Devel. Econ.* 14: 105-128.
- Behrman, J.R. 1993, The Economic Rationale for Investing in Nutrition in Developing Countries." *World Development* 21, no. 11: 1749-71.
- Behrman, J.R. 1996 The impact of health and nutrition on education. *World Bank Research Observer* 11(1): 23-37.
- Black R 2003, Micronutrient deficiency - an underlying cause of morbidity and mortality. *Bulletin of WHO* 2003. 81 (20) p.79
- Comisión Europea, Unidad de Seguridad Alimentaria. Sept. 2000. *La Economía Rural en Bolivia: Estructura de Empleo, Composición de Ingresos e Integración al Mercado. Apuntes Técnicos No. 3. La Paz, Bolivia.*
- Comisión Europea, Unidad de Seguridad Alimentaria. Dic. 2000. *Mercados Agroalimentarios en Bolivia: El caso de Arroz, Maíz, Trigo y Papa. Apuntes Técnicos No. 4. La Paz, Bolivia.*
- Comisión Europea, Unidad de Seguridad Alimentaria. Feb. 2000. *Household Income Strategies and Food Security Interventions in the Bolivian Highlands. Apuntes Técnicos No. 2. La Paz, Bolivia.*
- Current Anthropology* 27: 251-262.
- Davalos, A., and R. Dulon. 1999. *Fuentes y Niveles de Ingresos de Familias Rurales en Riesgo de Inseguridad Alimentaria. EU/Unidad de Seguridad Alimentaria. La Paz, Bolivia.*
- DHSS/INE 1988. *Encuesta Nacional de Demografía y salud. La Paz 1988*

- Filmer D. and Pritchett I. 2001, Estimating Wealth Effects without Expenditure Data – or tears: An application to Educational Enrollments in States of India, *Demography* 38 (1)
- Fortún JE. 1989, Reeducación alimentaria para el área rural La Paz 1989
- Franqueville A, Aguilar G. 1988, El Alto de La Paz migraciones y estrategia alimentarias en Bolivia. ORSTOM La Paz 1988.
- Gibson J. 2001, The effect of endogeneity and measurement error bias on models of the risk of child stunting, University of Waikato
- Government of Bolivia and World Bank. 1998, Estudio de Productividad Rural y Manejo de Recursos naturales. May, (the "rural productivity study").
- Greksa, L.P. 1986, Growth pattern of European and Amerindian high altitude natives.
- Greene W.H. 2000, *Econometric Analysis*, Prentice Hall, 4th Edition
- Haas, J.D., et al. Altitude and infant growth in Bolivia: a longitudinal study. *Am. J. Physical Anthropology*. 1982. 59: 251-262.
- Habicht, J.-P., R. Martorell, C. Yarbrough, R. Maloina, and R.E. Klein. Height and Weight Standards for Preschool Children. How relevant are ethnic differences in growth potential? 1974. *Lancet* 1(7858): 611-615.
- Henriques M., Strauss J., Thomas D. (1991), How does mother's education affect child height?, *J. Human Resources* 26
- Jimenez, W. Determinantes de la Nutrición en Bolivia. 5/6/2001. Mimeo
- León R, De la Vega C., Franqueville A, Aguerre M. 1992, El consumo alimentario en Bolivia Ediciones Runa La Paz 1992
- Lovon, M. Estudio de Evaluación de impacto en aspectos de nutrición y salud. Programa de Seguridad Alimentaria Nutricional en las provincias Arque, Bolivar y Tapacari. (PROSANA). Xerox. July 2000.
- Maddala G.S. 1983, Limited dependent and qualitative variables in econometrics, *Econometric Society monographs*
- Manski C.F. 1995, *Identification problems in the social sciences*, Harvard University Press
- Martorell R. 2000, The role of nutrition in economic development. *Nutrition Reviews*:54(4) S66-S71
- Martorell, R. 1984. Genetics, environment and growth: issues in the assessment of nutritional status. In Velazquez and A, Bourges. *Genetic factors in Nutrition*. NY: Academic Press.
- Mason, John. How Nutrition Improves and What That Implies for Policy Decisions. Narrative Paper for the World Bank UNICEF Assessment. 16 Nov. 1999.
- Miller T.W. 1991, Malnutrition and Mortality among Bolivian Children. An Analysis of DHS Data, M.A. University of California at Berkeley.
- Ministerio de Salud y Previsión Social 2000, Información Urgente! Situación de salud de la niñez boliviana frente al nuevo milenio. La Paz 2000
- Motion S, Northstone K, Emond A. et al. 2001 Persistent early feeding difficulties and subsequent growth and developmental outcomes. *Ambulatory Child Health* (2001) 7: 231–237, Unit of Pediatric and Perinatal Epidemiology, Institute of Child Health, University of Bristol, Bristol, UK
- Mukherjee C., White H., Wuyts M. 1998, *Econometrics and Data Analysis for Developing Countries*, Routledge, London and New York
- Obert, P., et al. The importance of socioeconomic and nutritional conditions rather than altitude on physical growth of prepubertal Andean highland boys. *Annals Human Biology* 21: 145-54.
- OMS. 2001, 54ª ASAMBLEA MUNDIAL DE LA SALUD A54/7. Punto 13.1 del orden del día provisional 9 de abril de 2001. Estrategia mundial para la alimentación del lactante y del niño pequeño. Informe de la Secretaría

