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**MOTHERS' EARLY FEEDING PRACTICES AND
THE ECOLOGICAL FACTORS THAT ARE
ASSOCIATED WITH IRON INTAKE OF
9 – 11 MONTH OLD INFANTS IN SOLANA,
CAGAYAN, PHILIPPINES**

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fulfilment of the requirements for the degree of**

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ABSTRACT

This study examines early infant feeding practices and the ecological factors that are associated with the diets of 9 – 11 month old infants. A face to face interview using a structured questionnaire was used to obtain the information from mothers of 120 infants in Solana, Cagayan, Philippines. Dietary information was obtained using a 24-hour dietary recall and a one week food diversity checklist. Ninety eight percent of the infants were breastfed but some mothers practiced early introduction of fluids and withholding nourishing foods from the infants. The infants' mean iron intake was found to be inadequate in terms of the RDA, indicating a high risk of iron deficiency. Meat, poultry, and fish were provided in small amounts to the infants and not on a daily basis. Iron fortified foods were also not a significant source of iron. It was found that the infants' food diversity was associated with the infants' iron intake, the higher the food diversity scores of the infants, the higher their iron intake. Factors associated with the infants' diet include maternal educational attainment, maternal attitude to variety of foods and child's sex and age. Attendance at nutrition education activities was not associated with higher iron intake of the infants. Although maternal attendance at bench conferences was associated with higher maternal nutrition knowledge, attendance at bench conference was associated with low iron intake among infants. There was not a clear association between family monthly income and the infants' diet. Maternal nutrition knowledge and the infants' food diversity were found to mediate the relationship between infants' iron intake and family and child's characteristics and nutrition education activities.

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CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Childhood malnutrition is a major public problem in the developing countries. It has serious effects on the growth and health of children. The death of children under 5 years of age accounts for one in every three deaths in the world (UNICEF, 1988). Protein energy malnutrition (PEM) affects one third of all the children under five in developing countries (UNICEF, 1995).

Aside from protein energy malnutrition, iron deficiency and iron deficiency anemia also have a great effect on the health status and development of children. Inadequate iron intake can reduce immunity and increase susceptibility to infectious diseases (Brock, 1995). Anemia in children, especially at infancy may also cause retarded physical and mental development (Stephenson, 1995). An association between iron deficiency and cognitive performance was seen in infants; anemic infants tend to score lower on mental and/ or motor development tests compared to non-anemic infants (Andraca et al., 1997). Iron deficiency is recognised as the most prevalent deficiency world-wide (WHO, 1972) and children less than two years old are considered as one of the highest risk groups (INACG, 1979). Baynes and Bothwell (1990) cited that prevalence of iron deficiency is estimated at 30% of the world's population, with highest prevalence in developing countries. One of the main causes of iron deficiency anemia in developing countries is poor availability of absorbable iron from the diet (Ohri-Vachaspati & Swindale, 1999).

Breastfeeding protects infants from iron deficiency for the first 6 months of life. Iron deficiency is uncommon in breastfed infants during their first 6 months (Owen et al., 1981; Duncan et al., 1985). Thereafter, infants become dependent upon dietary or supplemental iron to maintain adequate iron stores and to meet the requirements of

rapid growth and development. The emphasis of introducing iron rich foods at 4-6 months is very important (Wharton, 1989).

There are several factors that may influence nutrient intake including social, cultural and economic conditions. Poor people may not be able to buy adequate amounts of iron rich foods and parents of limited education may have the difficulty choosing an infant diet that contains sufficient amount of iron. Some studies show a positive correlation between dietary quality and total family income and between dietary quality and mothers education (Caliendo & Sanjur, 1978; Sanjur, LaChapell & Parker, 1973). Cronin et. al., (1982) also showed that other demographic factors such as age, race and religion significantly affect the selection of some foods and the frequency of their consumption.

Iron deficiency is a significant nutritional problem in the Philippines. A 1993 Nutrition Survey found infants aged 6 months to 1 year have the highest prevalence of iron deficiency anemia (Florentino, Villavieja & Molana, 1996). The 1993 survey found a prevalence of 49.2% in infants 6 months to less than 1 year, this is significantly less than the 70.4% iron deficiency anemia reported in 1987 ($P < 0.01$). This 30.1% reduction was assumed by the National Nutrition Council (1998) to be attributed to the gradual improvement in the Philippine economy. The Council also reported that the supplementation of vitamin A during National Micronutrient Day may have helped improve the iron nutriture of preschoolers, as vitamin A is responsible for the integrity of tissues including mucosal tissues of the gastrointestinal tract where iron absorption takes place.

Despite this improvement iron deficiency anemia still occurs in every region of the country. The 1998 Fifth National (Philippines) Survey showed that anemia among children aged 6-months infants to 5 years old is highest in the Autonomous Region of Muslim Mindanao with a prevalence of 50.6% and lowest at the Northern Mindanao Region with a prevalence of 19.8% (FNRI, 1998).

Breastfeeding in the Philippines is not universal. However, rates of breastfeeding are improving. Zablan (1986) reported a decline in breastfeeding at birth from 87% in 1973 to 85% in 1978 and 83% in 1983. Improvement in these rates were seen in the 1993 and 1998 National (Philippine) Demographic and Health Survey where 82% in urban areas and 93% in rural areas were breastfeeding in 1993 and 83% in urban areas and 92% in rural areas were breastfeeding in 1998 (National Statistics Office, 1994 and 1998).

The duration of breastfeeding in the Philippines is erratic. Zablan (1986) reported a decline in the mean duration of breastfeeding from 12.3 months in 1993 to 11.4 months in 1978 to 9.6 months in 1983. The 1993 National (Philippine) Demographic and Health Survey reported an increased in mean duration of breastfeeding to 14.1 months but again this declined to 13 months in the 1998 National (Philippine) Demographic and Health Survey (National Statistics Office, 1998). The National (Philippine) Statistics Office (1994) stated that this duration is only a slightly shorter than Thailand (14.5) but much shorter than Indonesia (23.3).

Solana is a rural area. There is no information on the prevalence of iron deficiency among infants in the municipality. However, the Cagayan Valley Region, ranked second among all the regions in the country with the highest prevalence of anemia (48.8%) among children aged 6-months infants to 5 years old and Cagayan, where Solana is located ranked second among all the provinces of Cagayan Valley with the highest prevalence of anemia at 51.1% (FNRI, 1998). Therefore it is thought that the infants of Solana are at risk of iron deficiency.

The majority (83%) of women in Solana, Cagayan, Philippines initiate breastfeeding (Rural Health Unit, 1999). Statistics show that majority of women in Solana introduces supplementary foods at the recommended age (4-6 months), however, there is no information on what supplementary foods are given to infants. In particular there is no information as to whether the children are receiving foods which are rich sources of iron and what factors influence their diet quality.

One of the interventions aimed at improving nutritional status of the children in Solana is nutrition education, in which the importance of both diet diversity and including iron rich foods in the diet is explained. It is thought that mothers who attend nutrition education activities such as nutrition classes, individual health teachings, bench conferences and household teachings and learn the information will be more likely to provide iron rich diet to their children.

1.2 Purpose of the Study

The purpose of this study is to describe the early feeding practices and to examine the ecological factors that are associated with diet quality, particularly iron intake, of 9-11 month old infants in Solana, Cagayan, Philippines, so that appropriate nutrition interventions can be planned.

1.3 Objectives

- A. To describe the early feeding practices of mothers with 9 – 11 month old infants in Solana, Cagayan, Philippines.

- B. To examine the ecological factors that are associated with the diets of 9-11 month old infants in Solana, Cagayan, Philippines.

Specifically to answer the following questions:

1. What are the early feeding practices of mothers with 9 – 11 month old infants?

2. What is the level of iron in the diets of 9 -11 month old infants? Is iron provided in sufficient amounts so that the risk of iron deficiency is low?

3. What family and child's characteristics and nutrition education activities are associated with infants' food diversity?

4. What family and child's characteristics and nutrition education activities are associated with infants' iron intake?
5. Is maternal nutrition knowledge and infants' food diversity associated with iron intake of the infants?
6. Is the relationship of family and child's characteristics and nutrition education activities with the infants' iron intake mediated by maternal nutritional knowledge and infants' food diversity?

1.4 Scope and Delimitation

The study is confined to 9-11 month old infants in Solana, Cagayan, Philippines. The study will examine the early feeding practices of mothers and the ecological factors, particularly the family and child's characteristics and nutrition education activities that have associations with the infants' food diversity and iron intakes. It will also examine if the effects of these factors on the infants' iron intakes are being mediated by the mothers' nutrition knowledge and infants' food diversity.

This thesis contains 6 Chapters. Chapter 2 contains the conceptual framework and a review of the related literature with respect to infant feeding, iron deficiency among infants, and factors affecting diet quality, intake and nutritional status of young children and the dietary assessment methods. The municipal nutrition program of Solana will also be discussed in this chapter. Research methodology will be described in chapter 3. In chapter 4, research results will be outlined. Results will be discussed in chapter 5. The final chapter, that is chapter six, will outline the conclusions, recommendations and areas for future research.

CHAPTER TWO

CONCEPTUAL FRAMEWORK AND REVIEW OF RELATED LITERATURE

2.1 Conceptual Framework

The conceptual framework of this study was developed based from Bronfenbrenner's (1979) view that human development occurs in an ecological environment. Bronfenbrenner identified three levels of ecological environment, which are conceived as a set of nested influences on human development. Each level exerts its influence through interaction with each other. He described these levels as follows:

The inner most level – this is the immediate setting containing the developing person. This may be the home and the family, the classroom or as often in research the laboratory.

The second level - this is the interaction between the developing person and his environment. For example, the ability of the child to learn to read in the primary grades may depend less on how he is taught than on the existence and nature of ties between the school and home. Or during breastfeeding, the child has an influence, e.g. a child who cries a lot and is unsettled may be identified as “unsatisfied” with breastmilk and this may result in a change of feeding. Or during feeding, a child's mealtime communication like throwing away disliked foods; turning of head or body away from food may lead to mothers' perception that the child has not eaten enough. Therefore, most mothers offer alternative choices either at mealtime or at shortly thereafter (Skinner et al., 1998). The age, sex and food preference of the child also has an influence on the feeding practices of the mother/care giver (Caliendo & Sanjur, 1978; Walker, 1995,). These may directly determine the amount of food the child can

and will eat and they may exert an influence on the mother's perception of an appropriate diet.

The third level – this level evokes a hypothesis that the person's development is profoundly affected by events occurring in settings in which the person is not even present. The work setting of the mother, e.g., number of hours at work and commuting, work schedules, work satisfaction can affect children's development (Campbell and Sanjur, 1992). The participation of the mother in nutrition education activities, in which the child may not be present but could also affect the child's development.

Based on this Bronfenbrenner's view on human development, the conceptual model of this study was developed. Within this framework, the study focuses on the three levels that influence the child's development. Two levels are the family and the child himself/herself and the third level is the mother's participation at nutrition education activities where the child may not enter but nevertheless influences what happens with the other settings. The model relates these influences to the child's diet. These associations could be mediated by the mothers' nutrition knowledge. Diet/food diversity is also conceptualized to have a mediating effect in the model since the diversity/variety of foods chosen for feeding children is assumed to be sensitive to environmental influences such as the family setting and maternal characteristics and diet/food diversity has been associated with improved diet quality.

Maternal employment, which is one of the settings that influences child development was not included in this model as this is not thought to have much of an influence in the rural area where this research is conducted. The majority of the mothers in the area do not work outside the home.

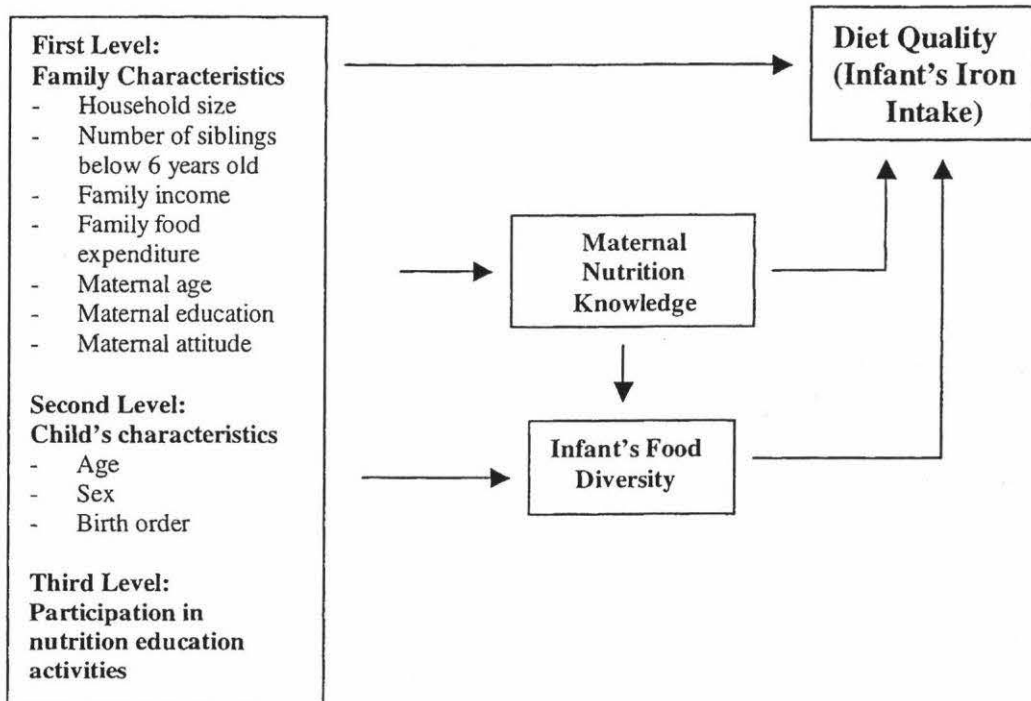


Figure 2.1 Conceptual Model

This framework was the basis of the study and was found useful in organizing the literature review. It was also adopted for the questionnaire design of this study.

2.2 Review of Literature

2.2.1 Feeding Infants

The first year is the most critical period of an infant's life. This is a time of great nutritional change for the child, from a diet that is consisting mainly of milk (either breast milk, infant formula or both) to one consisting of a variety of foods (Hendericks & Badruddin, 1992). Optimal nutrition probably has greater importance during this period than any other time not only because of physical growth occurring at the most rapid rate but also because psychomotor development and acculturation are taking place rapidly (Hofvander, 1983; Akre, 1989).

2.2.1.1 Feeding Recommendations and Guidelines

During the first four to six months of life, breast milk alone provides optimal nutrition for the rapidly growing young infant (Committee on Nutrition, 1976; Whitehead, 1985; WHO, 1985, Wharton, 1993, WHO, 1995). Thereafter, as the infant's physical and development capacities mature, he needs additional food and fluids other than milk to maintain and sustain his growing needs. Thus, the recommendations for infant feeding consider three overlapping periods: 1) the exclusive breast-feeding period 2) the weaning period and 3) the period of a modified adult diet (Hendricks & Badruddin, 1992).

The WHO recommends for all women to exclusively breastfeed their infants from birth to four to six months of age and to sustain breastfeeding together with adequate complementary foods up to two years of age or beyond (FAO & WHO, 1992, WHO, 1995). However, Borresen (1995) have suggested a change of this current recommendation to delay introducing the solid foods to six months for exclusively breastfed infants as some research that demonstrates that breast milk is adequate beyond six months (Ahn & Maclean, 1980, Salmenpera et al., 1985, Taren & Chen, 1993). A World Health Assembly resolution used a different wording, stating that breast-fed infants should receive complementary foods from the age of "about six months" (World Health Organization, 1992).

In the Philippines the Department of Health promotes the current recommendation of the WHO for all women to exclusively breastfeed their infants from birth to four to six months of age and to sustain breastfeeding together with adequate complementary foods up to two years of age or beyond.

Both early and late introductions of complementary foods are dangerous. Too early introduction before four months carries increased risk of diarrhoea and other infections leading to malnutrition due to diarrheal disease and increase risk to allergic disease due to intestinal immaturity. There is also a risk of decreased breastmilk production because it is displaced by weaning foods. (Brown et al., 1989; Popkin et al., 1990; De Zoysa et al., 1991; Hendricks & Dadruddin, 1992). Infants who are given complementary foods too early may not feed at the breast strongly because they may be too full, and therefore, they may be getting fewer nutrients than recommended since weaning foods will not have same nutrient density balance as breast milk (Uwaegbute, 1991, Wharton, 1993).

Late introduction of complementary foods beyond six months is also not good because breastmilk ceases to be adequate to meet the infant's needs at some point (Uwaegbute, 1991, Wharton, 1993). The child may fail to thrive due to inadequate food intake. Malnutrition, micronutrient deficiencies and depressed immunity can result from such practice (Ajenifija, 1987; Hendricks & Badruddin, 1992). Delayed introduction of solids has also been associated with an increased risk of iron deficiency among breastfed infants (Siimes et al, 1984; Calvo, Galindo & Aspres, 1992).

Throughout the first year of life, infant nutrition requirements change and other foods need to be gradually introduced. Infants must slowly build a varied diet from each of the basic food groups as they move from the exclusive nursing period. Gradual introduction of fruits, vegetables and grains is important during the transitional period of infant feeding. This will help infants learn to accept and enjoy foods high in complex carbohydrates, which will become the foundation of their diets during the

modified-adult period and beyond (Glinsman et al., 1996). Emphasis of iron rich foods at 4 to 6 months is also important (Wharton, 1989, Dallman, 1993), since iron stores at birth are only sufficient for the first four to six months of life (Fomon et al., 1979; Dallman, Siimes and Stekel, 1980, Dallman, 1993) after which iron rich foods are needed.

Soyza (1988) observed that in many developing countries, the introduction of semi-solid foods and solid foods to infant's diets are unsatisfactory in timing and the quality and quantity of the foods are insufficient.

2.2.1.2 Recommended Dietary Allowances

The Philippine RDA Committee (1989) used the definition of RDA similar to the US (1989 edition) as the objective of the RDA for Filipinos as follows:

“ Recommended dietary allowances are the levels of intakes of energy and essential nutrients considered adequate to maintain health and provide reasonable levels of reserves in body tissues of nearly all healthy persons in the population”

When determining iron requirements of infants, the Filipino Recommended Daily Iron Intake (Philippine RDA Committee, 1989) states that basal losses as well as increase in haemoglobin and iron content of body tissues must be accounted for. The normal full term infant at three months has satisfactory level of haemoglobin because of sufficient iron reserves at birth. However, at about four months iron stores become depleted when the total body iron content increases progressively from about 290mg to about 400mg at the first year. The total estimated basal loss is 0.86mg/d bringing the total iron need of 95% of children < one year to 134 ug/kg/d. Considering average body weight, infants 3 months to < 6 months would need to absorb .080 mg of iron per day, while 6 to <12 months need to absorb about 1.21 mg/d. Considering the average absorption 8.2% from the average Filipino meal, the recommendation for iron for 3 months to < 6 months infants is 10 mg /day and for 6 to < 12 months infants is 15 mg/day (Philippine RDA Committee, 1989).

Breastmilk provides from 0.15 to 0.68 mg of iron per day (Subcommittee on Nutrition During Lactation, 1991). Although this is little compared to that from iron-fortified formula, the absorption of iron in breastmilk is exceptionally high, averaging about 50% as compared to about 7% from iron fortified formula and 4% from infant cereals (Dallman, 1986). Body stores of iron and ferritin levels increase during the first three months of postnatal life and then drop during the fourth to sixth months (Saarinen et al. 1977; Duncan et al. 1985). Despite these changes, iron deficiency is uncommon in breastfed infants in the first six months of life (Owen et al., 1981; Duncan et al. 1985, Saarinen et al., 1977). Exclusive breastfed infants have been shown to receive sufficient iron to sustain normal status until at least four to six months of age (Saarinen et al., 1997).

2.2.1.3 Summary

The feeding recommendations are intended to provide optimal nutrition and to minimise the risk for nutrient deficiencies and other adverse health outcomes. They take into account nutrient adequacy and other issues as well as minimising the likelihood of allergic reactions.

The Department of Health (Philippines) promotes the WHO recommendation for all women to exclusively breastfeed their infants from birth to four to six months of age and to sustain breastfeeding together with adequate complementary food up to two years of age and beyond.

Both early and late introduction of foods to infants is not optimal. Both practices carry increased risk to malnutrition. Infants must be slowly introduced to a varied diet from each basic food group as they move from exclusive nursing to the period of weaning and finally to the period of a modified adult diet. Iron rich foods should be introduced by four to six months.

Considering the average iron absorption (8.2%) from an average Filipino meal, the recommendation for iron for 3 months to < 6 months is 10 mg per day and for 6 months to < 12 months is 15 mg. per day.

2.2.2 Iron Deficiency During Infancy

Iron deficiency anemia in infancy is a common form of nutritional deficiency in both the developing and developed countries (Calvo & Gnazzo, 1990; Crampton et al., 1993; Karr et al., 1996; Kuizòn et al., 1996; Looker et al., 1997; Willows et al., 2000). This is because at 6 to 12 months iron stores that are depleted may not be replaced by adequate dietary iron (Mills, 1990; Duggan et al., 1991; Mander et al., 1991). During this period, rapid brain growth occurs and cognitive and motor skills are developed (Andraca et al., 1997).

2.2.2.1 The Risk of Iron Deficiency After 4 Months of Age

Iron deficiency develops when the amount of iron absorbed from the diet by the gastrointestinal tract is insufficient to meet the requirements (Baynes & Bothwell, 1990; Hambraeus, 1999). Iron deficiency is not only caused by a low iron intake, but also to low bioavailability of dietary iron (Hambraeus, 1990; Layrisse & Garcia-Casal, 1997).

Term infants, > 3000 grams. are unlikely to develop iron deficiency from birth to four months because their neonatal stores are sufficient (Dallman, 1992). Infants are most at risk of iron deficiency from about 4 to 18 months of age, when their stores have been depleted but their iron needs for growth and development remain high (Dallman, 1992) and the risk of iron deficiency is much greater in low birth weight infants who have lower reserves (Dallman, 1993). During this later period of infancy, total body iron should increase substantially from about 250 mg to 420mg (Dallman, 1992). However, despite these changes in iron stores, iron deficiency is uncommon in breastfed infants during their first 6 months (Owen et al., 1981; Duncan et al., 1985). Recent study in Honduras showed that the risk of iron deficiency is low among

infants with birth weights > 3000 grams who are exclusively breastfed for 6 months (Dewey et al., 1998).

Pizarro et al. (1991) reported that 20% of infants fed milk based formula that was not fortified with iron developed iron deficiency anemia by 9 months of age. Likewise, 15% of infants that are exclusively breastfed for entire 9 months without iron supplements developed iron deficiency anemia. (Saarinen, 1978; Siimes et al., 1984; Calvo et al., 1992).

2.2.2.2 Consequences of Iron Deficiency During Infancy

The consequences of iron deficiency and iron deficiency anemia are well documented. They have been associated with poor growth, an increase in certain infections and reduced physical and intellectual performance (Aukett et al., 1986; Grindulis et al., 1986; Dallman, 1987; Walter et al., 1989; Angeles et al., 1991; Lozoff et al., 1991). The severity of an infant's iron deficiency anemia is associated with lower physical and mental development index scores. Walter (1989) showed that hemoglobin concentration of <105g/L for duration of > 3 months correlated with significantly lower motor and mental scores. The result of his study further showed that even with iron therapy, adverse influences in the performance of developmental tests appear and persist.

Several researchers reported evidence on the effects of iron deficiency and iron deficiency anemia. Idjradinata and Pollitt (1993) reported that iron treatment was associated with significant improvement in scores in both the Mental Development Index and Physical Development Index in iron deficient anemia infants in Indonesia. This was also seen in 24 infants and children aged 9-24 months in New York. There was a significant increase in the Mental Development Index within one week of intra muscular iron therapy among the infants and children (Oski & Honig, 1992).

Relationships between iron deficiency and psychomotor outcomes were also studied by Lozoff et al. (1987) in Costa Rica and by Walter et al. (1989) in Chile. In the

Costa Rica study, both the mental and motor skills are associated with hemoglobin level. The Bayley Scales of Infant Development were administered before and after 3 months treatment with IM or oral iron. Children with iron deficiency anemia showed significantly lower mental and motor test scores than controls. Even when iron deficiency anemia was treated for three months, it did not correct the observed developmental abnormalities in the majority of the children. These findings in the Costa Rica study were similar to that seen in the Chile study. Infants with iron deficiency anemia had significantly lower mental and motor test scores on the Bayley Scales of Infant Development than iron deficient infants at 12 months.

There are also several studies that show evidence on the association of iron deficiency, immune response and infection. Although the humoral component of the inflammatory response appears to be intact (Dallman, 1987), abnormalities have been described in cell-mediated immunity (MacDougall, et al., 1975; Dallman, 1987), in neutrophil function (Walter et al, 1986) and in the secretory response of macrophages (Helyar & Sherman, 1987). Lovric (1970) found that anemic children had a significantly higher prevalence of gastroenteritis than non-anemic controls. Cantwell (1972) also saw that Maori infants who received parenteral iron dextran in the neonatal period had lower hospital admission rates during the subsequent 2 years, principally for respiratory and gastrointestinal infection than untreated controls. Higher morbidity rates in anemic children have been significantly reduced after treatment with iron supplements in double-blind placebo controlled trials (Andelman and Sereed, 1966; Chwang et al., 1988).

Severe iron deficiency anemia in childhood has also been associated with increased mortality (Dallman, 1987).

2.2.2.3 Prevention, Control and Treatment of Iron Deficiency and Iron Deficiency Anemia

There are a number of interventions in combating iron deficiency and iron deficiency anaemia. These include iron supplementation, food fortification, diet diversification

and improvement through nutrition education and communication and epidemiologic surveillance (Sargent et al., 1996).

2.2.2.3.1 Iron Supplementation

Iron supplementation, is widely used in the developing countries to control and prevent iron deficiency. However, programs have often been ineffective because the targets were not reached, compliance and adherence were poor, the preparations used sometimes had low bioavailability of iron and because supplies of supplements were sometimes inadequate (Stephenson, 1995; Schultink, 1996, Viteri, 1997). Compliance and efficacy of this program may be increased when daily schedules are replaced by weekly schedules (Stephenson, 1995; Schultink, 1996, Viteri, 1997). Weekly dose of 6 mg/kg body weight for three months was observed to be well tolerated and effective to prevent and correct iron deficiency among 3-6 years old children in Changji, Xinjiang Province in China (Liu et al., 1995).

Several researchers have found improvement of iron status with supplementation (Palupi et al., 1997; Berger et al.2000) In Indonesian the effect of oral iron supplementation was assessed in a double-blind study (Chawng, 1988). It was found that treatment with 10-mg ferrous sulfate. $\text{kg}^{-1}.\text{d}^{-1}$ for twelve weeks resulted in a significant improvement in haematological status, growth velocity and level of morbidity among the anaemic subjects.

In the Philippines, micronutrient supplementation, which includes iron supplementation is provided to various population groups through massive campaigns such as the National Micronutrient Day or Araw ng Sangkap Pinoy (ASAP) (every October), Knock out Polio Plus (every April and May), and the national school enrolment day (every June). Infants, preschool children, school children, pregnant and lactating women are given priority for iron supplementation (National Nutrition Council, 1998).

2.2.2.3.2 Food Fortification with Iron

Food fortification with iron also has proved to be valuable and effective method in preventing and reducing iron deficiency anaemia in both the medium and long term. It can be targeted at the population in general or at specific segments of the population at relative low cost (Hallberg, 1978; Van Stuijvenberg et al., 1999). Aitken, (1994), has defined fortification as “the addition of one or more essential nutrients to a food to prevent or correct a deficiency in a population or population group”.

Staple foods consumed throughout the year by a large number of the population are the best vehicle for food fortification. This is to ensure that the most vulnerable members of the population benefit from the food fortification (Nilson & Piza, 1998).

In the Philippines, rice is the staple food and is an excellent vehicle for food fortification because all Filipinos regardless of income basically eat it. Efforts to fortify rice with iron in the country started in 1993 with iron fortified premix developed by the Food and Nutrition Research Institute and it was pilot tested in 15 municipalities. A clinical study to assess the efficacy of fortifying rice with iron was done by the same Institute and it was found that there was an increase in the iron status of school children who were fed iron enriched rice compared to the control group (Florentino and Pedro, 1998). However, fortification of rice has not been pursued on a wider scale due to problems with technology and lack of an investor for the commercial production of the fortificant (National Nutrition Council, 1998).

Also in the Philippines, in 1994, the Sangkap Pinoy¹ Seal Program (SPSP) was conceptualised to encourage production, distribution and marketing of fortified products. The Sangkap Pinoy seal was envisioned to be a prestigious stamp to be awarded to food manufacturers who were able to meet the standards set for fortifying

¹means micronutrient

products with either vitamin A, iron or iodine. By the end of 1997, a total of eleven fortified food products granted the Sangkap Pinoy seal of acceptance are already available in the market (National Nutrition Council, 1998). These foods include noodles, infant cereals, sardines, tomato catsup, chips, milk, margarine, and hotdogs.

The efficacy of iron fortification can be seen in the steady drop in the prevalence of iron deficiency in infants in USA. The two major sources of fortified foods for infants are the iron fortified infant formulas and cereals. These have been successful in reducing levels of anaemia in Sweden, United States, Venezuela, and South Africa (Layrisse et al., 1996; Hurrell, 1997; Layrisse & Garcia, 1997; Van Syuijvenberg, 1999). The used of iron fortified foods have been identified as an important contributory factor in the declining prevalence of anaemia both in low-income and middle-class infants in the United States (Dallman, 1990).

2.2.2.3.3 Diet Diversification and Improvement Through Nutrition Education And Communication

Diet diversification and improvement through nutrition education and communication offer a long-term solution to iron deficiency and iron deficiency anemia. This method aims at motivating and influencing the population to make dietary changes to improve iron status. These could include breastfeeding, consuming adequate amounts and varieties of foods in meals including heme iron, like meat, poultry and fish. Other foods like legumes and other vegetables should also be eaten with food rich in ascorbic acid to increase iron absorption. The avoidance of consumption of foods containing inhibitors of iron absorption such as beverages rich in polyphenols should also be practised (Hallberg, et al., 1992; Viteri, 1997).

In the Philippines, nutrition education is one of the 5 impact programs of the Philippines Plan of Action for Nutrition. One of its objectives is to prevent and eliminate micronutrient deficiencies in the country. And as discussed in chapter 1, iron deficiency anaemia is one of the common micronutrient deficiencies. Nutrition education messages include the utilisation of fortified foods, consumption of variety

of foods everyday, exclusive breastfeeding until four to six months, and home and community food production. This program addresses practical aspects by distributing in addition to the micronutrient supplements seeds and seedlings of vitamin A and iron rich vegetables to ensure availability of these foods at the household level during the Araw ng Sangkap Pinoy or National Micronutrient Day.

2.2.2.3.4 Epidemiologic Surveillance

Monitoring and surveillance of population at risk of iron deficiency is also to control iron deficiency. Highly directed screening of groups known to be at high risk is necessary so that the extent of the iron deficiency is identified and appropriate interventions could be instituted. Interventions could be iron supplementation to individuals, to a more widespread supplementation and general fortification (Pippard, 1995).

In the Philippines, nutrition surveillance is also one of the enabling mechanisms of the Philippine Plan of Action for Nutrition (National Nutrition Council, 1993). Hemoglobin determination to identify iron deficient individuals and individuals at risk of iron deficiencies are done. Iron supplementation is provided to individuals found to be iron deficient. But in some areas of the country where financial resources are limited, hemoglobin determination is not done regularly by the health office or sometimes is carried out for pregnant and lactating women only. However, the Food and Nutrition Research Institute (Philippines) regularly does its national nutrition and biochemical survey.

2.2.2.4 Summary

Iron deficiency and iron deficiency anemia in infancy remain important problems in both developed and developing countries. It develops when the amount of iron absorbed from the diet is not sufficient to meet the requirement.

The consequences of iron deficiency and iron deficiency anemia are well documented. They have been associated with poor growth, an increase in certain

infections and reduced physical, intellectual and cognitive performance. Anaemic infants may show some improvements in mental and or physical development following iron supplementation. However, some studies report no major improvements in infants' development scores with either short term or long term iron therapy. Nevertheless, these results suggest iron deficiency severe enough to cause anemia in infancy may have a long lasting effect and possibly permanent effects on development although this is likely to be determined to some extent by the duration of the anemia and age of infant.

Oral iron supplementation programs are a common public health intervention against iron deficiency and have been implemented in nearly all countries but adherence is poor.

One of the most recognized ways to ensure adequate iron nutrition of the population is iron fortification of commonly consumed foods. It aims to prevent and reduced iron deficiency in both the medium and long term.

Diet diversification and improvement through nutrition education also offers a long term solution to iron deficiency and iron deficiency anemia.

Epidemiological surveillance is one intervention that would monitor the population at risk of iron deficiency and iron deficiency anemia so that immediate interventions could be instituted to.

2.2.3 Health and Nutrition Situation in Solana

The 1999 general weighing results showed that out of the 13,489 pre-school children weighed (0 – 83 months) 0.69% (93) were moderately underweight (based on age for weight), 19.36% (2612) were mildly underweight, 78.53% (10,593) were normal and 1.41% (191) was overweight (Municipal Nutrition Committee, 1999).

Reports show that there is a downward trend of malnutrition (based on weight for age) among preschoolers in the municipality. Moderate undernutrition was reduced from 1.046% in 1994 to 0.69% in 1999 and moderate undernutrition was reduced from 41.76% in 1994 to 19.36% in 1999. However, in absolute numbers in 1999, there were still 2,705 preschoolers who were moderately and mildly underweight.

Hemoglobin determination showed that 2.47% of the 1,821 pregnant women were anemic and 2.05% of the 1,657 pregnant women were also anemic. Ninety three (0.687%) of preschoolers were anemic. Hemoglobin determination was not done to infants.

The 1999 report of showed infant death rate to be 15.42% and the identified ten leading causes were undermined, prematurity, pneumonia, crib death syndrome, tetanus neonatorum and sepsis neonatorum (Rural Health Unit, 1999).

Breastfeeding rate in 1999 was 83% and it was observed that majority of the women breastfeed up to two years (Rural Health Unit, 1999).

2.2.4 The Municipal Nutrition Action Plan of Solana

The Municipal Plan of Action for Nutrition of Solana is a broad, systematic and coordinated effort of both the government and private sectors to prevent and solve the malnutrition problem in the municipality. The plan adopts a two-pronged strategy to achieve its nutrition objectives: 1) promotion of household food security and 2) the prevention, control and elimination of micronutrient malnutrition. To meet these strategies, five impact programs are being implemented: 1) Home and community food production, 2) Micronutrient supplementation, 3) Credit Assistance to livelihood, 4) Nutrition education, and 5) Food Assistance. Enabling mechanisms such as nutrition surveillance, manpower development, and nutrition advocacy are also implemented (Municipal Nutrition Committee, 2000).

The Municipal Nutrition Committee is responsible for implementing the Nutrition Plan. They are involved in the 1) planning and formulation of programs and projects for nutrition improvement in the municipality; 2) implementation, monitoring and evaluation of the integrated local food and nutrition program; and 3) resource generation for nutrition programs and projects.

The Municipal Nutrition Committee of Solana is a multi-sectoral committee consisting of the following sectors: agriculture, health, social welfare, education, local development planning, local finance and treasury, municipal council and non-government organizations such as the Green Meadow Foundation development Inc., The Catholic Women's League and the Parochial Commission on Health Care Ministry.

The chairmanship of the council is vested in the Municipal Mayor. A Municipal Nutrition Action Officer who is at the same time the Municipal Health Officer of the municipality is designated by the Municipal Mayor.

2.2.4.1 Nutrition Education In Solana

Nutrition education in Solana is included as one topic in this literature review as it has been conceptualised in this study that the mother's participation in nutrition education activities (one of the three ecological influences) could influence the diet of the infants.

Nutrition education is one of the 5 impact programs of the Philippine Plan of Action for Nutrition. It education promotes the adoption of desirable food and eating/feeding practices that promotes nutritional well being (National Nutrition Council, 1993)

In Solana, nutrition education is a whole year round activity. It is conducted by the different member agencies of the Municipal Nutrition Committee. The nutrition education is also integrated with practical approaches to address barriers. In Solana

this broad view of nutrition education is coordinated/combined with tangible practical assistance.

Nutrition Education in Solana is conducted through mothers' classes, individual health and nutrition teachings, household teachings, bench conferences and the integration of nutrition concepts in the primary and secondary school curricula (Municipal Nutrition Committee, 2000). The main messages include:

- 1) consumption of a variety of foods such as those rich in calories, vitamin A, iron and iodine
- 2) exclusive breastfeeding until 4 to 6 months
- 3) introduction of calorie- dense weaning foods rich in iron and vitamin A by the end of six months,
- 4) monitoring child growth,
- 5) personal hygiene
- 6) healthy life styles,
- 7) establishment of home and community gardens,
- 8) participation in nutrition- related services, projects and activities.

Nurses, midwives, social welfare workers, teachers, agricultural technicians and volunteer nutrition workers do the teaching. The messages emphasized depend on the type of teaching and the situation.

Nutrition education in the municipality prioritizes mothers especially those with preschoolers and school children. Special attention to mothers with malnourished children, pregnant and lactating women, and school children.

Nutrition information and education materials are being used as a guide by the nutrition and health workers in their nutrition education activities. These materials are sometimes distributed to the mothers. (See excerpts at Appendix A).

2.2.4.2 Diet/Food Diversity As A Nutrition Education Message

The inclusion of variety of foods in the diet has been a long-standing dietary guideline of several countries (Truswell, 1987). The major reason for the inclusion of variety of foods as a dietary guideline is the general concept that eating a variety of foods improves nutrient adequacy and helps to ensure proper balance among nutrients (Butrum, 1988). A greater food variety has also been associated with improved health status (Hodgson et al., 1994; McCann et al., 1994; Miller et al., 1992; Trevisan et al., 1988).

The nutrition guidelines of Philippines recommend, among others, eating a variety of foods everyday. Mothers during classes, individual health teachings, household teachings, and bench conferences are taught the three major food groups known as “your guide to good nutrition”. The groups are 1) the energy giving foods, 2) the body building foods, and 3) the body regulating foods. Mothers are encouraged to provide their family with a variety of foods from these three food groups everyday.

For each of the major food groups, mothers are given examples and told the importance and usefulness of the major nutrients present in them.

