

Dietary Intake and other Factors in the Etiology of Malnutrition

A Study Among Poor Children in Three Northern Communities in Argentina



Sigrun Henjum

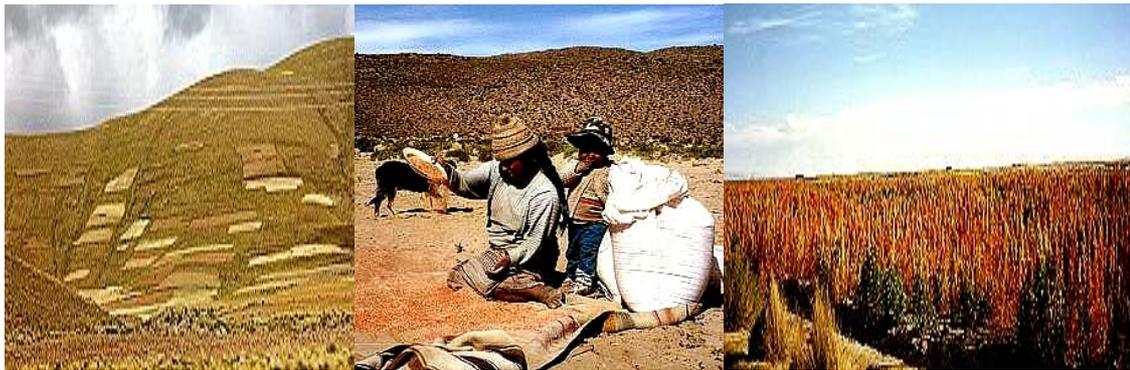
Thesis for the Cand. Scient. Degree
Department of Nutrition, Faculty of Medicine,
University of Oslo

Norway 2004

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UNIVERSITY OF OSLO

2004

Preface

I have now finished a work that actually was sparked eight years ago. In 1995-96, I spent one year as an exchange student in Quito in Ecuador, and I became fascinated by the history of the indigenous people. I read and talked to people who could tell that before the conquest, the indigenous population was taller than they are now. Later as a nutritionist I realized that had to do with changes in the nutritional situation and socioeconomic conditions. In the beginning of 2003, several years after my stay in Ecuador, I got the possibility to do field work in an indigenous location in Jujuy in Argentina.

Several people have contributed in the process of this work and deserve my gratitude.

- First of all my thanks go to my principal supervisor Siri Damman. You gave me the opportunity to do field work in Jujuy and put me in contact with key persons. Thank you for the wonderful time we shared together in Jujuy, thank you for your support and all the interesting conversations. I could never have a better supervisor than you! Your knowledge and enthusiastic interest in science has been a source of inspiration. I also want to thank my additional supervisor Wenche Bart Eide, for your inspiring comments, willingness to help and all the interest you showed in my work.
- Second my thanks go to Wara Alderete in San Salvador de Jujuy, who assisted me with practical issues and gave important advises of how and where to conduct the study. Also I would like to thank all the involved families in Maimara, Susques and Villa Belgrano and the assistant researchers who did a tremendous effort in the data collection. A special thank to Carlos Omonte, my faithful fieldworker in Maimara who was an invaluable support in work and leisure. Also I would like to thank Mariela Tolay and Hugo Vilca.
- Laila Quintar, my dear friend in Jujuy who opened up her house for me in Jujuy during the field study. Thanks you for your hospitality, all the interesting talks and laughs.
- Thanks to all my fellow students for the time we have shared together during the last five years!
- Thanks to my Spanish friend “la doctora” Marta Monjo and Kristin Opsahl who read through the thesis. Thank you Ingrid Barikmo, Kari Solvoll, Kjerstin Trygg, Anette Hjartåker and Christine Parr for your useful comments.
- My dearest Jørgen! Thank you for your endless patience, all the interesting conversations and your willingness to involve yourself in my thesis. Thank you for your help with Foodcalc and for reading through the thesis and contributing with helpful comments.
- Finally my thanks go to my parents Grete and Erik and my sister Ingrid, who have followed me through all this years of studies and always encouraged me to take higher education.

Sigrun Henjum

Abstract

Malnutrition in children is the consequence of a range of factors, often a combination of inadequate dietary intake and repeated infectious diseases. These factors, in turn, are closely linked to the overall standard of living and whether a population can meet its basic needs, such as access to food, housing and health care.

The aim of the present study was to evaluate factors assumed to cause malnutrition in a sample poor children from three locations in Jujuy in Northern Argentina.

The study was carried out in three locations with different level of urbanization in the province of Jujuy during February and March 2003. The sample consisted of 60 preschool children randomly selected among those brought to community kitchens by caregivers.

The children's dietary intake was assessed through a combination of food record by weighing and dietary recall. A questionnaire-based interview was used to gather data on child care and demographic and socioeconomic factors in the children's household. To get further information about various aspects of the culture of the informants, interviews with key informants and focus group interviews were conducted. Information about nutritional status and disease history for the sampled children was obtained from local health centers.

High rates of underweight was found among the children in the sample, and the prevalence was higher in rural than in urban locations. The children in the rural locations consumed more traditional food items than the children in more urban locations but they had also a relatively high consumption of western food items. In the urban location the knowledge of how to prepare traditional food had been lost. The quantity and quality of the dietary intake was inadequate. The children's diets had little diversity and consisted mainly of soups and starchy food items. There was no difference between mothers with normal weight children and underweight children in regard to marital status. Also there was no difference in the answers of the mother with underweight and normal weigh children in regard to the question "what do you do if the child refuses to eat?" There was no difference in income among the household in the three places, but the households in the rural locations had more animals, cultivated more land and sold more traditional handicraft than the households in the urban location. The caregiver's memory skills, the conceptualization skills of the siblings and intentional distortion were assumed to be the main limitations for an accurate registration of the dietary intake.

The inadequate dietary intake combined with frequent illnesses were believed to be the main causes which in the long run have contributed to the high levels of underweight among the children.

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List of abbreviations

ANOVA	Analysis of variance
CCIIRA	Comisión Coordinadora de Instituciones Indígenas de la República Argentina
FAO	Food and Agriculture Organization
FOPAR	Fondo Participativo de Inversion Social
GDP	Gross Domestic Product
IDH	Ingreso para el Desarrollo Humano
IFPRI	International Food Policy Research Institute
INDEC	Instituto Nacional de Estadísticas y Censos
INFOODS	International Network of Food Data Systems
MSAS	Ministry of Health and Social Action
NCHS	National Center for Health Statistics
NBI	Nececidades Básicas Insatisféchas
NGO	Non Governmental Organization
PAHO	Pan American Health Organization
POSOCO	Políticas Sociales Comunitarias
PROHUERTA	Program Huertas
PROMIN	Programa Materno Infantil y Nutricion
SD	Standard Deviation
SPSS	Statistical Package for Social Science
UNDP	United Nation Development Programme
UNICEF	United Nations Children's Fund
UNU	United Nations University
WB	World Bank
WFS	World Food Summit
WHO	World Health Organization

1 Introduction

1.1 Malnutrition

Worldwide, more than one-third of children under five are malnourished – whether stunted, wasted, or deficient in iodine, vitamin A or iron. These often irreversible and life-threatening forms of malnutrition are thoroughly rooted in poverty (WHO 2000). Malnutrition is found to be one of the common causes of death among children less than five years old in developing countries, along with malaria, measles, diarrhea, and acute respiratory infections (Gernaat et al. 1998). An inadequate dietary intake combined with frequent diseases strongly influences the development of malnutrition. The three most commonly used anthropometrical indices to assess growth status in children are weight for height, height for age and weight for age. On a population basis, high levels of stunting (low height for age) are associated with poor socioeconomic conditions. Wasting (low weight for height) in most cases indicates a recent and severe process of weight loss. Underweight (low weight for age) is influenced by both the height of the child and his or her weight and reflects body mass relative to chronological age (WHO/NUT 2003). In 2000 it was estimated that 33 percent of children under five in developing countries were stunted and 27 percent of preschool children were underweight (ACC/SCN 2000).

The consequences of malnutrition are several; from stunted growth, impaired cognitive functioning, increased vulnerability to disease, and to greater risk of death (Pollitt, 2000). Malnutrition can reduce mental capacity, interaction and school performance. Malnutrition is also directly or indirectly associated with 50 percent of all child mortality (ACC/SCN 2003). In regard to the immune system, malnutrition makes the children more prone to longer, more severe, and more frequent episodes of illness and thus increasing mortality risk. Infections cause appetite loss, and injury to the gastrointestinal mucosa, leading to malabsorption, particularly of micronutrients, and to increased permeability to antigens and bacteria (Tomkins & Watson 1989). Stunting is associated with obstructed labor in women and generally with increased mortality and lower physical productivity. Furthermore malnutrition in early life, including the period of fetal growth, influences the later development of chronic conditions such as heart disease, diabetes and high blood pressure (UNICEF 1998).

The causes of malnutrition are multifaceted and not just a problem of food shortage. It is stated that poverty underlies most of the world's malnutrition, with attendant inadequate and insecure food supply, inappropriate feeding practices and child care, nutritional emergencies, and poor socioeconomic conditions (WHO 2000). Although poverty is generally assumed to be the root cause of hunger and malnutrition, hunger and malnutrition can in turn cause poverty. It affects the capability of individuals to escape poverty through ill health, a shorter life expectancy and reduced work productivity (Kracht 2002).

This study focus on the causes of malnutrition among poor urban and rural children. In Latin America, poverty is generally higher in rural locations, and higher among indigenous people than in non-indigenous populations (IFAD 2001). It has however been stated that poor people in rural locations eat better than the poor in urban locations. In rural locations the poor often have some land they can cultivate and animals and are less prone to fluctuations in the economy (UNDP 2004). People in rural location and indigenous people generally maintain a more traditional way of living than people in more urban locations (Popkin 2000). It has been stated that the Andean traditional way of life provides protection against malnutrition and other health problems, and that a traditional Andean diet tends to be more nutritionally adequate than a processed western diet (Alderete 1992). In urban locations people are more dependent on money, but generally have better access to health services, food programmes and employment. However, the most affordable food items available in urban centers tend to have a low nutritional value (UNDP 2004).

In Argentina there are large regional differences in poverty. In the North West location, which includes Jujuy, the percentage of poor is higher than for the rest of the country. More than three quarter of the indigenous population in Argentina live in the province of Jujuy (Randall 2001).

1.2 The aim of the study

The aim of the study was to evaluate factors assumed to cause malnutrition in a sample poor children from three locations with different degree of urbanization in the province of Jujuy in Northern Argentina. The UNICEF conceptual framework on the causes of malnutrition was used as basis for analysis.

1.3 The location of the field study

When I was preparing for my master degree, I was looking for a possibility to do field work in an indigenous area. I got that opportunity in connection with the research of Siri Damman. She was doing fieldwork for her Ph.D in Jujuy in Argentina, a predominantly indigenous area. In Jujuy, nutritional data are in general scarce, and no information exists about the diet in the poor communities. It would therefore be relevant and interesting to look into the nutritional situation in the poor indigenous communities. Furthermore, Damman's collaborators in Argentina and Canada expressed an interest in acquiring information about the diet of indigenous people living in rural and urban locations respectively. The investigation was carried out in collaboration with the Faculty of Social Science in San Salvador de Jujuy, represented by Dr. Wara Alderete.

2 Background information on Argentina

2.1 The economic and political situation

Ten years ago Argentina was one of the richest countries in Latin America. Today the country is in its third year of economic crisis, poverty rates have exploded and people are emigrating to Europe and USA. In 1976 the rate of poverty in Argentina was 10 percent, and in December 2002, official statistics showed that more than half of the Argentinean population of 37 millions inhabitants were living below the poverty line (Nymark 2002). This is happening in a country with abundance of natural resources; from soil and water to gas and oil; a country called “the world’s grain chamber”. To understand what happened one has to go back to the 1970s, when internal and international conditions contributed to the beginning of Argentina's debt problems. In the years between 1976 and 1983 different military juntas were governing the country. Economically the military regime switched from the construction of own industry to a new liberal model based on deregulation and sale of national industry. With the new model the economic power concentrated in hands of few, and the rates of unemployment increased (Nymark 2002).

In 1983 the military was forced to renounce, and Raul Alfonsin from the radical party won the elections. Alfonsin’s reign was to an extended degree determined by the external debt and the fact that the economic power was in the hands of some few influential groups (Orieta et al. 2001). The new democratic government did not have enough financial resources to handle interests and installments, and Alfonsin was forced to ask the International Monetary Fund to finance the debt. The loan brought with it a demand to cut down on public expenses. Public salaries were cut down with 13 percent and the transmissions from the central government to the provinces were reduced by millions of dollars (Orieta et al. 2001). In a period of 6 years the debt increased from 45 to 65 billions. In 1989, at the end of his period, Alfonsin was forced to renounce after a hyperinflation of 3000 percent. During 2002 the cost of the basic food basket augmented with 100 percent (INDEC 2003). The price of flour increased 192 percent, rice 148 percent, oil 207 percent, milk 65 percent, pasta 62 percent and meat 75 percent (Gonzalez 2002).

In 1990 the Peronist party and the president Carlos Menem won the new elections. The minister of economy succeeded in reducing the inflation and turned the economical recession to a period of economic growth. The solution, according to him, was to bind the Argentinean peso to the dollar (“the Convertibility Plan”), and to sell off large companies of the state. At the same time total trade liberalization was introduced. All regulation and restriction of import, transactions of capital and investment disappeared during the five first years of the 1990s. At the end of 1995, when the supply of capital from the sale of public and private companies ceased, the Argentinean state had to cover the public expenses with new loans. In November 2001 the economic crisis seriously expanded, with the devaluation of the Argentinean peso. Efforts to protect the banking system from widespread withdrawal of deposits resulted in a sharp decline in economic activity and generated general discontent. This finally culminated in the resignation of the President de la Rúa in December 2001 and in early 2002, the abandonment of the Convertibility Plan, which produced hyperinflation and a sharp and sudden increase in poverty.

2.2 Poverty

2.2.1 Poverty in Argentina

According to the United Nation Development Programme (UNDP), Argentina ranks as number 34 on the human development index (HDI) (UNDP 2001)¹. The World Bank Poverty Report for 2003 states that in 1998 the poverty rate in Argentina was 29 percent, while by October 2002 the poverty rate had reached 58 percent. The Argentinean National Institute of Statistics and Census (INDEC) stated in May 2003 that more than 55 percent of the 37 millions Argentinean were suffering from poverty and 26 were destitute. Few countries have seen such a rapid rise in poverty, which constitutes an increase of more than 50 percent in 5 years (from 1998 to 2003). However there are large regional differences in the poverty in Argentina. The North-West and North-East are considered poorer than the rest of the country (World Bank 2003). Also a higher percentage of rural households in Jujuy have unmet basic needs compared to urban households (Alderete 1992). In 2003 in the North-West, which includes Jujuy, 70 percent were poor and 37 destitute. The poverty here seems rather stable even in times of economic change. According to INDEC in 2001, 19 percent of the households in the capital San Salvador de Jujuy had Unsatisfied Basic Needs, 42 percent of the households in Susques and 31 percent of the households in Maimara (INDEC 2001).

2.2.2 Initiatives to reduce poverty

According to the World Bank Poverty Report for Argentina from 2000, the Government of Argentina has various programmes that are considered important instruments for reducing or alleviating poverty. In 2000, Argentina spent 18 percent of its GDP on social programs, a 65 percent of the total consolidated public expenditures. This is one of the highest levels of social spending per person in Latin America (World Bank 2003). Within employment, and targeted social spending as a whole, the most important program is by far “Jefes y Jefas de Hogar”. This is a workfare program through which the workers receive 150 pesos per month in exchange for work in community projects or training. The program is partly financed by the World Bank, and the Government pays for one-third of the cost of the proposed projects. Local government finances the rest. However, the workfare program has received a lot of critics (El Tribuno 2003b). Most of the criticism concerns the low amount of money that the workers receive. In a household where both the man and the woman receive salary from the workfare program, they will not earn enough to cover the basic expenses for food. According to INDEC, in February 2003, a typical family of four needed 330 pesos monthly to cover their basic needs for food (the basic food basket). The total food basket cost 727 pesos, and includes clothing, transport, education and health (El Tribuno 2003a).

¹ The HDI measures achievements in terms of life expectancy, educational attainment and adjusted real income. Number one is the country, which has the highest life expectancy, educational attainment and adjusted real income. The counts are ranked from a high development index with number from 1-55, medium rank development index from 55-141 and a low development index from 142-175.

The IDH (Ingreso para el Desarrollo Humano), which was implemented in the second half of 2002, is aimed to prompt development, health, and schooling of children through the provision of cash transfers to poor families. The IDH, however, has been subject to significant implementation delays, resulting in much lower disbursements and coverage than expected for 2002. In education, the Social Emergency Program seeks to maintain the provision of education services and to facilitate access for vulnerable groups through three means: providing basic learning materials, through the new program “Útiles Escolares” and offering economical support through the program “Becas Estudiantiles” and school lunch programs, through the programme “Acciones Compensatorias en Educación”. Most of the funds allocated to these programs in 2002 have however been disbursed (World Bank 2003).

In the field of health, essential drugs are provided free of charge to poor people by a new health emergency program called “Remediar” through primary health care centers. Vaccinations have been provided through the National Immunization Program. Complementing the efforts of food programs, actions related to maternal and child health and nutrition have been channeled through “Programa Materno Infantil y Nutrición” (Promin) (World Bank 2003).

2.3 Urbanization

While urbanization historically has been closely linked to economic growth, the fastest urban growth today is occurring in low income countries, and is associated with a shift of poverty from the villages toward the cities, and then especially to urban slums (Drewnowski et al. 1997). Argentina is largely an urban country. From 1980 to 1999, the urban population grew from 83 percent to 87 percent (Hicks 2000). In 2001, 88 percent of the Argentineans lived in urban centers (Nation Master 2001) and more than 50 percent were residing in the five larger cities. In the province of Jujuy, the depopulation of rural departments has accelerated and the distribution of the population within the province is indicative of local patterns of economic development. San Salvador de Jujuy is the capital and the economical center in the province of Jujuy, and in 1992, 87 percent of the inhabitants in the province lived here. The population density is 90 people per square kilometer. In the two other departments of the province where the study locations Maimara and Susques are situated, the population density is of less than 1 person per square kilometer (Alderete 1992).

2.3.1 Urbanization and diet

Increasing urbanization in the developing world has brought a rapid shift in diet, physical activity, health, and nutrition. The term "nutrition transition" is used to describe this shift. The transition seems to start at a lower level of income, compared to what occurred in the Western countries after the Second World War. The reason is that many foods are relatively cheaper, especially fat and sugar. Urbanisation leads to over-consumption by increasing market access to fatty and sugary foods, including fast foods (Holmboe-Ottesen 2000). According to International Food Policy Research Institute (IFPRI) in 2000, worldwide, the urban diet contains a higher proportion of energy from fats and sugar than the rural diet, even in the poorest areas of very low-income countries. Most urban residents also eat greater amounts of animal products than their rural counterparts. Urban residents consume a more diversified diet and more micronutrients and animal proteins than rural residents but with considerably higher intakes of refined carbohydrates, processed foods, and saturated and total fat and lower intakes of fiber (Popkin 2000). In rural locations, new food items are brought into the diet on the background of a westernization process. The term "western food" refers to food items which have mainly been consumed in the western world (Drewnowski et al. 1997).

"Traditional food" refers to food items which have been consumed for a long period, is based on local production and is closely connected to the local identity and food culture. The traditional Andean indigenous diet consists of llama meat, maize, quinoa, potatoes and beans. Andean sources of meat are llama, alpaca, vicuna, and guanaco, all belonging to the Camelid family (Altizio et al. 2004). This meat is set to dry and later chopped and called "charqui". The most important seasoning used to prepare the meals is garlic. Quinoa is a grain which is cultivated in the Andes Mountains in South America. It has been a popular food item among natives for millennia. Quinoa was one of the three staple foods, along with corn and potatoes, of the Inca civilization. The proteins in the Quinoa are of unusually high quality, with an essential amino acid balance similar to milk. It also has a high content of calcium and iron. Unlike most other food crops, quinoa thrives with low rainfall, high altitudes, thin, cold air and hot sun (Quinoa Cooperation 2004). It has been stated that the traditional diet tends to be more nutritionally adequate than a western diet, with a high content of processed carbohydrates, fats and sugar (Alderete 1992;Kuhnlein et al. 1996). However, to what degree the populations in the rural locations of Jujuy maintain a traditional diet is questioned.

2.3.2 Urbanization and health

An adequate diet is a necessary but not in itself a sufficient condition for adequate nutritional status of children. Access to health services and prevention of disease is also important. Worldwide, children under five years of age in urban areas are less underweight and stunted than children in rural areas. For some countries the prevalence of acute malnutrition (wasting) is nearly the same in urban and rural areas, while chronic malnutrition (stunting) and underweight tend to be higher in rural areas (WHO/NUT 2003). In Bolivia, the urban centers experience impressive improvements in underweight, while stunting rates in the rural areas are relatively unchanged (WHO/NUT 2003). In Argentina, differences of malnutrition between urban and rural schools can be noted. The proportion of stunting is larger among school children in the rural areas of Jujuy. Among children in urban areas overweight is more pronounced (FAO 2004). In regard to aboriginal populations of the Americas, it seems that most of these communities have changed their diet and physical activity patterns to resemble the model presented by industrialized countries, in which they derive most of their diet from Western foods, and live sedentary and physically inactive lives. Under these circumstances they tend to develop high rates of obesity, insulin resistance and type 2 diabetes (Uauy et al. 2001).

2.3.3 Urban and rural poverty

Worldwide, rural populations are vulnerable to natural disasters such as drought or flooding. They generally have less access than urban areas to safe water, adequate sanitation, education and some health services (Kracht 2002). Urban residents purchase most of their food, while rural people, even those who do not live on farms, tend to produce at least some of their food. Economic crisis and reduction in wages, which influence consumer food prices and income, have higher impact for the urban populations. There is ample evidence that most rural households rely on the combination of farm and non-farm income sources, thereby reducing fluctuations and risk and, in some cases, increasing their asset base. Rural people, especially in remote areas, have weaker access to governmental, financial, or insurance support. On the other hand, rural people are usually supported by closer links to community which helps in emergency situations, and are less vulnerable to macroeconomic phenomena such as cyclical unemployment or inflation (UNDP 2004).

2.4 The nutrition situation

According to a survey conducted by Argentinean Department of Health in 1995, the main nutritional problems in Argentina were stunting (5-20 percent, according to province) and overweight (5-16 percent) (WHO/NUT 2003). There were regional differences, specifically, underweight was more pronounced among children in Northern Argentina. Height data collected among first year school children between 1991 and 1994 displayed a high level of malnutrition particularly in the Northern provinces. The prevalence in Jujuy was 16 percent (WHO/NUT 2003). A study conducted in 1994 by the Health Ministry in Jujuy for UNICEF, revealed that the proportion of underweight children in the province of Jujuy was 16 percent. The same year the prevalence in Maimara was 17 percent, in San Salvador de Jujuy 14 percent and in Susques 44 percent (Echenique 1995). In 2002 the prevalence of malnutrition had increased to 20 percent in Maimara, 17 percent in San Salvador de Jujuy and decreased marginally to 39 percent in Susques (Ministry of Health 2002).

2.4.1 Initiatives to improve the nutritional situation

Food distribution programs have a long history in Argentina. Since the end of the military dictatorship in 1983 the Government has had programmes for food distribution to the poor. These programmes have reached unknown proportions.

Community kitchens

Community kitchens, “Comedores populares”, arose as a survival strategy among urban residents around major cities in Argentina during the 1960s and 70s. The people formed clubs and functional organizations in order to improve their conditions. Some of these clubs began buying food in large quantities and preparing meals as a group to feed their families. Their popularity steadily increased, and by the late 1970s, government and donor agencies began to assist these kitchens by providing them with food aid and other assistance. The kitchens multiplied, and eventually became a major channel for food distribution for the poor, particularly during Argentina’s economic crisis (El Pregón 2002).

There are different types of community kitchens. Community kitchens for preschool children, the “comedores infantiles” are funded by the state, labor unions, non-governmental organizations (NGOs), churches and volunteers in the neighborhood. In community kitchens for school children, “comedores escolares”, pupils from 7 to 14 years old receive a meal or two during the school day. These community kitchens are run by public funds. Some of the schools and the community kitchens have kitchen gardens where they cultivate different vegetables for own consumption. The children in the community kitchens are selected from the local health centers. To enter the community kitchen the child needs a medical certification and a vaccination card, and only children from disadvantaged families are allowed to enter. In some community kitchens the parents have to collaborate by helping in the kitchen or by providing firewood. The parents who are not in a position or not willing to collaborate are not allowed to send their children to the community kitchen (Slavutsky et al. 1997). Today all the schools in Jujuy offer a meal during the school day and a fund has been established to cover the expenses of school meals. Food assistance is channeled through the “Programa de Emergencia Alimentaria” and through “Fopar” (Programa Fondo Participativo de Inversión Social), whose funds have been reallocated to finance community kitchens. The community kitchens also receive finances from “Posoco” (Políticas Sociales Comunitarias). However many community kitchens are still waiting for finances promised by the Government. Due to the lack of funding some of the community kitchens have been forced to close (El Pregón 2002).

Food packages

Food packages are another attempt to improve the diet in income poor families. Poor families receive packages of dry foods and oil distributed monthly. The nutritional content is supposed to cover a great part of the energy need in the families. However the food items do not have a satisfactory nutritional quality and contain low levels vitamins and minerals. The Government has received a lot of criticism of the quality of the food distributed and they are now trying to improve the nutritional content and making it more in accordance with traditional food habits by including local products. From October 2002 to March 2003 various families complained that they had not received the food packages (El Tribuno 2003b).

Milk distribution

The health centers in the province of Jujuy distribute milk powder to families with underweight children. On many occasions the distributed milk have not reached the beneficiaries and is said to have been stolen somewhere in the transport chain from the capital to the provinces. It has also been a problem that the whole family drinks the milk that was intended for the children (Himitian 2002). Furthermore, it has been reported that the milk distribution encourages families to keep at least one of the children in the family underweight to secure further supply of milk since only the families with underweight children receive milk (Echenique 1995). Some mothers even look at the milk distribution as a form for reward for having an under weight child (Pérez del Viso de Palou et al. 2000).