- Onis M. et al. 2000, ¿Esta disminuyendo la malnutrición? Análisis de la evolución del nivel de malnutrición
- OPS/ OMS 2002, Mejorando la nutrición del niño pequeño en El Alto Bolivia . Resultados utilizando la metodología ProPAN Junio 2002
- Paulson, S., and N. Velarde. 2001, Apreciación de Intervenciones Existentes: Estudio sobre Desnutrición y Pobreza en Bolivia. Informe Final, Marzo.
- Philip TJ, Nelson M, Ralph A, Leather S. 1997, Socioeconomic determinants of health: The contribution of nutrition to inequalities in health. *BMJ* 1997; 314
- Reuland DS, Steinhoff et al. 1991, Prevalence and prediction of hypoxemia in children with respiratory infections in the Peruvian Andes. *The Journal of Pediatrics* 119 (6); 1991:900-906
- Ruel M., Armar-Klemesu M., Arimond M. 2002, Good Care Practices Can Mitigate the Negative Effects of Poverty and Low Maternal Schooling on Children's Nutritional Status: Evidence from Accra, IFPRI, Discussion Paper # 62
- Ruel M. and Purnina M. 2001, Creating a child feeding index using the demographic and health surveys: an example for Latin America, IFPRI, FCND Discussion Paper # 130
- Sahn D. and Alderman H. 1997, On the determinants of nutrition in Mozambique: the importance of age-specific effects, *World Development* 25
- Skoufias E. 1999, Parental education and child nutrition in Indonesia. *Bulletin of Indonesian Economic Studies*, Vol 35, No 1
- Skoufias E. 2001, PROGRESA and its impacts on the human capital and welfare of households in rural Mexico: A synthesis of the results of an evaluation by IFPRI, Research Report, IFPRI, Washington D.C.
- Solomons N.W. 2000, Plant-based diets are traditional in developing countries: 21st century challenges for better nutrition and health , *Asia Pacific J Clin Nutr* (2000) 9(Suppl.): S41–S54, Center for Studies of Sensory Impairment, Ageing and Metabolism (CeSSIAM), Guatemala City, Guatemala S41
- United Nations Administrative Committee on Coordination. Sub- committee on Nutrition (ACC/SCN), 2000. 4th Report on The World Nutrition Situation . Nutrition throughout the Life Cycle Geneva 2000
- Webb P. and Block S. 2003, Nutrition knowledge and parental schooling as inputs to child nutrition in the long and short run, *Tuets Nutrition*, Discussion Paper # 21
- WHO 2000 Nutrition for health and development: A global agenda for combating malnutrition, WHO/NHD/00.6
- WHO 2000. Mortalidad infantil. *Bulletin of the World Health Organization*, 2000, 78 (10): 1222–1233
- WHO 1995, Physical status and the use and interpretation of anthropometry. WHO Technical Report Series No 854.
- WHO 1998, Complementary feeding of young children in developing countries: a review of current scientific knowledge. WHO/NUT/98.1 Geneva 1998
- WHO 2001, Nutrition for Health and Development. Sustainable. Development and Healthy Environments. World Health Organization. Turning the tide of malnutrition. Responding to the challenge of the 21st Century WHO/NHD 00.7 p. 18
- World Bank 2000: Poverty and Nutrition in Bolivia 24691-BO
- World Bank Bolivia. 2002, Poverty and Nutrition in Bolivia 2002 No 24691 – B0
- Xianghao Cao 1 , Kitone Rawalai 2 , Andrea J. Thompson et al. 2000, Relationship between feeding practices and weanling diarrhoea 85 *J HEALTH POPUL NUTR* Sep;18(2):85-92 © 2000 ICDDR,B: Centre for Health and Population Research