It is explained to mothers that energy giving foods are those rich in carbohydrates, and fats, such as rice, corn, rootcrops, bread, sugar, butter, margarine and oil. It is emphasized to them that these examples of foods are their main sources of energy for body activities and body heat.

Under the body building foods examples of protein rich foods such as meat and meat products, intestinal organs, poultry, egg, milk and milk products, fish, seafoods and dried beans are given. Mothers are informed that these foods are needed to build and repair body tissues. Children need them for optimum growth. These foods are also good sources of B-vitamins and iron.

Under the body regulating foods, examples of green and yellow vegetables, vitamin C rich foods and other fruits and vegetables are given to mothers. It is explained to mothers that these are good sources of vitamins and minerals, which help in the regulation of body processes.

Mothers are advised to provide their family at least one food from each group everyday.

Consequences of not eating a balanced diet containing a variety of foods are discussed. These consequences include protein energy-malnutrition, iodine deficiency disorder, iron deficiency anemia and vitamin A deficiency are also discussed with mothers.

2.2.4.3 Summary

The Municipal Nutrition Committee of Solana plans, implements, monitors and evaluates its Municipal Nutrition Action Plan. The Municipal Nutrition Action Plan of Solana is a broad, systematic and collective effort of both the government and private sector to prevent and solve the malnutrition problem of the municipality. This plan employs a two-pronged strategy consisting of five impact programs to meet the nutritional objectives of the municipality. Nutrition Education is one of the impact programs; it aims to promote the adoption of desirable food and eating practices to ensure nutritional well-being. Nutrition Education in the municipality involves quality individual and household teachings, bench conferences and mothers' nutrition classes, and the integration of nutrition concepts in the elementary and secondary school curriculum.

Priority target groups for nutrition education are the mothers of preschool and school children, especially those with malnourished children, pregnant and lactating women and school children.

2.2.5 Influences on the Diet Quality, Intake and Nutritional Status of Young Children

There are several influences in the diet and nutritional status that are interrelating and impinging on each other. These influences can be examined from an ecological point of view as nested levels of influences (Bronfenbrenner, 1979). Each level has an influence on the other levels by interaction with each other. In the conceptual model there are three levels that are conceptualised to be associated with the diet quality of the child. These are the family characteristics, the child himself and the mother's participation in nutrition education activities.

This section discusses these factors that influence the diet and nutritional status of the child. These influences do not exist in isolation but rather as a whole set of environmental factors that act together.

2.2.5.1 Studies In Other Countries

2.2.5.1.1 The Child

A complex aspect of the literature on child feeding is the role of the child. The child has a role in influencing dietary decisions of mothers (Walker, 1995). Caliendo and Sunjur (1978) recognized that the child is an individual capable of exerting an independent influence over his/her environment.

Piwoz, Black, de Romana, de Kanashiro and Brown (1994) comment,

Most studies of the determinants of infant feeding practices assume a unidirectional, causal relationship between maternal and household characteristics and feeding practices, and fail to take into account the infant's influence on the decision making process (p. 858)

The child's age, gender and birth order have been found to be statistically associated with nutrient intake (Caliendo & Sanjur, 1978; Crawford, et al., 1978; Chaudhury, 1984; Christian et al., 1989). These factors may directly determine the amount of food the child can and will eat. They may also exert an influence on the mother's perception of an appropriate diet. In some cultures the child's gender has implication

for foods, which should not be offered to the child or, the amount of food that has to be given (Chaudhury, 1984; Chaudhury, 1988).

The food preference of the child also may also influence his/her nutrient intake. Preference rankings made by preschool children are highly correlated with their consumption (Birch, 1979). Food preferences of children could be significantly influenced by adults who provide their care and their food (Trahms, 1993), however, there are also mothers who are willing follow their child's preferences (Pill, 1983).

2.2.5.1.2 Household/Family Characteristics

2.2.5.1.2.1 Maternal Nutrition Knowledge

Most studies of the diet of young children have focused on mothers or the characteristics of the general household and family. Mothers are usually the foremost provider of primary care for their children. In most of the situations they are responsible for the food availability for the entire family. They are responsible for the planning, purchasing, preparation and offering food to the child. Theoretically, improved maternal nutrition knowledge could lead to more informed decisions and enhancement of diet quality (Ramezani & Roeder, 1995). This lead to research on the relationship of maternal knowledge, feeding practices, dietary intakes, quality of diets and nutritional status of young children.

Blaylock et al. (1999) cited a study conducted by the Economic Research Service of the U.S. that found significant evidence that maternal nutrition knowledge leads to better diet quality for preschoolers.

In Panipat, India, a study by Chandna & Sehgal (1995) showed that intake of cereals, milk and milk products was significantly higher in children whose mothers had excellent, good and fair nutrition knowledge compared to children whose mothers had poor knowledge. Then children also had better anthropometric values and higher haemoglobin and serum retinol levels. This study indicates that nutrition knowledge level of mothers significantly affects nutritional status of their children.

Similarly, Christian et al. (1989) have shown that maternal nutrition knowledge was significantly related to nutritional status of 0-72 months infants as measured by weight for age in the rural and tribal villages of Panchmahals district, Gujarat State, India. The weight for age of boys and girls increased steeply with an increase in nutrition knowledge scores of mothers.

A study by Variyam et al. (1999) also showed that maternal nutrition knowledge influences children's diets and that such influence decreases, as the children grow older. Older children already make more dietary decisions independently of their mother and they tend to eat more away from home. It also showed that nutrition knowledge acts as a pathway through which maternal education influences children's diet.

There are some studies that show association of socio-economic factors and race with maternal nutrition knowledge. Moxley et al., (1981) reported that family income, race, mother's education and fathers education predict variation in mother's nutrition knowledge. Abbi et al. (1988) in their study of Mothers' nutritional knowledge and child nutritional status in India, found that economic status of mothers needs to be increased simultaneously with nutrition knowledge so that the mothers can practise what they know.

In the U.S. both maternal education and household income have been found to be positively associated with maternal knowledge (Blaylock et al., 1999). Similarly, Christian et al. (1988) observed a positive association of maternal literacy and income with maternal nutrition knowledge in India.

Maternal nutrition knowledge has been found to significantly correlate with mothers' attitude (Kumar et al., 1989). It is suggested that knowledge may raise confidence of mothers and hence improve attitudes towards various aspect of nutrition (Vickstrom & Fox, 1976; Cyrotkowski & Sims, 1978)

2.2.5.1.2.2 Maternal Attitude

Attitude is defined by Elms (1976) as a person's positive and negative feelings about the objects in his psychological world. Similarly, Bem (1970) defines it as the person's affinities for and aversion to situations, objects, persons, groups, or any other identifiable aspects of his environment, including abstract ideas and social policies.

Amarra & Florencio (1992) describe maternal attitudes toward children and motherhood as a "mother's interest in and behaviour toward children and child rearing". Similarly, they say, "attitudes towards nutrition refer to her emotions and actions regarding nutrition" pp. 1.

Maternal attitude plays an important role in the nutritional status and growth patterns of children, through their effect on the diet and childcare.

Positive maternal nutrition attitudes have been associated with better quality diets for pre-school children (Caliendo et al., 1977; Yperman & Vermeersch, 1979). Recent data indicate that parental positive nutrition attitudes, just like nutrition knowledge are important factors in the diets of pre-school children (Klesges et al., 1991; Koblinsky et al., 1992).

Pill (1983) in her study in South Wales saw that most mothers' food choices depend on what they saw to be of best interest to their family. In the study on working class mothers, there were two different views on health and diet. One group of mothers made their food choices based on the health and nutrition needs of their families before their own. The other group of women did not believe that food is particularly important in the prevention of illness and hence, they tend to let their child eat what he/she wants when he/she wants it. A mother in this group felt that letting the child chooses reflected a good standard of care on her part.

Maternal attitude was also seen to be positively correlated with infant growth as measured by "low weight" and "high weight" in Mali, West Africa (Dettwyler, 1986).

In a study in the United States, mother's attitude towards meal planning, preparation, and household tasks were found to be correlated with dietary quality (Caliendo & Sanjur, 1978).

2.2.5.1.2.3 Parental Education

The relationship of parental education and dietary intake of preschool children is a complicated one. More education is associated with greater awareness of children's need and better childcare practices. It is recognized that better educated parents have increased knowledge and resources and should be able to provide their children with better quality and more nutritious foods. However, higher education may have an adverse effect on the children's health and nutrition. Better educated mothers tend to work outside the home and this may lead to reduced breastfeeding and earlier weaning (FAO, 1975; Subbulakshmi & Udipi, 1990; Igbedioh & Aderiye, 1992).

In Bangladesh, Chaudhury (1984) showed a consistent significant and positive association of mother's education and nutrient intake of infants (< 1 year). Education of mother was also correlated with dietary quality in Caliendo & Sanjur's (1978) study on the dietary status of American preschool children. Sanjur et al. (1994) with their study on dietary pattern, nutrient intakes and nutritional anthropometry of Urban Puerto Rican toddlers found that mothers' education was statistically associated with nutrient intakes of the toddlers. The greater the level of education of the mothers, the greater the intakes for selected macronutrients except for protein.

Education of mother was shown to be significantly related to weight for age of boys in the study of Christian et al. (1989) among 0-72 months children in rural and tribal Panchmahals district, Gujarat, India.

A similar effect of maternal education on nutritional status of children was also observed by Tharakan & Suchindran (1999) in Botswana, and by Victoria et al (1986) among Brazilian children. They found out that maternal education is a major factor in reducing malnutrition among pre-school children. As the mother's education level

goes up, chances for stunting goes down. Children whose mothers have higher levels of education are less likely to be underweight.

Arroyo et al. (1972) have shown that the educational level of the father in the United States influenced the dietary behaviour of the family. Caliendo & Sanjur (1978) also found a correlation between father's education with preschoolers' diet quality. However, it may be noted that the effect of education on nutrient intake is likely to be more positive for female than male education as they are the primary meal planners and they primarily make the decisions when it comes to the nutritional well being of the family. Female education leads to efficient allocation for food consumption and also to an awareness of the importance of nutrition. The positive effect of male education on nutrition is mostly due to the association of food expenditure by virtue of his income earned (Arroyo et al., 1972; Chadhury, 1987)).

2.2.5.1.2.4 Household/Family Size

Increased family size may adversely affect the nutritional status of every member of the household, most specially the preschooler, because it may be associated with decreased intake per household member. In larger families, this means that the budget for food has to be stretched in order to feed each member. Large households more often include young children, these households use more food and spend more than small households, but the share of each person is less (Wilson et al., 1971; Rieley, 1973). Musgrove (1988) found that in northeast Brazil, the addition of family member results in the rapid decline in food consumption per person of nearly all foodstuffs. Per capita food consumption declines between 20% to 40% as family size doubles.

Musaiger (1982) cited that the majority of low social class households in Bahrain are large households. These households mainly depend on low priced food to satisfy their household members. The practice of the whole family eating together from the same plate, especially with large family size tends to provide the children smaller amounts of foods such as meat or fish while the older members can get more high protein foods.

However, in some situations, as in Bangladesh, family size itself points to a higher economic status of the household. In this case, larger family size may not lead to worsening of nutrient intake of household members and children (Chandhury, 1984). Household size showed a positive and significant relationship with calorie intake and calorie adequacy ratio for a sample preschool children in a study conducted in Bangladesh. The study also shows a significant and positive association of household size with protein intake of the preschool children, though it has a negative but insignificant effect on the protein adequacy ratio for the preschool children as a whole (Chaudhury, 1984).

It should also be taken into account that it is not necessarily family size per se but the number of adults relative to the number of children in a household that is the crucial factor influencing the intake of children in the household (Chandhury, 1984). With increased number of adults in the household chances are children have to compete with them for their share of the food.

2.2.5.1.2.5 Number of Young Siblings 0- 6 Years Old

The presence of many young siblings (the occurrence of close birth intervals) may adversely affect the nutrient intake and nutritional status of pre-school children for several reasons (Chaudhury, 1984):

- Nursing children are likely to be displaced earlier from the breast with the birth of a closely spaced sibling.
- A child in a family with a large number of siblings under six is likely to receive less food because the available food is being shared between a greater number of children.

A study in rural Bangladesh suggests that frequent birth intervals have a small but detrimental effect on nutrient intake and the nutrient adequacy ratio of pre-school children (Chaudhury, 1984). Another effect of number of siblings on nutritional status was seen in the study of Christian et al. (1989) among 0-72 months children in rural and tribal villages of Panchmahals district, Gujarat State, India which showed that

children who were spaced very close (< 24 months) from each other had lower weight for age than for children whose births were spaced more than 24 months from each other.

Victoria et al. (1986) in their study among Brazilian children aged 12-35.9 months found some degree of association between number of siblings with nutritional status as measured by weight for age. The prevalence of stunting and underweight tended to increase with the number of siblings in the home. However, this association was less significant when family income was included in the analysis. After family income was taken into account, the number of siblings was not nearly as important a risk factor, remaining significant for underweight only.

2.2.5.1.2.6 Household/Family Income

Income has been cited as a critical determinant of nutrition in developing countries (World Bank, 1984). World Bank (1980), reported that the serious and extensive nutritional deficiencies that occur in most of the developing countries are “largely a reflection of poverty, people don’t have enough income for food”. The economic status of a family is an influential factor in determining how much and what kind of food will be available for the family. It is expected that with higher income there is an increase in food expenditure as so there is an increase in the quantity and quality of food purchased (Gopalan et al., 1981). Income is an important influence on the decision whether to purchase a particular food, how often and how much to purchase. However, McCarthy (1977) and Taha (1977) have shown that as income increases, the percentage of income spent on food decreases. In other words, as people grow richer, they spend an increasing proportion of their budget on clothing, transportation and recreation. This feature of food consumption was noted in the nineteenth century by German statistician Ernst Engel and has become as “Engel’s Law”. Engel’s law would usually described as “ the share of food in total household expenditure decreases with increasing income” (Ritson & Hutchins 1995, pp. 50).

One measure of diet quality is diet diversity. Diet diversity is an indication of the variety and number of servings from each food group in the diet. In the United States and Canada higher diet diversity scores were found to be associated with higher income position (Caliendo and Sanjur 1978; Campbell & Sanjur, 1992). This is in agreement with the findings of Rao (1987), in Drarwad, India where food diversity score was shown to be strongly influenced by income.

Income has also been observed to have a significant effect on the nutritional status of Brazilian and rural and tribal Indian children (Victoria et al., 1986; Christian et al., 1989). In Brazil, the effect of income on prevalence of stunting, underweight, and wasting being approximately 7,4, and two times respectively higher from the poorest homes when compared to the wealthiest homes. In rural and tribal India, income has a significant effect on the nutritional status of boys and girls. The weight for age of children of families above the poverty line are higher than those of the children whose families with per capital incomes of Rs 65/- or less. Family income was also seen to be significantly related to nutritional status of children in rural Dharwad, India (Rao, 1987)

Chaudhury (1984) observed in his study on preschoolers in Bangladesh that in households with the lowest per capita income (less than Tk 149 per month), pre-school children do not meet their calorie requirements.

Devi and Geevani (1994) also observed that in Andhra Pradesh, India, income from land has a significant influence on the weight for age and height for age, and weight for height of children. It was seen that families with higher incomes from land have fewer constraints in feeding their children. These findings are similar to the observations of Bhuiya et al (1986), who have shown that proxies for income such as amount of land, structures of house and articles owned have a positive relationship with nutritional status of children.

2.2.5.1.2.7 Family Food Expenditure

Expenditure on food is a reflection of a household's income, resources and decisions. Income provides an index of the household's purchasing capacity (Chaudhury, 1984).

With improvement of household income, the expenditure on foods would be likely to increase and hence an increase in the calorie and protein intake of the household, including the children (Reutlinger, 1976). However, Chaudhury (1984) states "if the household has limited purchasing power, not only may the per capita intake be less, but also the deficits are likely to be shouldered disproportionately by the children"(p 24). With the decline of per capita expenditure on food, the nutritional status of children is likely to be more unfavorably affected than any member of the family.

In a study in Bangladesh, per capita expenditure on food is found to be an important factor determining the calorie intake and also calorie adequacy ratio of preschoolers. Protein adequacy of a preschool child also improves with per capita expenditure on food, but this change is not significantly different to zero (Chaudhury, 1984). Devi & Geervani (1994) found that per capita food expenditure is significantly correlated with weight for age and height for age.

Increasing consumers' incomes raises consumption of all nutrients, as they generally buy more foods. However, the levels of consumption in all nutrients do not increase equally. In the U.S. an increase of 1% in income would have the greatest effects on the consumption of fat, saturated fats, and vitamin A, C, and E. With an increase in income, there is also an improved consumption of nutrients consumed in insufficient amounts like calcium, iron and various nutrients. However, increase in income also increases the consumption of overconsumed nutrients by Americans like, energy, saturated fats and cholesterol (Huang, 1998). Therefore, the net nutrient effect of increasing income is mixed.

A study in England and Scotland showed that a change in income has a destabilizing effect on food habits. A decrease in income led to the change in variety and quantity of foods eaten. It was concluded that a long-term reduction in income might lead to a greater proportion of income being spent on food, but a reduction in intake of several foods currently recommended for a healthy diet (Shepherd et al., 1996).

Musaiger (1982) cited that in Bahrain income limited the purchasing power of the household particularly the low social classes. The poor families spent a greater amount of their limited money on cereals and wheat and less on meat, fish, fruits and nuts.

The significance of food expenditure is that families may make different decisions with the same income – presumably if more is spent on food, nutritional status will benefit even if income is the same.

2.2.5.1.3 Participation in Nutrition Education Activities

As nutrition is the foundation of good nutrition, education is the cornerstone of nutrition because to attain optimum nutrition, the individual must be taught to make good food selection and to maintain an environment conducive to the utilization of nutrients provided by the food (Eppright et al. 1963).

Gillespie and Brun (1992) defined nutrition education as: “a process which assists the public in applying knowledge from nutritional science and the relationship between diet and health to their food practices. It is a deliberate effort to improve the nutritional well being of the people by assessing the multiple factors that affect food choices, tailoring educational methodologies and messages to the public being reached and evaluating results. It can help individuals develop a knowledge base, make a commitment to good nutrition, promote selection of nutritionally adequate diets and/or develop decision making skills”. In other words nutrition education is more than just providing knowledge and information.

The mother being the one that is primary responsible for the nutritional well being and childcare is the usual target of nutrition education. Aside from preparing and cooking the meals they are also involved in teaching good habits to their children.

Participation of the mother in nutrition education alone has been seen to improve nutritional status of young children where economics are not the primary constraint (Zeitlin & Formacion, 1981; Pinstруп-Andersen et al., 1991). Likewise, nutrition education can result in maximizing benefit obtained from resources even when economics are primary constraint (Bairaga, 1980; Zeitlin & Formation, 1981; Pinstруп-Andersen et al., 1991).

Culturally appropriate nutrition education improved infant feeding and growth in rural Sichuan, China. Participation of mothers for one year in nutrition education significantly increased their nutrition knowledge and improved infant feeding practices. Infants whose mothers participated in nutrition education were significantly heavier and longer. Mothers that participated in nutrition education had longer breastfeeding rates and lower anemia rates among their infants compared to the controls (Guldan, et al., 2000).

In Bangladesh, parents' participation in nutrition education classes and motivation to grow vegetables and fruits rich in vitamin A and to feed these to their children resulted in significant improvement in the nutrition knowledge of the parents and an increase in the actual vegetable consumption of the children. As a consequence of these improvements, the prevalence of nightblindness among children under 6 years old dropped from 4.1% to 0.47% and there were no new reported cases. Analysis of these results indicate that this improved nightblindness situation was due to the parents' increased nutrition knowledge regardless of their occupation, income, and educational attainment (Yufuf & Islam, 1994).

Breastfeeding and provision of supplementary feeding at the recommended age was also seen to be associated with participation in health education course after

controlling child's age, site of delivery, maternal age, level of education, and parity (Shoham-Yakubovich, 1990).

2.2.5.2 Studies in the Philippines

Malnutrition continues to be a public health problem affecting the lives and well being of the population of the Philippines, especially the infant and preschool children. The Philippine Plan of Action for Nutrition has been implemented to end hunger and malnutrition in the country. Several research studies were conducted to provide a strong foundation for the design and implementation of the Action Plan. Recent studies examined food fortification, development of foods for food assistance programs, conducting of national nutrition surveys. Studies on demographic, socio-economic and cultural context underlying malnutrition have also been conducted. The research discussed in the following section will mainly dwell on the demographic and socio-economic factors affecting nutrient intake and malnutrition. It is presented using the conceptual model of this study.

2.2.5.2.1 The Child

Several studies in the Philippines have showed that the child has an influence in his/her diet and nutritional status and that sex discrimination is found in the Philippines. Lim and Florencio (1975) found out in their study in San Pablo, Laguna that boys had higher intakes of calories, protein and calcium than the girls. The same was also seen by Chulakarangka and Onate (1980) in a rural village, where male preschoolers have higher diet ratings (as measured by the dietary intakes) than their female counterparts. They found that the lower the diet rating, the higher the number of females in this study group. Battad (1978) has shown that female children are associated with larger reduction in nutritional status as measured by weight for age than their male counterparts. Findings in the study of Mia (1996) in Gamu and Ilagan Isabela indicated that weight for height showed a significant association with preschoolers' sex. It was observed that more male children were in the normal weight for age compared with the females.

2.2.5.2.2 Household/Family Characteristics

2.2.5.2.2.1 Maternal Nutrition Knowledge

Balanon (1977) in her study in Catarman, Samar found a positive relationship between the mother's nutrition knowledge and child's nutritional status as measured by weight for age. She observed that as the nutrition knowledge of the mothers increased, the number of normally nourished pre-school children also increased. Nutrition knowledge of the mother was also observed to be statistically correlated with the dietary rating¹ of pre-school children. This association between mother's nutrition knowledge and the children's dietary rating was also found by Chulakarangka and Onate (1980).

Chulakarangka and Onate (1980) also observed that maternal nutrition knowledge affected the relationship between maternal educational attainment and children's diet.

However, analysis of the First Nation-wide Food Consumption Survey (1978) by Celestino et al (1985) suggest that there is an almost negligible influence of the homemakers nutrition knowledge in predicting the households' percentage nutrient adequacy of energy, protein, iron and vitamin A. This finding suggests that there might be important variables other than nutrition knowledge that influence the adequacy of nutrient intake.

2.2.5.2.2.2 Parental Education

In the Philippines some studies show that both the fathers and mother's education have an influence on the diets and nutritional status of their children. Balanon (1977) found in her study in Catarman, Samar that fathers with no formal education had a lower proportion (33.3%) of normally nourished pre-school children compared to fathers with secondary education who had 50% of normally nourished preschool

¹ Term assigned to express the dietary intakes of pre-schoolers

children. In the same study it was observed that mothers education was related with nutritional status. The mothers who had no formal education had the highest proportion of malnourished pre-school children. Likewise, Battad (1978) in her study conducted in Laguna showed that there is a linear positive relationship of the mothers' education to the nutritional status of the pre-schoolers. Among 6- 23 month old children, a unit increase in the mothers' education was associated with 1.9 percentage point increase in the measure of nutritional status. She observed that the better educated mother allocates more resources for her child's nutriture, buys more nutritious foods and feeds her family well planned and well balanced meals. Gonzalo (1976) observed that as the education of the mothers increased the child's intake of calories and protein also increased significantly. Valenzuela, Florencio and Guthrie (1979) and Chulakarangka and Onate (1980) showed that mother's education was positively correlated with calorie adequacy ratio and diet rating of the child. Reynes (1979) observed that severe malnutrition in Bohol was related to mothers' lack of education. Bulatao-Jayme et al (1982) noted in their study done in Metro Manila that absence of any formal schooling on the part of the meal planners was shown to be associated with greater energy inadequacy. Results of the study showed that households with less than 80% adequacy levels had higher percentage (69.2%) of mothers who had no formal schooling as compared to those with ten years of schooling (17.8%).

2.2.5.2.2.3 Household/Family Size

Household size plays a significant role in child nutrition. Garcia (1991) found in her study that having more children in the household is associated with more chances of having malnourished children as a result of competition not only for household resources but also for attention and parents' care. Herrera (1977) found in Laguna that an increase in the number of children and/or household members consistently meant a decrease in the nutrient intake of household members. In Manila and Laguna, Florencio (1980) also noted that family size had a consistent negative effect on the quality of nutrient intake. For both rural and urban families, intake of energy and vitamin A decrease with family size; the same as the overall quality of the diet. Orlina

(1982) has also shown that household size was significantly correlated with nutritional status in her study in San Miguel, Bulacan. She observed that households with third degree underweight pre-schoolers and household without third degree pre-schoolers differ significantly in the size in of their household. Seventy three percent of those with third degree underweight pre-schoolers had more than five members compared to sixty percent households without third degree.

2.2.5.2.2.4 Number of Young Siblings 0-6 Years Old

USAID –Philippines (1974) noted that the physical growth among children in Laguna was more seriously impaired in families with more than two preschoolers than with families with only one or two. Aliling and Alequin (1976) found a linear relationship between number of siblings and the incidence of nutritional deficiency among children of 0-6 years old in Cavite. Villavieja et al (1984) also found in their study that a higher nutrient adequacy level was attained with fewer pre-schoolers in the family. In the same study it was seen that the proportion of undernourished children was lower in households with fewer pre-school children. Corpuz and Inciong (1981) also noted a positive correlation of nutritional status and number of pre-school children. They observed that there is more malnutrition in families with more that one pre-schooler.

2.2.5.2.2.5 Household/Family Income

The purchasing power of the family determines to a large extent what and how much food is made available for family consumption. Although it does not always mean that families with higher incomes have better food that those lower income, it is rational to say that families with higher income are in a better position to afford better food and partake of a better diet (Lim and Florencio, 1975).

Battad (1978) in her study, which involved households in Laguna, showed that there is a marginal effect of income on the nutritional status. Gonzalo (1976) found that a unit increase in income was associated with 64 % rise in household per capita intake in calories and protein. Azares (1982) also found in her study in San Francisco del

Monte, Quezon City that family energy adequacy had a tendency to increase with increasing income of the family. In Laguna, Lim and Florencio (1975) also observed that compared to families with malnourished children as measured by weight for age, families with healthy children have higher family income. A study by Mazon (1981) in Rosario, La Union, showed that income influenced nutritional status such that as income increased, the number of normal pre-schoolers also increased. Similarly, Balanon (1977) observed in her study in Catarman, Samar that with an increase in income the number of normally nourished children in the area also increased. Families with income of 6,000.00 pesos plus had the highest percent of normal weight children at 65.2%.

A study was done by the Food and Nutrition Research Institute (FNRI) on the effect of income on preschool children's nutrition. Among households with 0-4 year old pre-schoolers, income was a vital factor to the children's diet. There was a progressive increase in energy and protein adequacy as the annual per capita income level increased. Low-income families were inferior in terms of nutritional status as well as dietary status. The percentage of underweight for age children was higher in the bottom 30% group than in all other income groups.

2.2.5.2.2.6 Family Food Expenditure

In a study conducted by Valenzuela (1978) food expenditure was an influential factor in consumption. The study showed food expenditure positively affected calorie and protein intake and diet rating. A unit increase in food expenditure increased calorie adequacy ratio by 4.3%, protein adequacy ratio by 18.5% and diet rating by 22%. A study of Balanon (1977) revealed that the number of normally nourished children increased with increasing weekly food expenditure. The number of normally nourished children increased consistently from 34% for households whose weekly expenditure on food was 15.00 to 65.00 pesos to 53.8% for those with weekly expenditure of 118.00 to 170.00 pesos. The number of malnourished subjects consistently decreased with increasing food expenditure.

2.2.5.3 Summary

The factors influencing the child's dietary intake, diet quality and nutritional status can be viewed in three levels of influences with each level interacting with each other. These levels are the family characteristics, the child himself and maternal participation to nutrition education activities.

The influence of the child is clear that he/she as an individual is capable of exerting an influence on his mother or caretaker. The child's characteristics such as age, sex and birth order have been seen to determine the amount the amount of food the child can and will eat. These characteristics exert an influence on the mothers' perception of an appropriate diet for the child. Hence, these will affect his/her nutritional status.

The mother's nutrition knowledge and attitude as one aspect of family characteristics are also important. The mother is primarily incharge with the family's nutritional well being. Evidence has shown that the mother's nutrition knowledge and positive nutrition attitude influence her child's dietary intake, quality and nutritional status.

Family characteristics such as the socio-economic status and demographic characteristics of the family are associated with the dietary intake, quality and nutritional status of the child. Socio-economic status such as occupation, income, and educational attainment was also seen to be associated with maternal nutrition knowledge.

Participation of the mother in nutrition education activities is also associated with the dietary intake, quality and nutritional status of the child. It was seen that nutrition education could increase nutrition knowledge and improved diet regardless of occupation, income and educational attainment.

2.2.6 Dietary Assessment Methods

Diets of individuals and groups are assessed on the basis of nutrient intake and in relation to compliance with feeding recommendations.

There are four methods used to determine individual and group nutrient intakes and each of these has its own advantages and limitations. The four methods are the 1) 24-hour dietary recall; 2) dietary record or diary; 3) food frequency; 4) diet history.

The selection of an appropriate dietary assessment method depends basically on the objectives of the study, the accuracy of the method, the target group and the availability of resources.

2.2.6.1 24- Hour Dietary Recall

This is the most widely used method in assessing individual dietary intake. It provides quantitative assessments of nutrient intake. This method provides information on the consumption of food and beverages for the previous 24-hour period. This method is conducted by an interview including probing questions (Thompson & Byers, 1994). Visual aids, such as food models, pictures, or household measuring utensils, are often used to help the subjects to estimate quantities consumed (Randall, 1991).

There are many advantages of the 24 hour recall including a) the interviewer administers the tool and records the responses, therefore literacy of the respondent is not required; b) limited time is required to accomplish it. It takes only 20 minutes to complete a 24 hour recall; c) because there is relatively little burden, those who agree to give the 24 hour dietary recall are more likely to be representative of the population; d) in contrast with diet record, dietary recall occurs after foods have been consumed, so there is less potential for the assessment method to interfere with dietary behavior (Thompson & Byers, 1994).

The major limitation of the 24-hour recall relates to the day to day variation of an individual's diets. Due to the large intraindividual variability in day to day food and nutrient intake in most persons, it is not appropriate to use data from a single recall to characterize an individual's usual intake. (Randall, 1991; Thompson & Byers, 1994).

The principal use of a single 24-hour recall is to describe the average dietary intake of a group (Cameron & Van Staveren, 1988; Thompson & Byers, 1994).

2.2.6.2 Dietary Record or Diary

The dietary record requires the individual to record current food and beverage intake for at least 3 to 4 consecutive days. More than seven consecutive days recording is not usually feasible because of respondent tiredness.

The amounts of food, brand names, methods of preparation, recipes for food mixtures and portion sizes must be recorded by the respondent. The method requires adequate instructions and demonstrations (Thompson, & Byers, 1994).

The major strength of the food record method is that it does not rely on memory and the problem of omission is lessened. It is considered as the “gold standard” against which other dietary assessment methods are compared because of its potential of providing quantitatively accurate information of food consumed during the recording period (Thompson & Byers, 1994).

While the diet record or diary is considered as the gold standard against which other dietary assessment is compared, it is so laborious and the recording is such a detailed and a difficult process that the respondents would have to be highly motivated to be able to do the tedious recording of food intake (Gibson, 1990).

2.2.6.3 Food Frequency

The food frequency approach estimates how frequently foods are consumed by an individual either per day, week or month. This method provides qualitative and descriptive information about the usual food consumption pattern. The approach provides a list of foods and a set of frequency of use response categories (Gibson, 1990). However, the food frequency method may include a quantitative assessment of usual portion sizes and the term “semi-quantitative history” is sometimes used to

imply a general food frequency questionnaire that allows for a limited quantification of serving sizes (Thompson & Byers, 1994).

The food frequency has been widely used for epidemiological studies for ranking subjects with low medium and high intakes of specific foods, food components, or nutrients, for comparison with prevalence and/or mortality statistics of a specific disease (Hirayana, 1981, Gibson, 1990, Frank et al., 1992)

Despite the advantages of the food frequency method such as a) it allows the collection of data from large portion of individuals; b) it is rapid because it is easily administered with low respondent burden and high response (Gibson, 1990), it does not provide many details of dietary intake and the quantification is not as accurate as with the 24-hour recall and the food record method (Thompson & Byers, 1994). The food frequency method could lead to a systematic bias toward either underestimation or overestimation of food and nutrient intakes. The respondents' usual portion sizes may differ apparently from those specified in the semi-quantitative food frequency questionnaire or may differ from the average portion sizes used in nutrient analysis from the qualitative food frequency questionnaire (Marr, 1971).

2.2.6.4 Diet History

Diet history provides information about the usual intake over a prolonged period of time, which can be used to estimate the prevalence of inadequate intakes. This method is administered through an interview method consisting of a twenty four hour recall of actual intake, plus information of usual eating pattern, followed by a food frequency questionnaire to verify and clarify initial data (Gibson, 1990).

The major advantage of the diet history is its assessment of usual meal patterns and details of food intakes over a long time period, which can be used to estimate prevalence of inadequate intakes. The disadvantages of the diet history are it is labor intensive, time consuming and the results depend on the skill of the interviewer (Gibson, 1990).

2.2.5.5 Selected Issues Related to Dietary Assessment Methods

When the objectives of the study have been identified, some important issues related to dietary assessment methods need to be considered before selecting the most appropriate method. These include ethnic or cultural background of the population, estimation of portion size and the nutrient data base.

When the study population is composed of individuals with a strong sense of ethnic identity, special modifications need to be made in the content of the dietary assessment methods. If the method requires an interview, interviewers of the same ethnic or cultural background are preferable to obtain the necessary data easily. If dietary information is to be quantified into nutrient estimates, examination of nutrient composition data base is necessary to ensure a number of ethnic foods are included (Thompson & Byers, 1994).

The use of standard food list for food frequency questionnaires may not be suitable for populations of a strong ethnic identification. Development of the food list can be done either by modifying an existing food list or by examining the frequency of reported foods in the ethnic group from a set of dietary record or recalls (Thompson & Byers, 1994).

The respondents' estimation of portion sizes has always been a problem for all dietary assessment methods. There is poor estimation of the weights of foods and confusion about the term ounces, which is interpreted as indicating either volume or weight. Portion sizes of foods that are commonly bought or consumed in defined units, such as in bread by slices, beverages in cans or bottles are more easily reported than irregular shape foods (Thompson & Byer, 1994).

Three dimensional food models and household measures, such as cups and teaspoons have been used in research to help participants estimate portion sizes. In 24-hour recalls, diet records and food frequency methods, two and three- dimensional pictures have been developed and used (Thompson & Byers, 1994).

In many situations, respondents are unavailable or unable to report their diet or very young to report their diet. In these cases their diet are reported by surrogates.

In the case of pre-school children who are less able than adults to recall, estimate, and cooperate in usual dietary assessment procedure, the information has to be obtained from surrogate reporters (Thompson & Byers, 1994). Surrogate reporters for preschoolers are usually the mother and other primary caregiver(s). In cases where both the mother and external caregiver are the surrogate reporters, a consensus recall method is used, in which the child and surrogate reporters combine to give responses on a 24-hour dietary recall. This has been shown to give more accurate information than a recall from either surrogate reporter alone (Thompson & Byer, 1994).

2.2.6.6 Summary

There are four dietary assessment methods that have been established to assess the dietary intakes of individuals or groups.

A 24-hour recall or one day food record may be used to characterize the average intake of a large group, provided the sample is a representative of the population under study. Depending on the number of measurement days, repeated 24 hour recalls or replicate weighed or estimated food records are used to determine actual or usual nutrient intakes. The food frequency questionnaires and diet histories assess the usual food consumption patterns over a relatively long period. Each of these methods has their own advantages and limitations and may be used in combination to increase the accuracy of the results obtained.

The selection of an appropriate dietary assessment method depends primarily on the objective of the study. Assessment of methods may lead to provide a quantitative assessment of nutrient intakes, or to ranking of individuals according to their intakes.

2.2.7 Diet/Food Diversity Score

The food variety/diet diversity score is a qualitative assessment of dietary intake. It quantifies the number of different foods; individual foods, food mixtures, food categories, or a combination of these consumed by an individual and is expressed over a time, which may be a day, a week, a month or a year. A food frequency questionnaire, dietary recall and dietary record can be used for the calculation of food variety/diversity score. If a food is consumed a score of one is given. Generally, there are no assumptions made about quantity, or frequency of consumption when calculating the variety score (Hodgson et al., 1994). No additional score is given for larger portion/ serving sizes, or if food is eaten more than once over the time base.

Types of food variety scores include:

- 1) food product variety score, that is, foods are scored as they are eaten. Each item from a food frequency food questionnaire has a potential score of one and it is based on the distinctiveness of the individual food product (Hudgson et al., 1991)
- 2) food biological variety score, in which the scoring system is based on the biological distinctiveness of foods such as animal, plant and microbiological (Wahlqvist et al., 1989).
- 3) “food group” such as meat, dairy cereals or grains, fruits and vegetables as a basis for food variety score was used by some investigators like Kant et al. (1993); McCann et al. (1994).

The sum of the different foods as counted is the score.

The objectives and rationales of scoring food variety not food quantity is based on the assumption that it is advantageous to eat a variety of food. It is postulated that a variety will improve nutrient adequacy, dilute possible toxicants, and include a wider number of non nutrient components of food in the diet (Hodgson, et al., 1994).

The purpose of the research may determine the type of food variety score. For example, a hypothesis related directly to fruit intake may use a score of variety that include only fruits (Hudgson et al., 1994).

2.2.7.1 Summary

Diet/ Food Diversity scores quantify the number of different foods consumed, and are expressed over a period of time or base which may be a day, week, month or year. There are no assumptions about quantity, or frequency of consumption. No additional score is given to larger portions or if food is eaten more than once over the time base. Foods which are eaten are added together to obtain the final food diversity score.

2.2.8 Summary

The WHO recommends for all women to exclusively breastfeed their infants from birth to four months to six months of age and to sustain breastfeeding together with adequate complementary feeding up to two years and beyond. Both early and late introductions of complementary foods are not optimal. This carries an increased risk of malnutrition. Emphasis on the provision of iron rich food to infants is important since iron stores at birth are only sufficient for the first four to six months.