Kitchen gardens

The Government is also funding the “Prohuerta” program, which seeks to improve the nutrition of the urban and rural poor through the promotion of family and community gardens and farms (World Bank 2003). Schools, families, and neighborhoods are stimulated to make their own kitchen gardens and to produce food for own consumption. Both independent organizations and students at the University of San Salvador de Jujuy have started different attempts to get people in the different zones to grow the higher nutritional quality traditional crops (World Bank 2003).

Nutrition programme

Promin (Programa Materno Infantil y Nutrición) a programme which offers help and assistance to pregnant women and children less than 6 years old. In the area of nutrition, Promin is especially concerned with the nutritional status of pregnant and under-weight children. The World Bank and the Argentinean government finance the programme. As part of the programme, Promin collects data about the nutritional status of children less than six years old and teaches women about how to avoid malnutrition

2.5 The health system

The Ministry of Health and Social Action (MSAS) is in charge of regulating the entire health services system in Argentina. The health services can be divided into three subsystems, public, private, and social security. The resources of the public system come from taxes, the social security system is financed by compulsory contributions, and the emerging private system is funded through voluntary insurance schemes. Each provincial government is responsible for the health of the province’s inhabitants and the power is exercised through their respective ministries of health. In some provinces, the municipalities manage health centers dispensing primary care services and also have hospitals under their jurisdiction. Resources from the municipal budget, and subsidies or transfers from the provincial or national government finance these services. The provinces play a considerable role in the health services sector they spend more than 75 percent of total public expenditure on health. The public hospital is the cornerstone of the public services subsystem. It provides care to the poor who have insufficient or no medical coverage and subsidizes the health insurance by providing services to their beneficiaries without charge (Belmartino 2004).

The primary health system is a distinguishing characteristic of the health care system in the province of Jujuy. It was created in 1968 as a response to high infant mortality rates and prevalence of infectious disease in the province. The aim was to extend health care coverage by targeting low-income populations in rural and urban areas. The primary health care system is a preventive and sanitary health care program. It includes maternal child and child health, nutrition and immunization. Sanitary agents, who belong to the community, visit each household 3 times a year. They perform preventive, monitoring and primary health care activities (Alderete 1992).

2.6 The indigenous² population

The estimate of the indigenous population in Argentina is about 450,000, approximately one to four percent of the total Argentinean population (Randall 2001). They consist of 16 to 20 indigenous groups, the larger groups being the Collas (35,000), the Chiriguano (15,000), the Tobas (15,000), the Mapuches (40,000), the Guaranies (10,500) of Misiones, and the Wichi (25,000). The Collas live in the Northwest areas, especially Salta and Jujuy (Psacharopoulos et al. 1994). In the 1970, the Coordinating Commission of Indigenous Institutions (CCIIRA) was formed, with the intention of organizing indigenous groups and defining their demands. In 1983 the indigenous people received legal status within the country, and in 1984 a process to restore traditional indigenous lands and territories was started (Burke 1995).

2.6.1 Poverty in indigenous communities

In Latin America indigenous people are one and a half times as likely to be poor as non-indigenous people, and almost three times as likely to be extremely poor. They often live in rural areas and the children are more likely to repeat grades at the primary level and to drop out of school (Psacharopoulos et al. 1994). Their primary employment is agricultural or seasonal labor. In Argentina, 56 percent of the Mapuche people have no schooling. The same is true for only 7 percent of the non-indigenous population (Psacharopoulos et al. 1994).

2.6.2 Nutritional status in indigenous communities

Countries and regions in America with a high indigenous proportion show the highest rates of stunting. The problems seem most serious in the Andes region, in the jungle areas of South America and in Central America (Damman 2004b). According to a survey conducted in Mexico in 2003 by the National Center of Investigation of Nutrition and Health, indigenous children have higher probabilities of stunting and underweight than non-indigenous children. (Alderete 1992; Damman 2004b; PAHO 2003). Indigenous people in rural areas in Argentina have been reported to suffer from malnutrition, cholera, syphilis, gonorrhoea, tuberculosis, and high infant mortality rates (Burke 1995).

2.6.3 Indigenous people and the health system

The Pan American Health Organization (PAHO) published a report in 2003 on ethnicity and health, and states that ethnic origin has a significant impact on health in regard to differences in the attention received from health care providers and differences in the quality of services.

² In the Americas, the term “indigenous people” refers to the descendants of the pre-Colombian peoples.

In Argentina there seems to be no discrimination against the poor in terms of not admitting them to a hospital when they need it. However, in the hospital the poor do not get the same quality of care as those in the upper income groups. A poverty report on Argentina, written by the World Bank in 2000, states that over 25 percent of the women coming from the lowest income groups did not receive birth attendance from the public health system, while no woman from more wealthy households had such experiences. Over 30 percent of women from the low-income group, and only two percent of women from the upper income group received no post delivery follow up. The same pattern appears in ambulatory care; 74 percent of patients coming from the lowest household income groups had to wait more than 24 hours for a consultation, while only 45 percent of those in the upper quintile had such delay (Hicks 2000). In a study performed by Promin in Jujuy in 1997, a great number of women from poor households expressed anxiety and fear in meeting with the public health system. The women felt that they were not taken seriously, they felt ignored and complained about unsatisfactory treatment. They felt especially bad when the health workers did not inform them about the disease they were suffering from and when they were asked to repeat information after the health worker. Young pregnant girls who came to the clinic told that they were met with deprecatory attitudes and humiliations (Slavutsky et al. 1997).

2.6.4 Alcoholism in indigenous communities

Alcoholism is shown to be a considerable problem for indigenous people all over the world. A PAHO report on ethnicity and health from 2003 states that the incidence of alcoholism is higher in indigenous groups than in the general population (PAHO 2003). In the American continent, the rate of alcoholism-related deaths for Indians is more than 7 times that of the general population. In Latin America, the rate of alcoholism-related deaths for Indian youth between the ages of 15 and 24 is particularly a concern, as it is over 12 times that for the general population. And for young adults between the ages of 25 and 34 the rate is 13 times that of the general population. Furthermore drug abuse is the major contribution to health problems among American Indians (Charles et al. 2002; Damman 2004b; PAHO 2003).

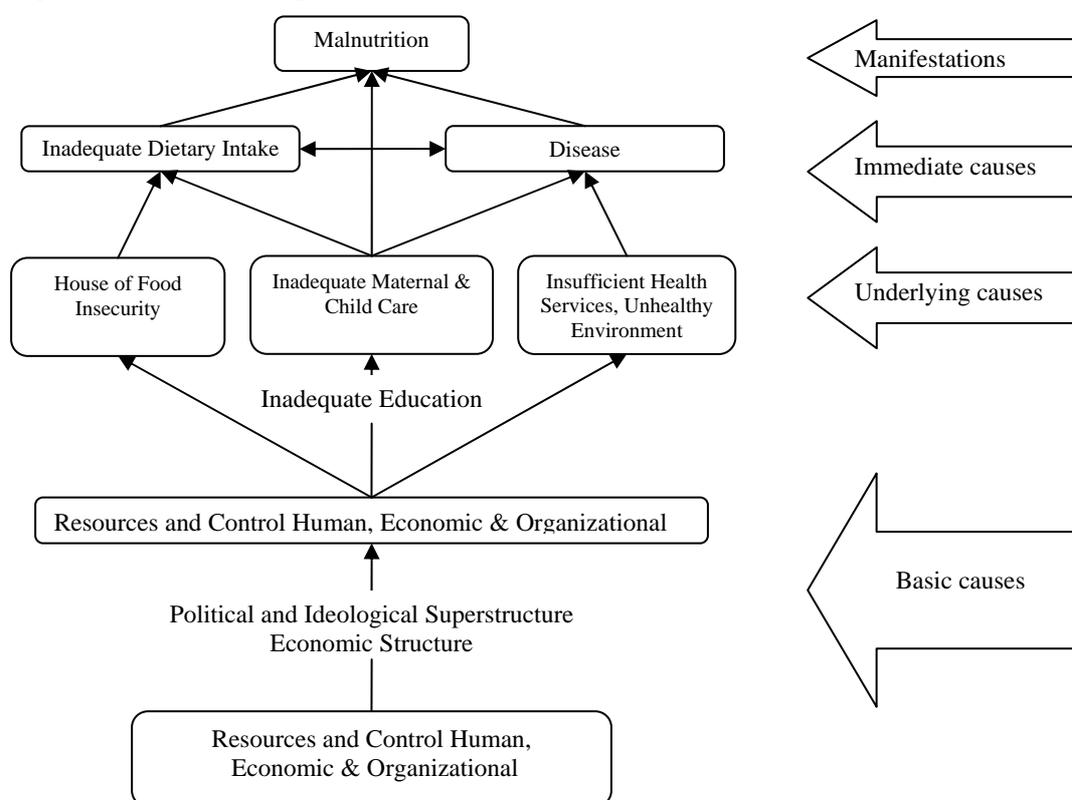
A focus group interview conducted by Promin in Jujuy revealed that on Mondays a lot of children came to school without having eaten, and it was said that sometimes they had not been eating during the whole weekend, because the father had spent the money on alcohol. It was also revealed that alcoholism among women is increasing (Slavutsky et al. 1997).

3 Theoretical framework and research questions

3.1 UNICEF conceptual framework for the causes of malnutrition

The conceptual framework on the causes of malnutrition was developed and field tested by UNICEF in the 1980s and launched in 1990 as a basis for the UNICEF strategy for the improvement of nutrition of women and children (UNICEF 1998). The framework reflects that causes of malnutrition are multifactorial, embracing aspects within the fields of dietary intake and food security, health and care. The nature of the causes can be classified as immediate, underlying and basic, whereby factors at one level influence those at other levels (Jonsson 1984). While malnutrition is an overt sign, this may be a symptom of deeper problems in the society. The causes of malnutrition can also be analyzed according to the level of society at which the causes exist. This can be the international level, the national, the local and the household level. Food intake may be inadequate in quantity or quality, while disease, particularly infections, reduces appetite and the ability to absorb nutrients. These immediate causes of malnutrition are often the result of household food insecurity, inappropriate care and feeding practices and inadequate health care. At the basis of all this is the availability, control and management of resources that may be affected by economic, social, political, technological, ecological, cultural and other constraints. It may also have to do with lack of tools or technology and by limited knowledge, skills and general ability to use the resources available.

Figure 1: UNICEF conceptual framework on the causes on malnutrition



3.2 Research questions

As described above, the aim of this master's thesis was to evaluate factors assumed to cause malnutrition in a sample poor children from three locations with different degree of urbanization in Jujuy in Northern Argentina. During the initial planning process, the aim was to collect anthropometric measurements of poor children in indigenous locations in Jujuy. The author was however informed that it might be difficult to obtain a permission to do so. However, among local researchers in Jujuy there was a wish to get more information about the diet of the indigenous population in the province of Jujuy. The present aim was then decided on, with a view to obtain information on the children's dietary intake, the mother's ability to provide adequate care and demographic and socioeconomic conditions in the household in three locations with different degree of urbanization. When the study started, it became clear that the health centers in the three locations were willing to share the files they had on the health and nutritional status of each child which also contained further information about family conditions.

There is little need to present the health concerns that motivate this work. Long-term reduced dietary intake and repeated episodes of illness cause malnutrition (UNICEF 1998). Among the poor and particularly the indigenous people, the prevalence of malnutrition is higher than for the rest of the population in Latin America. An inadequate diet and malnutrition in children have an immediate impact on their health and survival and may create irreversible health problems that will affect these individuals throughout their life.

It has been stated that the traditional Andean way of life provides protection against malnutrition, and that a traditional Andean diet normally is nutritionally more adequate than processed western food (Alderete 1992;Kuhnlein et al. 1996). Worldwide urban residents consume a more diverse diet with more animals products like milk, egg and meat than rural residents, but also higher in fat and sugar. Generally people in rural locations consume a diet higher in fibre and complex carbohydrates but with less diversity. They also consume more protein from non animal sources (Popkin 2000). Traditional food is normally consumed to a larger degree in rural locations, however it is difficult to decide to what degree rural people actually maintain a traditional diet. It was therefore considered interesting to look into the rural-urban differences in the diet in Jujuy. However, an adequate diet is a necessary but not in itself a sufficient condition for adequate nutrition of children. Adequate child care and satisfactory socioeconomic conditions are also important (WHO/NUT 2003). Among the several factors that are assumed to cause malnutrition in children, some were investigated here. The aim of the present study will be explored on the basis of the following research questions:

1. What is the nutritional status of the children in the three locations?
2. Is there a connection between malnutrition and disease?
3. What characterizes the children's dietary intake in the three locations?
4. To what degree has there been a change from a traditional to a western diet in the three locations?
5. Is there a connection between the children's nutritional status and selected factors associated with the mother's ability to provide adequate care in three locations?

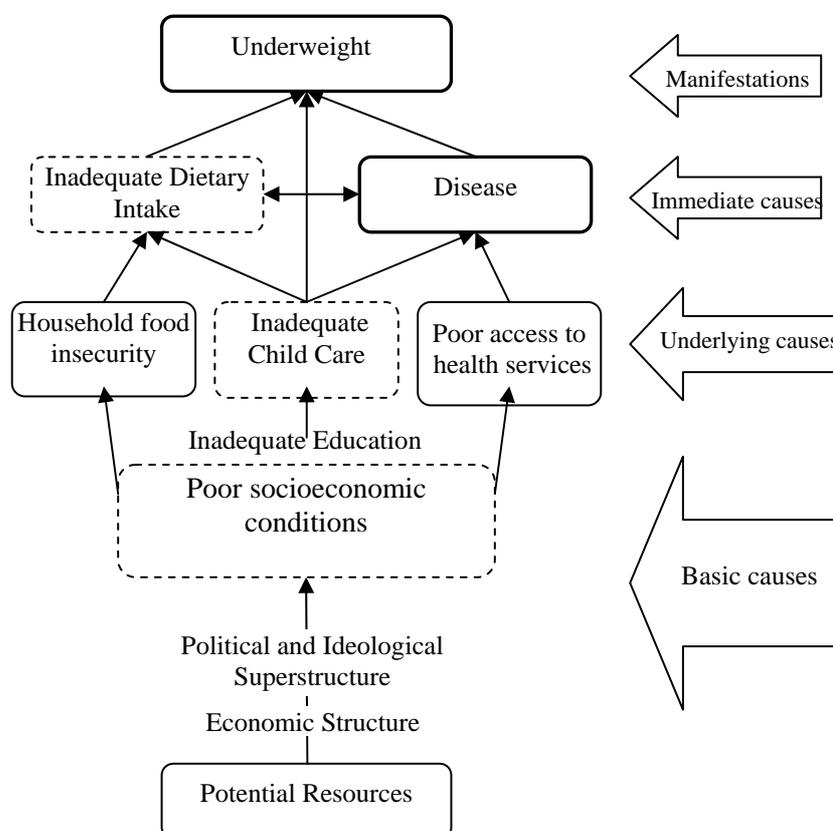
6. What demographic and socioeconomic indicators can help to explain the different prevalence of malnutrition in the three locations?
7. What are assumed to be the main limitations of the methods used to assess the dietary intake of the children in the sample?

The research questions will be referred to whenever relevant throughout the rest of this thesis, with a RQ and a number indicating to what particular question attention is being directed.

4 Methodology

4.1 Instruments and variables

Figure 2: Issue areas within the UNICEF framework which are considered in this thesis



The dotted boxes in figure 2 represent primary data, and the bold boxes represent secondary data. The remaining boxes are not discussed in this study. The primary data on dietary intake is based on the information obtained through a combination of food record by weighing and dietary recall. Information about demographic and socioeconomic indicators and child care was obtained through questionnaire based interview. Interviews with key informants and focus group interviews were also performed to obtain profound information about the culture of the informants. The secondary data on underweight and disease history was collected from local health centers. In this chapter the factors above will be further discussed. The nutritional status, the dietary intake, child care and demographic and socio-economic conditions were investigated for the whole sample, while disease was only investigated for the children in Susques.

Underweight

Anthropometric values need to be compared across individuals or populations in relation to an acceptable set of reference values. Different classification system with different cut off points can be used to define nutritional status. The Gomez classification system is one of the earliest international anthropometric classification systems, and measures weight for age (underweight) as percent of the Harvard/Boston standard. The reference point is the 50 percentile of the Harvard/Boston standard (Gomez et al. 1956). Promin in Argentina uses this classification system to assess weight for age in children with the same cut off points which Gomez used in his classification, but by using a national reference population as standard. The national reference population was developed by the Argentinean Health Ministry and the Argentinean Association for Pediatrics in 1986 (Lejarraga 2004) and the data collected from 1984-86 includes both breastfed children and formula-fed children (Lejarraga 2004).

Information about the sampled children's nutritional status was collected by Promin, mentioned in section 2.4.1, and made available through the children's files in the health centre in the three locations. The cut off points used by Gomez and adapted by Promin in Argentina are the following: Children with weight for age >90 percent of the standard are classified as normal weight, children with weight for age less than 75-90 percent of the standard are classified as mild underweight and children with weight for age less than 60-75 percent of the standard are classified as moderate underweight. Severe underweight are classified as weight for age less than 60 percent of the standard. If a child fell into the category mild, moderate or severe underweight further anthropometric measurements were carried out to see if the child had low weight for height (wasting). Children with low weight for height were classified as acute underweight (wasted). Children with low height for age fell into the category chronic underweight (stunted) (Arias 1996).

Disease

The children's journals were obtained in all three locations, but only of an acceptable quality for the children in Susques. In the two other places the children's journals were unsystematic with several dates, year and other information missing. The children were visiting the health center both when they were suffering from illness and when they went to normal controls. In the study the focus is on visits to the health center due to disease.

Inadequate dietary intake

To obtain a satisfactory nutritional status it is important to have a dietary intake that meets the body's need for energy and nutrients. To measure if the dietary intake is nutritionally adequate one has to compare it with recommended dietary intakes. The dietary recommendations used in this thesis were the FAO/WHO/UNU Expert Consultation on Energy and Protein Requirements, and Human Vitamin and Mineral Requirements (FAO/WHO 2002;FAO/WHO/UNU 1985).

In the present study the food composition table “ARGENFOODS” served as the reference food composition database. This food composition table was made in 2001 and is Argentina’s contribution to the INFOODS (International Network of Food Data Systems). INFOODS generates and compiles data on the composition of foods from all the countries in the world. United Nations University (UNU) and Food and Agriculture Organization (FAO) have supported the activities of this network (Masson 1999). ARGENFOODS is based on the national food composition tables made by the Argentinean National Institute of Nutrition. It also contains food items from the sub-regional center of Latin foods, situated in Chile (Closa et al. 2004). ARGENFOODS does not contain values for vitamin A and fiber. The content of vitamin A in the food items consumed by the children was therefore taken from the Mexican food composition table. The Mexican food composition table was preferred by others because it is considered to be of better quality than other food composition tables in Latin America, furthermore, it is available electronically. The Argentinean food composition table lacks information about the nutritional value of some food items. For example information on some food items were presented for either cooked or uncooked versions, but not both. The nutrient value of cooked pasta and rice was neither available from the Argentinean nor the Mexican food composition table. In these cases, values for the respective food items were found in the Norwegian food composition table (Statens ernæringsråd et al. 1995). The nutritional value of carbohydrates in the food table is calculated on the basis of difference: 100-(energy, fat, protein and ash) and the value of carbohydrates in the food table contain carbohydrates plus fiber. Nutritional values are calculated pr. 100 gram of the food item (Closa et al. 2004).

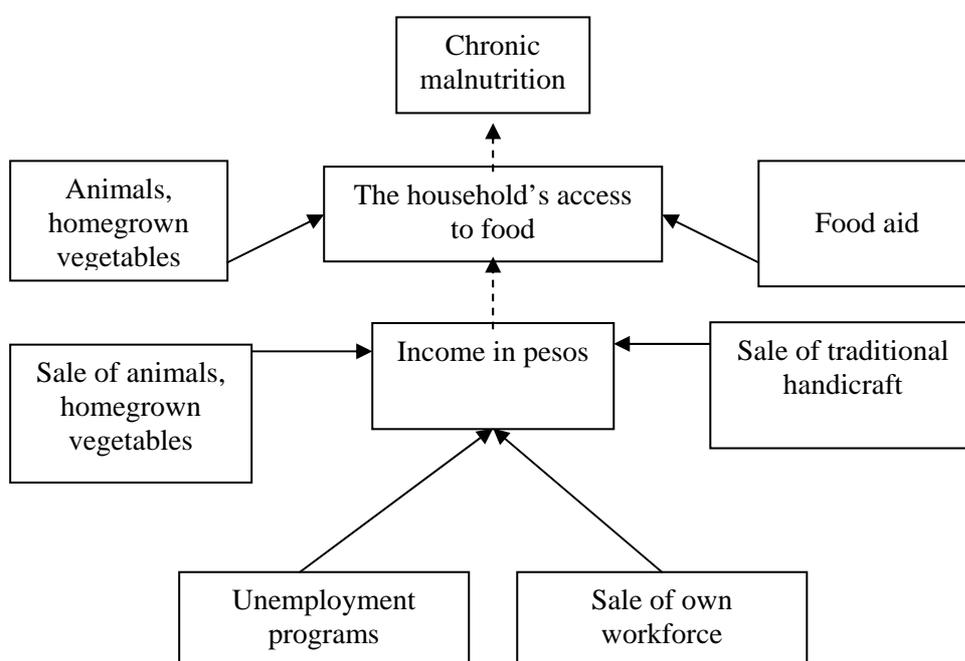
Inadequate child care

As mentioned above, an adequate dietary intake is a necessary but not in itself a sufficient condition for adequate nutrition of children. Adequate child care and access to health services are also important. “Care” refers to all of the behaviors performed by caregivers that affect food and nutrient intake, health, and the cognitive and psychosocial development of the child. A reduced capacity to care for dependants will have repercussions for their physical and nutritional status (UNICEF 2001). The variables chosen to measure child care in this investigation were, firstly, based on the question of how the mother would handle a child who refuses to eat and, secondly, selected socioeconomic conditions which were believed to influence the mother’s ability to provide adequate care. Such conditions were the mother’s marital status, the mother’s level of education, employment of the mother, the number of preschool children, and alcohol abuse of the husband. In this study some of the same variables were used to evaluate the mother’s ability to provide adequate care and the socioeconomic conditions in a household that is the mother’s educational level, the mother’s employment and the number of children under 6 years old.

Poor socioeconomic conditions

Household food security is crucial for adequate nutrition. According to The Rome Declaration on World Food Security and the World Food Summit Plan of Action, in 1996, food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life (FAO 1996). This definition implies four dimensions to food security, namely, sufficiency, access, security and time. In this study the household's access to food was considered and it is defined by entitlement to produce, purchase or exchange food or receive it as a gift (FAO 1996). The focus was on demographic and socioeconomic conditions influencing the household food security through the household's access to food.

Figure 3: Socioeconomic indicators believed to influence the prevalence of malnutrition through the household's access to food.



The selected socioeconomic indicators in figure 11 were assumed to influence the prevalence of malnutrition in the sample through the household's access to food. Health, child care and access to health services also strongly influence the nutritional status of a child. However, in this framework the focus is on socioeconomic and demographic conditions. The arrow between income and the household's access to food is dotted to emphasize that it is difficult to determine the amount of the income in a household actually spent on food. The arrow between the household's access to food and malnutrition is dotted to illustrate that there are other factors than the household's access to food that contribute to malnutrition. The conditions considered in this study were the sale of own workforce, traditional handicraft, and homegrown vegetables. Also food aid and unemployment programs were considered. Finally some demographic indicators were investigated for the families in the three locations because they were believed to influence the nutritional status of the children, that is: the number of children in the family, the number of children under 6, the mother's marital status, the mother's educational level, and the mother's employment.

4.2 Choice of variables

The variables used in the study to explore the research questions in section 3.2 are listed below.