Annex 2. Curriculum vitae of the researchers

ROLANDO MORALES

Título	Doctor en Economía
Especialidades	Políticas Sociales Desarrollo Humano Desarrollo Rural y Regional Estrategias de Alivio a la Pobreza Economía de la Salud y Educación Estudios de Demografía y Población Econometría y Estadística Aplicada Métodos Cuantitativos para las Ciencias Sociales Análisis de Datos y Modelos de Simulación Macroeconomía y Política Monetaria
Formación Académica	Ph. D. en Economía, con especialización en Econometría y Estadística Aplicada, 1976, Universidad de Ginebra, Suiza. Licenciado en Economía, con especialización en Matemáticas, 1970, Universidad de Ginebra, Suiza.
Experiencia	<p>El Sr. Morales cuenta con mas de 25 años de experiencia en el ejercicio de la economía. Se ha desarrollado como investigador y docente en universidades de Suiza y Bolivia, habiendo publicado una variedad de libros que han sido utilizados para dictar su docencia. Ha ocupado cargos públicos como Vice Ministro de Finanzas en Bolivia, durante la gestión 1982 – 1983; Director de Análisis y Muestreo del INE, entre 1976 - 1977, Consejero de la Comisión de Políticas Sociales de la Cámara de Diputados, entre 1994 –1995. También ha sido consultor internacional para varios organismos internacionales como el BID, Banco Mundial, la GTZ, OPS, UNICEF y la UNDP, en Latinoamérica y el Africa.. Para estos organismos, ha realizado varias consultarías en área de políticas sociales, desarrollo humano, desarrollo rural y regional, estrategias de alivio de la pobreza, entre otros.</p> <ul style="list-style-type: none">• Juntamente con el equipo de Ciess-Econométrica, ha desarrollando un Modelo de Equilibrio General, bajo la cooperación sueca, para el análisis de los efectos de la política pública, básicamente en lo que concierne la estructura sectorial del gasto de inversión pública y las políticas distributivas sobre la pobreza.• Ha elaborado un estudio para el Ministerio de Agricultura y Ganadería orientado a diseñar la política de desarrollo rural de este ministerio en el marco de la Estrategia Boliviana de Reducción de la Pobreza. En este estudio pone particular énfasis en la necesidad de centrar la atención de las políticas en el incremento del rendimiento físico de la producción incidiendo sobre los factores que la determinan.• Ha elaborado los lineamientos básicos para la estrategia de desarrollo del departamento de Cochabamba a pedido de la Prefectura. Puso particular énfasis en identificar las variables estructurales que inciden en el bajo desempeño de la economía regional y sugirió estrategias para modificar esta situación.• A pedido de la Universidad Mayor de San Simón (Cochabamba) elaboró un modelo de desarrollo como estructura básica al interior de la cual identificó las prioridades en investigación científica para este centro de estudios.• A solicitud del Ministerio de Vivienda, elaboró un estudio donde se describe la evolución reciente de las variables relacionadas con la vivienda, particularmente, las relativas a sus costos y sugirió algunas políticas que podrían aplicarse en este campo.•• Consultor del Instituto Nacional de Estadística de Bolivia para el Sistema de Indicadores Sociales, La Paz, Bolivia, 1998-1999. El SISAP es un proyecto financiado por el BID, con características similares al SISIN del Ecuador. Su función fue la

de responsable de este proyecto en todas sus componentes. A tal título diseñó el sistema, identificó las fuentes de información y estuvo a cargo de la preparación de su primera versión.