Iron deficiency deficiency is common in both developed and developing countries. Iron deficiency develops when the amount of food from the diet is insufficient to meet the requirements the body need. It is not only cause by low iron intake but also to low bioavailability of dietary iron.

Infants are at risk of iron deficient at four to six months when their stores are starting to deplete and their requirement for growth and development is increasing. If demands for iron are not met infants may develop iron deficiency anemia. Iron deficiency anemia has been found to have adverse effects on infants' growth and development. However, iron deficiency is uncommon in breastfed infants during their first six months.

Iron supplementation and food fortification are the most recognised ways to prevent and control iron deficiencies.

It may be summarised that there are certain family characteristics (i.e. maternal nutrition knowledge, maternal attitude, parental education, household size, number of siblings below six years old, family income, family food expenditure) and infant characteristics that are associated with and influence diet quality, intake and nutritional status. Nutrition education is also associated with diet quality, intake and nutritional status of the infant.

In Solana, a Municipal Nutrition Plan that has 5 impact programs is being implemented to address the protein - energy malnutrition and micronutrient deficiencies in the municipality.

Nutrition education is one of the impact programs. It aims to promote adoption of desirable food and eating/feeding practices to ensure nutritional well being. Diet/food diversity is one of the messages that is being promoted in nutrition education activities.

CHAPTER THREE

MATERIALS AND METHODS

This chapter provides the information about the research location, sample size, sample selection and recruitment, the research instruments/materials, and the procedures for the collection and analysis of the data. Ethical considerations are also discussed.

The materials/instruments and methods used in this study were carefully planned to be able to attain the objectives of the study. The objectives are:

- A. To describe the early feeding practices of mothers with 9 – 11 month old infants in Solana, Cagayan, Philippines.
- B. To examine the ecological factors that are associated with the diets of 9-11 month old infants in Solana, Cagayan, Philippines.

Specifically to answer the following questions:

1. What are the early feeding practices of mothers with 9 – 11 month old infants?
2. What is the level of iron in the diets of 9-11 month old infants? Is iron provided in sufficient amounts so that the risk of iron deficiency is low?
3. What family and child's characteristics and nutrition education activities are associated with infants' food diversity?
4. What family and child's characteristics and nutrition education activities are associated with infants' iron intake?

5. Is maternal nutrition knowledge and infants' food diversity associated with iron intake of the infants?
6. Is the relationship of family and child's characteristics and nutrition education activities with the infants' iron intake mediated by maternal nutritional knowledge and infants' food diversity?

3.1 Research Location

The research was carried out in the municipality of Solana, one of the 29 municipalities of the province of Cagayan.

The province of Cagayan where Solana is located at the northeastern most tip of the Philippines with a land area of 900,267 hectares. It is protected on its eastern side by the Sierra Madre Mountain, on the west by the Cordellera Mountains, on the south by the Caraballo Range, and on the north by a chain of sentinel islets called Babuyan. Tuguegarao City, the capital of Cagayan is 484 kilometers away from Manila, the Capital of the Philippines. By plane, travel time from Manila to Tuguegarao City, is one hour and ten minutes or by land transportation, nine hours. This nine-hour trip passes through the provinces of Bulacan, Nueva Ecija, Nueva Vizcaya, Caraballo Mountains and Isabela (See Attached Map of the Philippines – Appendix B and Map of Philippine Provinces – Appendix C).

The municipality of Solana is one of the twenty nine municipalities of the province of Cagayan. It is located on the western side of Cagayan River and is about nine (9) kilometers away from Tuguegarao City, passing through the national highway. The boundaries include the municipalities of Amulung on the South, and Piat and Tuao on the west (See attached Map of Cagayan – Appendix D and Map of Solana – Appendix E)

Solana has a land area of 28,773 hectares with thirty eight (38) barangays¹. Topographically, it is characterized by a westward trend of slopping to rolling terrain and on the north, an eastward trend of flat lands. The Pangul creek, which drains into the Cagayan river almost annually, floods the agricultural lands of the western barangays.

There are two distinct seasons in the area. The dry season during the months of December to April and the wet season during the months of May to November.

The major mode of transportation in Solana is by land. The main means of transportation within the four barangays in the town proper are calesas (horse drawn carts) (Appendix F), which also service to adjoining barangays. Tricycles also serve the town proper. Jeepneys are used in going to and coming from the town proper to the far and remote barangays of the municipality and to adjacent municipalities (Appendix F).

Solana had a total population of 65,022 in 1999 with 12,512 households.

The predominant occupation in the municipality is farming, as Solana is mostly an agricultural area. Likewise, farming is the main source of income in the area. Rice, corn, tobacco, peanuts, mungo, beans and vegetables are the main agricultural products of the area. Vegetable and watermelon are the important cash crops in the municipality. Farmers reserve some of their crops for home consumption.

The Municipal Town Hall where the Municipal Mayor holds office and the Rural Health Unit or otherwise called Main Health Center where the Municipal Health Officer (government physician) holds office are located at the town proper (Appendix F). There are also 13 Barangay Health Stations in the municipality (Appendix F).

¹ Barangay is the basic political unit in the Philippines. A municipality is composed of several barangays.

The municipality of Solana has only one government physician servicing the health and nutrition needs of its 65,022 residents. There are two nurses, 12 Rural Health Midwives, 1 Regional Malaria Coordinator, 1 microscopist, 4 Rural Sanitation Inspectors and 2 Public Health Dentist. There are also 5 private physicians and 2 private dentists to augment the medical and dental services provided by the personnel of the Rural Health Unit. There are also trained nutrition and health volunteer workers. These are the 38 Barangay Nutrition Scholars and 161 Barangay Health Workers (Rural Health Unit, 1999).

There is no nutritionist permanently servicing the municipality. However, a nutritionist from the Provincial Nutrition Committee frequently visits the municipality to extend technical assistance on the planning, implementation and monitoring of nutrition programs in the municipality.

There are three public markets (Appendix F) in the municipality where the residents buy most of their food supply. One is also located in the town proper and the other two are located in the barangays that are 10 and 12 kilometers away from the one located in the town proper. However, sari-sari stores¹ are also present in the barangays and sell some foods, however the price is higher than in the public markets and at the food shops/stores in the town proper.

3.2 Sample Size

Upon consultation with a statistician, the sample size for this study was decided. "A common rule of the thumb is that to produce stable results, a linear model should at least have 5 times as many observations as it has Degrees of Freedom" (D. Hedderly, personal communication, April 6, 2000). But "because of the size of the model proposed, even 100 observations would mean that the estimate of the error term would have been between 57 and 70 Degrees of Freedom, meaning it was likely to be

¹ small food shops in the barangays

stable, this means that the more observations you get, the better the estimates you get; which is why at the tables of the critical points of either the t or F distribution, at low numbers of Degrees of Freedom, an increase in the Degrees of Freedom causes a large change in the critical value; whereas at higher numbers of Degrees of Freedom (as in this study) the same changes in the Degrees of Freedom (i.e. the number of observations) cause much smaller changes in critical values. Hence the result is more stabilizing. Thus, in this study a 100 – 120 observations would be a reasonable sample size” (D. Hedderly, personal communication, April 6, 2000). A total of 120 participants was decided to be used in this study.

3.3 Sample Selection

Sampling is necessary because it is generally not practical or feasible to seek information from every member of a population so that generalisations can be inferred from the sample of the total population (Rea & Parker, 1997).

In probability sampling, unbiased estimates of population parameters that are linear functions of the observations can be constructed from the sample data because every element has a know chance of being selected (Levy & Lemeshow, 1999).

The participants of this study were mothers with 9-11 month old infants. Cluster sampling, which is a probability sampling technique, was used as the sampling method in this study. Cluster sampling means that the population is divided into sub-populations, and that some but not all of these are represented in the sample; those that are represented may be included in the sample in their entirety, or may be sub sampled (Konijin, 1973). In the case of this study, the municipality of Solana was subdivided into 38 barangays as the clusters and 12 barangays were represented in the sample. Further, the sampled clusters/barangays were subsampled using random sampling (Figure 3.1).

Cluster sampling was used in this research because Solana is a large municipality. Some barangays are far and remote; the farthest is from 15 kilometers from the town

proper and in several barangays households are far from each other. Transportation is limited and travel is slow, as one has to depend on the time schedules of the available transportation. It would be very expensive to conduct the survey if random sampling is used, because of the cost of travel between barangays. Likewise the limited time of the researcher to conduct the survey would not allow a random sampling.

Cluster sampling was done by drawing up a list of all the barangays of Solana. Of the 38 barangays of the municipality, 12 were randomly selected for the survey. These barangays were General Balao, Maguirig, Bangag, Lanna, Natappian East, Nangalisan, Dassun, Cattaran, Lingu, Basi East, Natappian West and Parug-Parug (See attached Map of Solana – Appendix E).

The total population of mothers with 9-11 months infants from these twelve (12) barangays was two hundred twenty eight (228)¹. Which meant that the desired sample size of 120 represented 52.63%. From each barangay, a simple random sample of 52.63% was taken from the general list of mothers with 9-11 month old infants.

The one hundred twenty (120) participants were randomly selected from the general list of mothers with 9-11 month old infants from the files of the Barangay Health Stations in the 12 randomly selected barangays. The sample from each barangay was done by simple random selection by assigning a number to each mother with 9 – 11 month old infant using the table of random numbers to select from this list. Numbers which had already been selected for the sample were skipped, consistent with the

¹As indicated from the list at the Barangay Health Stations.

premise of sampling without replacement (Rea & Parker, 1997). The total number of participants from each barangay was as follows:

General Balao	_____ 8	Basi East	_____ 8
Maguirig	_____ 11	Natappian West	_____ 9
Bangag	_____ 14	Parog-Parog	_____ 5
Lanna	_____ 7	Lingu	_____ 13
Natappian East	_____ 12	Nangalisan	_____ 6
Dassun	_____ 14	Cattaran	_____ 13

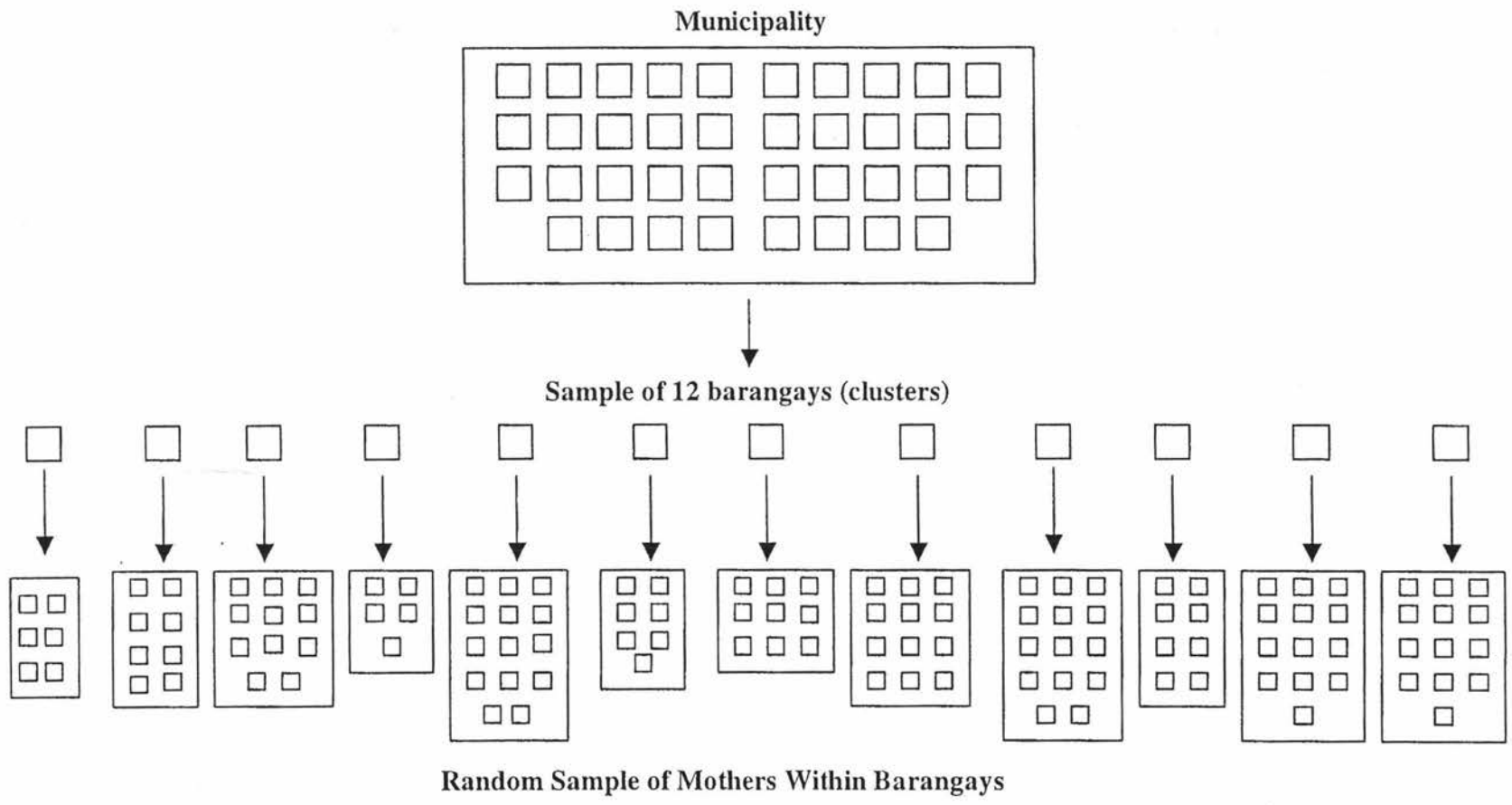


Figure 3.1 Diagram of Sampling Method Performed

3.4 Recruitment

The recruitment of the participants was done by providing the names of the selected women to the midwives and Barangay Nutrition Scholars¹ of every barangay. Information sheets were sent to the participants through the midwives and Barangay Nutrition Scholars. The information sheet explained the nature of the study. (See Appendix G). The midwives and Barangay Nutrition Scholars obtained approval of the participants to be contacted by the researcher. The participants were given one week to consider their participation in the study and to consult their families and friends. After this, the midwives and the Barangay Nutrition Scholars made a schedule of appointments for the researcher to visit. The participation of the women in the research was purely voluntary. They had the right to decline to take part in the research. If they chose to participate and changed their mind in the course of the interview, they could withdraw at any time.

Written consent was obtained by the researcher from the participants before the personal interview (See appendix H).

3.5 Data Collection

3.5.1 Survey

Survey information can be collected by means of any three different methods of implementation such as the mail –out, telephone and in-person interviews or personal interviews.

Because of the nature of the research and the research area, the researcher decided to use the in-person or personal interviews. Personal interviews are structured to permit an interviewer to solicit information directly from a respondent (Rea & Parker, 1999).

¹ Barangay Nutrition Scholar is the term given to barangay nutrition volunteers delivering as well as facilitating the delivery of basic health and nutrition services to the residents of the barangay

The advantages of the personal interview are 1) flexibility- the interviewer can probe in more detail, explain unclear questions and can use visual aids such as food models 2) greater complexity- the interviewer can administer highly complex questionnaires and can provide detailed instructions and lengthy lists of alternative responses 3) ability to contact hard to reach populations which are difficult or impossible to reach by methods other than the personal interviews, 4) high response rate –people often feel more comfortable sharing their feelings and information in this way than in written form and will therefore tend to provide more insight into the issues at hand 5) assurance that instructions are followed- the interviewer can make certain that the questions are answered in precisely the order intended so that the integrity of the questionnaire sequence is maintained (Rea & Parker ,1999).

The telephone interview was not feasible for this study since the municipality has no telephone lines to the barangays. Likewise, the mail out survey was not possible because the residents were not used to this type of survey, and it would have been a burden for respondents to go to the post office, which is at the town proper, to mail their responses.

Where possible, personal interviews were conducted in the homes of the participants for their convenience. The home interviews made the participants more relaxed and comfortable as they were in a familiar place. The home interviews also made it possible for the participants to easily attend to their infants. However, in barangays where households are far from each other and it would have been difficult for the researcher to move from one house to another, the mothers opted to be interviewed at the barangay halls and health centers (Appendix F).

A schedule of home interviews was made in such a way that mothers' household chores would not be disrupted. The mothers could also show some home utensils she used in feeding her infant. For the mothers that came to the Barangay Halls and Health Centers, their interviews were scheduled to coincide with immunization day and the day for mass hemoglobin determination for pregnant and lactating mothers.

In a few cases where the mothers were not at home at the scheduled time due to unexpected errands, the researcher made another appointment and went back for the interview.

3.5.2 Survey Questionnaire

The survey instrument used in this research was a structured questionnaire. The conceptual model of the research was the basis used for the construction of the questionnaire. The structured questionnaire contained both open ended and closed questions (See appendix I). In the closed questions, a fixed list of alternative responses was provided and the respondents are asked to select one or more of them as indicative of the best possible answer. In the open-ended questions, there was no pre-existing response, which allowed the words of the respondents to be captured (Rea & Parker, 1997).

The questionnaire had five sections:

- The first section consisted of open ended and closed questions on some infant feeding practices, including the infants' 24 hour dietary recall and a section on food diversity, where the mothers were asked about the foods they fed their infants in the past week. This section used both closed and open ended questions.
- The second portion contained the food and nutrition knowledge for the participants. A statement was given to the participants and they were asked if they "agree", "disagree" or have "no opinion" to it. The questions were developed based on the nutrition messages in the nutrition education activities in the research municipality.
- The third section requested the participants to provide information on their attendance at nutrition education activities.
- The fourth section dwelled on maternal attitudes to meal planning and preparation and the mothers' attitude to food variety. This section used both closed and open-ended questions.

- 5th section asked on demographic information pertaining to the participants, the index child and their families.

The questions were carefully constructed in a way that a) it would be easy for the respondents to answer; and b) the questions would elicit bias-free responses. The questionnaire was pre-tested before the actual data gathering to assess questionnaire clarity, comprehensiveness and acceptability (Rea and Parker, 1999). The pre-testing gave the approximate length of time required to administer the questionnaire (35 minutes). In pre-testing the researcher was not interested in statistical accuracy; rather the concern centers on feedback on the over-all quality of the questionnaire's construction (Rea & Parker, 1999). Following the pre-test, the researcher revised some of the questions as needed.

The questionnaire was administered in Filipino, the language in the Philippines.

3.6 Dietary Assessment Instruments

The dietary intakes of the participants' infants were obtained through the 24-hour recall and the diversity of the infants' diets were obtained using the National Nutrition Council (Philippines) food diversity checklist.

3.6.1 24 -Hour Dietary Recall

The most commonly used technique for the estimation of average/mean intakes of populations is still the 24 -hour food recall (Thompson & Byers, 1994). It is useful because, compared with other methods, it can be administered with relative ease, and it provides a reasonably accurate estimate of the mean energy and nutrient intake levels of groups of individuals. Respondents have to remember only their food intake only in the previous 24 hour (Gibson, 1990; Thompson & Byers, 1994). However, available data indicates that the adequacy of this tool varies for the different nutrients for various types of foods (Beaton et al. 1979).

Several authors have used the 24-hour recall in their studies to assess dietary intakes of preschoolers including 0-24 month infants (Lim and Florencio, 1975; Chaudhury, 1984; Ryan and Martinez, 1985). A Study on the validity of the 24 hour dietary recall for estimating the energy and selected nutrient intakes of rural Malawian preschool children showed that the 24 hour dietary recall could be substituted for weighed records of actual group mean intakes of energy, protein, iron and zinc. There was no significant differences in comparing group median energy and nutrient intakes using the 24-hour dietary recall and weighed record (Ferguson et al., 1989). The 24-hour dietary recall was seen to provide stable reports for cholesterol, protein, carbohydrates, calcium, sodium, potassium and fat consumption of preschoolers (Treiber et al., 1990).

A single 24-hour recall was chosen as the method to collect information on infants' iron intakes.

Samples of household measures such as spoon, glasses, and cups were used to assist the participants in estimating the portion sizes of foods given to their infants (Randall 1991).

The mothers were asked if this day was a typical day. The infant's diet might be substantially different if the infant is sick or there is an important event such as a wedding, a birthday, or feast on that day. If the day was not typical the researcher returned another day to administer the 24-hour recall.

The Philippine Food Composition Table (Food and Nutrition Research Institute, 1997) was used to compute the iron and calorie intake of the infants. Computations were done by hand by research specialists on food and nutrition. A random checking of the computation of 15% (18) of the 120 recalls was done by the researcher.

3.6.2 Food Diversity Checklist

The food diversity score was used to quantify the presence of the food groups in the infants' diet in the past week.

The food diversity checklist developed by the National Nutrition Council that is being used in the LAKASS Program (Lalakas ang Katawang Sapat sa Sustansiya)¹ was used in this study to obtain the food diversity score of the infants (Part of the questionnaire – Appendix I).

This food diversity checklist lists the recommended three basic food groups: 1) energy giving foods, 2) body building foods, and 3) body regulating foods. Sub food groups are listed under each group. Each food group has a possible total score of 4, 1 point for each sub food. Making a total of 12 points. The respondents are asked if their child has had a food in the sub group during the week, for example if the child was given rice or its equivalent, kamote (kumara) or potato, sugar, fats or oils. A score of one is given if the food was included in the week's diet and a score of zero is given if the food was not included in the diet for the week. This tool does not take into consideration the frequency, quantity or serving sizes of the foods consumed. Even if a larger portion is consumed a score of one is still given.

In this present study, the mothers were asked the food diversity question for the past week. As in the 24-hour recall, the mothers were also asked if the week's diet was typical. If it was not a typical week this would not be included in the analysis.

¹ LAKASS (Lalakas ang Katawang Sapat sa Sustansiya meaning Strong Body Through Adequate Nutrition) Program is a community-base strategy of the Philippine Plan of Action for Nutrition which aims to improve the nutrition situation in identified nutritionally depressed municipalities by building capabilities of communities in assessing their nutritional problems, and in planning, implementing and managing projects to solve these nutritional needs.

3.7 Ethical Considerations

Ethical approval was given by Massey University Human Ethics Committee, Palmerston North, New Zealand. No similar ethics committee exists in Solana/Philippines, but the research was approved by the Municipal Mayor and Municipal Health Officer of Solana, Cagayan, Philippines (See appendix J and K for letters of approval).

Confidentiality of the information obtained from the participants was guaranteed. The name of the participants did not appear on the questionnaire. Information that linked the participants' name to their code was safely kept in a locked cabinet. All questionnaires and signed consent forms were kept in a locked cabinet.

3.8 Handling of data

All responses in the questionnaire were coded. Answers to open ended questions were categorized according to words used by the respondents.

Due to the high similarities of answers to questions on the importance of planning meals to include variety of foods and feeding children a variety of foods everyday, these two questions were combined as the average score of response for the two. This variable "attitude" was used in the analysis.

Due to small sample size in two categories of the household income (4,500.00 – 6,500.00 pesos and above 6,500.00 pesos) these two categories were combined as above 4,500.00 pesos. The same was also done with the number of siblings. Categories with 3 – 4 siblings and more than 4 were combined as one category, more than 2 siblings.

The coded responses were entered in the SPSS (Statistical Package for the Social Sciences) file and the SAS callable SUDAAN and data file were analyzed using the SPSS and SAS callable SUDAAN.

Output from the diet analysis and the food diversity score were also entered at the SPSS and SAS – callable SUDAAN.

3.9 Data analysis

To test the links and associations in the responses, it was necessary to identify the independent and dependent variables in the study. The dependent variable is a variable that is to be predicted or explained while an independent variable is a variable that is expected to influence the dependent variable (Zikmund, 1994). In this study, based on the conceptual model the independent variables in the study were the family characteristics (i.e., number of household members, number of siblings below 6 years old, family monthly income, family weekly food expenditure, maternal education, maternal age, maternal attitude to variety of foods, meal planning and preparation), child's characteristics (i.e., child's age, sex and birth order) and participation at nutrition education activities (i.e., mothers' nutrition classes, individual health teachings, and bench conferences). In the model, maternal nutrition knowledge, and diet diversity were both independent and dependent variables. The iron intake of the infants was a dependent variable.

In this study the three levels of ecological influences (i.e., family characteristics, child's characteristics and participation at nutrition education activities) will be referred to as "ecological" factors.

Most statistical packages assume that the data is a simple random sample from the population, and this does not give appropriate results for a cluster sample, the sampling strategy used in this study. However SAS callable SUDAAN (Research Triangle Institute (2000), Research Triangle Park, North Carolina) incorporates the cluster sampling structure into the analysis. However, in the data gathered in the study, the design effects, which measures how much clustering reduces the effective sample size, were close to 1, indicating that the effective sample size was close to actual sample size. Thus it was considered reasonable to analyze the data without recognition of the cluster sampling structure, this could be done using SPSS. But

comparing analysis with and without taking into account the design effect, e.g. SPSS and SUDAAN, it was found that in this case SPSS was more conservative. Thus statistical analysis using the General Linear Model¹ was done using SAS callable SUDAAN other analysis, like Pearson correlation, chi-square and t-test were done using the SPSS. The latter will provide accurate estimation of means and proportions but may not detect all statistical significant relationships.

Descriptive analysis using the SPSS was done to describe the samples. This was also used to describe the iron intakes of the infants and the food sources of iron.

Analysis of the relationship of family characteristics and nutrition education activities with mother's nutritional knowledge was done using general linear model (GML) with SAS callable SUDAAN. This method was also used for the analysis of the relationship of family and child characteristics and nutrition education activities with the infants' food diversity, and infants' iron intake. It was also used to test the relationship of the infants' kilocalorie intake with infants' gender and age. It was also used to test the relationship of infant's age with infants' iron per kilocalorie intake.

The relationship of the variables is said to be significant if type III Sum of Squares in the general linear model (GML) procedure has a p – value <0.05 to $P = 0.05$ and it is said to be marginal if $P >0.05$ to $P <0.10$.

¹ both analysis of variance and regression are special cases of general linear model

To test if the ecological factors that did not appear to be associated with the infants' iron intake, food diversity or maternal nutrition knowledge added any significant predictive ability to the model, a comparison between the full and reduced model was done. The reduced model consisted of all the variables found to be significant or marginally related to the dependent variable using type III Sum of Squares in the general linear model (GML) procedure. The models were compared by determining the percentage of the variation accounted by the full model that was attributed to the variables not significantly or marginally related to the dependent variable. The formula for this is: $(R \text{ squared of the full model} - R \text{ squared of the reduced model} / R \text{ squared of full model}) * 100$. It was said that the full model added significant predictive ability if the attributable variation is more than 10% (D. Hedderly, personal communication, February 2, 2001).

Mediating effect of maternal nutrition knowledge and infants' food diversity on the relationship between the ecological factors and the infants' iron intake was examined by adding maternal nutrition knowledge and infants' food diversity score to the full model using general linear model (GLM) of SAS callable SUDAAN. The P-values of the variables then found to be associated with the infants' iron intake in the original model were compared with their P-values on the model with the maternal nutrition knowledge and infants food diversity as extra explanatory variables to see if the association was strengthened or weakened. Changes on the P-values of other variables that did not appear to be associated with infants' iron intake in the original model were also examined to see they were strengthened with the addition of maternal nutrition knowledge tertiles and infants' food diversity tertiles.

Analysis of variance using SAS callable SUDUAN was used to analyze the association of maternal nutrition knowledge and infants' food diversity with the infants' iron intake. For this analysis the sample was split into tertiles¹ on the basis of the mother's nutrition knowledge and infants' food diversity and the difference in the iron intake was tested with a t-test. The relationship of variables is said to be significant if p -value < 0.05 to $P = 0.05$ and marginal if $P > 0.05$ to $P < 0.10$.

Pearson correlation using SPSS was used to test relationship between infants' iron intake, infants' iron per kilocalorie intakes, and infants' kilocalorie intake.

The chi-square using SPSS was used to test the association of breastfeeding with family characteristics and maternal attendance at nutrition education activities.

A t-test using SPSS was used to test the association of age of introduction of solid foods to the infants with infants' iron intake and food diversity.

A t-test using SPSS was also used to test the association of the mothers' practice of withholding nourishing foods from their infants with maternal nutrition knowledge, the infants' iron intake and food diversity.

A t-test using SPSS was used to test the association of iron supplementation with the infants' iron intake.

The relationship of the variables in these tests (t-test, chi-square & Pearson correlation) was said to be significant if P -value < 0.05 to $P = 0.05$ and it was said to be marginal if $P > 0.05$ to $P < 0.10$.

¹Continuous data could easily be split into tertiles (three equal groups, high, medium and low), however, in this study the maternal nutrition knowledge scores and infants' food diversity scores are discrete (integer) scores, it was only possible to split the sample as evenly as possible into three groups.

CHAPTER FOUR

RESULTS

The purpose of this study is to describe the early feeding practices of mothers of 9 – 11 month old infants and to examine the ecological factors that are associated with the diets 9 –11 old month infants.

In this chapter, the results are divided into twelve sections. The first section describes the response in the study. Socio-demographic characteristics of the participants and that of their youngest child are presented in the second part. The third section investigates the mothers' infant feeding practices. The mothers' participation at nutrition education activities is presented in section four. The attitude of mothers to variety of foods, meal planning and preparation are discussed in section five. Section six discusses maternal nutrition knowledge and the family characteristics and nutrition education activities associated with maternal nutrition knowledge. Section seven presents the infants' food diversity and the family and child's characteristics and nutrition education activities associated with it. The infants' iron intake is investigated in section eight. In this section, the family and child's characteristics and nutrition education activities associated with the iron intake of the infants are also elucidated. The association of maternal nutrition knowledge and infants' food diversity with infants' iron intake is also presented in this section. The mediating effect of maternal nutrition knowledge on the relationship of family characteristics and child's characteristics and nutrition education activities with the infants' iron intake is discussed in section nine. The conceptual model is discussed in section ten. Section eleven discusses the limitations of the study. The final section presents the summary.

4.1 Response

A one hundred percent response rate was obtained in this study. All the 120 selected mothers agreed to participate in the study. A total of 12 barangays were visited by the researcher. Eleven point seven percent (11.7%) of respondents each came from Dassun and Bangag, 10.8% each from Cattaran and Lingu, 10% from Natappian East, 9.2% from Maguirig, 7.5% from Natappian West, 6.7% each from Basi East and General Balao, 5.8% from Lanna, 5.0% from Nangalisan, and 4.2% from Parog-Parog (Appendix L-Table L.1) These percents are in proportion to the population of the mothers with 9 – 11 month old infants in the barangays (as described in chapter three).

4.2 Socio-demographic Characteristics of the Participants and Index Child

4.2.1 Age of Infant

Mothers eligible to participate in this study were those with 9 – 11 month old infants. The ages of the infants were 55% aged 9 months, 19.2% aged 10 months and 25.8% aged 11 months (Table 4.1).

4.2.2 Sex of Infant

The genders of the infants are shown in Table 4.1. The majority of the infants are male (55.8%) and 44.2 % are female.

4.2.3 Birth Position of the Infant in the Family

Table 4.1 shows the birth position of the infant in the family; 29.2% of the infants were first born, 25.8% were second born, 14.2% were third born, 8.3% were fourth born, 5% were fifth born, and 17.5% were sixth to thirteenth born.

4.2.4 Maternal Age

The ages of the mothers who participated are shown in Table 4.1. Thirty two percent (32.5%) are aged 18-23, 36.7% are 24 – 30 years old and 30.8% are over 30 years old.

4.2.5 Maternal Educational Attainment

The mothers' educational attainment is shown in Table 4.1. The majority of the women are elementary graduates to with some high school education (44.2%), 13.3% have only some elementary education, 24.2% are high school graduates to with some college education, 10% are college graduates and 8.3% are graduates of either a two year secretarial or vocational course.

4.2.6 Family Monthly Income

Table 4.1 shows the household's monthly income. The majority of the families (45%) have incomes of 1,000.00 - 2,499.00 pesos (around \$NZ 50 - \$NZ 125), 26.7 % have under 1,000 pesos, 17.5% have 2,500.00 - 4,499.00 pesos, and 10.8% have above 4,500.00 pesos.

4.2.7 Family Weekly Food Expenditure

Table 4.1 shows the households' weekly food expenditure. Forty percent (40%) of the households have a weekly food expenditure of less than 300.00 pesos (equivalent to less than NZ\$ 15.00), 36.7% spend 300 to 499.00 pesos, 15.8% spend 500.00 to 799.00 pesos and only a few (7.5%) spend 800.00 to less than 1,000 pesos per week.

4.2.8 Number of Household Members

Fifty three percent (53.3%) of the households have less than six members, 31.7% have 6-8 members and 15% have more than 8 members (Table 4.1)

4.2.9 Number of Siblings Below Six Years Old

Table 4.2 shows the number of children other than the index child below six years old. Majority of the families (56.7%) have only 1-2 other children less than six years old, 6.6% have more than two children, and 36.7% have none (Table 4.1).

Table 4.1 Socio-demographic Characteristics of the Participants and Index Child

Characteristics	Frequency	Percent
Infant's Age (months)		
9 months	66	55
10 months	23	19.2
11 months	31	25.8
Infant's Sex		
male	67	55.8
female	53	44.2
Infant's Birth Position		
First	35	29.2
Second	31	25.8
Third	17	14.2
Fourth	10	8.3
Fifth	6	5.0
others (sixth to thirteenth)	21	17.5
Maternal Age (years)		
18 – 23	47	32.5
24 – 30	36	36.7
over 30	37	30.8
Maternal Educational Attainment		
some elementary	16	13.3
elementary graduate – some high school	53	44.2
high school graduate- some college	29	24.2
college graduate	12	10.0
others (two year secretarial & vocational graduate)	10	8.3
Family Monthly Income (In Pesos)		
under 1,000.00	32	26.7
1,000.00 – 2,499.00	54	45
2,500.00 – 4,499.00	21	17.5
4,500.00 and above	13	10.8
Family Weekly Food Expenditure (in Pesos)		
Less than 300	48	40
300.00 – 499.00	44	36.7
500.00 – 799.00	19	15.8
800 - less than 1,000	9	7.5
Number of Household Members		
less than 6	64	53.3
6-8	38	31.7
more than 8	18	15
Number of Siblings Below Six Years Old		
1-2	68	56.7
more than two	8	6.6
none	44	36.7

4.3 Infant Feeding Practices

Participants were asked about how they fed their youngest child since birth. Specifically, they were asked about breastfeeding and supplementary feeding practices.

4.3.1 Breastfeeding Practice

The first method of feeding after birth of these infants was breastfeeding for 87.5% of the mothers and bottle-feeding for 12.5% of the mothers (Appendix L-Table L.2). However, out the 15 mothers who bottle-fed after giving birth, 13 of the infants were fully breastfed after a few days and 2 were not breastfed at all (Appendix L-Table L.3). Thus, 118 or 98.33% mothers eventually breastfed with only two who did not breastfeed at all. Of the 118 mothers that breastfed, 53.39% exclusively breastfed until the third month and only 29.66% exclusively breastfed 4 months or longer (Table 4.2). At the date of the interview, of the 118 breastfeeding mothers, 89.8% of mothers were still breastfeeding (50.85% were still breastfeeding at 9 months, 16.10% at eight months and 22.88% at 11 months) and 12 (10.17%) mothers stopped breastfeeding (Appendix L-Table L.4).

Table 4.2 Duration of Exclusively Breastfeeding Mothers

Months	Frequency of Exclusively Breastfeeding mothers (n = 118)	Percent
First Month	89	75.42
Second Month	75	63.56
Third Month	63	53.39
Fourth Month	23	19.49
Fifth Month	8	6.78
Sixth Month	4	3.39

Of the 15 mothers who did not breastfeed after giving birth, the 13 that eventually breastfed after a few days said that they did not have breast milk right after giving birth. The 2 that never breastfed this infant said that they did not have any breast milk.

At the time of the interview, 14 mothers (12 were no longer breastfeeding and 2 did not breastfeed at all) were not breastfeeding. Of these, 42.9% fed their infants powdered milk and 57.1% fed infant formula (Appendix L-Table L.5).

Using the chi-square, breastfeeding was found not to be statistically associated ($P>0.1$) with any of the family characteristics such as family income, number of household members, number of siblings below six years old, family monthly income, family food expenditure, maternal educational attainment, maternal age, and maternal attitude to variety of foods and meal planning. Breastfeeding was also found not to be associated with maternal attendance at nutrition education activities.

4.3.2 Provision of Supplementary Feeding

4.3.2.1 Provision of Drinks other than Breastmilk

Out of the 105 women who exclusively breastfed from birth; 15.2% started giving drinks others than breastmilk in their infants' first month, 13.3% in the second month, 11.4% in the third month, 38.1% in the fourth month, 14.3% in the fifth month, 3.8% in the sixth month and 1.8% in either the seventh or eighth month (Appendix L-Table L.6).

4.3.2.2 Provision of "Solid" Foods

Of the 120 mothers, 8.3% started giving solid foods in the infants' third month, 37.5% in the fourth month, 25.8% in the fifth month, 17.5% in the sixth month and 10.8% in either the seventh or eighth month (Appendix L-Table L.7). Of the two mothers who were bottlefeeding, one started giving solid/ non-milk foods in the fifth month and the other one started sixth month.

At the date of interview, 57.5% of breastfeeding mothers fed their infants solid foods before breastfeeding and 42.5% fed their infants after breastfeeding (Appendix L-Table L.8). Of the bottle-feeding mothers; 85.7% feed their infants solids before bottle-feeding, and 14.3% fed after bottle-feeding (Appendix L-Table L.9).

Using the t-test the age of introduction of solid foods to the infants was neither associated with the infants' iron intake nor food diversity at 9 – 11 months ($P>0.1$).

4.3.3 Foods Withheld from the Infants

While the majority of the mothers (54.2%) did not withhold giving any food to their infants at 9 – 11 months, 45.8% did withhold some foods (Appendix L- Table L.10).

One third of the mothers (34.17%) withheld “junkfoods”¹ from their baby. (Table 4.3). They believed that junk foods destroy the appetite of the infant, and that they have lots of preservatives that are not healthy for the baby. They said that junk foods displace the nourishing foods that the baby should eat instead. They also said that junk foods cause diarrhea.