Table 1: Variables used in the study, organized according to the UNICEF conceptual framework on causes of malnutrition

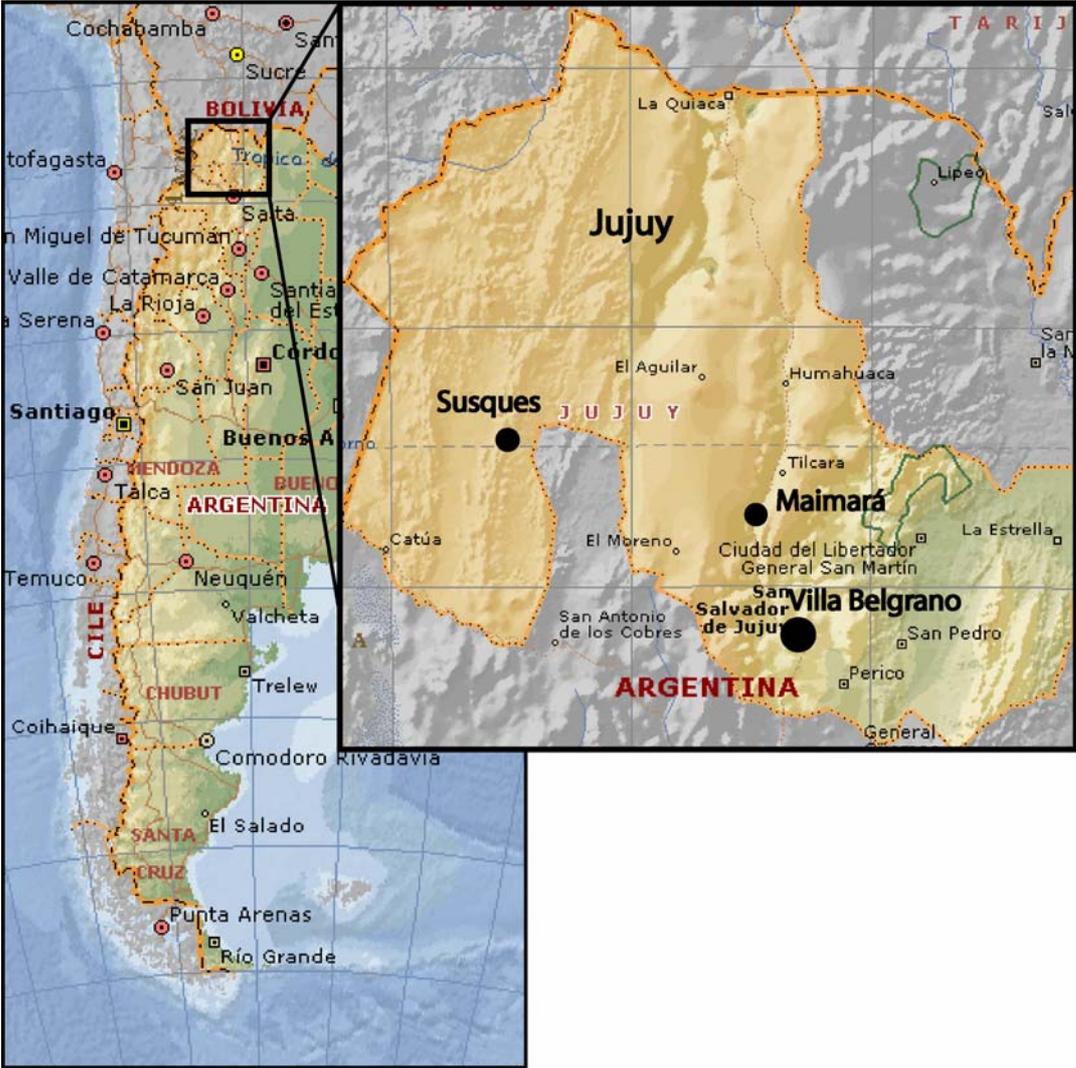
Causal level	Problem	Variables of measurement	Type of variables
Manifestations	Malnutrition	Weight/Age	Categorical
Immediate	Disease ^a	Cases of illness	Categorical
		Type of illness	Categorical
		Understanding of malnutrition	Descriptive
	Inadequate dietary intake, quantity and quality	Energy KJ	Continuous
		Fat	Continuous
		Carbohydrates	Continuous
		Protein	Continuous
		Vitamin A	Continuous
		Vitamin C	Continuous
		Vitamin B (thiamine, riboflavin, niacin)	Continuous
		Calcium	Continuous
		Iron	Continuous
Food groups, food items	Categorical		
Underlying	The mothers inability to provide adequate child care ^b	Ways of handling a child who refuses to eat	Categorical
		The mothers marital status	Categorical
		The mothers level of education	Categorical
		The mothers employment	Categorical
		Number of children under 6	Continuous
		Alcohol abuse	Categorical
Basic	Poor demographic and socioeconomic conditions ^c	Keeping of animals	Categorical
		Cultivating land (homegrown vegetables)	Categorical
		Household income	Continuous
		Food packages	Categorical
		Sale of traditional handicraft	Continuous
		The mothers employment	Categorical
		Total Number of children + children <6 years	Continuous
		The mothers marital status	Categorical
		Mothers level of education	Categorical

^a Investigated for the children in Susques only

^b Investigated for normal weight and underweight children

^c Investigated according to locations (Maimara, Susques and Villa Belgrano)

4.3 Field sites



4.3.1 Characteristics of the field locations

The province of Jujuy constitutes a cultural and geographical unit within the Andean mountains of Bolivia, Peru and Chile. It is located in the northwest of Argentina at the intersection of the Andean highlands and the Amazons. The province has about 500 000 inhabitants and can be divided into four different geographical zones. Puna is located in an elevated plateau with a mean altitude of 3000 meters and higher. The climate is harsh with thin air, hot sun and the soil is sandy and arid. The most rural study location, *Susques*, a small indigenous village 3800 meters above sea level is situated in Puna. *Susques* has 2000 inhabitants and is situated far from the main road and about 6 hours driving from the urban study location. The economy in *Susques* area is based on livestock, mainly llamas and sheep. The second geographical zone is Quebrada, where the landscape is featured by a series of small ravines, gorges and valleys. The climate is temperate and humid, with vegetation and fertile soils. *Maimara*, a small village with 3000 inhabitants, 1500 meters above sea level is situated in Quebrada and constitutes the second rural study location. In comparison to *Susques* it is situated on the main road to Bolivia and it is only 1 ½ hour from the urban study location. The main occupation of the inhabitants is agricultural or seasonal labor. Both *Susques* and *Maimara*, although villages, are considered rural, due to their relatively traditional way of life and the distance from the provincial capital. Since *Susques* has a more remote geographical location, in this study it is called the most rural location, while *Maimara* is called the second most rural location. The capital of the province San Salvador de Jujuy is situated in the third geographical zone, the Valleys, and has 200 000 inhabitants. The capital occupies only 7.5 percent of the territory of the province, but has the highest population density. The climate here is temperate; the fauna abundant and there are numerous of rivers that contribute to the fertility of the soil. *Villa Belgrano* is a shantytown in San Salvador de Jujuy where poor immigrants occupy patches of land. The people living here work in occupations such as construction work, services and in plantations. *Villa Belgrano* constitutes the urban study location. In all the three study locations the population is almost entirely indigenous. The forth-geographical zone of the province, Ramal, is situated in the lowland jungle north east of the Valleys. (Alderete 1992). The study was not carried out in Ramal.

4.3.2 The community kitchens in Maimara, Susques and Villa Belgrano

The funding of the selected community kitchens in *Susques* and in *Villa Belgrano* was governmental, and they were working in close connection to a local health center (puestos de salud) and a school in each location. This made it easy to obtain health information for each child. In *Susques* and *Villa Belgrano* only the preschool children attended the community kitchen; school children received food in community kitchens in the school. Both the community kitchens in *Susques* and *Villa Belgrano* functioned as kindergartens and there were professionals to take care of the children and the children received both breakfast and dinner in the community kitchens. The community kitchen in *Maimara* was funded from the local municipality. Every day the person in charge of the community kitchen in *Maimara* had to go to the mayor to ask for money/funds. The children who attended the community kitchen in *Maimara* were from 1 to 15 years of age. Only dinner was served and it was not cooperating with a local school or with a health center. It was closed during all kind of festivals, celebrations and vacations. The public school in *Maimara* had a serving in the morning called “copa de leche”, where the children came to eat breakfast. They were given a piece of white bread and a cup of milk, thereby the name.

4.4 Sampling

4.4.1 Sample criteria and size

The sample consisted of 60 randomly selected children, 20 children from each area. This is the required sample size to determine difference of 1 SD in the different groups (Altman 1999). The selection criteria were:

- Children younger than 6 years old. This age group was selected in order to compare the results with data from Programa Materno Infantil (Promin) since they only collect information about the nutritional status in children younger than 6 years old.
- Children who regularly attended public community kitchens.
- Children from different families, the one from the same families were excluded to ensure information of 60 children from different families.

To assure a number of 20 children from each of the selected areas, dietary assessments were made on more than 20 children. If data on some children were missing, other children attending the community kitchens were randomly selected to participate. Children from families where the data obtained through the dietary assessment or the questionnaire were not satisfactory, were excluded. If satisfactory data on more than 20 children were obtained in a sample area, the first 20 children who were registered were chosen. Of those who fulfilled the criteria the 20 first were randomly chosen.

4.4.2 Sample characteristics of the children's households

Table 2 shows the number of subjects included in the analysis and gives an overview of some characteristics of the sample in each of the three sampling locations. The average age of the children in Susques and Villa Belgrano was 3 years, and in Maimara 4 years. The total number of children in a family was highest in Maimara. In regard to number of children less than 6 years old in a family, in all the three locations the average number was 2. Susques had the highest proportion of single mothers, followed by Villa Belgrano and Maimara. The Maimara sample had the highest median age of the mothers and Susques had the lowest. The proportion of mothers who had completed primary school was highest in Villa Belgrano, followed by Susques and Maimara. A total of 95 percent of the mothers in the study were literate. The proportion of mothers who worked outside home was highest in Villa Belgrano and lowest in Susques.

Table 2: Some characteristics of the study sample in each of the three sampling areas Susques, Maimara and Villa Belgrano

	Locations			Total
	Maimara	Susques	Villa Belgrano	
Median age of the child, (P ₂₅ -P ₇₅)	4 (3-5)	3 (2-3)	3 (2-3)	3 (2-4)
N of children median, (P ₂₅ -P ₇₅)	5 (4-8)	3 (2-6)	3 (2-4)	4 (3-5)
N of children < 6 years old median (P ₂₅ -P ₇₅)	2 (2-3)	2 (1-3)	2 (1-3)	2 (1-3)
Median age of the mother (P ₂₅ -P ₇₅)	34 (27-37)	26 (22-31)	28 (25-31)	29 (24-34)
Single mothers % (n)	15 (3)	40 (8)	30 (6)	28 (17)
Literate women % (n)	90 (18)	100 (20)	95 (19)	95 (57)
Primary school completed % (n)	60 (12)	70 (14)	80 (16)	70 (42)
Mothers with a steady job % (n)	20 (4)	0 (0)	30 (6)	17 (10)
Cultivating land % (n)	40 (8)	45 (9)	10 (2)	32 (19)

4.5 Preparation of the field study

Procedures for establishing contact with informants

In consultation with the principal supervisor Siri Damman and her collaborative partner at the University in Jujuy, Dr. Wara Alderete, contact was established with key persons working with malnutrition, child health and indigenous peoples in the selected locations.

Research permit

In Argentina there is no regulation concerning research permissions, and there is no ethical committee to which one may apply. However, a formal application with information about the study was sent to the Faculty of Human and Social Sciences at the University of Jujuy and an approval was obtained (see appendix A). Research with indigenous people requires additional considerations, therefore the guide for doing research among indigenous people made by WHO was used as a basis in the formulation of the application. The WHO document provides information on some guiding principle for management of collaborative health research, covering the process required at various stage of the research, the main issues to be negotiated between the researcher and the indigenous people, drawing up research agreement and finally key ethical considerations that should govern all health research. Also the document emphasises that the results from the research should be made available to participants (WHO 2003).

Pilot study

A pilot study was carried out in Maimara two weeks before the survey started. A nurse and a social worker with experience from social science investigations participated in the development of the questionnaire. The questionnaire and the dietary recalls were tested on several mothers.

Information to the participants

A general information paper was given to the participants to inform them about the study so they could decide if they wanted to participate. In the study locations, meetings were arranged with key persons and the people were informed about the intention of the study and how it would be carried out (see appendix B).

The assistant researchers

As the researcher speaks Spanish fluently and all the informants spoke Spanish there was no need for interpreters. In all the three locations local health workers assisted in the registration in the community kitchen and in the interview in the households. In Maimara, a social health worker with experience from previous investigations became the research assistant. He knew the village and the inhabitants trusted him. He assisted in the community kitchen and during the visits to the different household where the 24 recalls and questionnaire based interviews was conducted. Through the social health worker in Maimara contact was made with a medical doctor in Susques. The medical doctor in Susques provided health data and a health worker from the hospital who assisted during the visits to the households. A social worker with knowledge of the living condition and the people in Susques assisted in the community kitchen and also during the visits to the households. A nurse in Villa Belgrano who worked in the health center next to the community kitchen assisted in the information gathering at the community kitchen and during the visits to the households.

The assistant researchers were given detailed instructions on how to measure and weigh food. They also received a salary for the work they had done.

Identification of relevant literature

In San Salvador de Jujuy literature studies were made at the university library. Also several previous master thesis on related themes and newspapers articles were reviewed.

Feed back to the participants

In January 2004, the researcher travelled back to Jujuy to give feed back of the study to the Health Department and to all the health workers and the participants in Maimara, Susques and Villa Belgrano. This is in accordance with the document from WHO “Indigenous peoples and participatory health research” mentioned above(WHO 2003).

4.6 Collection of primary data

4.6.1 Methods of dietary assessment

The methods shown in table 3 to collect primary data were applied in Susques, Maimara and Villa Belgrano on the following week's days.

Table 3: Weekly schedule on collection of primary data in Susques, Maimara and Villa Belgrano

Week day:	Methods to collect primary data			
	Food record by weighing in the community kitchens	Dietary recall in the household	Questionnaire based interviews	Focus group interview and in depth interviews
Monday	x			
Tuesday	x	x	x	
Wednesday	x	x	x	
Thursday	x	x	x	
Friday	x	x	x	
Saturday		x	x	x
Sunday				x

The dietary assessments in Maimara, Susques and Villa Belgrano were carried out during February and March 2003. The procedures of dietary assessment were carried out in all the three locations from Monday to Saturday. Each day four new children were added to the study and by the end of the week at least 20 children from each location were registered.

Table 4: Daily schedule of the dietary assessment Susques, Maimara and Villa Belgrano

Time	Meal	Place	Methods of dietary assessment	The day it was performed
8-9:00	Breakfast	Community kitchen	Food record by weighing	The first day
13-14:00	Dinner	Community kitchen	Food record by weighing	The first day
17-18:00	Tea/bread	Household	Dietary recall	The second day
20-21:00	Supper	Household	Dietary recall	The second day

Table 4 shows the daily schedule of the dietary assessment. The one-day dietary intake of each child was assessed through the combination of food record by weighing in the community kitchens and dietary recall for the remaining food consumption in the households. Breakfast and dinner were consumed in the community kitchens and tea and supper in the households. In the community kitchens the children's dietary intake was registered with food record by weighing the first day. In the afternoon the second day, the children were visited at home and the previous day's dietary intake was assessed by dietary recall. The caregivers were asked to recall what the children had consumed before they went to the community kitchens in the morning and after returning from the community kitchen until midnight. The registrations of the food intake in the community kitchens were performed by the researcher and by an assistant worker. In the households the researcher herself performed all the dietary recalls.

Food record by weighing

Food record by weighing is a prospective method where the consumption is registered while the subject is eating (Haraldsdottir et al. 1987). The researcher carefully registered the children's consumption by weighing the food immediately before eating, and by recording any leftovers for each meal. The consumption was registered by a kitchen scale and household measures.

Dietary recall

Dietary recall is a retrospective method, which is conducted after the consumption has taken place. The subjects are asked to list the foods they have consumed during a certain period of time, usually the preceding 24 hours (Callmer et al. 1986). This method is relatively quick and simple. A single 24-hours recall is not adequate for measurements of the usual intake of an individual; it can only be used to estimate the mean nutrient intake of groups of people (Langseth 1996).

In the household, the second day, the interview started by introducing the caregiver (from 12 years old) to the aim of the study and the procedure of dietary recall. The caregiver was asked to recall both if the child consumed anything before she or he went to the community kitchen the previous day in the morning and what the child had eaten after the return from the community kitchen, which implies from after 15 o'clock until midnight (9 hours recall).

Estimation of amounts

In the community kitchen the dietary intake at breakfast was measured according to the size of the cup and number of servings. The lunch was served from huge pots using ladles. The size and the number of ladles were carefully registered. Solid foods were weighed on a kitchen scale. Bread came in a standard size from the grocery store. Non-solid food amounts were estimated with equivalent amounts of water and measured in deciliters, for example: the size of the cup or the ladle was measured by filling it up with water and the volumes recorded in deciliters. The different foods were measured on a kitchen scale in the kitchen in gram per deciliters and multiplied with total number of deciliter each child received. Food which was not eaten was weighed and subtracted from the total amount the child had received.

In the households, the caregiver was asked to give information about what the child ate the previous day. Staple food like wheat, rice, maize and pasta was measured in deciliters, weighed and transformed to gram to yield their density in g/dl. Lists of foods density in g/dl were used in cases where the food was unavailable (Blaker et al. 1995). In order to estimate the amount of solid foods like fruit and vegetables the caregiver was asked to estimate the size (small, medium, large) and the number of the food. The food items, whose quantities were recorded by estimation of small, medium or standard portions, were bought on the local market and weighed.

The non-solid food was measured as followed: in the households the informant was asked to show the receptacle from which the child had eaten the previous day and to estimate how full the receptacle had been. To estimate quantity the fieldworker recorded the volumes in deciliters by filling it up with water and entering it into measuring jug of 5 deciliters. The density of the different foods was multiplied with the quantity in deciliters to yield the amount consumed in gram.

Recipes

In the community kitchens, the ingredients for the meal were weighed while the food was prepared. In Susques and Villa Belgrano the recipes and amounts of food used in the community kitchens were fixed. In the households, the person who had cooked was asked to estimate the recipes. The amount of each ingredient used in the recipe was estimated by using the same methods as described above. The ingredients used in the different soups, stews and pastas were almost the same with very little variation in the three selected locations. When a mother then told that her child ate soup of flour and vegetables, but didn't remember the recipes, a standard recipe³ for this food was used.

4.6.2 Questionnaire based interview

The day after the food record by weighing in the community kitchens, the respective children's households were visited and a caregiver was asked to answer a questionnaire. The questionnaire is presented in Appendix C and will be referred to whenever relevant throughout the rest of this thesis, with a Q and a number indicating to what particular question attention is being directed. The questions were predetermined with a fixed wording. The response alternatives were also fixed and pre-specified, however some of the alternatives were open ended. The interviewer asked the questions one by one and wrote down the answers. It took about 20 minutes to finish the questionnaire-based interview. The questionnaire was developed based on conversations with local social workers with experience from similar investigations and literature on the topic. It contained totally 37 questions and was divided into three sections. The first section contained questions on demographic and socioeconomic indicators, the second part included questions related to child care practices and the third was a food frequency questionnaire to investigate the intake of western and traditional food items.

³ An average recipe between the similar recipes from the three locations

Demographic and socioeconomic indicators

The main intention of these questions was to obtain information about demographic and socioeconomic conditions of the children's households to be able to analyze the findings in relation to location and the nutritional status. It was divided as follows; first there was a section with questions about name, sex, and age of all the family members in the household, and about how many of the children in the household attended community kitchens or "copa de leche"(Q. 1-2). Further, there was a section of household's assets such as house ownership, cultivating of land, or keeping animals. The question of animals were trichotomized into 0, 1-20 and >20 (Q 3-12). The questionnaire also contained a section about the mother's education (Q. 13-22) and current occupation and income (Q. 23-34).

Child care

An assessment of child care was obtained by having the caregivers answering Q.35. More specifically, the researcher asked what they did if the child did not want to eat. The Q.1-34 was used to study both demographic and socioeconomic conditions of the children's household and the mother's ability to provide adequate care.

Food frequency questionnaire

To investigate the intake of traditional and western food items in the three locations the questionnaire included a food frequency questionnaire Q.36-37. It contained questions of how frequent the children consumed selected traditional and western food items, Q.36. Five categories were used to describe how often the food items were consumed ranging from every day, every week, every month, every second month and every year. It also contained a section about the informants knowledge about traditional food, like if they knew the different traditional food items, if they considered the traditional food as healthy or not, if they knew how to prepare it and finally if it was possible to obtain, Q.37. The respective food items are presented in section 5.3.2. A local health worker with profound knowledge of the local diet guided the development of the food item list adapted specifically to be in accordance with the local food habits in the research locations. The data from the food frequency questionnaire was not used in the calculation of the total dietary intake. It is only used to investigate the frequency of some selected food items.

4.6.3 Focus group interview

A focus group interview is a group interview on a specific topic. It is an open-ended discussion guided by a researcher, typically extending over at least one hour. According to Robson et al, the advantage of using focus group interviews as a technique is the high efficiency in collection of qualitative data, stemming from the increase in amount and range that occurs when several people are joined (Robson 2002). The themes discussed were child care, alcoholism, diet, healthy vs. unhealthy food, living conditions, poverty and unemployment. The main points from the conversations were written down. The qualitative data were used to add additional information regarding various aspects of the culture, habits and general situation of the informants.

4.6.4 Interviews with key informants

Pelto has stated that the basis for all anthropological work is interviews with key informants. It is considered as an important method to get profound information about the culture of the informant (Pelto et al. 1997). In this study interviews were made with various key informants including nutritionists, medical doctors, nurses and health workers in Susques, Maimara and Villa Belgrano. Also interviews were made with people from the Health Ministry, Hospital San Roque, Promin and the Department for Health Education in San Salvador de Jujuy. The interviews provided important information about living conditions, diet and attitudes towards child care, food and health of the children in the three locations. See Appendix D for the complete list of key informants who participated.

4.7 Collection of secondary data

Information about the children's nutritional status was obtained at the local health centers for each child; additional information of acceptable quality about the disease history was only available for the children in Susques.

4.8 Data processing and statistical analysis

4.8.1 Data handling

Data from the dietary assessment was entered into the computer software Excel. The food intake and the recipes were entered into two separate files and then converted to text files. These files were run in FoodCalc, a computer program developed by Lauritsen (Lauritsen 1998). This software was run with a food composition table (ARGENFOODS).

The ratio between staple and sauce is assumed to be similar on a group level, and similar to the ratio in the soup measured by the researcher, as the researcher carefully selected the sample to measure. The consumption of the soup/stew was measured in deciliter and transformed into gram with the measured density of the soup. The computer program Foodcalc calculated the consumed amount of micro- and macro ingredients. The calculations used the recipe for the soup/stew, the consumed amount in gram, the food composition table (ARGENFOOD), an evaporation percentage and an equation which makes it possible for FoodCalc to calculate the relative amount of each ingredient per 100 grams. The equation is used for Foodcalc to accurately calculate the evaporation for the complete amount of water, including water present in ingredients and water added to the recipes.

Data from the questionnaires and the interviews were also entered into the computer software Excel. Comprehensive data cleaning was performed. All data handling and statistical analyzes were done using SPSS (Statistical Package for Social Science), version 11.0.

4.8.2 Continuous variables

The continuous data were checked for normality by using the Kolmogorov-Smirnov test of normality, by studying histograms and normality plots. Non-parametric methods were used in the statistical analysis, since none of the continuous variables were normally distributed. The different continuous outcome variables were analyzed according to sampling locations and for normal weight and underweight children. See table 1 for a complete list of the continuous variables. The data is presented with median and both 25, and 75- percentiles.

To compare two independent groups, Mann Whitney two independent sample test was used. Kruskal Wallis one-way analysis of variance (ANOVA) was used to compare more than two independent groups (Altman 1999).

4.8.3 Categorical variables

For hypothesis testing of association between two or more categorical variables the Chi-Square test and Fisher's exact test was used as suitable (Altman 1999). Categorical data is presented as percentage and number in every category. The different categorical outcome variables are analyzed according to sampling locations (Susques, Maimara and Villa Belgrano) and for normal weight and underweight children. See table 1 for a complete list of the categorical variables. Some of the originally continuous variables were transformed into categorical variables, like number of animals, which was divided in three categories.

4.8.4 Statistical significance

In the analysis, when speaking of statistical significance, it is the 5% level that is referred to (two-sided alternative for hypothesis testing).

5 Results

The results are sequenced according to the research questions.

5.1 What is the nutritional status of the children in the three locations?

Table 5: Weight for age for the children in Maimara, Susques and Villa Belgrano (N=60, 1-6 years old)

Locations	Weight/age			Total % (N)
	Normal weight % (n)	Mild underweight ^a % (n)	Moderate underweight ^b % (n)	
Maimara	35 (7)	60 (12)	5 (1)	100 (20)
Susques	35 (7)	55 (11)	10 (2)	100 (20)
Villa Belgrano	75 (15)	20 (4)	5 (1)	100 (20)
Total	48 (29)	45 (27)	7 (4)	100 (60)

^aWeight/age, 75-90 % ^bWeight/age, 60-75 %

Table 5 shows the weight for age of the sampled children in the three study locations. Susques and Maimara had the highest prevalence of moderate underweight children, 55 and 60 % respectively. In Villa Belgrano 20 % of the children in the sample were moderate underweight. Totally 48 % of the children were classified as normal weight, 45 % as moderate underweight and 7 % as severe underweight. There was no difference between boys and girls with regard to nutritional status ($p=0,81$)⁴. There was a difference between Susques and Villa Belgrano ($p=0,01$) and Maimara and Villa Belgrano ($p=0,01$) with regard to underweight. No difference was found between the age groups 1-3 and 4-6 years old according to nutritional status ($p=0,64$).

A social worker in Maimara said that the malnutrition in Northern Argentina is naturalized; it has been made a part of the culture.

“The culture here in Jujuy states that the indigenous people are short; it’s neither a disease nor a problem, it’s genetic.”

Various mothers said;

“I am short and the children’s father is short, so why should the children grow and be tall?”

Malnutrition was not considered a disease or a problem, the mothers looked at it as a natural condition, they often said; “he is like this, small and thin.” Also some mothers felt that it was beyond their control to keep the child healthy.

Angelica, a 25 years old mother of five, with three malnourished children, told about the changes she saw in her malnourished children:

⁴ Differences tested with Chi-Square, with significance level $p=0,05$. The categories moderate and severe underweight are merged, because the category of severe underweight contains only 4 persons

“They wanted to sleep all the time; their faces changed and they did not want to eat. They looked sad, cried and did not have a desire to play”.

A mother said that her daughter ate well but she didn't gain weight:

“Sandra was born with low weight, she has always been small and thin, now she is eight years old and the most intelligent of all my children. I think malnutrition can have adverse affects in some of the children but not in others like my daughter.”

5.2 Is there a connection between malnutrition and disease?

Thirteen of the twenty children in the sample from Susques⁵ were classified as underweight that is low weight per age. Five of the 20 children were born with birth weight less than 2500 gram. The children with birth weight less than 2500g were not significantly more malnourished than children with birth weight above 2500g ($p=0,56$)⁶. There was a clear difference ($p<0,01$)⁷ between the underweight and normal weight children regarding to number of visits to health centers because of illness. Eight children had visited the health center more than 10 times during their 4 years lives due to illness, four of the children had from 6 to 10 visits and 8 children from 1-5 visits to the health center.

Table 6: Cases of illness among 20 children in Susques

Type of illness	Cases of illness during the children's lifetime*	Percentage of children who had suffered from the illness
	Mean (min. -max.)	% (n)
Parasite/diarrhea	2 (1-3)	40 (8)
Cold/fever	3 (1-6)	45 (9)
Bronchitis	3 (1-8)	35 (7)
Underweight	6 (2-20)	60 (12)
Dermatitis	1 (1-2)	20 (4)

* History of disease in the children's life. Cases of illness only include those children who had the respective illness at least one time. The median age of the children in Susques was 3 years old with 25- and 75- percentile 2 and 3 years respectively.