- Consultor del Banco Interamericano de Desarrollo para la verificación de los Compromisos Sociales de Bolivia con el HIPC, La Paz, Bolivia, 1998. Su función ha sido la de acompañamiento de una misión del BID para la verificación de los compromisos que Bolivia efectuó en el marco del acuerdo HIPC que permitiría los primeros desembolsos. Paralelamente, su aporte se plasmó en la identificación de las líneas prioritarias en las cuales se basaría el nuevo acuerdo HIPC.
- Consultor de la Secretaría Nacional de Género, Generaciones y Etnias del Ministerio de Desarrollo Sostenible, La Paz, 1996. Su función principal fue la de desarrollar un estudio identificando el aporte de las mujeres a la economía y las estrategias que permitirían su mejor desenvolvimiento y remuneración.
- Banco Mundial – Ruta Social, Consultor para Centro América en Economía de la Salud y Políticas de Alivio de la Pobreza, Tegucigalpa, Honduras, 1996 – 1997. Fue el responsable de la identificación de áreas que requerían cooperación externa en economía de la salud y en políticas de alivio a la pobreza, del diseño de los proyectos respectivos de cooperación y de la identificación de las fuentes de financiamiento.
- UNDP, Consultor para la preparación del 6o Ciclo de Cooperación de la UNDP a Honduras, Tegucigalpa, Honduras, 1997. Periódicamente, los organismos internacionales preparan sus planes de cooperación quinquenal, para ser discutidos con los respectivos gobiernos. Estos planes incluyen un diagnóstico de la evolución reciente de las principales variables sociales y económicas, la identificación de los principales problemas o cuellos de botella para el desarrollo, la identificación de las áreas en las cuales el país requiere mayor cooperación y la propuesta específica en este campo.
- UNDP, Consejero Técnico Principal, para el proyecto de Fortalecimiento del Sistema Nacional de Estadística, Tegucigalpa, Honduras, 1997. Estuvo a cargo de desarrollar un plan de fortalecimiento institucional de esta institución, identificando las necesidades en recursos humanos, materiales e información del país. Paralelamente, estuvo a cargo de diseñar las fases iniciales del Censo de Población y Vivienda del año 2000.
- Consejero de la Comisión de Política Social de la Cámara de Diputados de Bolivia, La Paz, Bolivia, 1994-1995. Su función fue la asesorar a los diputados en materia de diseño de políticas sociales y aconsejar mejoras a las iniciativas en curso.
- Consejero de la Secretaría Nacional de Desarrollo Provincial y Rural (Proyecto del Banco Mundial), 1993-1994. Su función fue desarrollar un modelo de desarrollo rural con base provincial.
-
- Miembro y Socio del Centro de Investigación Económica y Social CIESS-Econometrica SRL, Bolivia, 1986-2002. En el año 1989, fue designado Director, cargo que ocupa hasta el presente. CIESS-Econométrica es una consultora que funge como un centro de investigaciones en el área socio-económica. Realiza estudios en varios campos; macroeconomía, modelos econométricos, encuestas y procesamientos estadísticos, políticas de salud, de educación, de vivienda, de desarrollo rural y agropecuario, de desarrollo económico, etc.
- Asesor de Métodos Cuantitativos del Banco Central de Bolivia, La Paz, 1979-1985. Su función inicial fue la puesta en marcha de un Modelo Macroeconómico de Corto Plazo elaborado por la Misión Musgrave. Posteriormente, colaboró al Banco Central en el diseño de políticas monetarias frente a un proceso de inflación galopante.
- Director del Departamento de Análisis y Muestreo del Instituto Nacional de Estadística (INE), 1976-1977. Sus funciones consistieron en el desarrollo de un sistema de encuestas de hogares y un sistema de muestreo e información estadística.
- Investigador en el Departamento de Econometría de la Universidad de Ginebra. Sus funciones estuvieron relacionadas a la docencia en la cátedra de la estadística para su uso en métodos cuantitativos de la economía y en investigaciones relacionadas a series de tiempo. El trabajo en este último campo culminó con su tesis de doctorado.