There were 17 (14.17%) mothers that withheld nourishing foods from their infants. Five percent (5.83%) of the mothers withheld chicken, 2.50% withheld pork, 5.00% withheld eggs, and 5.83% withheld fish (Table 4.3). Mothers who withheld chicken, pork, fish and eggs from their infants believe that these are allergens, and their infants were still too young to eat them and they might cause indigestion. Others believed that giving fish to babies might cause ascariasis (intestinal worms). Three percent (3.33%) mothers withheld giving ripe mangoes, one mother (0.83%) withheld giving oranges, one (0.83%) withheld giving kalamansi (similar to lemon) (Table 4.3). Mothers who withheld giving ripe mangoes, oranges and kalamansi (similar to lemon) to their children believed that these were sour foods and they might cause stomach pain. There was one (0.83%) mother who withheld bread and one (0.83%) mother who withheld beef. These mothers believed that their infants would choke if they give them bread and beef (Table 4.3).

¹ On further questioning, mothers were referring to curls, chips and softdrinks as junk foods

Table 4.3 Foods Withheld from Infants (n=55)

Foods Withheld	Frequency	Percent
Junk foods	41	34.17
Chicken	7	5.83
Pork	3	2.50
Eggs	6	5.00
Fish	7	5.83
Ripe Mango	4	3.33
Oranges	1	0.83
Kalamansi	1	0.83
Bread	1	0.83
Beef	1	0.83

Using the t-test, the mothers' practice of withholding nourishing foods to their infants was found not to be statistically associated ($P>0.1$) with maternal nutrition knowledge, infants' food diversity and infants' iron intake at 9 – 11 months.

4.3.4. Foods Withheld from Infant When He/She is Sick

The majority of the mothers in the sample (74.2%) did not withhold any specific food from their infants when they were sick. But (25.8%) said that there were foods they did not give their infants when sick (Appendix L-Table L.11).

Table 4.4 shows the foods being withheld from infants. Of the 120 mothers, 23.33% withheld giving eggs. They said that giving eggs when the baby is sick would aggravate the fever of the baby. Ten percent (10%) of the mothers withheld giving chicken, 6.67% withheld giving fish, 0.83% withheld giving shrimp and pork. These mothers believed that chicken, fish, shrimps, and pork are allergens and that these foods might aggravate the condition of the baby. Of these 31 mothers that withheld chicken, fish, shrimp and pork from their infants, seven were the same mothers who withheld these same food from their healthy infants. One (0.83%) mother withheld giving green leafy vegetables, believing that these are hard to digest and that when a baby is sick she must only be given food that is soft and easy to digest.

Table 4.4 Foods Withheld from Sick Infants (n = 31)

Foods Withheld to Sick Infants	Frequency	Percent
Chicken	12	10.00
Pork	1	0.83
Eggs	28	23.33
Fish	8	6.67
Shrimps	1	0.83
Green leafy vegetables	1	0.83

4.4 Participation in Nutrition Education Activities

The majority (85.8%) of mothers attended at least one nutrition education activity. Of the different nutrition education activities, the individual health teaching was the most commonly attended by the mothers (84.5%), this a form of nutrition education activity in Solana where the mothers are taught and given advice on health and nutrition as they visit the health center for consultations. Forty four percent (43.7%) attended bench conference, a type of nutrition education activity where a group of mothers, around 10 or more are taught about nutrition and health as they come to the clinic in groups e.g. during immunization day, full weighing of all pre-school children, growth monitoring and hemoglobin determination day. Nineteen percent (19.4%) attended mothers' nutrition class, a type of nutrition education activity where a group of mothers, around 25 to 30 are taught on nutrition, health and related topics. This activity is usually conducted one and a half to two hours daily over a period of at least five to ten days. This activity is usually done twice or three times a year in a barangay. Least commonly attended was the household teaching (1.9%), a nutrition education activity done at the homes of the families. The mother, father and adult members of the family/household are requested to sit down with the midwife or barangay nutrition and health workers to listen to the messages (Table 4.5)

Table 4.5 Mother's Attendance at Nutrition Education Activities (n = 103)

Nutrition Education Activity	Attending		Not Attending	
	Frequency	Percent	Frequency	Percent
Mothers' Nutrition Class	20	19.4	83	80.6
Individual Health Teaching	87	84.5	16	15.5
Bench Conference	45	43.7	58	56.3
Household Teaching	2	1.9	101	98.1

4.5 Maternal Attitude to Variety of Foods, Meal Planning and Preparation

Maternal Attitude was assessed from four questions. Attitude of mothers to things they consider most in planning meals, the importance of including varied of foods in planning meals, the importance of feeding children with a variety of foods and attitude to preparing and cooking meals for the family (Please refer to questionnaire, Appendix D).

Table 4.6 shows factors mothers consider when planning meals. Of the 120 mothers 28.3% said that the nutritional needs of the family is the factor they first consider when planning meals, 27.5% said the preference of the child/children, 20.8% said the ease of preparation, 20% said the budget, 1.7% said the preference of the father and also 1.7% said their own preference.

Of the 120 mothers, 42.5% said that budget is factor they consider second when planning meals, 25.8% said preference of the child, 12.5% said ease of preparation, 11.7% said nutritional needs of the family, 5.8% preference of the father, and 1.7% said her own preference (Table 4.6).

Table 4.6 Factors Mothers Consider When Planning Meals

Things Mother Consider When Planning Meals	First Thing Considered Most		Second Thing Considered Most	
	Frequency	Percent	Frequency	Percent
Preference of the child	33	27.5	31	25.8
Preference of the father	2	1.7	7	5.8
Nutritional needs of the family	34	28.3	14	11.7
Ease of preparation	25	20.8	15	12.5
Budget	24	20.0	51	42.5
Mother's own preference	2	1.7	2	1.7
Total	120	100	120	100

On the importance of including a variety of foods in meal planning, the majority of the mothers (52.5%) said that this was important, 25.8% said it was very important and 21.7% said it was not important (Table 4.7).

Table 4.7 **Importance to Include Variety of Foods in Planning Meals**

Importance to Include Variety of Foods in Planning meals	Frequency	Percent
Not important	26	21.7
Important	63	52.5
Very Important	31	25.8
Total	120	100

On the importance of feeding children with a variety of food everyday, 50% said it was important, 30.8% said it was very important and 19.2% said it was not important (Table 4.8)

Table 4.8 **Importance of Feeding Children Variety of Foods Everyday**

Importance of Feeding Children Variety of Foods Everyday	Frequency	Percent
Not Important	23	19.2
Important	60	50.0
Very Important	37	30.8
Total	120	100

Only two mothers said it was difficult to prepare and cook meals for their family.

4.6 Maternal Nutrition Knowledge

The distribution of scores for the nutrition knowledge test ranged from three to 12 with possible perfect score of 12 (Table 4.9). The standard deviation is 1.9 and mean score is 7.89. A perfect score was attained only by 2 of the mothers (1.7% of the sample) and none scored zero (Table 4.9). Forty two point fifty percent (42.50%) got a nutrition knowledge score of over 9, 35% got scored 7 to 8, and only 22.50% scored from 3 to 6 (Appendix L - Table L.12). The two statements most often responded to incorrectly were: "when children have enough food to satisfy their appetites, their diets are certain to be nutritious" (only 28.3% correctly disagreed), and "a child who eats regularly gets all the nutrients that he/she needs" (only 22.5% correctly disagreed) (Appendix L – Table L.13).

Table 4.9 Maternal Nutrition Knowledge Test Score

Score	Frequency	Percent
3	1	0.8
4	4	3.3
5	13	10.8
6	9	7.5
7	23	19.2
8	19	15.8
9	25	20.8
10	17	14.2
11	7	5.8
12	2	1.7
Total	120	100

4.6.1 Family Characteristics and Nutrition Education Activities Associated With Maternal Nutrition Knowledge

General linear model was used to measure the association of the family characteristics and nutrition education activities with the maternal nutrition knowledge score. All variables were included in the model at one time (Table 4.10)

Maternal educational attainment, and the number of siblings below six years old were the family characteristics significantly associated with maternal knowledge using type III Sum of Squares. Maternal attendance at bench conferences was marginally associated with maternal nutrition knowledge ($P=0.08$). Total R squared is 0.384 indicating that the model predicted 38.4% of the variability in the maternal nutrition knowledge scores (Table 4.10).

Characteristics found not to be significantly¹ associated with maternal nutrition knowledge when all variables are in the model were maternal age, family monthly income, weekly food expenditure, number of household members, maternal attitude to variety of foods and meal planning, and maternal attendance at mothers' nutrition classes and individual health teachings. (See section 4.10 for comparison of the reduced and full model).

¹ 95% confidence interval ($P=0.05$) using type III Sum of Squares

Table 4.10 Association of Family Characteristics and Nutrition Education Activities With Maternal Nutrition Knowledge

Dependent Variable	Degrees of Freedom	P-value	Significance
Family Characteristics			
Maternal age	2	0.11	Not Significant
Maternal educational attainment	4	0.01	Significant
Family monthly income	3	0.67	Not Significant
Family weekly food expenditure	3	0.89	Not Significant
Number of siblings below 6 years old	2	0.03	Significant
Number of household members	2	0.91	Not Significant
Maternal attitude to variety of foods, meal planning and preparation			
-importance of planning meals to include variety of foods and feeding children variety of foods everyday	1	0.71	Not Significant
-important factors to consider in meal planning (each respondent chose two)			
- children's preference	1	0.34	Not Significant
- husband's preference	1	0.27	Not Significant
- nutritional needs of the family	1	0.44	Not Significant
- budget	1	0.27	Not Significant
- ease of preparation	1	0.31	Not Significant
- mother's preference ¹			
- difficulty in preparing and cooking meals for the family ²			
Attendance at Nutrition Education Activities			
- mothers' nutrition class	1	0.21	Not Significant
- individual health teaching	1	0.92	Not Significant
- bench conference	1	0.08	Marginally Significant
- household teaching ³			
R-squared		0.384	

Least square means of maternal nutrition knowledge score was computed for family characteristics and nutrition education activities, which had a significant association with maternal nutrition knowledge. Least square means are estimates of what the mean nutrition knowledge scores for the independent variables would be if all other factors in the study were at their average level.

¹ variable not included in the analysis, as there were only four mothers who considered this factor

² variable not included in the analysis, as there were only two mothers that found it difficult to prepare and cook meal for the family

³ variable not included in the analysis, as there were only two mothers who attended the activity

4.6.1.1 Family Characteristics

4.6.1.1.1 Maternal Educational Attainment

Maternal educational attainment had a significant association with maternal nutrition knowledge ($P = 0.01$). Those mothers who were college or two year secretarial or vocational graduates had the highest nutrition knowledge scores while those with only some elementary to with some high school education had the lowest nutrition knowledge score. Table 4.11 shows the least square means of nutrition knowledge scores of mothers for each maternal educational attainment category.

Table 4.11 Least Square Means of Maternal Nutrition Knowledge Scores for Each Maternal Educational Attainment Category

Maternal Educational Attainment	Number	Least Square Means of Maternal Nutrition Knowledge Scores	Standard Error of Least Square Means
Some elementary	16	7.20 a ³ b ²	0.41
Elementary graduate – some high school	53	7.40 c ¹ d ² e ³	0.24
High school graduate – some college	29	8.03 c ¹ f ¹	0.24
Two year secretarial and vocational graduate	10	8.41 b ² d ²	0.43
College graduate	12	9.44 a ³ e ³ f ⁴	0.47

(Categories with the same letters are significantly different at ¹P < 0.10, ²P < 0.05, ³P < 0.01)

4.6.1.1.2 Number of Siblings Below Six Years Old

Number of children below six years old is significantly associated with maternal nutrition knowledge ($P = 0.03$). Those mothers who have no other children except for the index child had higher nutrition knowledge than those with 1 or 2 other children below 6 years old. However, there is no significant difference in the nutrition knowledge scores of mothers with no other children below 6 years old and those that had more than 2. Likewise, there is no significant difference in the nutrition knowledge scores of mothers with 1-2 other children below six years old and those that had more than 2. Table 4.12 shows the least square means for maternal nutrition knowledge scores for each number of siblings below six years old category.

Table 4.12 **Least Square Means of Maternal Nutrition Knowledge Scores For
Each Number of Siblings Below Six Years Old Category**

Number of Siblings Below Six years Old	Number	Least Square Means of Maternal Nutrition Knowledge Scores	Standard Error of Least Square Means
None	44	8.19 a	0.24
1 – 2 siblings	68	7.43 a	0.16
More than 2 siblings	8	8.32	0.55

(Categories with the same letters are significantly different at $P < 0.05$)

4.6.1.2 Participation in Nutrition Education Activities

4.6.1.2.1 Attendance at Bench Conferences

Attendance of mothers at bench conferences appeared to be marginally associated with maternal nutrition knowledge ($P = 0.08$). Mothers that had attended bench conferences had higher nutrition knowledge than those who had not attended. Mothers who had attended bench conferences had least square mean nutrition knowledge score of 8.01 with standard error of least square mean of 0.16 compared to those mothers who had not attended bench conferences, whose least square mean nutrition knowledge score was 7.60 with standard error of least square mean of 0.20.

Attendance at other nutrition education activities such as mothers' nutrition classes and individual health teachings were not significantly associated with nutrition knowledge.

4.7 Infants' Food Diversity

Infants' food diversity was measured through the food diversity score. The highest diversity score of the infants was 12 and the lowest was 3, with mean average score of 7.3. Twenty seven point five percent (27.5%) of the children scored 8, 23.3% scored 7, 14.2% each scored 6 and 9, 6.7% scored 10, 5% scored 5, 3.3 % scored 4, 2.5% scored 11 and 1.7% each scored 3 and 12 (Table 4.13). The majority scored 8 and above.

Table 4.13 Infants' Food Diversity Scores

Infants' Diversity Score	Frequency	Percent
3	2	1.7
4	4	3.3
5	6	5.0
6	17	14.2
7	28	23.3
8	33	27.5
9	17	14.2
10	8	6.7
11	3	2.5
12	2	1.7
Total	120	100

The infants' food diversity scores were split into tertiles. The lowest food diversity scores was from 3 to 6 (24.17% of the infants), the next third food diversity scores was from 7 to 8 (50.83% of the infants) and the remaining third food diversity scores ranged from 9 to 12 (25% of the infants) (Appendix L- Table L.14).

4.7.1 Family and Child's Characteristics and Nutrition Education Activities Associated With Infants' Food Diversity

General linear model was used to measure the association of the ecological factors with infants' food diversity score. All variables were included in the model at the same time (Table 4.14).

Family Characteristics that had significant association with the food diversity score of the infants were family monthly income, maternal educational attainment, and maternal attitude to variety of foods. The infant's gender/sex was the only child characteristic marginally associated with infant's food diversity score. The total R – squared is 0.458, indicating that the model predicted 45.8% variation in infants' food diversity score (Table 4.14).

Family and child's characteristics found not to be significantly¹ associated with infants' food diversity score when all variables were included in the model were family weekly food expenditure, number of siblings below 6 years old, number of household members, maternal age, maternal nutrition knowledge, maternal nutrition attitudes to meal planning, child's age and birth position. Maternal attendance at any nutrition education activities was not significantly associated with infants' food diversity score. (See section 4.10 for comparison of the reduced and full model)

Least square means of infants' food diversity score for family and child's characteristics which had significant association with infant food diversity score were computed. Least square means are estimates of what the mean infants' food diversity score for the independent variables would be if all other factors in study were at their average level.

¹ 95% confidence interval (P=0.05) using type III Sum of Squares

Table 4.14 Association of Family and Child's Characteristics and Nutrition Education Activities With Infants' Food Diversity

Dependent Variables	Degree of Freedom	P-value	Significance
Family Characteristics			
Maternal age	2	0.33	Not Significant
Maternal educational attainment	4	0.005	Significant
Family monthly income	3	0.05	Significant
Family weekly food expenditure	3	0.31	Not Significant
Number of siblings below 6 years old	2	0.85	Not Significant
Number of household members	2	0.11	Not Significant
Maternal nutrition knowledge	1	0.34	Not Significant
Maternal attitude to variety of foods, meal planning and preparation			
-importance of planning meals to include variety of foods and feeding children variety of foods everyday	1	0.003	Significant
-important factors to consider in meal planning (each respondent chose two)			
- children's preference	1	0.49	Not Significant
- husband's preference	1	0.26	Not Significant
- nutritional needs of the family	1	0.61	Not Significant
- budget	1	0.48	Not Significant
- ease of preparation	1	0.29	Not Significant
- mother's preference ¹			
-difficulty in preparing and cooking meals for the family ²			
Child's Characteristics			
Age	2	0.51	Not Significant
Sex	1	0.06	Marginally Significant
Birth Position	5	0.37	Not Significant
Attendance at Nutrition Education Activities			
- mothers' nutrition class	1	0.95	Not Significant
- individual health teaching	1	0.53	Not Significant
- bench conference	1	0.15	Not significant
- household teaching ³			
R-squared		0.458	

¹ variable not included in the analysis, as there were only four mothers who considered this factor

² variable not included in the analysis, as there were only two mothers that found it difficult to prepare and cook meal for the family

³ variable not included in the analysis, as there were only two mothers who attended the activity

4.7.1.1 Family Characteristics

4.7.1.1.1 Family Monthly Income

Family monthly income was significantly associated with the infants' food diversity score ($P = 0.05$). Infants' whose families had income of 2,500 – 4,499.00 pesos had a significantly higher food diversity score than infants whose families had an income of 1,000.00 – 2,499.00 pesos. The food diversity score of the infants in the families with the lowest income (under 1,000.00 pesos) and in the families with highest income (above 4,500.00) were not statistically different from the others. Table 4.15 shows the least square means of infants' food diversity scores for each income category.

Table 4.15 **Least Square Means of Infants' Food Diversity Scores
For Each Income Category**

Income Category (In Pesos)	Number	Least Square Means of Infants' Food Diversity Scores	Standard Error of Least Square Means
Under 1,000.00	32	7.78	0.48
1,000.00 – 2,499.00	54	6.93 a	0.22
2,500.00 – 4,499.00	21	8.33 a	0.48
4,500.00 and above	13	7.92	0.60

(Categories with the same letters are significantly different, $P < 0.05$)

4.7.1.1.2 Maternal Educational Attainment

Maternal educational attainment was significantly associated with the infants' food diversity score ($P = 0.005$). Infants whose mothers were two year secretarial or vocational course graduates had the highest food diversity scores, which was significantly different from the food diversity scores of infants whose mothers were in all other educational attainment group. There was no significant difference in the food diversity scores of those infants whose mothers were college graduate with those whose mothers had only some elementary or some college education. Table 4.16 shows the least square means of infants' food diversity scores for each maternal educational attainment category.

Table 4.16 Least Square Means of Infants' Food Diversity Scores For Each Maternal Educational Attainment Category

Maternal Educational Attainment	Number	Least Square Means of Infants' Food Diversity Scores	Standard Error of Least Square Means
Some elementary	16	7.21 a ²	0.55
Elementary graduate – some high school	53	7.33 b ¹	0.21
High school graduate - some college	29	7.58 c ³	0.36
Two year secretarial and vocational graduate	10	8.93 a ² b ¹ c ³ d ³	0.37
College graduate	12	7.15 d ³	0.48

(Categories with the same-letters are significantly different at ¹P = 0.01, ²P < 0.05, ³P < 0.01)

4.7.1.1.3 Maternal Attitude to Variety of Foods

Maternal attitude was also significantly associated with the infants food diversity score ($P < 0.003$). For every point increase of the attitude of mothers on the importance of planning meals to include a variety of food and importance of feeding children with variety of food everyday there was an increase in the infants' food diversity score of 0.96 points.

4.7.1.2 Child's Characteristics

4.7.1.2.1 Sex

Among the infant characteristics of gender, age and birth position, only gender had a marginal association with infants' food diversity score ($P = 0.06$). The infant's age and birth position were neither significantly nor marginally associated with infants' food diversity score. Boys had higher food diversity scores than girls. The least square mean food diversity score for boys was 7.70 with standard error of least square mean of 0.18 compared to girls' which was 7.25 with standard error of least square mean of 0.15. This means that the boys were provided with more of a variety of foods than girls were.

Using the general linear model (GML) procedure, it was observed that there was a significant relationship between infants' kilocalorie intake and gender ($P = 0.002$). Boys had higher kilocalorie intake than girls have. Boys had a mean kilocalorie intake of 349 per day while girls had mean kilocalorie intake of 240 per day.

4.8 Iron Intake of 9 – 11 Month Old Infants

4.8.1 Infants' Dietary Iron Intake

The over-all iron intake of the infants was inadequate. The mean iron intake of the whole group from sources other than breastmilk was 1.8 mg/day with a standard deviation of 1.91 (Figure 4.1). The Philippine Recommended Daily Allowance for iron for infants aged 6 months - <12 months is 15 mg. The range of the infants' iron intake from non breastmilk sources is 0 for those, whose diet was mainly breastmilk, vegetable broth and thin rice porridge¹, to 11.7 mg/day for those receiving a more varied diet.

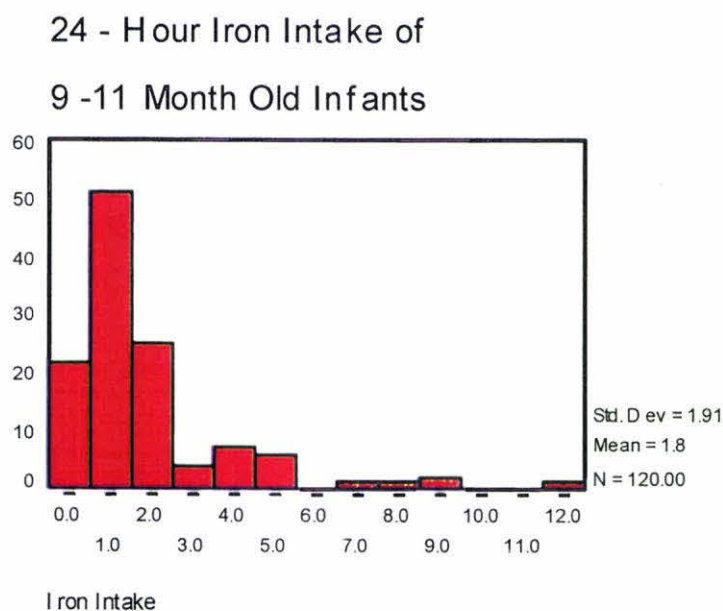


Figure 4.1

The mean kilocalorie intake of infants from non breastmilk sources was 300.9 kcal/day with a standard deviation of 192.1 kcal/day. The range of intake was 72 kcal/day for those who were mainly fed with breastmilk and broth to 1290 kcal/day for those who had more varied diets.

¹Infants with 0 iron intake were the ones who were not yet receiving a more varied /larger volume diet.

It was observed that the infants' iron intake was significantly correlated with their iron per kilocalorie and kilocalorie intake at $P = 0.01$ significance. As the infants' calorie intake increased their iron intakes also increased and as their iron per kilocalorie so did their iron intake. This means that as the infants ate more iron dense foods and more food in general their iron intake also increased.

Infants were categorized into tertiles based on iron intake and the sources of iron in their diets were examined. The lowest intake tertile was 0 – 0.75 mg Fe/day (31.7% of infants), the next third intake was 0.76 – 1.85 mg Fe/day (35.8 % of infants), and the remaining third intake ranged from 1.86 – 11.7 mg Fe/day (32.5% of infants) (Appendix L-Table L.15).

For the infants with the lowest iron intake, most of their iron came from rice (29.5%), 28.1% from bakery products, 13.7% came from legumes and beans, 7.1% from meat and poultry, 6.6% from fruits, 4.9% from fish, 4.4 % from powdered milk and 5.7% from other sources such as infant formula and root crops (Figure 4.2). Infant milk formula was only given to one infant as a mixture with his porridge.

Iron Sources of Infants with Low Iron Intake

0 - 0.75 mg/day

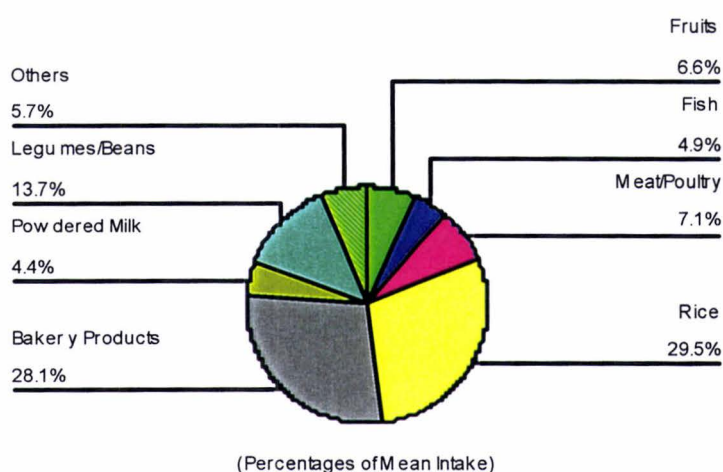


Figure 4.2

For the infants with medium iron intake most of their iron came from legumes and beans (30.6%), 21.9% from eggs, 17.1% from bakery products, 14.8% from rice, 5.5% from meat and poultry, and 10.2% came from other sources such as vegetables, fruits, fish, fortified noodles, meat products, infant foods, powdered milk, beverage and root crops (Figure 4.3).

Iron Sources of Infants with Medium Iron Intake

0.76 - 1.85 mg/day

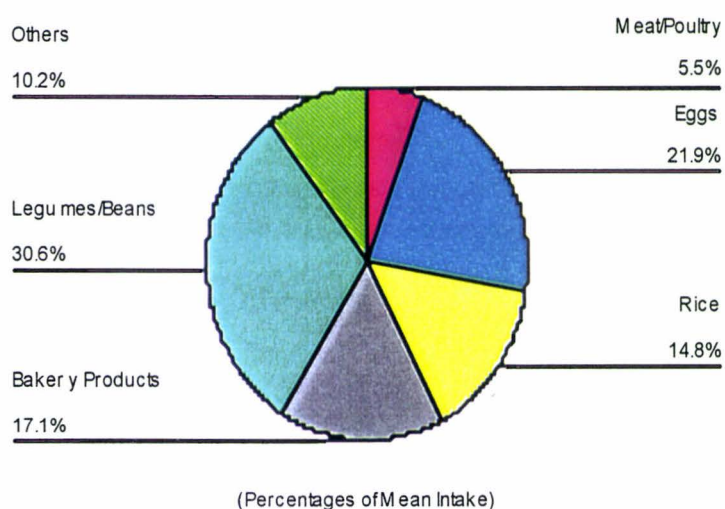


Figure 4.3

For the infants with high iron intake, it was noted that most of their iron came from infant milk formula (36.7%), 20.8% came from eggs, 16.9% from legumes and beans, 7.9% from bakery products, 5.8% from rice, 5.5% from meat and poultry and 6.4% came from other sources such as vegetables, fruits, fish, fortified noodles, meat products, infant foods, powdered milk, beverage and root crops (Figure 4.4).

Iron Sources of Infants with High Iron Intake 1.86 - 11.7 mg/day

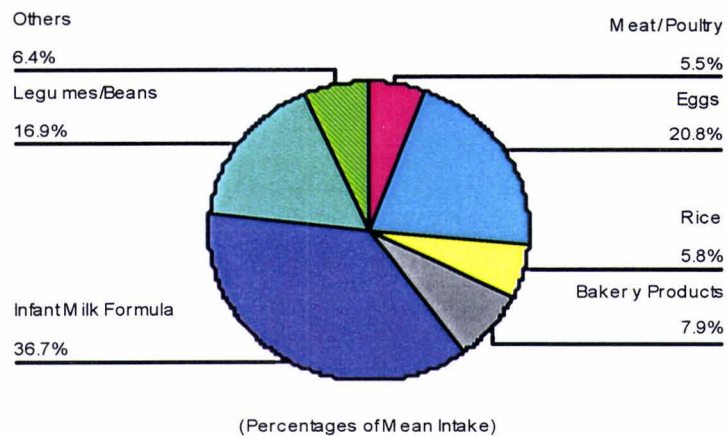


Figure 4.4

It was observed that iron sources of infants with low iron intake were mainly bakery products and rice, with a little from legumes/beans, meat and poultry, fish, fruits and milk. For those with medium intakes, the greatest percentage of iron was from legumes and eggs, then from bakery products and rice and a small percentage from meat and poultry.

Among infants in the high iron intake group, 35.90% consumed infant milk formula fortified with iron, which provided 68.69% of their total iron intake. The remaining iron came from other sources such as eggs which contributed 37.04%, legumes (32.51%), bakery products (10.70%), rice (5.76%), meat (5.36%), fruits (3.29%), noodles (2.47%), and 2.87% from vegetables, fish, infant foods, and beverages. The group had a mean daily iron intake of 5.54 mg with a range of 1.90 mg to 11.70 mg per day.

Sixty four percent (64.10%) of the infants with high iron intake were not given infant milk formula. They got 31.37% of their iron from eggs, 24.60% from legumes,

13.11% from bakery products, 10.31% from rice, 9.87% from meat and poultry, 4.71% from powdered milk, and 6.03% from other sources such as vegetables, fruits, fish, meat products, infant foods, beverages and root crops. The mean iron intake of this group was 2.72 mg per day with a range of 1.90 mg to 5.40 mg per day.

Overall in the high iron group, fish only provided 0.74% of their total iron intake with mean iron intake of 0.02mg/day while meat and poultry only provided 5.18% of their total iron intake with mean iron intake of 0.14 mg/day.

It was observed that for all groups, meat and poultry, and fish, which are good sources of iron, were only provided in small amounts in the infants' diet and were not consumed daily by all. Fish provided only 1.3% of the total iron intake of the infants and their mean iron intake from fish was only 0.02 mg/day. Fish was provided in the diets of only 15 (12.5%) of the infants. Meat and poultry provided 5.6% of infants' total iron intake and their mean iron intake from meat and poultry was only 0.10 mg/day. Meat and poultry was provided in the diets of only 23 (19.16%) of the infants.

While almost one half of the infants were fed noodles only 13 infants were provided with iron fortified noodles and were only provided in small amounts. It contributed only 0.4% of the infants' iron intake and their mean iron intake from fortified noodles was only 0.007mg/day. Only 5 children were fed iron fortified cereal and it provided only 0.2% of the infants' total iron intake with mean iron intake of 0.004mg/day.

4.8.2 Provision of Iron Supplements

Of the 120 infants, the majority (60.8%) was given iron supplements (Appendix L-Table L.16). The majority of these infants (63.0%) were provided iron supplements at 4-6 months of age, 1.4% at less than 1 month of age, 12.3% at 1-3 months, and 23.3% at 7-9 months (Appendix L-Table L.17). The first of iron supplement was usually a

15 ml bottle of ferrous sulfate drops with a concentration of 75mg/0.6ml given by the Health Center. This supply is usually good for only a month.

At the date of the interview, only 15% of the 120 infants were still provided iron supplements (Appendix L-Table L.18) and 100% of these infants were given supplements once a day. The supplements were bought by the mothers themselves. The supplements were mostly multi-vitamins with iron.

Using the t- test, iron supplementation at the time of the study was found not to be associated ($P>0.1$) with the infants' iron intakes.

4.8.3 Family Characteristics and Child's Characteristics and Nutrition

Education Activities Associated With Infants' Iron Intake

The general linear model was used to measure the association of the ecological factors with the infants' iron intake. All variables were included in the model at one time (Table 4.17).

The family and child's characteristics significantly associated with the infants' iron intake were family monthly income and child's age. Maternal attendance at bench conferences was also significantly associated with infants' iron intake. Total R-squared is 0.319, indicating that the model predicted 31.9% of the variation in the infant's iron intake (Table 4.17).

The family and child's characteristics found not to be significantly¹ associated with infants' iron intake were family weekly food expenditure, number of siblings below 6 years old, number of household members, maternal age, maternal educational attainment, maternal attitude to variety of foods and meal planning, child's sex and birth position. Nutrition education activities found not to be significantly associated

¹ 95% confidence interval using type III Sum of Squares

with infants' iron intakes were maternal attendance at mothers' nutrition classes and individual health teaching. (See section 4.10 for comparison of the reduce and full model)

The least square means of infants' iron intake for the family and child's characteristics and nutrition education activities which had significant association with infants' iron intake were computed. Least square means are estimates of what the mean infants' iron intake for the independent variables would be if all other factors in study were at their average level.

Table 4.17 Association Of Family and Child's Characteristics and Nutrition Education Activities With Infants' Iron Intake

Dependent Variable	Degrees of Freedom	P-value	Significance
Family Characteristics			
Maternal age	2	0.30	Not Significant
Maternal educational attainment	4	0.12	Not Significant
Family monthly income	3	0.03	Significant
Family weekly food expenditure	3	0.52	Not Significant
Number of siblings below 6 years old	2	0.92	Not Significant
Number of household members	2	0.77	Not Significant
Maternal attitude to variety of foods, meal planning and preparation			
-importance of planning meals to include variety of foods and feeding children variety of foods everyday	1	0.89	Not Significant
-important factors to consider in meal planning (each respondent chose two)			
- children's preference	1	0.71	Not Significant
- husband's preference	1	0.93	Not Significant
- nutritional needs of the family	1	0.75	Not Significant
- budget	1	0.81	Not Significant
- ease of preparation	1	0.92	Not Significant
- mother's preference ¹			
- difficulty in preparing and cooking meals for the family ²			
Child's Characteristic			
Age	2	0.04	Significant
Sex	1	0.72	Not Significant
Birth Order	5	0.59	Not Significant
Attendance at Nutrition Education Activities			
- mothers' nutrition class	1	0.12	Not Significant
- individual health teaching	1	0.94	Not Significant
- bench conference	1	0.01	Significant
- household teaching ³			
R-squared		0.319	

¹ variable not included in the analysis, as there were only four mothers who considered this factor

² variable not included in the analysis, as there were only two mothers that found it difficult to prepare and cook meal for the family

³ variable not included in the analysis, as there were only two mothers who attended the activity

4.8.3.1 Family Characteristics

4.8.3.1.1 Family Monthly Income

Family monthly income was significantly associated with the infants' iron intake ($P = 0.03$). Surprisingly, those infants whose families had income of 1,000.00 to 4,499.00 pesos had statistically significantly ($P = 0.01$) higher iron intake compared to those infants whose families had income of 4,500.00 pesos and above. There was no significant difference in the iron intake of infants whose families had income of under 1,000.00 pesos and those whose families had income of 4,500.00 pesos and above. Interestingly, in this sample, infants whose families had income of 4,500.00 pesos and above had the lowest iron intake. Table 4.18 shows the least square means of infants' iron intake for each income category.

Table 4.18 Least Square Means of Infants' Iron Intake For Each Income Category

Income Category (In Pesos)	Number	Least Square Means of Infants' Iron Intake	Standard Error of Least Square Means
Under 1,000.00	32	1.07 mg Fe/day	0.22 mg Fe/day
1,000.00 – 2,499.00	54	1.38 Fe mg/day a	0.11 mg Fe/day
2,500 – 4, 499.00	21	1.62 Fe mg/day b	0.20 mg Fe/day
4,500.00 and above	13	0.79Fe mg/day ab	0.17 mg Fe/day

(Categories with the same letters are significantly different at $P = 0.01$)

4.8.3.2 Child's Characteristics

4.8.3.2.1 Age

The child's age was significantly associated with the infants' iron intake ($P = 0.04$). The older the infants, the higher were their iron intake. Table 4.19 shows the least square means of infants' iron intake for each age group.

Table 4.19 Least Square Means of Infants' Iron Intake For Each Infants' Age Group

Child's Age	Number	Least Square Means of Infants' Iron Intake	Standard Error of Least Square Means
9 months	66	1.08 mg Fe/day a	0.10 mg Fe/day
10 months	23	1.20 mg Fe/day b	0.16 mg Fe/day
11 months	31	1.78 mg Fe/day ab	0.14 mg Fe/day

(Categories with the same letters are significantly different, $P < 0.05$)

Using the general linear model (GLM) procedure, the infants' age was also seen to be marginally associated with their kilocalorie intake ($P = 0.09$). The older the infants are the higher their kilocalorie intake. The mean kilocalorie intake of those who were 11 months old was 351 kilocalorie per day, the 10 months old was 330 kilocalorie per day and the 9 months old was 267 kilocalorie per day. The infant's age was found not to be associated with infants' iron/kilocalorie intake ($P > 0.10$).

4.8.3.3 Participation in Nutrition Education Activities

4.8.3.3.1 Attendance at Nutrition Education Activities

Attendance of mothers at bench conferences was significantly associated with reduced infants' iron intake ($P = 0.01$). Least square mean of infants' iron intake of those whose mothers did not attend bench conferences was 1.45 mg Fe/day with standard error least square mean of 0.08 mg Fe/day compared to those whose mothers attended bench whose least square mean iron intake was 1.04 mg Fe/day with standard error least square mean of 0.09 mg Fe/day.

4.8.4 Association of Maternal Nutrition Knowledge and Infant's Food

Diversity With Infant's Iron Intake

Univariate analysis of variance was used to test the association of maternal nutrition knowledge with infants' iron intakes. Splitting the sample into three groups on the basis of maternal nutrition knowledge (Appendix K-Table K.12), it was found that maternal nutrition knowledge was not associated with infants' iron intake ($P = 0.24$).

The association of infants' food diversity with iron intake was analyzed in a similar way. The sample was divided into three groups on the basis of infants' food diversity scores (Appendix K- Table K.14). It was found that infants' food diversity score was marginally associated with the infants' iron intake ($P = 0.06$). The higher the food diversity scores the higher the iron intake. Infants with low food diversity scores had lowest iron intake compared to those with medium and high food diversity scores. There was no significant difference in the iron intake of infants with high and medium food diversity scores. The R- squared is 0.038, indicating that the food diversity scores predicted 3.8% of the variation in the infants iron intake. Table 4.20 shows the means of infants' iron intake for each infant's food diversity score tertiles.

Table 4.20 Means of Infants' Iron Intake for Each Infants' Food Diversity Score Tertiles

Infants' Food Diversity Score Tertiles	Number	Means of Infants' Iron Intake	Standard Error of Means
Low food diversity score (3 – 6)	29	0.85 mg Fe/day a ¹ b ²	0.11 mg Fe/day
Medium diversity score group (7 – 8)	61	1.09 mg Fe/day a ¹	0.12 mg Fe /day
High Food diversity score (9 – 12)	30	1.52 mg Fe/day b ²	0.19 mg Fe/day

(Categories with the same letters are significantly different, ¹ $P < 0.10$, ² $P < 0.05$)

4.9 Mediating Effect of Maternal Nutrition Knowledge and Infants' Food Diversity to the Relationship of Family and Child's Characteristics and Nutrition Education Activities With the Infant's Iron Intake

The maternal nutrition knowledge and infants' food diversity scores were added as extra explanatory variables in the full model to test if they mediated the observed relationship between family monthly income, child's age and maternal attendance at bench conferences with infants' iron intake which were earlier found to be significantly associated with infant's iron intake (Section 4.8.3). There was a reduction in the strength of the associations between the infants iron intake and monthly family income (from $P = 0.03$ to $P = 0.04$) and maternal attendance at bench conferences (from $P = 0.01$ to $P = 0.02$), while the degree of association between child's age and infants' iron intake has improved from ($P=0.04$ to $P = 0.03$) (Table

4.17 & Table 4.21). The family monthly income, maternal attendance at bench conferences and infants' age influenced the infants' iron intake indirectly through maternal nutrition knowledge and infants' food diversity scores.