Table 6 shows the cases of illness the children had been suffering from during their lifetime. Except from underweight, the most frequent illnesses were cold and bronchitis, followed by diarrhea and dermatitis. The median number of times the children had been suffering from diseases was 8 times (with 25- and 75- percentile respectively 1 and 11).

A classic example was Veronica, a 3 years old girl who had visited the physician with because of illness 10 times the last two years. She was one of the youngest of the 10 siblings and lived with her aunt, who had 8 children. Veronica's mother was a shepherd and had given away most of her children to the extended family so they could take care of them. Veronica has had ear infection for the last two years and 7 of the 10 visits to the health centers were because of the infection. During that time she had also become moderately underweight.

5.3 What characterizes the dietary intake in the three locations?

5.3.1 A description of the children's diet

Four main meals were normally consumed each day. The children ate breakfast and dinner in the community kitchens, and tea and supper in their homes.

⁵ Disease history was only obtained for the children in Susques (n=20)

⁶ Differences tested with Chi-Square test, with significance level $p=0,05$

⁷ Differences tested with Mann-Whitney's two-independent sample test, with a significance level at $p=0,05$.

In the community kitchens

The breakfast consisted of white bread and “mate” with sugar, a typical Argentinean tea, milk or chocolate milk. In all the three locations the children came to the community kitchen with cups and received the amount of milk that they wanted. Some mornings the children were served a sweet porridge. The diets in the community kitchens in the three locations were very similar. For dinner it was common to serve a soup and a stew cooked on a staple with vegetables. The staple food most frequently consumed was pasta, rice and white bread. The vegetables used most frequently were tomato, onion, potatoes and pumpkin. Typically five different soups were prepared: pasta, rice, oat, vegetable and maize soup. The soups were eaten before the main dish, which was a stew of pastas or tomato sauce, pastas with vegetables or meat, or a stew with vegetables and rice. A sweet porridge called “anchi” made of maize flour, sugar, lemon and water, and another sweet porridge with boiled rice and milk were often served as a dessert. The children drank either fruit powder with sugar and water, or just water for dinner.

In the households

When the children returned to their homes in the afternoon they normally drank tea with sugar and a piece of plain bread, and in the night joined their families for supper. In Susques many families consumed tortillas made of wheat flour instead of white bread. The households in this survey were poor, and meat was not consumed frequently. Fish was not consumed at all. Some of the children consumed fruits like pears, peaches and apples in the afternoon. The drinks that were most frequently consumed in the households were milk, water and tea with sugar.

Table 7: Selected meals and food items consumed at home by the children in Maimara, Susques and Villa Belgrano (n=60).

	Eaten by %			
	Maimara (n)	Susques (n)	Villa Belgrano (n)	Total (n)
Tea	80 (16)	70 (14)	65 (13)	72 (43)
Milk	20 (4)	40 (8)	40 (8)	33 (20)
Fruit	30 (6)	40 (8)	30 (6)	33 (20)
Supper	90 (18)	75 (15)	85 (17)	83 (50)

Table 7 shows the percentage of the children who consumed selected meals and food items in their homes during the recall. The proportion of children who consumed tea and supper was highest in Maimara. The children in Maimara consumed less milk than the children in Susques and Villa Belgrano. The fruit consumption was highest in Susques. No difference was found between the number of children who had consumed the different meals and food items in the three locations.

5.3.2 Traditional versus western diet in Maimara, Susques and Villa Belgrano

As mentioned in the background chapter, traditional diets tend to be more nutritionally adequate than a processed western diet. The diet is typically high in protein and low in fat, while the western diet is high in sugar and saturated fat (Kuhnlein et al. 1996). The traditional Andean diet consists of maize, llama meat, goat cheese, quinoa, wheat tortillas, beans and potatoes. The western diet consists of various food items like sugar rich drinks, pasta, sausage, white bread, rice and cows meat.

Figure 4: Traditional food items⁸ consumed in the households the last week %

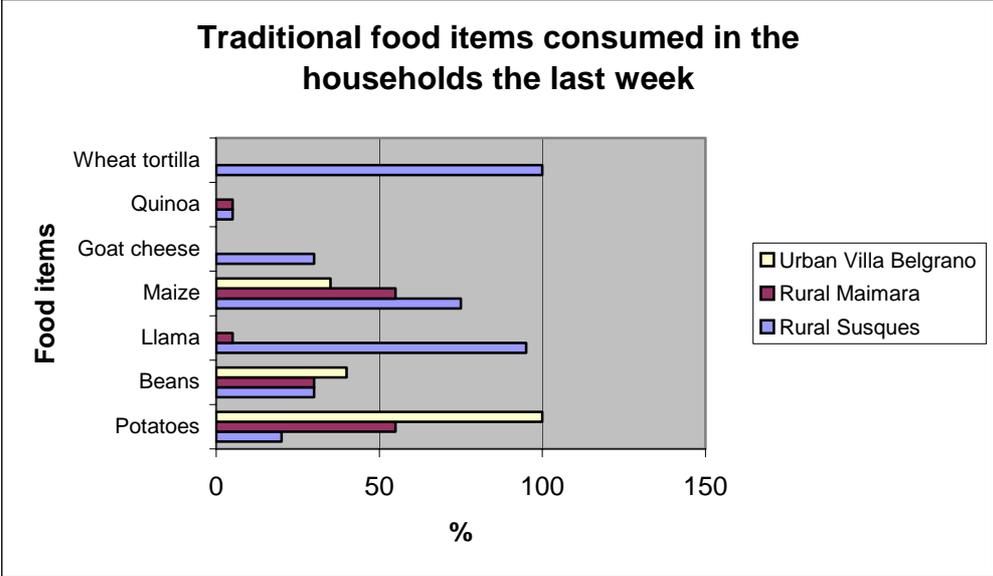


Figure 3 shows the traditional food items consumed in the households the last week in the three study locations. The households in Susques had the highest consumption of tortilla, quinoa, goat cheese, maize and llama. The households in Villa Belgrano had the highest consumption of beans and potatoes.

⁸ See section 2.3.1 for a description of a traditional Andean diet

Figure 5: Western food items⁹ consumed in the household the last week %

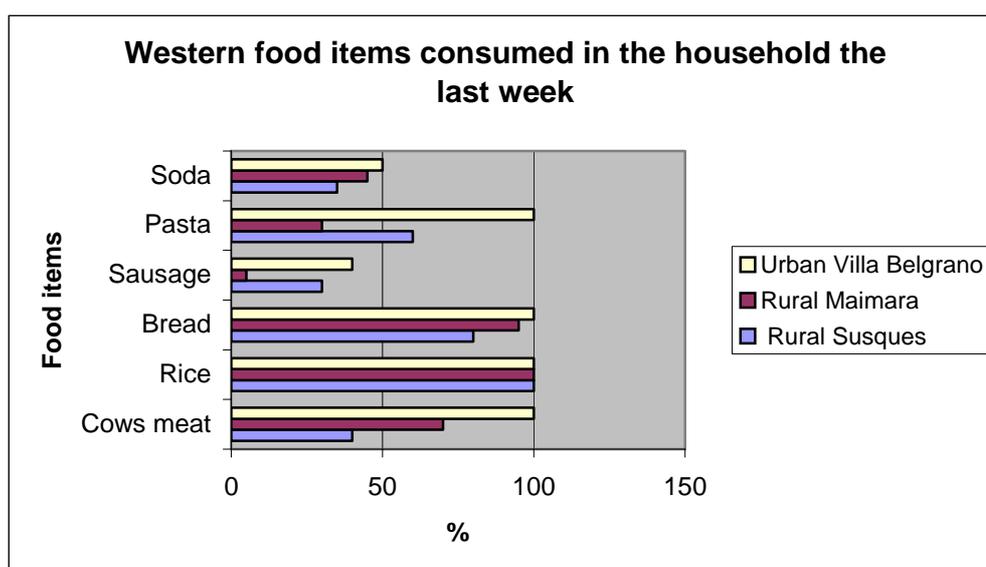


Figure 4 shows the consumption of western food items in the households the last week before the interview in Susques, Maimara and Villa Belgrano. The households in Villa Belgrano had the highest consumption of soda, pasta, sausage, white bread and cow's meat. The consumption of rice was the same in the three locations with different level of urbanization.

Information about the traditional diet was obtained from interviews with key informants and through a focus group in Susques. The informants told that the tradition of cultivating land and preparing traditional food had been lost, mainly because the children have been taught in school that the Andean culture is inferior. In school the children had experienced that the teacher talked about their culture in negative terms and made fun of their traditions. For example by telling that their food traditions and cultivating land is primitive. This makes the indigenous people start to picture themselves and their own traditions as inferior. One mother told that when the children were served traditional food in the community kitchen other mothers had complained because they felt that their children were being served food for poor people. However most of the people in the investigation had the impression that the traditional diet is healthier. An elderly woman said:

“When I grew up we ate maize and goat cheese and we were never sick. We were well nourished, but now the technology has taken over and we are losing our Andean culture. We do not any longer teach our children how to prepare or cultivate the traditional food.”

One key informant had the impression that the western food has a lower nutritional quality than the food consumed before and that people in rural location ate better than people in more urban locations.

“The diet is worse now than before, it has less variety, and the children mainly consume pasta and rice from the food aid programs. The people in rural locations eat better than people in urban locations”.

⁹ See section 2.3.1 for a description of the western diet.

5.3.3 Intake of selected food items in the three locations

Table 8: Percentage who consumed the selected food items^a and median intake among children who consumed the food items in gram (n=60).

	Locations					
	Maimara n=20	Susques n=20	Villa Belgrano n=20	Maimara	Susques	Villa Belgrano
	Eaten by % (n)			Median intake among the children who consumed the respective food item (g/day) Median (P ₂₅ -P ₇₅) ^b		
<u>Milk/diary</u>						
Whole milk ^c	45 (9)	35 (7)	80 (16)	200 (115-260)	370 (200-400)	229 (63-450)
Chocolate milk ^c	45 (9)	0 (0)	5 (1)	240 (175-300)	0	200
Cheese ^d	20 (4)	40 (8)	10 (2)	8	6 (4-8)	35
Yoghurt	5 (1)	5 (1)	15 (3)	150	300	150
<u>Egg</u>	50 (10)	40 (8)	35 (7)	7 (7-23)	10 (6-11)	7 (7-55)
<u>Meat</u> ^e	100 (20)	100 (20)	100 (20)	27 (10-30)	14 (9-23)	20 (8-55) †
<u>Cereals/bread</u>						
Maize flour	70 (14)	100 (20)	20 (4)	27 (26-40)	26 (19-36)	14 (11-22) †§
Rice	85 (17)	10 (2)	25 (5)	200 (100-200)	100,0	100(100-150) §
Pastas	75 (15)	70 (14)	50 (10)	119 (60-189)	20 (12-26)	60 (21-118) *†
White bread	95 (19)	75 (15)	95 (19)	60 (45-78)	60 (30-60)	45 (30-60) †
<u>Vegetable/fruit</u>						
Potatoes	60 (12)	100 (20)	55 (11)	9 (5-22)	21 (15-28)	10 (5-100) *
Pumpkin	15 (3)	100 (20)	50 (10)	18 (18-22)	10 (5-15)	7 (5-10) §*
Carrot	20 (4)	85 (17)	55 (11)	4 (4-5)	11 (6-16)	7 (4-15)
Tomato	75 (15)	65 (13)	75 (15)	22 (14-48)	7 (3-10)	15 (9-20)*+ †
Onion	70 (14)	100 (20)	70 (14)	20 (12-35)	21 (16-30)	10 (7-39)
Soup vegetables ^f	70 (14)	100 (20)	100 (20)	5 (3-10)	2 (1-4)	4 (2-9)
Fruits ^g	40 (8)	50 (10)	55 (11)	135 (110-200)	58 (50-120)	100 (65-100)†*
<u>Fats/oil</u>	75 (15)	85 (17)	60 (12)	3 (1-3)	1 (1-2)	1 (1-2)
<u>Sugar</u>	85 (17)	100 (20)	95 (19)	25 (5-51)	13 (11-16)	10 (5-10) §*
<u>Drinks</u>						
Tea	80 (16)	95 (19)	80 (16)	210 (163-338)	320 (200-450)	300 (200-400)
Orange juice	20 (4)	0 (0)	15 (3)	205 (129-278)	0	200

^a Food items consumed by less than 20 % of the children are not included (liver, parsley, garlic, pomes frites, and all brand muesli).

^b It was not possible to calculate the 25 and 75 percentile for food items consumed by less than 4 children

^c Prepared from milk powder

^d Parmesan cheese and white cheese

^e The different types of meat consumed (cow, sheep, pork, chicken) are calculated together

^f Soup vegetables consisted of swiss chard, peas and celery

^g Banana, peach, apple, pear, melon, mango, grape, lime

^h Differences tested with Kruskal Wallis one way Anova with $p=0,05$ as significance level *Susques and Maimara § Villa Belgrano and Maimara † Susques and Villa Belgrano, with the significant level $p=0,05$ Differences were only tested for the children who consumed the respective food items in the three locations. In cases where less than three children had eaten the food items, it was not possible to calculate the difference because SPSS could not handle so few children in a category.

Table 8 shows the percentage of children in each location who consumed selected food items at least once during the one-day dietary assessment and the median intake among the children who consumed the respective food item in gram. For the total group, bread was consumed by 88 % of the children, pasta by 65 %, rice by 40 % and maize flour by 63 % of the children. Fats and oil were consumed by 73 %, sugar was consumed by 93 % and milk by 70 % of the children. All the children had consumed meat.

The most consumed milk product in Villa Belgrano was whole milk based on milk powder, in Susques it was chocolate milk and in Maimara both chocolate milk and whole milk based on milk powder. In Villa Belgrano a significantly higher proportion of the children consumed meat than in Maimara. Sheep meat was the most consumed meat in Maimara, and cow's meat was the most consumed meat in Villa Belgrano and Susques. The children in Maimara and Susques had a significantly higher consumption of maize flour than the children in Villa Belgrano. The children in Maimara had the highest consumption in gram of pasta and rice. The children in Maimara and Villa Belgrano consumed significantly more pasta than the children in Susques. The children in Maimara had a significant higher consumption of rice than the children in Villa Belgrano. In regard to bread there was a difference in the consumption between Susques and Villa Belgrano. The vegetables most consumed in the three locations were potatoes, tomato and onion in Maimara, tomato, pumpkin and potatoes in Susques and tomato and onion in Villa Belgrano. In general, the intake of sugar in the three locations was low and the intake of sugar in gram was significant higher in Maimara than in the two other locations.

5.3.4 Food groups¹⁰ as sources of energy, macro-and micronutrients

Figure 6: Food groups from which the children in Maimara, Susques and Villa Belgrano got energy %

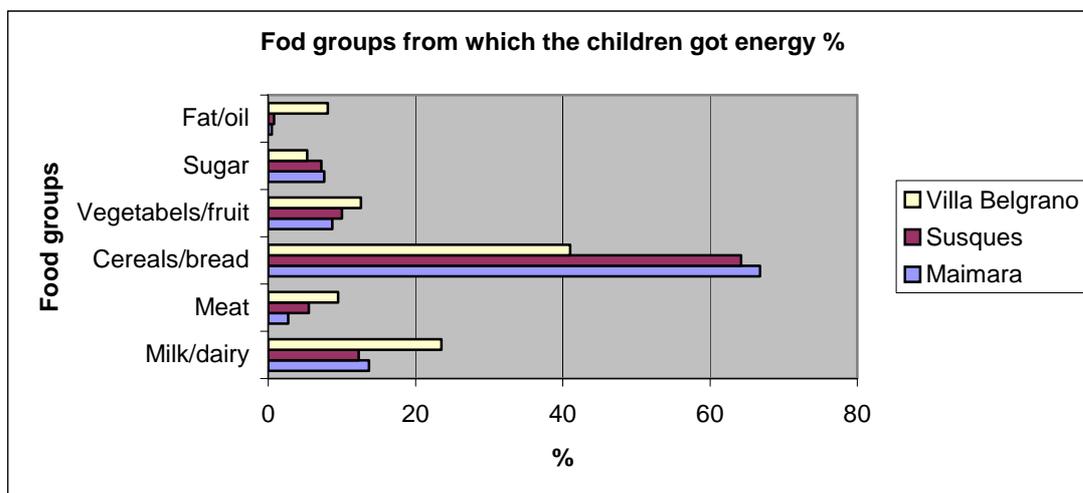
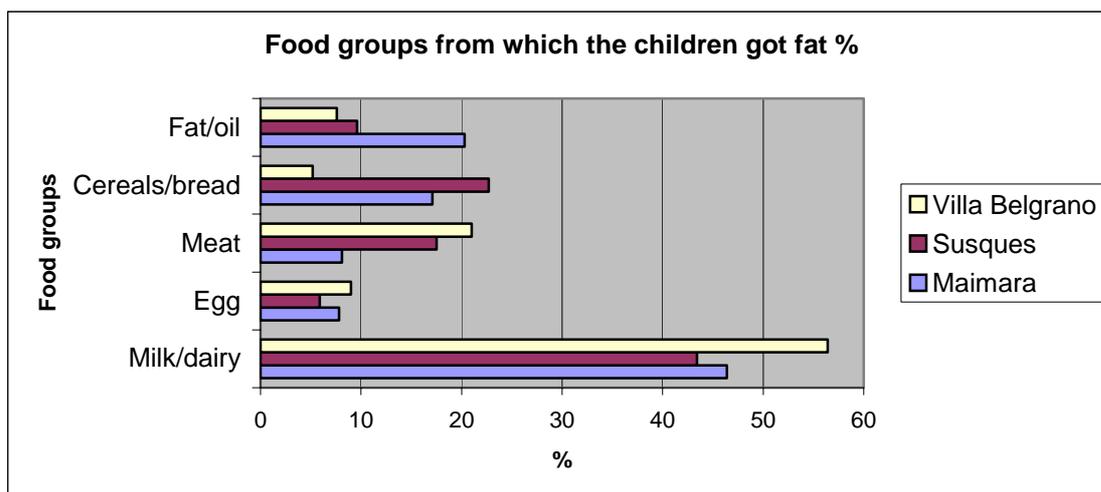


Figure 5 shows the food group from which the children got energy. The most important source was cereals and bread, which contributed to 67, 64 and 41 % of the energy in Maimara, Susques and Villa Belgrano respectively. Milk and cheese were also important sources of energy and contributed to 16, 12 and 24 % in Maimara, Susques and Villa Belgrano respectively. The children in Villa Belgrano got more of the energy from fat/oil, vegetables/fruit, meat and milk than the children in Susques and Maimara. The children in Maimara got more energy from sugar and cereals/bread than the children in Susques and Villa Belgrano. The category sugar includes chocolate, gelatin and different desserts (sweets potato dessert, peach, plum and strawberry dessert).

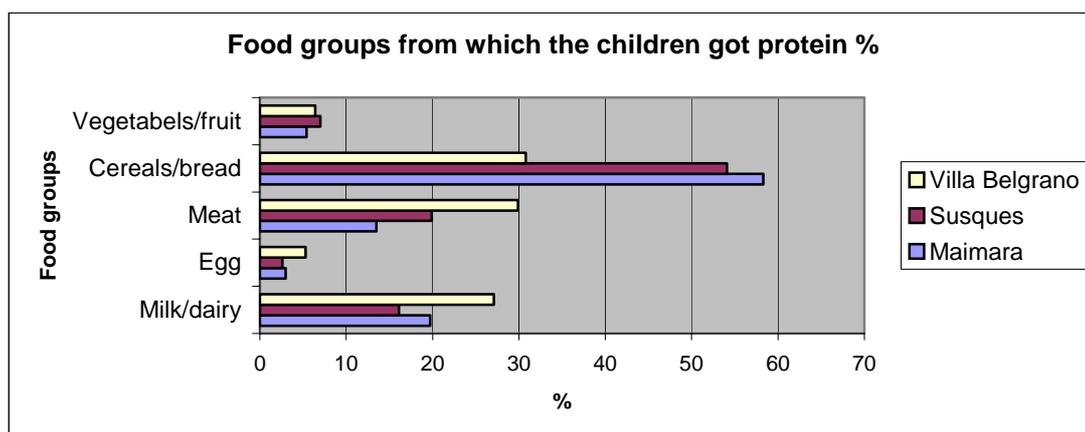
Figure 7: Food groups from which the children in Maimara, Susques and Villa Belgrano got fat %



¹⁰ Food groups, which contributed to less than 5 % of the nutrient in each of the three locations, are excluded.

Figure 6 shows the food group from which the children got fat. Milk and cheese countered for 46, 43 and 56 % of the fat intake in Maimara, Susques and Villa Belgrano respectively. In general, the children in Villa Belgrano got more fat from milk, egg and meat the children in Susques and Maimara. The children in Maimara got most of the fat from milk and fat/oil, while the children in Susques got most of the fat from milk and cereals/bread.

Figure 8: Food groups from which the children in Maimara, Susques and Villa Belgrano got protein %



The figure 7 shows the food group from which the children got protein. In Susques and Maimara cereals/bread contributed to most of the protein intake and in Villa Belgrano cereals/bread, meat and milk all contributed the same to the protein intake.

In regard to the intake of iron, the children in Maimara and Susques got it from the food groups' flour and bread. Fruit and vegetables was the second most important source of iron and the third food group was meat. In Villa Belgrano the meat contributed to most of the intake of iron, followed by cereals and vegetables/fruits.

Milk contributed to 50 and 58 % respectively of vitamin A in Maimara and Villa Belgrano. In Susques the food group which contributed most to the vitamin A intake was vegetables/fruit.

The most important source of calcium in the diet of the total of the sampled children was milk. Secondly, fruit and vegetables was the other food group which contributed to the calcium intake.

Totally 97 % of the children's intake of vitamin C came from vegetables/fruits, the remaining 3 % came from flour and bread.

In all the three locations thiamine came mainly from three food groups' fruit and vegetables, flour and bread, and milk and cheese. The main source of niacin was cereals/bread in Susques and Maimara, and vegetables/fruit in Villa Belgrano. Riboflavin came from vegetables/fruits and from cereals/bread in all the three locations.

5.3.5 Intake of energy and macronutrients according to the FAO/WHO recommendations

The estimated energy recommendations are from the FAO/WHO/UNU technical report, 1985. The energy recommendations are based on the age of the child and the mean weight of the reference population for the age of the child. The commendations for fat, carbohydrate and protein are calculated on the background of energy distribution. Of the children's dietary intake 30 percent of the energy should come from fat (Fats and oils in human nutrition) (FAO/WHO 1993), 55 percent from carbohydrates (FAO/WHO Carbohydrates in Human Nutrition) (FAO/WHO 1997) and 15 percent of the energy from protein (see Appendix F for a more detailed calculation).

Table 9: Median daily intakes of energy and macronutrients in Maimara, Susques and Villa Belgrano (n=60)

Recommendations of macronutrients according to age	Pr.person/day ^a			
	Maimara	Susques	Villa Belgrano	Total
	Median (P ₂₅ -P ₇₅) ^b	Median (P ₂₅ -P ₇₅)	Median (P ₂₅ -P ₇₅)	Median (P ₂₅ -P ₇₅)
<u>Energy MJ</u>				
Age: 2-3: 5,7	6,2 (4,1-6,7)	3,2 (2,1-3,6)	3,0 (1,8-4,3)	3,8 (2,9-5,2)
Age: 4-5: 6,5	4,5 (3,4-5,3)	3,4 (3,1-4,3)	3,8 (2,2-5,7)	3,2 (2,1-3,7)
<u>Fat g</u>				
Age: 2-3: 46	15 (8-25)	11 (6-18)	21 (9-32)	15 (8-24)
Age: 4-5: 53	13 (5-16)	8 (6-19)	13 (2-23)	9 (6-22)
<u>Protein^c g</u>				
Age: 2-3: 51	41 (30-54)	28 (21-30)	34 (17-42)	37 (27-43)
Age: 4-5: 57	37 (25-43)	32 (27-46)	28 (14-42)	26 (21-33)
<u>Carbohydrates g</u>				
Age: 2-3: 184	252 (190-325)	93 (72-136)	110 (76-129)	145 (105-235)
Age: 4-5: 210	224 (132-253)	146 (123-191)	136 (100-298)	117 (77-150)

^a Median for one-day dietary intake for 60 children. Rounded to nearest 0,5 for fat, protein and carbohydrate

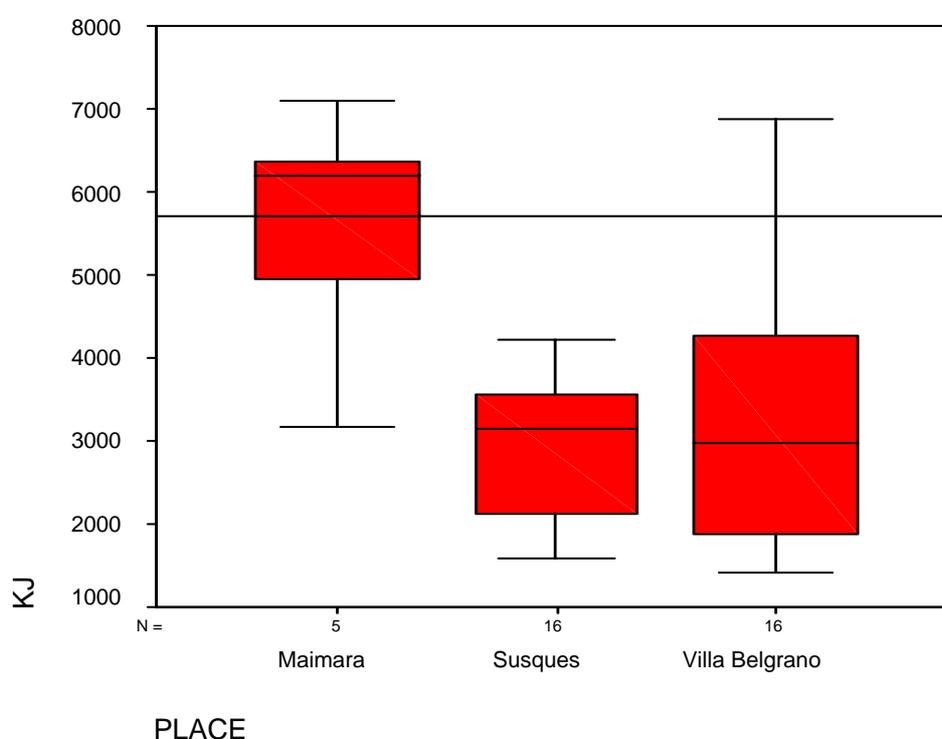
^b 25th and 75th percentiles

^c Safe level of protein is 30,6 gram for age group 2-3, 37,5 gram for the age group 4-5

The median intake of energy and macronutrients and the FAO/WHO recommendation for the two age groups are shown in table 9. The median intake of energy for the age group 2-3 was 3,8 MJ, and the age group 4-5, was 3,2 MJ. The children in Maimara had the highest intake of both energy and carbohydrates. Maimara had a significant higher intake of energy than Susques ($p=0,01$) and Villa Belgrano ($p=0,01$)¹¹. The children in Susques consumed less fat and protein than the children in Maimara and Villa Belgrano. The intake of fat was highest in Villa Belgrano. According to the fat intake there was a difference between Susques and Villa Belgrano ($p=0,03$). There was also a difference between the intake of carbohydrates in Susques and Maimara ($p<0,01$) and Maimara and Villa Belgrano ($p<0,01$). No differences were found between the intakes of protein in the three locations. No difference was found between energy intake and sex ($p=0,06$) and will not be further discussed. There was no difference between the normal and the underweight children in regard to the intake of energy KJ ($p=0,68$)¹².