**Historia
Profesional**

Consultor Internacional Independiente, La Paz, Bolivia 1977 a la fecha

USAID, La Paz, Bolivia, 1994 - 1995

Subsecretaría de Género, Gobierno Boliviano, La Paz, Bolivia. 1994 - 1995

Banco Mundial y Gobierno de Bolivia, La Paz, Bolivia, 1993 - 1994

CIESS-Econometrica, La Paz, Bolivia 1986 - 2002

Instituto Nacional de Estadística, La Paz, Bolivia, 1991 - 1992

Caritas-CRS-PROCOSI, La Paz, Bolivia, 1990

OPS/OMS, La Paz, Bolivia, 1987 – 1988.

Ministerio de Educación y CENDES, La Paz, Bolivia, 1990

UNICEF, La Paz, Bolivia, 1984 - 1998

Banco Mundial y Ministerio de Trabajo, La Paz, Bolivia, 1977 -1979

**Países donde
Ha Trabajado**

Suiza, Bolivia, Honduras, Ecuador, Guatemala, Nicaragua, El Salvador, Colombia, Burundi

Idiomas

Castellano, francés e inglés

ANA MARIA AGUILAR LIENDO

KEY QUALIFICATIONS : Dr. Aguilar Liendo has more than 20 years of experience developing, managing, implementing, and advising child health and nutrition programs. During this time she gave technical assistance for the implementation of national programs such as: Control of diarrhoeal diseases, Growth monitoring, Breast-feeding, Baby friendly initiative and Integrated Management of Childhood Illnesses in Bolivia . Main areas of work developed as BASICS country representative in Bolivia were: operational research , mortality surveillance, elaboration educational materials, design of pre-service medical curriculum to include breast and complementary feeding and management of diarrheal diseases. Activities were primarily targeted to develop MOH and local NGOs technical resources and to build public /private partnerships. At international level Dr. Aguilar-Liendo has participated in the evaluation of national child survival programs in Ecuador and Guatemala and facilitated workshops for professors of medical colleges in Dominican Republic and Brazil to introduce the appropriate management of diarrhoeal diseases and acute respiratory infections in pre-service training . Integrates the international team which promotes the implementation of the Baby friendly initiative in maternity hospitals,

Prominent extra curricular positions held were: President of the Bolivian Medical College and current member of the editorial board of the official journals of the Bolivian Medical College and the Bolivian Pediatric Society.

EDUCATIONAL BACKGROUND

Master of Science in Human Nutrition 1981 - Queen Elizabeth College, University of London

Especialist in Pediatrics 1982 – Resident at Southmead Hospital – Bristol ; General Hospital Stoke on Trent - UK

Titulo de Médico Cirujano 1976. Universidad de Chile

Additional Coursework

Diploma on education methodology Universidad Mayor de San Andres La Paz Bolivia 2002

Lactation clinical management education Wellstart San Diego California 1988

Primer Seminario de la región de las Americas sobre fortalecimiento de la enseñanza de Control de Enfermedades Diarreicas Agudas en las escuelas de medicina Santo Domingo 7 – 12 Junio 1993

PROFESSIONAL EXPERIENCE

2000 – 2003 MSH Representative in Bolivia and country advisor to M&L program Consultant Nutrition Ambulatory clinic Hospital del Niño La Paz

1994 - 2000 MSH representative in Bolivia and country advisor BASICS project , Post graduate professor of Nutrition Hospital del Niño de La Paz.

1988-1993 Country advisor PRITECH project managed resources for carrying out "sustained"

1987-1988 Technical Advisor for child health program at PROCOSI (Coordinating unit of NGOs in Bolivia)

1985-1987 Technical advisor to the PRITECH Project in La Paz, Bolivia

1983-1985 Head of Department of Health and Promotion of Caritas Boliviana La Paz Bolivia Responsible for educational and promotion programs in child health and nutrition.