It was also found that with the addition of maternal nutrition knowledge and infants' food diversity score, the association of maternal educational attainment ($P=0.05$) became statistically significant and maternal attendance at mothers' nutrition classes ($P = 0.06$) with infants' iron intake became marginally significant using type III Sum of Squares (Table 4.17 & Table 4.21)

The r-squared including the maternal nutrition education and the infants' food diversity score had improved from 0.319 in the original model to 0.352. (Table 4.17 & Table 4.21).

Table 4.21 Mediating Effect of Maternal Nutrition Knowledge and Infants Food Diversity to the Relationship of Family and Child's Characteristics And Nutrition Education Activities With The Infants Iron Intake

Dependent Variable	Degrees of Freedom	P-value	Significance
Family Characteristics			
Maternal age	2	0.38	Not Significant
Maternal educational attainment	4	0.05	Significant
Family monthly income	3	0.04	Significant
Family weekly food expenditure	3	0.78	Not Significant
Number of siblings below 6 years old	2	0.53	Not Significant
Number of household members	2	0.52	Not Significant
Maternal attitude to variety of foods, meal planning and preparation			
-importance of planning meals to include variety of foods and feeding children variety of foods everyday	1	0.83	Not Significant
-important factors to consider in meal planning (each respondent chose two)			
- children's preference	1	0.63	Not Significant
- husband's preference	1	0.78	Not Significant
- nutritional needs of the family	1	0.86	Not Significant
- budget	1	0.93	Not Significant
- ease of preparation	1	0.70	Not Significant
- mother's preference ¹			
-difficulty in preparing and cooking meals for the family ²			
Child's Characteristic			
Age	2	0.03	Significant
Sex	1	0.93	Not Significant
Birth Order	5	0.47	Not Significant
Attendance at Nutrition Education Activities			
- mothers' nutrition class	1	0.06	Marginally Significant
- individual health teaching	1	0.61	Not Significant
- bench conference	1	0.02	Significant
- household teaching ³			
Mediating Variable			
Maternal Nutrition Knowledge Tertiles	2	0.14	Not Significant
Infants' Food Diversity Tertiles	2	0.25	Not Significant
R-squared		0.352	

¹ variable not included in the analysis, as there were only four mothers who considered this factor

² variable not included in the analysis, as there were only two mothers that found it difficult to prepare and cook meal for the family

³ variable not included in the analysis, as there were only two mothers who attended the activity

4.10 Conceptual Model

A reduced model (including just the variables that had significant or marginal association with infants' food diversity, infants' iron intakes and maternal nutrition knowledge ($P < 0.01$)) was analyzed. The R-squared of the reduced model was compared with the R-squared in the full model to test if the factors not included in the reduced models added any significant predictive ability to the full model.

It was found that with the reduced model for infants' food diversity where the significant variables i.e., family monthly income, maternal educational attainment, maternal attitude to variety of foods, and infants' sex were included, the R-squared was 0.303 while the R-squared for the full model was 0.458. This means that about 34% of the variation accounted by the full model was attributed to variables that did not appear to be significantly associated with infants' food diversity score in the full model using the type III Sum of Squares. In the reduced model, family monthly income was no longer statistically significant ($P = 0.14$).

Analysis of reduced model for infants' iron intake where the significant variables i.e., family monthly income, maternal attendance at bench conferences and infant's age were included, the R-squared was 0.119 while the R-squared for the full model was 0.319. This means that about 63% of the variation accounted by the full model was attributed to the variables that did not appear to be significantly associated with infants' iron intake in the full model using the type III Sum of Squares. In the reduced model, infant's age was no longer statistically significant ($P = 0.12$).

It was found that with the reduced model for maternal nutrition knowledge where only the significant variables, i.e., maternal educational attainment, maternal attendance to bench conferences and number of siblings below 6 years old were included, the R-squared was 0.250 while the R-squared for the full model was 0.384. This means that about 35% of the variation accounted by the full model was attributed to the variables that did not appear to be significantly associated with

maternal nutrition knowledge in the full model using type III Sum of Squares. In the reduced model, maternal attendance at bench conferences was no longer statistically significant ($P=0.20$).

4.11 Summary

A large portion of the mothers in the study was breastfeeding. However, more than one half exclusively breastfed only until the third month. These mothers believed that they should introduced foods to their infants other than breast milk to accustom them with other taste and to prevent constipation. There were also mothers that withheld feeding some foods from their infants because of some beliefs that they think would make their infant sick.

Mothers in this study had positive nutrition attitude. They indicated “nutritional well being of the family” was their first priority in planning meals for the family. Mothers also consider “planning meals to include variety of foods” and “feeding children variety of food everyday” important.

The mean iron intakes of infants in the study was low (1.8mg/day). Higher intake of iron was associated with higher infants’ food diversity. Infants with high iron intake obtained more of their iron from infant formula fortified with iron. It was also observed that as infants ate more iron dense foods and more foods in general their iron intakes increased. Family monthly income and child’s age were positively significantly associated with infants’ iron intake while maternal attendance at bench conferences was marginally associated. However, the association of maternal attendance at bench conferences with the infants’ iron intake was negative. There was a univariate positive association between infants’ food diversity and iron intake.

The maternal knowledge test scores ranged from 3 to 12 with the possible perfect score of 12. Only two mothers got the perfect score of 12 and none scored zero. The mean nutrition knowledge score was 7.89. Maternal educational attainment and, the

number of siblings below six years old were found to be positively significantly associated with maternal nutrition knowledge while maternal attendance at bench conferences was marginally positively associated.

The highest infants' food diversity score was 12 and the lowest was 3. The majority of the infants' had a food diversity score of 8 and above. Family monthly income, maternal educational attainment and maternal attitude to variety of food were positively significantly associated with the infants' food diversity while the infant's gender/sex was marginally positively associated.

Maternal nutrition education and infants' food diversity was seen to mediate the relationships of ecological variables with the infants' iron intake. The strength of association of maternal educational attainment, maternal attendance at mothers' nutrition classes, and infants' age became with iron intake became stronger while association of family monthly income and maternal attendance at bench conferences became weaker.

CHAPTER FIVE

DISCUSSION

This study is concerned with the maternal early feeding practices and the ecological factors that are associated with the diets of 9 – 11 month old infants. This chapter discusses the findings and contrasts them with those of other studies. The conceptual model and the six objectives of this study have been used as a basis for organizing the discussion.

5.1 Methodology

Participants in this study were mothers of 9 – 11 month old infants. The participation in this study was voluntary. The response of the mothers to the recruiting effort was highly favorable. A total of 120 or 100% of the expected sample were recruited. The mothers were recruited from 12 of the 38 barangays of Solana, Cagayan. The request for the mothers to sign the consent form was an easy task, even though it is not a common practice in research in the Philippines. The mothers seem to understand the importance of signing the consent form, although a few thought that it was not necessary. They were anyway very much willing to participate in the study. The 100% response rate indicates no bias due to non- response. The high percentage (55%) of mothers with infants' 9 months old was purely coincidence. It had nothing to do with how the sample was selected.

The food intakes of the infants in the study were obtained by the 24-hour dietary recall. The validity of the results for nutrient intakes depends on the accuracy of the 24-hour food intake. Possible sources of error in the results include recording errors, memory lapses, over and under estimation of food items since the estimation of portion is not as accurate as weighing and measuring. "Bad" food may be under estimated and "good" food may be over estimated (Thompson & Byers, 1994).

A few mothers found it difficult to recall the foods they had fed their infants the preceding 24 hours. The probing questions of the researcher helped mothers recall foods given to the infants. The use of sample household measures to estimate food quantity given to the infants was of great help to the mothers to recall the quantities of food they gave to their infants although the possibility of over or under estimation cannot be discounted.

The food diversity checklist from the National Nutrition Council of the Philippines was used to assess the variety of foods eaten by the infants for the previous week.

As in the 24-hour diet recall, a few mothers found it difficult when faced with the food diversity checklist to recall the foods they fed their infants. The one-week period made it difficult for them. However, the food diversity checklist was easier than the 24-hour diet recall because the quantities of foods provided were not asked. Also the checklist method made it easier for the mothers to respond because the researcher provided list of foods.

5.2 Feeding Practices of Mothers

Breastfeeding is the best way of providing optimal nourishment for the healthy growth and development of the infant. Breastfeeding in Solana is not universal, however, a large portion of the mothers breastfeed. In the study, although only 87.5% of the mothers breastfed immediately after giving birth, 98.33% mothers breastfed eventually after a few days. Comparing it with the results of the 1993 and 1998 National (Philippine) Demographic and Health Survey, the 98.33% breast-feeding rate in Solana is higher than the 93% rate in rural areas from the national survey in 1993 and 92% breastfeeding rate in rural areas from the national survey in 1998 (National Statistics Office, 1998)¹. The 98.33% breastfeeding rate in Solana is also

¹1993 rate was 93% and in the intervening 5 years in spite of breastfeeding interventions, there was no increased nationally.

much higher than the breastfeeding rates in urban areas. Rural breastfeeding rates in the Philippines are usually higher than urban breast-feeding rates (WHO, 1981; National Statistics Office, 1993; National Statistics Office, 1998).

It is also noteworthy that at the date of interview the majority of the mothers (89.8%) in the study were still breastfeeding. They were breastfeeding their infant aged 9 months or more.

The high breastfeeding rate and observed long duration of breastfeeding in Solana may be due to the intensive breastfeeding promotion of the Municipal Health Office and the Municipal Nutrition Committee. The follow-up home visits of the midwives after the mother's delivery up to four months may have also contributed to this high rate¹. Most rural mothers do not work away from home hence this does not interfere with breastfeeding. Also, most rural mothers breastfeed due to economic reasons; they believe that breastfeeding is more economical than bottlefeeding. Rural mothers also said that breastmilk benefits the child and it is very convenient². These findings could be expected in other rural areas in the province of Cagayan as well. This is not only due to intensive breastfeeding promotion in all areas of Cagayan but also to economic reasons and convenience.

The majority of the mothers in this study did not adhere to the recommendation of the World Health Organization to exclusively breastfeed from birth to four to six months. Fifty three percent (53.4%) of mothers exclusively breastfed only to three months.

Exclusive breastfeeding to 4 months or longer was only 29.7%. Thirteen mothers (13) fed their infants formula after birth and shifted to breastmilk afterwards. It is notable that they then went on to exclusive breastfeeding for three months.

¹Taken from an interview with the midwives.

²Taken from a focus group discussion with mothers in Solana.

Liquids like water and juices were provided to some infants as early as the first month. However, the rate of exclusively breastfeeding at 4 months is high in Solana compared to the findings in the 1993 National (Philippine) Nutrition Survey, which found that only 15.7% of those 4-6 months were exclusively breastfed (FNRI, 1993). Similarly, the 1998 National (Philippine) demographic and health survey, which found that only 22.3% of those 4 – 7 months were exclusively breastfed (National Statistics Office, 1998).

While the high rate of breastfeeding in Solana is noteworthy, the short duration of exclusive breastfeeding may have an adverse effect on the nutritional status of the infants. The early introduction of liquids and foods before four months increase risk of diarrhea and other infections leading to malnutrition due to diarrhea. It will also increase risk to allergy because of intestinal immaturity (Brown et al., 1989; Popkin et al., 1990; De Zoyza et al., 1991; Hendricks & Dadruddin, 1992). The mothers in the study who exclusively breastfed for a short duration reported that they needed to give fruit juices and water to their infants so that they will not suffer from constipation. They also wanted to accustom their infants to other tastes. It is not surprising to hear that mothers give fruit juices and water to their infants to prevent constipation because this a common belief among rural people.

The high percentage of mothers that did not exclusively breastfeed to four months have important implications to those involved in educating breastfeeding mothers, especially if WHO changes recommendation to six months as has been suggested (Borresen, 1995).

This study found that majority of the mothers in the study adhered to the current recommendation of the WHO to provide complementary feedings to infants at four to six months, with only 8.3% starting solids before four months.

There is also a possible risk of not introducing foods other than breastmilk beyond six months. The child may fail to thrive due to inadequate nutrient intake. Malnutrition,

m micronutrient deficiencies and depressed immunity can result from such practice (Ajenifija, 1987; Hendricks & Badruddin, 1992). Delayed introduction of solids has also been associated with an increased risk of iron deficiency among breastfed infants (Siimes, et al., 1984; Calvo, Galindo & Aspnes, 1992). In the present study low iron intake from solids was seen among some infants who were introduced to solids at 8 months, although it was found overall that the age of introduction of solids was not associated with the infants' iron intake.

Another practice of the mothers that might have an impact on the nutritional status of their children was their practice of withholding foods from their infants. Forty six percent (45.8%) of the mothers reported withholding foods from their infants. The practice of one third (34.17%) of the mothers of withholding what they term "junk foods" from their infants will have a positive effect on the nutritional status of the children. It is noteworthy that these mothers recognized the disadvantages of feeding infants with "junk foods". However, the practice of 17 (14.17%) mothers in withholding nourishing foods such as chicken, pork, fish, egg, beef, some fruits and leafy vegetables (Table 4.3) may also have a negative effect on their infants' nutritional status. Chicken, pork, fish, egg and beef, which are good sources of protein and micronutrients such as iron and zinc, are important for infant's growth and development (Glinsmann et al., 1996). The infant's need for meat, poultry and fish is most obvious but not recognized by these mothers. This practice had been seen in the Philippines by Valdecanas (1971), Fernandez et al., (1983) Dalisay et al., (1986), and Guthrie, (1988) where mothers withheld meat and fish from their infants. Mothers in this study and in above mentioned studies believe these foods cause indigestion, allergy and ascariasis (intestinal worms).

Although this practice of withholding nourishing foods from their infants was found not to be associated with the infants' iron intake and food diversity the continued practice may cause a negative effect on the nutritional status of the infants in the long run. The lack of clear effect of the practice withholding nourishing foods from the

infants with the infants' iron intake and food diversity may be because only a few mothers in the sample did these practice.

More than one forth of the mothers (25.8%) withheld nourishing foods from their infant when sick. Withheld foods are chicken, eggs, fish, shrimp and green leafy vegetables (Table 4.4). They believed that eggs might aggravate the fever of the infant. While the chicken, fish and shrimp may cause allergies. One mother who did not give green leafy vegetables believed that this might cause stomach distress. This practice of the mothers is not optimal. Infants need all the nourishment during illness as well as to regain strength after it.

Although the widespread breastfeeding is noteworthy, the practice of some mothers of early introduction of fluids and of withholding nourishing foods from their infants needs special attention. This actual practice of the mothers needs to be clarified, if they withhold foods the rest of the family is eating, what are the foods they feed their infants instead. The health and nutrition workers also need to understand why these mothers choose to act differently than recommendations.

5.3 Maternal Attitude to Variety of Foods, Meal Planning and Preparation

It is noteworthy to find that 28.3% of the mothers in this study said that the nutritional needs of the family was the most important factor they consider in planning meals for their family. Not surprisingly only two considered their own preferences to be the most important. This is similar to what was seen by Schafer (1978) and Pill (1993) where mothers' food choices were based on the health and nutritional needs of their family before their own. Twenty seven percent (27.5%) of the mothers in the study said that the preference of their child/children was most important in meal planning. They said that this will make sure that what is served will be eaten and food wastage is avoided. However, giving in to the children's preferences may not be optimal, as some children's preferences are not nutritious.

The findings in this study that 20% budget considered budget first in meal planning is in contrast with the findings of Baclig et al. (1983) in the rural Philippines where almost majority (46%) of the mothers prioritized the amount of money on hand in meal planning, 19% cited preference of the family members and only 16% said they made choices based on the meals nutritive value.

The finding in the present study that more mothers prioritized nutritional needs of their family rather than money, opposite to that found by Baclig et al. (1983) may be due to the intensive nutrition education campaign in the municipality of Solana. It also may be due to the fact that most homes in this area have backyard gardens where foods are readily available hence; money is not a very important factor in planning meals to the mothers. It may also be that a few may take money for granted, especially among the low income families where the mothers believe that the very small amount of money basically buy the same foods everyday and so they don't actually consider it in meal planning anymore.

The priority of mothers regarding the factors they consider in meal planning was not seen to be associated with either maternal nutrition knowledge (Table 4.10), infants' food diversity score (Table 4.14), or infants' iron intake (Table 4.17). This means that the mothers had a positive attitude in meal planning but they do not practice it or they just gave a response that would "look good". Or how they define nutritional needs is different to how a nutritionist or health and nutrition worker would do so.

On the importance to include variety of foods in meal planning, the majority (52.5%) of the mothers said that it is important. Also, a majority of the mothers said it is important to feed children with variety of foods everyday. This positive attitude was associated with the infants' food diversity (Discussed in section 5.5).

5.4 Family Characteristics and Nutrition Education Activities Associated

With Maternal Nutrition Knowledge

Mothers are the foremost provider of primary care to their children and their understanding on basic nutrition and health influences the care they provide (Pinto et al., 1985). It has been recognized that the nutritional status of the child can be greatly affected by proper and sound nutrition knowledge of the mother (Christian et al., 1989; Chandna & Sehgal, 1995). The present study looked into the nutrition knowledge of the mothers and the ecological factors that were associated with it.

In the multivariate model, maternal educational attainment, the number of siblings below six years old and maternal attendance at bench conferences were the variables, which showed an association with maternal nutrition knowledge (Table 4.10).

It was found that as maternal educational attainment increased maternal nutrition knowledge increased (Table 4.11). Similar effect of maternal education on nutrition knowledge was reported by Moxley et al., (1991) and Variyam et al., (1999). This effect can be because mother's education increases mother's access to knowledge and information (Thomas et al., 1991; Grossman and Kaestner, 1997).

Maternal attendance at nutrition education activities such as bench conference was also associated with higher nutrition knowledge of mothers. Similar correlation between attendance to nutrition education activities, and nutrition knowledge was reported by Morse et al. (1967) and Celestino et al., (1982), who showed that a course in nutrition was directly beneficial to the score attained by a group of mothers on nutrition knowledge test. An analysis of the First Nationwide (Philippines) Food Consumption Survey by Celestino et al., (1985) also showed that maternal education and attendance in nutrition class significantly influenced the housewife nutrition knowledge score.

In the current study an association with maternal nutrition knowledge was only seen with attendance at bench conferences and not with other nutrition activities, i.e.

mothers' nutrition classes and individual health teachings. This may be because mothers' nutrition classes are only conducted two times a year in a barangay and the individual health teachings is only done as the mothers go to the health centers for consultation. Although most of the mothers had attended individual health teachings is it possible that they had not been in the clinic for a while. With bench conferences there is a more frequent contact with the mothers because these are conducted during immunization days, general weighing of preschool children, monthly growth monitoring, national micronutrient day, hemoglobin determination day or when ever a group of mothers visit the health center. The mothers may also have attended more than one bench conference.

Also found to be significantly associated with maternal nutrition knowledge was the number of siblings below six years old. Mother's with no children below six years old other than index child had higher nutrition knowledge compared to those with 1 or 2 children other than the index child. Mothers who had higher number of children below six years old other than the index child may not had the time to attend as many nutrition education activities. The marginal association between maternal attendance at individual health teachings and number of children below six years old supports this. It could also be presumed that those mothers with more children below six years old couldn't pay attention even when they do attend nutrition education activities compared to those who had lesser children. Or perhaps as they have more children they value or believe different information.

5.5 Family and Child's Characteristics and Nutrition Education Activities Associated With Infants' Food Diversity

Eating a variety of foods everyday is one of the dietary guidelines of the Philippines (Florentino, 1998). Eating a variety of foods everyday may improve nutrient adequacy and proper balance among nutrients (Butrum, 1988), hence, better diet quality. After introduction of solid foods, the infants' diet becomes more diverse. The infants slowly build a varied diet as they moved from exclusive breastfeeding period into the family diet.

In this study, the association of family and child's characteristics and nutrition education activities with infants' food diversity was examined.

It was found in this study that the family characteristics associated with infant's food diversity were family monthly income, maternal educational attainment, and maternal attitude to variety of foods. Infant's gender was the only child characteristics found to be associated with infant's food diversity (Table 4.14).

The economic status of the family is an influential factor in determining how much and what kind of food will be available for family consumption. In this study it was found that family monthly income was significantly associated with infants' food diversity. However, there was a lack of strong linear association between the income categories. It was only those infants whose families had income of 2,500.00 – 4,499.00 pesos that had a significantly higher food diversity score than infants whose families had an income of 1,000.00 – 2,499.00 pesos. The food diversity score of the infants in the families with the lowest income (under 1,000.00 pesos) and in the families with the highest income (above 4,500.00) were not statistically different from the others.

The absence of a strong linear association between family monthly income and infants' food diversity score may be due to the presence of backyard gardens in most of the households that made it possible for the mothers to provide their infants with variety of foods. Some of the low income households may also be beneficiaries of small animal dispersal or income generating projects, which could have augmented their income and hence contributed to the availability of food in the household. This absence of a strong linear association between family monthly income and infants' food diversity may also be due to the availability of the foods in the barangays. The mothers will feed the child with what is available at the food shops or at their gardens that are oftentimes the same in every household because of seasonal viability of fruits and vegetables. Hence, the uniformity of the variety of foods they feed their infants. Even those with higher income may just have to contend with what it available at the

local shops in the barangays. These observations support the statement of the mothers that money is not a big consideration in planning meals for their family.

In this study, it was found that the infants' food diversity scores were highest among those whose mothers were 2 year secretarial or vocational graduates. The infants' food diversity score increased with maternal education, although infants whose mothers were college graduates had low food diversity scores (Table 4.14). The higher score of secretarial and vocational graduates compared to those with only some elementary education is similar with Corpuz and Inciong (1981) in the Philippines where higher level of maternal education was associated with infants' higher food diversity scores. Similar finding has also been reported in the US, e.g. Caliendo & Sanjur (1978). This finding shows the importance of maternal education to the nutritional well being of her children. Caldwell (1979) postulates that the education of women alters the balance of power in the home, making women less fatalistic and giving them greater confidence to take decision making into their own hands. An educated woman, he claims, will allocate a bigger portion of the household's resources when needed to feeding and caring of his children. Mothers with higher education have increased knowledge and greater awareness of their children's dietary need. Educated women have better attitudes about life and thus making them better child rearers (Caliendo & Sanjur, 1978; LeVine, 1978).

The surprising finding that college graduate mothers' infants' food diversity was not statistically different from that of the infants whose mothers were only with some elementary or some college education may be due to the fact that better educated mothers tend to work outside the house and hence, have less time to attend to the nutritional needs of their children and in child caring. (Tucker, 1989). Mothers employed outside the home have less time for meal preparation (Ortiz et al., 1981; Goebel & Hennon, 1982; Axelson, 1986). Engel and Pederson, (1989) in Guatemala and Abbie et al. (1991) in India have shown a negative influence of maternal work on child nutrition. It would be useful in a future study to collect information on maternal employment and perhaps hours spent away from home.

It was found in this study that a positive attitude of mothers to food variety was positively associated with infants' food diversity. This finding is similar to the findings of several studies, which showed that mothers attitude towards meal planning, preparation and household task was correlated with diet quality (Caliendo & Sanjur, 1978; Klesges et al., 1991; Koblinsky et al., 1992). These findings show that maternal attitude plays an important role on the diets of children, as mothers are responsible for menu planning and purchasing. This positive maternal nutrition attitude will positively influence the child's familiarity with a variety of foods (Yperman & Vermeersch, 1979), which in the long run will have a positive effect on the nutritional status of the child.

In this study it was seen that there was gender bias, which had been found in other studies conducted in the Philippines. In this study boys were shown to have higher diet diversity scores than girls. Other studies in the Philippines have also found boys were given bigger variety (Lim & Florencio, 1975; Battad, 1978; Chulakarangka & Onate, 1980) and that boys had better nutritional status than girls (Caedo et al., 1972; Guzman et al., 1976; Aguillon et al., 1982). This was also seen to exist in rural Indian society (Sen & Sengupta, 1983; and Gopaldas et al., 1988) and in Bangladesh (Chaudhury, 1984) where greater malnutrition was seen in girls than boys. Boys in the current study also had higher kilocalorie intake than girls. The boys may be bigger, or mothers' may believe that boys are stronger and bigger than girls are, and that they need more foods than girls do. Boys are also seen as important source of labor on the family farm when they grow.

5.6 Iron Intake of 9 –11 Month Old Infants

Due to the difficulty of quantifying breastmilk intake of infants, this study did not include the contribution of iron from breastmilk in the computation of the infants' iron intake.

The mean iron intake of the 9-11 month old infants from sources other than breastmilk was 1.8 mg/day with standard deviation of 1.91 mg/day. The Philippine

Recommended Daily Allowance for iron for infants aged 6 months to < 12 months is 15 mg. The group mean intake was only 12% of the Recommended Daily Allowance. This means that the iron intake of the infants is inadequate. Even if breastmilk, which provides from 0.15 mg to 0.68 mg/day (Subcommittee on Nutrition During Lactation, 1991) was included in the computation of the infants' iron intake, the infants' iron intake was still inadequate.

Infants 6 to < 12 months need to absorb 1.21 mg Fe/day (Philippine RDA committee, 1989). Taking into account the high bioavailability of breastmilk, which is about 50%, the infants should still need to absorb at least 0.87 mg Fe/day from other sources to meet their requirement. Assuming that the rate of absorption of iron from the average Filipino meal is 8.2% (Philippine RDA committee, 1989) the infants need to have 7.13 mg Fe/day from other dietary sources other than breastmilk. Thus the recorded infants' mean group intake of 1.8 mg Fe/day was inadequate and the infants are at a high risk of iron deficiency, if their iron source is only dietary.

Iron supplementation had been shown to control and prevent iron deficiency. The majority of the infants (60.8%) were given iron supplement from the Barangay Health Station. The iron supplement provided by the Barangay Health Center was ferrous sulfate drops with a concentration of 75 mg/0.6ml, which was to be given once a day. The supply provided was good for at least one month.

At the date of interview only 15% of the infants were still receiving iron supplements. These infants still receiving iron supplements possibly have better iron status compared to those who are no longer receiving, especially since they have inadequate iron intake from foods. Czajka-Narins et al (1978) found in their study that infants that received mineral supplements for some period during infancy were less likely to be anemic. Those still receiving iron supplements may have better iron status. But again all infants may have a reasonable iron status because of the 1 month supplementation period. It is recommended that iron status of these infants be

determined and appropriate measures such as iron supplementation or provision of fortified foods be provided depending on the results obtained.

Infants were categorized into tertiles based on iron intake and the sources of iron in their diets were examined. It is recognized that this may not indicate "usual" diet, but does give an indication of the iron sources in the infants' diet.

It was observed that for all groups, meat and poultry, and fish, which are good sources of heme, iron and which also improve the availability of iron from non-heme sources (Allen and Ahluwalia, 1997) were provided infrequently and only in very small amounts and to only 38 infants. Fish only provided 1.3% of their total iron intake with mean iron intake of 0.02 mg/day while meat and poultry provided 5.6% of their total iron intake with mean iron intake of 0.10 mg /day. Even infants in the high iron group were provided with small amounts of meat, poultry and fish. Fish only provided 0.74% of their total iron intake with mean iron intake of 0.02mg/day while meat and poultry only provided 5.18% of their total iron intakes with mean iron intake of 0.14 mg/day. This may be attributed to the high cost of meat, poultry and fish and the difficulty of regularly obtaining meat, poultry and fish in the barangays. Even chicken, which could be readily available as they are raised in the backyards, was provided in small amounts. This is similar to the finding that children 3 – 12 months in rural Honduras had extremely low intake of meats, poultry and fish (0.02 mg Fe/day for breastfed infants and 0.06 mg Fe/day for non-breastfed infants). The dietary iron intake of these children were very low; it could not prevent iron deficiency anemia (Ohri-Vachaspati & Swindale, 1999).

Although almost one half of the infants had noodles only a few (13) had iron fortified noodles and they were also provided in small amount. They provided only 0.4% of the total iron intake of the infants with mean iron intake of 0.007 mg/day. Only one brand of noodles is fortified with iron, so maybe the mothers are not aware of which brand are fortified with iron or maybe this brand is not available at the food shops in the barangays.

There were only 5 infants that were provided iron fortified infant cereals and also only in small amounts. This provided only 0.2% of the infants total iron intakes with mean iron intake of 0.004mg/day. Iron fortified infant cereals are good sources of iron for infants but they are not easily available at the food shops in the barangays. If they were available the rural mothers would seem to prefer to feed their children with the family food, as this would not cost additional expense. Also in the rural areas, it is not a common practice for mothers to prepare/have a separate infant food. Infant foods are also those that are eaten by the other members of the family, only they are often mashed, flaked or minced and mixed with soup or sauce. Sometimes rice/rice porridge is mixed with the broth of vegetables, meat, poultry or fish.

The 14 infants fed iron fortified milk formula had the highest iron intake. Fortified milk formulas have much higher iron content than breastmilk, however its absorption is much lower than breastmilk. These infants provided with infant formula were the infants no longer breastfed. While iron fortified formulas increases iron intake of infants, iron is not the only nutrient needed by the infants. Iron fortified formulas do not give all the nutritional and health benefits breastmilk provides. Presumably if infant formula had substituted for breastmilk there are other “down-sides” of this practice even if iron intake was higher.

The iron intake was not only associated with the kind of food eaten by the infants, but also the amount. There is a correlation between the infants’ iron intake and iron/kilocalorie and kilocalorie intake of the infants. Thus, the infants with high iron intake not only ate more iron dense foods, but also more foods in general. Older infants had higher iron intake, which was associated with higher kilocalorie intake, not more iron dense foods.

5.7 Family and Child’s Characteristics and Nutrition Education Activities

Associated With Infants’ Iron Intake

Family monthly income was found to be the only family characteristic significantly associated with infants’ iron intake and child’s age was found to be the only child’s

characteristics significantly associated with infants' iron intake. Maternal attendance at bench conferences was also significantly associated with infants' iron intake (Table 4.17).

There was a trend for increase family monthly income to be associated with infants' iron intake, but there is no clear statistical association. Interestingly, those infants whose families had income of 4,500.00 pesos and above had the lowest iron intake in this sample. This is in contrast to several studies in the Philippines and in other countries that showed higher income to be associated with better nutritional status and nutrient intake of preschoolers (Gonzalo, 1976, Battad, 1978; Chulakarangka & Onate, 1980; Chaudhury, 1984; Victoria et al., 1986, Rao, 1987; Christian et al., 1989; Devi & Geervani, 1994).

The finding that those families with lower incomes had infants' with higher iron intake compared to those with income of 4,500.00 pesos and above and the finding that there is no significant difference of iron intake between infants whose families had incomes of under 1,000.00 compared to all others may be due (as in food diversity) to the presence of backyard gardens from which dark green leafy vegetables, chicken and eggs which are good sources of iron are readily available and the availability of food in the barangays. The mother feeds her child with what is available at the local shops or at the backyard garden that are oftentimes the same in every household because of the seasonal viability of fruits and vegetables. It could also be said that as the family income increases priorities are different. When people have the chance, extra money is spent on more tangible assets such as improvement in homes, new furniture, clothes, or jewelry (Valdecanas, 1971). Feasts may be held as soon as a good harvest is turned into cash (Valdecanas, 1971). It may also be due that in the high income group there may be mothers working outside the home and have less time in meal preparation (Ortiz et al., 1981; Goebel & Hennon, 1982; Axelson, 1986). It also be due that in this study only 13 families had incomes above 4,500.00 hence could be unrepresentative.

Maternal attendance at bench conferences was also seen to be significantly associated with infants' iron intake, however negatively. Mothers that did not attend bench conferences had infants' with higher iron intake compared to those who attended bench conferences everything else being equal. This finding suggests either the mothers who attended bench conference did not apply information they learned from the bench conferences or delivery of information was not properly understood by the mothers. Possibly the family diet of those who did not attend bench conferences was different, i.e. higher in iron for other reasons.

Older infants had higher iron intake. Mothers may change the amounts of different foods offered for non-nutritional reasons as well. For example, they may offer bigger serves of meat as the child gets older because the child is easier to feed lumpy foods. The mother may also offer more food when the child gets older because she thinks the child is ready for more taste, or she thinks, "meat is more acceptable" for older infants. In this study the main cause of high iron intake of older infants appear to be the high energy intake.

5.8 Association of Maternal Nutrition Knowledge and Infants' Food Diversity With Infants' Iron Intake

Infants' food diversity was marginally associated with infants' iron intake, while maternal nutrition knowledge was not.

It was found that the higher the infants' food diversity scores the higher the infants' iron intake. This finding is not surprising, since a greater variety of foods in the diet increase the likelihood of a selection of foods containing essential nutrients (Yperman & Vermeersch, 1979). This finding in this study agrees with findings in other countries that diet diversity improves nutrient intake and diet quality (Sanjur & Scoma, 1971; Schorr et al., 1972; Caliendo & Sanjur, 1978; Dewey, 1981; Shack et al., 1989; Hodgson et al., 1994).

This association of the infants' food diversity with the infants' iron intake supports use of the basic food groups in teaching diet quality as currently done in the Philippines.

The lack of association of maternal nutrition knowledge with the infants' iron intake may be that the mothers did not implement/ practice the knowledge they have learned from the nutrition education activities they had attended or information learned were not understood. The iron intake of the infants were also found not to be associated with maternal attendance at any nutrition education activity.

5.9 Mediating Effect of Maternal Nutrition Knowledge and Infants' Food Diversity to the Relationship of Family and Child's Characteristics and Nutrition Education Activities with the Infants' Iron Intake

It was found in this study that the initial strength of association of infants' iron intake with family monthly income and maternal attendance at bench conferences were reduced and the initial association of child's age with infants' iron intake was increased after taking into account maternal nutrition knowledge and infants' food diversity (Table 4.21). This means that the associations between family monthly income, and maternal attendance at bench conferences with infants' iron intake were mediated by maternal nutrition knowledge and infants' food diversity. Family monthly income and attendance at bench conferences appeared to exert indirect effects on infants' iron intake through maternal nutrition knowledge and infants' food diversity. This means that, two families with the same monthly income, the family whose mother has higher nutrition knowledge and feeds her infant with more variety of foods, her infant may have higher iron intake. This means that to some extent the maternal nutrition knowledge and the provision of variety of foods to the infants may overcome the effect of low income to the infants' iron intake.

The strength of the association between the child's age and infants' iron intake with the addition of maternal nutrition knowledge and infants' food diversity was increased. This means that two infants with mothers of the same nutrition knowledge

and with the same food diversity, the older infant would likely to have higher iron intake. This may be because it is already a common practice of mothers to feed her child better and more foods as he/she gets older. The difference in the iron intake due to age (i.e. older infants with higher iron intakes) is clearer when they are considered at equal level of maternal nutrition knowledge.

Maternal attendance at bench conferences was seen to exert an effect on the infants' iron intake. However, as it was found that attendance at bench conferences was associated with lower iron intake, even though attendance was associated with higher nutrition knowledge. It is important that health and nutrition workers pay greater attention that knowledge learned by the participants is practiced and make sure the information given includes practical ideas (See Section 6.2).

It was also seen that with addition of maternal nutrition knowledge and infants' food diversity score, the maternal educational attainment and maternal attendance to mothers' nutrition classes which were found not initially associated with the infants' iron intake became positively significantly associated. This means that maternal educational attainment and maternal attendance at mothers' nutrition classes through maternal nutrition knowledge or infants' food diversity score can likewise influence infants' iron intake. This means that if two women have the same nutrition knowledge and infant's food diversity scores, the one with higher education will have an infant with better iron intake. Suggesting that there is something in how a woman with higher education implements what is measured in these scales or knows how to implement what was learned. This effect could be because mother's education increases mother's access to knowledge and information (Thomas et al., 1991; Grossman & Kaetner, 1997). This finding is similar to the study in Lesotho where maternal nutrition knowledge was seen to mediate the association between maternal schooling and child nutritional status (Ruel et al., 1992).

5.10 CONCEPTUAL MODEL

Based on the results of the analysis of data gathered for this study the conceptualized three levels of ecological environment (Figure 2.1) were found to be associated with infants' iron intake and infants' diet diversity. Although there were only some family and child's characteristic and nutrition education activities that were shown to have a significant statistical association with the dietary intake of the infants, other ecological factors (those that did not appear to be associated with the infants' iron intake and food diversity) contributed to the influence. This can be explained by the findings that with infants' iron intake, 63% of the variation accounted in the full model was attributed to the variables that did not appear to be significantly associated with infants' iron intake and with infants' food diversity, 34% of the variation accounted in the full model was attributed to the variables that did not appear to be significantly associated with infants' food diversity (Section 4.10). Further statistical analysis to clarify these relationships could be done with this data.

5.11 Limitations of the Study

Due to resource constraints, one of the limitations of this study is it only used a single 24-hour recall. A multiple 24-hour dietary recall would have provided a better indicator for the individual infant's iron intakes. When the diets were analyzed as to low, and high iron intake, the researcher would not know if these diets/foods were indicative of general diet, or if all children had days like the "high iron" diet and days like the "low iron" diet.

In addition to the usual problem of recall, there might have been some foods that were not recalled by the mothers like the small amounts of foods that might have been fed to the infants by other members of the family.

The questions used to measure the nutrition knowledge of the mothers did not ask much on information on mother's feeding decisions and this may be one reason it did not come out to be an influential factor to the food diversity and iron intakes of the infants. It may have been more powerful if combined with an attitude/belief section.

For example they may “know” the health message that variety is important, but do they believe it is important for their child? Do they think it will influence the child’s health or growth? Also do they think that providing variety of foods is possible/practical in their family situation –can they afford it, will they eat it, etc.?