The energy distribution of the dietary intake of the sampled children was as followed: in Susques 69 % of the energy came from carbohydrates, 14 % of the energy came from protein, and 17 % came from fat. In Maimara the energy distribution was 77 % from carbohydrates, 13 % from protein and 10 % from fat. In Villa Belgrano the energy distribution was different; 24 % of the energy was from fat, 17 % from protein and 59 % from carbohydrates.

Figure 9: Energy intake according to FAO/WHO recommendations for children 2- 3 years old in Susques, Maimara and Villa Belgrano by age (n=60)



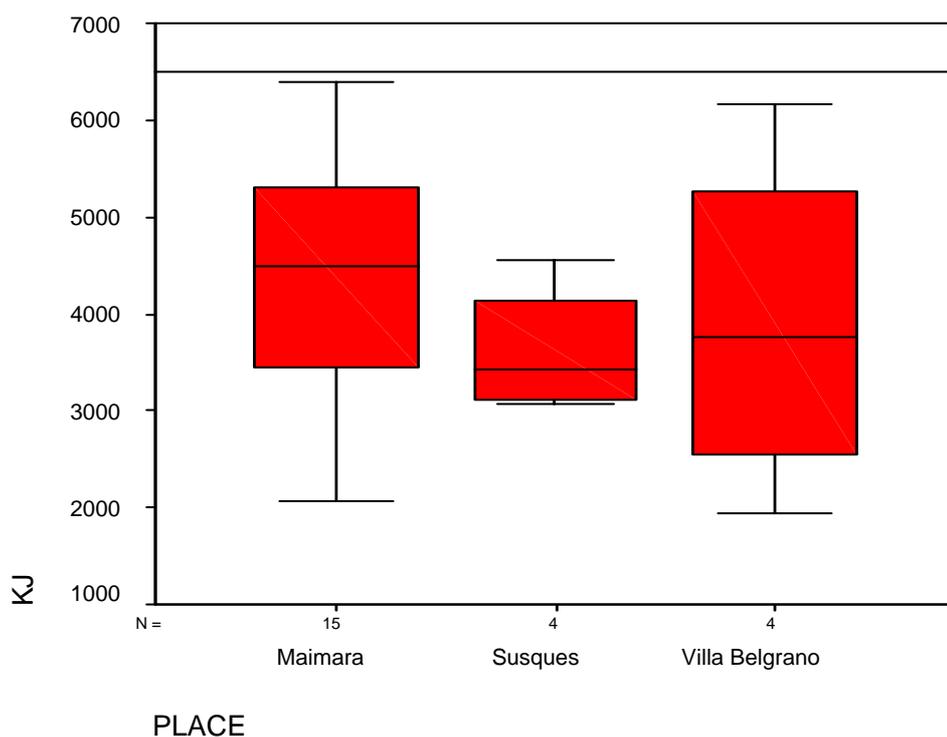
¹¹ Kruskal Wallis one-way Anova was used to test differences in intake of macronutrients between locations, with $p<0,05$ as significance level.

¹² Differences (intake and sex, intake and nutritional status) tested with Mann-Whitney's two-independent sample test, with a significance level at $p=0,05$.

Figure 8 shows the energy intake according to the FAO/WHO recommendations for the children in Susques, Maimara and Villa Belgrano by age. In the age group 2-3 years only three children in Maimara and one child in Villa Belgrano reached the recommended intake of energy. In general, the children in Maimara had higher percentage coverage of energy than the children in Susques and Villa Belgrano. The children in Maimara and Susques had an intake far below the recommendations.

In regard to the intake of macronutrients none of the children in Maimara and Susques had a fat intake according to the recommendations. In Villa Belgrano, one child in the age groups 2-3 years old had an intake of fat according to recommendations. In Susques, the intake of fat covered only 19 % of the requirements. The fat intake in Maimara and Villa Belgrano covered 28 % and 42 % respectively. According to intake of protein in the age group 2-3 years old, two children in Villa Belgrano and one child in Maimara covered the recommendations. Two of the children in Maimara and two of the children in Villa Belgrano had an intake of carbohydrate according to the recommendations. In Susques no children reached the recommended intake of carbohydrates.

Figure 10: Energy intake according to FAO/WHO recommendations for children 4- 5 years old in Susques, Maimara and Villa Belgrano by age (n=60)



In the age group from 4 to 5 years, no children reached the recommended intake of energy. The median intake of energy in respectively Maimara, Susques and Villa Belgrano covered 58 %, 45 % and 54 % of the energy recommendation. In general, the children in Maimara had higher percentage coverage of energy and macronutrients than the children in Susques and Villa Belgrano, and the children in Villa Belgrano were better off than the children in Susques. In all the three locations the intake of fat was below the recommendations. Eight of the children in Maimara and one child in Villa Belgrano had an intake of carbohydrate according to the recommendations. In Susques no children reached the recommended intake of carbohydrates. None of the children in the three locations reached the recommended intake of protein.

5.3.6 Intake of micronutrients according to the FAO/WHO recommendations¹³

Table 10: Median daily intakes^a of micronutrients in Maimara, Susques and Villa Belgrano (n=60)

Micronutrients ^b	Pr.person/day			
	Maimara	Susques	Villa Belgrano	Total
	Median (P ₂₅ -P ₇₅)			
<u>Retinol Equiv. µg</u>				
Age 1-3: 400	122 (46-335)	145 (96-284)	218 (106-317)	158 (96-304)
Age 4-6: 450	105 (49-140)	139 (70-319)	198 (40-271)	105 (52-196)
<u>Vitamin C mg</u>				
Age 1-3: 30	37 (21-91)	22 (18-28)	11 (8-32)	21 (9-31)
Age 4-6: 30	22 (10-41)	29 (22-29)	15 (10-131)	22 (11-38)
<u>Iron mg</u>				
Age 1-3: 11,6	4 (3-5)	5 (3-5)	3 (2-6)	4 (3-5)
Age 4-6: 12,6	5 (4-7)	5 (5-6)	4 (2-5)	5 (4-7)
<u>Calcium mg</u>				
Age 1-3: 500	250 (160-606)	47 (55-366)	277 (131-529)	246 (76-418)
Age 4-6: 600	297 (59-442)	96 (77-374)	207 (94-512)	136 (74-442)

^a Rounded to nearest 0,5, for the last three nutrients rounded to nearest 0,05 ^b see Appendix F for the intake of thiamine, riboflavin and niacin

¹³ Recommendations from “Human Vitamin and Mineral requirements FAO/WHO/ 2001.”

Table 10 shows the daily intakes of micronutrients in Maimara, Susques and Villa Belgrano. In general, the children in Maimara consumed more vitamin C, calcium, riboflavin and niacin than the children in Susques and Villa Belgrano. The children in Villa Belgrano consumed more vitamin A (Retinol Equivalents), and the children in Susques consumed more thiamin and iron. In regard to age groups, there was a difference between the age group 1-3 and 4-6 and the intake of vitamin A ($p=0,02$). No difference was found between the three locations in regard to the intake of the different micronutrients¹⁴. No differences were found between the intake of different micronutrients and sex, and between the intake of micronutrients and nutritional status¹⁵, and will not be further discussed.

Intake of micronutrients according to FAO/WHO recommendations

None of the children had an intake according to FAO/WHO recommendations for iron and niacin (see Appendix F for the intake of vitamin B). In regard to calcium, in respectively Maimara, Susques and Villa Belgrano only 2, 2, and 3 children in the age group 1-3 reached the recommendations. Only 2 children in the sample covered the recommendations for vitamin A, one in the age group 1-3 in Susques and another in the age group 4-6 in Villa Belgrano. The micronutrients which reached most of the children's requirement were vitamin C and riboflavin. Twenty-two of the children in the age group 1-3 years and 6 children the age groups 4-6 reached the requirement for riboflavin. Eight children in the age group 1-3 (four from Susques and four from Villa Belgrano) and one person in the age group 4-6 reached the requirement for thiamine. No one of the children in Maimara reached the requirements for thiamine and vitamin A.

5.3.7 Nutrient density

Table 11: Median daily intake^a of macro and micronutrients per 10 MJ in Maimara, Susques and Villa Belgrano (N=60).

Nutrients	Locations		
	Maimara	Susques	Villa Belgrano
	Median (P ₂₅ -P ₇₅)	Median (P ₂₅ -P ₇₅)	Median (P ₂₅ -P ₇₅)
Fat g	27 (16-37)	32 (20-58)	57 (40-74)
Protein g	78 (68-89)	87 (83-100)	98 (92-114)
Carbohydrate g	461 (441-487)	352 (329-429)	378 (332-415)
Retinol E. µg	249 (138-362)	500 (266-926)	519 (333-935)
Vitamin C mg	52 (37-127)	73 (62-86)	51 (24-78)
Iron mg	11 (7-14)	15 (13-17)	11 (8-16)
Calcium mg	645 (165-802)	281 (210-1161)	925 (429-1733)
Thiamin mg	1 (0-1)	1 (1-1)	1 (1-1)
Riboflavin mg	1 (1-2)	1 (1-2)	2 (1-3)
Niacin mg	5 (3-7)	9 (6-12)	6 (2-9)

^a Rounded to nearest 0.5, for the last three nutrients rounded to nearest 0,05.

¹⁴ Differences tested with Kruskal Wallis one way Anova with $p < 0,05$ as significance level

¹⁵ Differences tested with Mann-Whitney's two-independent sample test, with a significance level at $p = 0,05$.

Table 11 shows the median daily intake of macro and micronutrients per 10 MJ of the diets in Susques, Maimara and Villa Belgrano. The median diet in Villa Belgrano had a higher intake of fat and protein per 10 MJ than that in Susques. The diet in Maimara had the lowest intake of fat and protein. The diet in Maimara had a higher intake of carbohydrates per 10 MJ than the diets in Susques and Villa Belgrano. The intake of calcium and vitamin A (retinol equivalents) and riboflavin per 10 MJ was highest in Villa Belgrano. The intake of iron, vitamin C and niacin per 10 MJ was highest in Susques.

Energy density

The median energy density¹⁶ of the diet was 2,9 kJ/g (with 25- and 75- percentile respectively 2,3 and 3,8 kJ/g). In Maimara the median energy density of the diet was 3,6 kJ/g, in Susques 2,5 kJ/g and in Villa Belgrano 2,8 kJ/g. No difference was found between energy density and nutritional status ($p=0,62$). There was a difference between the diets in Susques and Maimara in regard to the energy density ($p=0,01$). No difference was found between energy density and sex ($p=0,13$). The energy density correlated significantly with the energy intake kJ ($r=0,64$, $p<0,01$).

5.4 Is there a connection between malnutrition and child care?

5.4.1 Ways of handling a child who refuses to eat

Figure 11: Answers by mothers with normal and underweight children to the question: "What do you do if the child refuses to eat?"

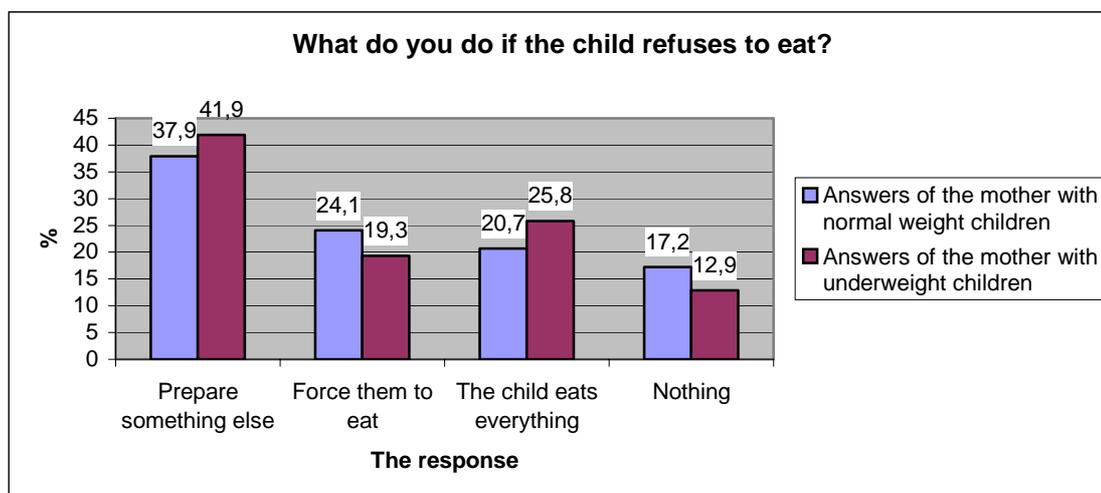


Figure 10 shows the answers of the mothers with normal and underweight children to the question; "What do you do if the child refuses to eat?" There was no difference between the responses of the mothers with normal and underweight children ($p=0,79$). Totally, 42 % of the mothers with underweight children prepared something else when the child refused to eat. For mothers with normal weight children, the percentage was 38 %. There was no difference between the responses of the mothers with normal and underweight children in the three locations ($p=0,56$) and the aspect of child care will therefore be presented and discussed for the total sample.

One mother told about her views on child care and problems related to it:

¹⁶ Energy density=energy intake kJ/total intake of food in gram.

“In many cases the mothers are young, the mothers are working outside the house and the children are left alone. The mothers do not know what their children have been eating. My son who is 5 years old is home alone with his 7 and 8 years old siblings from the return of the community kitchen to 7 'clock in the afternoon.”

Some informants in Susques claimed that the mothers often gave milk distributed from the health centers to the animals. Several of the key informants in San Salvador de Jujuy expressed concern about this occurrence and they explained that the indigenous people did it because they were ignorant and they didn't care for their children. However a nutritionist who had worked several years among the indigenous people in Susques could explain it.

“By giving milk to the animals, the indigenous population ensures the future for the whole family. The animals are their future because they provide meat, cotton and a mean through which they can exchange goods. If the animals die the whole family will die. Furthermore the indigenous population does not have a tradition of drinking milk.”

She also said that the culture in Susques is to think in groups and to ask what is best for the whole group. The best for the group in regard to the above problematic is to assure the future of the whole group by giving milk to the animals, not to give it to one child.

According to a nurse at the Villa Belgrano Center of early stimulation (Servicio de Estimulacion Temprano, Hogar Santa Rita) many children lack stimulation, they are rolled into a blanket and no one talks or plays with them.

In some cases the family prioritizes to buy material things to the house instead of food. In the case of 3 years old Astrid, who was moderate underweight, her family had two televisions; a horse and a car, but at the same time three of the children were malnourished. Violence was also a problem and a health worker in Maimara said:

“I have had to bring several children to the hospital because their parents have hit them. Enough food is not sufficient to assure the children a good health, the way you treat your child is also important. You should not hit the child, even though many parents do it because they think that children do not think, but the children are like small adults and they think.”

5.4.2 The nutritional status of the children and socioeconomic factors that affect the mothers ability to provide care

Table 12: Socioeconomic indicators in relation to the children's nutritional status (for categorical variables)

	Nutritional status			P-value ^b
	N	Normal weight % (n)	Underweight ^a % (n)	
<u>Total group</u>	60	48,3 (29)	51,7 (31)	
<u>The mothers marital status</u>				
Single	17	47,1 (8)	52,9 (9)	p=0,57
<u>The mothers level of education</u>				
Literate	57	49,1 (28)	50,9 (29)	p=0,53
Primary school	42	59,5 (25)	40,5 (17)	p=0,01*
Secondary school	12	66,7 (8)	33,3 (4)	p=0,14
<u>Employment of the mother</u>				
Steady job	10	70,0 (7)	30,0 (3)	p=0,03*
Unemployment programs	35	51,4 (18)	48,6 (17)	
<u>Alcohol abuse by the husbands^c</u>	13	23,1 (3)	76,9 (10)	p=0,13

^a Weight/age; 10-25% percentile

^b Differences tested with Chi-square for the categorical data, with significance level p=0, 05

^c Information about alcohol abuse was only obtained for the household in Maimara

Table 12 shows selected socioeconomic indicators in relation to the nutritional status of the children in the sample for categorical variables. In the sample totally 29 children were classified as having normal weight and 31 children were classified as underweight. No difference was found between marital status of the mothers and nutritional status of the child. There was a difference in the nutritional status of children with mothers who had completed primary or not completed primary school (p=0,01). In regard to occupation, there was a difference between nutritional status of the children who had mothers with a steady job and children who had mothers who were unemployed (p=0,03).

In this study no differences was found in regard to the nutritional status of children in household with or without alcohol abuse. A social health worker told that in Jujuy there is a strong social pressure to drink; it is part of the indigenous culture. Some women in the focus group told that men who do not drink were believed to be dominated by their women. Most of the informants meant that the main reason for the alcoholism was the unemployment. “

“Unemployment is hard for the self-esteem, the men feel superfluous, no one needs them and they are bored. They meet other unemployed men in town and start drinking together.”

The lack of identity, the fact that they are moving away from the traditional culture also influences the rate of alcoholism. According to a worker the discrimination of indigenous people causes them to drink:

”If we are working with white people they ignore us, shout at us and make us feel bad. To escape from reality it is easy to start drinking”

The alcoholism also influences the economical situation of the family. A medical doctor in Susques told that often mothers came to the health centers crying because their husbands had spent the money on alcohol. In one household with 11 children the father stole the kitchen pan and sold it to be able to buy alcohol.

In a family with 6 children the father was an alcohol abuser and he denied his wife to work outside the household because he was so jealous. When he got his salary he bought alcohol for the money instead of food for his children, the children had to beg for food, ask the neighbors, and several days the children told that they had not been eating yesterday.

Table 13: Socioeconomic factors in relation to nutritional status (for continuous variables)

	N	Nutritional Status		
		Normal weight	Underweight ^a	P-value ^b
		Median (P ₂₅ -P ₇₅)	Median (P ₂₅ -P ₇₅)	
Age first pregnancy	60	19 (17-21)	19 (17-22)	p=0,87
Number of children	60	3 (2-5)	4 (2-7)	p=0,40
Nr. children <6 years	60	2 (1-2)	2 (2-3)	p=0,03*
Household income	60	270 (200-400)	200 (150-300)	p=0,22

^a Weight/age; 10-25% percentile

^b Differences tested with Mann Whitney two independent sample test for the continuous variables, significant when p<0,05

Table 13 shows selected socioeconomic indicators in relation to the nutritional status of the children in the sample for continuous variables. There was a difference between the nutritional status of the children in families with a high number of children less than 6 years old and in families with a lower number of children under 6 years old (p=0,03).

According to a social worker it is a common view that the children are from God and that every child should be received with thanks. However, many children are not wanted and a mother who gets a new child every year is not in the position of taking care of all her descendents. For example a mother of 31 years in Maimara had 11 children and the ages of the children were as followed: 16,14,13,11,10,9,7,5,2,1 and an infant of 2 months.

Another informant claimed that the rich people blame the illiteracy for being the causes of malnutrition:

“In Buenos Aires they say that the illiteracy is the cause of the malnutrition, but I disagree. My mother and my grandmother could not read, but we were well nourished. My grandmother had 13 children and all her children ate well.”

A mother with 8 children explained about how she understood the causes of malnutrition

“The poverty is the root of malnutrition, we don't have permanent jobs, and the money I have is not enough to feed the children. The men get their salaries and go out and drink up the money. They have money to drink but not to feed their children.”

5.5 Are there differences between the three locations in regard to selected demographic and socioeconomic indicators?

Table 14 shows selected demographic and socio-economic indicators according to location. The demographic and socioeconomic indicators were believed to help to explain some of the different prevalence of malnutrition in the three locations.

Table 14: Demographic and socioeconomic indicators of the children's households in Maimara Susques and Villa Belgrano (n=60).

Demography and socioeconomic indicators	Locations				P-value ^a
	Maimara	Susques	Villa Belgrano	Total	
<u>Demography</u>					
Number of children median (P ₂₅ .P ₇₅)	5 (4-8)	3 (2-6)	3 (2-4)	4 (3-5)	*§ p<0,00
Number of children < 6 years old median (P ₂₅ .P ₇₅)	2 (2-3)	2 (1-3)	2 (1-3)	2 (1-3)	p=0,50
Single % (n)	15 (3)	40 (8)	30 (6)	28 (17)	p=0,21
<u>Socioeconomic conditions</u>					
The mothers level of education					
Literate % (n)	90 (18)	100 (20)	95 (19)	95 (57)	p=0,35
Primary school ^b completed % (n)	60 (12)	70 (14)	80 (16)	70 (42)	p=0,37
The mothers employment					
Steady job % (n)	20 (4)	0 (0)	30 (6)	17 (10)	p=0,10
Unemployment programs ^c % (n)	80 (16)	40 (8)	55 (11)	58 (35)	*§ p=0,04
Household assets					
House owner % (n)	55 (11)	75 (15)	20 (4)	50 (30)	† p<0,00
Owner of animals % (n)	0 (0-4)	6 (0-80)	0 (0-0)	1 (1-2)	†*p<0,01
Cultivating land % (n)	40 (8)	45 (9)	10 (2)	32 (19)	† p=0,04
Economics					
Income ^d median (P ₂₅ .P ₇₅)	205 (200-300)	250 (190-407)	285 (150-391)	230 (175-361)	p=0,11
Food packages ^e % (n)	70 (14)	40 (8)	20 (4)	43 (26)	p<0,01
Sale of handicrafts median (P ₂₅ .P ₇₅)	2 (3-4)	7 (5-9)	0 (0 -0)	2(2-5)	p=0,09

^a Differences tested with Kruskal Wallis One-way Anova for the continuous variables /Chi-square for the categorical data, with the significant level p=0,05. *Susques and Maimara § Villa Belgrano and Maimara † Susques and Villa Belgrano,

^bThe duration of primary school is 5 years

^cFor more information about the unemployment programs, see section 2.2.2

^dIn Argentinean pesos per month, the total income in the household

^eFor more information about the food packages see section 2.4.1

A difference was found between the children in Susques and Maimara, and Maimara and Villa Belgrano with regard to number of children in a family. The number of households participating in unemployment programs was higher in Maimara than in Susques and Villa Belgrano, and the difference was significant. Significantly more families in Susques had animals, were house owners and were cultivating land than the families in Villa Belgrano. Significantly more families in Susques had animals than the families in Maimara. Significantly more families in Maimara received food packages and participated in unemployment programs than the families in Susques and Villa Belgrano. No differences were found among the three locations in regard to the number of single mothers, the mother's educational level, income and proportion of mothers who had a steady job.

According to a key informant, the government's social plans have made people passive. Before, the youth in Maimara worked in the agricultural sector, now they receive unemployment money instead. The people get use to have the government takes care of everything. A nutritionist who had worked many years in Susques said:

“I think the social plans have had a negative impact in people's life; they have stopped to think how they can find food or cultivate it because they know that the state will help them. The people have lost the faith in themselves, lost the hope that they can do something with their situation. There is enough fertile land in Argentina, but the people are too lazy to cultivate. The government provides families with underweight children with milk, and gives economical support to families which have more than 7 children. The people are dependent on the state from they are born until they die. First they receive milk, then food aid through the “food packages” and then the community kitchens. The people do not take responsibility of their own feeding”.

According to the nutritionist, the community kitchens are also blamed for serving food, which is not in accordance with local food habits, and has a low nutritional quality:

“In the community kitchens, the food that is served is western, it represents the white man's culture. The food has low nutritional quality; it is sufficient in quantity but not quality.”

6 Discussion

The discussion is divided into two sections. In the first section, results from this study are discussed in light of the research questions and relevant literature. In the second section issues concerning the methodology, including sample, instruments and data collection procedures in the study are discussed.

Results

6.1 The nutritional status of the children in the sample

Data from WHO/NUT in 1995 showed a prevalence of underweight of 6 percent in the Northern provinces, Salta and Jujuy in Argentina (WHO/NUT 2003). A study conducted by Promin in 2002 showed that the prevalence of underweight in Susques, Maimara and San Salvador de Jujuy was 39 percent, 20 percent and 17 percent respectively (Ministry of Health 2002). According to the findings in the present study the prevalence of underweight in the sampled children in Susques was 65 percent, in Maimara 65 percent and in Villa Belgrano 25 percent.

There is at least one possible explanation for the high prevalence of underweight found in this study. Since the children sampled through the community kitchens were among the most disadvantaged in the three locations, it was expected that the children should be more malnourished than the rest of the population in the province of Jujuy. Furthermore, the children in the sample had a higher probability of being underweight than the rest of the population, because they were indigenous, due to high prevalence of stunting among indigenous children (Alderete 1992; Damman 2004b; PAHO 2003). Indigenous populations in Argentina are also discriminated in the public health system (Slavutsky et al. 1997), which generally limits the access to health care both for the mothers and the children. Various studies have showed a connection between malnutrition and access to health services (PAHO 2003).