1982-1985 Pediatrician in Caja Nacional de Seguridad Social La Paz

1977-1980 Resident in pediatrics and neonatology at Hospitals: del Niño de La Paz-Bolivia, City General Hospital-Stoke on Trent, England, Royal Worcester Infirmary-Worcester, England, South Mead. Hospital-Bristol, England.

1975-1976 Head Physician at Borg Hospital Alto Beni - Bolivia, only physician of the Local Hospital in Alto Beni (North La Paz), with a coverage of 20,000 inhabitants. Responsible for the attention of out-patient clinic and hospitalized patients and community service programs like Growth Monitoring, Yellow Fever disease control, immunizations, etc.

CONSULTANCIES

- 1997 Consultant for the Helen Kellogg Institute for International Studies - Proyecto America Latina 2000. Participant in the Forum ? The changing condition of childhood in latin america?
- 1996 Consultant for PAHO To facilitate a workshop for medical college professors.
- 1995 Consultant for WHO/ PAHO in Dominican Republic to train doctors and nurses.
- 1985 International Council of Churches Evaluation of Primary Care. Projects financed by ICCO in Cochabamba and La Paz I.C.C.O. in Cbba-Bolivia
- 1985 UNITAS La Paz, Bolivia. Nutrition Rehabilitation for pre-school children.
- 1984 UNICEF La Paz, Bolivia Feeding practices in young children with Diarrhoea.
- 1983 Hospital del Nino La Paz, Bolivia. Private research supported by Interamerican Foundation (IAF) to develop diets and guides for the treatment and rehabilitation of undernourished children.
- 1978 World Bank Norte de Potosi Health consultant of a multidisciplinary team making a diagnosis in the mining towns.

LANGUAGES

Native language - Spanish
 Read, write and speak fluently in English
 Read, write and speak French

COMPUTER SKILLS

Applied Knowledge of internet, Office 2000
 Applied knowledge of EPI - INFO

ORGANIZATIONS AFFILIATIONS

Member of the Colegio Medico de Chile.
 Member of the Colegio Medico de Bolivia.
 Member of Bolivian Pediatric Society
 Vice-president of the Bolivian association of editors of biomedical journals (ABEREB)

RESEARCH

1983 Analytic observation on specialized management of severe malnourished children at Hospital del Niño La Paz Presented at Jornadas Andinas del Altiplano 1984 Anca . Chile.

1985 Under fives growth chart and its use by paediatricians presented at National Congress of Paediatrics Cochabamba - Bolivia 1987

1987 Growth trends of children attending growth control clinic at Hospital del Niño - La Paz. Paper presented at Congreso Extraordinario del Instituto Boliviano de Biología de la Altura La Paz September 1988.

1990 Growth during the first six months of exclusively breast fed infants - Presented at Paediatrics National Congress Sucre . Bolivia 1991. Published

1991 Risk factors for acute and persistent diarrhoea PRITECH - CDC. A prospective study. Presented at the National Paediatric Meeting Trinidad . Bolivia 1994

1992 An outbreak of cholera in rural Bolivia. Rapid identification of a major vehicle of transmission. Presented by co-author at The 32nd interscience conference on antimicrobial agents and chemotherapy. 1992

- 1992** Prevalence of nutritional anemia using Hemo Cue Hemoglobinometer. Presented at the Paediatric Congress 1993.
- 1992 Evaluation of case management and use of Community Oral Rehydration Units. In Press
- 1992 Serum retinol in hospitalized patients Published
- 1993 Attitudes of Bolivian pharmacists in dealing with diarrhoea cases Published
- 1993** CDD Household survey in El Alto, Bolivia Survey done following WHO methodology previous a National campaign of CDD. In press
- 1994 CDD Household survey (as before) to measure campaign effectiveness on home diarrhoea case management.
- 1995 CDD/ARI Household survey ongoing
- 1995 Mortality survey - interviews to caretakers between 8 days to three months after a child's death to enquire about process of death.