Because of the cluster sampling, the statistical modeling was done using SAS callable SUDAAN, which the researcher was not trained to use. A statistician did the SUDAAN analysis. Therefore some questions, which might be answered with further analysis, have not been address. For example the interaction and intercorrelation of the independent variables in the models could be further examined in depth. Further statistical analysis could also examine whether the mediating effect was from both maternal nutrition knowledge and infants’ food diversity, or whether infants’ food diversity or maternal nutrition knowledge alone exerts the effect.

Lastly, my limitations as a researcher, both in data collection and analysis, need to be considered. Being a mother and a nutritionist at the time of data collection, I was consciously aware of some of the issues the mothers were sharing than had I not been a mother and a nutritionist. But this did not lessen my desire to clearly hear what the women were saying. I may have had existing biases, and had to be careful to listen to the women and not after hearing a few words assume they had a similar experience to one I had had. Being a mother could also be a strength in this way. The structure of the questionnaire, largely closed questions, lessened the possibility that I could introduce any bias.

5.12 Summary

The overall objectives of the study are to describe the early feeding practices of mothers with 9 – 11 month old infants and to examine the ecological factors that are associated with the diets of 9 – 11 month old infants.

The majority of the mothers in the study were breastfeeding. However, the majority of the mothers exclusively breastfed only to three months, but the majority started

giving solids to their infants in the fourth to sixth month which is adherent to the current WHO recommendations.

A few mothers withhold giving some nourishing foods from their infants and more than one fourth of the mothers withholds giving nourishing foods from their infants when they are sick. However, these practices of the mothers were not associated with the infants' diet.

The mean iron intake of the infants was 1.8 mg/day that is inadequate at 12% of the RDA; there is a high risk for iron deficiency. Sixty one percent (60.8%) of the infants received iron supplementation for one month at 1 – 9 months of age.

Low iron intake was partially a consequence of the fact that meat, poultry, fish and iron fortified foods were provided in small amounts in the infants' diet and less than one half of the infants consumed these iron rich foods on the day of the recall. Infants' food diversity was positively associated with iron intake.

The conceptualized three levels of ecological environment appeared to have influenced the diets of the infants and some influence was mediated by the nutrition knowledge of the mothers and the infants' food diversity.

CHAPTER SIX

CONCLUSIONS, RECOMMENDATIONS, AND AREAS FOR FUTURE RESEARCH

6.1 Conclusions

The objectives of this study were:

- A. To describe the early feeding practices of mothers with 9 – 11 month old infants in Solana, Cagayan, Philippines.
- B. To examine the ecological factors that are associated with the diets of 9-11 month old infants in Solana, Cagayan, Philippines.

Specifically to answer the following questions:

1. What are the early feeding practices of mothers with 9 – 11 month old infants?
2. What is the level of iron in the diets of 9-11 month old infants? Is iron provided in sufficient amounts so that the risk of iron deficiency is low?
3. What family and child's characteristics and nutrition education activities are associated with infants' food diversity?
4. What family and child's characteristics and nutrition education activities are associated with infants' iron intake?
5. Is maternal nutrition knowledge and infants' food diversity associated with iron intake of the infants?

6. Is the relationship of family and child's characteristics and nutrition education activities with the infants' iron intake mediated by maternal nutritional knowledge and infants' food diversity?

The conclusions drawn from the results of the study are the following:

Ninety eight percent of the infants were breastfed. However the early introduction of fluids, the practice of withholding nourishing foods from the infants and the low iron intake of the infants could be a problem.

Nutrition education on the consumption of variety of foods in the municipality appears to be successful. Feeding children with variety of foods everyday and the inclusion of variety of foods in meal planning were important to the mothers. In addition majority of the infants scored good in the food diversity checklist.

The infants' food diversity was positively associated with the infants' iron intake. But the mean dietary iron intake of the infants was inadequate, at only 12% of the RDA, indicating that there is a high risk of iron deficiency. This may be partly due to the fact that meat, poultry, fish and iron fortified foods were provided infrequently in very small amounts in the infants' diet and not to many infants. Thus, the message of food variety is not enough. The message needs to include feeding the infants with substantial amounts of food in general and also of high iron foods.

The ecological model used assures that family, child and nutrition education activities assert an influence on the diet through association with infants' food diversity and maternal nutrition education. Analysis of the model found variables with clearest relationship include:

- Maternal educational attainment was significantly associated with the infants' food diversity and maternal nutrition knowledge.

- Maternal positive attitude to variety of foods was associated with infants' food diversity.
- Maternal attendance at bench conferences was negatively associated with the infants' iron intake. This was surprising because maternal attendance at bench conference was positively associated with maternal nutrition knowledge.
- The infants also played a role in influencing their diet. Infant boys were provided more variety of foods than were the infant girls. Boys also had higher kilocalorie intake than girls. Infants who were also older had higher iron intake compared to the younger ones.
- The infants' food diversity was associated with the infants' iron intake.

There was not a clear association of monthly family income with the infants' diet.

Overall the ecological model proposed accounted for 45.8% of variation in the infants' food diversity, and 31.9% in the infants' iron intake.

The maternal nutrition knowledge and infants' food diversity emerged as variables mediating the association of family and child's characteristics and nutrition education activities with the infants' iron intake. With maternal nutrition knowledge and infants' food diversity the associations between maternal educational attainment, maternal attendance at mothers' nutrition classes, child's age and the infants' iron intake were strengthened while the associations between family monthly income, maternal attendance at bench conferences and the infants' iron intake were weakened.

6.2 Recommendations

The municipal nutrition program of Solana has in place 5 impact programs to address the nutrition problems in the municipality. The factors found in this study to be associated with dietary intakes can be considered in implementation and future planning.

Nutrition education is one of the 5 impact programs in Solana and it aims to promote the adoption of desirable food and eating/feeding practices that ensure good nutritional well being. This program is conducted through mother's nutrition classes, individual health teachings, household teachings, and bench conferences. Mothers, pregnant and lactating women are prioritized in these activities. However, these activities were not seen to be associated with better diet, even though maternal attendance at bench conference was seen to lead to higher nutrition knowledge. The nutrition knowledge gained by the mothers from these activities was not implemented by the mothers or not in a way that was evident from the infants' iron intake. Below are some recommendations that could improve the implementation of these activities based on the results of the study.

- 1) The lack of a clear association of nutrition knowledge with the infants' food diversity and iron intake and the negative association of attendance at bench conferences with the infants' iron intake suggest that health and nutrition workers should also pay greater attention that nutrition knowledge learned by participants is practiced. Nutrition education therefore should not focus only on the transmission of information but more importantly address the situations under which this information will actually be applied in the home. This will require more frequent interaction between health and nutrition workers and program participants to assist them in using the nutrition information acquired. For example, while health and nutrition workers may be successful in informing the mothers of the benefits of feeding their infants with fortified food, they should also visit them in their homes to see if they have actually served these foods to their infants. Or during the mothers' visit to the health center, the mothers could be asked what were the foods they gave their infant today or

the previous day. Or once in a while health and nutrition workers could also monitor the availability of these fortified foods at the sari-sari stores (food shops) to guaranty that supply is available in the area.

Another way that the health and nutrition workers could be assured that the nutrition knowledge the mothers learned is practiced is that they should also ensure that the “knowledge” gained by the mothers includes practical ideas and then discuss the suggested practices with the mothers to see if the mothers think they are feasible. For example they could examine the practice of the recommendation to feed infants with meat, poultry and fish to increase their iron intake. If the mothers think that it is expensive, the health and nutrition workers may need to help women plan for it in their budget, or agree that it is not practical and offer alternatives.

2) Of concern is that attendance at nutrition education activities is not associated with a better diet, even though bench conference attendance seems to lead to higher nutrition knowledge. This suggests that there is a need to look at what is taught and how. Nutrition education can be more successful when it is based on existing beliefs and feeding practices of the mothers. A nutrition education component designed to give mothers credit for what they are already doing right with respect to infant feeding (like the high rate of breastfeeding, the timely introduction of solid foods, withholding “junk foods” to infants and the positive maternal attitude to variety of foods and meal planning) could be beneficial to the families. For example, before nutrition education sessions mothers could be asked to share their feeding practices. Health and nutrition workers would identify mothers with good practice before sessions, and asking them to share in the session. This would then open to a discussion when other mothers shared and the health and nutrition workers could build upon positive practices. To do this well the health and nutrition workers need training in group facilitation and listening and responding skills. Even mothers with “bad” practices need acknowledge their desire to do the best.

Of concern is the finding in this study that boys were provided with bigger variety and more foods than girls were. Health and nutrition workers should look into this practice of the mothers and include in their nutrition education activities the promotion of feeding both infant boys and infant girls the same nutritious foods and the same substantial amount to meet their needs for rapid growth and development.

The promotion of breastfeeding in the municipality is successful. However the promotion of exclusive breastfeeding should be intensified or perhaps a different approach to promote it needs to be implemented. The practice of the mothers of withholding nourishing foods from their infants needs special attention. The health and nutrition workers need to discuss this practice with the mothers and find how it actually affects what the child eats e.g. are other nutritious foods offered instead?

The majority of the mothers' said that the "nutritional needs" of their family is the most important factor they consider in meal planning. However, this was not seen to be associated with the infants' diet. The health and nutrition workers need to see how the mothers understand what is meant by the knowledge they have – for example, they prioritize "nutritional needs" of their family in meal planning. What are the "nutritional needs" they think are important and how do the mothers think they can meet these?

Nutrition Education should also intensify on the promotion of consumption of iron rich foods and iron fortified foods. Meat, poultry, fish, iron fortified noodles and iron fortified cereals were fed in small amounts and to only a few infants. The promotion of feeding infants with sources of heme iron such as meat, poultry and fish to infants should be intensified. This promotion should include information on the adequate amount of food to be fed to infants. However, meat, chicken and fish are expensive and some mothers may not afford it on a regular basis and these are also difficult to obtain regularly in the barangays. Chicken is easily raised in the families' backyards, but it was provided in small amounts and even if it is raised in the yard the infants could not have chicken very often to eat. It is therefore important that the use of iron

fortified foods (e.g. noodles, infant cereals) with the Sangkap Pinoy Seal (which are reasonably cheap compared to meat, poultry and fish) is intensively promoted to increase the iron intake of the infants. This promotion should also include information on the adequate amount of fortified foods to be fed to infants. It should also include information on the types/brands of foods that are fortified with iron. Health and nutrition workers should also ensure that these foods are available in the food shops in the barangays.

Iron fortified milk formulas contain much higher amounts of iron than breastmilk. However, iron is not the only nutrient that is needed by the infant. Iron fortified formulas do not give all the health and nutrition benefits breastmilk accords. Breastmilk is still the best for the infant. Hence, iron fortified formulas should not be promoted as a way of increasing iron intake of infants.

Iron supplementation is also one of the 5 impact program of the municipality to prevent iron deficiency and to maintain body stores when not enough iron rich foods are eaten. It was found that the infants' dietary iron intake were inadequate, iron supplementation should be provided to these infants until such time that their dietary iron intake improved.

Although a clear association of income with dietary intakes was not found it is expected that with an increase in income there is a corresponding increase in the quantity and quality of food purchased and consumed by the family (Gopalan et al., 1981). The provision of income generating projects is also one of the 5 impact programs of the municipality. It provides projects to poor families with malnourished children. It aims to augment the income to the families to enable them to increase their food intakes and cope up with food shortage. Income was found to be significantly associated with the infants' food diversity score and iron intake. Provision of small scale income generating projects by the Municipal Nutrition Committee to these low income families could help to augment their income. Income

with more information on iron rich foods, the infants' nutritional status might improve. Presumably with more money, they could buy more fish, meat, and chicken.

6.3 Areas for Future Research

The child invariably influences those who influence him/her and the mother's feeding decision is influenced by the child (Caliendo & Sanjur, 1978). In this present study the only influence of the child taken into consideration were age, sex, and birth position and it was found out that the age and sex of the child influenced the feeding decisions of the mother. It also came out from the study that the preference of the child is one of the factors mothers consider in planning meals. A more intensive study on the influence the child has on his or her diet would also be an interesting area for further research. If the mothers' decisions are seen to be influenced by the child this needs to be considered in nutrition education, information, and campaign.

It will also be useful to look into the biochemical iron status of the infants related to the effect of the one month iron supplementation on the infants' iron status and their dietary intake on a longer period. Looking into the effect of the one month iron supplementation on the infants' iron status would be a basis of making a decision as to whether just one month iron supplementation is an effective intervention in maintaining a normal iron status of the infants or if iron supplementation should be sustained until the iron intakes of infants from food sources increase.

6.4 Summary

The major objectives of this study are to describe the early feeding practices in Solana and to examine the ecological factors that are associated with the diets of 9 – 11 month old infants.

Breastfeeding appeared to be the common feeding practice among the majority of the mothers after giving birth. However, the practice of early introduction of fluids to the infants and the practice of withholding foods from infants could be a problem.

The iron intake of the infants was inadequate at only 12% of the RDA, indicating that there is a high risk of iron deficiency particularly among children who have not received any iron supplementation.

The infants' food diversity was associated with infants' iron intake. The higher the infants' food diversity scores, the higher the iron intake.

Factors associated with the infants' diet include maternal educational attainment, maternal attitude to variety of foods and child's sex and age. Attendance at nutrition education activities was not associated with higher iron intake of the infants. Although maternal attendance at bench conferences was associated with higher maternal nutrition knowledge, attendance at bench conference was seen to be associated with low iron intake among infants. Surprisingly there was not a clear association between family monthly income and the infants' diet.

Maternal nutrition knowledge and the infants' food diversity were found to mediate the relationship between infants' iron intake and family and child's characteristics and nutrition education activities.

The municipal nutrition program of Solana has in place several projects to address the nutrition problems in the municipality. The results of this study will help the Municipal Nutrition Committee to review the implementation of the existing nutrition projects for improved implementation. They could improve, modify and/or intensify (as recommended) implementation of projects that already exist or identify new appropriate interventions/innovations that could significantly improve the nutritional status of the children including their iron intake.

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APPENDICES

**Appendix A: Excerpts From Nutrition Information
And Education Materials¹**

¹Permission was granted for the materials to be reprinted

Breastfeed —

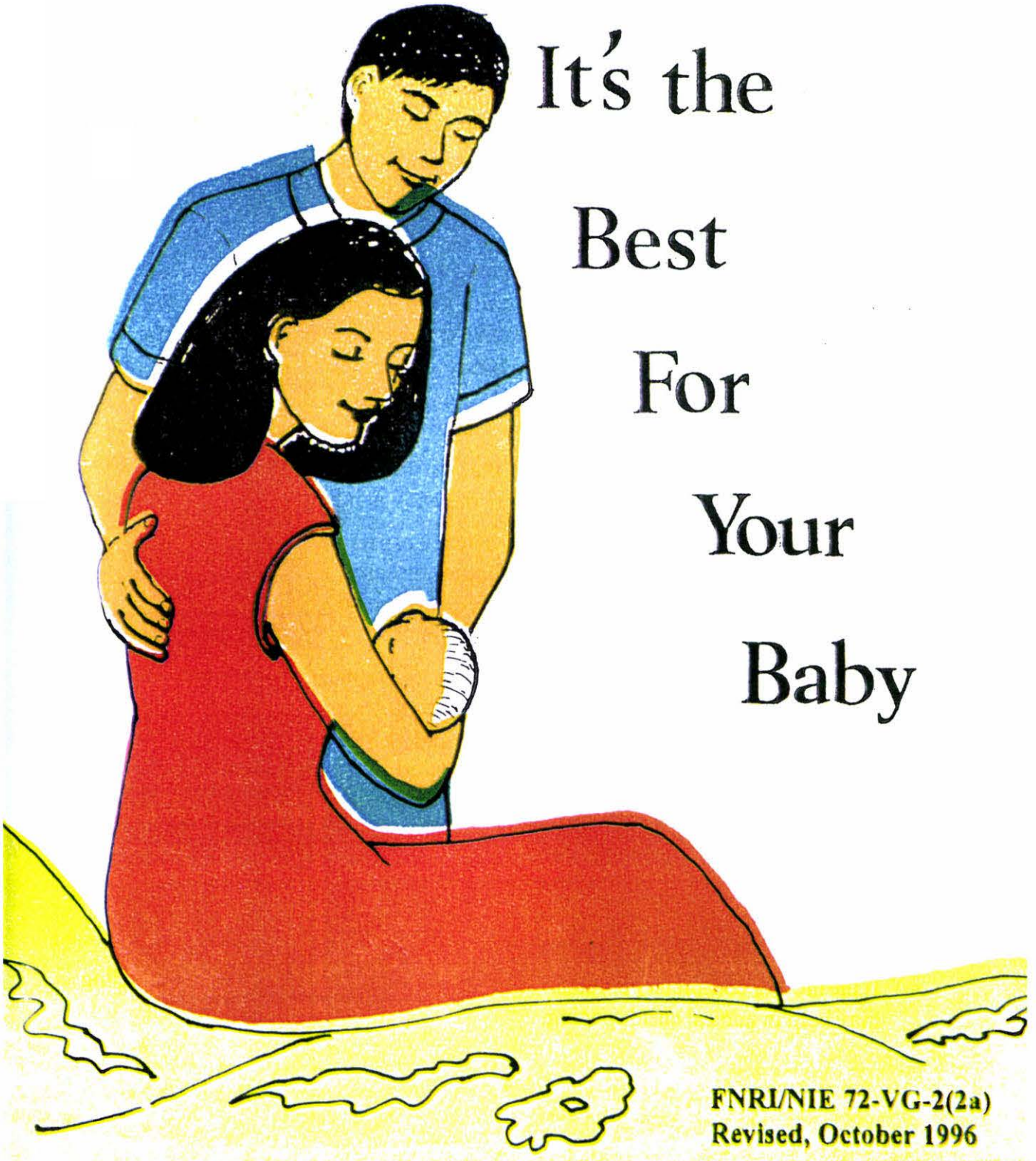
It's the

Best

For

Your

Baby



FNRI/NIE 72-VG-2(2a)
Revised, October 1996

WHY BREASTFEED?

- Mother's milk is the best single food babies can have during the first six months of life.
- It has the proper amount of all nutrients babies need to:
 - give their body heat and energy
 - make their muscles, bones, and teeth grow
 - have good eyesight and healthy skin
 - guard them from infection. Breastmilk does not cause allergy, rather it helps protect them from allergies.
 - keep their blood red and healthy
 - develop their brain cells
- It is clean and sanitary
- It is easier to digest than cow's milk.
- It is convenient for both mother and baby.
- It is economical. Canned milk is costly compared with the breast-milk.
- Colostrum, a thick yellowish fluid, is the first milk that is secreted by the breasts within the first three to four days after the baby is born. It has:
 - antibodies which make the newborn especially resistant to intestinal disorders and respiratory diseases.
 - a slightly laxative effect which clears the newborn's bowel of the dark green or blackish matter.
- Breastfeeding expresses a mother's love for her baby. It brings the mother and the baby closer together.
- It also helps the mother recover faster and the baby to adopt to the new environment faster.
 - Sucking of babies at the breast helps to form their teeth and palate, and assists in the development of their jaws.
 - The baby's sucking stimulates the uterus of the mother to contract and prevent post-delivery bleeding. This also helps the uterus to return more quickly to its normal size.
- If the mother completely breastfeeds during the first 4 to 6 months, breastfeeding may help in natural child spacing.

HERE'S HOW YOU CAN HAVE MORE MILK

Breastfeed properly:

- Breastfeed your baby as early as 30 minutes after normal delivery and 3-4 hours after caesarian delivery. Sucking will improve the flow of the milk later on even when there is little or no milk flow yet.
- Feed babies every 3-4 hours. Put them to breast if they show hunger and do not tire them from crying while waiting for the exact time to feed.
- At the next feeding, let your baby suck first on the last breast used in order to completely empty it of milk from the previous feeding. Sucking empties the breasts and stimulates more milk production.
- Breastfeed your baby day and night during the first months of life. Breastfeeding at night will prevent the breasts from becoming full in the early morning feeding making it difficult for the baby to suck.
- Your breasts can provide all the milk your baby needs anytime. On days when they are more hungry, they need only to suck. This will stimulate milk glands in the breasts to produce additional milk the baby needs each time the breast is emptied.
- If you have to work outside the home, keep on breastfeeding your baby just at the same time when you are at home. Pump out by hand your breastmilk into a clean glass or plastic container at the time of the missed feeding. Omitting this procedure will tend to dry the breasts as it is the complete emptying that stimulates milk production. The expressed milk can be kept in the refrigerator and fed to your baby the following day when you are outside the home.
- The more you breastfeed, the more milk will flow. In instances where it is not possible to breastfeed, handexpress your breastmilk to empty the breasts. This will stimulate more milk production.

Know and follow the **NUTRITIONAL GUIDELINES for FILIPINOS** to promote good health for yourself and your family. Below are the five basic messages to guide you:

1. Eat a variety of foods

This will make sure you are getting all the nutrients you need.

2. Promote breastfeeding and proper weaning.

This will ensure a healthy infant.

3. Achieve and maintain your desirable body weight.

This will ensure proper growth and development, help keep away heart disease and other chronic degenerative diseases.

4. Eat clean and safe foods

This will prevent food-borne illness in the family

5. Practice a healthy lifestyle

This will promote a long and enjoyable life

Prepared and Printed

by

Food and Nutrition Research Institute
Department of Science and Technology

for the

Philippine Plan of Action For Nutrition (PPAN)

If you want to know more about food and nutrition,
WRITE or CALL the:

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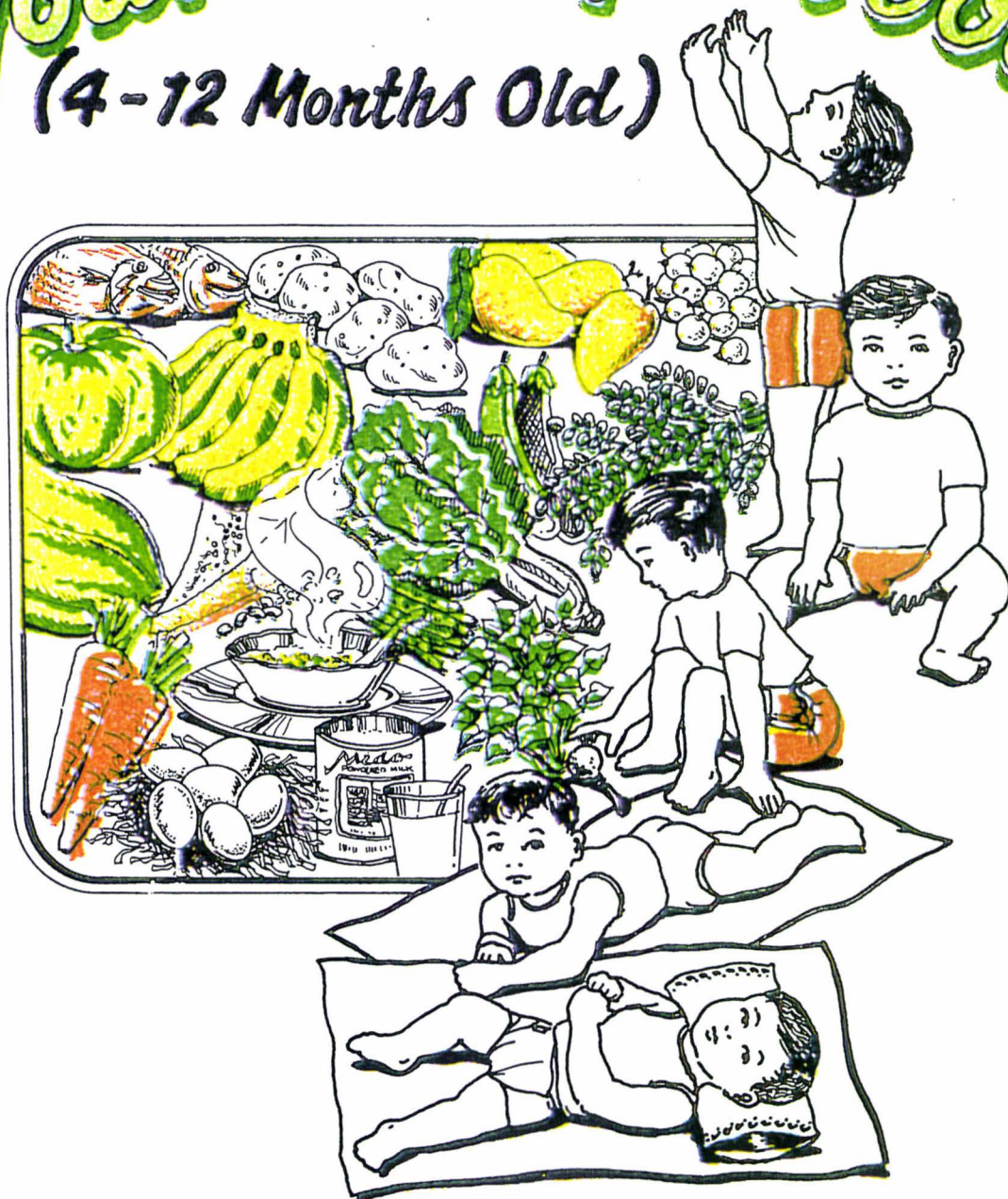
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Your Baby's Food

(4-12 Months Old)

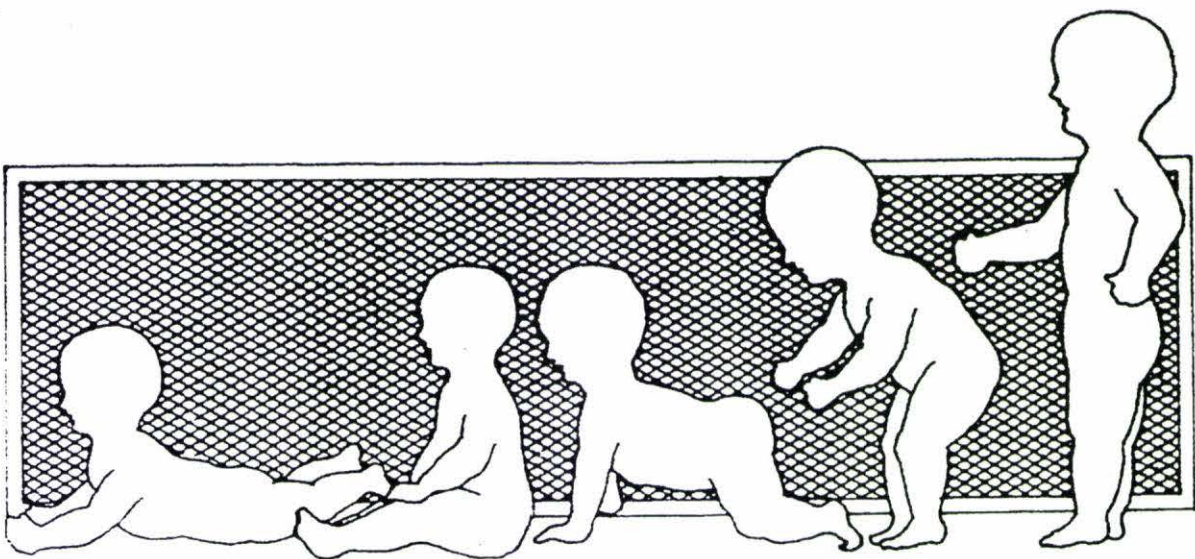


FNRI-85-VG-5
Reprinted, October 1986

Mother's milk is the best for your baby. But breastmilk alone cannot meet the baby's needs after six months. Earlier, at four months of age, start familiarizing him with the taste and texture of the other foods that he will eventually need for normal growth and development.

This pamphlet gives you tips on **WHAT, WHEN** and **HOW MUCH** food to give to your baby. It also suggests ways of introducing the additional foods through the daily family meals.

With proper feeding, your baby will grow healthy and strong, a pride and source of happiness to your family.



Make lugaw a good food for your baby. Add these foods one-at-a-time

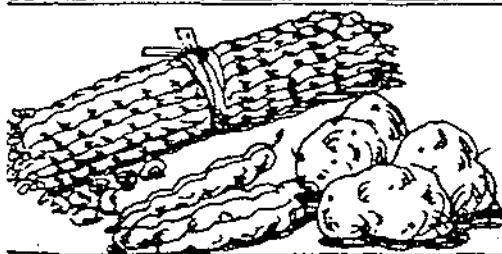


Banana (especially ripe latundan, at first), ripe papaya, mango and tiesa provide a variety of nutrients for good health. Mango, papaya, and citrus fruits like dalanghita are good sources of vitamin C which your baby needs to keep gums healthy, prevent easy bruising and help the body fight infection.



Green leafy and yellow vegetables like kamote tops, kangkong, malunggay, petsay, carrot and squash

* contain vitamins and minerals your baby needs for good eyesight, clear skin, glossy hair, good growth; keep away colds.



Other vegetables like *abitsuwelas*, *sitaw*, potatoes

* have added vitamins and minerals that promote growth and make the body fit.



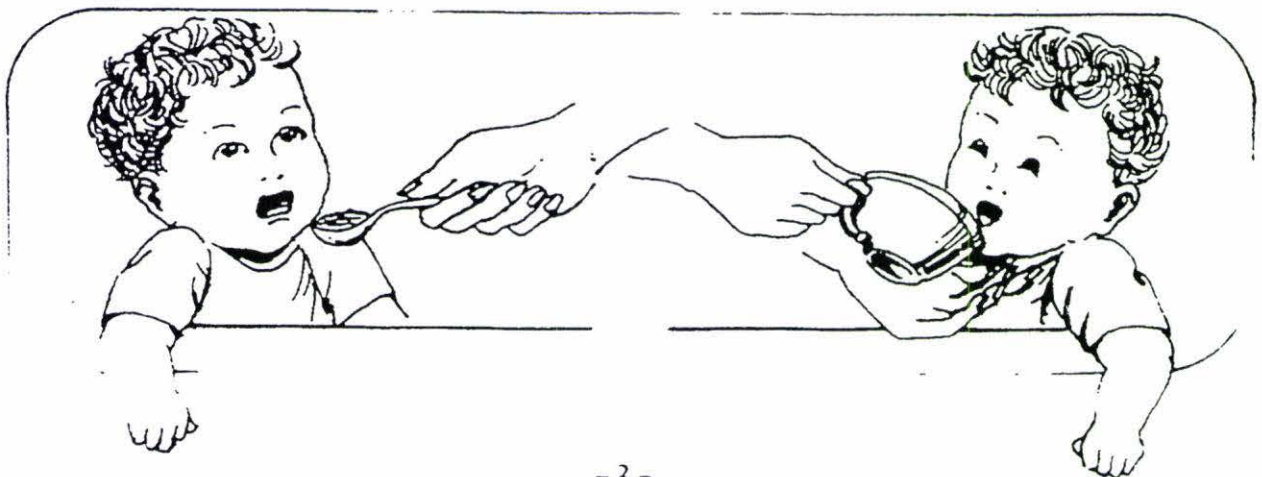
Eggs, fish, meat, liver, munggo, soybeans, garbanzos, peanuts

* are good body-builders that will help make your baby grow faster and healthier, build strong muscles, keep blood healthy and give body heat.

..... Also include other cereals like oatmeal, biscuits and boiled rootcrops, for more energy.

TIPS ON GIVING NEW FOODS

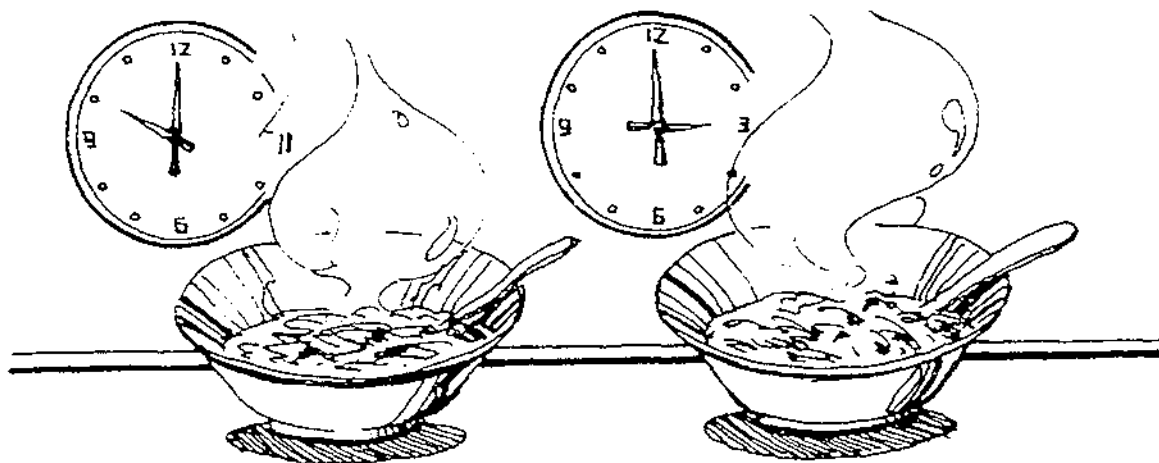
- After his fourth-month birthday, test the readiness of your baby to accept new foods by placing a teaspoon between his lips.
 - If he tends to close his lips or push the teaspoon away continuously, then he is not ready. Avoid forcing him to eat.
 - But if he accepts the food from a teaspoon, give liquid or semi-liquid foods first. Begin with thin *lugaw* and as your baby grows older, move on to thicker *lugaw* and then add, step-by-step mashed, chopped and thinly sliced foods
- Start any new food with much less than the amount indicated, and add gradually until you reach the recommended amount for his age on the subsequent days as your baby takes to the new taste
- Never start two new foods at the same time. Let the baby get used to a new food for about three days before trying him out on a new one.
- Show pleasure when giving a new food. This will make him like to eat a variety of foods.
- Give water between feeding to provide enough liquids, to remove waste from his body and to help regulate body functions.
- At about seven months of age, teach your baby to drink water and other liquids from a cup. Start by using a teaspoon and later a cup to avoid the use of a feeding bottle which is often the source of a baby's infection.



- Give finely chopped foods when your baby starts teething. *Biskotso* or any crisp toast is also good at this time.



- Offer bland foods to your baby.
 - Highly salted foods may injure his kidneys.
 - Too much sugar and sweets may develop in the baby a strong liking for these foods which may lead to tooth decay and obesity.
- Handle baby's food properly.
 - Wash hands with soap and clean water before handling baby's foods.
 - Dirty fingernails carry germs and eggs of worms which can cause worm infestation.
 - Use clean utensils and keep food away from flies and insects.
 - Boil liquids and cook food thoroughly.
- Feed baby only freshly cooked foods or fruits freshly peeled.
 - Avoid giving left-over foods to babies.
- If necessary, divide the recommended amount of supplementary foods listed on pages 5-6 into three or more feedings during the day at five months onward.



SUPPLEMENTARY FEEDING

When to give (Age in months)	Cereals ^{2/} (lugaw, oatmeal, boiled rice)	Fruits ³ (banana, papaya, mango, avocado)	Vegetables, Cooked (preferably leafy green & yellow veg)
4	5 Tbsp thin lugaw	2 Tbsp scraped or mashed	1 Tbsp veg. water in which green and yellow veg. were cooked
5	8 Tbsp thick lugaw	3 Tbsp mashed	1 Tbsp pureed ^{5/}
6	12 Tbsp thick lugaw	4 Tbsp bite-sized	2 Tbsp pureed
7	14 Tbsp thick lugaw	5 Tbsp bite-sized	3 Tbsp mashed
8	3/4 cup soft-cooked rice	5 Tbsp bite-sized	4 Tbsp mashed
9	3/4 cup soft-cooked rice	5 Tbsp bite-sized	4 Tbsp mashed
10	1 cup cooked rice	6 Tbsp bite-sized	4 Tbsp chopped
11	1 cup cooked rice	6 Tbsp bite-sized	4 Tbsp chopped
12	1 cup cooked rice	6 Tbsp bite-sized	4 Tbsp chopped

^{1/} This table suggests the kinds and amounts of food to supplement milk at specific ages, starting at age 4 months when the baby shows readiness. Introduce new foods one at a time at least three days apart.

^{2/} See recipes for preparing different types of lugaw and soft-cooked rice on p. 9

^{3/} Start with banana. Press with fork or spoon into a pulpy consistency. Give the other fruits (avocado last) as he grows older.

^{4/} Rub soft-cooked pulpy foods through a sieve to remove tough fibers for babies 4-6 months old.

^{5/} Prepare puree by rubbing soft cooked vegetables through a sieve/strainer.

FOR BREASTFEED INFANTS ¹

Egg ^{6/} (hard cooked)	Dried Beans, Cooked ^{7/} (munggo, peanuts)	Fish, Liver, Meat and Poultry ^{8/}	Fat ^{9/} (cooking oil, margarine)
—	—	—	—
1/2 yolk	1 Tbsp strained	—	—
1 whole yolk	2 Tbsp pureed ^{7/}	1 Tbsp flaked fish/ chicken or finely ground meat	2 tsp
1 whole yolk	3 Tbsp mashed	2 Tbsp flaked fish/ chicken or ground meat	2 tsp
1 whole yolk	3 Tbsp mashed	2 Tbsp flaked fish/ chicken or chopped meat	2 tsp
1 whole yolk	4 Tbsp mashed	2 Tbsp flaked fish/ chicken or chopped meat	2 tsp
1 whole egg	4 Tbsp mashed	3 Tbsp flaked fish/ chicken or chopped meat	2 tsp
1 whole egg	4 Tbsp whole	4 Tbsp flaked fish/ chicken or thinly sliced meat	2 tsp
1 whole egg	5 Tbsp whole	5 Tbsp flaked fish/ chicken or thinly sliced meat	2 tsp

^{6/} Egg yolk only should be given for additional iron. Egg white may cause allergy if given too early; 1/2 pc. chicken yolk is equivalent to 2 1/2 pc quail's yolk.

^{7/} Small amounts of milk and sugar may be added to boiled beans from the 6th to the 12th month.

^{8/} Powdered dilis or mini-shrimps can also be given in place of flaked fish or ground meat starting at 6 months of age.

^{9/} Fat may be incorporated in either sauteed or fried dishes for the baby.