The Gomez classification, underweight (low weight for age), is an unspecific measurement, because it is influenced by both the height of the child (height for age stunting) and the weight (weight for height wasting). For example, weight for age fails to distinguish between short children of adequate body weight and tall, thin children. Data from WHO/NUT confirmed that the main nutritional problem in the North region, which includes Jujuy, was stunting. The prevalence of stunting was 16 percent and wasting was 1 percent (WHO/NUT 2003). In the absence of significant wasting in a community, similar information is provided by weight for age and height for age, because children with a low weight for age will tend to be small for their age, but without signs of wasting (WHO/NUT 2003). Conversations with a medical doctor in Susques (see Appendix D), and observations made by the researcher, further asserts that it was reasonable to assume that most of the children in the sample were suffering from chronic malnutrition (stunting) (Ruel et al. 1995; WHO/NUT 2003).

6.2 Malnutrition and disease

6.2.1 Is there a connection between malnutrition and disease among the selected children?

As hypothesized there was a strong association between the history of illness and underweight in the children in Susques ($p < 0,01$). Eight of the 20 children in the sample from Susques had, due to illness, visited the health center more than 10 times during their lifetime. A considerable amount of studies show the same connection between malnutrition and disease (Pelletier et al. 1995; Tomkins et al. 1989).

Malnutrition and disease are interlinked in such a way that each contributes to the presence and permanence of the other (WHO/NUT 2003). Based on the knowledge about the interaction between malnutrition and disease, it is reasonable to believe that the high prevalence of diseases among the children in Susques was instrumental in the development of malnutrition. One episode of illness does not necessarily lead to malnutrition, but the children in the sample from Susques were suffering from frequent illnesses, which over time probably influenced both the impact and duration of the malnourishment.

6.3 Malnutrition and dietary intake

6.3.1 Energy

The energy intake

In general, the children in Maimara had a higher intake of energy than children the in Susques and Villa Belgrano. The main reason for the higher intake of energy was assumed to be the researcher's presence in the community kitchen. Several of the children and the women working in the community kitchen told that the diet changed during the study. The children received more food than normal and according to the leader of the community kitchen they also received more money and more food packages from the major. For example, during the investigation, beef was served for the first time. The change in diet might thus be explained by a wish on part of the major to give a good impression of the quality of food served in the community kitchen. Based on this, is it reasonable to assume that the registered energy intake in this study was not reflecting the children's usual consumption of energy. The presence of the researcher seemed not to have the same effect in the other locations. This methodological problem will be further discussed in the methodological section in the second part of the discussion.

Another observation is worth mentioning. The children from ages 1-3 covered more of their energy requirements than the children from ages 4-6. A likely explanation for this observation is that in the community kitchens in Maimara and Villa Belgrano all children, independent of age, got the same amount of food in each serving. In the community kitchen in Susques the children from ages 4 to 6 received dinner from bigger ladles than the children from ages 1-3 (2 dl versus 1 1/2 dl), thus the older children consumed more food. However, since the recommended intake for children from ages 4-6 is higher than the recommended intake for children from ages 1-3, a larger proportion of the children from ages 4-6 did not reach the recommended intake. However, an important limitation is that children in the age group 1-3 years in Maimara consisted of only 5 children, while the age group 4-6 consisted of 15 children. Three of the five children in the age group 1-3 years old had a consumption of energy higher than 6000 KJ. In the age group from 4-6 years only two children had a consumption of energy over 6000 KJ. The small number of children in the lowest age group makes the finding of a higher intake of energy less solid, since it may be accredited to a day to day variance of intake in a few children only.

The FAO/WHO recommendations of energy

According to the one-day dietary assessment of the 60 children, the intake of energy was below the estimated requirements for almost all the children in the sample (4 children had an intake above recommendations). Various studies of children less than 6 years old in developing countries have found an inadequate intake of energy according to recommendations (Barquera et al. 2003; Couceiro de Cadena et al. 1997; Garcia et al. 2002).

The FAO/WHO recommendations from 1985 are based on the data of intake of well-nourished children. According to Torun et al. energy needs should be determined by energy expenditure of normal children (Torun et al. 1996). Little information is however available on total energy expenditure of children. Torun et al. made a review over studies of energy intake of children from 1 to 5 years old and concluded that dietary energy intake studies tend to overestimate energy requirements of children less than 8 years of age. The reported energy intake of children 1-5 years old is about 13 % lower than FAO/WHO requirements (Torun et al. 1996). In this thesis, the energy requirement has been calculated on the basis of the mean body weight of the reference population multiplied with the energy requirement in KJ pr. kg bodyweight and the age of the child according to the WHO/FAO recommendations (FAO/WHO/UNU 1985). If the energy requirement based on energy intake is overestimated, the number of children who do not reach the recommended intake of energy is overestimated. However, the children's energy intake in this study was so low that even though the recommendation had been 13 % lower only 5 children would have their requirement covered (see Appendix F).

What about the energy requirements for chronically malnourished children since most of the sampled children were assumed to suffer from chronic malnutrition? Studies from Guatemala and Colombia show that stunted or slightly underweight children in developing countries seem to have a higher energy requirement per unit of body weight than their well-nourished, non-stunted counterparts (Torun et al. 1996). It is speculated on the reasons why energy expenditures per kg body mass or lean body mass tend to be higher in stunted children than in children of normal height. Behavioral and life-style differences could be responsible for some of the differences. Torun found that poorer children spent less time in sedentary and more time in light activities. According to Torun it seemed reasonable to recommend for them the same total dietary energy intakes as for well-nourished, non-stunted children of the same age and sex, provided that they are encouraged and have opportunities to be physically active. To recommend stunted but otherwise healthy children additional energy to catch up in height will tend to make them obese (Torun et al. 1996).

Linear growth retardation, stunting, occurs primarily in the first 2 to 3 years of life and is a reflection of the interactive effects of poor energy and nutrient intakes and infection. The process may start intrauterine and ends at approximately three years of age, after which mean heights run parallel to the reference. Therefore, the age of the child modifies the interpretation of the findings: for children in the age group below 2-3 years, low height-for-age probably reflects a continuing process of "failing to grow" or "stunting". For older children, it reflects a state of "having failed to grow" or "being stunted" (WHO/NUT 2003). Waterlow once interpreted stunting as the result of nutritional deficits in the past and an expression of chronic undernutrition (Waterlow 1994). At present there is some disagreement about whether complete catch-up growth in height of stunted children is achievable after the first 2-3 years of life. According to Martorell et al., follow-up studies find that subjects who remain in the setting in which they became stunted, experience little or no catch-up in growth later in life. Improvements in living conditions, like through food supplementation or through adoption, trigger catch-up growth, but does so more effectively in the very young (Martorell et al. 1994). Thus it is uncertain if catch up growth is possible for the stunted children in this study who were older than 4 years. The question is therefore if it is correct to recommend the same amount of energy to these children as for the non stunted children. A consumption of energy based on the energy requirement for children with ideal height for age will probably lead to an over consumption of energy, which in turn lead to obesity, if they are not suffering frequently from illnesses. They will probably remain small, but will gain weight and might become obese.

A consumption of energy based on the energy requirement for children with ideal height for age will probably lead to an over consumption of energy, which in turn lead to obesity, if they are not suffering frequently from illnesses.

An increasing number of studies have shown that stunting causes a series of important long-lasting changes in the body, such as lower energy expenditure, higher susceptibility to the effects of high-fat diets, lower fat oxidation, and impaired regulation of food intake (Sawaya I.A.L et al. 2003). This further questions the above statement of Torun et al., which says that stunted children have higher energy requirements per unit body weight. It is likely to assume that in stunted children younger than three years, who are still capable of catch-up growth, the energy requirements might be higher than the energy requirement for non-stunted children

A study was conducted by Hoffman et al. in 2000 to explore if stunted children have a lower metabolic rate and impaired fat oxidation relative to non stunted children. Stunted children had normal resting energy expenditure relative to body composition compared with non stunted children. The conclusion was that childhood nutritional stunting is associated with impaired fat oxidation, a factor that predicted obesity in other at-risk populations (Hoffman et al. 2000b). A study conducted in 2000 by the same researcher tested the hypothesis if stunted children had lower energy expenditure than non stunted children. There was no association between stunting and lower energy expenditure (Hoffman et al. 2000a).

Energy distribution

A study conducted in rural households with low socioeconomic status in Argentina in 1997 concluded that 14 percent of the energy the children consumed came from protein, 19 percent of the energy from fat and 67 percent of the energy from carbohydrates (FAO 2001). This corresponds nicely with the data from this study from the rural Susques and Maimara where the energy distribution was respectively 14 percent and 10 percent from protein, 69 percent and 77 percent from carbohydrates, and 17 percent and 13 percent from fat. In Villa Belgrano, the most urban location, the energy distribution was different; 24 percent from fat, 17 percent from protein and 59 percent from carbohydrates.

The energy distribution in Susques and Maimara demonstrated diets high in carbohydrates and low in fat. This distribution is typical for developing countries (Latham 1997). The problem with diets high in carbohydrates is that they tend to have low energy density, especially if the carbohydrates are complex. This is because complex carbohydrates absorb relatively large amounts of water and a diet diluted with water will decrease the energy density (FAO/WHO 1997). The more starch a food contains the more water it absorbs and different carbohydrates have different ability to absorb water. Maize absorbs more water than rice, and potato does not absorb as much water as cereals during cooking, because it already contain high amounts of water before they are cooked. Bread contains less water than boiled staples (King et al. 1993). The staple foods in the children's diet were pasta, which absorbs large amounts of water during cooking, rice, bread and maize flour.

Energy density

The children in Susques and Villa Belgrano consumed diets with less energy density (KJ/gram) than the children in Maimara. The higher energy density of the diet in Maimara is probably due to the high intake of refined carbohydrates in bread, pasta and rice. During childhood, the nutritional requirements are higher in proportion to the child's weight due to the high growth velocities of children, and, consequently, the opportunity for growth retardation is large in early childhood. Children have limited gastric capacity, and thus, the problem associated with low energy density is that it becomes difficult for the children to ingest a sufficient quantity to cover their energy requirement (Michaelsen et al. 1995). The low energy density of the diet combined with inadequate access to sufficient food may explain why most of the children in the three locations did not reach the requirement for energy. A dietary intake of more fat and protein would have higher the energy density of the food.

The number of meals is an important intervention to prevent development of malnutrition and a child should eat at least five small meals a day to get enough food (King et al. 1993). If the children had consumed more meals they would have been able to consume larger amounts of food. A study conducted by Brown in 1995 showed that when the number of meals were increased from three to four per day the total daily amount of food consumed increased with 16 percent (Brown 1995).

6.3.2 Macronutrients

Fat

None of the children in Susques, Maimara and Villa Belgrano had an energy distribution of 30 percent from fat as recommended by FAO/WHO (see Appendix F) (FAO/WHO 1993).

According to Michaelsen the main concern with a low-fat diet is that it can reduce the total energy intake. This is because a low fat diet has decreased energy density, with the result that young children cannot ingest a sufficient quantity to cover their energy requirement (Michaelsen et al. 1995). Fat is important because each gram provides more than twice as much energy as carbohydrate or protein, thus reducing the volume of food needed to ingest the required energy level (FAO/WHO, 1978). Also lower fat intakes may be associated with inadequate vitamin and mineral intakes and increased risk of poor growth. The high energy density of fat allows the young to meet their high-energy requirements, particularly for catch-up growth after infections, because it is difficult to sufficiently raise energy density without increasing fat intake (Butte 2000). In this study it is probable that the low fat intake has contributed to the low energy intake of the children.

If the women in the community kitchens had added some oil to the food, that could have contributed to higher the energy density of the children's diet. For a diet with a low energy density (2.1 KJ/g) the addition of two teaspoons of oil will increase the energy density such that 150-200g less food may be consumed while still getting the same amount of energy. The increase in density allows a reduction in amount, and this reduction is in the range of 150-200 g per serving, due to just one or two teaspoons of fat. This is substantial as it is almost equal to the size of one meal (Michaelsen et al. 1995). This would however not have improved the overall quality of the diet, in regard to the intake of vitamins and minerals.

Carbohydrate

A plausible explanation for the high intake of carbohydrates among the children in Maimara might be that during the investigation the community kitchen in Maimara received more food packages than normal. The children in Maimara had the highest consumption of rice, pasta and sugar, and these food items high in refined carbohydrates were distributed in the food packages. The households in Maimara also received significantly more food packages than the families in the two others study locations.

Among people of low socioeconomic status in developing countries, carbohydrates usually provide 70 percent or more of the energy intake (Latham 1997). The children in Susques and Maimara had consumed 69 percent and 77 percent respectively of carbohydrates. Various studies confirm the findings of a diet high in carbohydrates in developing countries: a study conducted from 1997 in Salta in Argentina among indigenous peoples, concluded that the diet was rich in carbohydrates (wheat flour, maize and sugar) and consisted mainly of soups (Couceiro de Cadena M 1997; Herold P 1986). Another study conducted in Mexico in 2003 confirmed that poor children had higher carbohydrate and lower fat intake than children from wealthier homes (Barquera et al. 2003). Finally, a study conducted in Chile in 2002, among indigenous children revealed that bread accounted for almost 50 percent of the total energy intake of the children living in rural and semi urban regions (Garcia, Amigo, & Bustos 2002). FAO/WHO recommends an optimum diet of at least 55 percent of total energy from a variety of carbohydrate sources for all ages, except for children under two years. It is questionable if it is correct to recommend a lower limit for intake of carbohydrates because of the high intake of carbohydrate among poor children as demonstrated in this study, perhaps it would have been safer to recommend a maximum intake of carbohydrates for children in developing countries. The actual recommendation is probably meant for developed countries, since the main nutritional problem here is the over consume of fat.

FAO/WHO recommends an optimum diet of at least 55 percent of total energy from a variety of carbohydrate sources for all ages, except for children under two years. The recommendation is probably meant for developed countries, where a main nutritional problem is the over consumption of fat. As demonstrated in this study, poor people often rely too much on relatively cheap and nutrient-poor carbohydrate rich food items. In such a context, and probably in a global recommendation, it seems appropriate to include a recommended maximum intake to supplement the recommended minimum intake

Protein

The protein intake of the children in the sample did not cover the FAO/WHO recommendations based on energy distribution (15 percent of the energy from protein). The “safe level of intake” is defined as the amount that will meet or exceed the requirements of practically all individuals in a population, which is generally calculated as the mean requirement + 2 SD of the requirement (FAO/WHO/UNU 1985; Torun et al. 1996). In the case of protein, this refers to proteins of high quality, both with respect to amino acid pattern and digestibility. Since the main source of protein in Susques and Maimara was cereals and bread, the “safe level” had to be adjusted for digestibility and amino acid composition of the foods consumed (FAO/WHO/UNU 1985). When these adjustments were done, 8 of the children in Susques, 15 of the children in Maimara and 10 of the children in Villa Belgrano had a satisfactory protein intake (see Appendix F). The process of protein synthesis and possibly of breakdown (turnover) is sensitive to energy deprivation and requires adequate sources of dietary energy. Thus in a child with a low energy intake the protein will to a large extent be used as energy source and not as building blocks (WHO/NUT 2003). Even though some of the children reached the recommendation for protein when the adjustment for safe level of protein was done, the energy intake was inadequate and might impair the synthesis of the protein

6.3.3 Micronutrients

In this study the micronutrients with the lowest coverage according to recommendations were vitamin A, niacin, calcium and iron. A study conducted in Mexico in 2003 found that children of lowest socio-economic status were at risk of an inadequate intake of vitamins A, C and folat, and for iron, zinc and calcium. Deficiencies were even more severe in rural areas than in urban (Barquera, Rivera, Safdie, Flores, Campos-Nonato, & Campirano 2003). A study conducted by Garcia in 2002 showed that if energy intake is inadequate due to food shortage then the dietary quality is also likely to be poor (Garcia et al. 2002) Such poor quality diets are associated with low intakes of several vitamins and minerals and poor mineral bioavailability. However, the diets of the children in rural Susques had the lowest content of energy but the most satisfactory quality per 10 MJ. Interestingly in this study the rural children's diets had a higher content of iron, vitamin C and niacin per 10 MJ than the content of these micronutrients in the diets of the children in the urban location. As mentioned before the children in Susques had the highest intake of traditional food items, and this may increase the overall quality of their diet by contributing to a higher micronutrient density.

Both the intake of iron and probably the capacity to absorb iron was low in all the three locations. The children drank huge amounts of tea, and the tannic acid in tea is known to inhibit the absorption of iron. Ascorbic acid is known to facilitate the absorption of iron; however the children in the study did not have a high consumption of food items with high levels of vitamin C. The predominantly cereal based diet can contain factors or ligands like phytates and inositol phosphates, that strongly bind ferrous ions and that subsequently inhibit absorption (FAO/WHO 2002). Frequent infections can also inhibit nutrient absorption. Garcia stated that parasite infections are associated with growth faltering, and may cause inhibited absorption of nutrients such as iron, vitamin A, zinc and copper (Garcia et al. 2002).

According to Golden, linear growth faltering or subsequent failure to recover can occur even when intakes of energy and protein are adequate, due to a deficiency in micronutrient. According to Golden, micronutrients can be classified as type 1 (iron, iodine, vitamin A) and type 2 (zinc, cobber magnesium, phosphorus, and potassium) according to a body's response on a deficiency (Golden 1995). A dietary deficiency of any type 2 nutrients will lead to growth failure. Interestingly, the high consumption of "yerba mate", the traditional Argentinean tea¹⁷, might have contributed to some of the intake of type 2 nutrients for the children in the sample due to the favorable nutrient composition of this herb, and since the children's intake of tea was high. However, the Argentinean food composition table contains no information about the mineral content in the "yerba mate", so the calculation mineral contribution of the tea is not included in the total calculation of type 2 nutrients. The mineral in the tea might have contributed some to the total intake of type 2 nutrients since the children's diet probably had low levels of zinc, cobber magnesium, phosphorus, and potassium, but probably not enough to assure normal growth.

¹⁷ "Yerba mate" is a widely cultivated, evergreen tree and the leaves are used as a natural tea beverage throughout South America. It is a rich source of vitamins and minerals (Raintree nutrition 2003).

Yerba mate also contains a special type of antioxidants, flavonoids, which can promote positive health effects in the children like inhibition of lipid peroxidation and stimulation of the immune system.

6.4 Traditional diet and urbanization

Traditional versus western food

The diet of many indigenous peoples in the America has undergone rapid change called a “nutritional transition”, from a “traditional” diet, dominated by a diet rich in fiber, high in protein and low in saturated fat, to a “western” diet where refined carbohydrates and saturated fats predominate (Uauy et al. 2001). A main reason for selecting children from three locations with different degree of urbanization was that this enabled the researcher to investigate to what degree the change from a traditional to a western diet had taken place in the three locations. In the study the children in the most rural location, Susques, generally consumed more traditional food items than the children in Maimara and Villa Belgrano. They had the highest consumption of wheat tortilla, goat cheese, and maize and llama meat, which are all considered elements of the traditional indigenous diet. However, they also had a relatively high intake of “western” store bought food items. The children in Susques consumed pasta and sausage more often than the children in Maimara. The children in the urban location Villa Belgrano had the highest consumption of potatoes and beans which is also part of the traditional indigenous diet. However the potatoes consumed in Villa Belgrano were mainly fried. The categorization of western and traditional foods is not classified in the same way by everyone. Depending on their socio-economic status, different people will classify it differently. Furthermore, the categorization will change over time (Drewnowski et al. 1997). According to the mothers in Susques, traditional food is the food that the people in the rural location consume and which has been consumed by their antecedents. They told that both the type of food items they had eaten and the way they prepared the food was changing. The most visible change was the introduction of pasta and white bread. Their parents and grandparent’s diets were based on “mote” which is cooked maize and on wheat tortillas. Lately a large variety of new food items were introduced in the diet, such as pasta, rice, and white bread, different types of meat, breakfast cereals, yogurt and fruit juices.

According to several women in Susques, foods that were boiled before in Susques, like maize and potatoes, were often fried in town. Also people had started to add oil in dishes that were traditional low in fat. According to the women in the focus groups in the urban study location Villa Belgrano, the knowledge to prepare traditional food little by little had been lost and several of the women admitted that they didn’t know how to cook traditional food. In Susques several of mothers said that their children preferred pasta and rice instead of “mote” and llama meat. A woman in Susques told that her daughters were not interested in learning how to cook according to traditions. The knowledge was not considered important and not valued. The availability of certain traditional food items was also limited. Like several of people in Villa Belgrano and Maimara said: “It is almost impossible to buy llama meat”. The food items sold in local shops in both rural and urban locations are mainly rice, bread and pasta. The availability of traditional food items was near zero. An informant in Villa Belgrano who had recently moved from Susques said that the availability western food was better in Villa Belgrano and rural Susques. According to him, in Villa Belgrano access to snack bars and supermarkets was better and this increased the consumption of such food items.

The distribution of food packages with western food items has probably accelerated the urbanization of the diet in rural Susques. Food aid in Argentina is provided by the government and political parties to a large numbers of poor families many of which are indigenous. This food aid has most probably contributed to a change in the diet from locally produced traditional foods, towards a western food items of little nutritional value. The introduction and free distribution of western products of like pasta, white rice, sugar and white flour interfere with the local food tradition (Damman 2004b).

The consumption of food items with low nutritional quality by the children in Susques probably impact severely on their nutritional status. However, if the food packages never had been distributed in Susques, what would the families have eaten and what would the nutritional status of the children have been? Would they have maintained a traditional diet, and would they have been able to maintain a traditional diet? The indigenous children in this sample were living in poverty and it is difficult to decide if it is the poverty, the fact that they have moved away from the traditional lifestyle, or a combination of the two, which contributed to the high prevalence of underweight.

According to Bustos and Amigos, there are few indigenous people in higher socioeconomic groups (Bustos et al. 2001), and the same seems to be the case in Jujuy. If there had been more people in this category in Jujuy, it would have been interesting to locate such a group and see if they maintain a traditional diet. This could have helped to explore whether the traditional diet and lifestyle might protect the population against malnutrition.

The urbanization with its spread of western ideology and culture might have contributed to a change in the diet since the cultural context influences how the food is acquired. According to the information obtained through the focus group in Susques, it was revealed that discrimination of the traditional indigenous way of living might have encouraged them to change their diet. As explained earlier, indigenous people are taught in school that the cultivation and consumption of traditional food items are signs of inferiority. The traditional food is related to indigenous identity and perceived as “food for the poor” by both the indigenous people and the white. The western food on the other hand is representing the diet of the white man which is perceived as a diet for rich and educated people.

The changes in the way of living and in the way of earning money might also have contributed to a change in the diet. Bartering used to be an integral part of the traditional indigenous economy in Susques, and interchanging goods is gradually replaced by the culture of using money. The need to obtain money makes people look for new and untraditional income possibilities. Western food is available at the supermarket, while traditional foods often are cultivated. According to some mothers in Susques, the reason for the change in diet is that the people are no longer motivated to cultivate land and keep animals, as little money is acquired while it is still hard work. Several women told that every family had at least one family member who had migrated to town, and according to the same women, the life in town seemed easier and more attractive.

Urban versus rural diet

The children in the most urban area of the study, Villa Belgrano, consumed more meat, eggs and soda in gram than the children in the two other places. The children in Villa Belgrano also had the highest fat intake compared with that in the two other locations. The food group from which they received most fat was milk. Milk contributed to 48,2 percent of the intake of fat, followed by meat, which contributed to 15,5 percent of the fat intake. The children in Villa Belgrano consumed more milk than the children in Maimara and more meat than the children in Susques. Totally 80 percent of the children in Villa Belgrano consumed powder milk (3,9 g fat/100 gram), which contains more fat per 100 g than chocolate milk (2,3 g fat/100 gram). Chocolate milk was consumed more frequently in Maimara and Susques. These findings coincide with observations made by International Food Policy Research Institute (IFPRI) in 2000. The report from IFPRI concludes that, worldwide, urban residents obtain a higher proportion of energy from fat and consume larger amounts of animal products than rural residents do (Popkin 2000). However, some of the findings in the study did not coincide with the IFPRI report. For example, the IFPRI reports concludes that most urban residents consume a more diversified diet than rural residents and with considerably higher intakes of refined carbohydrates, processed foods and sugar. In the study there was no difference in diversity of the diet measured in numbers of food items consumed, between Maimara, Susques and Villa Belgrano. The intake of refined carbohydrates, like cereals, bread and sugar was highest in rural Maimara.

6.5 Malnutrition and child care

A range of socioeconomic conditions indirectly influence children's nutritional status through the mother's ability to provide adequate care (Islam et al. 1994). Conditions assumed to influence the mother's ability to provide care, were discussed for both the normal weight and underweight children.

6.5.1 Marital status

A study by Carvalhaes and Benicio in 2000 showed a connection between malnutrition and single parenthood (Carvalhaes et al. 2002). More single mothers had underweight children than mother with a partner. In this study no connection was found between the nutritional status of children and the mother's marital status. This can indicate that the husbands do not contribute much to the family's economy. Perhaps he does not earn enough to contribute to the economy, or more probable, and according to several of the mothers in this study, the husbands bought alcohol for the money. Many of the husbands were also unemployed, and at the same time did not participate in the unemployment programs because they were waiting for seasonal agriculture work. Studies worldwide show that when men earn money, they more often spend them on themselves than women, who in general spend the money on the whole family (ACC/SCN 2004).

6.5.2 The mothers level of education

This study found an association between the mothers' lack of completion of primary school and malnutrition in the child. More of mothers with the primary school completed had normal weight children than mother who had not completed primary school. These observations coincide with finding from other studies. A study conducted in Bangladesh in 1994 demonstrated that lack of maternal education was found to be significantly related to severe malnutrition in the children (Islam, Rahman, & Mahalanabis 1994;Poletti & Barrios 2001).

One question in the questionnaire was formulated specifically to get information about the mother's knowledge of malnutrition (Q 35). The question was about how the mother handled a child who refused to eat. There was no difference in the responses of the mothers with normal and underweight children. This can indicate that the mothers with underweight children were aware of the problem and did what they could to prevent malnutrition. On the other side this could also indicate that the mother's contribution to prevent malnutrition did not influence the nutritional status of the children.

6.5.3 Employment of the mother

In the study there was an association between mothers working outside the home and the children's nutritional status. More of the mothers with a steady job had normal weight children than the mothers without a steady job.