ALVARO LUIS CALZADILLA RIVERA

I. Calificaciones

a. Académicas

2002 (En Curso) Maestría en Economía: Evaluación Cuantitativa de Políticas Económicas. Universidad Andina Simón Bolívar.
2000 Licenciado en Economía. Universidad Católica Boliviana.

b. Computacionales

Métodos Estadísticos (SPSS, STATA, TSP)
Métodos de Optimización (GAMS)
Paquetes (Excel, Word, Power Point)

c. Idiomas

Español Lengua Materna.
Inglés Buenos Conocimientos. Centro Boliviano Americano. La Paz.

II. Experiencia Profesional

2001 – 2002 Investigador, en el Centro de Estudios Económicos y Sociales CIESS – ECONOMETRICA. Asistencia Técnica en la elaboración de un Modelo de Equilibrio General para el Estudio de la Estrategia Boliviana de Reducción de la Pobreza. ASCI.
2001 (tres meses) Investigador, en el Instituto de Investigaciones Socio-Económicas de la Universidad Católica Boliviana. Asistencia técnica en la elaboración del proyecto "Impactos en la Pobreza de las Reformas Macroeconómicas". (The Kiel Institute of World Economics).
2001 (un mes) Asistente de Investigación, en la consultoría de "Leasing Habitacional", para el Fondo Financiero Privado PRODEM.
2000 (tres meses) Asistente de Investigación, en el Instituto de Investigaciones Socio-Económicas de la Universidad Católica Boliviana. Asistencia en el componente de "Inversión Extranjera Directa" del Proyecto Andino de Competitividad. (CAF, CID-Universidad de Harvard y UCB).

III. Áreas de Investigación

Modelos de Equilibrio General
Matrices de Contabilidad Social
Políticas Sociales
Inversión Extranjera Directa
Sistemas de Pensiones
Análisis de Encuestas

IV. Publicaciones

"Efectos de Política Económica en la Economía Boliviana: El Caso de la Reforma al Sistema de Pensiones". En el cual se realizaron estimaciones del Sistema de Reparto, del Sistema de Capitalización Individual y del Costo Fiscal de la Reforma al Sistema de Pensiones. Con toda esta información y sobre la base de un modelo de equilibrio general se estudió el impacto en la economía boliviana de las posibles alternativas de financiamiento de la reforma al Sistema de Pensiones. Tesis de Grado. Universidad Católica Boliviana.

V. Otras Actividades

Reemplazo temporal en la cátedra de Economía Matemática, en la Universidad Católica Boliviana (Primer Semestre 2001).

NOTAS

ⁱ World Bank Bolivia. 2002, Poverty and Nutrition in Bolivia 2002 No 24691 – B0

ⁱⁱ OPS/ OMS 2002, Mejorando la nutrición del niño pequeño en El Alto Bolivia . Resultados utilizando la metodología ProPAN Junio 2002

4. DHSS/INE 1988. Encuesta Nacional de Demografía y salud. La Paz 1988

5. Ministerio de Salud y Previsión Social 2000, Información Urgente! Situación de salud de la niñez boliviana frente al nuevo milenio. La Paz 2000

6. World Bank 2000: Poverty and Nutrition in Bolivia 24691-BO

7. Philip TJ, Nelson M, Ralph A, Leather S. 1997, Socioeconomic determinants of health: The contribution of nutrition to inequalities in health. BMJ 1997; 314

8. Reuland DS, Steinhoff et al. 1991, Prevalence and prediction of hypoxemia in children with respiratory infections in the Peruvian Andes. The Journal of Pediatrics 119 (6); 1991:900-906

9. Martorell R. 2000, The role of nutrition in economic development. Nutrition Reviews:54(4) S66-S71

10. Fortún JE. 1989, Reeducación alimentaria para el área rural La Paz 1989

11. León R, De la Vega C., Franqueville A, Aguerre M. 1992, El consumo alimentario en Bolivia Ediciones Runa La Paz 1992

12. Franqueville A, Aguilar G. 1988, El Alto de La Paz migraciones y estrategia alimentarias en Bolivia. ORSTOM La Paz 1988.

13. Antezana M. 2001, Seguridad Alimentaria en Pando CIPA PIEB La Paz 2001