MODIFICATION OF FAMILY ME
BREASTI

Sample Family Menu	4 months	5 months	6 months	7 months
BREAKFAST				
Papaya	2 Tbsp scraped papaya ^{1/}	1 Tbsp mashed papaya	1 Tbsp bite-sized papaya	1 Tbsp bite-sized papaya
Hard-Cooked Egg		1/2 yolk	1 whole yolk	1 whole yolk
Fried Fish			1 tsp flaked fish	2 tsp flaked fish
Boiled Rice	5 Tbsp thin lugaw ^{1/}	2 Tbsp thick lugaw	1 tsp fat 4 Tbsp thick lugaw	1 tsp fat 4 Tbsp thick lugaw
LUNCH:				
Munggo Gisado with Malunggay Leaves	1 Tbsp vegetable water ^{2/}	1/2 Tbsp strained munggo 1/2 Tbsp pureed vegetable	1 Tbsp pureed munggo 1 Tbsp pureed vegetable	1 1/2 Tbsp mashed munggo 1/2 Tbsp mashed vegetable
Sapsap Pinangat			1 tsp flaked fish	2 tsp flaked fish
Boiled Rice		3 Tbsp thick lugaw	4 Tbsp thick lugaw	5 Tbsp thick lugaw
Banana		1 Tbsp mashed banana	1 1/2 Tbsp bite-sized banana	2 Tbsp bite-sized banana
A.M. SNACK:				
Boiled Munggo with Milk & Sugar		1/2 Tbsp strained munggo ^{2/}	1 Tbsp pureed munggo ^{2/}	1 1/2 Tbsp mashed munggo ^{2/}
SUPPER:				
Pork Sinigang Pork			1 tsp finely chopped pork	2 tsp chopped pork
Kangkong, Radish, Eggplant, sitaw		1/2 Tbsp pureed vegetables	1 Tbsp pureed vegetables	1 1/2 Tbsp mashed vegetables
Boiled Rice		3 Tbsp thick lugaw	1 tsp fat 4 Tbsp thick lugaw	1 tsp fat 5 Tbsp thick lugaw
Mango		1 Tbsp mashed mango	1 1/2 Tbsp bite-sized mango	2 Tbsp bite-sized mango

^{1/} Preferably given all in one meal (mid-morning)
^{2/} Small amounts of milk and sugar may be added to boiled munggo starting at 6 months of age

Tbsp - Tablespoon
tsp - teaspoon

**FOODS FOR THE SUPPLEMENTARY FEEDING OF
THE INFANT 4-12 MONTHS**

8 months	9 months	10 months	11 months	12 months
Tbsp bite-sized papaya whole yolk	1 Tbsp bite-sized papaya 1 whole yolk	2 Tbsp bite-sized papaya 1 whole egg	2 Tbsp bite-sized papaya 1 whole egg	2 Tbsp bite-sized papaya 1 whole egg
tsp flaked fish	2 tsp flaked fish	1 Tbsp flaked fish	1 Tbsp flaked fish	1 Tbsp flaked fish
tsp fat Tbsp soft-cooked rice	1 tsp fat 4 Tbsp soft-cooked rice	1 tsp fat 5 Tbsp cooked rice	1 tsp fat 5 Tbsp cooked rice	1 tsp fat 5 Tbsp cooked rice
½ Tbsp mashed munggo Tbsp mashed vegetable tsp flaked fish	2 Tbsp mashed munggo 2 Tbsp mashed vegetable 2 tsp flaked fish	2 Tbsp mashed munggo 2 Tbsp chopped vegetable 1 Tbsp flaked fish	2 Tbsp whole munggo 2 Tbsp chopped vegetable 1½ Tbsp flaked fish	2½ Tbsp whole munggo 2 Tbsp chopped vegetable 2 Tbsp flaked fish
Tbsp soft-cooked rice Tbsp bite-sized banana	4 Tbsp soft-cooked rice 2 Tbsp bite-sized banana	5 Tbsp cooked rice 2 Tbsp bite-sized banana	5 Tbsp cooked rice 2 Tbsp bite-sized banana	5 Tbsp cooked rice 2 Tbsp bite-sized banana
½ Tbsp mashed munggo ^{2/}	2 Tbsp mashed munggo ^{2/}	2 Tbsp mashed munggo ^{2/}	2 Tbsp whole munggo ^{2/}	2½ Tbsp whole munggo ^{2/}
tsp chopped pork Tbsp mashed vegetables tsp fat Tbsp soft-cooked rice Tbsp bite-sized mango	2 tsp chopped pork 2 Tbsp mashed vegetables 1 tsp fat 4 Tbsp soft-cooked rice 2 Tbsp bite-sized mango	1 Tbsp chopped pork 2 Tbsp chopped vegetables 1 tsp fat 5 Tbsp cooked rice 2 Tbsp bite-sized mango	1½ Tbsp thinly sliced pork 2 Tbsp chopped vegetables 1 tsp fat 5 Tbsp cooked rice 2 Tbsp bite-sized mango	2 Tbsp thinly sliced pork 2 Tbsp chopped vegetables 1 tsp fat 5 Tbsp cooked rice 2 Tbsp bite-sized mango

EASY-TO-PREPARE BABY FOODS

You can easily prepare baby's foods from dishes cooked for the family. These are just as nutritious and much cheaper than the commercial ones in jars or in cans.

Here are some tips:

- Get vegetable water for your four month-old baby from the family dishes like *sinuwam*, *linaga* and other vegetable dishes.



- Prepare *lugaw* and soft cooked rice from already boiled family rice. Mix the following proportions and boil for the given time:

Final Product	Boiled Rice	Water	Boiling Time	Total Yield
Thin Lugaw (for 4 mos. old babies)	1/2 Tbsp	1/2 cup	10 mins.	About 5 Tbsp
Thick Lugaw (for 5-7 mos. old babies)	4 Tbsp	3/4 cup	10 mins.	About 12 Tbsp
Soft-cooked rice (for 8-9 mos. old babies)	3/4 cup	3/4 cup	5 mins.	About 1 cup

- By ten months your baby may share the family rice.

HOW TO CHECK IF YOUR CHILD IS GETTING THE RIGHT FOOD

Measuring your baby's growth is one way of checking his health and the quality of his nutrition. Growth is assessed in different ways. Body weight is the most simple, and in children, change in weight is the more reliable indicator of growth. Healthy babies double their birth-weight in 5 months and triple by 12 months. Height (or length) is another measurement of growth. Healthy babies almost double their birth-height in 12 months.

Below is the table on the recommended weight and height for use among Filipino children from birth to 12 months to give you an idea of how they should weigh and progress in length. To use it, get your baby's birthdate. The age given below applies to the age in months as of in last birthdate. Thus a child born on January 4th is two months old on April 3rd and becomes three months old on April 4th.

Recommended Weight (kg) and Height (cm) of Filipino Children from Birth to 12 Months of Age*

Age as of last birthdate (month)	Weight (kg)	Standard Height (cm)	
		Boy	Girl
0	3.2	—	—
1	3.9	57.0	55.9
2	4.6	61.2	60.0
3	5.2	63.6	62.4
4	5.8	65.7	64.4
5	6.3	67.7	66.0
6	6.6	69.2	67.6
7	7.2	70.8	69.1
8	7.7	72.3	70.4
9	8.1	73.8	71.7
10	8.4	75.0	72.8
11	8.7	76.6	74.0
12	9.0	77.5	75.0

*Based on 1983 FNRI Anthropometric Studies

More tips on good nutrition . . .

Attend to the food needs of your infant and pre-school children first before serving the other members of your family.

A sick child needs enough nourishment to make him fight infection. Feed him with soft, nutritious foods like fish, beans, eggs, milk, vegetables and fruits. Consult a doctor for further advice.

Weigh your child to check his health. Weigh every month to follow up growth.

Eat a variety of foods everyday. No single food can supply all nutrients the body needs.

Make green, leafy and yellow vegetables and fruits a must in your daily meals.

If you are a pregnant or a nursing mother, eat more body-building foods like fish, beans and eggs and regulating foods like green and yellow vegetables, vitamin C-rich foods and other fruits and vegetables.

Prepared and Printed

by

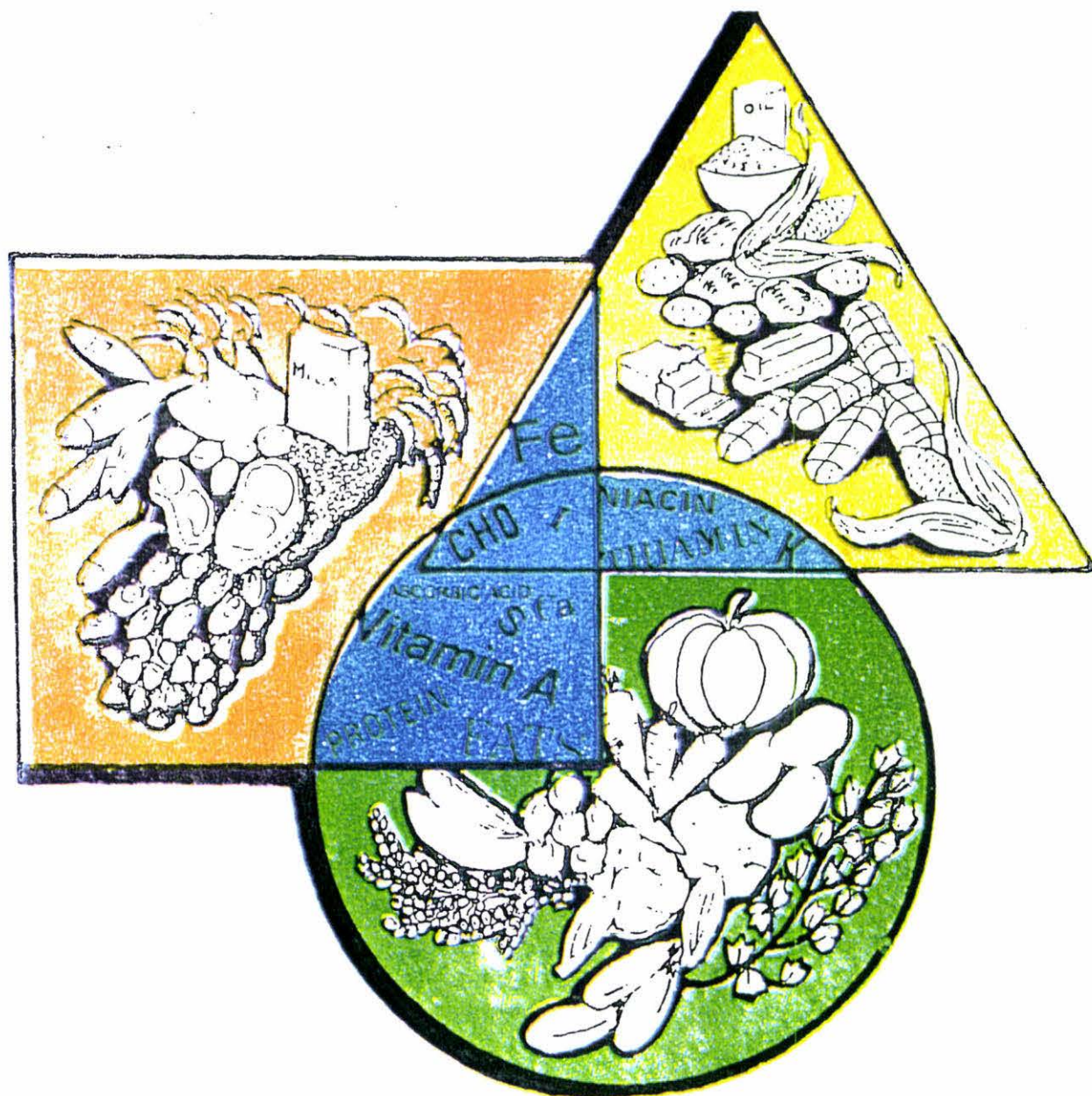
FOOD AND NUTRITION RESEARCH INSTITUTE
National Science and Technology Authority

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YOUR KEY NUTRIENTS

(FUNCTIONS AND IMPORTANT SOURCES)



FNRI/NIE 53-BN 1 (8)
Reprinted, September 1996

FOREWORD

This handbook is primarily intended for the use of professional groups and/or community workers, particularly teachers and extension personnel involved in nutrition work.

The publication is a pictorial presentation of food sources of key nutrients essential to good nutrition. It is a revision of our previous material entitled, "Some Essential Food Nutrients." Users will find this a handy reference especially in teaching basic nutrition. An added feature is the Nutritional Guidelines for Filipinos which contains the first basic messages to promote good health through proper nutrition. Said "Guidelines" seek to provide the general public with recommendations about proper diet and wholesome practices. Also added are the newly developed dietary guidelines for the prevention of cancer including those on heart diseases and diabetes mellitus.

It is hoped that the new presentation will make possible a more effective use of this material as a teaching tool.



RODOLFO F. FLORENTINO, MD., Ph.D.

Director

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What Foods Do For You

Food nourishes your body in three ways: First, it supplies energy for body activities. Second, it provides materials that build and repair body tissues. Third, it provides substances that regulate the functions of your body.

Food contains nutrients that perform these functions. No single food can supply all the nutrients your body needs. You should eat a variety of foods everyday to get all the needed nutrients.

Your key nutrients are grouped into three types. **Macronutrients** are those which are present and needed in large amounts such as the carbohydrates, protein, and fats. **Micronutrients** such as the vitamins and minerals are present in smaller amounts. **Water** though normally not thought of as a nutrient, is a basic component of all foods, and is essential to life. Each type has specific functions, e.g. the macronutrients provide energy and protein and help maintain and repair the body; vitamins regulate the chemical processes that take place in the body; minerals assist with this, and play a role in body maintenance as well, notably in the formation of new tissues, including bones, teeth, and the blood; water provides a fluid medium for all chemical reactions in the body, and for the circulation of blood and removal of waste; it is a lubricant, and plays a critical role in regulating body temperature.

Macronutrients:

- **Carbohydrates** are your most important source of energy. They are the most efficient fuel for the body because they can be broken down to produce energy almost instantly. You need to eat the recommended amounts of carbohydrate-rich foods everyday to get enough energy for work and play. If your intake is adequate for your body needs, protein will be saved from being used as a source of energy. Protein can then perform its more important role of body-building. The two types of carbohydrates are the simple and the complex. Simple carbohydrates are the sugars while complex carbohydrates are the starches which we can get from cereals and cereal products.

- **Protein.** Everybody needs protein to build new tissues and repair worn out ones and maintain them. Some people need more protein per unit of body weight than others. This is because they need additional materials for growth. Children need more protein-rich foods in their daily meals for optimum growth. Likewise, pregnant women and nursing mothers and the elderly need more protein for building and repairing tissues.

- **Fat** is your concentrated source of energy although not as readily available as in carbohydrates. Besides its important role of supplying heat and energy for your daily activities, fat helps your body make use of fat-soluble vitamins A, D, E, K. Fat also adds to the flavor and satiety value of food because it stays longer in the stomach than carbohydrate or protein.

Micronutrients:

Vitamins are substances you need only in small amount but which the body cannot produce. These have to be supplied daily by the diet. These are grouped into: *fat-soluble vitamins* which include vitamins A, D, E, and K; *water soluble*, which include the B-vitamins and ascorbic acid or vitamin C. They work together in the body, each one performing a specific function. The body stores fat-soluble vitamins for relatively long periods of time (usually in the liver and in fat-tissues) while water-soluble vitamins are stored in various tissues, remain in the body for only a short time and so need to be replenished frequently.

Minerals are those elements which remain largely as ash when food materials are burned in your body. They are important for growth and normal functioning of your body. The nutritionally important minerals are calcium, phosphorus, iron, and iodine.

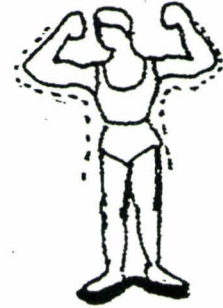
These nutrients work together in the body as a team. Therefore, you must eat enough of the foods that provide these nutrients for optimum growth and health. "YOUR GUIDE TO GOOD NUTRITION" will help you select the right kinds of food that contain these essential nutrients.

MACRONUTRIENTS

CARBOHYDRATE

Carbohydrate is your main source of energy:

- Supplies energy to the body
- Takes part in building body tissues to some limited extent



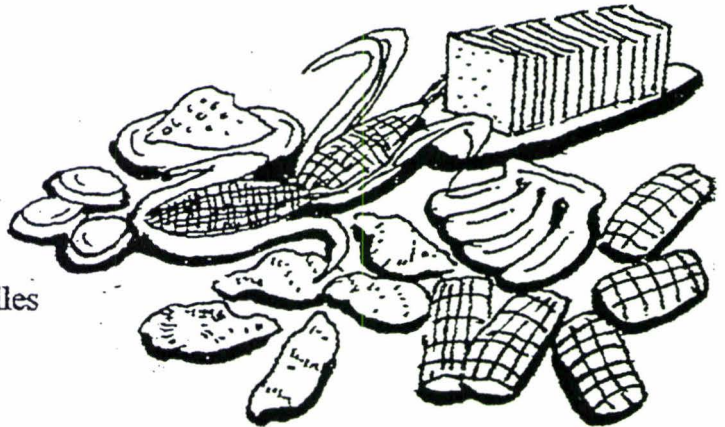
Lack of carbohydrate results in:

- Underweight and/or loss of weight
- General weakness
- Poor physical performance
- Fainting or collapse, in severe deficiency

Your rich sources of carbohydrate are starches and sugars:

Starches:

- Rice and Rice Products
(*puto, suman, kutsinta, etc.*)
- Corn and Corn Products
- Other Cereals
- Bread and Other Bakery Products
- Rice Flour (*bihon*) and Other Noodles
- Starchy Roots and Tubers
(*kamote, gabi, ubi, etc.*)
- Bananas



Sugars:

- Table Sugar
- Fruits, Molasses, Jams
- Preserves, Jellies, Candies

Recommended daily servings for a normal adult:

- Rice 5-7 cups, cooked
- or Corn 6 2/3 - 9 1/4 cups, cooked
- or Rice-Corn Mix 5-7 cups, cooked
- and Rootcrops 1 small piece
- and Sugar 5-9 level teaspoons

"Eat kamote and other rootcrops everyday for energy at work and play"

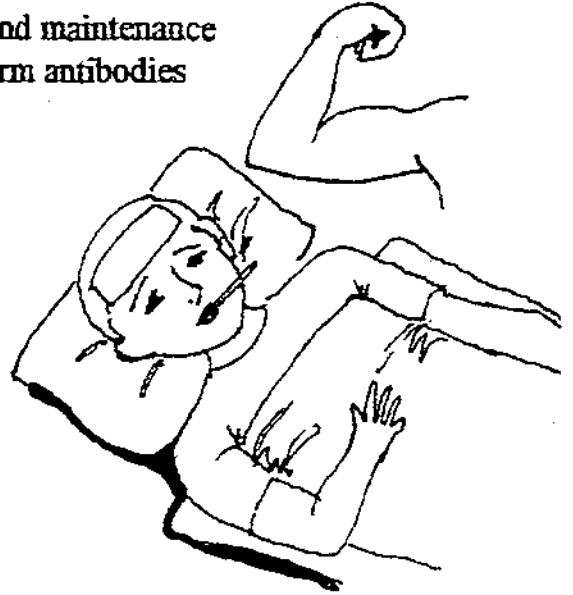
PROTEIN

Protein is your body builder

- Builds and repairs body tissues for growth and maintenance
- Builds resistance to infections by helping form antibodies
- Supplies additional energy
- Maintains water balance

Lack of protein results in:

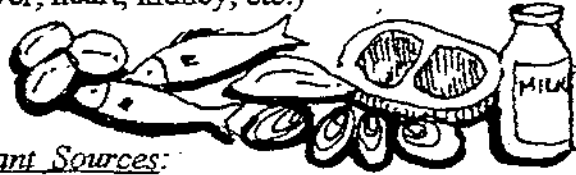
- Retarded growth in children
- Low resistance to infection at any age
- Slow recovery from illness
- Low birthweight
- Anemia
- Loss of weight
- Edema, skin lesions, mental sluggishness



Your rich sources of protein are:

Animal Sources:

- Meat (lean), Internal organs (liver, heart, kidney, etc.)
- Chicken, Eggs
- Fish, Shellfish
- Milk and Milk Products



Plant Sources:

- Munggo and Other Dried Beans
(garbanzos, tokwa, etc.)
- Nuts (peanuts, etc.)



Recommended daily servings for a normal adult:

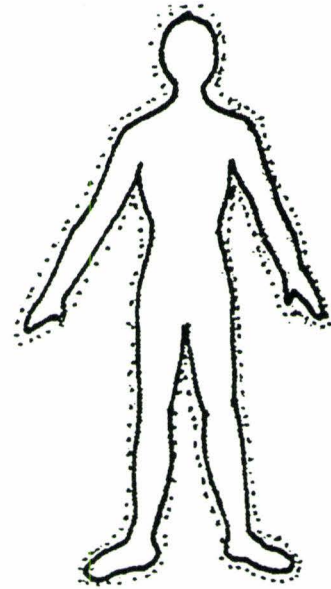
- Fish 1 3/4 - 2 servings,
one serving = 2 medium-sized fish, about
16 cm long or 55-60 gm. each as purchased
or about 3 cm cube cooked lean meat, 30 gm
or 2 medium-sized eggs, 50 gms each
or 1 1/2 cups cooked dried beans
- and Dried Beans/Nuts 1/2 cup, cooked
- and Eggs 1/2 piece

*"These foods make your muscles firm & strong
keep you active all day long"*

IRON

You need iron to:

- Help build and maintain blood supply and give healthy red color to the blood
- Prevent simple anemia



Lack of iron results in:

- Nutritional anemia
- Fatigability
- General weakness
- Poor physical performance
- Pallor in the face, conjunctiva, lips and fingernails
- Weight loss

Your rich sources of iron are:

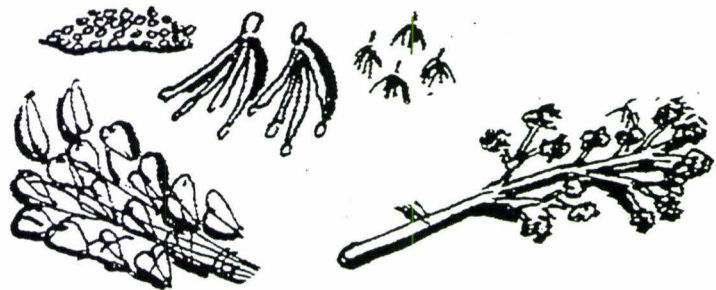
Animal Sources:

- Liver (pork & beef)
- Fish (dried fish, shrimp and salted fermented fish)
- Tahong, tulingan*
- Chicken blood



Plant Sources:

- Munggo (pula)*
- Balbalulang*
- Kintsay, tsina*
- Kasubha*
- Kulitis*
- Sabitan (dahon)*
- Saging bulaklak (dried)*
- Saluyot*



Normal healthy adult males need about 12 mg of iron everyday while adult females need more than twice this amount (26 mg). However pregnant women need much more (41 mg) and lactating mothers need less (23 mg)

***"Healthy red blood will keep you going
so fish, meat and dried beans you should be eating"***

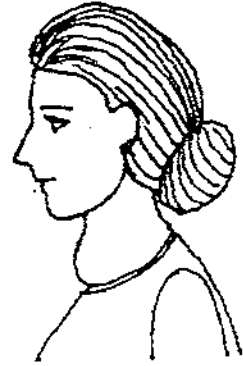
IODINE

Iodine is the nutrient which:

Helps in the normal functioning of the thyroid gland in regulating energy metabolism
Prevents simple goiter

Lack of iodine results in:

- Enlarged thyroid gland at the front neck
- Painful swallowing
- Endemic cretinism (mental and physical retardation accompanied by irreversible hearing and speech problem)
- Increased risk of abortion, stillbirths, miscarriage and infant deaths



Your rich sources of iodine are:

Animal Sources:

Fish and Shellfish

Salt water fish:

Maya-maya, dilis, bisugo, tamban

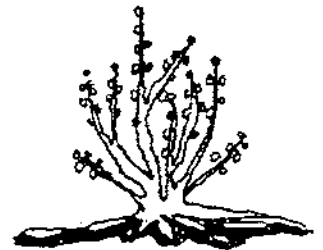
Shellfish:

*Kuhol
Alimango
Tahong
Alamang
Susong pilipit
Tagunton
Talaba
Ararosep
Pokpoklo*



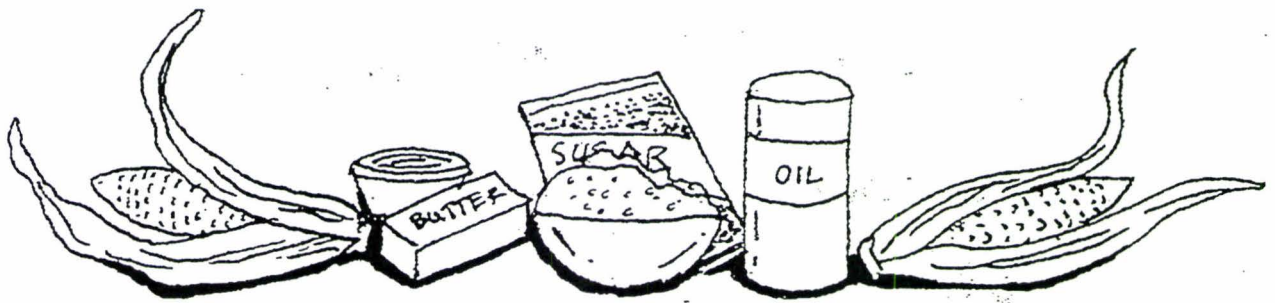
Plant Sources:

Dried: *Gulaman Dagat
Kulot*
Fresh: *Lato
Kulot
Balbalulang
Gamet*



Normal healthy adults need from 100 to 120 ug iodine while pregnant women need 125 ug and nursing mothers need 150 ug.

**"Keep goiter away
Eat seafoods regularly"**



Your Guide To Good Nutrition

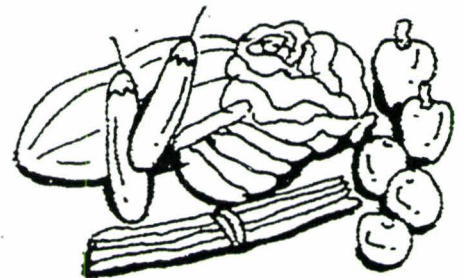
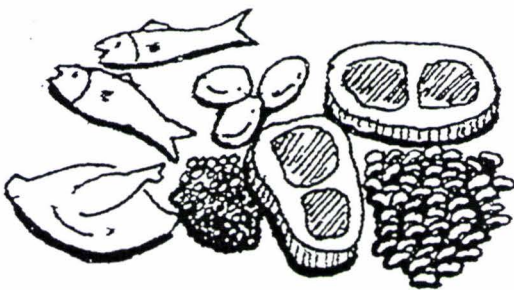
An easy-to-use tool to determine what foods to eat is "Your Guide to Nutrition" shown next page. This Guide suggests amounts of the different food groups that we need to maintain health. Foods within the group have similar nutritive values and may be substituted for one another. Use this Guide to plan, select and prepare adequate meals for your family.

The **energy foods** are rice and other starchy foods including sugar and fat-rich foods as oil, butter, margarine. In addition, because of the bulk eaten, rice becomes an important source of protein in the Filipino meals.

The **body-building foods**, i.e. fish, meat, poultry, egg, and dried beans are important for their protein. These foods also contribute iron and B-vitamins.

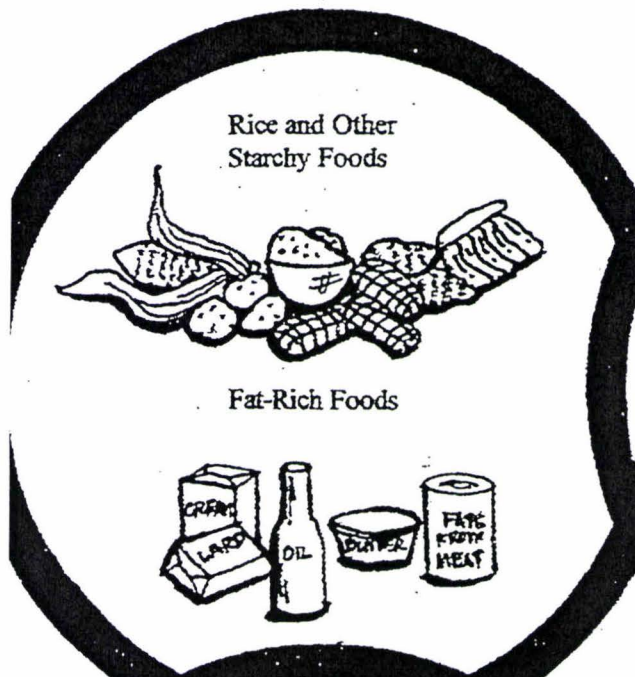
The **regulating foods**, i.e. vegetables and fruits, are valuable sources of vitamins and minerals. In the Guide, the sub-group on leafy green and yellow vegetable is counted on to supply most of the vitamin A value in the Filipino meal. Fruits particularly *dalanghita*, *atis*, cashew and guavas are relied on to supply a large share of the vitamin C needs for the day. The other fruits and vegetables, i.e. banana, stringbeans, eggplant, provide some amounts of vitamins and minerals as well as bulk and roughage in the diet.

The table on page 25 gives the average amounts of various foods needed daily by normal healthy Filipinos.

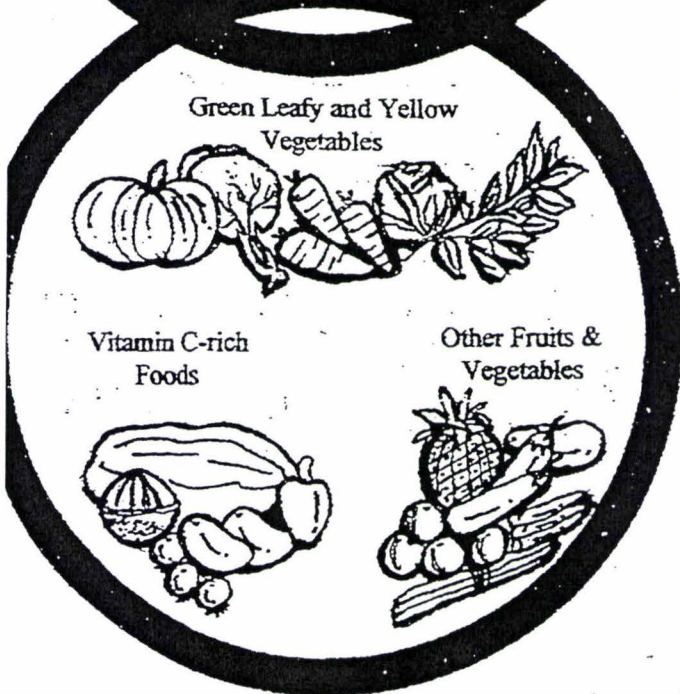
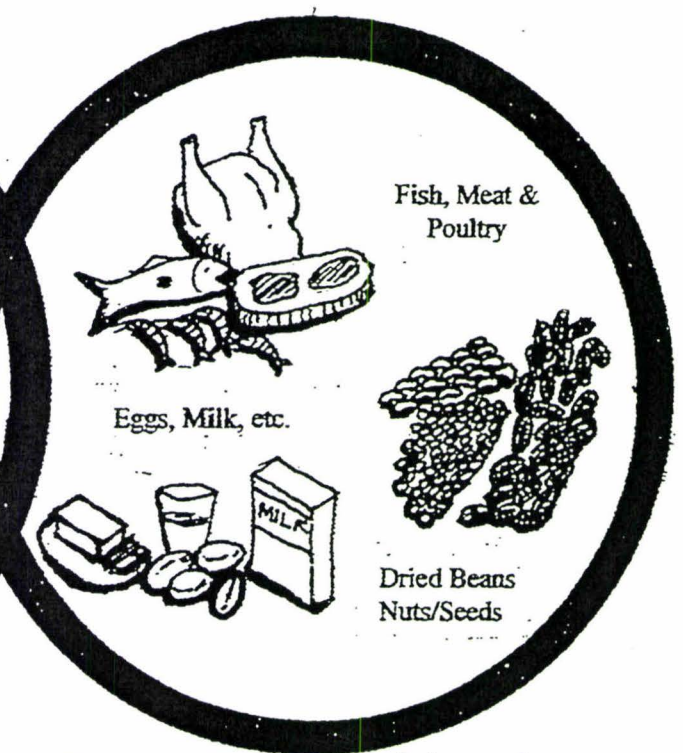


YOUR GUIDE TO GOOD NUTRITION

ENERGY FOODS



BODY-BUILDING FOODS



EAT
THE
RECOMMENDED
AMOUNT FROM
EACH GROUP
EVERYDAY!

REGULATING FOODS

Developed by the
Food & Nutrition Research Institute
Department of Science & Technology

Prepared and Printed

by

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Department of Science and Technology

for the

PHILIPPINE PLAN OF ACTION FOR NUTRITION (PPAN)

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Appendix B : Map of the Philippines

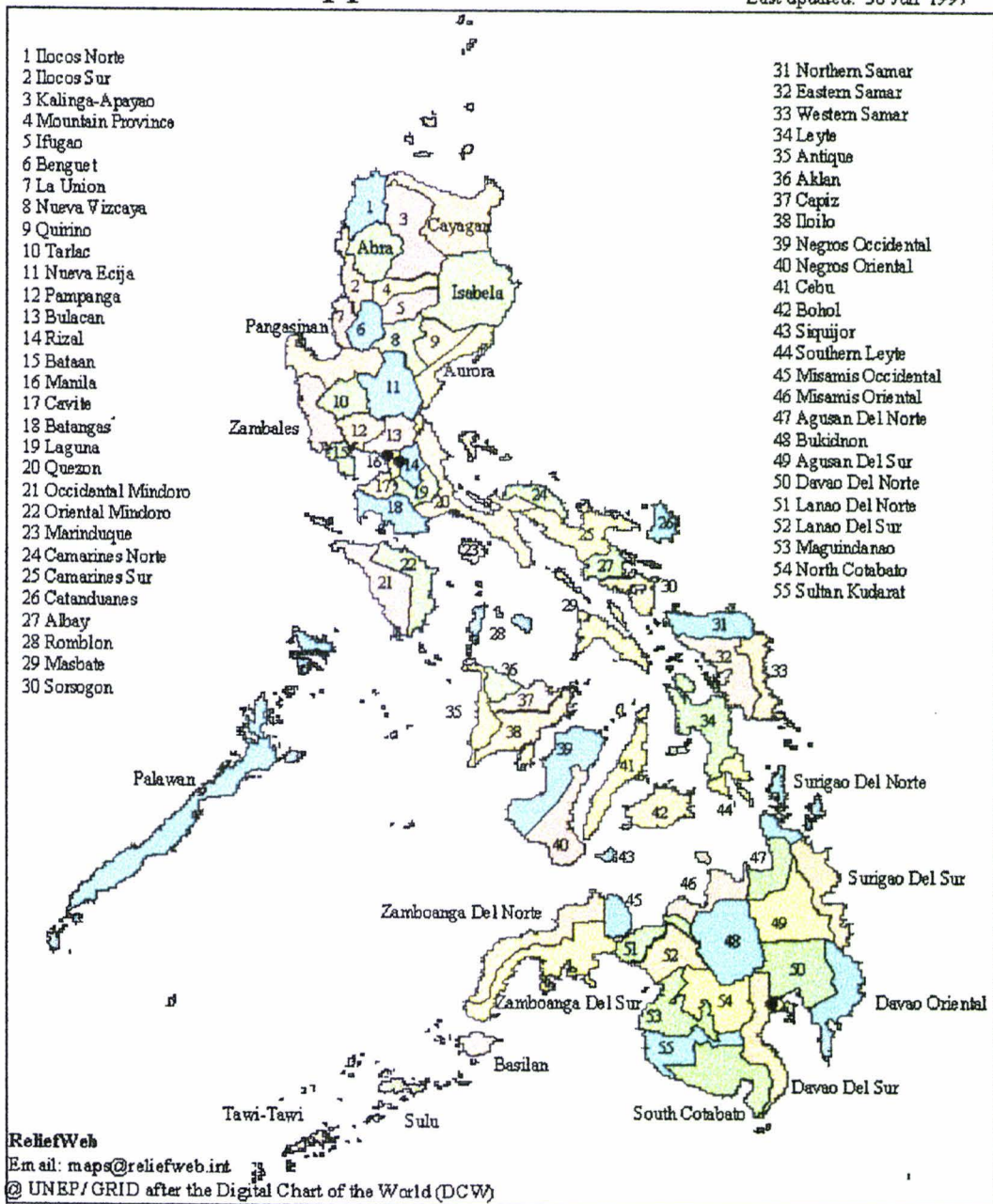
MAP OF THE PHILIPPINES



Appendix C : Map of Philippine Provinces

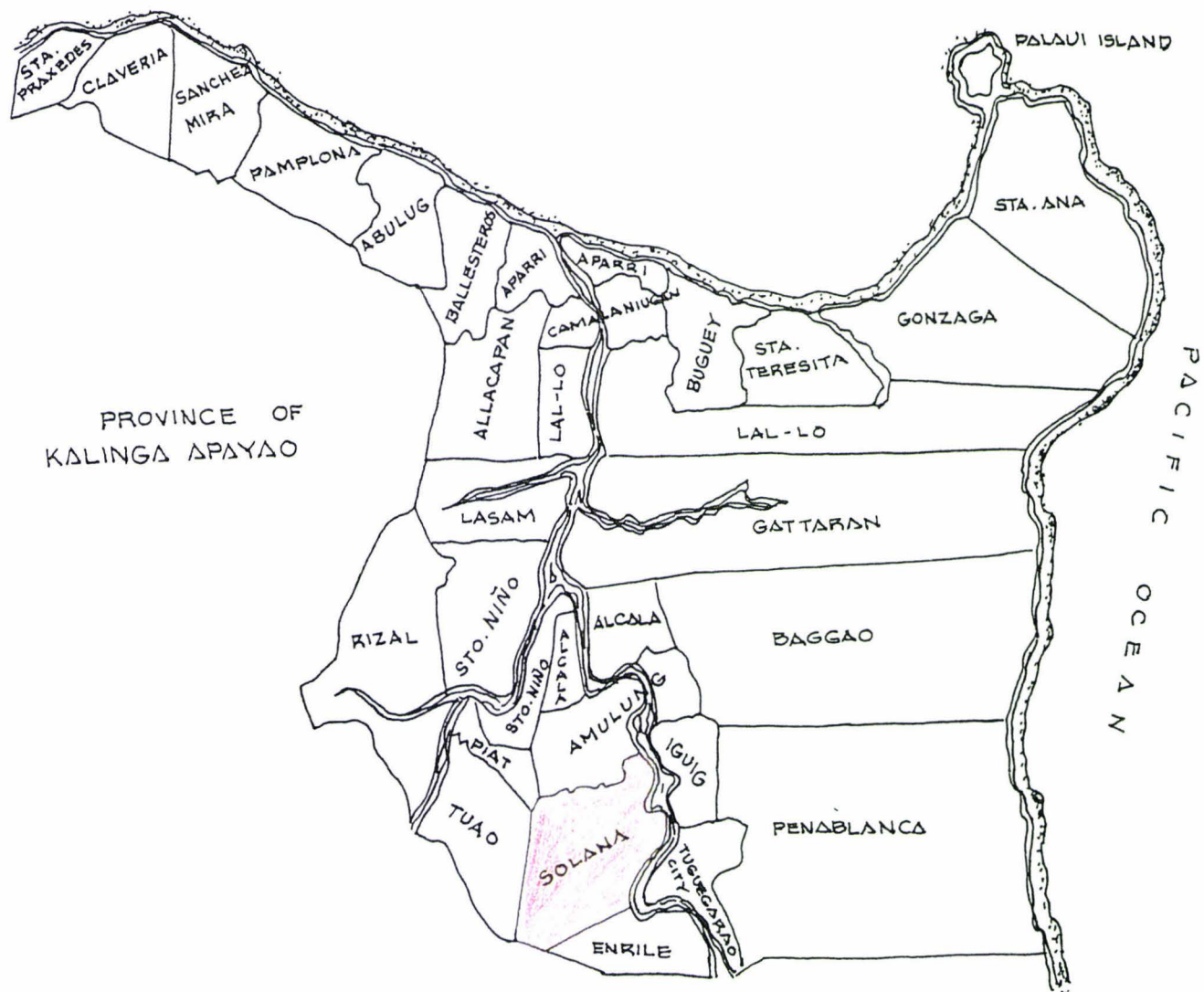
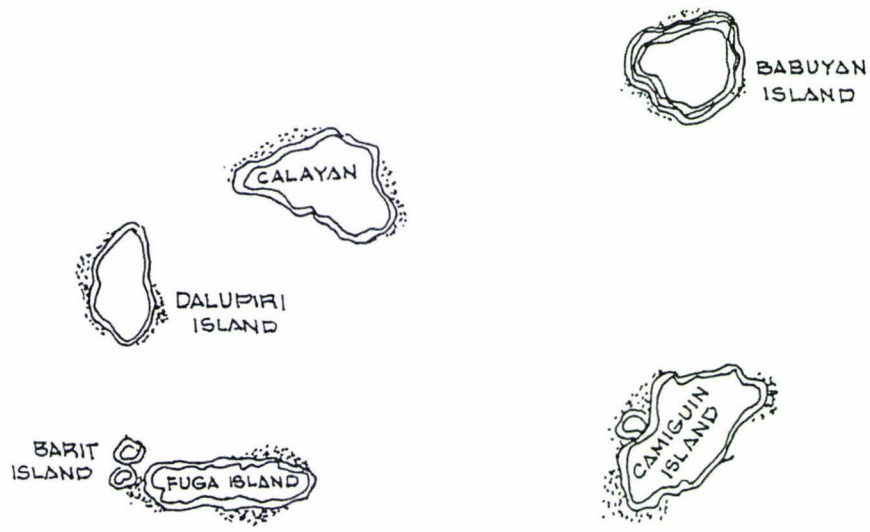
Philippines Provinces