Various studies confirm that the mother's employment can affect her ability to provide adequate care in a negative way. It is speculated that the decline in nutritional status observed among children of the most educated mothers reflects the tendency of these women to be employed, with child care responsibilities allocated to an older sibling (Reed et al. 1996) . The women in this study were not well educated, but working outside home. The allocation of child care responsibilities to an older sibling seemed not to have influenced the nutritional status of the children in a negative way. Instead the economic contribution of the mother's employment seems to have influence the nutritional status of the children positively. A study conducted by Islam et al. showed that when mothers are heavily engaged in work outside the households, and their children are only fed few times a day, this probably have a negative impact on the nutritional status of the child. Often mothers leave their children with older siblings, who are not able to take proper care of them (Islam et al. 1994;Pongpaew et al. 2004). It seems like the mother's presence make a significant difference with respect to care and feeding, and thus nutritional status. However, in this study the children in the sample spent half of their day in the community kitchens. Thus it seems like the economic contribution of the mothers who were engaged in work outside the household did contribute to better nutritional status in the children.

6.5.4 The number of children under 6 years old

In this study no difference was found between the total number of children in a family and the nutritional status of the children. However a difference was found between malnutrition and the number of household with children less than 6 years of age. A study conducted by Herold et al. in Peru in 1986 supports this finding. An example mentioned before in this study, was the family in Maimara with 11 children, 4 of them was under 6 years old. The mother was working outside home during the day and the oldest daughter of 13 years had to take care of her younger siblings. The youngest was only 2 months. Her husband was an alcoholic and the 4 youngest children were underweight. Children of families with a high number of preschool children seem to be at greater nutritional risk. In addition to a deteriorating economic situation there could be less maternal care devoted to each child. Limiting family size may be a way to improve the nutritional status of the children (Herold et al. 1986).

6.5.5 Alcohol abuse

The prevalence of alcoholism among indigenous people tends to be higher than in the rest of the population (WHO 1996). The prevalence of alcoholism was also high in the sample; thirteen of the twenty children in Maimara came from households with an alcoholic father. This information was obtained from the social health worker who knew the family conditions quite well. No difference was found between malnutrition and alcoholism. Several other studies have showed association between alcoholism in a family and the mother's ability to provide care (Carvalhaes et al. 2002). The mothers in Maimara with an alcoholic husband complained that the money in the household was spent on alcoholic beverages. Also alcoholic husbands often lost their jobs or were often not in a position to maintain a steady job and then supply the family with money. Health workers in Maimara testified that many of the children came to school Monday morning without the equipment required to start the week (handkerchief, uniform, utensils, and other school material). Even though there was not a statistically significant association malnutrition and alcoholism in this study, which might be due to the low sample size, alcoholism is believed to heavily influence the nutritional status of a child through broken family relations and poor family economy.

6.6 Malnutrition, socioeconomic conditions, and urbanization

In general, children below five years of age in urban areas are less underweight and stunted than children in rural areas (FAO 2004). In Argentina the proportion of stunting is greater among school children in the rural areas of Jujuy (FAO 2004). In this study the prevalence of malnutrition was higher in rural Susques and Maimara than urban Villa Belgrano. Malnutrition reflects the general socioeconomic conditions in the society and high levels of stunting are associated with poor socioeconomic conditions (Damman 2004b;WHO/NUT 2003). In general rural populations are poorer than the urban population (UNDP 2004). Based on this information it was interesting to investigate if the differences in socioeconomic indicators among the three places with different degree of urbanization collected in this study could explain the differences in the prevalence of malnutrition.

The three factors, which were assumed to influence the household's access to food in this study, were food aid, income in pesos and households assets, such as animals and homegrown vegetables. In the rural locations, as opposed to the urban, people had significantly more household assets (Susques), and more people participated in unemployment programs (Maimara) and received food aid (Maimara). Several families in the rural locations had small field or gardens where they were growing maize, onion, tomatoes, swiss chard, carrots, pumpkin and peas. Animals are household assets which can provide a family with either food or money. A higher proportion of the households in rural Susques had animals, was house owners, and cultivated land compared to the households in Maimara and Villa Belgrano. More of the families in Susques sold traditional handicraft than the families in the two other study locations. No difference was found in income between the urban and rural locations. In regard to employment more of the mothers in urban locations had a steady job when compared to the mother's employment in the rural locations.

According to the findings above, the rural locations had a higher number of families with household's assets, and a higher number of families receiving food aid than the urban study location Villa Belgrano. However, the prevalence of malnutrition was highest in the rural location.

Perhaps this can be explained by the fact that the children in the rural locations were living in a harsher and colder climate and this could have influenced the prevalence of illness (Pérez del Viso de Palou et al. 2000). In regard to the children in urban Villa Belgrano, they might have had better access to health services and been less ill. Urban populations are widely considered by development specialists to be better off than rural populations: healthier, better housed, and better educated and with access to a wider range of services and opportunities. Indeed, rural-urban differences in incomes or in access to secondary schools help to explain the long-term trend towards growing urban locations, as rural dwellers move to urban areas in response to better opportunities or chances of survival (Kracht 2002). However, in this study there was no difference in the mother's levels of education and no difference between the incomes in the three locations.

Finally perhaps the difference can be explained by the fact that households in rural locations had more children than the families in urban locations (Herold et al. 1986). In numerous families there is less maternal care devoted to each child. It is also an open question whether the people in the rural Susques and Maimara ate or sold the vegetables they cultivated at home, and whether the animals were used for food or not. The connection between income and the nutritional status of the children might not always be clear cut. In a family in Maimara that obviously had money, four of the children were underweight. Their money was invested in material things, and these non-food items were probably of no benefit to the nutritional situation of the children. This was confirmed by the medical doctor in Susques, who told stories about families who had malnourished children, but spent the money on material things like televisions. No difference was found between the three locations in regard to the mother's ability to provide adequate care.

Methodology

6.7 The representativity of the sample

6.7.1 The selection of subjects

It is reasonable to assume that the children in the sample came from poor families because the children were sampled through the community kitchens, and the criteria of entrance to the community kitchens were that the child belong to a poor household. On the basis of the mean income in the children's households, which was below the amount needed to buy basic food items, one could further determine that the children in the sample were from poor households. That these children, from one of the poorest provinces of Argentina, are of indigenous origin underpin the strong correlation between indigenous origin and poverty that can be found all over Latin America (Psacharopoulos et al. 1994). The assumption that the sampled children were indigenous is based on geographical locations, physical appearance and self-awareness.

However, some poor children may have been excluded from the community kitchens because their parents did not want to collaborate in the kitchen. Also strong political interests by the financial leaders of the community kitchens may have influenced acceptance to the community kitchens. The community kitchen in Maimara was fully financed by a local major. It can be the case that families who were not poor enough to send their children to the community kitchens, were allowed to send their children due political contacts. Also it may be that families with a different political view were hindered in or morally objected to send their children to the community kitchen (Damman 2004a). In any case, even if some eligible children were not attending, the income in the sampled children's household was so low that they were eligible to participate, and thus the sample is considered as representative

6.7.2 The selection of community kitchen as sampling environments

Two conditions were decisive in the selection of community kitchens as sampling environments. Firstly, the community kitchens were chosen because of the high probability of finding poor children there. It would have been next to impossible to get a big enough sample of poor children who did not attend community kitchens. Secondly most of the community kitchens worked in close cooperation with health centers. This was assumed to facilitate the permission to use data from the children's journals. The assumption that the samples from the three community kitchens are comparable is supported by the fact that there were similar criteria for entrance in the three community kitchens.

6.7.3 The selection of locations

According to Yach defining what constitutes an urban location can be problematic. In general this is dependent on many aspects, such as the form of administration, population density, economic and occupational functions, and access to basic services (Yach et al. 1990). In this study the strategic selection of study locations was based on population density and geographical localization or distance to an urban center. Susques and Maimara have lower population density than Villa Belgrano. In regard to geographical localization, Susques is situated in a more remote area than Maimara and is situated further away from urban locations than Maimara. The assessment of urbanity was in accordance with both knowledge of local researchers and initial observations by the researcher. Villa Belgrano is an urban location that houses many people from Susques and Maimara. Therefore it was a natural choice to facilitate comparison between children of similar origin who lived in locations with different level of urbanization (Alderete 1992).

6.8 Evaluation of the methods for measuring dietary intake

Methods of measuring dietary intake are associated with both random and systematic errors. Systematic errors influence the validity. Random errors influence the reliability (Burema et al. 1988; Margetts et al. 1997). The term reliability refers to the degree with which repeated measurements, or measurements taken under identical circumstances, will yield the same results. The validity of a measurement can be defined as the degree with which the measured value reflects the characteristic it is intended measure (Cameron et al. 1988). Triangulation involves the use of multiple sources to enhance the rigor of the research (Robson 2002). In the study multiple dietary methods were used to investigate the consumption of traditional and western food items, that is 24 hours registration and a food frequency questionnaire. Focus group interviews were also conducted to evaluate the information obtained both through the recall and through the food frequency questionnaire.

6.8.1 The choice of dietary methods

The dietary methods in this study were chosen because they were all relatively quick and simple to perform. This was important because there was only one fieldworker and restricted time to conduct the study. The study had to finish before the carnival started because during the carnival, which lasts 2-3 weeks, many community kitchens are closed, families move away, and the children's diet changes.

The combination of the food frequency questionnaire and the recall was necessary because of the children's eating locations. During the weekdays the children ate breakfast and dinner in the community kitchens and had tea and supper in their households. The problem of combining the two selected methods in the same investigation was that the caregivers could get a prior warning of the dietary assessment and alter the food habits in a such way that the diet improved. On the other hand the households in the survey had very limited resources available and therefore it would probably not be feasible for them to change their diet much.

6.8.2 One day dietary assessment

Normally one single 24 hours registration is not found to be sufficient to reflect habitual intake in a population. In the context of this thesis this is less problematic. The day-to-day variation in food intake in developing countries is found to be less than in developed countries (Torheim 2004). One reason for the low diversity in the dietary intake in this study is that the registrations were done in community kitchens, and the children sampled the same day had thus eaten the same food. If the dietary intake of one new child per day had been assessed for example during three weeks the numbers of different diets would have increased and provided a more accurate picture of the diversity of the children's diet. Although this study only provided information about the children's diet for one day, on the group level the study provided information about dietary intake for a group of poor children during five days.

6.8.3 Food record by weighing

The advantage of using food record by weighing is that the actual food intake is registered carefully; from the amounts of food items used in each recipe the exact portion every child ate (Cameron et al. 1988; Margetts et al. 1997). However in the community kitchen it was difficult to estimate the exact intake of foods, because at times when the children ate, part of the food ended up on the floor and on their clothes. In some cases siblings who also attended the community kitchen ate parts of their food. This has influenced the accuracy of the dietary intake and lead to an underestimation, but the extent is difficult to determine.

The main problem with food record by weighing is that people may change their dietary pattern in the presence of a researcher (Nelson et al. 1997). During the study in the community kitchen in Maimara there is no doubt that the diet was changed as a result of the researcher's presence. In the community kitchen those responsible for cooking received more money from the major than normally, and consequently, the children ate beef for the first time. Several of the women working in the kitchen and the children confirmed the change in diet. In Susques and in Villa Belgrano, the menus were planned months ago and the foodstuff had been bought in advance, thus it was infeasible to change the diet. However, in Susques the problem was of a different kind. It became clear the mothers tended to come to the community kitchen to collect the child's dinner. The week the investigation was carried out, the mothers were not allowed to bring food home, due to orders from the medical doctor. This created some arguments among mothers and those working at the day care center. The researcher and her assistant asked questions about whom in fact were to consume the food that the mothers wanted to bring with them. It became clear that it was common that the family shared the food. One informant claimed that the mothers did not cook dinner themselves, but relied on the food collected at the community kitchen. The size of the food containers the mothers brought with them would probably allow for this. In homes where the whole family shared the food, one would assume that the intake of the child would be less than intended, and might possibly have been a factor adding to malnutrition in the children. However, since the mothers were not allowed to bring the food home, the researcher had no way of verifying this. Although the presence of the researcher in both Maimara and Susques influenced the research situation, these locations were not excluded due to limited time.

An assistant participated in registrations of food in the community kitchens. This might have affected the validity of the study because the inexperienced assistant may have registered inaccurately. However the assistants in the study had been given detailed instructions of how to measure and weigh food. They had practiced on how to weigh and measure food and received feedback on the quality of the measuring.

6.8.4 Dietary recall

Dietary recall is commonly used in cross-sectional investigations and is appropriate for measuring current diet in groups, and thus particularly well suited to studies where differences between means in groups are assessed, either cross-sectionally or longitudinally (Nelson et al. 1997).

Memory skills

Dietary recall depends both on the subject's ability to remember correct information about quantities and the ability to estimate portion sizes correctly, both which vary in an unsystematic way from person to person (Nelson et al. 1997). In a family with several children, it was difficult for the caregivers to remember and differentiate between what 4 or 5 children had eaten the previous day. In the household it was also a problem to remember what bowl or cup the child had eaten and drunk from. Some of the mothers had obvious difficulties in remembering what the child had been eating other women admitted that they did not remember or know. If an older sibling could not answer the question, the child was excluded from the investigation.

In the study the caregiver's memory skills was assumed to be one of the most important limitations of the quality of the dietary data and an influential factor on the accuracy of the reporting.

Conceptualization skills

Conceptualization skills, the ability to relate actual consumption to description of portion sizes, will vary substantially between individuals. Children under 12 are likely to be poor at conceptualization (Nelson et al. 1997). During the dietary recall in the household, there were many incidents where siblings less than 12 years had to give information about the child's consumption on the previous day. This was due to the fact that many mothers were working outside home and did not know what their children had eaten the previous afternoon. The lack of conceptualization skills of the siblings below 12 years old probably has a notable impact on the validity of the dietary data in this study. It may have caused inaccuracy in the estimated volumes of food items eaten and thereby reduced the precision of the final estimated weight. In the study the incomplete reporting of youngsters is believed to be one of the most important factors influencing the accuracy of the dietary data.

Some mothers also had problems with estimating weights; a mother told that her 3 years old son had eaten 5 dl soup for supper last night. When the mother was asked to show the receptacle from which the child had eaten and it was filled up with water until she said stop, the amount of soup consumed turned out to be 2 dl.

Intentional distortion

Subjects may distort their reported diet for several reasons. Primarily they may not wish to confess to the consumption of certain types of foods, or they wish to report a diet which they believe will be acceptable to interviewer. In developed countries this is typically related to unhealthy food items and consumption of fat or the overestimation of intake of healthy food items like fruit and vegetables (Nelson et al. 1997). In developing countries and therefore in this study the caregivers probably wanted to give the impression that the child consumed a diet higher in both quantity and quality, than what was actually the case. For example, in one household in Susques a mother with 7 children told that her 2 years old son had consumed chocolate milk, beef, rice and salad for supper the previous day. The researcher got suspicious because the family was in an unfortunate economic situation. The research assistant asked to wait outside the house when the socio-economic questionnaire was conducted and used the time to ask the 14 years old sister what the 2 years old boy consumed in the household the previous day. She reported that he had not eaten supper, only a piece of bread and a cup of tea in the afternoon. The reporting by the 14 years old sibling was then recorded. This behavior may be explained by the fact that the mothers were ashamed that they were not in an economical situation to provide their children with enough food. Also this reaction could be explained by the fact that the mothers were afraid that the researcher would report the poor economical situation to the social workers, and they might seize the child. Several mothers expressed this fear in focus group interviews in Maimara and Susques. While the recalls were conducted the researcher several times got the impression that the information provided by the caregivers was not in concordance with the real intake. In this study the distorted reporting may have influenced the dietary intake in such a way that the registered dietary intake may not represent the actual diet for several of the children in the sample.

Unintentional distortion

A problem with dietary recall of youngsters in general and therefore in this study, is that the caregivers often have little control of what the children eat outside of the home. For example some children in Villa Belgrano were observed in the afternoon eating fruits and sweets, which were not reported the next day during the 24 hours recall. This might have lead to an systematic underestimation of the total intake (Nelson et al. 1997).

Dietary recall in the children's households

One advantage of conducting the interview at home is that the subject will usually feel more secure and relaxed. Some subjects however can react the opposite way and tense up under what they regard as the searching gaze of the interviewer (Nelson et al. 1997). Some mothers would not let the researcher enter the house and refused to show the receptacle from which the child has eaten. If it was not possible the woman was asked to estimate the amount in the measuring jug brought by the researchers.

The unequal distribution of ingredients in each serving of soup

A problem with the consumption of soup is the unequal distribution of ingredients in each serving. This makes it difficult to estimate the exact nutrient value of a given amount of soup. Thus the ingredients and the amount of the different ingredients the children receive in the soup were random. Some children probably receive both meat and vegetables in a serving while other children only receive vegetables. The intake of nutrient on an individual basis then differs but on the group level this is not assumed to have influenced the dietary estimates significantly.

Failure to estimate day to day variation

The principal limitation of the 24 hours recall is that it does not provide a reliable estimate of an individual's intake due to day-to-day variation depending on the weekday the data were collected. Interviews should be evenly distributed over all days of the week (Margetts et al. 1997).

In this study no information about the children's diet during the weekend was collected and the diet probably changed during the weekend. In the western world the consumption of fat and sugar increases during weekend's (Margetts et al. 1997). The fact that the food registration was not performed during weekends could have lead to an underestimation of the intake of fat and sugar. In this study it can also be the case that the children ate less during the weekend, due to the high rate of alcoholism. The health workers in all the three locations could report on parents who spent all the money on alcohol, and the children came to the community kitchens Monday morning without having eaten during the weekend. Some of the children probably consumed more during the weekends because relatives visited the house and brought food as gifts.

It is reasonable to assume that at least two conditions made the availability of food better than normal during the period of the study. The study was conducted in the summer and several people confirmed that the availability of food was better during the summer than the rest of the year. Also the study was conducted just before the national elections in Argentina and various political parties distribute food and material things to poor people to gain political support.

6.9 Evaluation of the questionnaire based interview

According to Robson (Robson 2002) multiple methods can be used in a complementary fashion to enhance interpretability. Rather than focusing on a single specific research question, multiple methods are used to address different and complementary questions within a study. In this study 3 methods were used to collect data on socioeconomic conditions and child care in the households; a questionnaire, focus group interviews and interviews with key informants. Quantitative and qualitative approaches were combined in each of these methods. The following chapter evaluates problematic areas in the conduction of questionnaire-based interviews.

6.9.1 Questionnaire on socioeconomic conditions and childcare

A potential weakness with interview-based surveys is that the data might have been affected by characteristics of the interviewer, called interview bias. The interviewer, probably unwittingly, may influence the responses and one interviewer may ask a different set of questions from another. This may affect the validity of the findings. However in the study this is not believed to have influenced the results significantly because the same researcher performed all the interviews and was conscious that the comportment and the questions should be as neutral as possible (Robson 2002). Personal interviews were chosen because the level of education among the informants was unknown and a personal interview does not require reading and writing skills of the informants. Because it was the first time researchers had visited the selected community kitchens for data collection, it was assumed that it would be less complicated for the informants to grasp the questions when they were presented through an interview, as misunderstandings could easily be clarified. As an added benefit of this method the presence of the interviewer can also encourage participation and involvement (Robson 2002). The questionnaire had a substantial amount of questions and covered several areas. The longer the interview the higher is the risk that the assertiveness and focus of the informant is reduced or lost, which may influence the quality of the responses. In some cases the informants in the study obviously got tired of all the questions, when this happened a break was issued and the interview continued at a later stage. The use of assistant researchers was necessary because the people were skeptic to a foreign researcher, furthermore the presence of local health workers was assumed to help the conversation. However the presence of local health workers might have imposed a perception of authority in the interview subject, which again could have led to a desire to please and thus alter the response, a phenomena known as social desirability response bias (Robson 2002). If this occurs, it may lead to either over- or under-estimation, depending on the nature of the question. Due to selective recruiting the assistant workers in Maimara, Susques and Villa Belgrano knew the informants and their situation well, which allowed verification of the answers. It turned out that in most of the cases the answers were satisfactory.

6.9.2 Food frequency questionnaire

According to Nelson and Bingham (Nelson et al. 1997), a food frequency questionnaire is designed to assess usual eating habits during recent months or year and comprise a list of the foods of interest. The food frequency in this study was designed to get information about the frequency of the consumption of selected traditional and western food items in the household. However, the children only ate at home in the afternoon and in evening, and the information achieved through the food frequency questionnaire only mapped the household consumption. There is no guarantee that food items reported were consumed by the children. However, the aim of this research question was to collect information about the consumption of traditional and modern food items in the household and a large part of the consumption probably also applied to the children since normally the same food was served for dinner as for supper. According to table 6 totally 83 percent of the children in the sample had eaten supper and the children also ate in the household during the weekend.

Participants might have had difficulties in choosing the correct category of how often a food item is consumed, and this might have led to an over- or underestimation of the number of times a food is eaten over a defined period of time (Nelson et al. 1997). According to the food frequency questionnaire a high percentage of the households in Susques ate llama meat on a weekly basis; however, based on the dietary recall in the households, no family had consumed it the last 24 hours. The 24 hours recall was conducted during five days, from Monday to Friday. To what degree this difficulty of choosing the proper category has influenced the quality of the dietary data is difficult to determine. A solution would be to repeat the 24 hours recall registering over several days to find out how often llama was consumed. However in this study the resource and time to do this were unavailable.

The advantages and disadvantages with in depth interviews are the same as discussed for the questionnaire-based interviews.

6.10 Evaluation of the focus group interviews

A possible disadvantage with focus group interviews is the requirement of considerable expertise on part of the interviewer (Robson 2002). In this study the researcher conducted focus group interviews for the first time and it became a problem that the less articulate in the group did not share the extreme and verbal views of one or two who dominated the conversation. Conflicts may arise between individuals during focus group interviews, and there may be trust issues within the group due to lack of confidentiality for the group participants. Some of the women in Maimara considered themselves enemies. They used some of the time to fight about husbands instead of answering the questions proposed by the researcher. For a relatively inexperienced researcher it was difficult to handle the fighting.

A homogeneous group consists of people with the same background at the same socio economic level, and there are both advantages and disadvantages by using a such group as in this study. The fact that the group is homogeneous may strengthen the communication and give a sense of safety in expressing beliefs and concern. It may also result in homogeneous thinking to the extent where the entire group shares position or view. The researcher had the impression that the participants in the focus groups expressed identification with each other which strengthened the communication in the group when they discussed themes like poverty, unemployment, malnutrition and alcoholism.

The main problem with the focus groups in this study were the participant's expectation of gifts, perhaps due to the political culture in Argentina of combining participation with distribution of goods. Participation in strikes and political meetings is normally combined with distribution of goods including food. As such they are used to being rewarded for their participation. Some of the informants silenced, when they realized that no such reward would occur. In conclusion, the qualitative information obtained in the focus groups contributed greatly to the overall understanding of both the children's situation and of their society, despite some difficulties in conducting the interviews. The findings in the focus group also coincide with and confirm the information obtained through the in depth interviews.

6.11 Other methodological considerations in the study

Food composition table of Argentina

The accuracy of the estimation of the nutrient intake depends on food composition tables of acceptable quality. One particular weakness of the Argentinean food composition table was the lack of several food items. Furthermore information was missing for key nutritional content for many food items. Although the Argentinean food composition table has many weaknesses, it was still used because it is believed to have the most correct and up to date information on nutrient values of Argentinean food items.

Values of nutrient content of food items may be inaccurate, and when they are it is classified as a systematic error (Nelson et al. 1997). A report from FAO about food composition tables in Latin America states that little effort has been made to upgrade the quality of the data and increase the number of nutrients reported per food since 1960, when most of the tables were published (Bressani 1992). Although many kinds of foods were analyzed, the number of samples per food was small because of the urgency of the data at that time.

This may have caused inaccuracy in the nutrient values of the present study, but these inaccuracies were deemed smaller compared to the errors expected from using food composition tables from other parts of the world.

The reference population

The World Health Organization adopted the reference curves of the NCHS for international use in the late 1970s, based on the then growing evidence that the growth patterns of well-fed, healthy preschool children from diverse ethnic backgrounds are very similar (Forchheh 2002;WHO/NUT 2003). However these reference curves have been considered inappropriate for assessing the growth of breastfed infants because the references were based on children who were primarily artificially fed and formula fed infants are known to have higher weights. By using the reference population suggested by WHO, the actual number of underweight children can be overestimated (WHO 2003). As a result there is an international effort to develop a new international growth reference (WHO/NUT 2003).

If each and every country uses its own growth charts this can lead to severe misclassification of both underweight and normal weight children. The forthcoming new international growth chart will be based on population from diverse geographical settings including Africa, America, Asia and Europe. Also, using an international reference population will make it possible to compare differences in the nutritional status between nations and continents.

Many countries have however developed their own growth standards as an alternative to the NCHS references. According to the medical doctor in Susques, in Argentina it has long been claimed that because the indigenous population in general is shorter than the rest of the population, they cannot use a reference population based on white children.

However, a study conducted in Chile by Amigos and Bustos among the Mapuche population demonstrated that this indigenous group has the potential to achieve heights similar to those of the reference population at ages 6-9 years and short stature among indigenous people is due to poverty not genetics. As a consequence Amigos and Bustos supports the recommendation of Habicht et al that international reference data are appropriate for assessing the growth of young children worldwide, including the indigenous people of American continent (Amigo et al. 2001;Bustos et al. 2001;Habicht et al. 1974).

7 Conclusion

In regard to RQ 1, whether there was any difference in the nutritional status among the children in the three locations, this study demonstrated alarmingly high rates of underweight among the poor children in Susques, Maimara and Villa Belgrano and the prevalence was higher in the rural locations than in the urban.

The aim of the present study was to evaluate factors assumed to cause malnutrition. According to RQ 2 whether there was a connection between malnutrition and disease, the present study demonstrated a clear connection between malnutrition and disease.