Last updated: 30 Jun 1997



The boundaries and names shown on this map do not imply official endorsement or acceptance by the United Nations or ReliefWeb. These maps may be freely distributed. If more current information is available, please update the maps and return them to ReliefWeb for posting

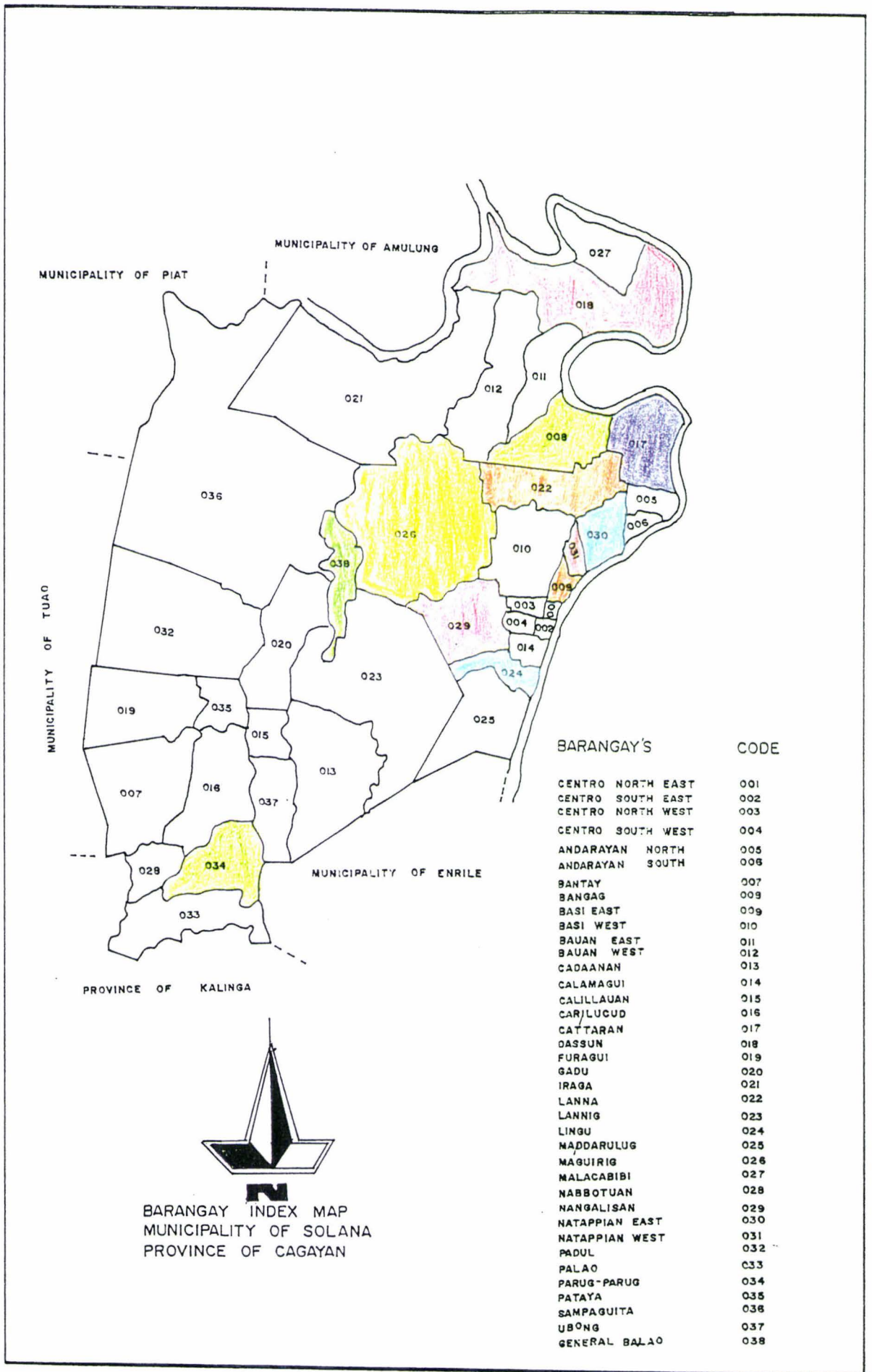
Appendix D : Map of Cagayan



MAP OF CAGAYAN

(SOURCE: PROVINCIAL ASSESSOR'S OFFICE, CAGAYAN, PHILIPPINES)

Appendix E: Map of Solana



(SOURCE: PROVINCIAL ASSESSOR'S OFFICE, CAGAYAN, PHILIPPINES)

Appendix F: Photos from Solana



Jeepney – means of transportation to and from the town proper to the other barangays of Solana and to and from other municipalities of Cagayan



Calesa (a horse drawn cart) – means of transportation at the town proper and to and from the town proper to adjoining barangays



Municipal Town Hall of Solana, Cagayan



Rural Health Unit of Solana, Cagayan



Barangay Health Station of Basi East. Also in the picture are the barangay officials, the midwife and volunteer nutrition and health workers of the barangay



Nutrition Guidelines posted in a Barangay Health Station



Fish and Meat Sold at the Public Market





**Legumes/Beans, Fruits and Vegetables and other Food
Stuffs sold at the Public Market**





The researcher explaining to the mothers about the research and consent form



Appendix G: Information Sheet



**MOTHERS' EARLY FEEDING PRACTICES AND THE ECOLOGICAL
FACTORS THAT ARE ASSOCIATED WITH IRON INTAKES
OF 9-11 MONTH OLD INFANTS IN SOLANA, CAGAYAN, PHILIPPINES**

INFORMATION SHEET

You are invited to participate in a personal interview in a study of infant feeding practices. The study will examine the factors that influence the diet quality of 9-11 months infants in your municipality. You have been randomly picked from the general list of mothers with 9-11 months infants provided by the Barangay Health Stations.

If you chose to participate in this study you would be interviewed for about 30 minutes. In that interview you would be asked about your experiences with feeding your youngest child. You would also be asked about the foods and drinks you are giving your baby and the factors that influence what you feed him/her.

I am Maria Gisela Lonzaga and the researcher of the study. I am presently studying for a Master of Science in Nutritional Science at Massey University, Palmerston North, New Zealand. My supervisor in this research is Dr. Janet Weber and she could be contacted at the Institute of Food, Nutrition and Human Health, Massey University, New Zealand.

Mrs. Magdalena Lara and Mrs Fe Soriano from the Provincial Nutrition Committee will assist me in carrying out interviews.

Permission to conduct this research has been received from Mayor Rodrigo de Asis and Dr Anastacia Taguba. The Provincial Nutrition Committee, and the Municipal Nutrition Committee through the midwives and Barangay Nutrition Scholars (nutrition volunteer workers) will provide their support and assistance to me in conducting this research.

All your responses will be confidential. Your name will not appear in the results. Neither your participation nor non-participation in this research will affect the level of care and assistance you are currently receiving from the Barangay Health Station.

You could discuss your participation with your family or friends. If you have any questions or you want more information on your participation in this interview, please contact me at these telephone numbers 884-0481 or 844-0043 and I would be very happy to speak to you. Or you may contact my advisor Dr Janet Weber at this telephone number (0064) 350-4403 or at her email address J.L. Weber @ massey.ac.nz.

I or one of my assistants will visit you in one week to see if you are willing to participate.



The results of the survey will be presented in my Master of Science thesis.

The Municipal Health Office will be provided a final copy of the thesis. I hope that the results of the research will provide information to support infant feeding and nutrition in your municipality and our province as a whole. I will be glad to provide you with a summary of my findings should you wish.

MARIA GISELA LONZAGA

Appendix H: Consent Form



**MOTHERS' EARLY FEEDING PRACTICES AND THE ECOLOGICAL
FACTORS THAT ARE ASSOCIATED WITH IRON INTAKE OF
9 -11 MONTH OLD INFANTS IN
SOLANA, CAGAYAN, PHILIPPINES**

CONSENT FORM

1. I have read the Information Sheet, and the details of the research and the interview has been explained to me. My questions have been answered to my satisfaction, and I understand that I may ask further questions at any time. I understand that I may interrupt or shorten the interview if I need to attend to my baby, family or for any other reason.
2. I understand that the confidentiality of the information is guaranteed and in situation where the discussion touches on matters I consider extremely personal or sensitive I may request that such material not be used in any form of publication.
3. I agree to provide information to the researcher on the understanding that my name will not be used without my permission.
4. I understand that the interviewer's role is restricted to obtaining information and that she is not in a position to provide advice and information on infant feeding.
5. I agree to participate in this interview to be conducted at my residence.

Signed: _____

Name: _____

Date: _____

Appendix I: Structured Questionnaire

Structured Questionnaire

--	--	--

Date of Interview: _____

Barangay : _____

Thank you very much for agreeing to participate in this interview. As you know I am interested in finding out how you feed your baby.

I. FEEDING PRACTICES

1. How did you feed (name of youngest) after birth? (Papaano ninyo pinakain ang iyong bunsong anak pagkapanganak?)

- 1 breastfeeding (pagpapasuso)
- 2 bottlefeeding (gatas sa bote)

(for those breastfeeding proceed to question 3, for those bottle feeding proceed to question 2)

2. Did you give your breast at all to your baby (Pinasuso mo ba ang iyong sanggol maliban sa bote)?

- 1 yes (Oo)
 - 2 no (hindi)
- (proceed to question 4)

3. When did you first give your baby drinks other than breastmilk?
(Kailan mo inumpisahang bigyan ng maininom maliban sa iyong gatas ang iyong anak?)

- 1 1 month(1 buwan)
- 2 2 months(2 buwan)
- 3 3 months (3 buwan)
- 4 4 months(4 buwan)
- 5 5 months (5 buwan)
- 6 6 months (6 buwan)
- 7 others, specify(Iba pa, banggitin)

4. When did you first give your baby foods other than breastmilk /formula/milk?
(Kailan mo inumpisahan bigyan ng pagkain maliban sa iyong gatas o gatas sa lata/carton ang iyong anak?)

- 1 1 month (1 buwan)
- 2 2 month (2 buwan)
- 3 3 month (3 buwan)
- 4 4 months (4 buwan)
- 5 5 months(5 buwan)
- 6 6 months(6 buwan)
- 7 others, specify(iba pa, banggitin)

5. At present, are there any food you withhold feeding your baby ? (May mga pagkain ba na hindi mo pinapakain sa iyong sanggol?)

1 yes(Oo) 2 no (hindi)

6.a. What are these foods that you do not give your baby? (Ano ang mga pagkaing hindi mo ibinibigay sa iyong anak?)

6.b. Why do you do this? (Bakit hindi mo ipinapakain ang mga ito?)

7. Are there any food you are not giving your baby when he is sick? (May mga pagkain ba na hindi mo binibigay sa iyong anak kung siya ay may sakit?)

1 yes (Oo) 2 no (hindi)

7.a. What are these foods that you are not giving him? (Ano ang mga pagkaing ito na hindi mo ipinapakain sa kanya?)

7.b. Why do you do this practice?(Bakit mo ito ginagawa?)

8.a Is your baby getting any breastmilk now? (Pinapasuso mo pa ba ang iyong anak hanggang ngayon?)

1 yes (Oo) 2 no (hindi)

(If yes, proceed to question 8.d, if no, proceed to question 8.b and 8.c)

8.b. If no, what milk are you giving your baby now? (Kung hindi anong gatas ang binibigay mo sa iyong sanggol sa kasalukuyan?)

- ₁ condensed milk(condesada) ₂ evaporated milk (evaporada)
- ₃ powdered milk ("powdered") ₄ infant formula (gatas para sa sanggol)
- ₅ others, specify (iba pa banggitin) _____
- ₆ none

(If none proceed to question 9.a)

8.c. At present, when do you give foods to your baby? (Kailan mo binibigyan ng pagkain ang iyong sanggol?) **(Choices will be read)**

- ₁ before bottle feeding (baga magsuso sa bote)
- ₂ after bottlefeeding(pagkatapos magsuso sa bote)
- ₃ instead of bottle feeding(sa halip na magsuso sa bote)

(proceed to 9.a)

8.d. At present, when do you give foods to your baby? (Kailan mo binibigyan ng pagkain maliban sa iyong gatas sa iyong sanggol?)

- ₁ before breastfeeding (bago magpasuso)
- ₂ after breastfeeding (pagkatapos magpasuso)
- ₃ instead of breastfeeding (sa halip na magpasuso)

8.e. Sometimes babies change their breastfeeding pattern when they start to eat solids. How would you describe your baby's breastfeeding pattern now that he is given foods other than milk? (Kung minsan nagiiba ang pagsususo ng sanggol kung ito ay naguumpisa nang kumain. Papaano mo idescribe and pagbabagong ito?)

- ₁ breastfeeding more (mas malakas magsuso)
- ₂ the same as before (tulad ng dati)
- ₃ breastfeeding less (huminang magsuso)

9.a. Have you ever given your baby iron supplements? (Nagbibigay ka ba ng gamot na may yero sa iyong sanggol?)

₁ yes (Oo) ₂ no (hindi)

9.b. If yes, when was your baby first given iron supplements?(Kung Oo, kailan ito unang nabigyan ng gamot na may yero?)

₁ less than 1 month (kulang sa isang buwan) ₂ 1-3 months(1-3buwan)

₃ 4-6 months (4-6 buwan) ₄ 7-9 months (7-9 buwan)

₅ 10- 11 months (10-11 months)

9.c. Do you give your baby iron supplements now? (Binibigyan mo ba ng gamot na may yero ang iyong sanggol sa kasalukuyan?)

₁ yes (Oo) ₂ no (hindi)

(If no proceed to question 10)

9.d. How often do you give your baby iron supplements?(Gaano kadalas ninyo binibigyan ng gamot na may yero ang iyong sanggol?)

₁ once a day(isang bese sa isang araw) ₂ three times a week (tatlong beses sa isang linggo)

₃ once a week(isang beses sa isang linggo) ₄ others, please specify(iba pa, banggitin)

10. Now, I am interested to know all the foods and drinks together with breastmilk/formula/milk you gave [name] all day yesterday, from midnight to midnight. (Ngayon naman, interesado akong malaman kung ano ang mga pagkain at maiimon pati na ang gatas mo/ formula/o iba pang gatas na ibinigay mo sa iyong anak boung araw kahapon, mula hatinggabi hanggang hatinggabi) (24 Hour Dietary Recall)

(Information provided will be recorded in a separate sheet)

12. I am interested to know the different types of food you are giving your baby. I am giving you a list of foods and tell me if you gave this foods to your baby in the past week. (Interesado kong malaman ang klase ng mga pagkain na pinapakain mo sa iyong anak. Magbabangit ako ng mga pagkain at sabihin mo kung pinakin mo ang mga ito sa kanya noong nakaraang linggo). **(Food Diversity)**

(Information provided will be recorded in a separate sheet)

II. FOOD AND NUTRITION KNOWLEDGE

I am also interested to know some of your knowledge on food and nutrition.

Just say if you agree, disagree or have no opinion on the following statements.

1. It is not important to give growing children foods like meat, fish , chicken and eggs because they already get enough of protein from milk (Hindi mahalagang bigyan ng karne, isda, manok at itlog and mga lumalaking bata dahil meron na silang sapat na protina mula sa gatas.)

₃ agree (sang-ayon) ₂ disagree (di sang-ayon)
₁ no opinion (walang opinyon)

2. Feeding the child variety of foods reduces his/her chances of getting sick. (Nababawasan ang tyansa ng bata na magkakasakit kung ito ay pinapakain ng iba-ibang klase ng mga pagkain).

₃ agree (sang-ayon) ₂ disagree (di sang-ayon)
₁ no opinion (walang opinyon)

3. When children have enough food to satisfy their appetites, their diets are certain to be nutritious (Kung ang mga bata ay may madaming pagkain para mabusong, nangangahulugan na ang kanilang pagkain ay masustansiya)

₃ agree (sang-ayon) ₂ disagree (di sang-ayon)
₁ no opinion (walang opinyon)

4. Healthy, active young children need foods such as rice, bread, rootcrops margarine, lard and the like everyday for their energy needs (Ang mga mululusog at aktibong bata ay nangangailangan ng karbohydrata at taba tulad ng kanin, tinapay, laman lupa tulad ng kamote, ubi, margarine, mantika at iba pa araw-araw para sa lakas na kailangan nila.)

₃ agree (sang-ayon) ₂ disagree (di sang-ayon)

₁ no opinion (walang opinyon)

5. It doesn't matter what the child eats as long as they get enough milk (Hindi mahalaga kung ano ang kinakain ng bata basta binibigyan sila ng sapat na gatas)

₃ agree (sang-ayon) ₂ disagree (di sang-ayon)

₁ no opinion (walang opinyon)

6. It is dangerous to feed a child a variety of foods because you might give the wrong food combinations and he/she will get sick, e.g chicken & squash, milk & fish, juices & milk. (Delikado ang pagpapakain ng sari-raing pagkain sa bata dahil baka mabigyan ito ng maling kombinasyon tulad ng manok at kalabasa, gatas at isda, gatas at juices at baka siya ay magkasakit.)

₃ agree (sang-ayon) ₂ disagree (di sang-ayon)

₁ no opinion (walang opinyon)

7. Rice porridge should be the only food given to growing infants because this can easily be digested. (Dapat na lugaw lang ang ipapakain sa lumalaking sanggol dahil ito ay madaling tunawin.)

₃ agree (sang-ayon) ₂ disagree (di sang-ayon)

₁ no opinion (walang opinyon)

8. A child who eats regularly gets all the nutrients he/she needs (Nakukuha ng bata ang lahat ng sustansiyang kailangan niya kung ito ay kumakain ng regular).

₃ agree (sang-ayon) ₂ disagree (di sang-ayon)

₁ no opinion (walang opinyon)

9. If there is not much iron in the diet, an infant is more likely to get sick (Madaling magkasakit and batang hindi sapat sa yero ang kinakain).

₃ agree (sang-ayon) ₂ disagree (di sang-ayon)

₁ no opinion (walang opinyon)

10. It is better not to feed children with milk and fruit juices in the same meal (Mas mabuting hindi pagsabaying painumin ng gatas at fruit juices ang bata sa iisang kainan).

₃ agree (sang-ayon) ₂ disagree (di sang-ayon)

₁ no opinion (walang opinyon)

11. Dark green and yellow vegetables are good for children because they help maintain normal eyesight (Ang mabeberde at madidilaw na gulay ay makabubuti sa mga bata dahil ito ay nakakatulong sa kanilang normal na paningin).

₃ agree (sang-ayon) ₂ disagree (di sang-ayon)

₁ no opinion (walang opinyon)

12. Foods fortified with iron and vitamin A like noodles, cheeses, milk, hotdogs, sardines biscuits, juices and chocolate drinks should also be provided in the diets of children (Ang mga pagkaing "fortified" ng yero at binamina A tulad ng noodles, cheese, gatas hotdog, biscuit, sardines, juice, "chocolate drink" ay dapat isama sa mga ipinapakain sa mga bata).

₃ agree (sang-ayon) ₂ disagree (di sang-ayon)

₁ no opinion (walang opinyon)

Total correct score _____

PARTICIPATION IN NUTRITION EDUCATION ACTIVITIES

I am interested in any nutrition education activities you might have participated in.

1. Are you attending nutrition education activities (Sumasali ba kayo sa mga "nutrition education" na aktibidades) ?

- ₁ yes (Oo)
- ₂ no(hindi)

(If yes, proceed to question 2)

2. Have you attended any of the following (Sumasali ba kayo sa mga sumusunod)?

- ₁ Mothers' nutrition classes
- ₂ Individual Health Teachings
- ₃ Bench conference
- ₄ Household teachings
- ₅ others, specify

IV. MATERNAL ATTITUDE

1. What are the two things you consider most when you plan meals? (Ano sa mga sumusunod ang pinakamahalaga sa iyo kung nagplaplano kayo ng pagkain para sa iyong pamilya?) (Please say which is first most, then second most) (Pakisabi ang una at pangalawang pinakamahalaga sa inyo)

- ₁ preference of the child (gusto ng anak)
- ₂ preference of the father(gusto ng ama)
- ₃ nutritional needs of the family(sustansiyang kailangan ng pamilya)
- ₄ ease of preparation and cooking(ginhawa sa paghahanda at pagluluto)
- ₅ budget (pera)
- ₆ own preference (sariling kagustuhan)
- ₇ others, specify,(iba pa banggitin) _____

1st mos

2nd mc

2. How important is planning meals to include variety of foods to you? (Gaano ka kahalaga sa iyo ang magpapalano ng sari-saring pagkain ihahanda ?)

- ₁ not important (hindi mahalaga) ₂ important (mahalaga)
₃ very important (napakahalaga)

3. How important is feeding your children a variety of foods everyday (Gaano kahalaga ang pagbibigay ng sari-saring pagkain sa iyong anak araw- araw)?

- ₁ not important (hindi mahalaga) ₂ important (mahalaga)
₃ very important (napakahalaga)

4.a Do find it difficult to prepare and cook meals for your family (Nahihirapan ka ba sa paghahanda at pagluluto ng pagkain para sa pamilya mo)?

- ₁ yes ₂ no

4.b. If yes why do you say that? (Kung Oo, bakit mo ito nasabi?)

Lastly, I need to ask some questions about your family and yourself.

V. RESPONDENT'S PROFILE

1. How old is your youngest child now? (Ilan buwan na ang iyong bunso?)

- ₁ 9 months (9 buwan) ₂ 10months (10 buwan) ₃ 11 months (11 buwan)

2. Sex of your child (Kasarian ng iyong anak)

- ₁ male(lalaki) ₂ female(babae)

i. What is the birth position of your youngest child? (Pang-ilan ang iyong bunsong anak sa pamilya)

- | | | |
|--|---|--------------------------|
| <input type="checkbox"/> ₁ first child (panganay) | <input type="checkbox"/> ₂ second child (pangalawa) | <input type="checkbox"/> |
| <input type="checkbox"/> ₃ third child (pangatlo) | <input type="checkbox"/> ₄ fourth child (pangapat) | |
| <input type="checkbox"/> ₅ fifth child (panglima) | <input type="checkbox"/> ₆ others, specify (iba pa, banggitin) | |

4. May I ask your age? (Pwede bang malaman kung ilang taon na kayo?)

(record actual age) _____

5. What is your educational attainment (Ano ang iyong natapos na edukasyon)?

- | | |
|--|--------------------------|
| <input type="checkbox"/> ₁ some elementary | <input type="checkbox"/> |
| <input type="checkbox"/> ₂ elementary graduate - some high school | |
| <input type="checkbox"/> ₃ high school graduate - some college | |
| <input type="checkbox"/> ₄ college graduate | |
| <input type="checkbox"/> ₅ others, specify (iba pa banggitin) _____ | |

6. How much is your family monthly income? (Magkano ang buwanan kita ng iyong pamilya ?)

- | | | |
|--|--|--------------------------|
| <input type="checkbox"/> ₁ under P 1,000.00 | <input type="checkbox"/> ₂ P1, 000.00 – 2,499.00 | <input type="checkbox"/> |
| <input type="checkbox"/> ₃ P2,500.00 – 4,499.00 | <input type="checkbox"/> ₄ above P 4, 500.00 – 6,500.00 | |
| <input type="checkbox"/> ₅ above P6,500.00 | | |

7. How much do you spend for food in a week? (Magkano ang inyong ginagastos para sa pagkain sa isang linggo?)

- | | | |
|---|---|--------------------------|
| <input type="checkbox"/> ₁ less than P300.00 | <input type="checkbox"/> ₂ P300.00 – less than P500.00 | <input type="checkbox"/> |
| <input type="checkbox"/> ₃ P500.00 - less than P800.00 | <input type="checkbox"/> ₄ P800.00 - less than P1,000.00 | |
| | <input type="checkbox"/> ₅ more than P1,000.00 | |

How many other children do you have who are below 6 years old and are here with you?
(Ilan pang mga anak mo na wala pang anim na taon na kasama mo ngayon sa bahay?)

₁ 1 child-2 children (1-2 anak)

₂ 3-4 children (3-4 anak)

₃ more than 4 children
(higit sa 4 anak)

₄ none (wala)

How many are you in the household that normally (almost everyday) eat from your kitchen?(Ilan kayo sa pamilya na halos araw-araw kumakain sa iisang lutuan?)

₁ Less than 6 (kukang sa anim)

₂ 6 - 8 members (6-8 membro)

₃ more than 8 (higit sa 8)

Once again take you very much. I sincerely appreciate your co-operation and indulgence

1. Is the day typical?(Ito ba'y pangkaraniwang araw?) ___yes (Oo) ___ no
(Hindi). If no, why do say this?(Kung hindi, bakit ?) _____
_____.

2. Is the baby sick? (May sakit ba ang iyong bunso?)___yes(Oo) ___ no (wala)
 - 2.a If yes, did sickness affect his appetite?(Kung may sakit ito, may pagbabago ba sa kanyang ganang kumain?) _____yes (Oo) _____ no (wala)

 - 2.b If yes, how? (Kung Oo, papaano?) _____ increase (lumakas kumain)
_____decrease (huminang Kumain)

3. Is this a feast day? (May handaan bang naganap sa araw na ito?)
___yes (Oo) ___ no (wala)

FOOD DIVERSITY CHECKLIST

Respondent/Case No.

Food Group	Points	Maximum Points	Foods Eaten Last Week	Actual Score
Energy Giving Foods (Mga Pagkaing Tagapagbigay Lakas)		4		
Rice or its equivalent (kanin o katumbas nito)	1			
Camote or Potato (kamote o patatas)	1			
Sugar (asukal)	1			
Fats and oils (taba at mantika)	1			
Body Building Foods (Mga Pagkaing Tagapagbuo ng Katawan)		4		
Whole Milk (gatas)	1			
Fish, Meat, Poultry (isda, karne, manok)	1			
Eggs (itlog)	1			
Dried Beans or nuts or seeds (munggo, mani o mga katumbas nito)	1			
Body Regulating Foods (Mga Pagkaing Tagapagsaavos ng Katawan)		4		
Leafy Green and Yellow Vegetables (berde at madahon o dilaw na gulay)	1			
Vitamin C –Rich Foods (mga pagkaing sagana sa bitamina C)	1			
Other Fruits (iba pang prutas)	1			
Other Vegetables (iba pang gualy)	1			
TOTAL SCORE		12		

1. Is the week typical?(Ito ba'y pangkaraniwang linggo?) ___yes (Oo) ___no (Hindi). If no why do say this?(Kung hindi, bakit ?) _____
_____.

2. Is the baby sick? (May sakit ba ang iyong bunsong anak?) _____yes (Oo) _____no (Wala)

2.a If yes, did sickness affect appetite? (Kung may sakit ito, may pagbabago ba sa kanyang ganang kumain?) _____yes (Oo) _____no (wala)

2.b If yes how? (Kung Oo, papaano?) _____increase (lumakas kumain) _____decrease (huminang kumain)

3. Is this a feast week? (May mga handaan bang naganap sa linggong ito?) _____yes (Oo) _____no (wala)

**Appendix J: Letter of Research Approval
From the Mayor of Solana**



Republic of the Philippines
Province of Cagayan
Municipality of Solana

OFFICE OF THE MUNICIPAL MAYOR

June 20, 2000

Mrs. MARIA GISELA LONZAGA
Institute of Food, Nutrition and Human Health
Massey University
Palmerston North, New Zealand

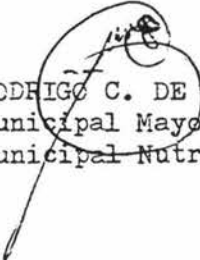
Dear Mrs. Lonzaga,

Anent your letter dated 27 December 1999 requesting permission to conduct your masteral research in our municipality particularly in the barangays, I wish to inform that I have approved your request as I have said to you when we had a meeting on 27 December 1999.

I believe that the results of your study will be of help in improving the nutrition situation in our municipality.

Please be informed too that the Municipal Nutrition Committee of Solana in which I am the Chairman, and the Barangay Nutrition Committees will give you all the support and assistance you need in the conduct of your research.

Very truly yours,


RODRIGO C. DE ASIS
Municipal Mayor & Chairman
Municipal Nutrition Committee

**Appendix K: Letter of Research Approval From
the Municipal Health Officer of Solana**

MUNICIPAL HEALTH OFFICE

Municipality of Solana

Solana, Cagayan

Philippines

19 June 2000

Mrs. Maria Gisela Lonzaga

Institute of Food, Nutrition, & Human Health

Massey University

Palmerston North, New Zealand

Dear Mrs. Lonzaga:

This is to inform you that I have approved your request to conduct your research in the barangays of Solana, Cagayan. I also wish to inform you that you are granted the permission to have an access to the general list of mothers with 9-11 months infants from the Barangay Health Centers (Community Health Centers).

Please know too that the Municipal Nutrition Committee in which I am the Municipal Nutrition Action Officer is glad to support and extends its assistance to you in the conduct of your research. The Midwives and the Barangay Nutrition Scholars will be in the barangays to assist you.

With best wishes!

Very truly yours,



ANASTACIA TAGUBA, MD

Municipal Health Officer & Municipal

Nutrition Action Officer

Appendix L: Descriptive Tables

Table L.1 Distribution of Participants Per Barangay

Barangay	Frequency	Percent
Nangalisan	6	5.0
Cattaran	13	10.8
Lingu	13	10.8
Natappian East	12	10.0
Maguirig	11	9.2
Basi East	8	6.7
Parog-Parog	5	4.2
Natappian West	9	7.5
Lanna	7	5.8
Bangag	14	11.7
General Balao	8	6.7
Dassun	14	11.7
Total	120	100

Table L.2 Mothers' Feeding Method After Giving Birth

Feeding Method	Frequency	Percent
Breastfeeding	105	87.5
Bottlefeeding	15	12.5
Total	120	100

Table L.3 Distribution of Bottlefeeding Mothers Shifting to Breastfeeding

Shifted to Breastfeeding	Frequency	Percent
Yes	13	86.7
No	2	13.3
Total	15	100

Table L.4 Distribution of Mothers Who are Still Breastfeeding Infants 9-11 Months

Mothers Who are Still Breastfeeding	Frequency	Percent
Still breastfeeding	106	89.8
Stopped breastfeeding	12	10.2
Total	118	100

Table L.5 Type of Milk Fed To Bottlefed Infants

Type of Milk	Frequency	Percent
Powdered Milk	6	42.9
Infant Formula	8	57.1
Total	14	100

Table L.6 Month Infant was First Provided Drinks Other Than Breastmilk to Those Exclusively Breastfed at Birth

Month Infant was Provided Drinks	Frequency	Percent
First month	16	15.2
Second month	14	13.3
Third month	12	11.4
Fourth month	40	38.1
Fifth month	15	14.3
Six month	4	3.8
Others (seventh & eighth month)	4	1.8
Total	105	100

Table L.7 Month Infant was First Provided "Solid" Foods

Month Infant was First Provided Foods	Frequency	Percent
Third month	10	8.3
Fourth month	45	37.5
Fifth month	31	25.8
Sixth month	21	17.5
Others (seventh & eighth month)	13	10.8
Total	120	100

Table L.8 Time Foods are Given to Breastfed Infant at 9-11 Months of Age

Time	Frequency	Percent
Before breastfeeding	61	57.5
After breastfeeding	45	42.5
Total	106	100

Table L.9 Time Foods are Given to Bottlefed Infants at 9- 11Months of Age

Time	Frequency	Percent
Before bottlefeeding	12	85.7
After bottlefeeding	2	14.3
Total	14	100

Table L.10 Distribution of Mothers Withholding Food to Their Infants

Mothers Withholding Foods to Their Infants	Frequency	Percent
Withholding foods	55	45.8
Not withholding foods	65	54.2
Total	120	100

Table L.11 Distribution of Mothers Withholding Foods to Their Sick Infants

Mothers Withholding Foods to Their Sick Infants	Frequency	Percent
Withholding foods	31	25.8
Not withholding foods	89	74.2
Total	120	100

Table L.12 Maternal Nutrition Knowledge Score Tertiles

Nutrition Knowledge Score Tertiles	Frequency	Percent
Bottom tertile (NK = 3-6)	27	22.5
Middle Tertile (NK =7- 8)	42	35.0
Upper Tertile (NK = 9-12)	51	42.5
Total	120	100

Table L.13 Maternal Nutrition Knowledge Test Results by Item

Question	Correct Answer	Mothers' Answers (%) N = 120		
		Percent Correct	Percent Incorrect	No Opinion
1. It is not important to give growing children foods like meat, fish, chicken, and eggs because they already get enough of protein from milk.	Disagree	65%	35%	0
2. Feeding the child variety of foods reduces his/her chances of getting sick.	Agree	83.3%	16.7%	0
3. When children have enough food to satisfy their appetites, their diets are certain to be nutritious.	Disagree	28.3%	70.8%	0.8%
4. Healthy active young children need foods such as rice, bread, root crops, margarine, lard and the like, everyday for their energy needs.	Agree	97.5%	2.5%	0
5. It doesn't matter what the child eats as long as they get enough milk.	Disagree	40.8%	58.3%	0.8%
6. It is dangerous to feed a child a variety of foods because you might give the wrong food combinations and he/she will get sick, eg. chicken and squash, milk and fish, juices and milk.	Disagree	51.7%	48.3%	0
7. Rice porridge should be the only food given to growing infants because this can easily be digested.	Disagree	72.5%	27.5%	0
8. A child who eats regularly gets all the nutrients that he/she needs.	Disagree	22.5%	75.8%	1.7%
9. If there is not much iron in the diet, an infant is more likely to get sick.	Agree	85.8%	14.2%	0
10. It is better not to feed children with milk and juices in the same meal.	Disagree	45%	54.2%	0.8%
11. Dark green yellow vegetables are good for children because they help maintain normal eyesight.	Agree	96.7%	2.5%	0.8%
12. Foods fortified with iron and vitamin A like noodles, cheeses, milk, hotdogs ,chips, sardines, biscuits juices and chocolate drinks should also be provided in the diets of children.	Agree	97.5%	2.5%	0%

Table L.14 Infants' Food Diversity Score Tertiles

Food Diversity Score Tertiles	Frequency	Percent
Bottom Tertile (FDS = 3-6)	29	24.17
Middle Tertiles(FDS =7-8)	61	50.83
Upper Tertile (FDS = 9-12)	30	25.00
Total	100	100

Table L.15 Infant's Iron Intake Tertiles

Group Intake	Frequency	Percent
0 – 0.75 mg/day	38	31.7
0.76 - 1.85 mg/day	43	35.8
1.86 – 11.7 mg/day	39	32.5
Total	120	100

Table L.16 Distribution of Infants Ever Given Iron Supplements

Mothers That Ever Given Iron Supplements	Frequency	Percent
Ever Given Iron Supplements	73	60.8
Did not give iron supplements	47	39.2
Total	120	100

Table L.17 Month Infant was First Given Iron Supplement

Month Infant was First Given Iron Supplement	Frequency	Percent
Less than 1 month	1	1.4
1-3 months	9	12.3
4-6 months	46	63
7-9 months	17	23.3
Total	73	100

Table L.18 Distribution of Infants Still Provided with Iron Supplements

Provision Of Iron Supplements	Frequency	Percent
Infants still given with iron supplements	18	15.0
Infants no longer given iron supplements	102	85.0
Total	120	100