Concerning RQ 3 on what characterizes the children's dietary intake in the three locations, the study revealed that the sampled children had an inadequate diet both in quantity and quality. Their diets had little diversity and consisted mainly of soups and starchy food items like white bread and pasta. The energy distribution for the macronutrient showed that the children in the rural locations got around 70 percent of the energy from carbohydrates. A problem related to a diet high in carbohydrates is that they tend to be voluminous which decreases the energy density in the food. The energy density of the sampled children's diet was low and this was probably due to a combination of a high intake of carbohydrates and a low intake of fat. The children in Susques, the most rural study location, had the highest consumption of traditional food items and also the diet with the highest content of intake of vitamins and minerals per 10 MJ. The children's diet in the second rural study location, Maimara, had the lowest content of vitamins and minerals per 10 MJ. Interestingly they had the highest consumption of food items received in the food packages from the government. In the long run the children's inadequate dietary intake combined with frequent illness is assumed to be the main cause which has contributed to the high level of underweight.

In regard to RQ 4, whether there has been a change from a traditional to a western diet in the three locations, this study showed that the families in rural Susques had the highest intake of traditional food items but they also had a relatively high consumption of western food items. The families in Villa Belgrano had a low consumption of traditional food items, and explained that it was difficult to obtain these food items in town, at the same time as the knowledge of how to prepare such food had gradually been lost. The factors which were believed to influence the change in diet were the food packages from the government, the difficult availability of the traditional food in Maimara and Villa Belgrano and the general disregard for traditional Andean foods. The finding from this study indicates that the informants had ambivalent views on the traditional diet. According to the informants there was no doubt that the traditional diet was healthier than the western, while at the same time they preferred the western diet because they disregard their traditional diet and lifestyle as inferior.

Concerning RQ 5, whether there is a connection between the children's nutritional status and selected factors associated with the mother's ability to provide adequate care this study showed no connection between malnourished children and single mothers. The opposite was expected. Perhaps this is an indication that the contribution of the husband was scarce. There was no difference between mothers with normal weight and mothers with underweight children in their strategies if the child refused to eat. This is somehow in contrast with claims from health workers that the mothers with underweight children are not providing appropriate care to their children. Even though there was not a statistically significant association between malnutrition and alcoholism in this study, which might be due to the low sample size, alcoholism is believed to heavily influence the nutritional status of a child through broken family relations and poor family economy. The present study also revealed that the economical resources in poor families are not necessary spent on food.

Research question six (RQ 6) was about demographic and socioeconomic indicators in a household which can help to explain the prevalence of malnutrition in the three locations. Findings from this study demonstrated that in the most rural location a higher number of families owned household assets associated with food security, and in the second most rural location the families received more food aid than those in the urban study location, while at the same time the prevalence of malnutrition was highest in these two rural locations. The higher prevalence of malnutrition in the rural locations might in part be explained by a harsher and colder climate, which could have influenced the prevalence of illness. Furthermore, the children in urban Villa Belgrano might have had better access to health services. Also in the urban location more mothers had a steady job when compared to the mother's employment in the rural locations. Finally the families in the urban location had fewer children than the families in the rural locations.

In this study the main limitations of the methods to assess the children's dietary intake (RQ 7), were the informant's memory skills, the conceptualization skills of the siblings below 12 years old and intentional distortion by the informants. Most of the mothers had difficulties in remembering what and how much the respective child had eaten due to the high numbers of children in a family. Because a large proportion of the mothers were working outside the home, an older sibling would then have to recall the child's dietary intake. The siblings sometimes had difficulties in estimating type of food and amounts. Finally the intentional distortion was probably due to the mothers shame to admit that they were not in a position to provide sufficient food to their children.

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9 Appendices

Appendix A: The application to the Faculty of Human and Social Sciences

Appendix B: Information to the participants in the study

Appendix C: The questionnaire

Appendix D: List of key informants

Appendix E: Example of one-day dietary assessment

Appendix F: The calculation of the recommendations for nutrients

Appendix A: The application to the Faculty of Human and Social Sciences

Este nota es para informarle sobre el proyecto :

“Comedores para niños – una medida eficaz para mejorar la dieta de los niños en familias humildes en Argentina? un estudio de campo en tres zonas de Jujuy“

Estudiante: Sigrun Henjum, Universidad de Oslo, Noruega
Supervisoras: Dr. Wara Alderete, Universidad de Jujuy, Argentina
Siri Damman, Universidad de Oslo, Noruega
Wenche Bart Eide, Universidad de Oslo, Noruega

Introducción

Hoy Argentina, el quinto exportador más grande del mundo de comida, sufre una de las crisis más graves de su historia. Más de 6 millones de Argentinos pasan hambre. La crisis económica que sufrió Argentina en noviembre 2001, ha resultado en que la situación nutricional se ha empeorado bastante, y niños se mueren del hambre. El estado ha introducido varios programas de ayuda como el comedor, donde niños puedan venir para obtener una o dos comidas por día. En los últimos tiempos, los comedores han recibido muchas críticas porque la comida que les dan a los niños no es de buena calidad. Esta investigación toma como punto de vista los comedores y el significado nutricional que tienen ellos tras una selección de niños en tres zonas en Jujuy y cómo eso influye en la situación nutricional para una selección de niños en tres zonas con diferente nivel de modernización en Jujuy, Argentina.

La zona de investigación

El estudio va a ser realizado en tres zonas con diferente nivel de modernización en la provincia de Jujuy. Una parte de San Salvador de Jujuy va a representar el territorio más modernizado en el estudio, Maimara es un pueblo relativamente modernizado. Una comunidad en La Puna representa el territorio menos modernizado.

La selección

La selección de este estudio va a constar de 20 niños menores de 6 años que van a los comedores del estado en Jujuy, Maimara y La Puna, en total 60 niños.

Objetivo principal

El objetivo principal de esta investigación es evaluar la significancia nutricional de los comedores públicos y cómo estos influyen en la situación nutricional para una selección de niños en tres zonas con diferente nivel de modernización en Jujuy, Argentina. También investigar aspectos sociales, económicos y culturales seleccionados que influyen en la situación alimentaria de los niños.

1. Evaluar la calidad nutricional de la comida de los niños en tres comedores en Jujuy, Maimara y Puna. (24 t.) comparando la necesidad nutricional del niños de la selección
2. Evaluar la calidad nutricional de la comida de los niños en sus casas en Jujuy, Maimara y Puna (24 t. recall) comparando la necesidad nutricional del niños
3. Evaluar la significancia relativa de los comedores en la comida total del niño
4. Evaluar si hay diferencia en la calidad nutricional de la comida servida en las casas de zonas con diferente nivel de modernización.
5. Evaluar la contribución nutricional de los alimentos tradicionales en los comedores y en las casa de las tres zonas.
6. Investigar aspectos sociales, económicos y culturales seleccionados que influyen en la situación alimentaria de los niños

Los métodos

Entrevista

Entre las actividades de este estudio se harán entrevistas individuales y en grupos, en las que hablaremos sobre temas y estrategias relacionadas con la nutrición. La entrevista individual se trata diferentes aspectos del estado socioeconómico.

Recordatorio de las 24 horas

Una parte del estudio va a ser sobre la calidad de la comida del niño. Voy a preguntar a las madres que han comido los niños las últimas 24 horas.

Grupos focales

En la entrevista en grupos vamos a hablar sobre la cultura, los alimentos tradicionales, y la salud de los niños Indígenas de la provincia de Jujuy.

El tiempo

	Enero 2003	Febrero 2003	Marzo 2003	Abril 2003
Preproyecto -preparación 24 horas recall -crear la entrevista -un piloto del 24 horas recall + cuestionario	x			
Maimara -Cálculo de nutrición de la comida del comedor -24 timers recall+ tredelt sporreskjema		x		
Susques - Cálculo de nutrición de la comida del comedor -24 timers recall+ cuestionario		x		
Jujuy - Cálculo de nutrición de la comida del comedor -24 horas recall+ cuestionario		x		

Appendix B: Information to the participants in the study

Universidad Nacional de Jujuy de Humanidades y Ciencias Sociales Centro de Acción Social y Académica de los Pueblos Indígenas “Yachayhuasi”

Hoja de información para los participantes

Esta nota es para informarle sobre el proyecto: “Comedores para niños – una medida eficaz para mejorar la dieta de los niños en familias humildes en Argentina? Un estudio de campo en tres zonas de Jujuy”

El objetivo principal de esta investigación es evaluar la significación nutricional de comedores pública y como estos influye en la situación nutricional para una selección de niños en tres zonas con diferente nivel de modernización en Jujuy, Argentina.

Actividades

Entre las actividades de este estudio se harán entrevistas individuales y en grupos, en las que hablaremos sobre temas y estrategias relacionadas con la nutrición. La entrevista individual trata de diferentes aspectos del estado socioeconómico. Una parte del estudio va a ser sobre la calidad de la comida del niño. Voy a preguntar las madres que han comido los niños las últimas 24 horas. En la entrevista en grupos vamos a hablar sobre la cultura, los alimentos tradicionales, y la salud de los niños Indígenas de la provincia de Jujuy.

Su participación en este estudio es completamente voluntaria. Si en algún momento Usted desea dejar de contestar las preguntas puede hacerlo sin problemas.

Beneficios

No habrá beneficios directos para los participantes, pero este estudio puede ayudar a las comunidades Indígenas a mejorar su alimentación y su salud, y también puede ayudar a mejorar los planes alimentarios del gobierno.

Preguntas

Si tiene alguna pregunta o comentario sobre este estudio, puede hablar con la investigadora Sigrun Henjum, o con la Dr. Wara Alderete al teléfono 4263060 en el horario de lunes a viernes de 8:00 a 17:00 horas: o puede dirigirse al Instituto de Investigaciones Sociales, Facultad de Humanidades y Ciencias Sociales en la calle Otero 262, que tiene el mismo horario de atención.

Appendix C: The questionnaire

Questionario 2003 En la provincial de Jujuy, Argentina

Sobre el estado socioeconómico, cuidado del niño y algunos aspectos de la modernización

El estado socioeconómico

La familia

1. Cuantas personas viven en la casa?

2. Cuantos de los niños reciben comida en el comedor/copa del leche?

	Nombre	Edad	Relación	Van al comedor	Van al copa de leche
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

La vivienda

3. Son propietarios de la vivienda?

- Comparten con la familia
- Cuidadores
- Alquilan
- Otras

4. Quien solventa los gastos de alimentación?

- Abuelos
- Tíos
- Esposo
- Hermanos
- Otros

5. Con quien comparte la mesa diariamente?

- Abuelos
- Hermanos
- Otros

6. Eres propietario de terrenos para agricultura?

- Si, cuantas hectarias?
- No

7. Arrienda terrenos?

- Si, cuantas hectarias?
- No

8. Es mediero?

- Si, cuantas hectarias?
- No

9. Tiene huerta familiar?

- Si
- No

10. Si no, por qué no tiene huerta?

.....

11. Qué cultiva en la huerta?

.....

12. Tiene animales?

- Si, cuantos.....
- No

Educación

13. Sabes;

leer ?

- Si
- No

escribir?

- Si
- No

14. Tiene escuela primaria completa?

- Si
- No, hasta qué grado?.....

15. Tiene escuela secundaria completa?

- Si
- No, hasta qué grado?.....

16. Tiene alguna profesión?

- Maestro
- Profesor
- Profesor universitario
- Ama de casa
- Otro

17. Has recibido capacitación?

- Si, qué tipo?
- No

18. Tu pareja sabe leer y escribir?

- Si
- No

19. Tu pareja tiene escuela primaria completa?

- Si
- No, hasta qué grado?.....

20. Tu pareja tiene escuela secundaria completa?

- Si
- No, hasta qué grado?.....

21. Tu pareja tiene alguna profesión?

- Maestro
- Profesor
- Profesor universitario
- Ama de casa
- Otro

22. Tu pareja has recibido capacitación?

- Si, qué tipo?
- No

Trabajo e ingresos

23. Usted trabaja?

- Si
- No

24. En qué condiciones?

- Empleo estable
- Ocasional
- Plan de jefas y jefes
- Empleado doméstico
- Otro.....

25. Si no tiene trabajo, hace cuanto que está desocupado?

.....

26. Cuanto es su ingreso mensual?

- < 150 pesos
- 150-300 pesos
- >300 pesos

27. Tu pareja trabaja?

- Si
- No

28. En qué condiciones?

- Empleo estable
- Ocasional
- Plan de jefas y jefe
- Empleado domestico
- Otro.....

29. Si no tiene trabajo, hace cuando que esta desocupado?

.....

30. Cuanto es su ingreso mensual?

- < 150 pesos
- 150-300 pesos
- >300 pesos

31. Reciben alguna forma de ayuda del estado?

- Si
- No

32. Qué tipo de ayuda?

- Ayuda alimentaria
- Subsidio
- Discapacidad
- Ancisnidad
- Otro,

33. El grupo familiar tiene otro ingreso? Que?

.....

34. Cual es el ingreso total aproximado de su grupo familiar?

.....

Aspectos del cuidado del niño

35. Si el niño no quiere comer, que haces?.....

Aspectos de la modernización

36. Cuando come?

	Carne de llama	Maiz	Quinoa	Papa criolla	habas	Queso de cabra	Tortilla de harina
Diariamente							
Semanal							
Mensual							
Casi nunca							
Nunca							

	Carne	Arroz	Pan	Salchicha	Fideo	Gaseosa	Frutas	Verduras
--	-------	-------	-----	-----------	-------	---------	--------	----------

	de vaca	blanca	blanco					
Diariamente								
Semanal								
Mensual								
Casi nunca								
Nunca								

37. Usted me cuenta que usas.....(los alimentos tradicionales, question 36) Piensa usted que estos alimentos son (si/no):

	Llama	Maiz	Quinoa	Papa criolla	Habas
Bueno para la salud?					
Tiene un sabor agradable?					
Que es mucho trabajo prepararlo					
No saben prepararlo					
No lo conocen					
No lo consiguen					

Appendix D: List of key informants

List of key informants

Maimara:

Carlos Omonte	Social health worker, Maimara
Luisa Omonte	Nurse at the hospital of Maimara
Angelica Cruz	A 5 child's mother
Salma Rodriguez	The boss in the community kitchen

Susques:

Facunda Soriano	The boss of the community kitchen
Ruben Cruz	The pastor
Jose Omar	A medical doctor
Maria Delgado	Woman working in the community kitchen
Christian Cruz	The health workers
Guillermo Ruiz	The headmaster of the primary school

Villa belgrano:

Hugo Vilca	A nurse at Puesto de Salud, Belgrano
Mabel Osinaga	Stimulation service, Belgrano
Martha Rocha	Social assistant, Hogar Santa Rita
Benita Guitierres	A nurse at Puesto de Salud, Belgrano

San Salvador de Jujuy:

Maria del Carmen Echenique	Ministerio de Bienestar
Marcelo Belone	The boss of the Ministerio de Bienestar
Elba Vilte	Ministerio de Educacion
Ana Maria Rodriguez	Nutritionist at Hospital del Niños
Ariel Diaz	A student in social work
Mario Zegada	A student in social work
Laila Quintar	A psychologist
Daniel Gaggero	A social health worker
Wara Alderete	A professor at the University of Jujuy
Salma Haidar	The president in the foundation of "sujeto y predicada-asociacion por la paridad"

Appendix E: Example of one-day dietary assessment

Example of one-day dietary assessment

Name: Arnaldo C.

Age: 4

Place: Maimara

Date: 06.02.2003

Community kitchen

Time	Meal	Dish	Ingredients/Number	Quantity
9:00	Breakfast	Tea	Mate	2,4 dl
			Sugar (2)	10 gram
		White bread	(1)	60 gram
12:30	Dinner	Pasta with tomato sauce	*1001	200 gram
		Maize soup	*1002	250 gram

Household

17:30	Tea	Tea	Mate	2,4 dl
			Sugar (2)	10 gram
		White bread	(2)	120 gram
20:00	Supper	Rice soup	*1003	350 gram
		Banana		150 gram
		Milk		150 dl

Recipes

Recipe number	Name	Ingredients	Quantity	Prepared for how many
Community kitchen				
1001	Pasta with tomato sauce	Pasta	5 kg	100
		Onion	5 kg	
		Tomatoes	2 kg	
		Ground meat	3 kg	
		Garlic	200 gram	
		Black pepper	100 gram	
		Oil	250 gram	
1002	Maize soup	Flour of maize	4 kg	100
		Sugar	4 kg	
		Cinnamon	100 gram	
		Lime	450 gram	
		Water	30 liters	
Household				
1003	Rice soup with vegetables	Rice	3 dl	4
		Tomato	2 small	
		Potato	3 small	
		Carrot	2 medium	
		Onion	2 large	
		Water	6 dl	
		Salt	1 teaspoon	
		Oil	1 teaspoon	

Appendix F: The calculation of the recommendations for nutrients

The calculation of energy and macronutrients based on the FAO/WHO recommendations

Energy recommendations:

The calculation of the energy requirements for the children are based on the FAO/WHO/UNU Expert Consultation on Energy and Protein Requirements, published as a Technical Report by WHO in 1985 with the basis of the age of the child and the median weight of the reference population:

The energy recommendation for children between 2-3 years is 5,7 MJ and for children between 4-5 years is 6,5 MJ (FAO/WHO/UNU 1985).

Recommendations for macronutrients

The macronutrients are calculated on the background of the recommendations for energy intake and the energy distribution:

1) Carbohydrates in human nutrition

An optimum diet of at least 55 percent of total energy from a variety of carbohydrate sources for all ages, except for children under two years. The optimum diet should be introduced gradually beginning at two years of age (FAO/WHO 1997).

Carbohydrates 55 %

A child from 2-3 years:

$0,55 \times 5,7 \text{ MJ} = 3,135 \text{ MJ}$ from carbohydrates

Carbohydrate yields 16.7 KJ/g : $3135 \text{ KJ} / 16,7 \text{ KJ/g} = 184,4 \text{ gram}$

The same calculations were done for fat and protein based on the following energy distributions:

Fat 30 %

Protein 15 %

2) Fats and oils in human nutrition

Both the amount and quality of dietary fat consumed can affect child growth and development (FAO/WHO 1993). Children in developing and developed countries need provision of a sufficiently energy-dense diet to meet energy needs and as an adequate supply of essential fatty acids and fat-soluble vitamins. Fat should not be specifically restricted below the age of 2 years. The optimum diet should be gradually introduced beginning at 2 years of age (FAO/WHO 1997). However the children in developing countries may have additional needs imposed by environmental stresses, particularly recurrent infections (Prentice et al. 2000). From two years of age the children in the developing world would benefit from a fat intake of 30 % of dietary energy.

3) Proteins in human nutrition

The protein requirement for an individual is based on nitrogen balance, involving measuring the total nitrogen in the food and in excreta. For children the requirement for protein in gram also includes the amount and protein necessary for growth (Dewey et al. 1996). According to Dewey et al, infection increases the requirement for protein. This is because there is an increased synthesis of new immune proteins associated with host defense, muscle protein loss, altered metabolic concentrations of amino acid in the tissue and circulation during the active infection and impaired intestinal absorption. All these responses are initiated by the increase in cytokine levels consequent upon immune activation and the increased secretion of the stress hormones: cortisol, epinephrine and glucagon. A reasonable estimate of protein needs following infection is a 20-30 % increased need of protein (30-50 % in the case of diarrhea) during a recovery period that is two to three times longer than the duration of the illness (Dewey et al. 1996).

The children in Susques had a high prevalence disease, and based on the information above this has lead to increased requirements. However, adjustments for increased protein requirements were not calculated, because information about the children disease history was only obtained for twenty children, and also because it was considered beyond the scope of the thesis to evaluate the protein recommendations in that detail.

An example of the calculation of a safe level of dietary protein intake

The amino acid score of a preschool child with a rice/wheat/maize diet. The amino acid score must be calculated according to the most limiting amino acid (FAO/WHO/UNU 1985); in this case it is lysine.

Amino acid score: 57

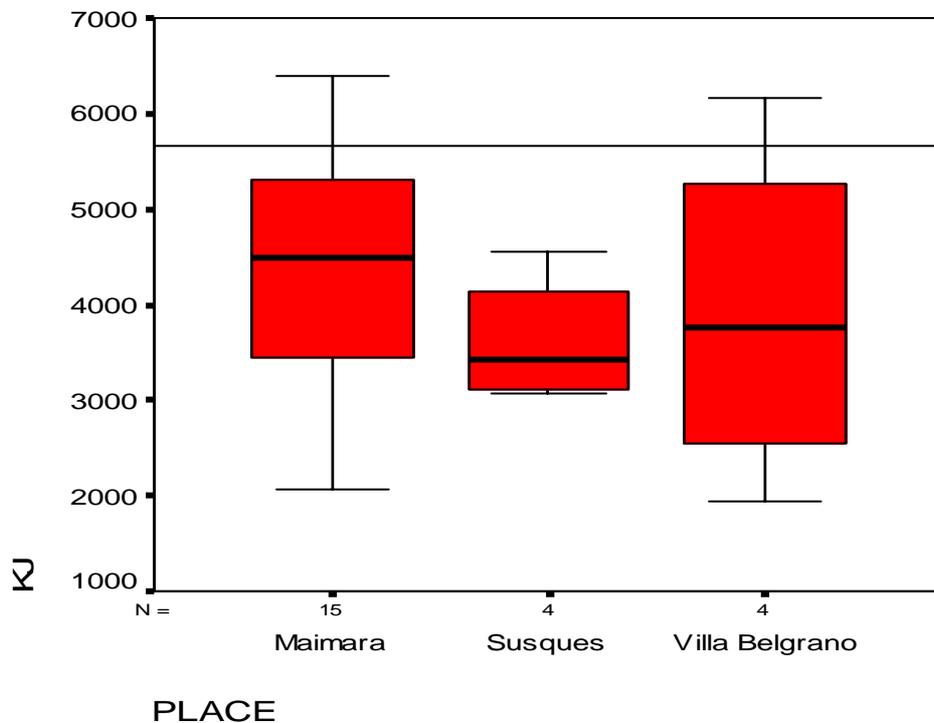
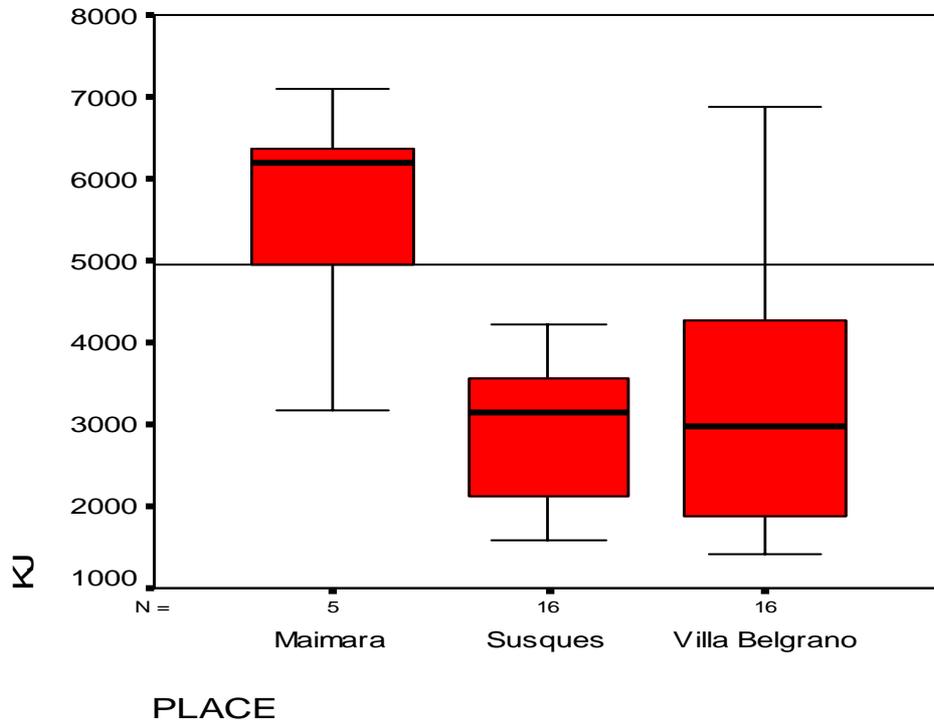
Digestibility: 85

Safe level of reference protein (in term of protein with the digestibility and quality of milk and egg): 1,10g/kg

Safe level of dietary protein: $1,10 \times 100/85 \times 100/57 = 2,27 \text{ g/kg}$

A child of 2-3 years with a weight of 13,5 kg need $13,5 \times 2,27 = 30,6$ gram protein to reach the safe level of protein.

A calculation of the energy requirement when the reported energy intake of children 1-5 years old is about 13 % lower than FAO/WHO recommendations (Torun et al. 1996)



(Children 2-3: $1-0,13 \times 5700 \text{ KJ} = 4959 \text{ KJ}$, children 4-5: $0,87 \times 6500 = 5655 \text{ KJ}$)

The intake of vitamin B (thiamin, riboflavin and niacin) according to FAO/WHO recommendations in the sampled children (n=60, 1-6 years)

<u>Thiamin mg</u>				
Age 1-3: 0,5	0,3 (0,3-0,5)	0,4 (0,3-0,5)	0,2 (0,1-0,7)	0,3 (0,2-0,5)
Age 4-6: 0,6	0,2 (0,2-0,4)	0,3 (0,2-0,4)	0,3 (0,2-0,3)	0,3 (0,2-0,4)
<u>Riboflavin mg</u>				
Age 1-3: 0,5	0,8 (0,4-1,0)	0,4 (0,3-0,6)	0,5 (0,2-1,0)	0,5 (0,3-0,9)
Age 4-6: 0,6	0,6 (0,2-1,0)	0,3 (0,2-0,6)	0,7 (0,3-0,9)	0,6 (0,2-0,9)
<u>Niacin mg</u>				
Age 1-3: 6	3 (3-4)	3 (2-5)	1 (1-3)	2 (1-4)
Age 4-6: 8	2 (1-3)	2 (2-3)	2 (1-3)	2 (1-3)

The equation which makes it possible for FoodCalc to calculate the relative amount of each ingredient per 100 grams:

"tot.g" = "water.g" + "protein.g" + "fat.g" + "carbohydrates.g" + "carbo.ass.g" + "fibre.g" + "ash.g" + ("na.mg" / 1000) + ("k.mg" / 1000) + ("ca.mg" / 1000) + ("p.mg" / 1000) + ("iron.mg" / 1000) + ("zn.mg" / 1000) + ("tiamin.mg" / 1000) + ("riboflavin.mg" / 1000) + ("niacin.mg" / 1000) + ("vit.c.mg" / 1000) + ("vit.a.ug" / 1000000)